

20 Cedarow Court Wellings Phase 2 Transportation Impact Assessment Strategy Report

October 24, 2019

Prepared for: Nautical Lands General Contractors Inc.

Prepared by:

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1.0 SCREENING

1.1 SUMMARY OF DEVELOPMENT

Municipal Address	20 Cedarow Court (Stittsville)
Description of Location	North-west quadrant of the Hazeldean Road at Fringewood Drive intersection
Land Use Classification	Senior Adult Housing - Attached, Commercial, Restaurant, Medical
Development Size (units)	414 units
Development Size (m²)	Commercial: 512 m² GFA (5,500 ft² GFA) Restaurant: 586 m² GFA (6,300 ft² GFA) Medical: 514 m² GFA (5,500 ft² GFA)
Number of Accesses and Locations	1 full movements main access to the extension of Fringewood Drive 1 full movements access to Cedarow Court
Phase of Development	2 Phases, subject TIA will assess the entire development together as one phase
Buildout Year	Assumed build-out and occupancy by 2024

If available, please attach a sketch of the development or site plan to this form.

1.2 TRIP GENERATION TRIGGER

Considering the Development's Land Use type and Size (as filled out in the previous section), please refer to the Trip Generation Trigger checks below.

Land Use Type	Minimum Development Size	Triggered
Single-family homes	40 units	×
Townhomes or apartments	90 units	×
Office	3,500 m²	×
Industrial	5,000 m²	×
Fast-food restaurant or coffee shop	100 m ²	\checkmark
Destination retail	1,000 m ²	×
Gas station or convenience market	75 m²	×
Generates more than 60 person trips per hour		

* If the development has a land use type other than what is presented in the table above, estimates of person-trip generation may be made based on average trip generation characteristics represented in the current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual.

If the proposed development size is greater than the sizes identified above, <u>the Trip Generation Trigger is</u> <u>satisfied.</u>



1.3 LOCATION TRIGGERS

	Yes	No
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks?	~	
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone? *		×

*DPA and TOD are identified in the City of Ottawa Official Plan (DPA in Section 2.5.1 and Schedules A and B; TOD in Annex 6). See Chapter 4 for a list of City of Ottawa Planning and Engineering documents that support the completion of TIA).

If any of the above questions were answered with 'Yes,' the Location Trigger is satisfied.

1.4 SAFETY TRIGGERS

	Yes	No
Are posted speed limits on a boundary street are 80 km/hr or greater?		×
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?		×
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions)?	✓	
Is the proposed driveway within auxiliary lanes of an intersection?		×
Does the proposed driveway make use of an existing median break that serves an existing site?		×
Is there a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?		×
Does the development include a drive-thru facility?		×

If any of the above questions were answered with 'Yes,' the Safety Trigger is satisfied.

1.5 SUMMARY

	Yes	No
Does the development satisfy the Trip Generation Trigger?	\checkmark	
Does the development satisfy the Location Trigger?	\checkmark	
Does the development satisfy the Safety Trigger?	\checkmark	

If none of the triggers are satisfied, <u>the TIA Study is complete</u>. If one or more of the triggers is satisfied, <u>the TIA Study must continue into the next stage</u> (Screening and Scoping).



2.0 SCOPING

2.1 EXISTING AND PLANNED CONDITIONS

2.1.1 Proposed Development

Nautical Lands General Contractors Inc. ("Nautical") is preparing a development application for Site Plan Control of a proposed development in the Stittsville community of Ottawa, Ontario. The proposed development is located at the north-west corner of the Hazeldean Road at Fringewood Drive intersection. The site is bound by Hazeldean Road to the south, Nautical's Wellings Phase 1 development to the east, existing commercial / industrial lands to the west, and Poole Creek to the north.

Figure 1 illustrates the location of the subject development. The subject site is currently zoned as Arterial Mainstreet (AM) Zone; the purpose of the AM Zone, according to the City of Ottawa's Official Plan, is to:

- "Accommodate a broad range of uses including retail, service commercial, offices, residential and institutional uses in mixed-use buildings or side by side in separate buildings in areas designated **Arterial Mainstreet** in the Official Plan; and
- Impose development standards that will promote intensification while ensuring that they are compatible with the surrounding uses."

The existing property is currently a vacant lot. The proposed primary site access makes up the north leg of the Hazeldean Road at Fringewood Drive intersection. This site access is shared with the adjacent Wellings Phase 1 development to the east of the subject site and is a full movements access without any turning restrictions. A secondary access is proposed to connect into Cedarow Court on the west side of the property. The secondary access is also a full movements access without any turning restrictions. A total of 490 vehicle parking spaces will be provided as part of the proposed development; 414 underground parking spaces and 76 above ground parking spaces.

The proposed development will be constructed in two phases. The first phase contains the building fronting Hazeldean Road and the second phase contains the building on the northern edge of the property. Build-out and occupancy of the entire development (i.e. both phases) is anticipated to occur by 2024. The subject TIA will assess the full build-out of the entire development.

Table 1 outlines the proposed land uses assumed for the analysis which were obtained from the *Institute of Transportation (ITE) Trip Generation Manual 10th Edition*.

Figure 2 illustrates the proposed site plan.





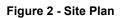
Figure 1 - Site Location

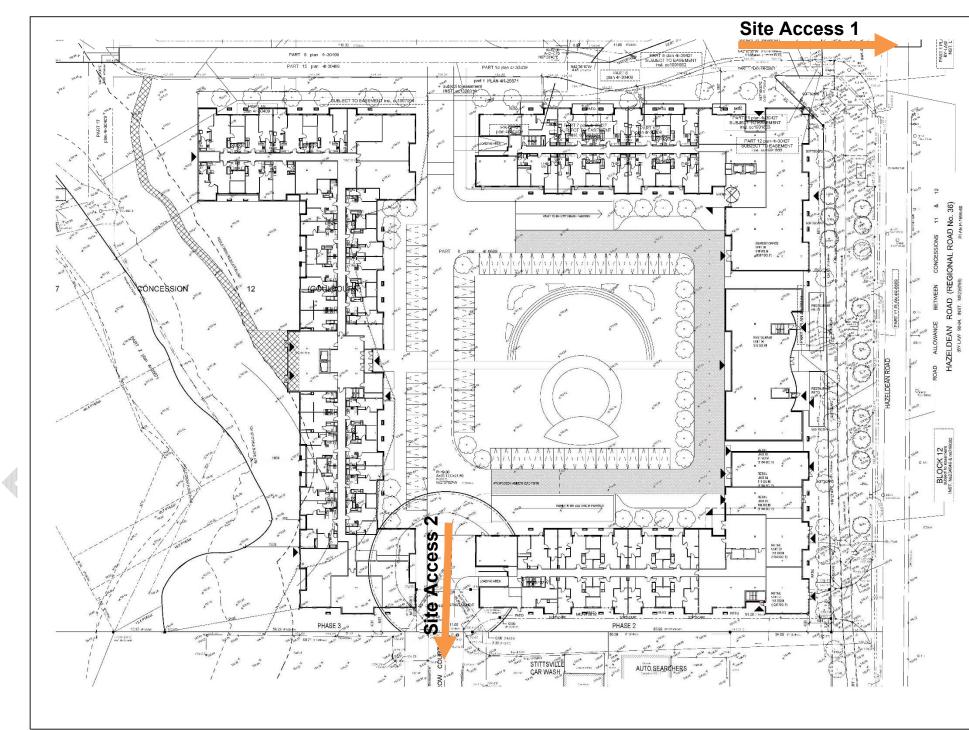
Table 1 - Proposed Land Uses / Land Use Codes

Land Use	Land Use Code (LUC)	Size
Senior Adult Housing - Attached	252	414 units
Shopping Centre	820	5,700 ft² GFA
High-Turnover Sit-Down Restaurant	932	6,000 ft² GFA
Medical-Dental Office	720	5,575 ft² GFA

It is noted that recent changes to the site plan resulted in minor modifications to the size of each land use. The minor discrepancy between the sizes depicted in **Table 1** above and the analysis contained within this report is acknowledged, however, it does not impact the findings or recommendations of this report.







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2.1.2 Existing Conditions

2.1.2.1 Roads and Traffic Control

The roadways under consideration in the study area are described as follows:

Hazeldean Road	Within the vicinity of the subject site, Hazeldean Road is a municipal four-lane divided arterial road with an urban cross-section. The posted speed limit along Hazeldean Road across the frontage of the subject site is 60 km/h. Sidewalks and on-street bicycle lanes are provided along both sides of Hazeldean Road.
Huntmar Drive	Huntmar Drive is a municipal two-lane major collector road with an urban cross-section. The posted speed limit along Huntmar Drive is 50 km/h. Sidewalks and on-street bicycle lanes are provided along both sides of Huntmar Drive. The intersection with Hazeldean Road is signalized and has auxiliary left and right turning lanes on all approaches.
lber Road	Iber Road is a municipal two-lane major collector road with a rural cross-section. The posted speed limit along Iber Road is 60 km/h. Gravel shoulders are provided along both sides of Iber Road.
Fringewood Drive	Fringewood Drive is a municipal two-lane local road with a rural cross-section. The posted speed limit along Fringewood Drive is 40 km/h. Gravel shoulders are provided along both sides of Fringewood Drive. The intersection with Hazeldean Road is signalized and includes auxiliary left and right turn lanes in the eastbound and westbound directions. The eastbound left and westbound right turn lanes are already in place in order to accommodate the future developments on the north side of the intersection (the subject development as well as the adjacent Wellings Phase 1 development).
Cedarow Court	Cedarow Court is a municipal two-lane local road with an urban cross-section. In the absence of a posted speed limit, the default speed limit along Cedarow Court is 50 km/h. The intersection with Hazeldean Road is stop-controlled along the Cedarow Court approach. There is currently a median break along Hazeldean Road at this location to allow the intersection with Cedarow Court to operate as a full movements intersection.

Along Hazeldean Road, approximately 160m east of Fringewood Drive, there is an unsignalized access to the Keg restaurant on the north side of Hazeldean Road. Due to the median along Hazeldean Road, this access operates as a right-in / right-out only access. There are numerous existing commercial accesses along the entire length of Cedarow Court.

Figure 3 illustrates the existing lane configuration and traffic control.



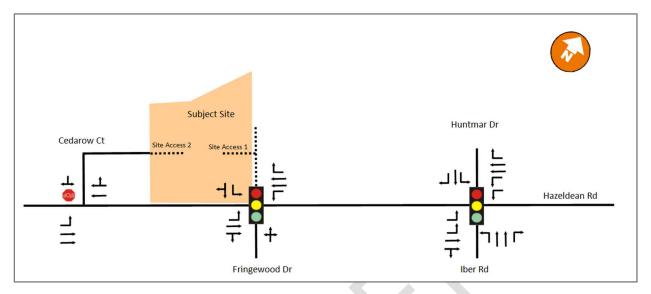


Figure 3 - Existing Lane Configuration and Traffic Control

2.1.2.2 Walking and Cycling

Within the vicinity of the subject site, sidewalks and on-street bicycle lanes are provided along both sides of Hazeldean Road and Huntmar Drive. The City of Ottawa's Ultimate Cycling Plan includes Hazeldean Road, Huntmar Drive, and Iber Road as spine cycling routes. It also designates Fringewood Drive as a local cycling route.

Figure 4 illustrates the existing and planned cycling and pedestrian facilities in the vicinity of the subject site.



Figure 4 - Cycling and Pedestrian Facilities

(Source: geoOttawa, accessed June 24th, 2019)

2.1.2.3 Transit

Transit service is currently provided in the immediate vicinity of the proposed development via the following routes:

Route 61	is a Rapid route that runs between Stittsville and Tunney's Pasture/Gatineau.
Route 62	is also a Rapid route that runs between Stittsville and Tunney's Pasture.
Route 261	is a weekday Connexion peak directional route that runs between Stittsville Main and Tunney's Pasture.
Route 263	is a weekday Connexion peak directional route that runs between Stanley Corners and Tunney's Pasture.
Route 303	is a Local peak directional route that runs on Wednesdays only between Dunrobin and Carlingwood Mall

There are two transit stops along Hazeldean Road at the intersection of Fringewood Drive. These bus stops are serviced by all five transit routes listed above. Although depicied, no schedule information is available for Route 303; it is believed no longer as per its exclusion from OC Transpo's In My Neighborhood webpage.

Figure 5 illustrates the transit routes and transit stops within the vicinity of the subject site.





Figure 5 - Study Area Transit Routes and Stops

(Source: OC Transpo System Map, accessed October 11, 2019)

2.1.2.4 Traffic Management Measures

No traffic management measures are currently provided near the subject site.

2.1.2.5 Traffic Volumes

Turning movement counts at the study area intersections were collected by the City of Ottawa in July and August of 2019. **Figure 6** illustrates the existing traffic volumes at the study area intersections.

Appendix A contains the traffic data and is provided for reference.

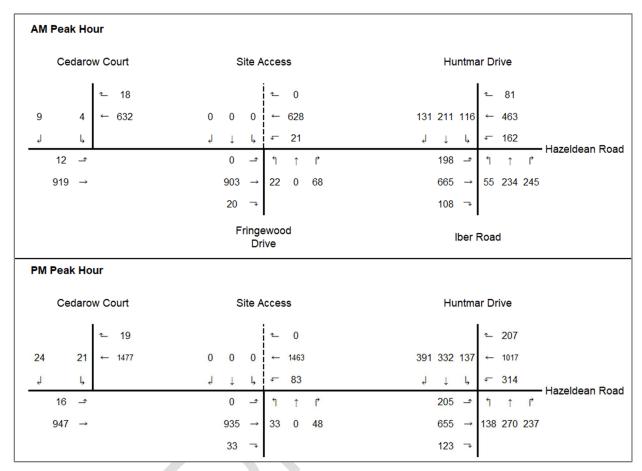


Figure 6 - 2019 Existing Traffic Volumes

2.1.2.6 Collision History

Collision data was provided by the City of Ottawa for the period January 2013 to December 2017 in the vicinity of the subject site. The data was reviewed to determine if any intersections or road segments exhibited an identifiable collision pattern during the five (5) year period. **Table 2** summarizes the collision class and impact types for each road segment and intersection in the study area.

		Hazeldean Road between Cedarow Court and Fringewood Drive	Hazeldean Road at Fringewood Drive	Hazeldean Road between Fringewood Drive and Huntmar Drive	Hazeldean Road at Huntmar Drive	
Classification	Property Damage Only	2	4	3	37	
Classification	Non-Fatal Injury	0	3	2	15	
	Sideswipe	0	1	1	3	
	Angle / Turning	1	3	1	14	
Collision Type	Rear End	1	1	0	32	
	Single Motor Vehicle	0	2	3	2	
	Other	0	0	0	1	
	Other Motor Vehicle	1	4	2	47	
	Ran off Road	0	1	0	0	
	Cyclist	1	1	0	2	
Event	Pedestrian	0	1	0	0	
	Skidding	0	0	0	3	
	Wild Animal	0	0	1	0	
	Physical (curb, pole, barrier)	0	0	2	0	

Table 2 - Collision Summary

Based on the collision data summarized in **Table 2** above, it was found that the majority of the collisions resulted in property damage only (70%), which suggests that the collisions were low enough speeds to not cause injury to people. The Hazeldean Road at Huntmar Drive intersection experienced the highest number of collisions (79%) with the majority of them being rear end collisions (62%). The rear end collisions at the Hazeldean Road at Huntmar Drive intersection were reviewed further to determine if there are any discernable patterns and can be seen in **Table 3** below.



		Hazeldean Road at Huntmar Drive
	Clear	25
Environment	Rain	4
	Snow	3
	Dry	23
Surface Condition	Wet	8
	Slush	1
	West	7
Vehicle Direction	South	9
venicle Direction	East	11
	North	5

Table 3 – Rear End Collisions at the Hazeldean Road at Huntmar Drive Intersection

The vast majority of the rear end collisions at the Hazeldean Road at Huntmar Drive intersection occurred under clear environmental conditions (78%) and with dry surface conditions (72%). In terms of vehicle direction, the rear end collisions were evenly spread across all four directions.

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2.1.3 Planned Conditions

2.1.3.1 Road Network Modifications

A number of roadway and transit improvements are scheduled to occur within the vicinity of the subject development, as outlined in the City of Ottawa's Transportation Master Plan, and are summarized in **Table 4** below.

Project	Description	TMP Phase
Hazeldean Road	Transit signal priority and queue jump lanes between Stittsville Main Street and Eagleson Road.	Affordable Network (2031) and Network Concept
Stittsville Main Street	Transit signal priority and queue jump lanes between Fernbank Road and Hazeldean Road.	Network Concept (post 2031)
Stittsville North-South Arterial	New two-lane road between Palladium Drive and Fernbank Road.	Between Fernbank Road and Iber Road (already constructed) Between Palladium and Iber Road - Phase 2 (2020 – 2025)
	Transit signal priority and queue jump lanes at selected intersections.	Affordable Network (before 2031)
West Transitway	Exclusive and at-grade BRT between Terry Fox and Eagleson Station.	Affordable Network (before 2031)
Extension	Exclusive BRT between Fernbank Road and Eagleson Station.	Network Concept (post 2031)
Huntmar Drive	Widen from two to four lanes between Campeau Drive extension and Cyclone Taylor Boulevard. Widen from two to four lanes between Palladium Drive and Maple Grove Road.	Phase 3 (2026 – 2031)
Stittsville Main Street Extension	New two-lane road between Palladium Drive and Maple Grove Road.	Phase 3 (2026 – 2031)
Palladium Drive Realignment	Realignment of roadway within the vicinity of Huntmar Road to new North-South Arterial.	Phase 2 (2020 – 2025)
Maple Grove Road	Widen from two to four lanes between Terry Fox Drive and Huntmar Drive.	Network Concept (post-2031)

Table 4 - City of Ottawa Transportation Master Plan Projects

Figure 7 illustrates roadway and transit improvements as outlined in the TMP.



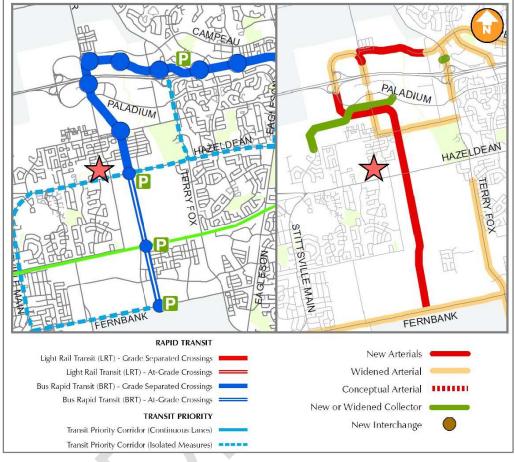


Figure 7 - TMP Roadway and Transit Improvements

Source: City of Ottawa's Transportation Master Plan, 2013.

Contrary to the above **Figure 7**, the section of the Stittsville Main Street Extension between the Stittsville North-South Arterial and Palladium Drive was included in the City's TMP in error. This section of roadway is not planned to be included in the future roadway network. In addition, although not depicted in the above figure, Maple Grove Road is planned to extend to the Stittsville Main Street Extension.

Although the City's TMP calls for Bus Rapid Transit between Eagleson Station and Fernbank Road, based on the recently completed *Kanata Light Rail Transit Planning and Environmental Assessment Study (August 30, 2018)*, the West Transitway Extension will now include Light Rail Transit in place of Bus Rapid Transit. The alignment of the LRT, as outlined in the completed EA, is located on the north side of Highway 417 and includes stations at March Road, Kanata Town Centre, Terry Fox Drive, Didsbury Road, Campeau Drive, Palladium Drive, Maple Grove Road, and Hazeldean Road. The LRT will cross Highway 417 at Huntmar Drive and will continue south until Hazeldean Road. There is a proposed station at the intersection of Hazeldean Road and the North-South Arterial, which is approximately 600m east of the proposed subject site.

Figure 8 illustrates the proposed Hazeldean Road LRT Station.



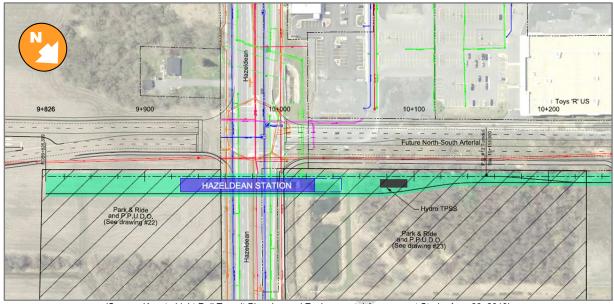


Figure 8 - Recommended Hazeldean Road LRT Station

(Source: Kanata Light Rail Transit Planning and Environmental Assessment Study, Aug. 30, 2018)

2.1.3.2 Future Background Developments

There are numerous developments scheduled to occur in the vicinity of the subject site as illustrated in **Figure 9** and described in **Table 5**.

