

ADDENDUM TRAFFIC IMPACT STUDY

**SECTION OF LOTS 7,8 AND 9, CONCESSION 10
TOWNSHIP OF PUSLINCH
COUNTY OF WELLINGTON**

PREPARED FOR:

**TIMBERWORX CUSTOM HOMES INC., SLOOT
CONSTRUCTION LTD., JOHN SLOOT
INVESTMENTS LTD.**

PREPARED BY:

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FEBRUARY 2026

CFCA FILE NO. 2433-6646

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Revision Number	Date	Comments
Rev.0	March 2024	Issued for 1 st Submission
Rev.1	August 2025	Issued for 2 nd Submission
Rev.2	February 2026	Issued for 3 rd Submission

EXECUTIVE SUMMARY

C.F. Crozier & Associates Inc. (Crozier) was retained by Timberworx Custom Homes Inc., Sloot Construction Ltd., John Sloot Investments Ltd. to undertake a Traffic Impact Study in support of the Zoning By-Law Amendment application for the property located on sections of Lots 7, 8 and 9 of Concession 10, in the Township of Puslinch, County of Wellington. The purpose of the study is to assess the impacts of the proposed development on the boundary road network and to recommend required mitigation measures, if warranted. This study has been completed in accordance with the County of Wellington's Traffic Impact Study Guidelines (2021).

A Traffic Impact Study and an Addendum Traffic Impact Study were previously prepared in March 2024 and August 2025, respectively. The addendum herein, addresses the Town staff comments on previous submission.

As illustrated on the conceptual site plan prepared by Stovel and Associates Inc. dated July 2025, the development proposal includes the following:

- Forty-four (44) Single detached residential properties.
- Associated internal roads.
- Proposed Site Accesses via Watson Road South and Arkell Road

The trip generation and traffic operations analysis summarized herein are based on an older site plan which had 50 residential properties. However, this was conservatively maintained as no material change in transportation operations or recommendations is expected.

Under 2023 existing traffic conditions, the study intersection of Arkell Road and Watson Road South is operating below capacity with minimal delay during both weekday a.m. and p.m. peak hours. The study intersections include Arkell Road and Watson Road South and the proposed access connection to Watson Road South.

The proposed development is expected to generate 40 and 52 two-way primary trips in the a.m. and p.m. peak hours, respectively.

Under the ultimate 2031 future total conditions,

- the all-way stop-controlled intersection of Arkell Road and Watson Road South is projected to operate below capacity at a LOS "A" and "B" during the weekday a.m. and p.m. peak hours, respectively. Average intersection control delays of 9.5 and 14.3 seconds in the a.m. and p.m. peak hours, respectively and maximum volume-to-capacity ratios of 0.27 (EB) and 0.54 (NB) are expected in the weekday a.m. and p.m. peak hours, respectively.
- The proposed site access connection at Watson Road South is forecast to operate at a LOS "A" and "B" during the a.m. and p.m. peak hours, respectively.
- The proposed site access connection at Arkell Road is forecast to operate at a LOS "A" during both a.m. and p.m. peak hours, respectively.
- Overall, the nearby road network is projected to operate adequately without any capacity constraints under the ultimate 2031 future total scenario. The nearby road network is expected to operate similarly or better under the 2026 horizon year.

- These operations are similar to the 2031 and 2026 Future Background traffic operations. Therefore, operations are expected to be similar with or without the proposed development.

The proposed access connections to Watson Road South and Arkell Road are satisfactory per the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR) with regards to sight distance, access spacing, corner clearance and Transport Canada's Grade Crossing Standards with regards to access spacing.

Based on the study findings, the development application can be supported from a traffic operations perspective as the nearby road network can accommodate the increase in traffic volumes attributable to the proposed development located on sections of Lots 7, 8 and 9 of Concession 10, in the Township of Puslinch, County of Wellington.

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1.0 INTRODUCTION

C.F. Crozier & Associates Inc. (Crozier) was retained by Timberworx Custom Homes Inc., Sloot Construction Ltd., John Sloot Investments Ltd. to undertake a Traffic Impact Study in support of the Zoning By-Law Amendment application for the property located on sections of Lots 7,8 and 9 of Concession 10, in the Township of Puslinch, County of Wellington. The purpose of the study is to assess the impacts of the proposed development on the boundary road network and to recommend required mitigation measures, if warranted.

The Traffic Impact Study assesses the impacts of the proposed development on the boundary road network and recommends required mitigation measures as warranted. In accordance with the procedures set out in the County of Wellington's Traffic Impact Study Guidelines (2021), a Traffic Impact Study and an Addendum Traffic Impact Study were previously prepared in March 2024 and August 2025, respectively. The addendum herein, addresses the Town staff comments on previous submission. The terms of reference correspondence and Town staff comments on previous submission are included in **Appendix A**.

2.0 DEVELOPMENT PROPOSAL

As illustrated on the conceptual site plan prepared by Stovel and Associates Inc. dated July 2025, the development proposal includes the following:

- Forty-four (44) Single detached residential properties.
- Associated internal roads.
- Proposed Site Accesses via Watson Road South and Arkell Road

Refer to **Appendix B** for the Site Plan.

3.0 EXISTING CONDITIONS

This section outlines the current conditions of the transportation network in the vicinity of the subject site. Details of the study road network, including traffic controls, lane configurations, speed limits, active transportation infrastructure and other relevant transportation elements are identified.

3.1 Development Lands

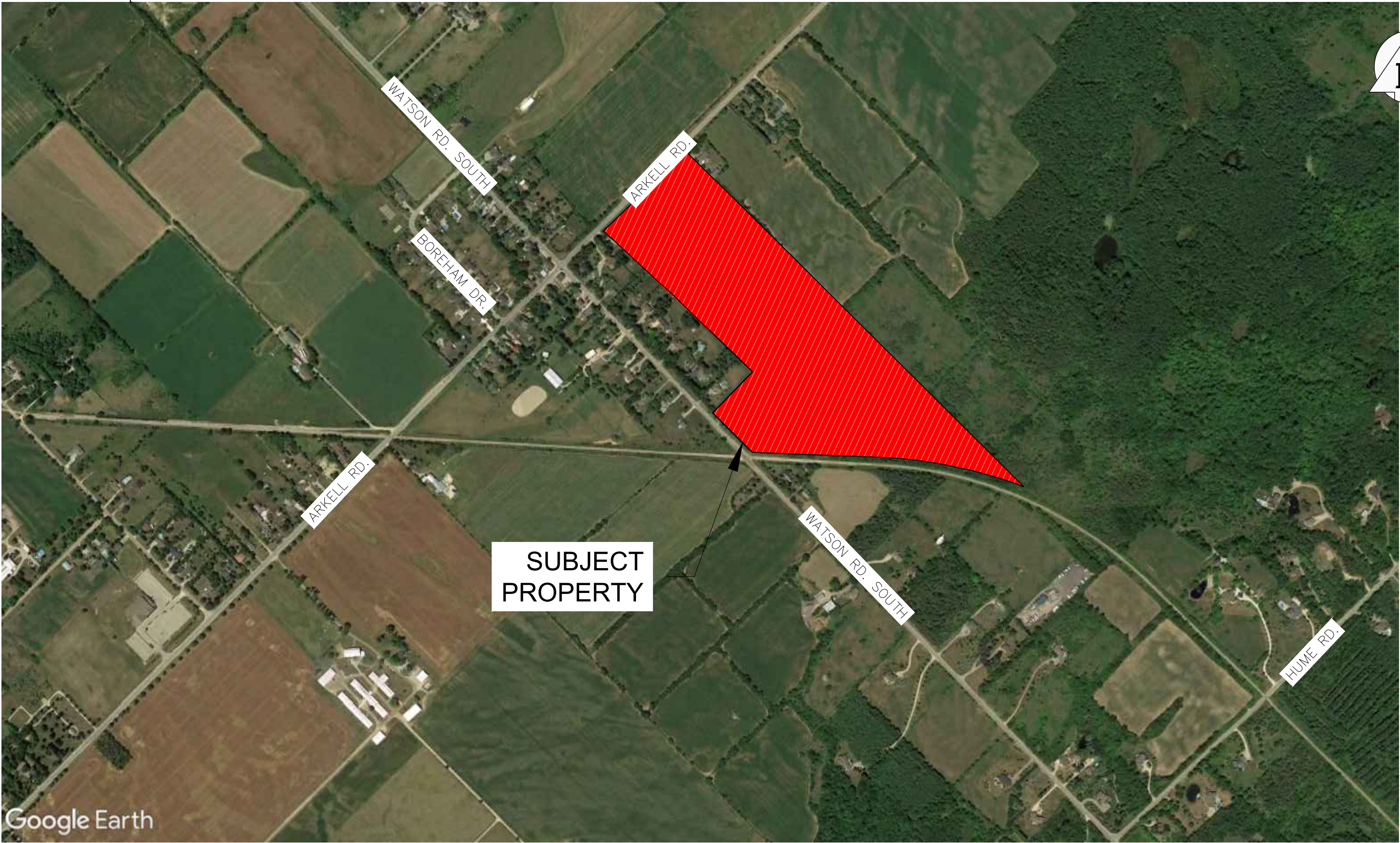
The subject lands cover an area of approximately 17 ha and currently consists of agricultural/vegetated land. The property, located on the northeast corner of the intersection at Arkell Road and Watson Road South, is bounded by a residential property to the west, agricultural/vegetated lands to the north, the Guelph Junction Railway to the east, and Watson Road/residential properties to the south. The site location and surrounding area are illustrated in **Figure 1**.

3.2 Study Area

The Traffic Impact Study analyzes the following study intersections as confirmed with Town of Puslinch and County of Wellington staff (refer to **Appendix A**).

- Watson Road South and Arkell Road
- Proposed Site Accesses via Watson Road South and Arkell Road

Details of the boundary road network is provided in **Section 3.3**.



TIMBERWORX CUSTOM HOMES
PARTS OF LOTS 7 & 8, CONCESSION 10
TOWNSHIP OF PUSLINCH

SITE LOCATION



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Drawn	R.L.	Design	Project No.	2433-6646
Date	08/05/2025	Check	Scale	Dwg.
		M.I.	N.T.S.	FIG. 1

3.3 Boundary Road Network

The boundary road network is described in **Table 1** below.

Table 1: Boundary Road Network

Feature	Roadway	
	Arkell Road	Watson Road South
Alignment	Two-Way (North-South)	Two-Way (East-West)
Classification ¹	Collector	Collector
Jurisdiction	County of Wellington	Town of Puslinch
Speed Limit	50 km/h	50 km/h
Pedestrian Facilities	Yes (Only available on the east side, north of Watson Road)	None
Cycling Facilities	None	None

Table 2 outlines the existing traffic control, configurations, at the study intersections on the boundary road network.

Table 2: Study Intersections

Intersection	Control	App. ¹	Major Street	Lane Configurations
Arkell Road and Watson Road South	All-Way Stop	4	Arkell Road	EBLTR; WBLTR; NBLTR; SBLTR

Note 1: App. - number of approaches for a given intersection.

Figure 2 illustrates the existing boundary road network, including lane configurations, lane storage lengths, and intersection control.

3.4 Existing Active Transportation Network

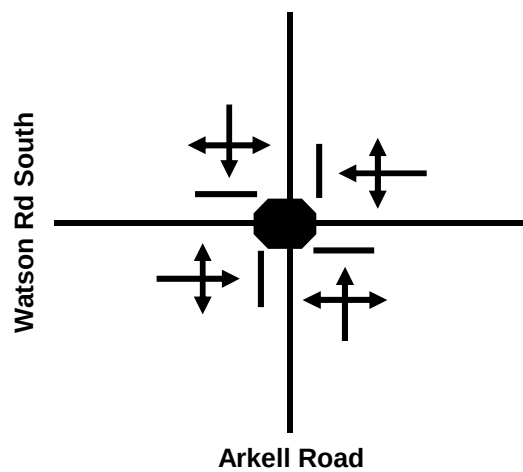
Sidewalks are available on the east side of Arkell Road, south of the intersection of Arkell Road and Watson Road, no cycling facilities exist on the boundary roads near the site.

3.5 Existing Transit Services

Given the rural nature and largely undeveloped surrounding lands, there are no transit services available within the study area currently.

3.6 Traffic Data

Turning movement counts (TMC) were collected at the study intersection from 7:00 a.m. to 7:00 p.m. on Thursday, July 28, 2022, by Wellington County. The traffic count data is summarized in **Appendix C**. 2023 existing traffic volumes were derived by applying annual growth rate of 2% to 2022 volumes. **Figure 3** illustrates the 2023 existing traffic volumes.



Legend

xx A.M. Peak Hour Traffic Volumes
 (xx) P.M. Peak Hour Traffic Volumes
 {xx} Weekend Peak Hour Traffic Volumes

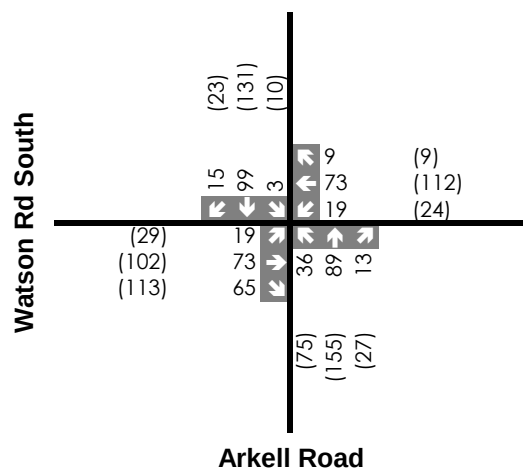
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Boundary Road Network



Figure 2

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 Analyst. Parth Bhatt



Legend

xx A.M. Peak Hour Traffic Volumes
 (xx) P.M. Peak Hour Traffic Volumes
 {xx} Weekend Peak Hour Traffic Volumes

Arkell Developments

Existing Traffic Volumes



Figure 3

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 Date. 45321
 Analyst. Parth Bhatt

3.7 Traffic Modeling

Synchro software (Version 11) was used for the intersection capacity and queueing analysis. Capacity Analysis per the general guidelines from the County and Town were used for the study intersections. All parameters for the intersection analysis were based on the Synchro default values.

The intersection assessment is based on the method outlined in the "Highway Capacity Manual, 2010" using Synchro modelling software. Intersections are assessed using a Level of Service metric, with ranges of delay assigned a letter from "A" to "F." For stop-controlled intersections, a Level of Service "A" or "B" would typically be measured during off-peak hours when lesser traffic volumes are on the roadways. Levels of Service "C" through "F" would typically be measured in the commuter peak hours when more significant vehicle volumes cause longer travel times. The Level of Service (LOS) definitions for signalized and stop control intersections are included in **Appendix D**.

3.8 Intersection Operations

The traffic operations at the study intersections were analyzed based on the 2023 existing traffic volumes illustrated in **Figure 3**. Detailed capacity analysis worksheets are included in **Appendix E. Table 4** outlines the 2023 existing traffic operations.

Table 4: 2023 Existing Traffic Operations Summary

Intersection	Control	Peak Hour	Level of Service ¹	Control Delay	v/c ratio ²	95 th Percentile Queue Length > Storage Length
Arkeil Road and Watson Road South	All-Way Stop	A.M.	A	8.8s	0.21 (EB)	None
		P.M.	B	11.4s	0.42 (NB)	None

Note 1: Level of Service – The Level of Service (LOS) of a signalized intersection is based on the average control delay per vehicle. The LOS of unsignalized intersection is based on the critical control delay per approach.

Note 2: The critical v/c ratio is considered to be the maximum v/c ratio for movements at the intersection where the maximum v/c ratio does not exceed the critical thresholds.

As outlined in **Table 4**, under the 2023 existing conditions scenario, the all-way stop-controlled intersection of Arkeil Road and Watson Road South is operating below capacity at a Level of Service (LOS) "A" and "B" during the weekday a.m. and p.m. peak hours, respectively. The average intersection control delay is 8.8s and 11.4s in the weekday a.m. and p.m. peak hours, respectively, and the maximum volume-to-capacity ratios are 0.21 (EB) and 0.42 (NB) in the weekday a.m. and p.m. peak hours, respectively.

4.0 FUTURE BACKGROUND CONDITIONS

This section summarizes the future background conditions of the study road network and provides details relating to growth rates, future transportation network improvements, and background developments within the study area.

4.1 Study Horizons

As confirmed through Terms of Reference correspondence, the full buildout year as well as five years beyond buildout is required, consistent with the County guidelines. Therefore, the 2026 horizon year (anticipated full buildout year) as well as 2031 were selected to assess future operations of the boundary road network.

4.2 Future Roadway Improvements

Currently, there are no planned improvements to roadway network within the study area. Therefore, the future background and future total analysis herein assumes the existing roadway configurations in the 2026 and 2031 horizon years.

4.3 Growth Rate

The Town recommended annual growth rate of 2%, compounded annually, was applied to all movements.

4.4 Background Developments

As confirmed by Town's staff, no background developments were identified in the vicinity of the site.

4.5 Intersection Operations

The traffic operations at the study intersections were analyzed based on the 2026 and 2031 future background traffic volumes illustrated in **Figures 4 and 5**. Detailed capacity analysis worksheets are included in **Appendix E. Tables 6 and 7** outline the 2026 and 2031 future background traffic operations.