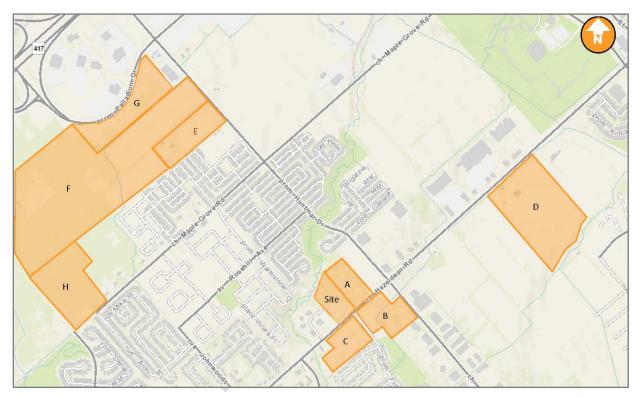
Table 5 -	Background	Developments
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Key Plan Reference	Development	Location	Description
A	5731 Hazeldean Road	North-east quadrant of the Hazeldean Road at Fringewood Drive intersection	Congregate Care, Assisted Living, Office, and Retail
В	5754 Hazeldean Road	South-east quadrant of the Hazeldean Road at Fringewood Drive intersection	Retail, Office, and Medical
С	5 Orchard Road	South-west quadrant of the Hazeldean Road at Fringewood Drive intersection	Residential and Commercial
D	590 Hazeldean Road	West of the City of Ottawa and south of Hazeldean Road within the Fernbank Community.	748 residential dwelling units consisting of a mix of dwelling types, as well as approximately 3.7 hectares of mixed-use commercial areas.
E	173 Huntmar Drive	West of Huntmar Drive and north of Maple Grove in Ottawa's western community of Kanata.	A mixed-use subdivision with 206 residential dwelling units and approximately 65,000 ft ² of commercial office / retail.
F	195 Huntmar Drive	West of Huntmar Drive and South of Highway 417.	Mixed-use subdivision comprising of a 2.5-hectare commercial block, a 5.98-hectare district park, and 691 residential units.



Key Plan Reference	Development Location		Description	
G	2499 Palladium Drive	Southwest quadrant of Highway 417 and Palladium Drive interchange in Kanata West.	Rezoning of 7.8-hectares of land to accommodate luxury auto dealerships.	
Н	1981 Maple Grove Road	Northeast quadrant of Stittsville Main Street, north of Maple Grove Road.	196 mixed type residential units.	

Figure 9 - Background Developments



2.2 STUDY AREA AND TIME PERIODS

2.2.1 Study Area

The proposed study area is limited to the following intersections:

- Hazeldean Road at Huntmar Drive / Iber Road;
- Hazeldean Road at Cedarow Court; and
- Hazeldean Road at Fringewood Drive.

2.2.2 Time Periods

The proposed scope of the transportation assessment includes the following analysis time periods:

- Weekday AM peak hour of roadway; and
- Weekday PM peak hour of roadway.

2.2.3 Horizon Years

The scope of the transportation assessment proposes the following horizon years:

- 2019 existing conditions;
- 2024 future background conditions;
- 2024 total future conditions (site build-out); and
- 2029 total future conditions (5 years beyond build-out).

2.3 EXEMPTIONS REVIEW

Table 6 summarizes the Exemptions Review table from the City of Ottawa's 2017 Transportation Impact Assessment

 Guidelines.

Module	Element	Exemption Considerations	Exempted?
Design Review Component			
	4.1.2 Circulation and Access	Only required for site plans	No
4.1 Development Design	4.1.3 New Street Networks	Only required for plans of subdivision	Yes
	4.2.1 Parking Supply	Only required for site plans	No
4.2 Parking	4.2.2 Spillover Parking	Only required for site plans where parking supply is 15% below unconstrained demand	Yes
Network Impact Component			
4.5 Transportation Demand Management	All Elements	Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time	No
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds	Yes
4.8 Network Concept		Only required when proposed development generates more than 200 person-trips during the peak hour in excess of the equivalent volume permitted by established zoning	Yes
4.9 Intersection Design	All Elements	Not required if site generation trigger is not met.	No

Table 6 - Exemptions Review

3.0 FORECASTING

The Step 3.0 – Forecasting section has been reviewed by the City of Ottawa and was subject to revision as per the comments prepared the City, dated August 30, 2019. The comment responses reflected herein were accepted by the City of Ottawa on September 10 of the same year. Correspondence detailing the Step 3.0 comment responses can be found in **Appendix B**.

3.1 DEVELOPMENT GENERATED TRAVEL DEMAND

3.1.1 Trip Generation and Mode Shares

The *Institute of Transportation (ITE) Trip Generation Manual* (10th edition) was used to forecast auto trip generation for the proposed development. Land use codes 252 – Senior Adult Housing – Attached, 820 – Shopping Centre, 932 – High-Turnover Sit-Down Restaurant, and 720 – Medical / Dental Office were thought to be the most representative of the proposed land uses.

Table 7 outlines the assumed land uses and the trip generation rates for each land use.

As per the City of Ottawa's 2017 *TIA Guidelines,* the auto trip generation rates for the proposed land uses were converted to person trips using a conversion factor of 1.28.

Table 8 outlines development-generated person trips for each land use.

LUC	Land Use	Size	Weekday AM Peak Hour			Weekday PM Peak Hour		
	Lanu Use	Size	In	Out	Rate	In	Out	Rate
252	Senior Adult Housing Attached	434 Units	35%	65%	0.20	55%	45%	0.25
820	Shopping Centre	10,000 ft ²	62%	38%	0.94	48%	52%	3.81
932	High-Turnover Sit-Down Restaurant	7,000 ft ²	55%	45%	9.94	62%	38%	9.77
720	Medical-Dental Office	6,000 ft ²	78%	22%	3.04	28%	72%	3.73

Table 7 - Land Uses and Trip Generation Rates

LUC	Land Use	Trip Conversion	Weekday AM Peak Hour			Weekday PM Peak Hour		
		The Conversion	In	Out	Total	In	Out	Total
	o ·	Auto Trips	30	57	87	58	48	106
252	Senior Adult Housing Attached	Conversion Factor	1.28	1.28	1.28	1.28	1.28	1.28
	Allacheu	Person Trips	38	73	111	74	61	136
		Auto Trips	6	3	9	18	20	38
820	Shopping Centre	Conversion Factor	1.28	1.28	1.28	1.28	1.28	1.28
		Person Trips	8	4	12	23	26	49
		Auto Trips	39	32	70	42	26	68
932	High-Turnover Sit-Down Restaurant	Conversion Factor	1.28	1.28	1.28	1.28	1.28	1.28
	Restaurant	Person Trips	50	41	90	54	33	87
		Auto Trips	14	4	18	6	16	22
720	Medical-Dental Office	Conversion Factor	1.28	1.28	1.28	1.28	1.28	1.28
		Person Trips	18	5	23	8	20	28
	Auto Trips		89	96	185	124	110	234
	Total	Person Trips	114	123	237	159	140	299

Table 8 - Person Trips Generated by Land Use

To reflect local travel characteristics, the person trips were assigned to the four primary modal shares (i.e. auto, passenger, transit, and active moves) according to the TRANS Committee's 2011 Origin-Destination (O-D) Survey for the Kanata / Stittsville District. The modal shares were based off those in the approved *5731 Hazeldean Road Transportation Impact Study (March 2016)*, which is the development adjacent to the subject site.

Table 9 outlines the anticipated trip generation potential of the proposed development by travel mode based on the assumed mode share targets.

LUC	Land Use	Trip Conversion		Weeko	Weekday AM Peak Hour			Weekday PM Peak Hour		
LUC	Lanu Use			In	Out	Total	In	Out	Total	
		Auto	50%	19	37	56	37	31	68	
252	Senior Adult Housing	Passenger	15%	6	11	17	11	9	20	
252	Attached	Walk / Bike	10%	4	7	11	7	6	14	
		Transit	25%	10	18	28	19	15	34	
		Auto	50%	4	2	6	12	13	25	
820	Shopping Centre	Passenger	15%	1	1	2	3	4	7	
020	Shopping Centre	Walk / Bike	10%	1	0	1	2	3	5	
		Transit	25%	2	1	3	6	7	12	
		Auto	50%	25	21	45	27	17	44	
932	High-Turnover Sit-	Passenger	15%	8	6	14	8	5	13	
932	Down Restaurant	Walk / Bike	10%	5	4	9	5	3	9	
		Transit	25%	13	10	23	14	8	22	
		Auto	50%	9	3	12	4	10	14	
700	Madiaal Dantal Office	Passenger	15%	3	1	3	1	3	4	
720	Medical-Dental Office	Walk / Bike	10%	2	1	2	1	2	3	
		Transit	25%	5	1	6	2	5	7	
			Auto	57	63	119	80	71	151	
	Total	Pas	senger	18	19	36	23	21	44	
	IULAI	Wal	k / Bike	12	12	23	15	14	31	
			Transit	30	30	60	41	35	75	

Table 9 - Trips Generated by Travel Mode



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3.1.2 Internal Capture and Pass-By

When predicting trips that are associated with different land use types the interaction between those land use types must be accounted for by applying the principals of internal capture adjustments. Internal capture trips are trips which are shared between two or more uses on the same site. A portion of the generated trips for each individual land use is therefore drawn from the adjacent land uses. Internal capture adjustments were made to account for vehicles that visit more than one land use within the subject commercial development. Since these trips are contained within the subject site, accounting for each trip separately on the roadway network would result in "double-counting". For this reason, land uses that may have associated internal capture trips between one another ultimately had their net new trips adjusted consistent with typical industry standards. In the subject development, the land uses that are subject to internal capture reductions are the shopping centre, restaurant, and medical office land uses.

A portion of the auto trips generated by the proposed restaurant and shopping centre land uses will be 'pass-by' in nature. Pass-by trips are considered intermediate stops between an origin and a destination. They are site trips that are drawn from existing traffic volumes on the road network that are "passing-by" the site. While the total number of trips generated by a given development remains the same, the turning movements at study area intersections and site accesses require adjustments to reflect pass-by traffic. The rate of pass-by traffic is based on the specific land use and the various pass-by rates were obtained from the *ITE Trip Generation Manual*. A pass-by rate of 43% was used for the restaurant land use and a pass-by rate of 34% was used for the shopping centre land use. Due to the nature of the land uses, the pass-by rates were only applied to the PM peak hour.

Table 10 outlines the pass-by, internal capture, and net new trips anticipated for the proposed development.

LUC Land Use		Trip Conversion		Weekday AM Peak Hour			Weeko	Weekday PM Peak Hour		
				In	Out	Total	In	Out	Total	
		Auto Trips		19	37	56	37	31	68	
252 Ho	Senior Adult	Internal Capture	0%	0	0	0	0	0	0	
	Housing	Net Auto Trips		19	37	56	37	31	68	
	Attached	Pass-By	0%	0	0	0	0	0	0	
		Net New Auto	o Trips	23	44	67	44	0 31 0 37 13 37 13 37 13 37 13 37 113 3 10 3 17 3 14 8 6 10 2 8 0 0	82	
		Auto Trips		4	2	6	12	13	25	
	Ohannina	Internal Capture	20%	1	0	1	2	3	5	
820	Shopping Centre	Net Auto Trips		3	2	5	10	10	20	
		Pass-By	34%	0	0	0	3	3	6	
		Net New Auto Trips		3	2	5	7	7	14	
		Auto Trips		25	21	45	27	17	44	
	High-Turnover 932 Sit-Down Restaurant	Internal Capture	20%	5	4	9	5	3	8	
932		Net Auto Trips		20	17	36	22	14	36	
		Pass-By	43%	0	0	0	8	8	16	
		Net New Auto Trips		20	17	36	14	6	20	
		Auto Trips		9	3	12	4	10	9	
	Medical- Dental Office	Internal Capture	20%	2	1	2	1	2	2	
720		Net Auto Trips		7	2	10	3	8	12	
		Pass-By	0%	0	0	0	0	0	0	
		New Auto Trips		7	2	10	3	8	12	
		Auto Trips		57	63	119	80	71	151	
		Internal Capture		8	5	12	8	8	15	
	Total	Net Auto Trips		49	58	107	72	63	136	
		Pass-By		0	0	0	11	11	22	
		Net New Auto	49	58	107	61	52	114		

Table 10 - Pass-By and Internal Capture Trips

3.1.3 Trip Distribution

The distribution of traffic to / from the study area was determined through examination of the TRANS Committee's 2011 Origin-Destination (O-D) Survey for the Kanata / Stittsville District as well as the approved *5731 Hazeldean Road Transportation Impact Study (March 2016)*.

 Table 11 provides a summary of the estimated distribution for the traffic generated by the proposed development.

		Via (To / From)						
Cardinal Direction		Hazeldean Road	Hazeldean Road					
		(East)	(West)					
North	5%	5%	0%					
East	40%	40%	0%					
South	5%	0%	5%					
West	0%	0%	0%					
Internal (Kanata / Stittsville)	50%	35%	15%					
Total	100%	80%	20%					



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3.1.4 Trip Assignment

Site generated trips were assigned to the study area road network based on the trip distribution assumptions outlined in **Table 11**. New site trips are assigned to the road network and pass-by trips were then added to develop the net new site trips generated by the proposed development. **Figure 10** illustrates the net site generated trips for the proposed development after accounting for pass-by trips, during the AM and PM peak hours.

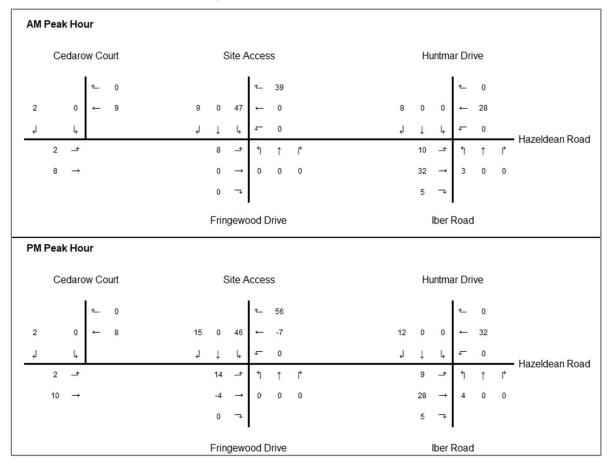


Figure 10 – Net Site Generated Trips

3.2 BACKGROUND NETWORK TRAVEL DEMAND

3.2.1 Transportation Network Plans

As outlined in **Table 4** in **section 2.1.3.1**, a number of road network projects are expected to occur within the vicinity of the proposed development. Through recent discussions with City of Ottawa staff, it is understood that the timelines for the roadway projects outlined in the City of Ottawa's *2013 Transportation Master Plan* have been pushed back one Phase (i.e. Phase 2 (2020 – 2025) projects are now Phase 3 (2026 -2031) projects, etc.). For this reason, it was assumed that there will not be any improvements to the roadway network that will affect the study area intersections prior to the 2029 ultimate (+5 year) horizon.

3.2.2 Background Growth

The existing traffic counts were grown at a rate of 2% annually, non-compounding, to represent background traffic volumes. This rate of background growth is consistent with that in the approved *5731 Hazeldean Road Transportation Impact Study (March 2016)*.

3.2.3 Other Developments

As outlined in **Section 2.1.3.2**, a number of background developments are planned in the vicinity of the subject site. The traffic volumes that these background developments will generated were obtained from their respective traffic studies and added to the roadway network as background traffic.

Appendix C contains the background traffic data and is provided for reference.

3.3 DEMAND RATIONALIZATION

The traffic forecasts indicate that the demand along Hazeldean Road is anticipated to approach or exceed the available capacity by the 2024 future background horizon. As traffic volumes start to increase along Hazeldean Road, delays at intersections will subsequently start to increase. Motorists will start to see their commute times increase which may lead to some changes in their behaviors with the intention of reducing commute times. The following subsections outline the potential ways in which motorists could change their behaviors, which would in turn help to reduce traffic volumes on the roads during peak hours, thus assisting with rationalizing the demands.

3.3.1 Rerouting of Traffic

Motorists may alter their regular route in order to select a route with less delays to reduce their overall commute time. There are only two major connections for the subject development out of the Stittsville community; Hazeldean Road and Highway 417. Fallowfield Road is also a connection out of Stittsville; however, it would require motorists to take a circuitous route in the southbound direction before heading east, which is not realistic.

With Highway 417 being regularly congested during the peak hours, it is unlikely that motorists will alter their route from Hazeldean Road onto the Highway, therefore rerouting of traffic is not a feasible solution for demand rationalization.



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3.3.2 Reduction in Auto Modal Share

Motorists may alter their mode of transportation and opt to use public transit which would reduce number of vehicles on the road during the peak hours, thus improving the operations along Hazeldean Road. As the study area is currently well serviced by public transit, this is a viable option for demand rationalization. It was assumed that 10% of the traffic volumes will alter their mode of transportation from vehicles to transit in the future to reduce their commute times. This 10% reduction was applied to all three future horizons (2024 future background, 2024 total future, and 2029 ultimate) however, it is recognized that this reduction does not eliminate the capacity concerns along Hazeldean Road entirely, it merely reduces it.

3.3.3 Change in Travel Times

Motorists may start to alter their travel times to travel outside of the peak hour with the goal of reducing their commute time. This would reduce the demand on the network during the peak hour and subsequently increase the demand on the network just before and just after the peak hour, which is referred to as peak spreading. It was assumed that 10% of motorists will change their travel times to travel outside of the peak hour to reduce their commute. The traffic volumes along Hazeldean Road were therefore reduced by 10%, however, it is recognized that this reduction does not eliminate the capacity concerns along Hazeldean Road entirely, it merely reduces it.



4.0 STRATEGY

4.1 DEVELOPMENT DESIGN

4.1.1 Design for Sustainable Modes

Bicycle facilities: A total of 80 bicycle parking spaces are provided for the proposed development. These bicycle parking spaces are provided next to the retail / restaurant units as well as near the rear building.

Pedestrian facilities: Pedestrian connections are included on the site plan which will connect the proposed building to the existing sidewalks along Hazeldean Road.

Parking areas: A total of 490 vehicle parking spaces are provided. This consists of 414 underground vehicle parking spaces and 76 above grade vehicle parking spaces.

Transit facilities: Transit stops for OC Transpo routes 61, 62, 261, 263, 301 and 303 are currently located at the study intersections. There are sidewalks along both sides of Hazeldean Road as well as pedestrian crosswalks at the intersection of Hazeldean Road and Fringewood Drive for pedestrians to access these transit stops.

4.1.2 Circulation and Access

Two site accesses are proposed as part of the subject site; Site Access 1 will tie into the future extension of Fringewood Drive, approximately 110m north of Hazeldean Road, on the east side of the property and Site Access 2 will be located at the terminus of Cedarow Court on the west side of the property. Both accesses will be full movements accesses with no turning restrictions. Site Access 1 will be stop-controlled along the site access approach and Site Access 2 will simply be a continuation of Cedarow Court.

Within the vicinity of the subject site, pedestrian access is facilitated through the existing sidewalks along Hazeldean Road and Huntmar Drive. Sidewalk connections are proposed between Hazeldean Road and the proposed building as well as along the north leg of the Hazeldean Road at Fringewood Drive intersection to facilitate pedestrian access to and from the proposed development.

4.1.3 New Street Networks

Not applicable; exempted during screening and scoping.

4.2 PARKING

4.2.1 Parking Supply

Auto Parking - As per City of Ottawa Zoning By-law 2008-250 (Sections 101 and 102), the minimum parking space requirement is 0.25 vehicle spaces per dwelling unit, 3.4 vehicle spaces per 100m² of retail space (gross floor area), 10 vehicle spaces per 100m² of restaurant space (gross floor area), and 4 vehicle spaces per 100m² of medial space (gross floor area).



Based on the proposed land uses, a minimum of 104 vehicle spaces are required for the residential component, 17 vehicle spaces are required for the retail component, and 59 vehicle spaces are required for the restaurant component, and 21 vehicle spaces are required for the medial component for a total of 201 vehicle parking spaces for the proposed development.

The proposed site plan indicates there will be a total of 490 parking spaces provided, which meets the minimum requirements.

Bicycle Parking – As per City of Ottawa Zoning By-law 2008-250 (Section 111), the minimum bicycle parking rate of 0.25 bicycle parking spaces per dwelling unit, 1 bicycle parking space per 250m² of retail (gross floor area), 1 bicycle parking space per 250m² of restaurant (gross floor area), and 1 bicycle parking space per 100m² of medical (gross floor area).

Based on the proposed land uses, a minimum of 104 bicycle spaces are required for the residential component, 2 bicycle spaces are required for the retail component, 2 bicycle spaces are required for the restaurant component, and 5 bicycle spaces are required for the medical component, for a total of 113 bicycle spaces for the proposed development.

The proposed site plan indicates there will be 80 bicycle spaces provided, which does not meet the minimum requirements.

4.2.2 Spillover Parking

Not applicable; exempted during screening and scoping.

4.3 BOUNDARY STREET DESIGN

4.3.1 Design Concept

As outlined in the City of Ottawa's *Official Plan* Schedule B, Hazeldean Road is designated as an Arterial Mainstreet and Huntmar Drive and Cedarow Court are both within the 'General Urban Area'. With these designations, the MMLOS targets are prescribed in the City of Ottawa's *Multi-Modal Level of Service (MMLOS) Guidelines*.

Hazeldean Road

The Pedestrian Level of Service (PLOS) target for Hazeldean Road is C. The Ultimate Cycling Network from the City of Ottawa's Transportation Master Plan (2013) designates Hazeldean Road as a spine cycling route, therefore, it is subject to a Bicycle Level of Service (BLOS) target of C. Transit service travelling along Hazeldean Road currently operates within mixed traffic, and as such, the Transit Level of Service (TLOS) target is D. Hazeldean Road is designated as truck route and therefore has a Truck Level of Service (TkLOS) target of D.

Due to the posted speed along Hazeldean Road, the PLOS target of C is not currently being met. Reducing the posted speed limit to 50 km/h would allow the segment to meet the PLOS target. Another option would be to reduce the volume of vehicles on the road so that the Average Annual Daily Traffic (AADT) is less than 3000 per lane. Due to the nature of arterial roads, reducing the speed limit or the decreasing the volume along Hazeldean Road are not feasible options. The BLOS, TLOS, and TkLOS targets along Hazeldean Road are currently being met.



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Huntmar Drive

The Pedestrian Level of Service (PLOS) target for Huntmar Drive is C. The Ultimate Cycling Network from the City of Ottawa's Transportation Master Plan (2013) designates Huntmar Drive as a spine cycling route, therefore, it is subject to a Bicycle Level of Service (BLOS) target of C. Transit service travelling along Huntmar Drive currently operates within mixed traffic, and as such, the Transit Level of Service (TLOS) target is D. Huntmar Drive is not designated as a truck route, and therefore Truck Level of Service (TkLOS) does not apply to this road segment.

The PLOS, BLOS, and TLOS targets are all currently being met along Huntmar Drive. As Huntmar Drive is not a truck route, the TkLOS does not apply to this road segment.

Cedarow Court

The Pedestrian Level of Service (PLOS) target for Cedarow Court is C. The Ultimate Cycling Network from the City of Ottawa's Transportation Master Plan (2013) has no cycling designation for Cedarow Court, therefore it is subject to a Bicycle Level of Service (BLOS) target of D. There is no transit service along Cedarow Court and therefore Transit Level of Service (TLOS) does not apply to this road segment. Cedarow Court is not designated as a truck route, and therefore Truck Level of Service (TkLOS) does not apply to this road segment.

As Cedarow Court does not currently have any pedestrian facilities, the PLOS target of C is not currently being met. Implementing a 1.8m wide sidewalk would allow the PLOS target to be met along this road segment. The BLOS target of B is currently being met along Cedarow Court. As Cedarow Court is neither a transit route nor a truck route, both the TLOS and TkLOS do not apply.

Table 12 presents the MMLOS conditions for all three roadway segments. As the existing and future conditions remain

 the same, the MMLOS results have been provided as one entry.

Appendix D contains the detailed MMLOS analysis.

Intersection	PLOS		BLOS		TLOS		TkLOS	
InterSection	Target	Actual	Target	Actual	Target	Actual	Target	Actual
Hazeldean Road	С	D	С	С	D	D	D	A
Huntmar Drive	С	С	С	С	D	D	N	/A
Cedarow Court	С	F	D	D	N	/A	N	/A

Table 12 - Roadway Segment MMLOS

4.4 ACCESS INTERSECTIONS DESIGN

4.4.1 Location and Design of Access

The proposed primary site access ties into the future north leg of the Hazeldean Road at Fringewood Drive intersection, approximately 110m north of Hazeldean Road. This site access is proposed to be a full movements access without any



turning restrictions. A secondary access is proposed to connect into Cedarow Court on the west side of the property. The secondary access is also a full movements access without any turning restrictions.

4.4.2 Intersection Control

Site Access 1 ties into the future north leg of the existing Hazeldean Road at Fringewood Drive intersection and will be stop-controlled on the site access approach. Site Access 2 ties into the terminus of Cedarow Court, therefore, based on the geometry, no traffic control is required at this location.

4.4.3 Intersection Design

Section 4.9.2 contains the detailed intersection and MMLOS analyses under all study horizons.

4.5 TRANSPORTATION DEMAND MANAGEMENT

4.5.1 Context for TDM

The proposed development is currently owned by Nautical Lands Group, however, the tenants for the retail, restaurant, and medical components are not yet known. As outlined in **Section 3.1.1**, the Traffic Assessment Zone (TAZ) in which the subject development resides calls for an auto driver mode share of approximately 50%, a transit mode share of approximately 25%, a bicycle / walking mode share of approximately 10%, and an auto passenger mode share of approximately 15%.

As the proposed development is not anticipated to generate a substantial amount of vehicle traffic as compared to the traffic that is already on the boundary road network, these auto modal shares do not make up a significant portion of the background network's traffic.

4.5.2 Need and Opportunity

In order to support the transit and active modal share targets outlined in **Table 9**, cycling and transit infrastructure will need to be included. This includes the provision of bicycle parking as well as ensuring convenient pedestrian connections are provided to sidewalk facilities leading to bus stop locations. These aforementioned facilities have been included on the site plan to support active modes.

4.5.3 TDM Program

The City of Ottawa TDM Checklists were used to determine what TDM measures could be implemented based on the available information.

The TDM checklists are contained in Appendix E.

4.6 NEIGHBOURHOOD TRAFFIC MANAGEMENT

Not applicable; exempted during screening and scoping.



4.7 TRANSIT

4.7.1 Route Capacity

An assumed transit modal share of 25% was adopted for all four land uses contained within the proposed development. The forecasted transit trips for the proposed development is 60 and 75 total transit trips during the AM and PM peak hours, respectively.

There are six OC Transpo transit routes within a 400m walking distance of the proposed site; routes 61, 62, 261, 263, 301, and 303. Route 61 is a Rapid route that operates at approximately 30-minute headways during the weekday morning and afternoon peak periods. Route 62 is also a Rapid route that operates at approximately 30-minute headways during the weekday morning and afternoon periods. Route 261 is a Connexion route that operates at approximately 30-minute headways during the weekday morning and afternoon periods. Route 261 is a Connexion route that operates at approximately 30-minute headways during the weekday morning and afternoon peak periods. Route 263 is also a Connexion route that operates at approximately 30-minute headways during the weekday morning and afternoon peak periods. Route 263 is also a Connexion route that operates at approximately 30-minute headways during the weekday morning and afternoon peak periods. Route 263 is also a Connexion route that operates at approximately 30-minute headways during the weekday morning and afternoon peak periods. Route 263 is also a Connexion route that operates at approximately 30-minute headways during the weekday morning and afternoon peak periods. Routes 303 is a Local peak direction route that operates on Wednesdays and will therefore not be the primary routes for transit users to / from the subject development.

Based on the above information, which was obtained from OC Transpo's website, there are approximately 8 transit routes in the vicinity of the subject development during the morning and afternoon peak hours, respectively. Articulated buses and double-decker buses have seated capacities of 70 and 90 people; respectively, and therefore the hourly transit capacity will be 560 – 720 people during the AM peak hour and 700 – 900 people during the PM peak hour.

The proposed development is therefore anticipated to occupy between 8% and 11% of transit capacity during the AM peak hour and 11% - 13% of transit capacity during the PM peak hour.

4.7.2 Transit Priority

The proposed development will utilize the existing transit stops abutting the subject site and is therefore not expected to significantly impact the transit travel times of the existing routes or trigger the need for transit priority measures.

4.8 **REVIEW OF NETWORK CONCEPT**

Not applicable; exempted during screening and scoping.

4.9 INTERSECTION DESIGN

4.9.1 Intersection Control

The existing intersection control will be maintained as the default control for all three existing study area intersections. Any intersection improvements triggered through the intersection level of service analysis are highlighted and adopted accordingly. The signal timing plan for the Hazeldean Road at Huntmar Drive / Iber Road and the Hazeldean Road at Fringewood Drive were obtained from the City of Ottawa and used in the analysis for the subject TIA.



4.9.2 Intersection Design

An assessment of the study area intersections was undertaken to determine the operational characteristics of the study area intersections under the horizons identified in the Screening and Scoping report. Intersection operational analysis was facilitated by Synchro 10.0[™] software package and the MMLOS analysis was completed for the signalized intersection for all modes and compared against the City of Ottawa's MMLOS targets.

4.9.2.1 2019 Existing Conditions

Figure 6 illustrates 2019 Existing AM and PM peak hour traffic volumes at the study area intersections.

Intersection Capacity Analysis

Table 13 summarizes the results of the Synchro analysis under 2019 existing conditions.

Hazeldean Road at Huntmar Drive / Iber Road

While the intersection of Hazeldean Road at Huntmar Drive / Iber Road generally operates acceptably under 2019 existing conditions, it should be noted that there is little capacity remaining in the westbound through direction during the PM peak hour. As outlined in **Section 3.3**, demand rationalization was undertaken for the future traffic volumes, and therefore, the operations of this movement will likely improve in the future horizons.

Hazeldean Road at Fringewood Drive

The Hazeldean Road at Fringewood Drive intersection currently operates acceptably, and no improvements are required to supplement existing conditions.

Hazeldean Road at Cedarow Court

With Hazeldean Road being a four-lane arterial, Hazeldean Road at Cedarow Court currently operates at or above capacity with significant delays in the southbound direction during the PM peak hour. Restricting this intersection to a right-in / right-out would improve the operations on the southbound approach; however, this may have negative implications on the existing commercial uses along Cedarow Court. As such, no improvements to this intersection are recommended as part of the subject TIA.

Appendix F contains detailed intersection performance worksheets.



Intersection	Intersection Control	Аррі	roach / Movement	LOS	V/C	Delay (s)	Queue 95 th (m)
			Left	A (B)	0.54 (0.63)	35.5 (80.2)	21.9 (42.7)
		EB	Through / Right	A (C)	0.59 (0.73)	21.9 (30.7)	107.0 (122.5)
			Left	A (C)	0.56 (0.80)	56.7 (65.3)	21.9 (42.7) 107.0 (122.5) 32.0 (#63.8) 70.1 (#195.3) 0.0 (17.3) 18.0 (#46.1) 76.4 (88.3) 21.2 (18.7) 33.6 (38.6) 68.8 (111.5) 3.2 (58.7) - 62.5 (69.0) 0.7 (2.8) 8.6 (38.9) 18.5 (16.7) - 0.0 (0.6) 0.0 (0.0) 0.0 (0.0)
		WB	Through	A (D)	0.43 (0.89)	31.7 (46.1)	
Hazeldean Road	Traffic		Right	A (A)	0.13 (0.32)	0.4 (5.1)	0.0 (17.3)
at Huntmar Drive /	Signals		Left	A (C)	0.24 (0.80)	29.4 (59.3)	18.0 (#46.1)
Iber Road	5	NB	Through	C (B)	0.74 (0.67)	55.6 (47.3)	76.4 (88.3)
			Right	A (A)	0.53 (0.45)	8.6 (6.5)	21.2 (18.7)
			Left	ftA (B) $0.54 (0.63)$ $35.5 (80.2)$ 21.9 / RightA (C) $0.59 (0.73)$ $21.9 (30.7)$ 10 ftA (C) $0.56 (0.80)$ $56.7 (65.3)$ 32.0 ughA (D) $0.43 (0.89)$ $31.7 (46.1)$ $7($ htA (A) $0.13 (0.32)$ $0.4 (5.1)$ $0.0 (6.1)$ htA (C) $0.24 (0.80)$ $29.4 (59.3)$ $18.0 (1.1)$ ughC (B) $0.74 (0.67)$ $55.6 (47.3)$ 76.4 htA (A) $0.53 (0.45)$ $8.6 (6.5)$ 21.2 ftA (B) $0.59 (0.62)$ $42.0 (40.8)$ 33.6 ughA (D) $0.60 (0.82)$ $47.3 (57.0)$ $68.8 (1.6)$ htA (B) $0.29 (0.70)$ $2.4 (17.3)$ $3.2 (1.6)$ ectionC (D) $0.74 (0.89)$ $29.9 (40.4)$ / RightA (A) $0.44 (0.42)$ $19.5 (18.5)$ 18.5 ftA (A) $0.06 (0.24)$ $1.0 (2.4)$ 0.7 ughA (A) $0.02 (0.05)$ $9.2 (14.9)$ 0.0 ughA (A) $0.02 (0.05)$ $9.2 (14.9)$ 0.0 ughA (A) $0.0 (0.0)$ $0.0 (0.0)$ 0.0 ughA (A) $0.0 (0.0)$ $0.0 (0.0)$ 0.0 ughA (A) $0.0 (0.0)$ $0.0 (0.0)$ 0.0 RightA (A) $0.0 (0.0)$ $0.0 (0.0)$ 0.0	33.6 (38.6)		
		SB	Through	A (D)	0.60 (0.82)	47.3 (57.0)	68.8 (111.5)
			Right	A (B)	0.29 (0.70)	2.4 (17.3)	3.2 (58.7)
		Ove	erall Intersection	C (D)	0.74 (0.89)	29.9 (40.4)	-
		EB	Through / Right	A (A)	0.41 (0.46)	7.1 (8.8)	62.5 (69.0)
Hazeldean Road	T	WB	Left	A (A)	0.06 (0.24)	1.0 (2.4)	0.7 (2.8)
at Fringewood	Traffic Signals	VVD	Through	A (A)	0.26 (0.60)	1.2 (5.0)	8.6 (38.9)
Drive	Oighais	NB	Left / Right	A (A)	0.44 (0.42)	19.5 (18.5)	18.5 (16.7)
		Overall Intersection		A (A)	0.44 (0.60)	5.5 (6.7)	-
Hanaldaan Daad		EB	Left	A (B)	0.02 (0.05)	9.2 (14.9)	0.0 (0.6)
			Through	A (A)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Hazeldean Road at Cedarow Court	Minor Stop	WB	Through / Right	A (A)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
		SB	Left / Right	A (F)	0.05 (<mark>1.11</mark>)	18.3 (<mark>311.6</mark>)	1.2 (28.2)
		Ove	erall Intersection	A (A)	-	0.2 (5.7)	-

Table 13 - 2019 Existing Intersection Operations

2

v/c - represents the anticipated volume divided by the predicted capacity

- 95th percentile volume exceeds capacity, queue may be longer

Multi-Modal Level of Service Analysis

Hazeldean Road at Huntmar Drive / Iber Road

Based on the Land-Use Designations for Hazeldean Road and Huntmar Drive / Iber Road, the Pedestrian Level of Service (PLOS) target for this intersection is C. The Ultimate Cycling Network from the City of Ottawa's Transportation Master Plan (2013) designates Hazeldean Road as a spine cycling route, therefore the Bicycle Level of Service (BLOS) target is C. Transit service travelling on Hazeldean Road and Huntmar Drive currently operate within mixed traffic, and as such, the Transit Level of Service (TLOS) target is D. Hazeldean Road is designated as a truck route and therefore has a Truck Level of Service (TkLOS) target of D.

The Pedestrian Level of Service (PLOS) at the intersection of Hazeldean Road at Huntmar Drive is currently operating with a PLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection PLOS is largely influenced by the number of lanes pedestrians cross. Due to the nature of arterial roads, reducing the number of lanes along Hazeldean Road and Huntmar Drive is not a feasible option.

The Bicycle Level of Service (BLOS) at the Hazeldean Road at Huntmar Drive intersection is currently operating with a BLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection BLOS is influenced by the availability of dedicated cycling amenities, number of lanes cyclists must cross to negotiate turns at intersections,



and roadway operating speeds. Due to the nature of arterial roadways, the number of vehicle travel lanes is often more than one in each direction which increases the number of lanes cyclists must cross to navigate turning movements at the intersection. In addition, the posted speed limit is typically 60 km/h or greater along arterial roadways. These two factors limit the potential improvements to BLOS at signalized arterial intersections. In order to meet the BLOS target of C for this intersection, the number of lanes along Hazeldean Road and Huntmar Drive would need to be reduced to one lane in each direction and the speed limit would need to be reduced to 50 km/hr. Alternatively, two-stage left-turn bike boxes could be implemented at the intersection or cycle tracks could be implemented along both road segments to meet the BLOS target of C.

The transit level of service at the Hazeldean Road at Huntmar Drive intersection is currently operating with a TLOS of F, which does not meet the targeted value of D. Based on the MMLOS guidelines, intersection TLOS is governed by the delay at the intersection. Increasing the number of lanes along Hazeldean Road would theoretically reduce the intersection delay and thus improve the TLOS, however, this is not a feasible solution as Hazeldean Road is not scheduled to be widened as per the City's TMP. In addition, widening Hazeldean Road would conversely reduce the operations for both cyclists and pedestrians.

The Truck Level of Service (TkLOS) at the Hazeldean Road at Huntmar Drive intersection is currently operating with a TkLOS of B, which meets the target of D.

Table 14 outlines the 2019 existing multi-modal level of service results.

Appendix D contains the detailed MMLOS analysis.

Hazeldean Road at Fringewood Drive

Based on the Land-Use Designations for Hazeldean Road and Fringewood Drive, the Pedestrian Level of Service (PLOS) target for this intersection is C. The Ultimate Cycling Network from the City of Ottawa's *Transportation Master Plan* (2013) designates Hazeldean Road as a spine cycling route, therefore the Bicycle Level of Service (BLOS) target is C. Transit service travelling on Hazeldean Road and Fringewood Drive currently operate within mixed traffic, and as such, the Transit Level of Service (TLOS) target is D. Hazeldean Road is designated as a truck route and therefore has a Truck Level of Service (TkLOS) target of D.

The Pedestrian Level of Service (PLOS) at the intersection of Hazeldean Road at Fringewood Drive is currently operating with a PLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection PLOS is largely influenced by the number of lanes pedestrians cross. Due to the nature of arterial roads, reducing the number of lanes along Hazeldean Road is not a feasible option.

The Bicycle Level of Service (BLOS) at the Hazeldean Road at Fringewood Drive intersection is currently operating with a BLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection BLOS is influenced by the availability of dedicated cycling amenities, number of lanes cyclists must cross to negotiate a turn at intersections, and roadway operating speeds. Due to the nature of arterial roadways, the number of vehicle travel lanes is often more than one in each direction which increases the number of lanes cyclists must cross to navigate turning movements at the intersection. In addition, the posted speed limit is typically 60 km/h or greater along arterial roadways. These two factors limit the potential improvements to BLOS at signalized arterial intersections. In order to meet the BLOS target of C for this intersection, the number of lanes along Hazeldean Road would need to be reduced to one



lane in each direction and the speed limit would need to be reduced to 50 km/hr. Alternatively, two-stage left-turn bike boxes could be implemented at the intersection or cycle tracks could be implemented along both road segments to meet the BLOS target of C.

The Transit Level of Service (TLOS) at the Hazeldean Road at Fringewood Drive intersection is currently operating with a TLOS of C, which meets the target value of D.

The Truck Level of Service (TkLOS) at the Hazeldean Road at Fringewood Drive intersection is currently operating with a TkLOS of D, which meets the target value of D.

Table 14 outlines the 2019 existing multi-modal level of service results.

Appendix D contains the detailed MMLOS analysis.

Table 14 - 2019 Existing Intersection MMLOS

Interpotion	PLOS		BLOS		TLOS		TkLOS		
Intersection	Target	Actual	Target	Actual	Target	Actual	Target	Actual	
Hazeldean Road at Huntmar Drive / Iber Road	С	F	С	F	D	F	D	В	
Hazeldean Road at Fringewood Drive	С	F	С	F	D	С	D	В	

4.9.2.2 2024 Future Background Conditions

Figure 11 illustrates 2024 future background AM and PM peak hour traffic volumes at the study area intersections with demand rationalization in place as per **Section 3.3**.

Intersection Capacity Analysis

Table 15 summarizes the results of the Synchro analysis for the 2024 future background horizon.

Hazeldean Road at Huntmar Drive / Iber Road

As outlined in Section 3, the projected demands along Hazeldean Road were exceeding the available capacity under the 2024 future background horizon. As such, the demands were rationalized in order to determine provide a more realistic outcome of the traffic patterns in the future. With the demand rationalization in place, the intersection of Hazeldean Road at Huntmar Drive / Iber Road is projected to operate acceptably under 2024 future background conditions.

Hazeldean Road at Fringewood Drive

Consistent with the findings from the existing conditions, the Hazeldean Road at Fringewood Drive intersection is projected to operate acceptably under 2024 future background conditions.

Hazeldean Road at Cedarow Court



Consistent with the findings from the existing conditions, the southbound movement at the Hazeldean Road at Cedarow Court intersection is anticipated to operate at or above capacity with significant delays during the PM peak hour. Restricting this intersection to a right-in / right-out would allow the intersection to operate acceptably, however, this could have negative implications on the existing commercial uses along Cedarow Court. As such, no improvements to this intersection are recommended as part of the subject TIA.

Appendix F contains detailed intersection performance worksheets.