Table 6: 2026 Future Background Traffic Operations

Intersection	Control	Peak Hour	Level of Service ¹	Control Delay	v/c ratio ²	95 th Percentile Queue Length > Storage Length
Arkell Road and Watson Road South	All-Way Stop	A.M.	A	9.0s	0.24(EB)	None
		P.M.	B	12.1s	0.46(NB)	None

Note 1: Level of Service – The Level of Service (LOS) of a signalized intersection is based on the average control delay per vehicle. The LOS of unsignalized intersection is based on the critical control delay per approach.

Note 2: The critical v/c ratio is considered to be the maximum v/c ratio for movements at the intersection where the maximum v/c ratio does not exceed the critical thresholds.

Table 7: 2031 Future Background Operations Summary

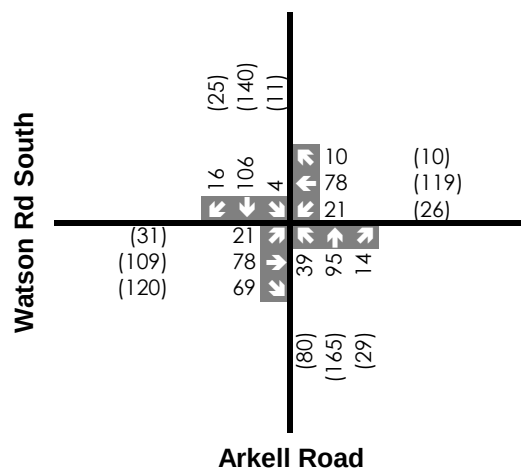
Intersection	Control	Peak Hour	Level of Service ¹	Control Delay	v/c ratio ²	95 th Percentile Queue Length > Storage Length
Arkell Road and Watson Road South	All-Way Stop	A.M.	A	9.3s	0.27(EB)	None
		P.M.	B	13.7s	0.53(NB)	None

Note 1: Level of Service – The Level of Service (LOS) of a signalized intersection is based on the average control delay per vehicle. The LOS of unsignalized intersection is based on the critical control delay per approach.

Note 2: The critical v/c ratio is considered to be the maximum v/c ratio for movements at the intersection where the maximum v/c ratio does not exceed the critical thresholds.

As shown in **Table 7**, under 2031 future background conditions, the all-way stop-controlled intersection of Arkell Road and Watson Road South is projected to operate below capacity at a LOS "A" and "B" during the weekday a.m. and p.m. peak hours, respectively. Average intersection control delays of 9.3 and 13.7 seconds in the a.m. and p.m. peak hours, respectively and maximum volume-to-capacity ratios of 0.27 (EB) and 0.53 (NB) are expected in the weekday a.m. and p.m. peak hours, respectively. The intersection is forecast to operate efficiently with reserve capacity to accommodate future increases in traffic volumes.

The study intersection is forecast to operate similarly or better under the 2026 future background compared to the 2031 future background. No traffic operation issues are forecast on the boundary road network.



Legend

xx A.M. Peak Hour Traffic Volumes
 (xx) P.M. Peak Hour Traffic Volumes
 {xx} Weekend Peak Hour Traffic Volumes

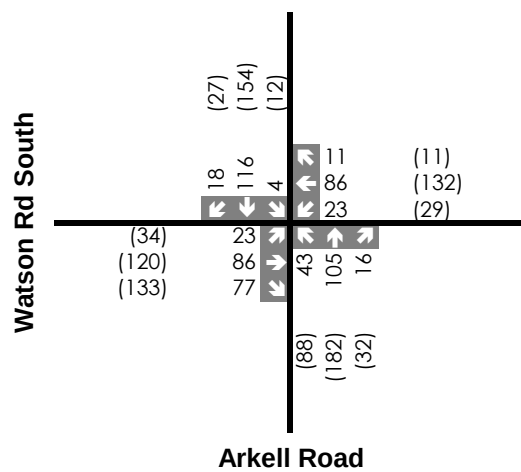
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2026 Future Background Traffic Volumes



Figure 4

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Legend

xx A.M. Peak Hour Traffic Volumes
 (xx) P.M. Peak Hour Traffic Volumes
 {xx} Weekend Peak Hour Traffic Volumes

Arkell Developments

2031 Future Background Traffic Volumes



Figure 5

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5.0 SITE GENERATED TRAFFIC

The proposed development will result in new traffic turning movements on the boundary road network that would otherwise not exist. This section presents the generated trips and trip assignment through the study intersections.

5.1 ITE Trip Generation

To forecast the trips generated by the development, the ITE Trip Generation Manual, 11th Edition was used. The ITE Trip Generation Manual is a compendium of industry collected trip generation data across North America for a variety of land uses and is used industry wide as a source for trip generation forecasts. Given the site location, the general urban/suburban setting was used; fitted curve estimates were used if available and deemed statistically valid per the ITE Trip Generation Manual (i.e., more than 20 data points and coefficient of determination $R^2 > 0.75$). The trips generated by the proposed development are presented in **Table 8**. It is noted that the trip generation is based on an older site plan which had 50 residential units. This was conservatively maintained as no material change in traffic operations or recommendations is expected.

Table 8: Total Site Generated Traffic

Land Use	Units	Peak Hour	Equation Used	Inbound	Outbound	Total
Single-Family Detached Housing (LUC 210)	50	A.M.	$\ln(T)=0.91*\ln(X)+0.12$	10 (25%)	30 (75%)	40
		P.M.	$\ln(T)=0.94*\ln(X)+0.27$	33 (63%)	19 (37%)	52

As shown in **Table 8**, the proposed residential development is expected to generate a total of 40 and 52 two-way trips in the a.m. and p.m. peak hours, respectively.

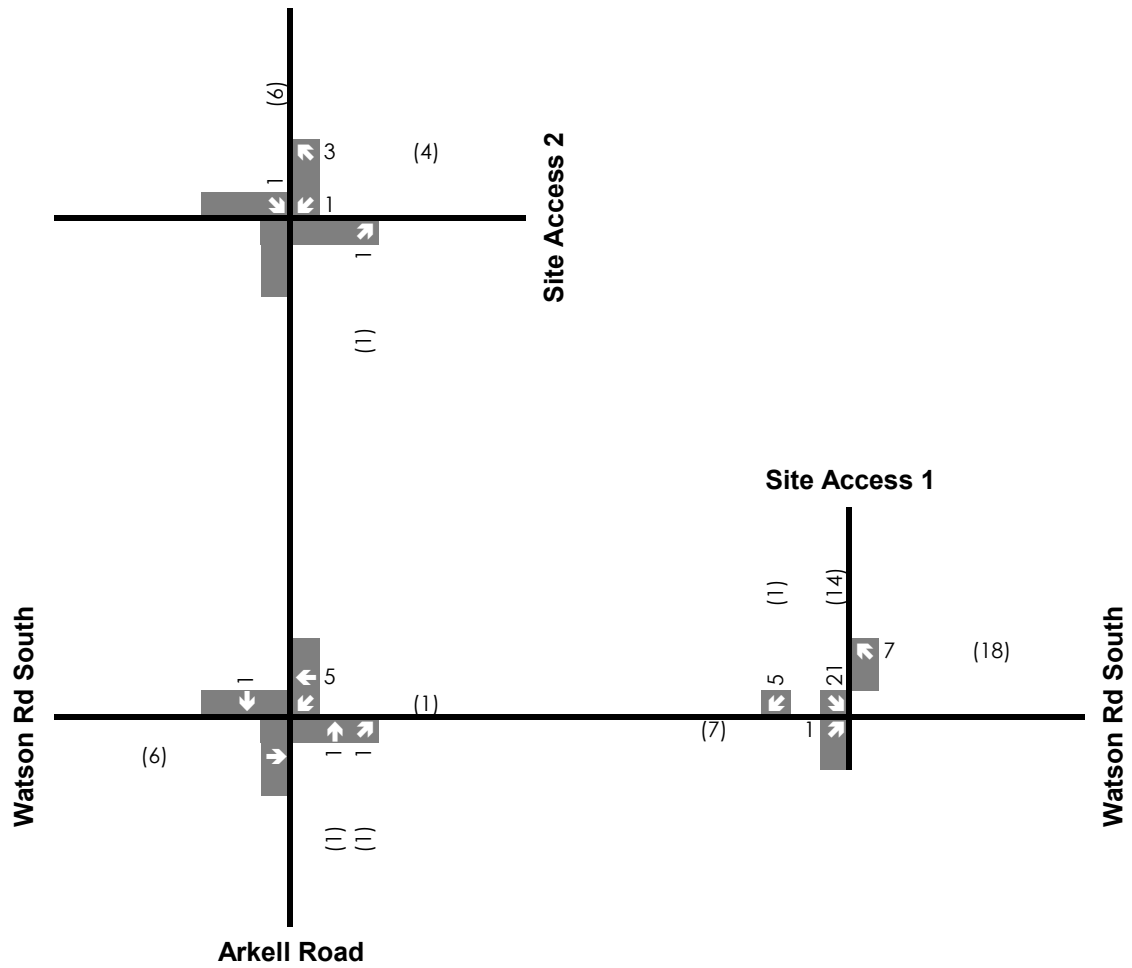
5.2 Trip Distribution and Assignment

The Transportation Tomorrow Survey (TTS) is a comprehensive travel data survey conducted in the Greater Toronto and Hamilton Area. Data from the 2016 TTS was used to determine the peak hour trip distribution at the site for the residential land use proposed at the site.

The inbound and outbound trip distributions were derived by filtering TTS data with a trip purpose of "Home", destined to and originating from the subject GTA Zone 8303. The A.M. and P.M. distributions were determined by filtering for trips starting during the periods of 6:30 A.M. – 9:30 A.M. and 3:30 P.M. – 6:30 P.M., respectively. **Appendix F** provides the TTS query used to determine the site trip distribution. **Table 9** summarizes the trip distribution at the site. **Figure 6** illustrates the trip assignment for the proposed development.

Table 9: Trip Distribution

Direction	A.M. Inbound	A.M. Outbound	P.M. Inbound	P.M. Outbound
Northwest	24%	18%	32%	40%
North	0%	0%	0%	0%
Northeast	0%	0%	7%	0%
East	0%	18%	15%	0%
Southeast	0%	0%	0%	0%
South	0%	0%	0%	0%
Southwest	38%	7%	12%	13%
West	38%	58%	35%	47%
Total	100%	100%	100%	100%



Legend

xx A.M. Peak Hour Traffic Volumes
(xx) P.M. Peak Hour Traffic Volumes

Arkell Developments

Trip Assignment



Figure 6

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6.0 TOTAL TRAFFIC CONDITIONS

This section discusses the traffic operations of the study intersections with the addition of the new site generated trips. It's noted the future total analysis outlined herein is based on the trips generated for an older site plan with 50 residential units. This was conservatively maintained as no material change in traffic operations or recommendations is expected.

6.1 Intersection Operations

Traffic operations at the study intersections were assessed with the addition of the new site generated trips to the future background traffic volumes. The 2026 and 2031 future total traffic volumes are illustrated in **Figures 7 and 8**. **Tables 10 and 11** outline the future total traffic operations for the 2026 and 2031 horizon years, respectively. Detailed capacity analysis worksheets are included in **Appendix E**.

Table 10: 2026 Future Total Traffic Operations Summary

Intersection	Control	Peak Hour	Level of Service ¹	Control Delay	v/c ratio ²	95 th Percentile Queue Length > Storage Length
Arkell Road and Watson Road South	All-Way Stop	A.M.	A	9.0s	0.24(EB)	None
		P.M.	B	12.3s	0.47(NB)	None
Site Access via Watson Road South	Stop (Minor Street)	A.M.	A(SB)	9.6s	0.07(WB)	None
		P.M.	B(SB)	10.3s	0.10(WB)	None
Site Access via Arkell Road	Stop (Minor Street)	A.M.	A (WB)	9.2s	0.08 (NB)	None
		P.M.	A (WB)	9.4s	0.12 (NB)	None

Note 1: Level of Service – The Level of Service (LOS) of a signalized intersection is based on the average control delay per vehicle. The LOS of unsignalized intersection is based on the critical control delay per approach.

Note 2: The critical v/c ratio is considered to be the maximum v/c ratio for movements at the intersection where the maximum v/c ratio does not exceed the critical thresholds.

Table 11: 2031 Future Total Operations Summary

Intersection	Control	Peak Hour	Level of Service ¹	Control Delay	v/c ratio ²	95 th Percentile Queue Length > Storage Length
Arkell Road and Watson Road South	All-Way Stop	A.M.	A	9.4s	0.27(EB)	None
		P.M.	B	14.1s	0.54(NB)	None
Site Access via Watson Road South	Stop (Minor Street)	A.M.	A(SB)	9.6s	0.07(WB)	None
		P.M.	B(SB)	10.5s	0.10(WB)	None
Site Access via Arkell Road	Stop (Minor Street)	A.M.	A (WB)	9.2s	0.08 (NB)	None
		P.M.	A (WB)	9.4s	0.12 (NB)	None

Note 1: Level of Service – The Level of Service (LOS) of a signalized intersection is based on the average control delay per vehicle. The LOS of unsignalized intersection is based on the critical control delay per approach.

Note 2: The critical v/c ratio is considered to be the maximum v/c ratio for movements at the intersection where the maximum v/c ratio does not exceed the critical thresholds.

Under the ultimate 2031 future total conditions, the study intersections are projected to operate similarly compared to the corresponding 2031 future background scenario, with minor additional delays attributable to the proposed development traffic.

As shown in **Table 11**, under 2031 future total conditions, the all-way stop-controlled intersection of Arkell Road and Watson Road South is projected to operate below capacity at a LOS "A" and "B"

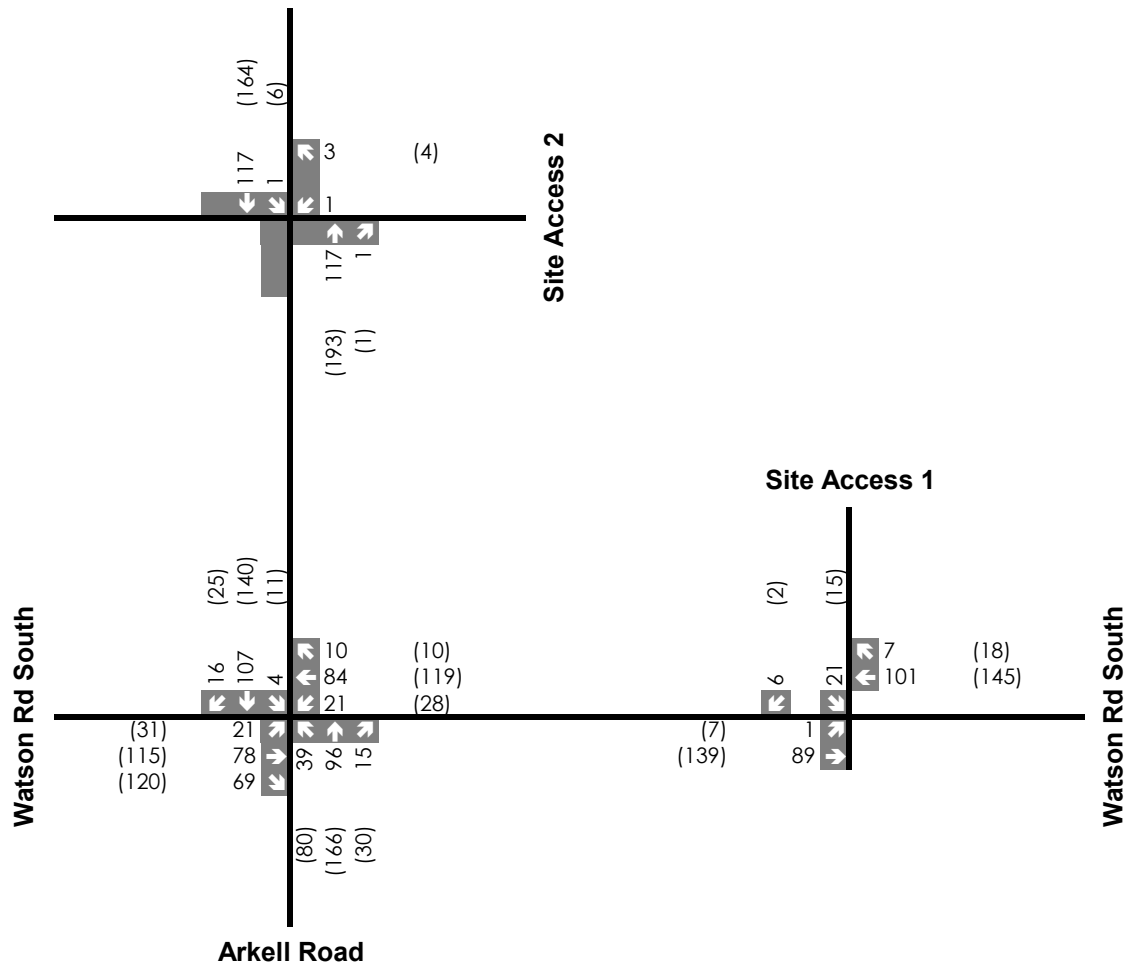
during the weekday a.m. and p.m. peak hours, respectively. Average intersection control delays of 9.5 and 14.3 seconds in the a.m. and p.m. peak hours, respectively and maximum volume-to-capacity ratios of 0.27 (EB) and 0.54 (NB) are expected in the weekday a.m. and p.m. peak hours, respectively.

The proposed Access Connection at Watson Road South is forecast to operate below capacity at a LOS "A" and LOS "B" during the a.m. and p.m. peak hours respectively.

The proposed Access Connection at Arkell is forecast to operate below capacity at a LOS "A" during both a.m. and p.m. peak hours respectively.

Overall, the boundary road network is projected to operate adequately without any capacity constraints under the ultimate 2031 future total scenario. The boundary road network is expected to operate similarly or better under the 2026 horizon year.

Based on the analysis herein, the proposed development is not expected to significantly alter the traffic operations of the study intersections. The proposed development can be supported from a traffic operations perspective.



Legend

xx A.M. Peak Hour Traffic Volumes
(xx) P.M. Peak Hour Traffic Volumes

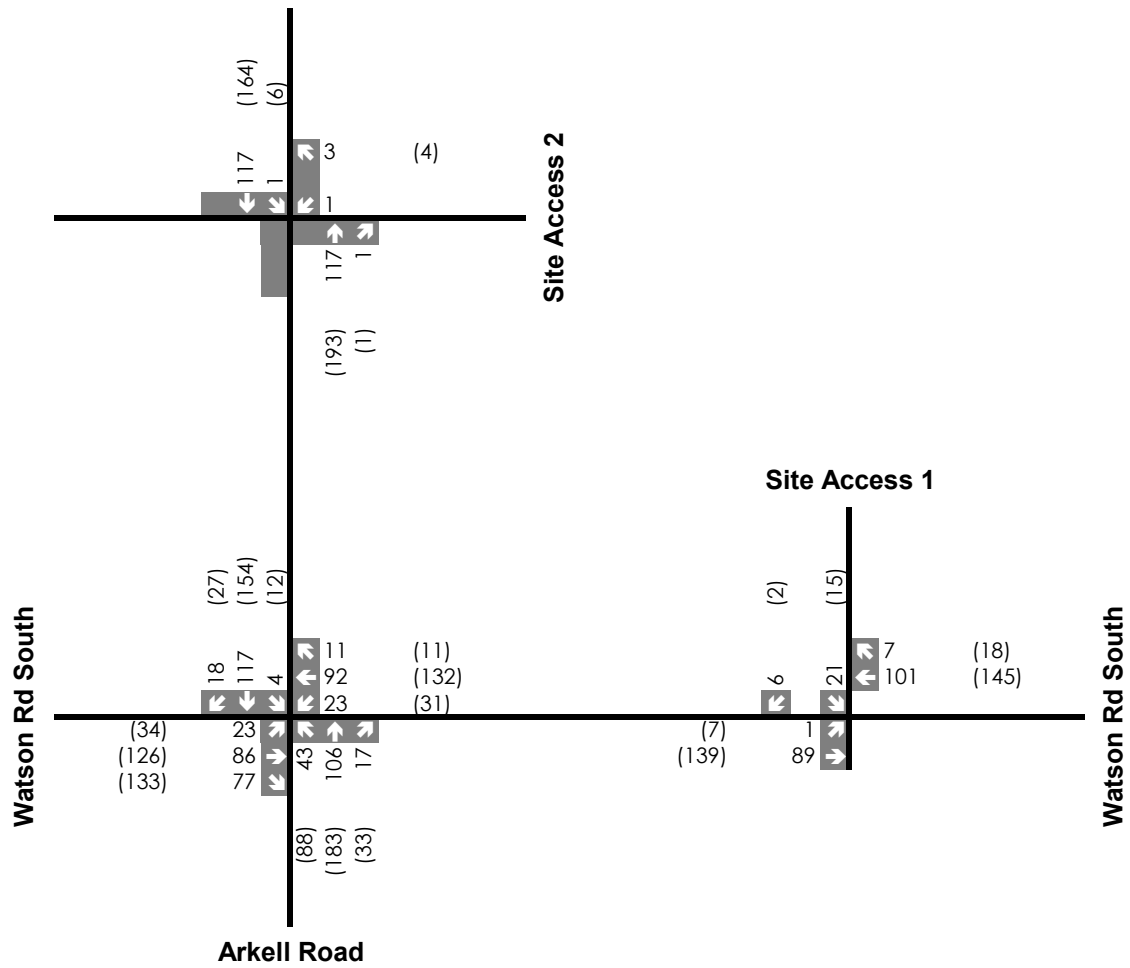
Arkell Developments

2026 Future Total Traffic Volumes



Figure 7

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Legend

xx A.M. Peak Hour Traffic Volumes
(xx) P.M. Peak Hour Traffic Volumes

Arkell Developments

2031 Future Total Traffic Volumes



Figure 8

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7.0 SITE ACCESS SAFETY REVIEW

In the following section, the geometrics of the proposed site accesses were reviewed against the guidelines provided in the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR).

7.1 Sight Distance Assessment

The available sightlines at the site access connections to Watson Road South and Arkell Road were measured and compared to the standards set out in the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR). Sight distance was measured from the proposed site accesses using the following assumptions:

- A standard driver eye height of 1.08 metres for a passenger car, and
- A 4.4 metre setback from the approximate extension of the outer curb to represent a vehicle waiting to exit the site.

Intersection sight distance is calculated using equation 9.9.1 from the GDGCR as outlined below:

$$ISD = 0.278 * V_{major} * t_g$$

Where;

ISD = Intersection Sight Distance

V_{major} = design speed of roadway (km/h)

t_g = assumed time gap for vehicles to turn from stop onto roadway (s)

The design speed of a Collector Road in a suburban environment is typically 10-20 km/h greater than posted speed limit. The posted speed limit on Watson Road South and Arkell Road at the site frontages are 50 km/h and 80 km/h, respectively. Therefore, design speeds of 60 km/h and 90 km/h were assumed for Watson Road South and Arkell Road, respectively. **Table 12** outlines the sight distance analysis for the proposed site accesses.

Table 12: Sight Distance Analysis

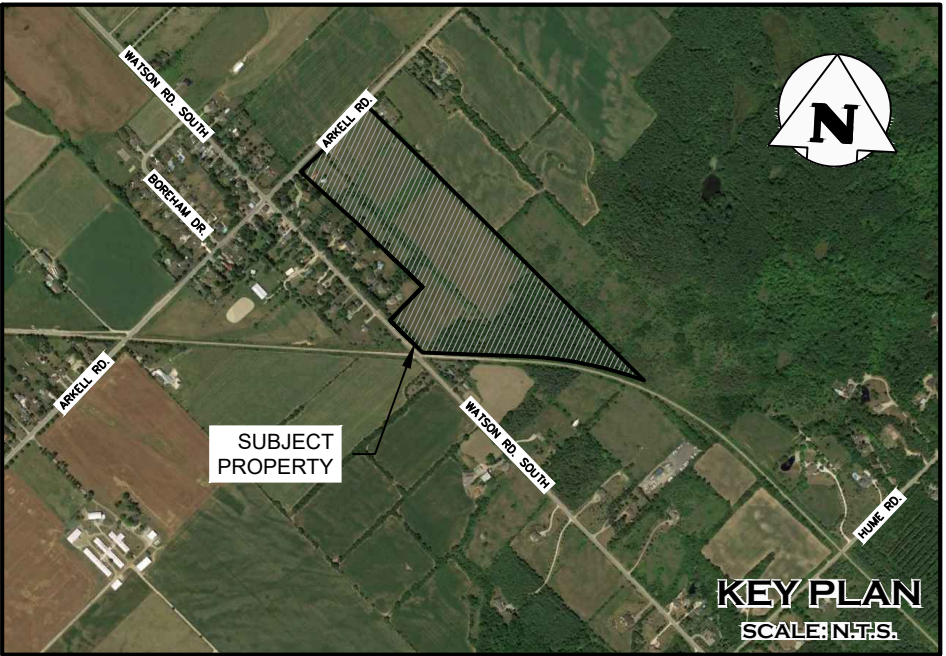
Feature	Site Access at Watson Road South	Site Access at Arkell Road
Access Type	Full moves	Full moves
Intersection Control	Stop Control on Minor Road	Stop Control on Minor Road
Speed Limit of Roadway	50 km/h	80 km/h
Assumed Design Speed	60 km/h	90 km/h
Design Vehicle	Passenger Car	Passenger Car
Base Time Gap	6.5 s (for right-turn) ¹ 7.5 s (for left turn) ²	6.5 s (for right-turn) ¹ 7.5 s (for left turn) ²
Vertical Alignment of Roadway	Fairly flat	Fairly flat
Grade of Roadway	Less than 3%	Less than 3%
Horizontal Alignment of Roadway	Straight	Straight
Sight Distance Required ³	110 m (right turn) 130 m (left turn)	165 m (right turn) 190 m (left turn)
Measured Sight Distance	> 150 m (looking right) 190 m (looking left)	> 190 m (looking right) > 165 m (looking left)
Minimum Sight Distance Satisfied?	Yes	Yes

Note 1: Time gap for right-turning passenger cars from a stop onto a two-lane highway with no median and with a grade less than 3%. Value from Table 9.9.5 in the GDGCR.

Note 2: Time gap for left-turning passenger cars from a stop onto a two-lane highway with no median and with a grade less than 3%. Value from Table 9.9.3 in the GDGCR.

Note 3: Sight distance value calculated from Intersection Sight Distance equation 9.9.1 in the GDGCR.

As outlined in **Table 12**, minimum sight distance requirements are satisfied at the location of the access connections to Watson Road South and Arkell Road. **Figures 9 and 10** contains Sight Distance Assessment Drawings.



NOTE:
AVAILABLE SIGHT DISTANCES WERE DETERMINED BASED ON A SITE VISIT.

No.	ISSUE	DATE: MM/DD/YYYY
1	ISSUED FOR 1st SUBMISSION	03/08/2024
2	ISSUED FOR 2nd SUBMISSION	08/05/2025
3	ISSUED FOR 3rd SUBMISSION	10/29/2025
4	ISSUED FOR 4th SUBMISSION	02/27/2026

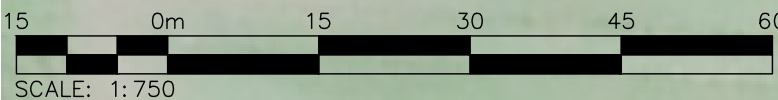
Project
TIMBERWORX CUSTOM HOMES
PARTS OF LOTS 7 & 8, CONCESSION 10
TOWNSHIP OF PUSLINCH

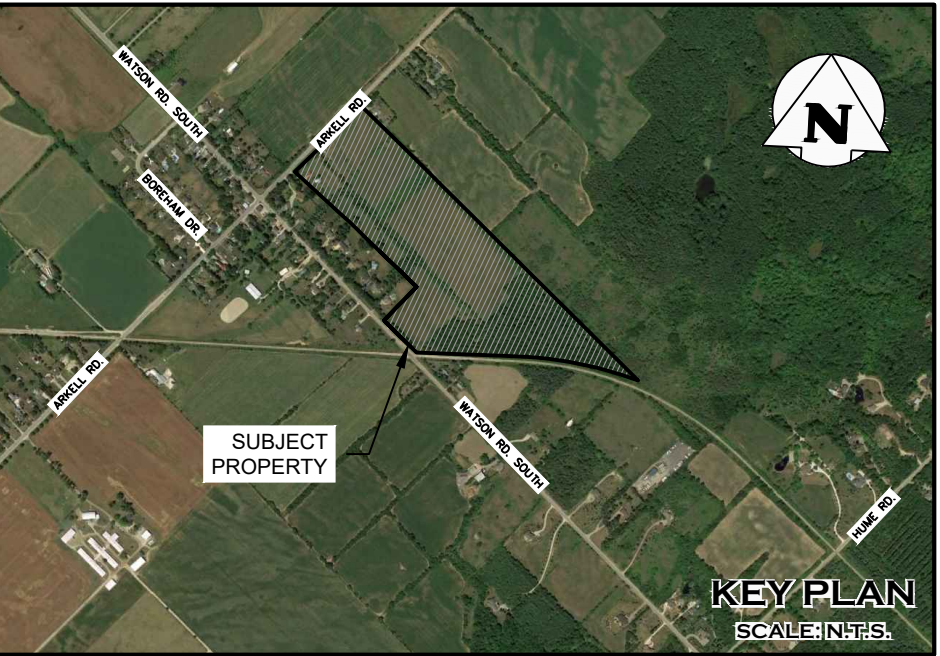
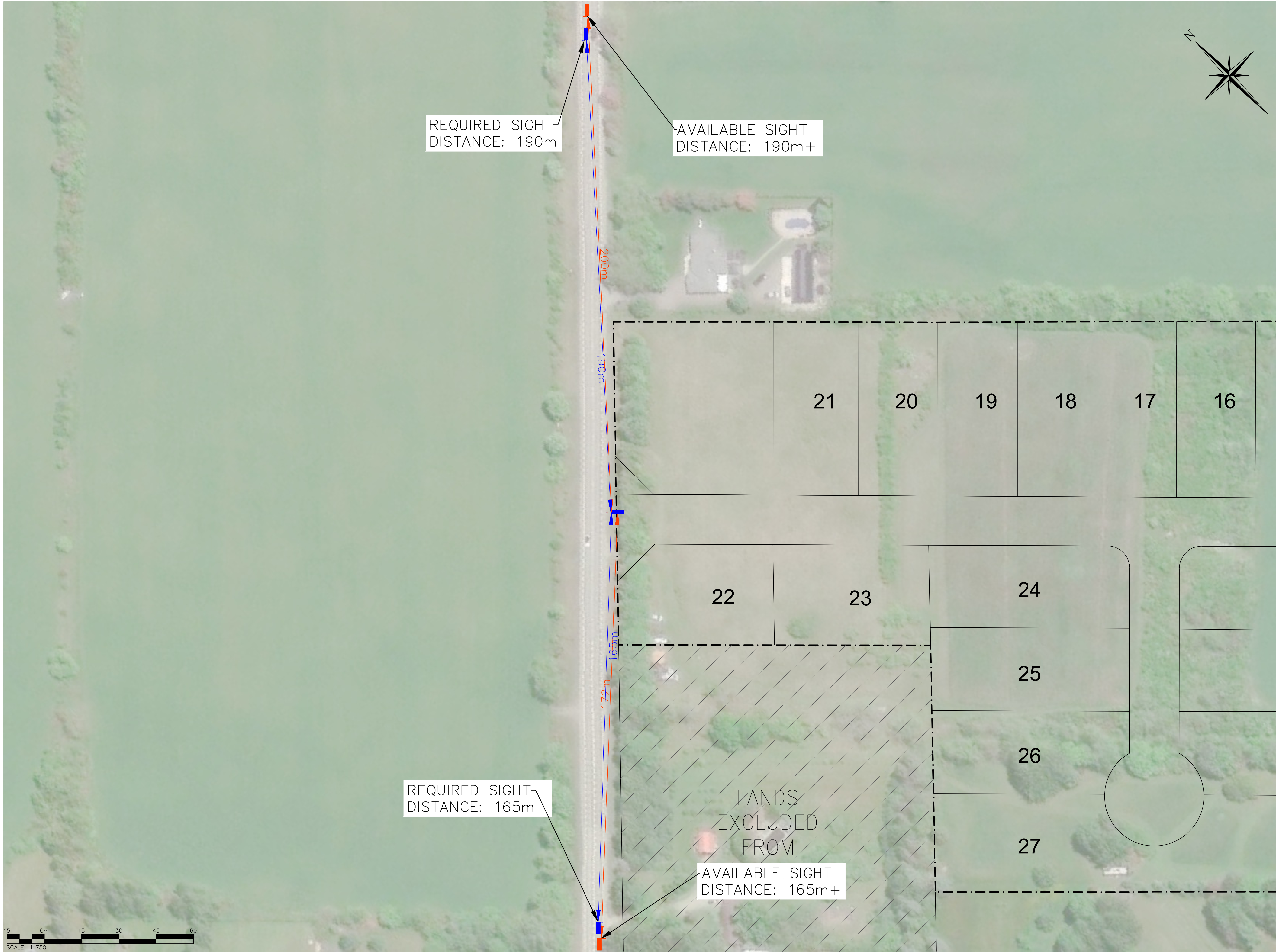
Drawing
SIGHT DISTANCE ASSESSMENT
ACCESS TO WATSON RD. S



211 YONGE STREET
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INFO@CFCROZIER.CA

Drawn By	R.L.	Design By	Project	2433-6646
Check By	M.I.	Check By	Drawing	FIG. 9





NOTE:
AVAILABLE SIGHT DISTANCES WERE DETERMINED BASED ON A SITE VISIT.