Intersection	Intersection Control	Approach / Movement		LOS	V/C	Delay (s)	Queue 95 th (m)		
		EB	Left	A (B)	0.50 (0.67)	43.3 (76.3)	22.4 (44.2)		
		EB	Through / Right	A (B)	0.47 (0.64)	18.8 (28)	88 (85.2)		
			Left	A (C)	0.52 (0.73)	55.1 (61.8)	28.7 (52.7)		
		WB	Through	A (C)	0.35 (0.73)	28.4 (37.3)	58.4 (133.6)		
			Right	A (A)	0.25 (0.33)	2.7 (4.9)	8.5 (16.9)		
Hazeldean Road	Traffic		Left	A (A)	0.23 (0.55)	30.5 (35.2)	15.9 (32.6)		
at Huntmar Drive / Iber Road	Signals	NB	Through	B (C)	0.70 (0.80)	54.9 (59.5)	67.6 (94.6)		
iber Roau			Right	A (A)	0.49 (0.45)	8.6 (7.4)	18.3 (18.3)		
			Left	A (D)	0.57 (0.85)	41.8 (58)	34.7 (63.4)		
		SB	Through	B (C)	0.68 (0.78)	51.9 (55.3)	75.2 (98.4)		
			Right	A (B)	0.27 (0.63)	1.4 (14.3)	0 (43.4)		
		Overall Intersection		C (D)	0.70 (0.85)	29.0 (38.0)	-		
		EB	Left	A (A)	0.01 (0.03)	6.3 (9.4)	1.3 (2.7)		
			Through / Right	A (A)	0.35 (0.4)	7.7 (10.6)	52.7 (70.6)		
		WB	Left	A (A)	0.09 (0.27)	1.4 (3.7)	2.2 (8.2)		
Llanddaan Daad			Through	A (A)	0.21 (0.49)	1.2 (3.5)	8.6 (42.2)		
Hazeldean Road at Fringewood	Traffic Signals		Right	A (A)	0.02 (0.03)	0.2 (0.5)	0 (0.3)		
Drive		NB	Left / Through / Right	A (B)	0.51 (0.64)	30 (51.6)	25.8 (41.8)		
		SB	Left	A (A)	0.10 (0.33)	48.8 (54.2)	7.3 (19.5)		
			Through / Right	A (A)	0.04 (0.07)	40.9 (27.5)	5.3 (7.1)		
		Ove	erall Intersection	A (A)	0.51 (0.64)	7.1 (9.6)	-		
		EB	Left	A (B)	0.01 (0.03)	8.7 (12.4)	0 (6)		
Llamalda en Da sid		ED	Through	A (A)	0.0 (0.0)	0 (0)	0 (0)		
Hazeldean Road at Cedarow Court	Minor Stop	WB	Through / Right	A (A)	0.0 (0.0)	0 (0)	0 (0)		
		SB	Left / Right	B (F)	0.03 (0.44)	14.2 (73.8)	6 (10.8)		
		Ove	erall Intersection	A (A)	-	0.2 (1.3)	-		
Notes: 1. Table format: AM (PM) 2. v/c – represents the anticipated volume divided by the predicted capacity									

Table 15 – 2024 Future Background Intersection Operations



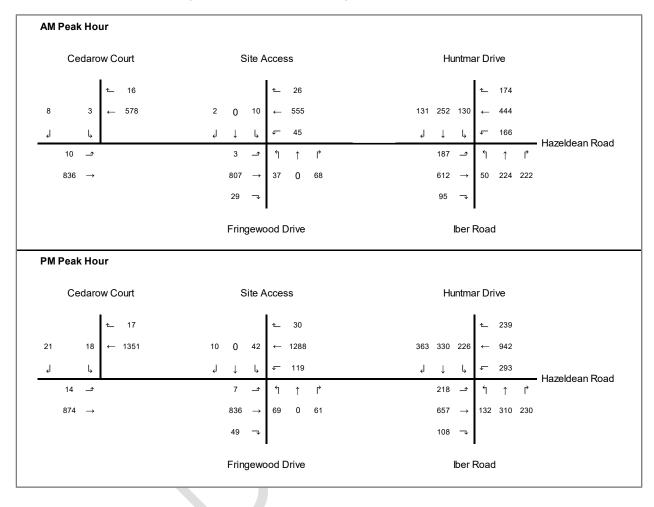


Figure 11 – 2024 Future Background Traffic Volumes



October 24, 2019

Multi-Modal Level of Service Analysis

Hazeldean Road at Huntmar Drive / Iber Road

Based on the Land-Use Designations for Hazeldean Road and Huntmar Drive / Iber Road, the Pedestrian Level of Service (PLOS) target for this intersection is C. The Ultimate Cycling Network from the City of Ottawa's *Transportation Master Plan* (2013) designates Hazeldean Road as a spine cycling route, therefore the Bicycle Level of Service (BLOS) target is C. Transit service travelling on Hazeldean Road and Huntmar Drive currently operate within mixed traffic, and as such, the Transit Level of Service (TLOS) target is D. Hazeldean Road is designated as a truck route and therefore has a Truck Level of Service (TkLOS) target of D.

The Pedestrian Level of Service (PLOS) at the intersection of Hazeldean Road at Huntmar Drive is projected to operate with a PLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection PLOS is largely influenced by the number of lanes pedestrians cross. Due to the nature of arterial roads, reducing the number of lanes along Hazeldean Road is not a feasible option.

The Bicycle Level of Service (BLOS) at the Hazeldean Road at Huntmar Drive intersection is projected to operate with a BLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection BLOS is influenced by the availability of dedicated cycling amenities, number of lanes cyclists must cross to negotiate a turn at intersections, and roadway operating speeds. Due to the nature of arterial roadways, the number of vehicle travel lanes is often more than one in each direction which increases the number of lanes cyclists must cross to navigate turning movements at the intersection. In addition, the posted speed limit is typically 60 km/h or greater along arterial roadways. These two factors limit the potential improvements to BLOS at signalized arterial intersections. In order to meet the BLOS target of C for this intersection and the speed limit would need to be reduced to 50 km/hr. Alternatively, two-stage left-turn bike boxes could be implemented at the intersection or cycle tracks could be implemented along both road segments to meet the BLOS target of C.

The transit level of service at the Hazeldean Road at Huntmar Drive intersection is projected to operate with a TLOS of F, which does not meet the targeted value of D. Based on the MMLOS guidelines, intersection TLOS is governed by the delay at the intersection. Increasing the number of lanes along Hazeldean Road would theoretically reduce the intersection delay and thus improve the TLOS, however, this is not a feasible solution as Hazeldean Road is not scheduled to be widened as per the City's TMP. In addition, widening Hazeldean Road would conversely reduce the operations for both cyclists and pedestrians.

The Truck Level of Service (TkLOS) at the Hazeldean Road at Huntmar Drive intersection is currently operating with a TkLOS of B, which meets the target of D.

Table 16 outlines the 2024 future background multi-modal level of service results.

Appendix D contains the detailed MMLOS analysis.



Hazeldean Road at Fringewood Drive

Based on the Land-Use Designations for Hazeldean Road and Fringewood Drive, the Pedestrian Level of Service (PLOS) target for this intersection is C. The Ultimate Cycling Network from the City of Ottawa's *Transportation Master Plan* (2013) designates Hazeldean Road as a spine cycling route, therefore the Bicycle Level of Service (BLOS) target is C. Transit service travelling on Hazeldean Road and Fringewood Drive currently operate within mixed traffic, and as such, the Transit Level of Service (TLOS) target is D. Hazeldean Road is designated as a truck route and therefore has a Truck Level of Service (TkLOS) target of D.

The Pedestrian Level of Service (PLOS) at the intersection of Hazeldean Road at Fringewood Drive is project to operate with a PLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection PLOS is largely influenced by the number of lanes pedestrians cross. Due to the nature of arterial roads, reducing the number of lanes along Hazeldean Road is not a feasible option.

The Bicycle Level of Service (BLOS) at the Hazeldean Road at Fringewood Drive intersection is projected to operate with a BLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection BLOS is influenced by the availability of dedicated cycling amenities, number of lanes cyclists must cross to negotiate a turn at intersections, and roadway operating speeds. Due to the nature of arterial roadways, the number of vehicle travel lanes is often more than one in each direction which increases the number of lanes cyclists must cross to navigate turning movements at the intersection. In addition, the posted speed limit is typically 60 km/h or greater along arterial roadways. These two factors limit the potential improvements to BLOS at signalized arterial intersections. In order to meet the BLOS target of C for this intersection, the number of lanes along Hazeldean Road would need to be reduced to one lane in each direction and the speed limit would need to be reduced to 50 km/hr. Alternatively, two-stage left-turn bike boxes could be implemented at the intersection or cycle tracks could be implemented along both road segments to meet the BLOS target of C.

Due to high delays associated with the northbound approach, the Transit Level of Service (TLOS) at the Hazeldean Road at Fringewood Drive intersection is projected to operate at a F, which fails to meet the targeted value of D. Increasing the number of lanes along Hazeldean Road would theoretically reduce the intersection delay and thus improve the TLOS, however, this is not a feasible solution as Hazeldean Road is not scheduled to be widened as per the City's TMP. In addition, widening Hazeldean Road would conversely reduce the operations for both cyclists and pedestrians.

As the extension of Fringewood Drive north of Hazeldean Road will have only one receiving lane, the Truck Level of Service (TkLOS) at the Hazeldean Road at Fringewood Drive intersection is projected to operate with a TkLOS of E, which fails to meet the target value of D. Adding two receiving lanes along the north leg would allow this intersection to meet the TkLOS target.

Table 16 outlines the 2024 future background multi-modal level of service results.

Appendix D contains the detailed MMLOS analysis.



Table 16 – 2024 Future Background Intersection MMLOS

Intersection	PL	PLOS		BLOS		TLOS		OS
Intersection	Target	Actual	Target	Actual	Target	Actual	Target	Actual
Hazeldean Road at Huntmar Drive / Iber Road	С	F	С	F	D	F	D	В
Hazeldean Road at Fringewood Drive	С	F	С	F	D	F	D	E

4.9.2.3 2024 Total Future Conditions

Figure 12 illustrates 2024 total future AM and PM peak hour traffic volumes at the study area intersections with demand rationalization in place as per **Section 3.3**.

Intersection Capacity Analysis

 Table 17 summarizes the results of the Synchro analysis for the 2024 total future horizon.

Hazeldean Road at Huntmar Drive / Iber Road

Consistent with the findings from the 2024 future background horizon, the intersection of Hazeldean Road at Huntmar Drive / Iber Road is projected to operate acceptably under 2024 total future conditions.

Hazeldean Road at Fringewood Drive

Consistent with the findings from the 2024 future background conditions the Hazeldean Road at Fringewood Drive intersection is projected to operate acceptably under 2024 total future conditions.

Hazeldean Road at Cedarow Court

Consistent with the findings from the 2024 future background conditions, the southbound movement at the Hazeldean Road at Cedarow Court intersection is anticipated to operate at or above capacity with significant delays during the PM peak hour. Restricting this intersection to a right-in / right-out would allow the intersection to operate acceptably, however, this could have negative implications on the existing commercial uses along Cedarow Court. As such, no improvements to this intersection are recommended as part of the subject TIA.

Appendix F contains detailed intersection performance worksheets.



Intersection	Intersection Control	Approach / Movement		LOS	V/C	Delay (s)	Queue 95 th (m)
		EB	Left	A (B)	0.52 (0.68)	43.2 (75.5)	22.5 (45.3)
		ED	Through / Right	A (B)	0.49 (0.66)	20.1 (29.1)	93.5 (104.8)
			Left	A (C)	0.52 (0.73)	55.1 (62.1)	28.7 (52.7)
		WB	Through	A (C)	0.37 (0.75)	28.8 (38.1)	61.6 (138.3)
			Right	A (A)	0.25 (0.33)	2.8 (4.9)	8.5 (16.9)
Hazeldean Road	Traffic		Left	A (A)	0.24 (0.57)	30.7 (36.1)	16.2 (33.6)
at Huntmar Drive / Iber Road	Signals	NB	Through	B (C)	0.70 (0.79)	54.9 (58.8)	67.6 (94.6)
IDEI I (Udu			Right	A (A)	0.49 (0.45)	8.60 (7.3)	18.3 (18.3)
			Left	A (D)	0.57 (0.87)	41.8 (60.8)	34.7 (53.0)
		SB	Through	B (C)	0.68 (0.79)	51.9 (56.3)	75.2 (99.0)
			Right	A (B)	0.28 (0.65)	1.9 (15.6)	1.5 (46.6)
		Overall Intersection		C (D)	0.70 (0.87)	29.3 (38.6)	-
		EB	Left	A (A)	0.02 (0.07)	6.8 (9.9)	2.7 (5.2)
			Through / Right	A (A)	0.35 (0.40)	7.9 (10.6)	53.6 (70.5)
		WB	Left	A (A)	0.09 (0.27)	1.4 (3.9)	2.2 (7.9)
Hereldsen Deed			Through	A (A)	0.21 (0.49)	1.2 (3.9)	8.5 (44.1)
Hazeldean Road at Fringewood	Traffic		Right	A (A)	0.05 (0.06)	0.3 (0.5)	0 (0.8)
Drive	Signals	NB	Left / Through / Right	A (B)	0.50 (0.64)	29.5 (51.6)	25.7 (41.8)
		SB	Left	A (B)	0.44 (0.61)	61.6 (69.3)	22.2 (32.4)
			Through / Right	A (A)	0.08 (0.12)	30.1 (21.4)	6.9 (9.2)
		Ove	erall Intersection	A (B)	0.5 (0.64)	8.4 (10.3)	-
		EB	Left	A (B)	0.01 (0.03)	8.8 (12.5)	0 (0.6)
Hereldeen Deed		ED	Through	A (A)	0.0 (0.0)	0 (0)	0 (0)
Hazeldean Road at Cedarow Court	Minor Stop	WB	Through / Right	A (A)	0.0 (0.0)	0 (0)	0 (0)
		SB	Left / Right	A (F)	0.03 (0.03)	13.8 (<mark>75</mark>)	0.6 (11.4)
		Ove	erall Intersection	A (A)	-	0.2 (1.4)	-

Table 17 – 2024 Total Future Intersection Operations

Table format: AM (PM)
 v/c - represents the anticipated volume divided by the predicted capacity



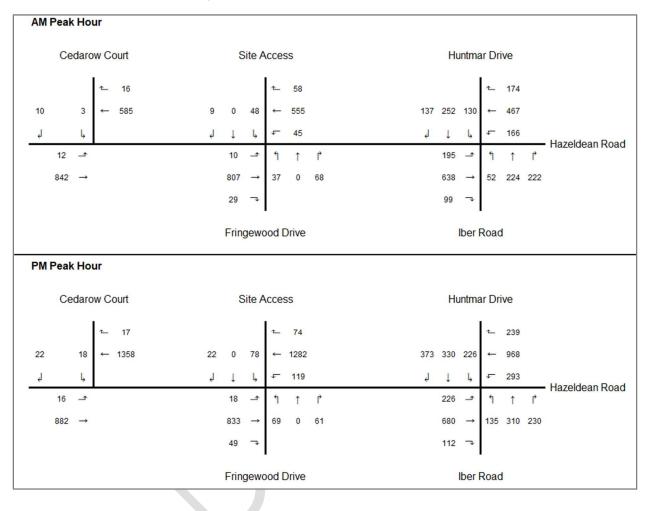


Figure 12 – 2024 Total Future Traffic Volumes



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Multi-Modal Level of Service Analysis

Hazeldean Road at Huntmar Drive / Iber Road

Based on the Land-Use Designations for Hazeldean Road and Huntmar Drive / Iber Road, the Pedestrian Level of Service (PLOS) target for this intersection is C. The Ultimate Cycling Network from the City of Ottawa's *Transportation Master Plan* (2013) designates Hazeldean Road as a spine cycling route, therefore the Bicycle Level of Service (BLOS) target is C. Transit service travelling on Hazeldean Road and Huntmar Drive currently operate within mixed traffic, and as such, the Transit Level of Service (TLOS) target is D. Hazeldean Road is designated as a truck route and therefore has a Truck Level of Service (TkLOS) target of D.

The Pedestrian Level of Service (PLOS) at the intersection of Hazeldean Road at Huntmar Drive is projected to operate with a PLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection PLOS is largely influenced by the number of lanes pedestrians cross. Due to the nature of arterial roads, reducing the number of lanes along Hazeldean Road is not a feasible option.

The Bicycle Level of Service (BLOS) at the Hazeldean Road at Huntmar Drive intersection is projected to operate with a BLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection BLOS is influenced by the availability of dedicated cycling amenities, number of lanes cyclists must cross to negotiate a turn at intersections, and roadway operating speeds. Due to the nature of arterial roadways, the number of vehicle travel lanes is often more than one in each direction which increases the number of lanes cyclists must cross to navigate turning movements at the intersection. In addition, the posted speed limit is typically 60 km/h or greater along arterial roadways. These two factors limit the potential improvements to BLOS at signalized arterial intersections. In order to meet the BLOS target of C for this intersection and the speed limit would need to be reduced to 50 km/hr. Alternatively, two-stage left-turn bike boxes could be implemented at the intersection or cycle tracks could be implemented along both road segments to meet the BLOS target of C.

The transit level of service at the Hazeldean Road at Huntmar Drive intersection is projected to operate with a TLOS of F, which does not meet the targeted value of D. Based on the MMLOS guidelines, intersection TLOS is governed by the delay at the intersection. Increasing the number of lanes along Hazeldean Road would theoretically reduce the intersection delay and thus improve the TLOS, however, this is not a feasible solution as Hazeldean Road is not scheduled to be widened as per the City's TMP. In addition, widening Hazeldean Road would conversely reduce the operations for both cyclists and pedestrians.

The Truck Level of Service (TkLOS) at the Hazeldean Road at Huntmar Drive intersection is currently operating with a TkLOS of B, which meets the target of D.

 Table 18 outlines the 2024 total future multi-modal level of service results.

Appendix D contains the detailed MMLOS analysis.

Hazeldean Road at Fringewood Drive

Based on the Land-Use Designations for Hazeldean Road and Fringewood Drive, the Pedestrian Level of Service (PLOS) target for this intersection is C. The Ultimate Cycling Network from the City of Ottawa's *Transportation Master*



Plan (2013) designates Hazeldean Road as a spine cycling route, therefore the Bicycle Level of Service (BLOS) target is C. Transit service travelling on Hazeldean Road and Fringewood Drive currently operate within mixed traffic, and as such, the Transit Level of Service (TLOS) target is D. Hazeldean Road is designated as a truck route and therefore has a Truck Level of Service (TkLOS) target of D.

The Pedestrian Level of Service (PLOS) at the intersection of Hazeldean Road at Fringewood Drive is projected to operate with a PLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection PLOS is largely influenced by the number of lanes pedestrians cross. Due to the nature of arterial roads, reducing the number of lanes along Hazeldean Road is not a feasible option.

The Bicycle Level of Service (BLOS) at the Hazeldean Road at Fringewood Drive intersection is projected to operate with a BLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection BLOS is influenced by the availability of dedicated cycling amenities, number of lanes cyclists must cross to negotiate a turn at intersections, and roadway operating speeds. Due to the nature of arterial roadways, the number of vehicle travel lanes is often more than one in each direction which increases the number of lanes cyclists must cross to navigate turning movements at the intersection. In addition, the posted speed limit is typically 60 km/h or greater along arterial roadways. These two factors limit the potential improvements to BLOS at signalized arterial intersections. In order to meet the BLOS target of C for this intersection, the number of lanes along Hazeldean Road would need to be reduced to one lane in each direction and the speed limit would need to be reduced to 50 km/hr. Alternatively, two-stage left-turn bike boxes could be implemented at the intersection or cycle tracks could be implemented along both road segments to meet the BLOS target of C.

Due to high delays associated with the northbound approach, the Transit Level of Service (TLOS) at the Hazeldean Road at Fringewood Drive intersection is projected to operate at a F, which fails to meet the targeted value of D. Based on the MMLOS guidelines, intersection TLOS is governed by the delay at the intersection. Increasing the number of lanes along Hazeldean Road would theoretically reduce the intersection delay and thus improve the TLOS, however, this is not a feasible solution as Hazeldean Road is not scheduled to be widened as per the City's TMP. In addition, widening Hazeldean Road would conversely reduce the operations for both cyclists and pedestrians.

As the extension of Fringewood Drive north of Hazeldean Road will have only one receiving lane, the Truck Level of Service (TkLOS) at the Hazeldean Road at Fringewood Drive intersection is projected to operate with a TkLOS of E, which fails to meet the target value of D. Adding two receiving lanes along the north leg would allow this intersection to meet the TkLOS target.

Table 18 outlines the 2024 total future multi-modal level of service results.

Appendix D contains the detailed MMLOS analysis.



Intersection	PLOS		BLOS		TLOS		TkLOS	
Intersection	Target	Actual	Target	Actual	Target	Actual	Target	Actual
Hazeldean Road at Huntmar Drive / Iber Road	С	F	С	F	D	F	D	В
Hazeldean Road at Fringewood Drive	С	F	С	F	D	F	D	E

Table 18 – 2024 Total Future Intersection MMLOS

4.9.2.4 2029 Ultimate Conditions

Table 19 – 2029 Ultimate Intersection Operations

Intersection	Intersection Control	Approach /	Movement	LOS	V/C	Delay (s)	Queue 95th (m)		
			Left	B (C)	0.62 (0.72)	49 (74)	27.6 (51.9)		
		EB	Through / Right	A (C)	0.55 (0.77)	21.7 (33.9)	104.2 (130.3)		
			Left	A (C)	0.55 (0.76)	55.5 (63.1)	30.4 (56.5)		
Hazeldean		WB	Through	A (D)	0.42 (0.87)	30.7 (46.1)	67.7 (170.3)		
Road at			Right	A (A)	0.26 (0.36)	3.2 (5.1)	9.9 (17.8)		
Huntmar	Traffic		Left	A (A)	0.27 (0.59)	30.4 (35.2)	17 (35)		
Drive / Iber	Signals	NB	Through	C (D)	0.71 (0.82)	54.5 (60.4)	71.7 (101.7)		
Road			Right	A (A)	0.50 (0.46)	8.1 (7.2)	18.8 (18.9)		
			Left	B (D)	0.61 (0.85)	43.7 (54.2)	35.7 (59.7)		
		SB	Through	B (C)	0.70 (0.79)	51.6 (54.4)	79.2 (105.8)		
			Right	A (B)	0.3 (0.68)	2.5 (18)	3.7 (57.4)		
		Overall In	tersection	C (D)	0.71 (0.87)	30.8 (41.2)	-		
		EB	Left	A (A)	0.02 (0.08)	6.8 (10.7)	2.7 (5.4)		
			Through / Right	A (A)	0.38 (0.44)	8.2 (11.4)	60.3 (80.6)		
		WB	Left	A (A)	0.10 (0.30)	1.6 (3.5)	2.1 (7.3)		
Hazeldean			Through	A (A)	0.23 (0.54)	1.5 (3.3)	9 (44.3)		
Road at	Traffic		Right	A (A)	0.05 (0.06)	0.3 (0.4)	0 (0.5)		
Fringewood Drive	Signals	NB	Left / Through / Right	A (B)	0.52 (0.66)	29.4 (52.5)	26.6 (43.6)		
		SB	Left	A (B)	0.46 (0.60)	62.9 (67.7)	22.3 (32.2)		
			Through / Right	A (A)	0.08 (0.10)	30 (21)	6.9 (9.1)		
		Overall In	tersection	A (B)	0.52 (0.66)	8.5 (10.4)	-		
		EB	Left	A (B)	0.01 (0.04)	8.9 (13.4)	0 (0.6)		
Hazeldean			Through	A (A)	0.0 (0.0)	0.0 (0.0)	0 (0)		
Road at Cedarow	Minor Stop	WB	Through / Right	A (A)	0.0 (0.0)	0.0 (0.0)	0 (0)		
Court		SB	Left / Right	C (F)	0.04 (0.67)	15.8 <mark>(128.7)</mark>	0.6 (17.4)		
		Overall In	tersection	A (A)	-	0.2 (2.4)	0.6 (17.4)		
Notes: 1. Table format: AM (PM) 2. v/c – represents the anticipated volume divided by the predicted capacity									

v/c – represents the anticipated volume divided by the predicted capacity

Figure 13 illustrates 2029 ultimate AM and PM peak hour traffic volumes at the study area intersections with demand rationalization in place per **Section 3.3**.