No.	ISSUE	DATE: MM/DD/YYYY
1	ISSUED FOR 1st SUBMISSION	03/08/2024
2	ISSUED FOR 2nd SUBMISSION	08/05/2025
3	ISSUED FOR 3rd SUBMISSION	10/29/2025
4	ISSUED FOR 4th SUBMISSION	02/27/2026

Project
TIMBERWORX CUSTOM HOMES
PARTS OF LOTS 7 & 8, CONCESSION 10
TOWNSHIP OF PUSLINCH

Drawing
SIGHT DISTANCE ASSESSMENT
ACCESS TO ARKELL RD.



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Drawn By	R.L.	Design By	Project	2433-6646
Check By	M.I.	Check By	Drawing	FIG. 10

7.2 Access Location and Spacing Review

The Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR) and Transport Canada's Grade Crossing Standards were used to review access spacing and corner clearance for the proposed site access connections to Watson Road South and Arkell Road. The site access spacing requirements and proposed spacings are presented in **Table 13**.

Table 13: Access Spacing Review

Site Access	Available Spacing	Minimum Spacing Requirements	Evaluation	Source
Private Access connection to Watson Road South	Approximately 500 m (to Arkell Road and Watson Road South Intersection)	Minimum 60m spacing between adjacent intersections along a collector road	Satisfied	TAC-GDGCR Section 9.4.2.2
Private Access connection to Arkell Road	Approximately 250 m (to Arkell Road and Watson Road South Intersection)	Minimum 60m spacing between adjacent intersections along a collector road	Satisfied	TAC-GDGCR Section 9.4.2.2

The site corner clearance requirements, Transport Canada's Grade Crossing requirements and proposed clearances are presented in **Table 14**.

Table 14: Corner Clearance and distance from Grade Crossing Review

Site Access	Available Corner Clearance	Minimum Corner Clearance Requirements	Evaluation	Source
Private Access connection to Watson Road South	Approximately 500 m (to Arkell Road and Watson Road South Intersection)	Minimum 25m corner clearance from stop-controlled intersection	Satisfied	TAC-GDGCR Figure 8.8.2
	Approximately 50 m (to Grade Crossing)	Minimum 30m distance from Grade Crossing	Satisfied	Transport Canada's Grade Crossing Standards
Private Access connection to Arkell Road	Approximately 250 m (to Arkell Road and Watson Road South Intersection)	Minimum 25m corner clearance from stop-controlled intersection	Satisfied	TAC-GDGCR Figure 8.8.2

As presented in **Tables 13 and 14**, the proposed accesses are satisfactory compared to the minimum spacing and corner clearance requirements of the TAC-GDGCR and Transport Canada's Grade Crossing Standards.

8.0 PARKING REVIEW

The Township of Puslinch's Zoning By-Law No. 023-18, section 5.2.2 identifies a requirement of 2 parking spaces per unit for the proposed development. As part of the subdivision plan, the parking supply identified in the By-Law will be provided along with potential on-street visitor parking as applicable.

9.0 CONCLUSIONS AND RECOMMENDATIONS

This study has assessed the transportation impacts of the proposed residential development located on sections of Lots 7, 8 and 9 of Concession 10, in the Township of Puslinch, County of Wellington. It is noted that the trip generation and traffic operations analysis were based on an older site plan which had 50 residential units. This was conservatively maintained as no material change in traffic operations or recommendations is expected. The detailed analysis contained within this report has resulted in the following key findings:

- Under 2023 existing traffic conditions, the study intersection of Arkell Road and Watson Road South is operating below capacity with minimal delay during both weekday a.m. and p.m. peak hours.
- The proposed development is expected to generate 40 and 52 two-way primary trips in the a.m. and p.m. peak hours, respectively.
- Under the ultimate 2031 future total conditions:
 - The all-way stop-controlled intersection of Arkell Road and Watson Road South is projected to operate below capacity at a LOS "A" and "B" during the weekday a.m. and p.m. peak hours, respectively. Average intersection control delays of 9.4 and 14.1 seconds in the a.m. and p.m. peak hours, respectively and maximum volume-to-capacity ratios of 0.27 (EB) and 0.54 (NB) are expected in the weekday a.m. and p.m. peak hours, respectively.
 - The proposed site access connection at Watson Road South is forecast to operate at a LOS "A" and "B" during the a.m. and p.m. peak hours respectively.
 - The proposed site access connection at Arkell Road is forecast to operate at a LOS "A" during both a.m. and p.m. peak hours respectively.
 - Overall, the nearby road network is projected to operate adequately without any capacity constraints under the ultimate 2031 future total scenario. The nearby road network is expected to operate similarly or better under the 2026 horizon year.
 - These operations are similar to the 2031 and 2026 Future Background traffic operations. Therefore, operations are expected to be similar with or without the proposed development.
- The proposed access connections to Watson Road South and Arkell Road are satisfactory per the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR) with regards to sight distance, access spacing, corner clearance and Transport Canada's Grade Crossing Standards with regards to access spacing.

Based on the study findings, the development application can be supported from a traffic operations perspective as the boundary road network can accommodate the increase in traffic volumes attributable to the proposed development located on sections of Lots 7, 8 and 9 of Concession 10, in the Township of Puslinch, County of Wellington. Further, the proposed accesses are forecast to be functionally adequate with immaterial impacts to the study intersections.

Prepared by,

C.F. CROZIER & ASSOCIATES INC.



Masoud Imaniboossejin
Engineering Intern

C.F. CROZIER & ASSOCIATES INC.



Brandon Bradt, M.Eng. CEM, P.Eng.
Manager, Transportation Planning

\\\\Crozier-Files\\Projects\\2400\\2433 - Timberworx Custom Homes\\6646 - Arkell Developments\\Reports\\Traffic\\3rd Submission\\2026.02.27_Arkell Developments TIS (CROZIER).Docx

APPENDIX A

Correspondence

Township of Puslinch	C.F. Crozier & Associates Inc. Comment Responses
Traffic	
- The TIS continues to say that the proposed road connection to Arkell Road is for emergency purposes, but the site concept plan that was included with the application appears to include a fully open public road connection. As Arkell Road is a Wellington County Road, I will defer to the County to comment on the proposed road connection. The addition of a second road connection for the subdivision would result in more routing options for traffic and less traffic at the Watson Road South connection near the railway and reduced impacts on any one traffic movement at the Watson/Arkell intersection.	Noted. The Addendum TIS has assessed the impact of the proposed development on the boundary road network under the assumption that the site will be served by two access connections, one to Watson Road South and the other to Arkell Road.
- The study maintains analysis for 50 units when 44 are now proposed. A reduction in the number of units would result in fewer trips on the road network so the current analysis is conservative.	Noted. The addendum TIS maintains the trip generation based on an older site plan which had 50 residential properties. It's noted that this was conservatively maintained as no material change in transportation operations or recommendations is expected.
- The TIS indicates that the sight distance assessment was based on a review of base mapping and aerial mapping. The aerial mapping in the TIS illustrates the available sight distance in plan view, but does not confirm that there are no vertical curves in the road. Were vertical road plans reviewed to confirm the sight distance or did the consultant do a field visit to confirm? How was the available sight distance confirmed?	Noted. A field visit was conducted to confirm the adequacy of the available sightlines. The field visit confirmed the following: There were no visual obstructions along Arkell Road, with sight distances exceeding 190 meters to the right and 165 meters to the left. Given the design speed of 90 km/h, the minimum required sight distances are 165 meters for right turns and 190 meters for left turns. Since the available sight distances surpass these requirements in both directions, all safety standards are met and no concerns regarding site access are expected.

	On Watson Road South, the available sight distance was 190 m looking south and over 150 m looking north. With a design speed of 60 km/h, the required minimum sight distances are 110 m for right turns and 130 m for left turns. Since available sight distances are 150 m (right) and 190 m (left), all minimum requirements are met and no safety concerns are anticipated at the proposed site access.
- Guelph Junction Railway provided comments indicating that additional signals may be required for the new driveway entrance. The consultant team has indicated that traffic signals will not be required at the new road connection to Watson Road, but it's possible that GJR was referring to railway signals or other technical requirements at the rail/road crossing. I would like to receive a copy of any further comments provided by GJR when and if they become available to understand if they are in agreement with the new road location.	Noted. The rail crossing currently consists of a warning system without gates, therefore, we have analyzed the rail crossing to determine whether an upgrade (to a warning system with gates) is warranted under the 2031 future total scenario. Information pertaining to the relevant rail crossing was obtained from GJR. The conditions outlined in Section 9.2 of Transport Canada's Grade Crossing Standards (January 2019) are not met. Therefore, no upgrades to the existing rail crossing are warranted. Refer to Appendix A of the Addendum TIS for email correspondence with GJR, relevant Grade Crossing Standards excerpts, and warrant analysis.
- The changes in the plan to include a new road connection and fewer units would impact how much traffic access the road network and how. Additionally, my previous comment about the routing of traffic applies to this study since the analysis is the same. It is still my opinion that updating the analysis to reflect an additional road connection, fewer units, and a modified assignment of traffic would not materially change the capacity analyses and would not change the recommendations in the report. The two study area intersections are forecast to operate at good levels of service and the traffic volumes generated by the proposal are low.	Noted.

-The County and their consultant may have additional comments based on their review of the proposed road connection to Arkell Road and the Watson/Arkell intersection.	Noted.
In response to the Township's request, I offer the following feedback: 1. The Zoning By-law Amendment application can be deemed complete from a transportation perspective and I am in support of the application. 2. Conditions of approval should include: a. confirmation of how the sight distance was measured on Watson Road South, and b. confirmation from Guelph Junction Railway that they will support the location of the new road connection to Watson Road South adjacent to the at-grade railway crossing. 3. n/a 4. Technical requirements are described in point 2 above. 5. No additional requirements beyond those identified in point 2 above.	1. Noted. 2. - a: A field visit was conducted to confirm the adequacy of the available sightlines. The field visit confirmed the following: • There were no visual obstructions along Arkell Road, with sight distances exceeding 190 meters to the right and 165 meters to the left. Given the design speed of 90 km/h, the minimum required sight distances are 165 meters for right turns and 190 meters for left turns. Since the available sight distances surpass these requirements in both directions, all safety standards are met and no concerns regarding site access are expected. • On Watson Road South, the available sight distance was 190 m looking south and over 150 m looking north. With a design speed of 60 km/h, the required minimum sight distances are 110 m for right turns and 130 m for left turns. Since available sight distances are 150 m (right) and 190 m (left), all minimum requirements are met and no safety concerns are anticipated at the proposed site access. - b: The rail crossing currently consists of a warning system without gates, therefore, we have analyzed the rail crossing to determine whether an upgrade (to a warning system with gates) is warranted under the 2031 future total scenario. Information pertaining to the relevant rail crossing was obtained from GJR. The conditions outlined in Section 9.2 of Transport Canada's Grade Crossing Standards (January 2019) are not met. Therefore, no upgrades to the existing rail crossing are warranted. Refer to Appendix A of the Addendum

	TIS for email correspondence with GJR, relevant Grade Crossing Standards excerpts, and warrant analysis. 3. Noted. 4. Noted. 5. Noted.
Guelph Junction Railway (GJR)	
-Possibility of additional signals required for new driveway entrance to the development.	Noted. Given the traffic volumes generated by the proposed development are low and as detailed in Section 6.1 of the Addendum Traffic Impact Study, the proposed Access Connection at Watson Road South is forecast to operate below capacity at a LOS "A" and LOS "B" during the a.m. and p.m. peak hours respectively. Accordingly, signals are not warranted at this intersection and therefore not recommended.

PART A – INTRODUCTION

1 CITATIONS

The following are the citations for documents referred to in the Standards:

“62-GP-11M is the standard for *Marking Material, Retroreflective Elements, Adhesive Backing*, 62-GP-11M, published by the Canadian General Standards Board (CGSB), dated May 1978 - as amended in July 1987 (Amendment No 1);

“AREMA Communications and Signals Manual” is the 2014 edition of the *Communications and Signals Manual of Recommended Practice*, published by the Communications and Signals Group of the American Railway Engineering and Maintenance of Way Association, in effect on December 31, 2013;

“ASTM D4956” is the 11th edition of the *Standard Specification for Retroreflective Sheeting for Traffic Control*, published by the American Society for Testing and Materials, dated March 30, 2011;

“GCS” means the *Grade Crossings Standards*;

“Manual of Uniform Traffic Control Devices for Canada” refers to the 4th ed. of the *Manual of Uniform Traffic Control Devices for Canada*, prepared by the Traffic Operations and Management Standing Committee, published by the Transportation Association of Canada, dated September 1998.

2 INTERPRETATION

The following definitions apply in this Standard:

“crossing user” means drivers of vehicles, pedestrians, cyclists and persons using assistive devices;

“cross-product” means the product of the average annual daily railway movements and the average annual daily traffic of vehicles on the road that pass across the grade crossing;

“travelled way” means that part of a road intended for vehicular use, excluding shoulders.

9 WARNING SYSTEMS SPECIFICATION

9.1 The specifications for a public grade crossing at which a warning system without gates is required are as follows:

- a) where the forecast cross-product is 2,000 or more;
- b) Where there is no sidewalk, path or trail and the railway design speed is more than 129 km/hr (80 mph);
- c) Where there is a sidewalk, path or trail and the railway design speed is more than 81 km/hr (50 mph); or
- d) where the railway design speed is more than 25 km/hr (15 mph) but less than the railway design speed referred to in b) or c), as the case may be, and
 - i. where there are two or more lines of railway where railway equipment may pass each other; or
 - ii. the distance as shown in Figure 9-1(a) between a Stop sign at an intersection and the nearest rail in the crossing surface is less than 30 m; or
 - iii. in the case of an intersection with a traffic signal, the distance between the stop line of the intersection and the nearest rail in the crossing surface, as shown in Figure 9-1(b), is less than 60 m, or where there is no stop line, the distance between the travelled way and the nearest rail in the crossing surface is less than 60 m.

9.2 The specifications for a public grade crossing at which a warning system with gates is required are as follows:

9.2.1 a warning system is required under article 9.1 and;

- (a) the forecast cross-product is 50,000 or more;
- (b) there are two or more lines of railway where railway equipment may pass each other;
- (c) the railway design speed is more than 81 km/hr (50 mph);
- (d) the distance as shown in Figure 9-1(a) between a Stop sign at an intersection and the nearest rail in the crossing surface is less than 30 m; or
- (e) in the case of an intersection with a traffic signal, the distance between the stop line of the intersection and the nearest rail in the crossing surface, as shown in Figure 9-1(b), is less than 60 m, or where there is no stop line, the distance between the travelled way and the nearest rail in the crossing surface is less than 60 m.

9.3 The specifications for a private grade crossing at which a warning system without gates is required are as follows:

9.3.1 where the forecast cross-product is 2,000 or more, or

9.3.2 where the railway design speed is more than 25 km/hr (15 mph), and;

- (a) the forecast cross-product is 100 or more and there are two or more lines of railway where railway equipment may pass each other;
- (b) the forecast cross-product is 100 or more and grade crossing does not includes a sidewalk, path or trail and the railway design speed is more than 129 km/hr (80 mph); or
- (c) the grade crossing includes a sidewalk, path or trail and the railway design speed is more than 81 km/hr (50 mph).

AHV 124.75 vehicles per hour
 AADT 1996 vehicles per day

avg annual daily railway movements 6 trains per day (provided by GJR)

cross-product 11976 < 50000

Method 1

The Average Hourly Volume for a typical day can be estimated from the Peak Hour Volumes using the following relationships:

$$AHV = \frac{PHV}{2} \text{ or } AHV = \frac{amPHV + pmPHV}{4}$$

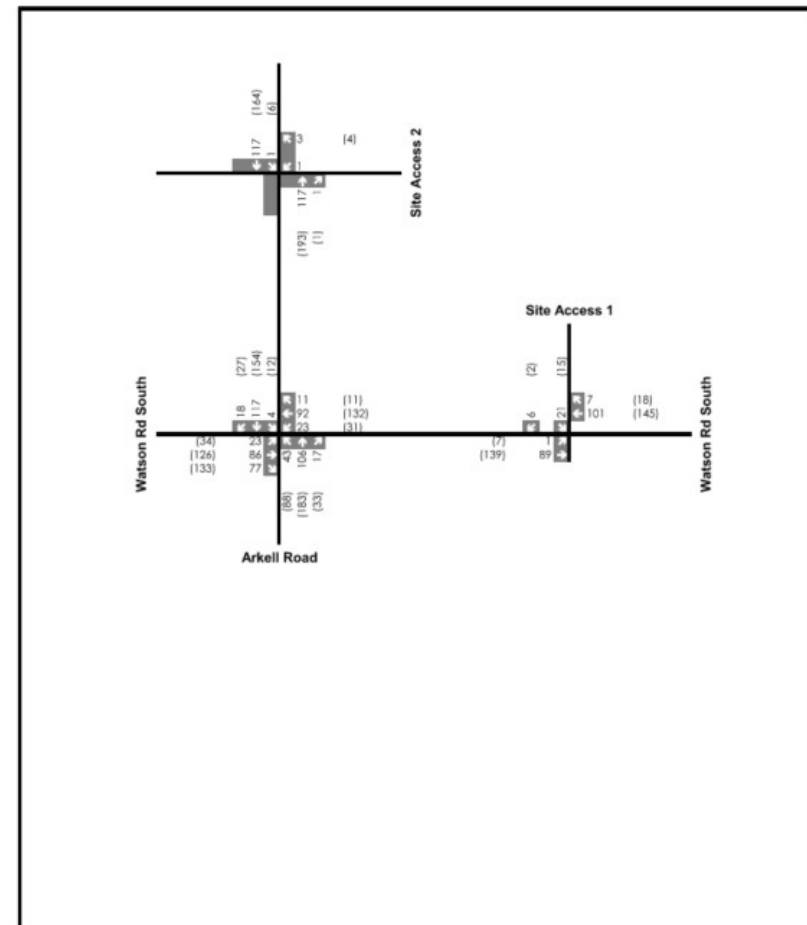
Alternately, the Average Hourly Volume for the eight highest hours of an average day can be estimated from Annual Average Daily Traffic (AADT) volume using the following relationship:

$$AHV = \frac{AADT}{16}$$

Method 2

Peak hour traffic volumes outlined above were converted to daily traffic projections using the following approach, which is generally accepted within the transportation industry:

$$AADT = PM \text{ Peak Hour Traffic} / 10\%$$



Legend xx A.M. Peak Hour Traffic Volumes (xx) P.M. Peak Hour Traffic Volumes	Arkell Developments		Figure 8 Project No. 2433-6446
	2031 Future Total Traffic Volumes		

From: Ryan Lafuente
Sent: February 24, 2026 11:39 AM
To: Les Petroczi
Cc: Masoud Imaniboossejin
Subject: RE: Arkell Subdivision – Proposed Public Road Access Near Watson Road South Grade Crossing

Hi Les,

Thank you for your prompt response. The information you've provided will be helpful.

Best regards,

Ryan Lafuente

Engineering Intern, Transportation

Office: 905.876.7111

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From: Les Petroczi <Les.Petroczi@guelph.ca>

Sent: February 24, 2026 11:16 AM

To: Ryan Lafuente <rlafuente@cfcrozier.ca>

Cc: Masoud Imaniboossejin <mimaniboossejin@cfcrozier.ca>

Subject: Re: Arkell Subdivision – Proposed Public Road Access Near Watson Road South Grade Crossing

Please see below Ryan

Thank you

Les

From: Ryan Lafuente <rlafuente@cfcrozier.ca>

Sent: Tuesday, February 24, 2026 10:35 AM

To: Les Petroczi <Les.Petroczi@guelph.ca>

Cc: Masoud Imaniboossejin <mimaniboossejin@cfcrozier.ca>

Subject: Arkell Subdivision – Proposed Public Road Access Near Watson Road South Grade Crossing

[EXTERNAL EMAIL] This email originates outside the City of Guelph. Do not click links or attachments unless you recognize the sender and know the content is safe.

Hi Les,

I am writing on behalf of the Arkell Subdivision project, located at a section of Lots 7, 8, and 9, Concession 10, in the Township of Puslinch, County of Wellington.

As part of the proposed development, a new public road access is being planned approximately 50 metres from the existing railway crossing at Watson Road South. We would like to confirm that the proposed location of this access is acceptable and to determine whether any upgrades to the existing railway crossing may be warranted as a result of the development.

With a 50m distance additions signals will not be required.

Question:

Will a turning lane for the new proposed driveway be installed?

To support our assessment, we are seeking the following information related to the Watson Road South crossing:

- Whether the existing grade crossing is classified as a **public or private crossing**

Public Crossing

- The **average annual daily railway movements** at the Watson Road South crossing GJR can have up to 6 train movements per day through the crossing, 3 northbound and 3 southbound moves

- The **railway design speed** in the vicinity of the Watson Road South crossing
Railway design speed is 25mph.

Please let us know if you require any additional information. Would be happy to coordinate further or discuss this in more detail if helpful.

Kind regards,

Ryan Lafuente

Engineering Intern, Transportation

Office: 905.876.7111

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Archived: September 19, 2023 1:46:22 PM

From: julia@salviniconsulting.com

Sent: Mon, 18 Sep 2023 14:41:57 +0000Received: from YT3PR01CA0145.CANPRD01.PROD.OUTLOOK.COM (2603:10b6:b01:83::14) by MN2PR03MB4992.namprd03.prod.outlook.com (2603:10b6:208:1aa::15) with Microsoft SMTP Server (version=TLS1_2, cipher=TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384) id 15.20.6792.26; Mon, 18 Sep 2023 14:41:54 +0000Received: from YT3CAN01FT019.eop

To: 'Lynne Banks'; Parth Bhatt

Subject: RE: Terms of Reference for residential development on sections of Lots 7 and 8 of Concession 10, in the Township of Puslinch, County of Wellington

Importance: Normal

Hi Parth,

Generally I'm okay with the Terms of Reference you've proposed. We will also be circulating to the rail authority to get their comments – I'll be curious to see how the new road connection works relative to the rail crossing.

There are no active developments in the area for you to include specifically so we are okay with the background growth rates recommended by the County.

I look forward to reviewing your study and feel free to reach out with any other questions.

Julia

Julia Salvini (she, her), PEng, FITE

President

julia@salviniconsulting.com

519-591-0426

From: Lynne Banks <lbanks@puslinch.ca>

Sent: Monday, September 18, 2023 10:33 AM

To: Parth Bhatt <pbhatt@cfcrozier.ca>

Cc: julia@salviniconsulting.com

Subject: RE: Terms of Reference for residential development on sections of Lots 7 and 8 of Concession 10, in the Township of Puslinch, County of Wellington

Hi Parth –

I can confirm that Julia Salvini of Salvini Consulting will be reaching out to you directly regarding the TOR.

Thanks –

Lynne



Lynne Banks
Development and Legislative Coordinator
Township of Puslinch
7404 Wellington Rd 34, Puslinch ON N0B 2J0
519-763-1226 ext. 226 Fax 519-736-5846 www.puslinch.ca

From: Parth Bhatt <pbhatt@cfcrozier.ca>

Sent: Thursday, September 7, 2023 9:42 AM

To: Lynne Banks <lbanks@puslinch.ca>; Mike Fowler <mfowler@puslinch.ca>

Cc: Brandon Bradt <bbradt@cfcrozier.ca>; Masoud Imaniboossejin <mimaniboossejin@cfcrozier.ca>

Subject: RE: Terms of Reference for residential development on sections of Lots 7 and 8 of Concession 10, in the Township of Puslinch, County of Wellington

Hi Lynne,

Hope you are doing well. I am following up for the background development information. Did you hear anything ? Let us know

Thanks

Parth

Parth Bhatt, M.Eng., P.Eng.

Project Engineer, Transportation

Office: 416.477.3392

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From: Lynne Banks <lbanks@puslinch.ca>

Sent: Tuesday, August 29, 2023 2:09 PM

To: Parth Bhatt <pbhatt@cfcrozier.ca>; Mike Fowler <mfowler@puslinch.ca>

Cc: Brandon Bradt <bbradt@cfcrozier.ca>; Masoud Imaniboossejin <mimaniboossejin@cfcrozier.ca>

Subject: RE: Terms of Reference for residential development on sections of Lots 7 and 8 of Concession 10, in the Township of Puslinch, County of Wellington

Hi Parth –

Our consultant was on vacation for 2 weeks, but is reviewing your proposal now that she is back. I will forward comments to you once I receive them.

Regards –

Lynne



Lynne Banks
Development and Legislative Coordinator
Township of Puslinch
7404 Wellington Rd 34, Puslinch ON N0B 2J0
519-763-1226 ext. 226 Fax 519-736-5846 www.puslinch.ca

From: Parth Bhatt <pbhatt@cfcrozier.ca>

Sent: Thursday, August 24, 2023 10:04 AM

To: Lynne Banks <lbanks@puslinch.ca>; Mike Fowler <mfowler@puslinch.ca>

Cc: Brandon Bradt <bbradt@cfcrozier.ca>; Masoud Imaniboossejin <mimaniboossejin@cfcrozier.ca>

Subject: RE: Terms of Reference for residential development on sections of Lots 7 and 8 of Concession 10, in the Township of Puslinch, County of Wellington

Hi Lynne,

Hope you are doing well. I am following up with this email for my request on background development information. Did you hear anything? Let us know.

Thanks

Parth

Parth Bhatt, M.Eng., P.Eng.
Project Engineer, Transportation
Office: 416.477.3392
Collingwood | Milton | Toronto | Bradford | Guelph

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From: Parth Bhatt

Sent: Friday, August 18, 2023 4:24 PM

To: Lynne Banks <lbanks@puslinch.ca>; Mike Fowler <mfowler@puslinch.ca>

Cc: Brandon Bradt <bbradt@cfcrozier.ca>; Masoud Imaniboossejin <mimaniboossejin@cfcrozier.ca>

Subject: RE: Terms of Reference for residential development on sections of Lots 7 and 8 of Concession 10, in the Township of Puslinch, County of Wellington

Hi Lynne,

Please find the draft plan of subdivision attached. Thanks

Parth

From: Lynne Banks <lbanks@puslinch.ca>

Sent: Friday, August 18, 2023 3:54 PM

To: Parth Bhatt <pbhatt@cfcrozier.ca>; Mike Fowler <mfowler@puslinch.ca>

Cc: Brandon Bradt <bbradt@cfcrozier.ca>; Masoud Imaniboossejin <mimaniboossejin@cfcrozier.ca>

Subject: RE: Terms of Reference for residential development on sections of Lots 7 and 8 of Concession 10, in the Township of Puslinch, County of Wellington

Hi Parth –

Can you please provide me with a copy of the draft plan of subdivision and I will forward it, and the information below, to the Township's traffic consultant for review and comments regarding anything else that should be considered.

Thanks –

Lynne



Lynne Banks
Development and Legislative Coordinator
Township of Puslinch
7404 Wellington Rd 34, Puslinch ON N0B 2J0
519-763-1226 ext. 226 Fax 519-736-5846 www.puslinch.ca

From: Parth Bhatt <pbhatt@cfcrozier.ca>
Sent: Friday, August 18, 2023 3:19 PM
To: Mike Fowler <mfowler@puslinch.ca>; Lynne Banks <lbanks@puslinch.ca>
Cc: Brandon Bradt <bbradt@cfcrozier.ca>; Masoud Imaniboossejin <mimaniboossejin@cfcrozier.ca>
Subject: RE: Terms of Reference for residential development on sections of Lots 7 and 8 of Concession 10, in the Township of Puslinch, County of Wellington

Hi Mike and Lynne,
Can you please advise if any background developments should be accounted for in our analysis based on email chain below and also let us know if there are any comments on our Terms of Reference ? Thanks
Parth

Parth Bhatt, M.Eng., P.Eng.
Project Engineer, Transportation
Office: 416.477.3392
Collingwood | Milton | Toronto | Bradford | Guelph

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From: Pasquale Costanzo <pasqualec@wellington.ca>
Sent: Friday, August 18, 2023 1:49 PM
To: Parth Bhatt <pbhatt@cfcrozier.ca>; Kooistra, Tim <tkooistra@dillon.ca>
Cc: mfowler@puslinch.ca; Brandon Bradt <bbradt@cfcrozier.ca>; Masoud Imaniboossejin <mimaniboossejin@cfcrozier.ca>; Meagan Ferris <meaganf@wellington.ca>; Lynne Banks <lbanks@puslinch.ca>
Subject: RE: Terms of Reference for residential development on sections of Lots 7 and 8 of Concession 10, in the Township of Puslinch, County of Wellington

Hi Parth,

The Township would be your contact to provide you background developments for your study.

Pasquale Costanzo, C.E.T., CMMI Infrastructure Specialist
Technical Services Supervisor
County of Wellington, Roads Division
T 519.837.2601 x 2250
E pasqualec@wellington.ca

From: Parth Bhatt <pbhatt@cfcrozier.ca>
Sent: Friday, August 18, 2023 12:24 PM
To: Kooistra, Tim <tkooistra@dillon.ca>
Cc: mfowler@puslinch.ca; Pasquale Costanzo <pasqualec@wellington.ca>; Brandon Bradt <bbradt@cfcrozier.ca>; Masoud Imaniboossejin <mimaniboossejin@cfcrozier.ca>
Subject: RE: Terms of Reference for residential development on sections of Lots 7 and 8 of Concession 10, in the Township of Puslinch, County of Wellington

CAUTION: This email originated from outside the organization. Do not click links or open attachments unless you know the contents to be safe.

Hi Tim,

Hope you are doing well. I am following up regarding my email below for the background developments. Let us know if you have the information. Thanks

Parth

Parth Bhatt, M.Eng., P.Eng.
Project Engineer, Transportation
Office: 416.477.3392
Collingwood | Milton | Toronto | Bradford | Guelph

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From: Parth Bhatt
Sent: Tuesday, August 15, 2023 11:21 AM
To: Kooistra, Tim <tkooistra@dillon.ca>
Cc: mfowler@puslinch.ca; pasqualec@wellington.ca; Brandon Bradt <bbradt@cfcrozier.ca>; Masoud Imaniboossejin <mimaniboossejin@cfcrozier.ca>
Subject: RE: Terms of Reference for residential development on sections of Lots 7 and 8 of Concession 10, in the Township of Puslinch, County of Wellington

Hi Tim,

Thanks for your feedback and TMC, can you please let us know the background developments that needs to be accounted and provide us with the respective traffic impact studies.

Parth

From: Kooistra, Tim <tkooistra@dillon.ca>
Sent: Tuesday, August 15, 2023 10:47 AM
To: Parth Bhatt <pbhatt@cfcrozier.ca>

Cc: mfwler@puslinch.ca; pasqualec@wellington.ca; Brandon Bradt <bbradt@cfcrozier.ca>; Masoud Imaniboossejin <mimaniboossejin@cfcrozier.ca>
Subject: Re: Terms of Reference for residential development on sections of Lots 7 and 8 of Concession 10, in the Township of Puslinch, County of Wellington

Good morning Parth,

Thank you for reaching out regarding the planned Transportation Impact Assessment you are looking to prepare for a proposed residential subdivision found within the community of Arkell in the Township of Puslinch. As you are aware, Dillon Consulting Limited has been retained by the County of Wellington to review the proposed scope of work for various traffic impact studies that may impact the County road network and associated intersections. As a result, this response is being provided on behalf of the County of Wellington for your consideration.

The scope you have identified is generally acceptable from the County's perspective, noting that the following needs to be considered in the study:

- Rather than having to collect a new turning movement count (TMC) at the Wellington Road 37 and Wellington Road 41 intersection in Arkell, you may be pleased to know that a TMC was completed at this intersection in 2022. This TMC is attached for your reference.
- A 2.0% per annum growth rate is required within the study area.
- The Township of Puslinch will need to identify any other background developments and/or associated traffic impact studies that have been previously submitted that may impact the future traffic volumes that need to be considered in the study.