Intersection Capacity Analysis



Table 19 summarizes the results of the Synchro analysis for the 2029 ultimate horizon.

Hazeldean Road at Huntmar Drive / Iber Road

Consistent with the findings from the 2024 total future horizon, the intersection of Hazeldean Road at Huntmar Drive / Iber Road is projected to operate acceptably under 2029 ultimate conditions.

Hazeldean Road at Fringewood Drive

Consistent with the findings from the 2024 total future conditions, the Hazeldean Road at Fringewood Drive intersection is projected to operate acceptably under 2029 ultimate conditions.

Hazeldean Road at Cedarow Court

Consistent with the findings from the 2024 total future conditions, the southbound movement at the Hazeldean Road at Cedarow Court intersection is anticipated to operate at or above capacity with significant delays during the PM peak hour. Restricting this intersection to a right-in / right-out would allow the intersection to operate acceptably, however, this could have negative implications on the existing commercial uses along Cedarow Court. As such, no improvements to this intersection are recommended as part of the subject TIA.

Appendix F contains detailed intersection performance worksheets.



Intersection	Intersection Control	Approach /	Movement	LOS	V/C	Delay (s)	Queue 95 th (m)				
			Left	B (C)	0.62 (0.72)	49 (74)	27.6 (51.9)				
		EB	Through / Right	A (C)	0.55 (0.77)	21.7 (33.9)	104.2 (130.3)				
			Left	A (C)	0.55 (0.76)	55.5 (63.1)	30.4 (56.5)				
Hazeldean		WB	Through	A (D)	0.42 (0.87)	30.7 (46.1)	67.7 (170.3)				
Road at			Right	A (A)	0.26 (0.36)	3.2 (5.1)	9.9 (17.8)				
Huntmar	Traffic		Left	A (A)	0.27 (0.59)	30.4 (35.2)	17 (35)				
Drive / Iber	Signals	NB	Through	C (D)	0.71 (0.82)	54.5 (60.4)	71.7 (101.7)				
Road			Right	A (A)	0.50 (0.46)	8.1 (7.2)	18.8 (18.9)				
			Left	B (D)	0.61 (0.85)	43.7 (54.2)	35.7 (59.7)				
		SB	Through	B (C)	0.70 (0.79)	51.6 (54.4)	79.2 (105.8)				
			Right	A (B)	0.3 (0.68)	2.5 (18)	3.7 (57.4)				
		Overall In	tersection	C (D)	0.71 (0.87)	30.8 (41.2)	-				
		EB	Left	A (A)	0.02 (0.08)	6.8 (10.7)	2.7 (5.4)				
			Through / Right	A (A)	0.38 (0.44)	8.2 (11.4)	60.3 (80.6)				
		WB	Left	A (A)	0.10 (0.30)	1.6 (3.5)	2.1 (7.3)				
Hazeldean			Through	A (A)	0.23 (0.54)	1.5 (3.3)	9 (44.3)				
Road at	Traffic		Right	A (A)	0.05 (0.06)	0.3 (0.4)	0 (0.5)				
Fringewood Drive	Signals	NB	Left / Through / Right	A (B)	0.52 (0.66)	29.4 (52.5)	26.6 (43.6)				
		SB	Left	A (B)	0.46 (0.60)	62.9 (67.7)	22.3 (32.2)				
			Through / Right	A (A)	0.08 (0.10)	30 (21)	6.9 (9.1)				
		Overall In	tersection	A (B)	0.52 (0.66)	8.5 (10.4)	-				
		ЕВ	Left	A (B)	0.01 (0.04)	8.9 (13.4)	0 (0.6)				
Hazeldean			Through	A (A)	0.0 (0.0)	0.0 (0.0)	0 (0)				
Road at Cedarow	Minor Stop	WB	Through / Right	A (A)	0.0 (0.0)	0.0 (0.0)	0 (0)				
Court		SB	Left / Right	C (F)	0.04 (0.67)	15.8 (128.7)	0.6 (17.4)				
		Overall In	tersection	A (A)	-	0.2 (2.4)	0.6 (17.4)				
Notes: 3. Table form	Notes:										

Table 19 – 2029 Ultimate Intersection Operations

Table format: AM (PM)
 v/c - represents the anticipated volume divided by the predicted capacity



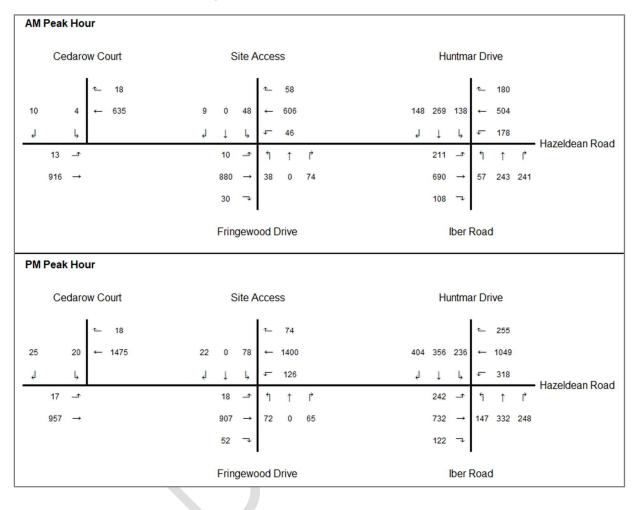


Figure 13 - 2029 Ultimate Traffic Volumes



October 24, 2019

Multi-Modal Level of Service Analysis

Hazeldean Road at Huntmar Drive / Iber Road

Based on the Land-Use Designations for Hazeldean Road and Huntmar Drive / Iber Road, the Pedestrian Level of Service (PLOS) target for this intersection is C. The Ultimate Cycling Network from the City of Ottawa's *Transportation Master Plan* (2013) designates Hazeldean Road as a spine cycling route, therefore the Bicycle Level of Service (BLOS) target is C. Transit service travelling on Hazeldean Road and Huntmar Drive currently operate within mixed traffic, and as such, the Transit Level of Service (TLOS) target is D. Hazeldean Road is designated as a truck route and therefore has a Truck Level of Service (TkLOS) target of D.

The Pedestrian Level of Service (PLOS) at the intersection of Hazeldean Road at Huntmar Drive is projected to operate with a PLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection PLOS is largely influenced by the number of lanes pedestrians cross. Due to the nature of arterial roads, reducing the number of lanes along Hazeldean Road is not a feasible option.

The Bicycle Level of Service (BLOS) at the Hazeldean Road at Huntmar Drive intersection is projected to operate with a BLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection BLOS is influenced by the availability of dedicated cycling amenities, number of lanes cyclists must cross to negotiate a turn at intersections, and roadway operating speeds. Due to the nature of arterial roadways, the number of vehicle travel lanes is often more than one in each direction which increases the number of lanes cyclists must cross to navigate turning movements at the intersection. In addition, the posted speed limit is typically 60 km/h or greater along arterial roadways. These two factors limit the potential improvements to BLOS at signalized arterial intersections. In order to meet the BLOS target of C for this intersection and the speed limit would need to be reduced to 50 km/hr. Alternatively, two-stage left-turn bike boxes could be implemented at the intersection or cycle tracks could be implemented along both road segments to meet the BLOS target of C.

The transit level of service at the Hazeldean Road at Huntmar Drive intersection is projected to operate with a TLOS of F, which does not meet the targeted value of D. Based on the MMLOS guidelines, intersection TLOS is governed by the delay at the intersection. Increasing the number of lanes along Hazeldean Road would theoretically reduce the intersection delay and thus improve the TLOS, however, this is not a feasible solution as Hazeldean Road is not scheduled to be widened as per the City's TMP. In addition, widening Hazeldean Road would conversely reduce the operations for both cyclists and pedestrians.

The Truck Level of Service (TkLOS) at the Hazeldean Road at Huntmar Drive intersection is projected to operate with a TkLOS of B, which meets the target of D.

 Table 20 outlines the 2029 ultimate multi-modal level of service results.

Appendix D contains the detailed MMLOS analysis.



Hazeldean Road at Fringewood Drive

Based on the Land-Use Designations for Hazeldean Road and Fringewood Drive, the Pedestrian Level of Service (PLOS) target for this intersection is C. The Ultimate Cycling Network from the City of Ottawa's *Transportation Master Plan* (2013) designates Hazeldean Road as a spine cycling route, therefore the Bicycle Level of Service (BLOS) target is C. Transit service travelling on Hazeldean Road and Fringewood Drive currently operate within mixed traffic, and as such, the Transit Level of Service (TLOS) target is D. Hazeldean Road is designated as a truck route and therefore has a Truck Level of Service (TkLOS) target of D.

The Pedestrian Level of Service (PLOS) at the intersection of Hazeldean Road at Fringewood Drive is projected to operate with a PLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection PLOS is largely influenced by the number of lanes pedestrians cross. Due to the nature of arterial roads, reducing the number of lanes along Hazeldean Road is not a feasible option.

The Bicycle Level of Service (BLOS) at the Hazeldean Road at Fringewood Drive intersection is projected to operate with a BLOS of F, which is below the desired target of C. Based on the MMLOS guidelines, intersection BLOS is influenced by the availability of dedicated cycling amenities, number of lanes cyclists must cross to negotiate a turn at intersections, and roadway operating speeds. Due to the nature of arterial roadways, the number of vehicle travel lanes is often more than one in each direction which increases the number of lanes cyclists must cross to navigate turning movements at the intersection. In addition, the posted speed limit is typically 60 km/h or greater along arterial roadways. These two factors limit the potential improvements to BLOS at signalized arterial intersections. In order to meet the BLOS target of C for this intersection, the number of lanes along Hazeldean Road would need to be reduced to one lane in each direction and the speed limit would need to be reduced to 50 km/hr. Alternatively, two-stage left-turn bike boxes could be implemented at the intersection or cycle tracks could be implemented along both road segments to meet the BLOS target of C.

Due to high delays associated with the northbound approach, the Transit Level of Service (TLOS) at the Hazeldean Road at Fringewood Drive intersection is projected to operate at a F, which fails to meet the targeted value of D. Based on the MMLOS guidelines, intersection TLOS is governed by the delay at the intersection. Increasing the number of lanes along Hazeldean Road would theoretically reduce the intersection delay and thus improve the TLOS, however, this is not a feasible solution as Hazeldean Road is not scheduled to be widened as per the City's TMP. In addition, widening Hazeldean Road would conversely reduce the operations for both cyclists and pedestrians.

As the extension of Fringewood Drive north of Hazeldean Road will have only one receiving lane, the Truck Level of Service (TkLOS) at the Hazeldean Road at Fringewood Drive intersection is projected to operate with a TkLOS of E, which fails to meet the target value of D. Adding two receiving lanes along the north leg would allow this intersection to meet the TkLOS target.

Table 20 outlines the 2029 ultimate multi-modal level of service results.

Appendix D contains the detailed MMLOS analysis.



Table 20 – 2029 Ultimate Intersection MMLOS

Intersection	PLOS		BLOS		TLOS		TkLOS	
	Target	Actual	Target	Actual	Target	Actual	Target	Actual
Hazeldean Road at Huntmar Drive / Iber Road	С	F	С	F	D	F	D	В
Hazeldean Road at Fringewood Drive	С	F	С	F	D	F	D	E



20 CEDAROW COURT WELLINGS PHASE 2 TRANSPORTATION IMPACT ASSESSMENT Conclusion October 24, 2019

5.0 CONCLUSION

This Transportation Impact Assessment (TIA) was prepared in support of a Site Plan application for a mixed-use proposed development located at 20 Cedarow Court. The proposed site is located at the northwest corner of the Hazeldean Road at Fringewood Drive intersection in the Stittsville community of Ottawa, Ontario. The site features a primary site access that ties into the future north leg of the Hazeldean Road at Fringewood Drive intersection. This site access is proposed to be stop-controlled along the site access approach and will be a full movements access without any turning restrictions. A secondary access is proposed to connect into Cedarow Court on the west side of the property. The secondary access is also a full movements access without any turning restrictions.

The subject development is anticipated to generate 107 and 114 two-way auto trips during the AM and PM peak hours, respectively. Development generated site trips are not anticipated to adversely impact traffic operations at all three study area intersections. All study area intersections are projected to operate acceptably under all study horizons.

The Multi-Modal Level of Service (MMLOS) assessment for roadway segments found that:

- Hazeldean Road, across the frontage of the subject development, currently meets the Bicycle, Transit, and Truck Level of Service targets, however, it does not meet the Pedestrian Level of Service target. Reducing the posted speed limit to 50 km/h would allow the segment to meet the PLOS target. Another option would be to reduce the volume of vehicles on the road so that the Average Annual Daily Traffic (AADT) is less than 3000 per lane. Due to the nature of arterial roads, reducing the speed limit or the decreasing the volume along Hazeldean Road are not feasible options.
- Huntmar Drive currently meets the Pedestrian, Bicycle, and Transit Level of Service targets. As Huntmar Drive is not a truck route, the TkLOS does not apply to this road segment.
- Cedarow Court currently does not meet the Pedestrian Level of Service (PLOS) target as there are no
 pedestrian facilities currently provided along this road. Implementing a 1.8m wide sidewalk would allow the
 PLOS target to be met. It does, however, meet the Bicycle Level of Service target. As Cedarow Court is
 neither a transit route nor a truck route, both the TLOS and TkLOS do not apply.

The Multi-Modal Level of Service assessment for signalized intersections found the following:

- The intersection of Hazeldean Road at Huntmar Drive currently does not meet the Pedestrian, Bicycle, and Transit level of service targets. It is, however, meeting the Truck Level of Service Target. In order to meet the Pedestrian and Bicycle targets at this intersection, the number of lanes along Hazeldean Road would have to be reduced and the speed limit would need to decrease, Conversely, in order to meet the Transit target, the number of lanes would need to increase to improve the delay at the intersection. These findings hold true in the analysis of the future horizons.
- The intersection of Hazeldean Road at Fringewood Drive currently does not meet the Pedestrian and Bicycle targets. It does, however, meet the Transit and Truck targets. To meet the Pedestrian and Bicycle targets, the number of lanes along Hazeldean Road would have to be reduced and the speed limit would need to decrease,



20 CEDAROW COURT WELLINGS PHASE 2 TRANSPORTATION IMPACT ASSESSMENT Conclusion October 24, 2019

Once the north leg of the Hazeldean Road at Fringewood Drive intersection is built, the intersection fails to
meet the Truck and Transit level of service targets. Increasing the number of lanes along Hazeldean Road
would reduce the delay experienced at this intersection and thus allow the Transit target to be met, however,
this would decrease the Pedestrian and Bicycle levels of service. To meet the Truck target, an additional
receiving lane on the north leg would have to be implemented.

Based on the transportation evaluation presented in this study, the proposed development located at 20 Cedarow Court can be supported and should be permitted to proceed from a transportation perspective.



APPENDICES

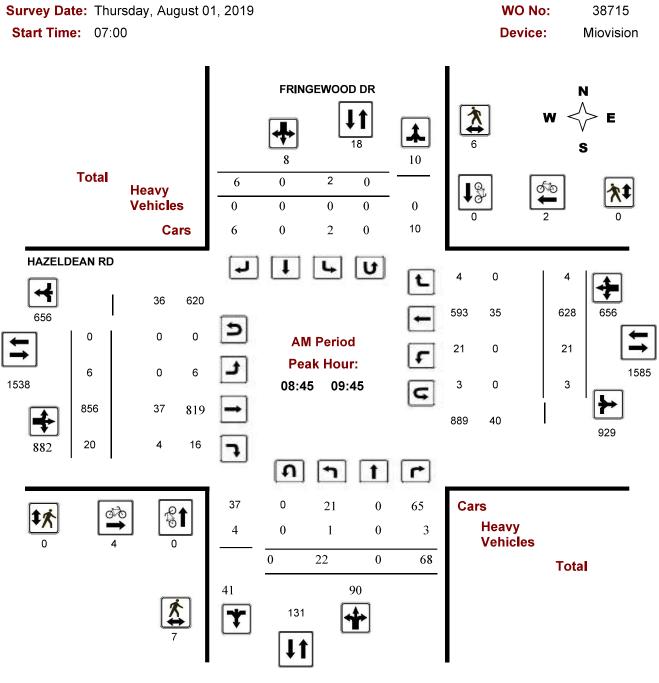
Appendix A Traffic Data October 24, 2019

Appendix A TRAFFIC DATA



Transportation Services - Traffic Services

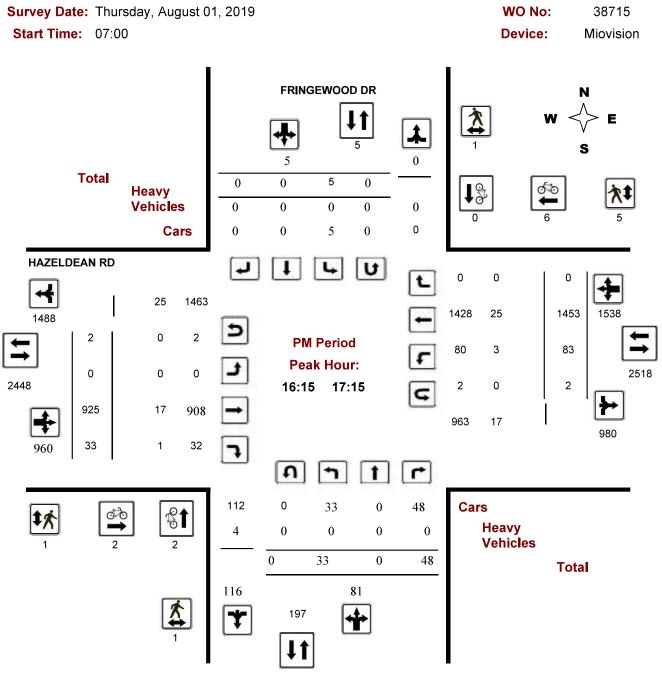
Turning Movement Count - Full Study Peak Hour Diagram HAZELDEAN RD @ FRINGEWOOD DR





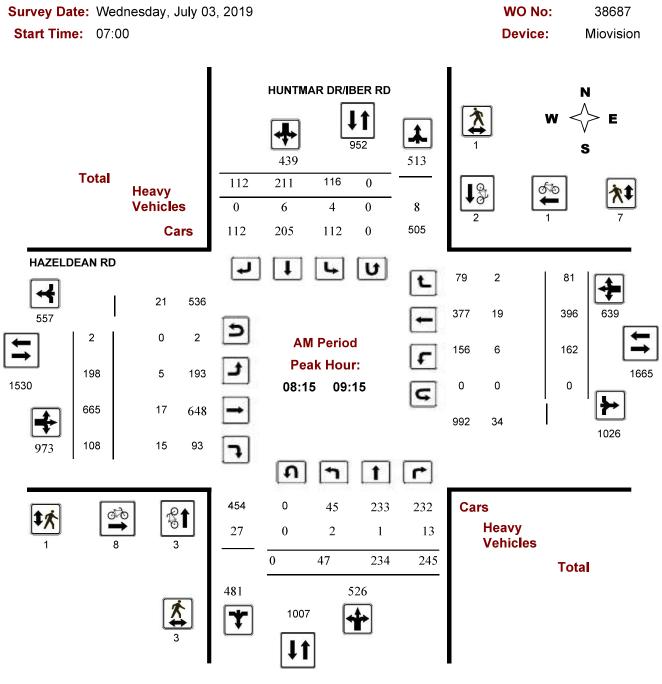
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram HAZELDEAN RD @ FRINGEWOOD DR