Thank you,

Tim

</



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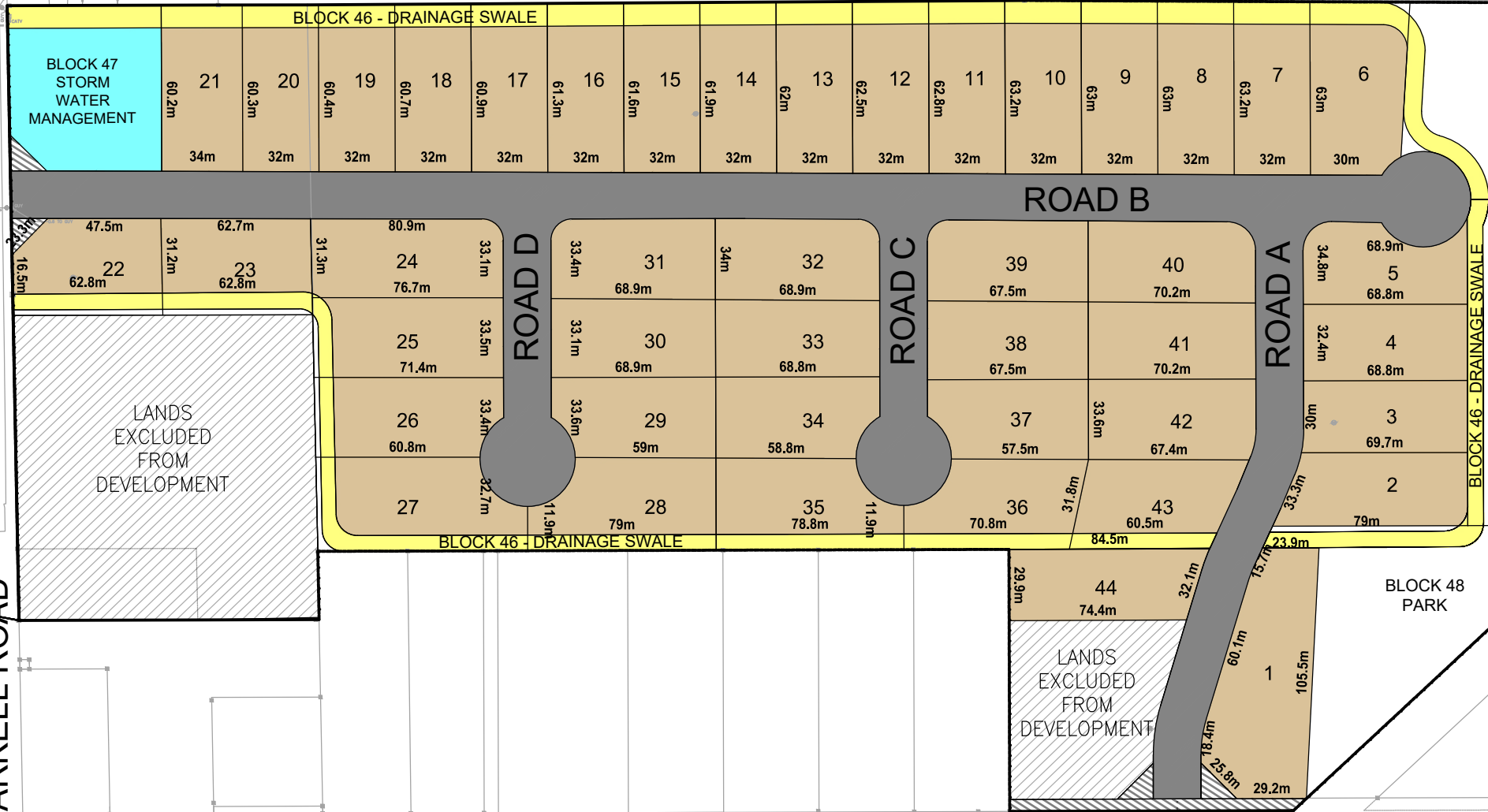
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APPENDIX B

Site Plan

ARKELL ROAD

WATSON ROAD SOUTH



Lot No	Frontage (m)	Depth (m)	Area (ha)
1	94.2	44	0.39
2	33.3	79	0.23
3	30	69.7	0.21
4	32.4	68.8	0.21
5	34.8	68.8	0.21
6	37.9	63	0.24
7-20	32	63.2-60.3	0.2
21	34	60.2	0.21
22	47.5	31.2	0.19
23	62.7	31.2	0.19
24	33.1	76.7	0.26
25	33.5	71.4	0.24
26	33.4	60.8	0.23
27	32.7	60.8	0.23
28	32.5	79	0.22
29	33.6	59	0.22
30	33.1	68.9	0.23
31	33.4	68.9	0.23
32	34	68.9	0.22
33	32.5	68.8	0.22
34	33.9	58.8	0.22
35	32.5	78.8	0.22
36	32.5	70.8	0.2
37	33.6	57.5	0.22
38	32.5	67.5	0.22
39	34	67.5	0.23
40	34	70.2	0.24
41	32.5	70.2	0.23
42	33.6	67.4	0.24
43	33.5	60.5	0.2
44	32.1	74.4	0.24

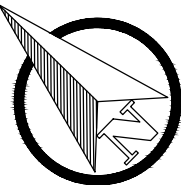
Conceptual Plan
44 Lots

PART OF LOTS 7, 8, & 9, CONCESSION 10
ASSESSMENT ROLL NUMBER 2301000008034800000
ARKELL, ONTARIO

- 1. This is Not a Plan Of Survey.
- 2. Locations of Natural Features Have Been Extracted From The Government of Ontario: Land Information Ontario Open Data.
- 3. Distances Shown on This Plan Are Adjusted Ground Distances and Can Be Converted To Grid Distances by Multiplying by An Averaged Combined Scale Factor of 0.999636.
- 4. Coordinates on This Plan Are UTM, ZONE 17, NAD83 (CSRS-2010) Adjustment and Are Based on GPS Observations From a Network of Permanent GPS Reference Stations.

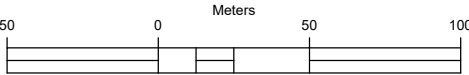


Stovel and Associates Inc.
651 Orangeville Road,
Fergus ON
N1M 1T9
P: 519-766-8042
E: stovel.associates@outlook.com



DRAFT

July 29, 2025



1:2500

6646_GRAD-sm.dwg



Lot No	Frontage (m)	Depth (m)	Area (ha)
1	94.2	44	0.39
2	33.3	79	0.23
3	30	69.7	0.21
4	32.4	68.8	0.21
5	34.8	68.8	0.21
6	37.9	63	0.24
7-20	32	63.2-60.3	0.2
21	34	60.2	0.21
22	47.5	31.2	0.19
23	62.7	31.2	0.19
24	33.1	76.7	0.26
25	33.5	71.4	0.24
26	33.4	60.8	0.23
27	32.7	60.8	0.23
28	32.5	79	0.22
29	33.6	59	0.22
30	33.1	68.9	0.23
31	33.4	68.9	0.23
32	34	68.9	0.22
33	32.5	68.8	0.22
34	33.9	58.8	0.22
35	32.5	78.8	0.22
36	32.5	70.8	0.2
37	33.6	57.5	0.22
38	32.5	67.5	0.22
39	34	67.5	0.23
40	34	70.2	0.24
41	32.5	70.2	0.23
42	33.6	67.4	0.24
43	33.5	60.5	0.2
44	32.1	74.4	0.24

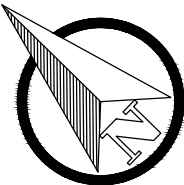
Conceptual Plan
44 Lots

PART OF LOTS 7, 8, & 9, CONCESSION 10
ASSESSMENT ROLL NUMBER 2301000008034800000
ARKELL, ONTARIO

- 1. This is Not a Plan Of Survey.
- 2. Locations of Natural Features Have Been Extracted From The Government of Ontario: Land Information Ontario Open Data.
- 3. Distances Shown on This Plan Are Adjusted Ground Distances and Can Be Converted To Grid Distances by Multiplying by An Averaged Combined Scale Factor of 0.999636.
- 4. Coordinates on This Plan Are UTM, ZONE 17, NAD83 (CSRS-2010) Adjustment and Are Based on GPS Observations From a Network of Permanent GPS Reference Stations.

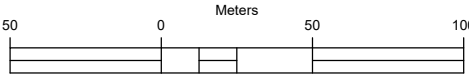


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DRAFT

July 29, 2025



1:2500

6646_GRAD-smss.dwg

APPENDIX C

Traffic Data

WELLINGTON COUNTY TRAFFIC COUNT SUMMARY	
Intersection:	WR 37 at WR 41 (Puslinch)
Site code:	00004137
Count date:	07/28/2022
Counted by:	Shayna - student

North approach: WR 37 (major)					N/S totals	South approach: WR 37 (major)				
Hour	Right	Thru	Left	Peds		Hour	Right	Thru	Left	Peds
7:00	10	72	6	8	207	7:00	11	81	27	0
8:00	15	97	3	1	250	8:00	13	87	35	1
9:00	0	0	0	0	0	9:00	0	0	0	0
10:00	0	0	0	0	0	10:00	0	0	0	0
11:00	9	62	4	2	207	11:00	22	75	35	1
12:00	21	74	7	1	251	12:00	33	75	41	2
13:00	18	76	4	0	244	13:00	25	88	33	1
14:00	0	0	0	0	0	14:00	0	0	0	0
15:00	0	0	0	0	0	15:00	0	0	0	0
16:00	23	128	10	2	413	16:00	26	152	74	2
17:00	14	122	12	6	352	17:00	22	136	46	3
18:00	18	100	6	1	303	18:00	28	89	62	3
Totals	128	731	52	21		Totals	180	783	353	13

East approach: WR 41 (minor)					E/W totals	West approach: WR 41 (minor)				
Hour	Right	Thru	Left	Peds		Hour	Right	Thru	Left	Peds
7:00	3	43	9	3	176	7:00	42	65	14	1
8:00	9	72	19	2	255	8:00	64	72	19	1
9:00	0	0	0	0	0	9:00	0	0	0	0
10:00	0	0	0	0	0	10:00	0	0	0	0
11:00	11	49	25	5	182	11:00	39	41	17	4
12:00	7	60	25	3	199	12:00	41	44	22	1
13:00	13	70	21	0	209	13:00	40	47	18	2
14:00	0	0	0	0	0	14:00	0	0	0	0
15:00	0	0	0	0	0	15:00	0	0	0	0
16:00	9	110	24	0	382	16:00	111	100	28	1
17:00	9	87	27	0	300	17:00	66	83	28	6
18:00	8	79	29	4	219	18:00	41	47	15	26
Totals	69	570	179	17		Totals	444	499	161	42

Calculated values for traffic crossing major street									
Hour:	7:00	8:00		11:00	12:00	13:00		16:00	17:00 18:00
Value:	186	222		176	197	201		364	316 257

WR 37 at WR 41 (Puslinch)	
Count date:	07/28/2022
Intersection:	WR 37 at WR 41
Major road:	WR 37
Major road runs:	north/south (one lane each way)
Speed of major road:	80 km/h
Operating conditions:	Free flow

SATISFIED

No. of lanes	Minimum requirements					Hours								Percentage warrant
	1 lane each way		2 lanes each way		3+ lanes									
Flow cond'n	f. flow (code 1)	r. flow (code 2)	f. flow (code 3)	r. flow (code 4)	r. flow (code 5)	7:00	8:00	11:00	12:00	13:00	16:00	17:00	18:00	
100%	480	720	600	900	1125	383	505	389	450	453	795	652	522	100% NO
80%	385	575	480	720	900									
All approaches	100% fulfilled					0	100	0	0	0	100	100	100	400
	80% fulfilled					0	0	80	80	80	0	0	0	240
	Actual % if below 80%					80	0	0	0	0	0	0	0	80
										Total:				720
										Actual average (total/8):				90

100%	120	170	120	170	170	176	255	182	199	209	382	300	219	100%
80%	95	135	95	135	135									YES
Both approaches	100% fulfilled					100	100	100	100	100	100	100	100	800
	80% fulfilled					0	0	0	0	0	0	0	0	0
	Actual % if below 80%					0	0	0	0	0	0	0	0	0
										Total:				800
										Actual average (total/8):				100

WR 37 at WR 41 (Puslinch)	
Count date:	07/28/2022
Intersection:	WR 37 at WR 41
Major road:	WR 37
Major road runs:	north/south (one lane each way)
Speed of major road:	80 km/h
Operating conditions:	Free flow

NOT SATISFIED

No. of lanes	Minimum requirements					Hours								Percentage warrant
	1 lane each way		2 lanes each way		3+ lanes									
Flow cond'n	f. flow (code 1)	r. flow (code 2)	f. flow (code 3)	r. flow (code 4)	r. flow (code 5)	7:00	8:00	11:00	12:00	13:00	16:00	17:00	18:00	
100%	480	720	600	900	1125	207	250	207	251	244	413	352	303	100% NO
80%	385	575	480	720	900									
All approaches	100% fulfilled					0	0	0	0	0	0	0	0	0
	80% fulfilled					0	0	0	0	0	80	0	0	80
	Actual % if below 80%					43	52	43	52	51	0	73	63	378
										Total:				458
										Actual average (total/8):				57

100%	50	75	50	75	75	186	222	176	197	201	364	316	257	100%
80%	40	60	40	60	60									YES
All approaches	100% fulfilled					100	100	100	100	100	100	100	100	800
	80% fulfilled					0	0	0	0	0	0	0	0	0
	Actual % if below 80%					0	0	0	0	0	0	0	0	0
										Total:				800
										Actual average (total/8):				100

WR 37 at WR 41 (Puslinch)	
Count date:	07/28/2022
Intersection:	WR 37 at WR 41
Major road:	WR 37
Major road runs:	north/south (one lane each way)
Speed of major road:	80 km/h
Operating conditions:	Free flow

WARRANT #3 ACCIDENT EXPERIENCE

A. Reportable accidents within a 12 month period averaged over 36 consecutive months susceptible to correction by a traffic signal			
Minimum requirements per year	Actual number of accidents in 36 months	Average number of accidents per year	Fulfilled
5	2	0.67	13%
B. Adequate trial of less restrictive remedies has failed to reduce accident frequency			No
C. Either Warrant 1 or Warrant 2 satisfied 80% or more			Yes

WARRANT #4 COMBINATION WARRANT (used if no warrant satisfied 100%)

Minimum requirements	Warrant satisfied 80% or more	Fulfilled
At least two warrants satisfied 80%	Warrant 1 (Minimum Vehicular Volume)	Yes
	Warrant 2 (Delay to Cross Traffic)	No
	Warrant 3 (Accident Experience)	No

CONCLUSION

Traffic signal is not warranted

APPENDIX D

Level of Service Definitions

Level of Service Definitions

Two-Way Stop Controlled Intersections

Level of Service	Control Delay per Vehicle (seconds)	Interpretation
A	≤ 10	EXCELLENT. Large and frequent gaps in traffic on the main roadway. Queuing on the minor street is rare.
B	> 10 and ≤ 15	VERY GOOD. Many gaps exist in traffic on the main roadway. Queuing on the minor street is minimal.
C	> 15 and ≤ 25	GOOD. Fewer gaps exist in traffic on the main roadway. Delay on minor approach becomes more noticeable.
D	> 25 and ≤ 35	FAIR. Infrequent and shorter gaps in traffic on the main roadway. Queue lengths develop on the minor street.
E	> 35 and ≤ 50	POOR. Very infrequent gaps in traffic on the main roadway. Queue lengths become noticeable.
F	> 50	UNSATISFACTORY. Very few gaps in traffic on the main roadway. Excessive delay with significant queue lengths on the minor street.

Adapted from Highway Capacity Manual 2000, Transportation Research Board

Signalized Intersections

Level of Service	Control Delay per Vehicle (seconds)	Interpretation
A	≤ 10	EXCELLENT. Extremely favourable progression with most vehicles arriving during the green phase. Most vehicles do not stop and short cycle lengths may contribute to low delay.
B	> 10 and ≤ 20	VERY GOOD. Very good progression and/or short cycle lengths with slightly more vehicles stopping than LOS "A" causing slightly higher levels of average delay.
C	> 20 and ≤ 35	GOOD. Fair progression and longer cycle lengths lead to a greater number of vehicles stopping than LOS "B".
D	> 35 and ≤ 55	FAIR. Congestion becomes noticeable with higher average delays resulting from a combination of long cycle lengths, high volume-to-capacity ratios and unfavourable progression.
E	> 55 and ≤ 80	POOR. Lengthy delays values are indicative of poor progression, long cycle lengths and high volume-to-capacity ratios. Individual cycle failures are common with individual movement failures also common.
F	> 80	UNSATISFACTORY. Indicative of oversaturated conditions with vehicular demand greater than the capacity of the intersection.

Adapted from Highway Capacity Manual 2000, Transportation Research Board

APPENDIX E

Detailed Capacity Analysis Reports

Lanes, Volumes, Timings

2023 Existing AM

1: Arkell Road (WR 37) & Watson Road S. (WR 41)

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	73	65	19	73	9	36	89	13	3	99	15
Future Volume (vph)	19	73	65	19	73	9	36	89	13	3	99	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
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		0.944			0.988			0.987			0.983	
Flt Protected		0.994			0.991			0.987			0.999	
Satd. Flow (prot)	0	1748	0	0	1824	0	0	1815	0	0	1829	0
Flt Permitted		0.994			0.991			0.987			0.999	
Satd. Flow (perm)	0	1748	0	0	1824	0	0	1815	0	0	1829	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		415.4			515.6			455.7			424.1	
Travel Time (s)		29.9			37.1			32.8			30.5	
Confl. Peds. (#/hr)	2		1	1		2	1		1	1		1
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
Adj. Flow (vph)	21	79	71	21	79	10	39	97	14	3	108	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	171	0	0	110	0	0	150	0	0	127	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	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway 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
Turning Speed (k/h)	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	31.6%											
Analysis Period (min)	15											
	ICU Level of Service A											

HCM 2010 AWSC
1: Arkell Road (WR 37) & Watson Road S. (WR 41)

2023 Existing AM

Intersection	
Intersection Delay, s/veh	8.8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	19	73	65	19	73	9	36	89	13	3	99	15
Future Vol, veh/h	19	73	65	19	73	9	36	89	13	3	99	15
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	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	21	79	71	21	79	10	39	97	14	3	108	16
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.8	8.6	9	8.7
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	26%	12%	19%	3%
Vol Thru, %	64%	46%	72%	85%
Vol Right, %	9%	41%	9%	13%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	138	157	101	117
LT Vol	36	19	19	3
Through Vol	89	73	73	99
RT Vol	13	65	9	15
Lane Flow Rate	150	171	110	127
Geometry Grp	1	1	1	1
Degree of Util (X)	0.197	0.214	0.146	0.166
Departure Headway (Hd)	4.738	4.506	4.781	4.7
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	755	795	748	760
Service Time	2.783	2.546	2.826	2.747
HCM Lane V/C Ratio	0.199	0.215	0.147	0.167
HCM Control Delay	9	8.8	8.6	8.7
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.7	0.8	0.5	0.6

Lanes, Volumes, Timings

2023 Existing PM

1: Arkell Road (WR 37) & Watson Road S. (WR 41)

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	102	113	24	112	9	75	155	27	10	131	23
Future Volume (vph)	29	102	113	24	112	9	75	155	27	10	131	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
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			0.991			0.986			0.981	
Flt Protected		0.994			0.992			0.986			0.997	
Satd. Flow (prot)	0	1737	0	0	1831	0	0	1811	0	0	1822	0
Flt Permitted		0.994			0.992			0.986			0.997	
Satd. Flow (perm)	0	1737	0	0	1831	0	0	1811	0	0	1822	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		415.4			513.9			455.7			424.1	
Travel Time (s)		29.9			37.0			32.8			30.5	
Confl. Peds. (#/hr)			1	1			2		2	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
Adj. Flow (vph)	32	111	123	26	122	10	82	168	29	11	142	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	266	0	0	158	0	0	279	0	0	178	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	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway 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
Turning Speed (k/h)	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	50.2%											
Analysis Period (min)	15											
ICU Level of Service A												

HCM 2010 AWSC
1: Arkell Road (WR 37) & Watson Road S. (WR 41)

2023 Existing PM

Intersection	
Intersection Delay, s/veh	11.4
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	29	102	113	24	112	9	75	155	27	10	131	23
Future Vol, veh/h	29	102	113	24	112	9	75	155	27	10	131	23
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	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	32	111	123	26	122	10	82	168	29	11	142	25
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	11.5	10.5	12.3	10.6
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	29%	12%	17%	6%
Vol Thru, %	60%	42%	77%	80%
Vol Right, %	11%	46%	6%	14%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	257	244	145	164
LT Vol	75	29	24	10
Through Vol	155	102	112	131
RT Vol	27	113	9	23
Lane Flow Rate	279	265	158	178
Geometry Grp	1	1	1	1
Degree of Util (X)	0.418	0.384	0.247	0.272
Departure Headway (Hd)	5.383	5.211	5.631	5.484
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	668	690	635	652
Service Time	3.427	3.258	3.682	3.534
HCM Lane V/C Ratio	0.418	0.384	0.249	0.273
HCM Control Delay	12.3	11.5	10.5	10.6
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	2.1	1.8	1	1.1

Lanes, Volumes, Timings

2026 Future Background AM

1: Arkell Road (WR 37) & Watson Road S. (WR 41)

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	78	69	21	78	10	39	95	14	4	106	16
Future Volume (vph)	21	78	69	21	78	10	39	95	14	4	106	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
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		0.945			0.988			0.987			0.983	
Flt Protected		0.994			0.990			0.987			0.999	
Satd. Flow (prot)	0	1750	0	0	1822	0	0	1815	0	0	1829	0
Flt Permitted		0.994			0.990			0.987			0.999	
Satd. Flow (perm)	0	1750	0	0	1822	0	0	1815	0	0	1829	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		415.4			515.6			455.7			424.1	
Travel Time (s)		29.9			37.1			32.8			30.5	
Confl. Peds. (#/hr)	2		1	1		2	1		1	1		1
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
Adj. Flow (vph)	23	85	75	23	85	11	42	103	15	4	115	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	183	0	0	119	0	0	160	0	0	136	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	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway 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
Turning Speed (k/h)	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	36.7%											
Analysis Period (min)	15											
ICU Level of Service A												

HCM 2010 AWSC
1: Arkell Road (WR 37) & Watson Road S. (WR 41)

2026 Future Background AM

Intersection	
Intersection Delay, s/veh	9
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	21	78	69	21	78	10	39	95	14	4	106	16
Future Vol, veh/h	21	78	69	21	78	10	39	95	14	4	106	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
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	23	85	75	23	85	11	42	103	15	4	115	17
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9	8.8	9.2	8.9
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	26%	12%	19%	3%
Vol Thru, %	64%	46%	72%	84%
Vol Right, %	9%	41%	9%	13%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	148	168	109	126
LT Vol	39	21	21	4
Through Vol	95	78	78	106
RT Vol	14	69	10	16
Lane Flow Rate	161	183	118	137
Geometry Grp	1	1	1	1
Degree of Util (X)	0.215	0.232	0.16	0.182
Departure Headway (Hd)	4.809	4.579	4.856	4.775
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	743	780	735	748
Service Time	2.862	2.629	2.911	2.83
HCM Lane V/C Ratio	0.217	0.235	0.161	0.183
HCM Control Delay	9.2	9	8.8	8.9
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.8	0.9	0.6	0.7

Lanes, Volumes, Timings
1: Arkell Road (WR 37) & Watson Road S. (WR 41)

2026 Future Background PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	109	120	26	119	10	80	165	29	11	140	25
Future Volume (vph)	31	109	120	26	119	10	80	165	29	11	140	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
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				0.991				0.986		0.981	
Flt Protected	0.994				0.992				0.986		0.997	
Satd. Flow (prot)	0	1737	0	0	1831	0	0	1811	0	0	1822	0
Flt Permitted	0.994				0.992				0.986		0.997	
Satd. Flow (perm)	0	1737	0	0	1831	0	0	1811	0	0	1822	0
Link Speed (k/h)	50				50				50		50	
Link Distance (m)	415.4				513.9				455.7		424.1	
Travel Time (s)	29.9				37.0				32.8		30.5	
Confl. Peds. (#/hr)			1	1			2			2	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
Adj. Flow (vph)	34	118	130	28	129	11	87	179	32	12	152	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	282	0	0	168	0	0	298	0	0	191	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	Left	Right	Left	Left	Right
Median Width(m)	0.0				0.0				0.0		0.0	
Link Offset(m)	0.0				0.0				0.0		0.0	
Crosswalk Width(m)	4.8				4.8				4.8		4.8	
Two way Left Turn Lane												
Headway 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
Turning Speed (k/h)	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	52.8%											
Analysis Period (min)	15											
ICU Level of Service A												

HCM 2010 AWSC
1: Arkell Road (WR 37) & Watson Road S. (WR 41)

2026 Future Background PM

Intersection	
Intersection Delay, s/veh	12.1
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	31	109	120	26	119	10	80	165	29	11	140	25
Future Vol, veh/h	31	109	120	26	119	10	80	165	29	11	140	25
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	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	34	118	130	28	129	11	87	179	32	12	152	27
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12.3	11	13.2	11.1
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	29%	12%	17%	6%
Vol Thru, %	60%	42%	77%	80%
Vol Right, %	11%	46%	6%	14%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	274	260	155	176
LT Vol	80	31	26	11
Through Vol	165	109	119	140
RT Vol	29	120	10	25
Lane Flow Rate	298	283	168	191
Geometry Grp	1	1	1	1
Degree of Util (X)	0.457	0.421	0.271	0.3
Departure Headway (Hd)	5.525	5.36	5.798	5.644
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	649	670	617	633
Service Time	3.58	3.417	3.863	3.707
HCM Lane V/C Ratio	0.459	0.422	0.272	0.302
HCM Control Delay	13.2	12.3	11	11.1
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	2.4	2.1	1.1	1.3

Lanes, Volumes, Timings
1: Arkell Road (WR 37) & Watson Road S. (WR 41)

2031 Future Background AM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	86	77	23	86	11	43	105	16	4	116	18
Future Volume (vph)	23	86	77	23	86	11	43	105	16	4	116	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
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	0.944				0.988				0.987		0.982	
Flt Protected	0.994				0.990				0.987		0.999	
Satd. Flow (prot)	0	1748	0	0	1822	0	0	1815	0	0	1827	0
Flt Permitted	0.994				0.990				0.987		0.999	
Satd. Flow (perm)	0	1748	0	0	1822	0	0	1815	0	0	1827	0
Link Speed (k/h)	50				50				50		50	
Link Distance (m)	415.4				515.6				455.7		424.1	
Travel Time (s)	29.9				37.1				32.8		30.5	
Confl. Peds. (#/hr)	2	1		1			2	1	1		1	1
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
Adj. Flow (vph)	25	93	84	25	93	12	47	114	17	4	126	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	202	0	0	130	0	0	178	0	0	150	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	Left	Right	Left	Left	Right
Median Width(m)	0.0				0.0				0.0		0.0	
Link Offset(m)	0.0				0.0				0.0		0.0	
Crosswalk Width(m)	4.8				4.8				4.8		4.8	
Two way Left Turn Lane												
Headway 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
Turning Speed (k/h)	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	39.3%											
Analysis Period (min)	15											
ICU Level of Service A												

HCM 2010 AWSC
1: Arkell Road (WR 37) & Watson Road S. (WR 41)

2031 Future Background AM

Intersection	
Intersection Delay, s/veh	9.3
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	23	86	77	23	86	11	43	105	16	4	116	18
Future Vol, veh/h	23	86	77	23	86	11	43	105	16	4	116	18
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	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	25	93	84	25	93	12	47	114	17	4	126	20
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.4	9.1	9.6	9.2
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	26%	12%	19%	3%
Vol Thru, %	64%	46%	72%	84%
Vol Right, %	10%	41%	9%	13%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	164	186	120	138
LT Vol	43	23	23	4
Through Vol	105	86	86	116
RT Vol	16	77	11	18
Lane Flow Rate	178	202	130	150
Geometry Grp	1	1	1	1
Degree of Util (X)	0.243	0.263	0.18	0.204
Departure Headway (Hd)	4.912	4.679	4.971	4.885
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	726	762	716	729
Service Time	2.982	2.744	3.042	2.957
HCM Lane V/C Ratio	0.245	0.265	0.182	0.206
HCM Control Delay	9.6	9.4	9.1	9.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.9	1.1	0.7	0.8

Lanes, Volumes, Timings
1: Arkell Road (WR 37) & Watson Road S. (WR 41)

2031 Future Background PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	120	133	29	132	11	88	182	32	12	154	27
Future Volume (vph)	34	120	133	29	132	11	88	182	32	12	154	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
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		0.937			0.991			0.986			0.981	
Flt Protected		0.994			0.992			0.986			0.997	
Satd. Flow (prot)	0	1735	0	0	1831	0	0	1811	0	0	1822	0
Flt Permitted		0.994			0.992			0.986			0.997	
Satd. Flow (perm)	0	1735	0	0	1831	0	0	1811	0	0	1822	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		415.4			513.9			455.7			424.1	
Travel Time (s)		29.9			37.0			32.8			30.5	
Confl. Peds. (#/hr)			1	1			2		2	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
Adj. Flow (vph)	37	130	145	32	143	12	96	198	35	13	167	29
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	312	0	0	187	0	0	329	0	0	209	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	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway 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
Turning Speed (k/h)	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 57.0%	ICU Level of Service B											
Analysis Period (min) 15												

HCM 2010 AWSC
1: Arkell Road (WR 37) & Watson Road S. (WR 41)

2031 Future Background PM

Intersection	
Intersection Delay, s/veh	13.7
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	34	120	133	29	132	11	88	182	32	12	154	27
Future Vol, veh/h	34	120	133	29	132	11	88	182	32	12	154	27
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	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	37	130	145	32	143	12	96	198	35	13	167	29
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	14	12	15.2	12.2
HCM LOS	B	B	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	29%	12%	17%	6%
Vol Thru, %	60%	42%	77%	80%
Vol Right, %	11%	46%	6%	14%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	302	287	172	193
LT Vol	88	34	29	12
Through Vol	182	120	132	154
RT Vol	32	133	11	27
Lane Flow Rate	328	312	187	210
Geometry Grp	1	1	1	1
Degree of Util (X)	0.526	0.486	0.316	0.346
Departure Headway (Hd)	5.772	5.612	6.089	5.933
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	620	636	585	600
Service Time	3.855	3.697	4.188	4.027
HCM Lane V/C Ratio	0.529	0.491	0.32	0.35
HCM Control Delay	15.2	14	12	12.2
HCM Lane LOS	C	B	B	B
HCM 95th-tile Q	3.1	2.7	1.3	1.5

Lanes, Volumes, Timings

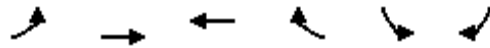
2026 Future Total AM

1: Arkell Road (WR 37) & Watson Road S. (WR 41)

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	78	69	21	84	10	39	96	15	4	107	16
Future Volume (vph)	21	78	69	21	84	10	39	96	15	4	107	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
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		0.945			0.988			0.987			0.983	
Flt Protected		0.994			0.991			0.987			0.999	
Satd. Flow (prot)	0	1750	0	0	1824	0	0	1815	0	0	1829	0
Flt Permitted		0.994			0.991			0.987			0.999	
Satd. Flow (perm)	0	1750	0	0	1824	0	0	1815	0	0	1829	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		415.4			515.6			455.7			275.0	
Travel Time (s)		29.9			37.1			32.8			19.8	
Confl. Peds. (#/hr)	2		1	1		2	1		1	1		1
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
Adj. Flow (vph)	23	85	75	23	91	11	42	104	16	4	116	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	183	0	0	125	0	0	162	0	0	137	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	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway 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
Turning Speed (k/h)	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	37.0%											
Analysis Period (min)	15											
	ICU Level of Service A											

Lanes, Volumes, Timings
2: Watson Road S. (WR 41) & Site Access 1

2026 Future Total AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	1	89	101	7	21	6
Future Volume (vph)	1	89	101	7	21	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.991		0.968	
Flt Protected		0.999			0.963	
Satd. Flow (prot)	0	1861	1846	0	1736	0
Flt Permitted		0.999			0.963	
Satd. Flow (perm)	0	1861	1846	0	1736	0
Link Speed (k/h)		50	50		30	
Link Distance (m)		515.6	23.5		109.1	
Travel Time (s)		37.1	1.7		13.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	97	110	8	23	7
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	98	118	0	30	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		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	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 15.7%				ICU Level of Service A		
Analysis Period (min) 15						

Lanes, Volumes, Timings
3: Arkell Road (WR 37) & Site Access 2

2026 Future Total AM

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	1	3	117	1	1	117
Future Volume (vph)	1	3	117	1	1	117
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.899		0.999			
Flt Protected	0.988					
Satd. Flow (prot)	1655	0	1861	0	0	1863
Flt Permitted	0.988					
Satd. Flow (perm)	1655	0	1861	0	0	1863
Link Speed (k/h)	50		50			50
Link Distance (m)	178.3		275.0			149.1
Travel Time (s)	12.8		19.8			10.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	3	127	1	1	127
Shared Lane Traffic (%)						
Lane Group Flow (vph)	4	0	128	0	0	128
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		0.0			0.0
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	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type: Unsignalized						
Intersection Capacity Utilization 17.0%						
ICU Level of Service A						
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis 1: Arkell Road (WR 37) & Watson Road S. (WR 41)

2026 Future Total AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	21	78	69	21	84	10	39	96	15	4	107	16
Future Volume (vph)	21	78	69	21	84	10	39	96	15	4	107	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)	23	85	75	23	91	11	42	104	16	4	116	17
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	183	125	162	137								
Volume Left (vph)	23	23	42	4								
Volume Right (vph)	75	11	16	17								
Hadj (s)	-0.19	0.02	0.03	-0.03								
Departure Headway (s)	4.6	4.9	4.9	4.8								
Degree Utilization, x	0.24	0.17	0.22	0.18								
Capacity (veh/h)	721	678	691	687								
Control Delay (s)	9.1	8.9	9.2	8.9								
Approach Delay (s)	9.1	8.9	9.2	8.9								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			9.0									
Level of Service			A									
Intersection Capacity Utilization			37.0%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

2: Watson Road S. (WR 41) & Site Access 1

2026 Future Total AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	89	101	7	21	6
Future Volume (Veh/h)	1	89	101	7	21	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	97	110	8	23	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	118				213	114
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	118				213	114
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	99
cM capacity (veh/h)	1470				775	939
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	98	118	30			
Volume Left	1	0	23			
Volume Right	0	8	7			
cSH	1470	1700	808			
Volume to Capacity	0.00	0.07	0.04			
Queue Length 95th (m)	0.0	0.0	0.9			
Control Delay (s)	0.1	0.0	9.6			
Lane LOS	A		A			
Approach Delay (s)	0.1	0.0	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			15.7%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 3: Arkell Road (WR 37) & Site Access 2

2026 Future Total AM

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	1	3	117	1	1	117
Future Volume (Veh/h)	1	3	117	1	1	117
Sign Control	Stop		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)	1	3	127	1	1	127
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	256	128			128	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	256	128			128	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	732	923			1458	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	4	128	128			
Volume Left	1	0	1			
Volume Right	3	1	0			
cSH	866	1700	1458			
Volume to Capacity	0.00	0.08	0.00			
Queue Length 95th (m)	0.1	0.0	0.0			
Control Delay (s)	9.2	0.0	0.1			
Lane LOS	A		A			
Approach Delay (s)	9.2	0.0	0.1			
Approach LOS	A					
Intersection Summary						
Average Delay		0.2				
Intersection Capacity Utilization		17.0%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings

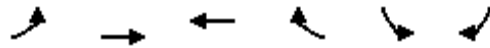
2026 Future Total PM

1: Arkell Road (WR 37) & Watson Road S. (WR 41)

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	115	120	28	119	10	80	166	30	11	140	25
Future Volume (vph)	31	115	120	28	119	10	80	166	30	11	140	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
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		0.939			0.991			0.985			0.981	
Flt Protected		0.994			0.991			0.986			0.997	
Satd. Flow (prot)	0	1739	0	0	1829	0	0	1809	0	0	1822	0
Flt Permitted		0.994			0.991			0.986			0.997	
Satd. Flow (perm)	0	1739	0	0	1829	0	0	1809	0	0	1822	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		415.4			513.9			455.7			281.0	
Travel Time (s)		29.9			37.0			32.8			20.2	
Confl. Peds. (#/hr)			1	1			2		2	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
Adj. Flow (vph)	34	125	130	30	129	11	87	180	33	12	152	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	289	0	0	170	0	0	300	0	0	191	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	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway 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
Turning Speed (k/h)	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	53.0%											
Analysis Period (min)	15											
ICU Level of Service A												