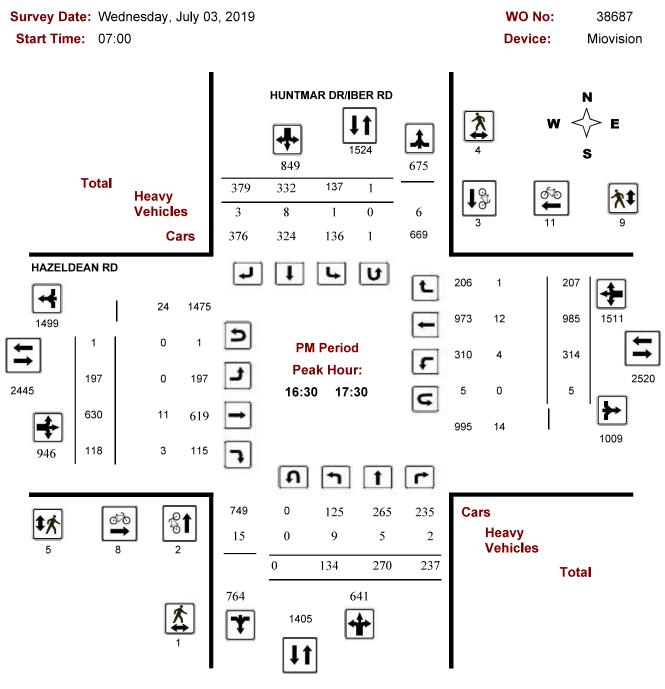


Turning Movement Count - Full Study Peak Hour Diagram HAZELDEAN RD @ HUNTMAR DR/IBER RD





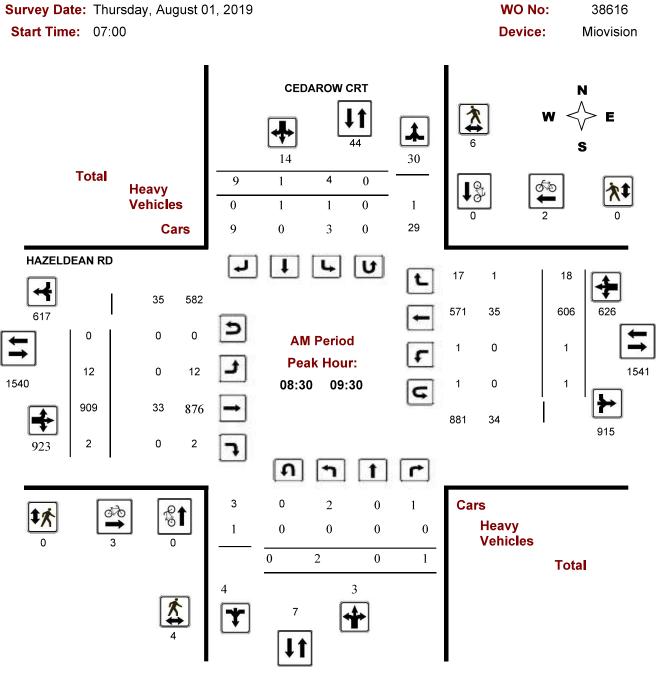
Turning Movement Count - Full Study Peak Hour Diagram HAZELDEAN RD @ HUNTMAR DR/IBER RD





Transportation Services - Traffic Services

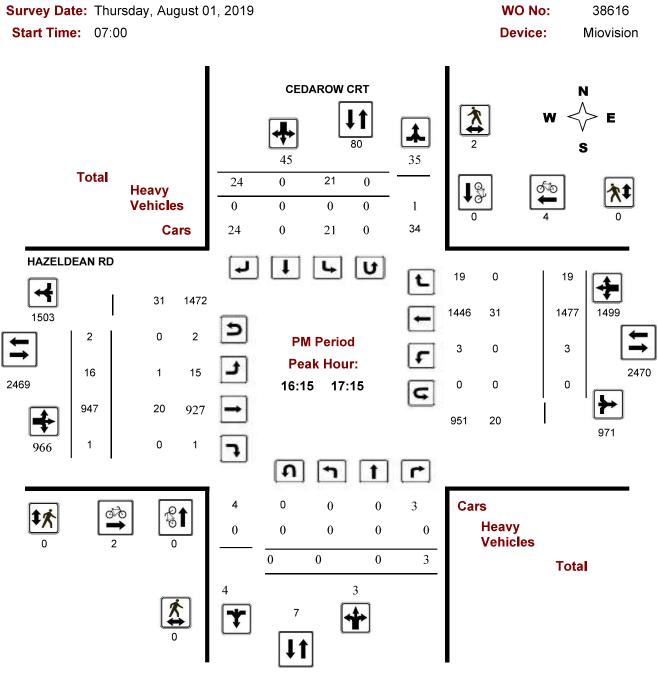
Turning Movement Count - Full Study Peak Hour Diagram CEDAROW CRT @ HAZELDEAN RD





Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram CEDAROW CRT @ HAZELDEAN RD



20 CEDAROW COURT WELLINGS PHASE 2 TRANSPORTATION IMPACT ASSESSMENT

Appendix B Comment response corresponence October 24, 2019

Appendix B COMMENT RESPONSE CORRESPONENCE

FYI

Rosanna Baggs, C.E.T.

Project Manager, Infrastructure Approvals | GPRJ Approbation demandes infrastructure Development Review West Branch | Dir Services d'exam des dem d'amgt Tel |Tél. : 613-580- 2424 ext. | poste 26388

From: Franklin, Carol <carol.franklin@ottawa.ca>
Sent: September 10, 2019 9:36 AM
To: Baggs, Rosanna <Rosanna.Baggs@ottawa.ca>
Cc: McMahon, Patrick <patrick.mcmahon@ottawa.ca>; Prevost, Pauline
<Pauline.Prevost@ottawa.ca>
Subject: RE: 20 Cedarow Court Step 3 TIA

Hi Rosanna,

Yes, we are good with the responses. Given that the City has a good understanding of the LOS at the Huntmar and Maple Grove intersection, we will accept the exclusion.

Carol

From: Baggs, Rosanna
Sent: September 04, 2019 8:51 AM
To: Franklin, Carol <<u>carol.franklin@ottawa.ca</u>>
Cc: McMahon, Patrick <<u>patrick.mcmahon@ottawa.ca</u>>; Prevost, Pauline
<<u>Pauline.Prevost@ottawa.ca</u>>
Subject: FW: 20 Cedarow Court Step 3 TIA

Hi Carol,

Please review the response below and let me know if they are satisfactory.

Rosanna Baggs, C.E.T.

Project Manager, Infrastructure Approvals | GPRJ Approbation demandes infrastructure Development Review West Branch | Dir Services d'exam des dem d'amgt Tel |Tél. : 613-580- 2424 ext. | poste 26388 From: O'Grady, Lauren <<u>Lauren.OGrady@stantec.com</u>>
Sent: September 04, 2019 8:47 AM
To: Baggs, Rosanna <<u>Rosanna.Baggs@ottawa.ca</u>>
Cc: Moroz, Peter <<u>peter.moroz@stantec.com</u>>; Angela Mariani <<u>angela@nlgc.com</u>>
Subject: RE: 20 Cedarow Court Step 3 TIA

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Good morning Rosanna,

Please see my comment responses in green below.

Can you please verify with TES that these are acceptable so I can proceed with my Step 4 TIA?

Thank you,

Lauren O'Grady P.Eng. Transportation Engineer

Direct: 613-784-2264 lauren.o'grady@stantec.com

Stantec 400 - 1331 Clyde Avenue Ottawa ON K2C 3G4



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From: Baggs, Rosanna <<u>Rosanna.Baggs@ottawa.ca</u>>
Sent: Friday, August 30, 2019 1:55 PM
To: O'Grady, Lauren <<u>Lauren.OGrady@stantec.com</u>>
Cc: Angela Mariani <<u>angela@nlgc.com</u>>; Moroz, Peter <<u>peter.moroz@stantec.com</u>>
Subject: Re: 20 Cedarow Court Step 3 TIA

Hi Lauren,

Please see the comments for the forecasting report:

Transportation Engineering Services

1. Given that this community will have residents able to walk and ride bicycles, as well as the close proximity of other commercial developments, revise the presented modal shares to include separate walking and cycling trips. The modal share for the subject development was taken from the recently

completed *5731 Hazeldean Road TIS* (March 2016) that is directly adjacent to it. This approved TIS included a negligible modal share for walking / cycling, and as such, the modal share for walking / cycling was included as 0% in the subject TIA. Upon further review, given that the subject development is considered 'senior adult housing' and not a 'care facility' like the 5731 Hazeldean Road development, the walking and cycling modal shares were increased from 0% to 5% for each mode. This will be reflected in the Step 4 TIA. This increase in active modal share will decrease the auto modal share from 60% to 50%.

2. The text in Section 3.1.2 indicates that pass-by reductions will only be applied to PM peak volumes, but Table 10 accounts for these reductions in both peak hours. Correct the error. This error will be corrected in the Step 4 TIA.

3. Provide the background trips generated in section 3.2.3 in an appendix for reference. Noted, this will be included in the Step 4 TIA.

4. Given the likelihood of outgoing trips using this route to reach Highway 417, evaluate Huntmar Drive and Maple Grove Road as a study area intersection. The proposed development is anticipated to generate 18 and 26 vehicles during the AM and PM peak hours, respectively, traveling north on Huntmar towards the Highway (refer to Figure 10 in the Step 3 TIA). This is a negligible amount of traffic as compared to the existing and future volumes, therefore, it will have a negligible impact on the intersection of Huntmar Drive and Maple Grove Road. Including this intersection as part of the subject study will not add any value, and as such, it is proposed to not be included as part of the Step 4 TIA.

5. PM peak volumes are high along Hazeldean Road on Figure 13. Despite this development is not being a major contributor to the overall through traffic, demand rationalization should be reconsidered when intersection LOS is completed as part of step 4. Depending on the results from the LOS analysis as part of the Step 4 TIA, demand rationalization may be reconsidered to adjust the volumes along Hazeldean Road.

If the above can be incorporated into Step 4, please proceed. Otherwise, please contact me to discuss.

Regards,

Rosanna Baggs, C.E.T.

From: O'Grady, Lauren <<u>Lauren.OGrady@stantec.com</u>>
Sent: Wednesday, August 21, 2019 9:56:54 AM
To: Baggs, Rosanna <<u>Rosanna.Baggs@ottawa.ca</u>>
Cc: Angela Mariani <<u>angela@nlgc.com</u>>; Moroz, Peter <<u>peter.moroz@stantec.com</u>>
Subject: 20 Cedarow Court Step 3 TIA

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Good morning Rosanna,

Please see attached the Step 3 TIA for the proposed development located at 20 Cedarow Court in Stittsville. Please let me know if you have any questions or comments.

Thank you,

Lauren O'Grady P.Eng. Transportation Engineer

Direct: 613-784-2264 lauren.o'grady@stantec.com

Stantec 400 - 1331 Clyde Avenue Ottawa ON K2C 3G4

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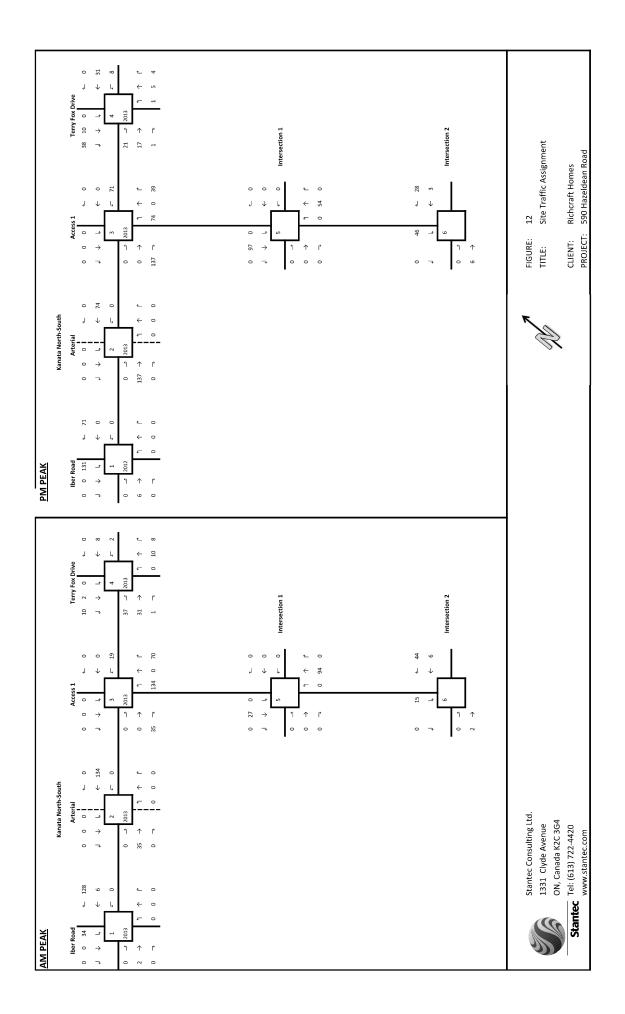
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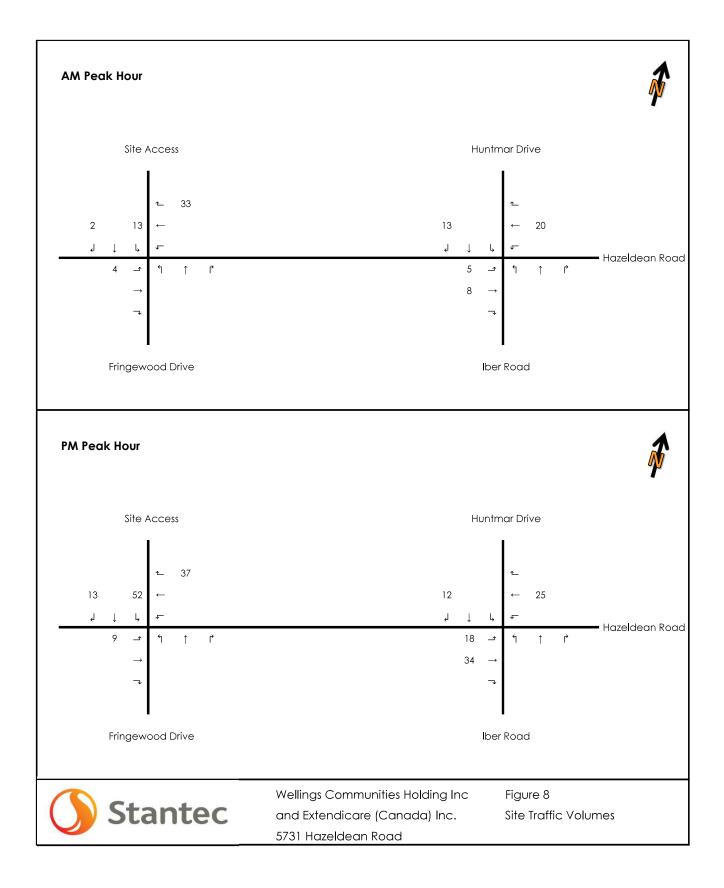
20 CEDAROW COURT WELLINGS PHASE 2 TRANSPORTATION IMPACT ASSESSMENT

Appendix C Background Traffic Volumes October 24, 2019

Appendix C **BACKGROUND TRAFFIC VOLUMES**







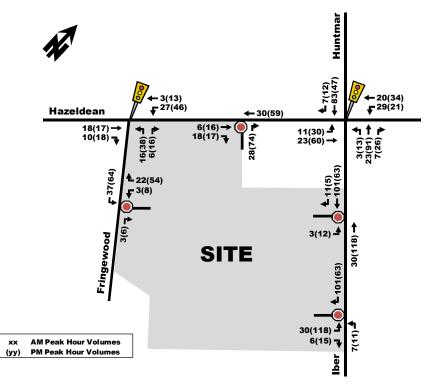
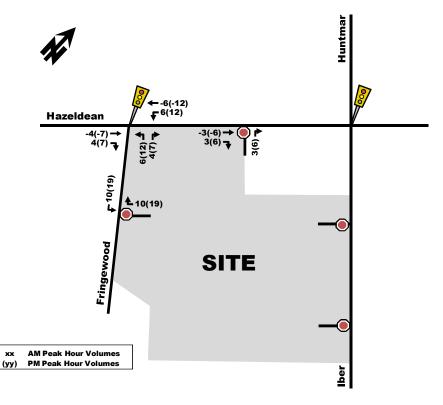


Figure 7: 'New' Site-Generated Traffic Volumes

Figure 8: Site-Generated 'Pass-by' Traffic Volumes





Appendix D Multi-Modal Level of Service Assessment October 24, 2019

Appendix D MULTI-MODAL LEVEL OF SERVICE ASSESSMENT

Appendix D Multi-Modal Level of Service Assessment October 24, 2019

Appendix D MULTI-MODAL LEVEL OF SERVICE ASSESSMENT

Consultant	Stantec	0 Cedarow Court			
Scenario	2019 Existing	Date	20-Sep-19		
Comments					
] [
SEGMENTS		Hazeldean Road	Huntmar Drive	Cedarow Court	
Ē	Sidewalk Width Boulevard Width	≥ 2 m > 2 m	≥ 2 m > 2 m	no sidewalk n/a	
ria.	Avg Daily Curb Lane Traffic Volume	> 3000	> 3000	≤ 3000	
Pedestrian	Operating Speed On-Street Parking	> 60 km/h no	> 50 to 60 km/h no	> 50 to 60 km/h yes	
Å	Level of Service	D	С	F	
	Type of Cycling Facility	Curbside Bike Lane	Curbside Bike Lane	Mixed Traffic	
	Number of Travel Lanes	2 ea. dir. (w median)	2 ea. dir. (w median)	≤ 2 (no centreline)	
	Operating Speed	>50 to 70 km/h	≤ 50 km/h	≥ 50 to 60 km/h	
5	# of Lanes & Operating Speed LoS	С	C	D	
Bicycle	Bike Lane (+ Parking Lane) Width	≥ 1.8 m	≥ 1.8 m		
_	Bike Lane Width LoS	A	Α	-	
	Bike Lane Blockages	Rare	Rare		
	Blockage LoS	A	Α	-	
	Level of Service	С	С	D	
sit	Facility Type	Mixed Traffic	Mixed Traffic		
Transit	Friction or Ratio Transit:Posted Speed	Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8		
L ST	Level of Service	D	D	-	
	Truck Lane Width	≤ 3.5 m			
IC K	Travel Lanes per Direction	> 1			
Truck	Level of Service	A	-	-	

Stantec

Consultant Scenario Comments

2024 Future Background

Project 20 Cedarow Court Date 20-Sep-19

SEGMENTS		Hazeldean Road	Huntmar Drive	Cedarow Court
Pedestrian	Sidewalk Width Boulevard Width Avg Daily Curb Lane Traffic Volume Operating Speed On-Street Parking	≥ 2 m > 2 m > 3000 > 60 km/h no	≥ 2 m > 2 m > 3000 > 50 to 60 km/h no	no sidewalk n/a ≤ 3000 > 50 to 60 km/h yes
<u> </u>	Level of Service	D	С	F
	Type of Cycling Facility	Curbside Bike Lane	Curbside Bike Lane	Mixed Traffic
	Number of Travel Lanes	2 ea. dir. (w median)	2 ea. dir. (w median)	≤ 2 (no centreline)
	Operating Speed	>50 to 70 km/h	≤ 50 km/h	≥ 50 to 60 km/h
	# of Lanes & Operating Speed LoS	C	C	D
Bicycle	Bike Lane (+ Parking Lane) Width	≥ 1.8 m	≥ 1.8 m	
	Bike Lane Width LoS	Α	Α	-
	Bike Lane Blockages	Rare	Rare	
	Blockage LoS	A	А	-
	Level of Service	С	С	D
sit	Facility Type	Mixed Traffic	Mixed Traffic	
Transit	Friction or Ratio Transit:Posted Speed	Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	
Ц Ц	Level of Service	D	D	-
	Truck Lane Width	≤ 3.5 m		
<u>Č</u>	Travel Lanes per Direction	> 1		
Truck	Level of Service	A	-	-

Consultant Stantec Scenario 2024 Tot Comments

2024 Total Future

Project	20 Cedarow Court
Date	20-Sep-19

		1		
SEGMENTS		Hazeldean Road	Huntmar Drive	Cedarow Court
an	Sidewalk Width Boulevard Width	≥ 2 m > 2 m	≥ 2 m > 2 m	no sidewalk n/a
i, iii	Avg Daily Curb Lane Traffic Volume	> 3000	> 3000	≤ 3000
Pedestrian	Operating Speed On-Street Parking	> 60 km/h no	> 50 to 60 km/h no	> 50 to 60 km/h yes
Å	Level of Service	D	С	F
	Type of Cycling Facility	Curbside Bike Lane	Curbside Bike Lane	Mixed Traffic
	Number of Travel Lanes	2 ea. dir. (w median)	2 ea. dir. (w median)	≤ 2 (no centreline)
	Operating Speed	>50 to 70 km/h	≤ 50 km/h	≥ 50 to 60 km/h
	# of Lanes & Operating Speed LoS	С	C	D
Bicycle	Bike Lane (+ Parking Lane) Width	≥ 1.8 m	≥ 1.8 m	
	Bike Lane Width LoS	A	Α	-
	Bike Lane Blockages	Rare	Rare	
	Blockage LoS	A	A	-
	Level of Service	С	С	D
sit	Facility Type	Mixed Traffic	Mixed Traffic	
Transit	Friction or Ratio Transit:Posted Speed	Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	
Тĸ	Level of Service	D	D	-
	Truck Lane Width	≤ 3.5 m		
CK	Travel Lanes per Direction	> 1		
Truck	Level of Service	Α	-	-

Consultant	Stantec Project 20 Cedarow Court						
Scenario	2029 Ultimate	Date	20-Sep-19				
Comments							
SEGMENTS		Hazeldean Road	Huntmar Drive	Cedarow Court			
u	Sidewalk Width Boulevard Width	≥ 2 m > 2 m	≥ 2 m > 2 m	no sidewalk n/a			
tria	Avg Daily Curb Lane Traffic Volume	> 3000	> 3000	≤ 3000			
Pedestrian	Operating Speed On-Street Parking	> 60 km/h no	> 50 to 60 km/h no	> 50 to 60 km/h yes			
Å	Level of Service	D	С	F			
	Type of Cycling Facility	Curbside Bike Lane	Curbside Bike Lane	Mixed Traffic			
	Number of Travel Lanes	2 ea. dir. (w median)	2 ea. dir. (w median)	≤ 2 (no centreline)			
	Operating Speed	>50 to 70 km/h	≤ 50 km/h	≥ 50 to 60 km/h			
	# of Lanes & Operating Speed LoS	C	C	D			
Bicycle	Bike Lane (+ Parking Lane) Width	≥ 1.8 m	≥ 1.8 m				
_	Bike Lane Width LoS	A	Α	-			
	Bike Lane Blockages	Rare	Rare				
	Blockage LoS	A	A	-			
	Level of Service	С	С	D			
sit.	Facility Type	Mixed Traffic	Mixed Traffic				
Transit	Friction or Ratio Transit:Posted Speed	Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8				
Tra	Level of Service	D	D				
	Truck Lane Width	≤ 3.5 m					
CK CK	Travel Lanes per Direction	> 1					
Truck	Level of Service	A	-	-			

Consultant	Stantec	Project	20 Cedarow Court
Scenario	2019 Existing	Date	25-Sep-19
Comments			

mments				•					
	INTERSECTIONS		Hazeldean at Huntmar			Hazeldean a	t Fringewood		
	Crossing Side	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
	Lanes	5	5	7	7	3	3	6	5
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	Protected/ Permissive	Protected/ Permissive	Protected	Protected	Protected/ Permissive	Protected/ Permissive	Protected/ Permissive	No left turn / Prohib.
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	No right turn	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR prohibited	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No
rian	Right Turn Channel	Smart Channel	No Channel	Smart Channel	No Channel	No Channel	No Channel	No Channel	No Channel
sti	Corner Radius	15-25m	10-15m	15-25m	10-15m	10-15m	10-15m	10-15m	10-15m
Pedestrian	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
	PETSI Score	41	37	16	12	70	70	28	45
	Ped. Exposure to Traffic LoS	E	E	F	F	С	С	F	D
	Cycle Length	120	120	120	120	120	120	120	120
	Effective Walk Time	9	9	7	7	14	14	10	10
	Average Pedestrian Delay	51	51	53	53	47	47	50	50
	Pedestrian Delay LoS	E	E	E	E	E	E	E	E
		E	E	F	F	E	E	F	E
	Level of Service		l	-				-	
	Approach From	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
_					Curb Bike Lane,	North		Curb Bike Lane,	Curb Bike Lane,
	Bicycle Lane Arrangement on Approach IF Dedicated Right Turn Lane,	Pocket Bike Lane	Pocket Bike Lane	Pocket Bike Lane	Cycletrack or MUP		Mixed Traffic	Cycletrack or MUP	Cycletrack or MUP
	THEN Right Turn Configuration, ELSE lank>	Bike lane shifts to the left of right turn	> 50 m Introduced right turn lane	Bike lane shifts to the left of right turn					
	Dedicated Right Turning Speed	>25 to 30 km/h	>25 to 30 km/h	>25 to 30 km/h					
<u>e</u>	Cyclist Through Movement	F	D	F	Not Applicable	-		Not Applicable	Not Applicable
Ś	Separated or Mixed Traffic	Separated	Separated	Separated	Separated	-	Mixed Traffic	Separated	Separated
Bicycle	Left Turn Approach	1 lane crossed	1 lane crossed	≥ 2 lanes crossed	≥ 2 lanes crossed		No lane crossed	≥ 2 lanes crossed	
	Operating Speed	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h		> 40 to ≤ 50 km/h	≥ 60 km/h	
	Left Turning Cyclist	С	С	F	F	-	В	F	-
		F	D	F	F	-	В	F	-
	Level of Service		I	F			I	=	
t.	Average Signal Delay	> 40 sec	> 40 sec	> 40 sec	> 40 sec		≤ 20 sec	≤ 10 sec	≤ 10 sec
Transit		F	F	F	F	-	С	В	В
La .	Level of Service			F			(c	
	Effective Corner Radius	> 15 m	10 - 15 m	> 15 m	10 - 15 m		10 - 15 m	10 - 15 m	10 - 15 m
	Effective Corner Radius Number of Receiving Lanes on Departure from Intersection	> 15 m ≥ 2	10 - 15 m ≥ 2	> 15 m ≥ 2	10 - 15 m ≥ 2		10 - 15 m ≥ 2	10 - 15 m ≥ 2	10 - 15 m ≥ 2
	Number of Receiving Lanes on Departure	-				-			
Truck	Number of Receiving Lanes on Departure	≥2	≥2 B	≥2	≥ 2	-	≥ 2 B	≥2	≥2

Consultant	Stantec		Project 20 Cedarow Court			1			
Scenario	2024 Future Background		Date	25-Sep-19					
Comments									
	INTERSECTIONS		Hazeldean	at Huntmar			Hazeldean a	t Fringewood	
	Crossing Side	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
	Lanes	5	5	7	7	3	3	6	5
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	Protected/ Permissive	Protected/ Permissive	Protected	Protected	Protected/ Permissive	Protected/ Permissive	Protected/ Permissive	Protected/ Permissive
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No
ian	Right Turn Channel	Smart Channel	No Channel	Smart Channel	No Channel	No Channel	No Channel	No Channel	No Channel
str	Corner Radius	15-25m	10-15m	15-25m	10-15m	10-15m	10-15m	10-15m	10-15m
Pedestrian	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
<u> </u>	PETSI Score	41	37	16	12	70	70	20	37
	Ped. Exposure to Traffic LoS	E	E	F	F	С	С	F	E
	Cycle Length	120	120	120	120	120	120	120	120
	Effective Walk Time Average Pedestrian Delay	17 44	17 44	9 51	9 51	58 16	58 16	11 50	11 50
	Pedestrian Delay LoS	E	E	E	E	В	В	E	E
		E	E	F	F	C	C	F	E
	Level of Service			F				F	
	Approach From	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
	Bicycle Lane Arrangement on Approach	Pocket Bike Lane	Pocket Bike Lane	Pocket Bike Lane	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic	Pocket Bike Lane	Curb Bike Lane, Cycletrack or MUP
	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank></blank>	Bike lane shifts to the left of right turn	> 50 m Introduced right turn lane	Bike lane shifts to the left of right turn	Cycle add of mor			> 50 m Introduced right turn lane	
	Dedicated Right Turning Speed	>25 to 30 km/h	>25 to 30 km/h	>25 to 30 km/h				>25 to 30 km/h	
e	Cyclist Through Movement	F	D	F	Not Applicable			D	Not Applicable
Bicycle	Separated or Mixed Traffic	Separated	Separated	Separated	Separated	Mixed Traffic	Mixed Traffic	Separated	Separated
ä	Left Turn Approach	1 lane crossed	1 lane crossed	≥ 2 lanes crossed	≥ 2 lanes crossed	No lane crossed	No lane crossed	≥ 2 lanes crossed	≥ 2 lanes crossed
	Operating Speed	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h
	Left Turning Cyclist	c	<u>с</u>	F	F	в	В	F	F
	Level of Service	F	D F F			F			
	Average Signal Delay	> 40 sec	> 40 sec	> 40 sec	> 40 sec		> 40 sec	≤ 20 sec	≤ 10 sec
Isi		F	F	F	F	-	F	С	В
Transit	Level of Service			F				F	
	Effective Corner Radius	> 15 m	10 - 15 m	> 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m	10 - 15 m
×	Number of Receiving Lanes on Departure from Intersection	≥ 2	≥ 2	≥ 2	≥ 2	≥2	≥2	1	≥2
Truck		А	В	Α	В	В	В	Е	В
F	Level of Service			B	_			 E	
0	Volume to Capacity Ratio								
Auto	Level of Service			-				-	

Consultant				urt					
Scenario	2024 Total Future		Date	25-Sep-19					
Comments									
	INTERSECTIONS		Hazaldaan	at Huntmar			Hazaldaan a	t Fringewood	
	Crossing Side	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
	Lanes	5	5	7	7	3	3	6	5
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	Protected/ Permissive	Protected/ Permissive	Protected	Protected	Protected/ Permissive	Protected/ Permissive	Protected/ Permissive	Protected/ Permissive
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No
rian	Right Turn Channel	Smart Channel	No Channel	Smart Channel	No Channel	No Channel	No Channel	No Channel	No Channel
sti	Corner Radius	15-25m	10-15m	15-25m	10-15m	10-15m	10-15m	10-15m	10-15m
Pedestrian	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
	PETSI Score	41	37	16	12	70	70	20	37
	Ped. Exposure to Traffic LoS	E	E	F	F	С	С	F	E
	Cycle Length	120	120	120	120	120	120	120	120
	Effective Walk Time Average Pedestrian Delay	15 46	15 46	9 51	9 51	57 17	57 17	12 49	12 49
	Pedestrian Delay LoS	E	E	E	E	В	В	E	E
		E	E	F	F	C	C	F	E
	Level of Service	E			F	U U	-	-	
				7				=	
	Approach From	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
	Bicycle Lane Arrangement on Approach	Pocket Bike Lane	Pocket Bike Lane	Pocket Bike Lane	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic	Pocket Bike Lane	Curb Bike Lane, Cycletrack or MUP
	IF Dedicated Right Turn Lane,								
	THEN Right Turn Configuration,	Bike lane shifts to the left of right turn	> 50 m Introduced right turn lane	Bike lane shifts to the left of right turn				> 50 m Introduced right turn lane	
	THEN Right Turn Configuration, ELSE <blank></blank>								
<u>o</u>	THEN Right Turn Configuration,	the left of right turn	right turn lane	the left of right turn	Not Applicable			right turn lane	Not Applicable
ycle	THEN Right Turn Configuration, ELSE blank> Dedicated Right Turning Speed	the left of right turn >25 to 30 km/h	right turn lane >25 to 30 km/h	the left of right turn >25 to 30 km/h	Not Applicable Separated	Mixed Traffic	Mixed Traffic	right turn lane >25 to 30 km/h	Not Applicable Separated
Bicycle	THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement</blank>	the left of right turn >25 to 30 km/h F	right turn lane >25 to 30 km/h D	the left of right turn >25 to 30 km/h F		Mixed Traffic No lane crossed	Mixed Traffic No lane crossed	right turn lane >25 to 30 km/h D	
Bicycle	THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed</blank>	the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h	right turn lane >25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h	the left of right turn >25 to 30 km/h F Separated	Separated			right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h	Separated
Bicycle	THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach</blank>	the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C	right turn lane >25 to 30 km/h D Separated 1 lane crossed >40 to ≤ 50 km/h C	the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h F	Separated ≥ 2 lanes crossed > 50 to < 60 km/h F	No lane crossed > 40 to ≤ 50 km/h B	No lane crossed > 40 to ≤ 50 km/h B	right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F	Separated ≥ 2 lanes crossed ≥ 60 km/h F
Bicycle	THEN Right Turn Configuration, ELSE Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic 	the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h	right turn lane >25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h	the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h	Separated ≥ 2 lanes crossed > 50 to < 60 km/h 	No lane crossed > 40 to ≤ 50 km/h	No lane crossed > 40 to ≤ 50 km/h	right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h	Separated ≥ 2 lanes crossed ≥ 60 km/h
Bicycle	THEN Right Turn Configuration, ELSE Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist Level of Service	the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F	right turn lane >25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h C D	the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F	Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F	No lane crossed > 40 to ≤ 50 km/h B	No lane crossed > 40 to ≤ 50 km/h B B	right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F F	Separated ≥ 2 lanes crossed ≥ 60 km/h F F
	THEN Right Turn Configuration, ELSE Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic 	the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F F > 40 sec	right turn lane >25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h C D > 40 sec	the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F - S 40 sec	Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F > 40 sec	No lane crossed > 40 to ≤ 50 km/h B	No lane crossed > 40 to ≤ 50 km/h B B > 40 sec	right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F = ≤ 10 sec	Separated ≥ 2 lanes crossed ≥ 60 km/h F F ≤ 20 sec
	THEN Right Turn Configuration, ELSE Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist Level of Service Average Signal Delay	the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F	right turn lane >25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h C D	the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F	Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F	No lane crossed > 40 to ≤ 50 km/h B	No lane crossed > 40 to ≤ 50 km/h B B	right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F F	Separated ≥ 2 lanes crossed ≥ 60 km/h F F
Transit Bicycle	THEN Right Turn Configuration, ELSE Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist Level of Service	the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F F > 40 sec	right turn lane >25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h C D ↓ 40 sec F	the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F - S 40 sec	Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F > 40 sec	No lane crossed > 40 to ≤ 50 km/h B	No lane crossed > 40 to ≤ 50 km/h B B > 40 sec F	right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F = ≤ 10 sec	Separated ≥ 2 lanes crossed ≥ 60 km/h F F ≤ 20 sec
	THEN Right Turn Configuration, ELSE Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist Level of Service Average Signal Delay	the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F F > 40 sec	right turn lane >25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h C D ↓ 40 sec F	the left of right tum >25 to 30 km/h Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F S > 40 sec F	Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F > 40 sec	No lane crossed > 40 to ≤ 50 km/h B	No lane crossed > 40 to ≤ 50 km/h B B > 40 sec F	right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F F S ≤ 10 sec B	Separated ≥ 2 lanes crossed ≥ 60 km/h F F ≤ 20 sec
Transit	THEN Right Turn Configuration, ELSE Else Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist Level of Service Average Signal Delay Level of Service	the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F > 40 sec F	right turn lane >25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h C D ↓ 40 sec F	the left of right tum >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F > 40 sec F F -	Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F > 40 sec F	No lane crossed > 40 to ≤ 50 km/h B B -	No lane crossed > 40 to ≤ 50 km/h B B 	right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F S ≤ 10 sec B	Separated ≥ 2 lanes crossed ≥ 60 km/h F F ≤ 20 sec C
Transit	THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist Level of Service Average Signal Delay Level of Service Effective Corner Radius Number of Receiving Lanes on Departure from Intersection</blank>	the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F > 40 sec F > 40 sec F > 40 sec F	right turn lane >25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h C D A A to sec F 10 - 15 m	the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F - - - - - - - - - - - - -	Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F > 40 sec F 10 - 15 m	No lane crossed > 40 to ≤ 50 km/h B B - - 10 - 15 m	No lane crossed > 40 to ≤ 50 km/h B B - 40 sec F 10 - 15 m	right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F S 10 sec B 10 - 15 m	Separated ≥ 2 lanes crossed ≥ 60 km/h F F ≤ 20 sec C 10 - 15 m
	THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist Level of Service Average Signal Delay Level of Service Effective Corner Radius Number of Receiving Lanes on Departure</blank>	the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F > 40 sec F 2 > 15 m ≥ 2	right turn lane >25 to 30 km/h Separated 1 lane crossed > 40 to ≤ 50 km/h C D 1 C D 1 1 1 1 1 1 1 1	the left of right tum >25 to 30 km/h Separated ≥ 2 lanes crossed > 50 to < 60 km/h F 50 to < 60 km/h	Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F > 40 sec F 10 - 15 m ≥ 2	No lane crossed > 40 to ≤ 50 km/h B B - - 10 - 15 m ≥ 2	No lane crossed > 40 to ≤ 50 km/h B B > 40 sec F 10 - 15 m ≥ 2 B	right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F S ≤ 10 sec B 10 - 15 m 1	Separated ≥ 2 lanes crossed ≥ 60 km/h F F ≤ 20 sec C 10 - 15 m ≥ 2

Consultant Scenario	Stantec 2029 Ultimate		20 Cedarow Cou 25-Sep-19	ırt					
Comments									
			<u>-</u>						
	INTERSECTIONS			at Huntmar				t Fringewood	
	Crossing Side	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
	Lanes Median	5	5	7 No Median - 2.4 m	7	3	3	6	5
	Median	Protected/	Protected/	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m Protected/	Protected/	No Median - 2.4 m Protected/	No Median - 2.4 m Protected/
	Conflicting Left Turns	Permissive	Permissive	Protected	Protected	Permissive	Permissive	Permissive	Permissive
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No
ian	Right Turn Channel	Smart Channel	No Channel	Smart Channel	No Channel	No Channel	No Channel	No Channel	No Channel
sti	Corner Radius	15-25m	10-15m	15-25m	10-15m	10-15m	10-15m	10-15m	10-15m
Pedestrian	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
_	PETSI Score	41	37	16	12	70	70	20	37
	Ped. Exposure to Traffic LoS	E	E	F	F	С	С	F	E
	Cycle Length	120	120	120	120	120	120	120	120
	Effective Walk Time	16	16	10	10	59	59	10	10
	Average Pedestrian Delay	45	45	50 E	50	16 B	16 B	50	50 E
	Pedestrian Delay LoS	E	E		E			E	
	Level of Service	E	E	F	F	С	С	F	E
		F F							
	Approach From	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
	Bicycle Lane Arrangement on Approach	Baalaat Bilaa Laara	D 1 1 D'1 1	D 1 1 D'1 1	Curb Bike Lane,				Curb Bike Lane,
	Dicycle Lane Analigement on Apploach	Pocket Bike Lane	Pocket Bike Lane	Pocket Bike Lane	Cycletrack or MUP	Mixed Traffic	Mixed Traffic	Pocket Bike Lane	Cycletrack or MUP
	IF Dedicated Right Turn Lane, THEN Right Turn Configuration,	Bike lane shifts to the left of right turn	 > 50 m Introduced right turn lane 	Bike lane shifts to the left of right turn		Mixed Traffic	Mixed Traffic	 > 50 m Introduced right turn lane 	
	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE blank>	Bike lane shifts to the left of right turn	> 50 m Introduced right turn lane	Bike lane shifts to the left of right turn		Mixed Traffic	Mixed Traffic	> 50 m Introduced right turn lane	
Ū	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE blank> Dedicated Right Turning Speed	Bike lane shifts to	> 50 m Introduced	Bike lane shifts to	Cycletrack or MUP	Mixed Traffic	Mixed Trattic	> 50 m Introduced	Cycletrack or MUP
ycle	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE blank>	Bike lane shifts to the left of right turn >25 to 30 km/h	 > 50 m Introduced right turn lane >25 to 30 km/h 	Bike lane shifts to the left of right turn >25 to 30 km/h		Mixed Traffic	Mixed Traffic Mixed Traffic	 > 50 m Introduced right turn lane >25 to 30 km/h 	
Bicycle	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE blank> Dedicated Right Turning Speed Cyclist Through Movement	Bike lane shifts to the left of right turn >25 to 30 km/h F	> 50 m Introduced right turn lane >25 to 30 km/h D	Bike lane shifts to the left of right turn >25 to 30 km/h F	Cycletrack or MUP			 > 50 m Introduced right turn lane >25 to 30 km/h D 	Cycletrack or MUP
Bicycle	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic</blank>	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated	> 50 m Introduced right turn lane >25 to 30 km/h D Separated	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated	Cycletrack or MUP Not Applicable Separated	Mixed Traffic	Mixed Traffic	> 50 m Introduced right turn lane >25 to 30 km/h D Separated	Cycletrack or MUP Not Applicable Separated
Bicycle	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach</blank>	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated 1 lane crossed	 > 50 m Introduced right turn lane > 25 to 30 km/h D Separated 1 lane crossed 	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed	Mixed Traffic No lane crossed	Mixed Traffic No lane crossed	> 50 m Introduced right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed
Bicycle	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist</blank>	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h	 >50 m Introduced right turn lane >25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h 	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed > 50 to < 60 km/h	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h	> 50 m Introduced right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed ≥ 60 km/h
Bicycle	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed</blank>	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C	> 50 m Introduced right turn lane >25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h C D	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h F	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed > 50 to < 60 km/h F	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B B B	> 50 m Introduced right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed ≥ 60 km/h F
	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist</blank>	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F F S S 2 40 to ≤ 50 km/h	> 50 m Introduced right turn lane > 25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h C D D > 40 sec	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F F	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F F > 40 sec	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B B A B A A0 sec	> 50 m Introduced right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F F ≤ 10 sec	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed ≥ 60 km/h F F 5 2 20 sec
	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist Level of Service Average Signal Delay</blank>	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F	> 50 m Introduced right turn lane > 25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h C D	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F F	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B B	> 50 m Introduced right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed ≥ 60 km/h F F F
Transit Bicycle	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist Level of Service</blank>	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F F S S 2 40 to ≤ 50 km/h	> 50 m Introduced right turn lane >25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h C D > 40 sec F	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F F	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F F > 40 sec	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B B B A A 0 sec F	> 50 m Introduced right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F F ≤ 10 sec	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed ≥ 60 km/h F F F 2 lanes 2 lanes crossed
	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist Level of Service Average Signal Delay</blank>	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F F S S 2 40 to ≤ 50 km/h	> 50 m Introduced right turn lane >25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h C D > 40 sec F	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F F ► 40 sec F	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F F > 40 sec	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B B B A A 0 sec F	> 50 m Introduced right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F ≤ 10 sec B	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed ≥ 60 km/h F F F 2 lanes 2 lanes crossed
Transit	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist Level of Service Average Signal Delay Level of Service</blank>	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F > 40 sec F	> 50 m Introduced right turn lane >25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h C D D > 40 sec F	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F > 40 sec F F	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F > 40 sec F	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B B -	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B B B > 40 sec F	> 50 m Introduced right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F F ≤ 10 sec B	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed ≥ 60 km/h F 5 2 20 sec C
Transit	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist Level of Service Average Signal Delay Level of Service Effective Corner Radius Number of Receiving Lanes on Departure</blank>	Bike lane shifts to the left of right turn >25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F S S S S S S S S S S	> 50 m Introduced right turn lane > 25 to 30 km/h D Separated 1 lane crossed > 40 to ≤ 50 km/h C D > 40 to ≤ 50 km/h C F 10 - 15 m	Bike lane shifts to the left of right turn >25 to 30 km/h F 2 lanes crossed > 50 to < 60 km/h F F > 40 sec F F F A 5 sec A 5 sec	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F Separated Separate	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B B B - - 10 - 15 m	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B B B > 40 sec F F 10 - 15 m	> 50 m Introduced right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F S S 10 sec B B 10 - 15 m	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed ≥ 60 km/h F 2 20 sec 2 0 sec 10 - 15 m
	IF Dedicated Right Turn Lane, THEN Right Turn Configuration, ELSE <blank> Dedicated Right Turning Speed Cyclist Through Movement Separated or Mixed Traffic Left Turn Approach Operating Speed Left Turning Cyclist Level of Service Average Signal Delay Level of Service Effective Corner Radius Number of Receiving Lanes on Departure</blank>	Bike lane shifts to +25 to 30 km/h F Separated 1 lane crossed > 40 to ≤ 50 km/h C F S C C C C C C C C	> 50 m Introduced right turn lane >25 to 30 km/h D Separated 1 lane crossed 1 lane crossed 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Bike lane shifts to >25 to 30 km/h F Separated ≥ 2 lanes crossed > 50 to < 60 km/h F F S S S S S S S S	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed > 50 to < 60 km/h F 3 40 sec F 10 - 15 m ≥ 2	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B B B - - 10 - 15 m ≥ 2	Mixed Traffic No lane crossed > 40 to ≤ 50 km/h B B B > 40 sec F 10 - 15 m ≥ 2 B	> 50 m Introduced right turn lane >25 to 30 km/h D Separated ≥ 2 lanes crossed ≥ 60 km/h F F ≤ 10 sec B F 10 - 15 m 1	Cycletrack or MUP Not Applicable Separated ≥ 2 lanes crossed 6 0 km/h F 5 20 sec C 10 - 15 m 2 2