Lanes, Volumes, Timings
2: Watson Road S. (WR 41) & Site Access 1

2026 Future Total PM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	7	139	145	18	15	2
Future Volume (vph)	7	139	145	18	15	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.985		0.985	
Flt Protected		0.997			0.957	
Satd. Flow (prot)	0	1857	1835	0	1756	0
Flt Permitted		0.997			0.957	
Satd. Flow (perm)	0	1857	1835	0	1756	0
Link Speed (k/h)		50	50		30	
Link Distance (m)		513.9	23.5		109.1	
Travel Time (s)		37.0	1.7		13.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	151	158	20	16	2
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	159	178	0	18	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		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	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization		23.0%		ICU Level of Service A		
Analysis Period (min) 15						

Lanes, Volumes, Timings
3: Arkell Road (WR 37) & Site Access 2

2026 Future Total PM

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	4	193	1	6	164
Future Volume (vph)	0	4	193	1	6	164
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.865		0.999			
Flt Protected						0.998
Satd. Flow (prot)	1611	0	1861	0	0	1859
Flt Permitted						0.998
Satd. Flow (perm)	1611	0	1861	0	0	1859
Link Speed (k/h)	50		50			50
Link Distance (m)	190.1		281.0			143.1
Travel Time (s)	13.7		20.2			10.3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	4	210	1	7	178
Shared Lane Traffic (%)						
Lane Group Flow (vph)	4	0	211	0	0	185
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		0.0			0.0
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	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type: Unsignalized						
Intersection Capacity Utilization 23.5%			ICU Level of Service A			
Analysis Period (min) 15						

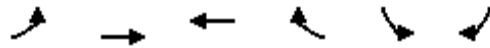
HCM Unsignalized Intersection Capacity Analysis
1: Arkell Road (WR 37) & Watson Road S. (WR 41)

2026 Future Total PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	31	115	120	28	119	10	80	166	30	11	140	25
Future Volume (vph)	31	115	120	28	119	10	80	166	30	11	140	25
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)	34	125	130	30	129	11	87	180	33	12	152	27
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	289	170	300	191								
Volume Left (vph)	34	30	87	12								
Volume Right (vph)	130	11	33	27								
Hadj (s)	-0.21	0.03	0.03	-0.04								
Departure Headway (s)	5.4	5.9	5.6	5.7								
Degree Utilization, x	0.44	0.28	0.47	0.30								
Capacity (veh/h)	611	545	595	564								
Control Delay (s)	12.6	11.1	13.4	11.2								
Approach Delay (s)	12.6	11.1	13.4	11.2								
Approach LOS	B	B	B	B								
Intersection Summary												
Delay				12.3								
Level of Service				B								
Intersection Capacity Utilization				53.0%	ICU Level of Service		A					
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis 2: Watson Road S. (WR 41) & Site Access 1

2026 Future Total PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	139	145	18	15	2
Future Volume (Veh/h)	7	139	145	18	15	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	151	158	20	16	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	178				335	168
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	178				335	168
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	100
cM capacity (veh/h)	1398				656	876
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	159	178	18			
Volume Left	8	0	16			
Volume Right	0	20	2			
cSH	1398	1700	675			
Volume to Capacity	0.01	0.10	0.03			
Queue Length 95th (m)	0.1	0.0	0.7			
Control Delay (s)	0.4	0.0	10.5			
Lane LOS	A		B			
Approach Delay (s)	0.4	0.0	10.5			
Approach LOS			B			
Intersection Summary						
Average Delay		0.7				
Intersection Capacity Utilization		23.0%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis 3: Arkell Road (WR 37) & Site Access 2

2026 Future Total PM

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	4	193	1	6	164
Future Volume (Veh/h)	0	4	193	1	6	164
Sign Control	Stop		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)	0	4	210	1	7	178
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	402	210			211	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	402	210			211	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			99	
cM capacity (veh/h)	601	830			1360	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	4	211	185			
Volume Left	0	0	7			
Volume Right	4	1	0			
cSH	830	1700	1360			
Volume to Capacity	0.00	0.12	0.01			
Queue Length 95th (m)	0.1	0.0	0.1			
Control Delay (s)	9.4	0.0	0.3			
Lane LOS	A		A			
Approach Delay (s)	9.4	0.0	0.3			
Approach LOS	A					
Intersection Summary						
Average Delay		0.2				
Intersection Capacity Utilization		23.5%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings

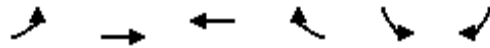
2031 Future Total AM

1: Arkell Road (WR 37) & Watson Road S. (WR 41)

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	86	77	23	92	11	43	106	17	4	117	18
Future Volume (vph)	23	86	77	23	92	11	43	106	17	4	117	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
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		0.944			0.988			0.986			0.982	
Flt Protected		0.994			0.991			0.987			0.999	
Satd. Flow (prot)	0	1748	0	0	1824	0	0	1813	0	0	1827	0
Flt Permitted		0.994			0.991			0.987			0.999	
Satd. Flow (perm)	0	1748	0	0	1824	0	0	1813	0	0	1827	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		415.4			515.6			455.7			273.7	
Travel Time (s)		29.9			37.1			32.8			19.7	
Confl. Peds. (#/hr)	2		1	1		2	1		1	1		1
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
Adj. Flow (vph)	25	93	84	25	100	12	47	115	18	4	127	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	202	0	0	137	0	0	180	0	0	151	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	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway 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
Turning Speed (k/h)	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	39.6%											
Analysis Period (min)	15											
ICU Level of Service A												

Lanes, Volumes, Timings
2: Watson Road S. (WR 41) & Site Access 1

2031 Future Total AM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	1	89	101	7	21	6
Future Volume (vph)	1	89	101	7	21	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.991		0.968	
Flt Protected		0.999			0.963	
Satd. Flow (prot)	0	1861	1846	0	1736	0
Flt Permitted		0.999			0.963	
Satd. Flow (perm)	0	1861	1846	0	1736	0
Link Speed (k/h)		50	50		30	
Link Distance (m)		515.6	23.5		109.1	
Travel Time (s)		37.1	1.7		13.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	97	110	8	23	7
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	98	118	0	30	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		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	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 15.7%				ICU Level of Service A		
Analysis Period (min) 15						

Lanes, Volumes, Timings
3: Arkell Road (WR 37) & Site Access 2

2031 Future Total AM

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	1	3	117	1	1	117
Future Volume (vph)	1	3	117	1	1	117
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.899		0.999			
Flt Protected	0.988					
Satd. Flow (prot)	1655	0	1861	0	0	1863
Flt Permitted	0.988					
Satd. Flow (perm)	1655	0	1861	0	0	1863
Link Speed (k/h)	50		50			50
Link Distance (m)	168.4		273.7			150.4
Travel Time (s)	12.1		19.7			10.8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	3	127	1	1	127
Shared Lane Traffic (%)						
Lane Group Flow (vph)	4	0	128	0	0	128
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		0.0			0.0
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	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type: Unsignalized						
Intersection Capacity Utilization 17.0%			ICU Level of Service A			
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
1: Arkell Road (WR 37) & Watson Road S. (WR 41)

2031 Future Total AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	23	86	77	23	92	11	43	106	17	4	117	18
Future Volume (vph)	23	86	77	23	92	11	43	106	17	4	117	18
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	93	84	25	100	12	47	115	18	4	127	20
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	202	137	180	151								
Volume Left (vph)	25	25	47	4								
Volume Right (vph)	84	12	18	20								
Hadj (s)	-0.19	0.02	0.03	-0.04								
Departure Headway (s)	4.8	5.0	5.0	5.0								
Degree Utilization, x	0.27	0.19	0.25	0.21								
Capacity (veh/h)	701	654	669	665								
Control Delay (s)	9.5	9.2	9.6	9.3								
Approach Delay (s)	9.5	9.2	9.6	9.3								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			9.4									
Level of Service			A									
Intersection Capacity Utilization			39.6%	ICU Level of Service		A						
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 2: Watson Road S. (WR 41) & Site Access 1

2031 Future Total AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	89	101	7	21	6
Future Volume (Veh/h)	1	89	101	7	21	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	97	110	8	23	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	118				213	114
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	118				213	114
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	99
cM capacity (veh/h)	1470				775	939
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	98	118	30			
Volume Left	1	0	23			
Volume Right	0	8	7			
cSH	1470	1700	808			
Volume to Capacity	0.00	0.07	0.04			
Queue Length 95th (m)	0.0	0.0	0.9			
Control Delay (s)	0.1	0.0	9.6			
Lane LOS	A		A			
Approach Delay (s)	0.1	0.0	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			15.7%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 3: Arkell Road (WR 37) & Site Access 2

2031 Future Total AM

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	1	3	117	1	1	117
Future Volume (Veh/h)	1	3	117	1	1	117
Sign Control	Stop		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)	1	3	127	1	1	127
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	256	128			128	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	256	128			128	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	732	923			1458	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	4	128	128			
Volume Left	1	0	1			
Volume Right	3	1	0			
cSH	866	1700	1458			
Volume to Capacity	0.00	0.08	0.00			
Queue Length 95th (m)	0.1	0.0	0.0			
Control Delay (s)	9.2	0.0	0.1			
Lane LOS	A		A			
Approach Delay (s)	9.2	0.0	0.1			
Approach LOS	A					
Intersection Summary						
Average Delay		0.2				
Intersection Capacity Utilization		17.0%		ICU Level of Service		A
Analysis Period (min)		15				

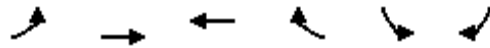
Lanes, Volumes, Timings
1: Arkell Road (WR 37) & Watson Road S. (WR 41)

2031 Future Total PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	126	133	31	132	11	88	183	33	12	154	27
Future Volume (vph)	34	126	133	31	132	11	88	183	33	12	154	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
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		0.939			0.991			0.985			0.981	
Flt Protected		0.994			0.991			0.986			0.997	
Satd. Flow (prot)	0	1739	0	0	1829	0	0	1809	0	0	1822	0
Flt Permitted		0.994			0.991			0.986			0.997	
Satd. Flow (perm)	0	1739	0	0	1829	0	0	1809	0	0	1822	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		415.4			513.9			455.7			278.3	
Travel Time (s)		29.9			37.0			32.8			20.0	
Confl. Peds. (#/hr)			1	1			2		2	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
Adj. Flow (vph)	37	137	145	34	143	12	96	199	36	13	167	29
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	319	0	0	189	0	0	331	0	0	209	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	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway 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
Turning Speed (k/h)	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 57.2%	ICU Level of Service B											
Analysis Period (min) 15												

Lanes, Volumes, Timings
2: Watson Road S. (WR 41) & Site Access 1

2031 Future Total PM



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	7	139	145	18	15	2
Future Volume (vph)	7	139	145	18	15	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.985		0.985	
Flt Protected		0.997			0.957	
Satd. Flow (prot)	0	1857	1835	0	1756	0
Flt Permitted		0.997			0.957	
Satd. Flow (perm)	0	1857	1835	0	1756	0
Link Speed (k/h)		50	50		30	
Link Distance (m)		513.9	23.5		109.1	
Travel Time (s)		37.0	1.7		13.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	151	158	20	16	2
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	159	178	0	18	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		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	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization		23.0%		ICU Level of Service A		
Analysis Period (min) 15						

Lanes, Volumes, Timings
3: Arkell Road (WR 37) & Site Access 2

2031 Future Total PM

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	4	193	1	6	164
Future Volume (vph)	0	4	193	1	6	164
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.865		0.999			
Flt Protected						0.998
Satd. Flow (prot)	1611	0	1861	0	0	1859
Flt Permitted						0.998
Satd. Flow (perm)	1611	0	1861	0	0	1859
Link Speed (k/h)	50		50			50
Link Distance (m)	172.3		278.3			145.8
Travel Time (s)	12.4		20.0			10.5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	4	210	1	7	178
Shared Lane Traffic (%)						
Lane Group Flow (vph)	4	0	211	0	0	185
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.6		0.0			0.0
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	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		15	25	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	23.5%			ICU Level of Service A		
Analysis Period (min)	15					

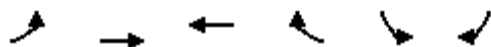
HCM Unsignalized Intersection Capacity Analysis 1: Arkell Road (WR 37) & Watson Road S. (WR 41)

2031 Future Total PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	34	126	133	31	132	11	88	183	33	12	154	27
Future Volume (vph)	34	126	133	31	132	11	88	183	33	12	154	27
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)	37	137	145	34	143	12	96	199	36	13	167	29
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	319	189	331	209								
Volume Left (vph)	37	34	96	13								
Volume Right (vph)	145	12	36	29								
Hadj (s)	-0.22	0.03	0.03	-0.04								
Departure Headway (s)	5.7	6.3	5.9	6.1								
Degree Utilization, x	0.51	0.33	0.54	0.35								
Capacity (veh/h)	579	502	566	519								
Control Delay (s)	14.6	12.3	15.7	12.4								
Approach Delay (s)	14.6	12.3	15.7	12.4								
Approach LOS	B	B	C	B								
Intersection Summary												
Delay				14.1								
Level of Service				B								
Intersection Capacity Utilization				57.2%	ICU Level of Service	B						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis 2: Watson Road S. (WR 41) & Site Access 1

2031 Future Total PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	139	145	18	15	2
Future Volume (Veh/h)	7	139	145	18	15	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	151	158	20	16	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	178				335	168
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	178				335	168
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	100
cM capacity (veh/h)	1398				656	876
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	159	178	18			
Volume Left	8	0	16			
Volume Right	0	20	2			
cSH	1398	1700	675			
Volume to Capacity	0.01	0.10	0.03			
Queue Length 95th (m)	0.1	0.0	0.7			
Control Delay (s)	0.4	0.0	10.5			
Lane LOS	A		B			
Approach Delay (s)	0.4	0.0	10.5			
Approach LOS			B			
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			23.0%		ICU Level of Service	
Analysis Period (min)			15		A	

HCM Unsignalized Intersection Capacity Analysis 3: Arkell Road (WR 37) & Site Access 2

2031 Future Total PM

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	4	193	1	6	164
Future Volume (Veh/h)	0	4	193	1	6	164
Sign Control	Stop		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)	0	4	210	1	7	178
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	402	210			211	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	402	210			211	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			99	
cM capacity (veh/h)	601	830			1360	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	4	211	185			
Volume Left	0	0	7			
Volume Right	4	1	0			
cSH	830	1700	1360			
Volume to Capacity	0.00	0.12	0.01			
Queue Length 95th (m)	0.1	0.0	0.1			
Control Delay (s)	9.4	0.0	0.3			
Lane LOS	A		A			
Approach Delay (s)	9.4	0.0	0.3			
Approach LOS	A					
Intersection Summary						
Average Delay		0.2				
Intersection Capacity Utilization		23.5%		ICU Level of Service		A
Analysis Period (min)		15				

APPENDIX F

TTS Data

Wed Aug 16 2023 22:26:10 GMT-0400 (Eastern Daylight Time) - Run Time: 2393ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig

Column: 2006 GTA zone of destination - gta06_dest

Filters:

2006 GTA zone of destination - gta06_dest In 8303

and

Start time of trip - start_time In 0630-0930

and

Trip purpose of destination - purp_dest In H

Trip 2016

Table:

	8303
8057	15
8171	24
8195	24

Wed Aug 16 2023 22:42:01 GMT-0400 (Eastern Daylight Time) - Run Time: 2432ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of destination - gta06_dest

Column: 2006 GTA zone of origin - gta06_orig

Filters:

2006 GTA zone of origin - gta06_orig In 8303

and

Start time of trip - start_time In 0630-0930

and

Trip purpose of origin - purp_orig In H

Trip 2016

Table:

	8303
52	12
3357	36
4126	13
7016	24
8035	12
8057	36
8086	24
8091	12
8092	22
8107	36
8151	12
8165	30
8195	24
8199	49

Wed Aug 16 2023 22:56:15 GMT-0400 (Eastern Daylight Time) - Run Time: 2512ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig

Column: 2006 GTA zone of destination - gta06_dest

Filters:

2006 GTA zone of destination - gta06_dest In 8303

and

Start time of trip - start_time In 1530-1830

and

Trip purpose of destination - purp_dest In H

Trip 2016

Table:

	8303
52	12
3357	36
4143	24
7016	24
8029	36
8035	12
8048	21
8057	36
8086	24
8107	36
8165	30
8195	24
8307	15

Wed Aug 16 2023 23:15:50 GMT-0400 (Eastern Daylight Time) - Run Time: 2427ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of destination - gta06_dest

Column: 2006 GTA zone of origin - gta06_orig

Filters:

2006 GTA zone of origin - gta06_orig In 8303

and

Start time of trip - start_time In 1530-1830

and

Trip purpose of origin - purp_orig In H

Trip 2016

Table:

	8303
8029	36
8048	21
8057	15
8082	72
8169	12
8195	24