Appendix E Transportation Demand Management Checklist October 24, 2019

Appendix E TRANSPORTATION DEMAND MANAGEMENT CHECKLIST

TDM-Supportive Development Design and Infrastructure Checklist:

Non-Residential Developments (office, institutional, retail or industrial)

Legend					
REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed				
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users				
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance				

	TDM-s	supportive design & infrastructure measures: Non-residential developments	Check if completed & add descriptions, explanations or plan/drawing references
	1.	WALKING & CYCLING: ROUTES	
	1.1	Building location & access points	
BASIC	1.1.1	Locate building close to the street, and do not locate parking areas between the street and building entrances	
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	
BASIC	1.1.3	Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	
	1.2	Facilities for walking & cycling	~
REQUIRED	1.2.1	Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations <i>(see Official Plan policy 4.3.3)</i>	
REQUIRED	1.2.2	Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible <i>(see Official</i> <i>Plan policy 4.3.12)</i>	

	TDM-s	supportive design & infrastructure measures: Non-residential developments	Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3	Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks (see Official Plan policy 4.3.10)	
REQUIRED	1.2.4	Make sidewalks and open space areas easily accessible through features such as gradual grade transition, depressed curbs at street corners and convenient access to extra-wide parking spaces and ramps (see Official Plan policy 4.3.10)	
REQUIRED	1.2.5	Include adequately spaced inter-block/street cycling and pedestrian connections to facilitate travel by active transportation. Provide links to the existing or planned network of public sidewalks, multi-use pathways and on- road cycle routes. Where public sidewalks and multi-use pathways intersect with roads, consider providing traffic control devices to give priority to cyclists and pedestrians (see Official Plan policy 4.3.11)	
BASIC	1.2.6	Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	\checkmark
BASIC	1.2.7	Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	
BASIC	1.2.8	Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	
	1.3	Amenities for walking & cycling	
BASIC	1.3.1	Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	
BASIC	1.3.2	Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	

	TDM-s	supportive design & infrastructure measures: Non-residential developments	Check if completed & add descriptions, explanations or plan/drawing references
	2.	WALKING & CYCLING: END-OF-TRIP FACILI	TIES
	2.1	Bicycle parking	
REQUIRED	2.1.1	Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible (see Official Plan policy 4.3.6)	
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well- used areas (see Zoning By-law Section 111)	
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored (see Zoning By-law Section 111)	
BASIC	2.1.4	Provide bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met), plus the expected peak number of customer/visitor cyclists	
BETTER	2.1.5	Provide bicycle parking spaces equivalent to the expected number of commuter and customer/visitor cyclists, plus an additional buffer (e.g. 25 percent extra) to encourage other cyclists and ensure adequate capacity in peak cycling season	
	2.2	Secure bicycle parking	_
REQUIRED	2.2.1	Where more than 50 bicycle parking spaces are provided for a single office building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers (see Zoning By-law Section 111)	
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met)	
	2.3	Shower & change facilities	
BASIC	2.3.1	Provide shower and change facilities for the use of active commuters	
BETTER	2.3.2	In addition to shower and change facilities, provide dedicated lockers, grooming stations, drying racks and laundry facilities for the use of active commuters	
	2.4	Bicycle repair station	
BETTER	2.4.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	

	TDM-s	supportive design & infrastructure measures: Non-residential developments	Check if completed & add descriptions, explanations or plan/drawing references
	3.	TRANSIT	
	3.1	Customer amenities	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	
	4.	RIDESHARING	
	4.1	Pick-up & drop-off facilities	
BASIC	4.1.1	Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	
	4.2	Carpool parking	
BASIC	4.2.1	Provide signed parking spaces for carpools in a priority location close to a major building entrance, sufficient in number to accommodate the mode share target for carpools	
BETTER	4.2.2	At large developments, provide spaces for carpools in a separate, access-controlled parking area to simplify enforcement	
	5.	CARSHARING & BIKESHARING	
	5.1	Carshare parking spaces	
BETTER	5.1.1	Provide carshare parking spaces in permitted non- residential zones, occupying either required or provided parking spaces (see Zoning By-law Section 94)	
	5.2	Bikeshare station location	
BETTER	5.2.1	Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	

	TDM-s	supportive design & infrastructure measures: Non-residential developments	Check if completed & add descriptions, explanations or plan/drawing references
	6.	PARKING	
	6.1	Number of parking spaces	
REQUIRED	6.1.1	Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	$\mathbf{\Lambda}$
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly <i>(see Zoning By-law</i> <i>Section 104)</i>	
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking <i>(see Zoning By-law Section 111)</i>	
	6.2	Separate long-term & short-term parking areas	
BETTER	6.2.1	Separate short-term and long-term parking areas using signage or physical barriers, to permit access controls and simplify enforcement (i.e. to discourage employees from parking in visitor spaces, and vice versa)	
	7.	OTHER	
	7.1	On-site amenities to minimize off-site trips	
BETTER	7.1.1	Provide on-site amenities to minimize mid-day or mid-commute errands	

TDM Measures Checklist:

Non-Residential Developments (office, institutional, retail or industrial)

Legend

C The measure is generally feasible and effective, and in most cases would benefit the development and its users

BETTER The measure could maximize support for users of sustainable modes, and optimize development performance

The measure is one of the most dependably effective tools to encourage the use of sustainable modes

	TDM	measures: Non-residential developments	Check if proposed & add descriptions
	1.	TDM PROGRAM MANAGEMENT	
	1.1	Program coordinator	
BASIC	* 1.1.1	Designate an internal coordinator, or contract with an external coordinator	
	1.2	Travel surveys	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	
	2.	WALKING AND CYCLING	
	2.1	Information on walking/cycling routes & destin	ations
BASIC	2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances	
	2.2	Bicycle skills training	
		Commuter travel	
BETTER	★ 2.2.1	Offer on-site cycling courses for commuters, or subsidize off-site courses	
	2.3	Valet bike parking	
		Visitor travel	
BETTER	2.3.1	Offer secure valet bike parking during public events when demand exceeds fixed supply (e.g. for festivals, concerts, games)	

TDM Measures Checklist

Version 1.0 (30 June 2017)

	TDM	measures: Non-residential developments	Check if proposed & add descriptions
	3.	TRANSIT	
	3.1	Transit information	
BASIC	3.1.1	Display relevant transit schedules and route maps at entrances	
BASIC	3.1.2	Provide online links to OC Transpo and STO information	
BETTER	3.1.3	Provide real-time arrival information display at entrances	
	3.2	Transit fare incentives	
		Commuter travel	
BETTER	3.2.1	Offer preloaded PRESTO cards to encourage commuters to use transit	
BETTER	★ 3.2.2	Subsidize or reimburse monthly transit pass purchases by employees	
		Visitor travel	
BETTER	3.2.3	Arrange inclusion of same-day transit fare in price of tickets (e.g. for festivals, concerts, games)	
	3.3	Enhanced public transit service	
		Commuter travel	
BETTER	3.3.1	Contract with OC Transpo to provide enhanced transit services (e.g. for shift changes, weekends)	
		Visitor travel	
BETTER	3.3.2	Contract with OC Transpo to provide enhanced transit services (e.g. for festivals, concerts, games)	
	3.4	Private transit service	
		Commuter travel	
BETTER	3.4.1	Provide shuttle service when OC Transpo cannot offer sufficient quality or capacity to serve demand (e.g. for shift changes, weekends)	
		Visitor travel	
BETTER	3.4.2	Provide shuttle service when OC Transpo cannot offer sufficient quality or capacity to serve demand (e.g. for festivals, concerts, games)	

	TDM	measures: Non-residential developments	Check if proposed & add descriptions
	4.	RIDESHARING	
	4.1	Ridematching service	
		Commuter travel	
BASIC ★	4.1.1	Provide a dedicated ridematching portal at OttawaRideMatch.com	
	4.2	Carpool parking price incentives	
		Commuter travel	
BETTER	4.2.1	Provide discounts on parking costs for registered carpools	
	4.3	Vanpool service	
		Commuter travel	
BETTER	4.3.1	Provide a vanpooling service for long-distance commuters	
	5.	CARSHARING & BIKESHARING	
	5.1	Bikeshare stations & memberships	
BETTER	5.1.1	Contract with provider to install on-site bikeshare station for use by commuters and visitors	
		Commuter travel	
BETTER	5.1.2	Provide employees with bikeshare memberships for local business travel	
	5.2	Carshare vehicles & memberships	
		Commuter travel	
BETTER	5.2.1	Contract with provider to install on-site carshare vehicles and promote their use by tenants	
BETTER	5.2.2	Provide employees with carshare memberships for local business travel	
	6.	PARKING	
	6.1	Priced parking	
		Commuter travel	
BASIC ★	6.1.1	Charge for long-term parking (daily, weekly, monthly)	
BASIC	6.1.2	Unbundle parking cost from lease rates at multi-tenant sites	
		Visitor travel	
BETTER	6.1.3	Charge for short-term parking (hourly)	

TDM Measures Checklist

Version 1.0 (30 June 2017)

	TDM	measures: Non-residential developments	Check if proposed & add descriptions
	7.	TDM MARKETING & COMMUNICATIONS	
	7.1	Multimodal travel information	
		Commuter travel	
BASIC ★	7.1.1	Provide a multimodal travel option information package to new/relocating employees and students	
BETTER ★	710	Visitor travel Include multimodal travel option information in	
BETTER ★	1.1.2	invitations or advertising that attract visitors or customers (e.g. for festivals, concerts, games)	
	7.2	Personalized trip planning	
		Commuter travel	
BETTER ★	7.2.1	Offer personalized trip planning to new/relocating employees	
	7.3	Promotions	
		Commuter travel	
BETTER	7.3.1	Deliver promotions and incentives to maintain awareness, build understanding, and encourage trial of sustainable modes	
	8.	OTHER INCENTIVES & AMENITIES	
	8.1	Emergency ride home	
		Commuter travel	
BETTER ★	8.1.1	Provide emergency ride home service to non-driving commuters	
	8.2	Alternative work arrangements	
		Commuter travel	
BASIC ★	8.2.1	Encourage flexible work hours	
BETTER	8.2.2	Encourage compressed workweeks	
BETTER ★	8.2.3	Encourage telework	
	8.3	Local business travel options	
		Commuter travel	
BASIC ★	8.3.1	Provide local business travel options that minimize the need for employees to bring a personal car to work	
	8.4	Commuter incentives	
		Commuter travel	
BETTER	8.4.1	Offer employees a taxable, mode-neutral commuting allowance	
	8.5	On-site amenities	
		Commuter travel	
BETTER	8.5.1	Provide on-site amenities/services to minimize mid-day or mid-commute errands	

TDM-Supportive Development Design and Infrastructure Checklist:

Residential Developments (multi-family or condominium)

Legend		
REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed	
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users	
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance	

	TDM-s	supportive design & infrastructure measures: Residential developments	Check if completed & add descriptions, explanations or plan/drawing references
	1.	WALKING & CYCLING: ROUTES	
	1.1	Building location & access points	
BASIC	1.1.1	Locate building close to the street, and do not locate parking areas between the street and building entrances	
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	
BASIC	1.1.3	Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	
	1.2	Facilities for walking & cycling	
REQUIRED	1.2.1	Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations <i>(see Official Plan policy 4.3.3)</i>	
REQUIRED	1.2.2	Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible <i>(see Official</i> <i>Plan policy 4.3.12)</i>	

	TDM-s	supportive design & infrastructure measures: Residential developments	Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3	Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks (see Official Plan policy 4.3.10)	
REQUIRED	1.2.4	Make sidewalks and open space areas easily accessible through features such as gradual grade transition, depressed curbs at street corners and convenient access to extra-wide parking spaces and ramps (see Official Plan policy 4.3.10)	
REQUIRED	1.2.5	Include adequately spaced inter-block/street cycling and pedestrian connections to facilitate travel by active transportation. Provide links to the existing or planned network of public sidewalks, multi-use pathways and on- road cycle routes. Where public sidewalks and multi-use pathways intersect with roads, consider providing traffic control devices to give priority to cyclists and pedestrians (see Official Plan policy 4.3.11)	
BASIC	1.2.6	Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	
BASIC	1.2.7	Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	
BASIC	1.2.8	Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	
	1.3	Amenities for walking & cycling	
BASIC	1.3.1	Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	
BASIC	1.3.2	Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	

	TDM-s	supportive design & infrastructure measures: Residential developments	Check if completed & add descriptions, explanations or plan/drawing references
	2.	WALKING & CYCLING: END-OF-TRIP FACILI	TIES
	2.1	Bicycle parking	_
REQUIRED	2.1.1	Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible (see Official Plan policy 4.3.6)	bicycle storage is provided in the below grade parking lot
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well- used areas <i>(see Zoning By-law Section 111)</i>	
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored <i>(see Zoning By-law Section 111)</i>	
BASIC	2.1.4	Provide bicycle parking spaces equivalent to the expected number of resident-owned bicycles, plus the expected peak number of visitor cyclists	
	2.2	Secure bicycle parking	~
REQUIRED	2.2.1	Where more than 50 bicycle parking spaces are provided for a single residential building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers (see Zoning By-law Section 111)	bicycle storage is provided in the below grade parking lot
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments	
	2.3	Bicycle repair station	
BETTER	2.3.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	
	3.	TRANSIT	
	3.1	Customer amenities	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	

	TDM-s	upportive design & infrastructure measures: Residential developments	Check if completed & add descriptions, explanations or plan/drawing references
	4.	RIDESHARING	
	4.1	Pick-up & drop-off facilities	
BASIC	4.1.1	Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	
	5.	CARSHARING & BIKESHARING	
	5.1	Carshare parking spaces	
BETTER	5.1.1	Provide up to three carshare parking spaces in an R3, R4 or R5 Zone for specified residential uses <i>(see Zoning By-law Section 94)</i>	
	5.2	Bikeshare station location	
BETTER	5.2.1	Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	
	6.	PARKING	
	6.1	Number of parking spaces	_
REQUIRED	6.1.1	Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	at grade: 94 standard, 4 accessible below grade: 189 (incl.
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	accessibility) Site Plan date: July 3, 2019
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly <i>(see Zoning By-law</i> <i>Section 104)</i>	
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking <i>(see Zoning By-law Section 111)</i>	
	6.2	Separate long-term & short-term parking areas	
BETTER	6.2.1	Provide separate areas for short-term and long-term parking (using signage or physical barriers) to permit access controls and simplify enforcement (i.e. to discourage residents from parking in visitor spaces, and vice versa)	

TDM Measures Checklist:

Residential Developments (multi-family, condominium or subdivision)

Legend

C The measure is generally feasible and effective, and in most cases would benefit the development and its users

BETTER The measure could maximize support for users of sustainable modes, and optimize development performance

The measure is one of the most dependably effective tools to encourage the use of sustainable modes

	TDM	measures: Residential developments	Check if proposed & add descriptions
	1.	TDM PROGRAM MANAGEMENT	
	1.1	Program coordinator	
BASIC ★	1.1.1	Designate an internal coordinator, or contract with an external coordinator	
	1.2	Travel surveys	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	
	2.	WALKING AND CYCLING	
	2.1	Information on walking/cycling routes & des	tinations
BASIC	2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances (multi-family, condominium)	
	2.2	Bicycle skills training	• •
BETTER	2.2.1	Offer on-site cycling courses for residents, or subsidize off-site courses	

	TDM	measures: Residential developments	Check if proposed & add descriptions
	3.	TRANSIT	
	3.1	Transit information	
BASIC	3.1.1	Display relevant transit schedules and route maps at entrances (multi-family, condominium)	
BETTER	3.1.2	Provide real-time arrival information display at entrances (multi-family, condominium)	
	3.2	Transit fare incentives	
BASIC ★	3.2.1	Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	
BETTER	3.2.2	Offer at least one year of free monthly transit passes on residence purchase/move-in	
	3.3	Enhanced public transit service	
BETTER ★	3.3.1	Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels (<i>subdivision</i>)	
	3.4	Private transit service	
BETTER	3.4.1	Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	
	4.	CARSHARING & BIKESHARING	
	4.1	Bikeshare stations & memberships	
BETTER	4.1.1	Contract with provider to install on-site bikeshare station (<i>multi-family</i>)	
BETTER	4.1.2	Provide residents with bikeshare memberships, either free or subsidized <i>(multi-family)</i>	
	4.2	Carshare vehicles & memberships	
BETTER	4.2.1	Contract with provider to install on-site carshare vehicles and promote their use by residents	
BETTER	4.2.2	Provide residents with carshare memberships, either free or subsidized	
	5.	PARKING	
	5.1	Priced parking	
BASIC ★	5.1.1	Unbundle parking cost from purchase price (condominium)	
BASIC ★	5.1.2	Unbundle parking cost from monthly rent (multi-family)	

	TDM	measures: Residential developments	Check if proposed & add descriptions
	6.	TDM MARKETING & COMMUNICATIONS	
	6.1	Multimodal travel information	
BASIC ★	6.1.1	Provide a multimodal travel option information package to new residents	
	6.2	Personalized trip planning	
BETTER ★	6.2.1	Offer personalized trip planning to new residents	

Appendix F Intersection Performance Worksheets October 24, 2019

Appendix F INTERSECTION PERFORMANCE WORKSHEETS



Appendix F Intersection Performance Worksheets October 24, 2019

F.1 2019 EXISTING CONDITIONS



Lanes, Volumes, Timings
1: Iber Rd/Huntmar Dr & Hazeldean Rd

1: Iber Rd/Huntmar		lazeide	ean Ro								2019 Exis	ung Aiv
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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ኘኘ	≜ î≽		ካካ	**	7	٦	↑	1	۲	1	7
Traffic Volume (vph)	198	665	108	162	463	81	55	234	245	116	211	131
Future Volume (vph)	198	665	108	162	463	81	55	234	245	116	211	131
Satd. Flow (prot)	3288	3319	0	3288	3390	1517	1695	1784	1517	1695	1784	1517
Fit Permitted	0.950			0.950			0.466			0.363		
Satd. Flow (perm)	3288	3319	0	3288	3390	1517	831	1784	1517	648	1784	1517
Satd. Flow (RTOR)		18				215			266			212
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	220	859	0	180	514	90	61	260	272	129	234	146
Tum Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	59	2		1	6		3	8		7	4	
Permitted Phases						6	8		8	4		4
Detector Phase	59	2		1	6	6	3	8	8	7	4	4
Switch Phase						-						
Minimum Initial (s)		5.0		5.0	5.0	5.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)		36.3		11.6	36.3	36.3	11.3	39.6	39.6	11.3	39.6	39.6
Total Split (s)		49.0		14.0	37.0	37.0	12.0	40.0	40.0	12.0	40.0	40.0
Total Split (%)		42.6%		12.2%	32.2%	32.2%	10.4%	34.8%	34.8%	10.4%	34.8%	34.8%
Yellow Time (s)		3.7		3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)		2.6		2.8	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2.9
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tota Lost Time (s)		6.3		6.5	6.3	6.3	6.3	6.6	6.6	6.3	6.6	6.6
Lead/Lag		Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?		Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode		C-Max		None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	14.2	49.7		11.2	40.2	40.2	28.7	22.7	22.7	29.9	25.1	25.1
Actuated g/C Ratio	0.12	0.43		0.10	0.35	0.35	0.25	0.20	0.20	0.26	0.22	0.22
v/c Ratio	0.54	0.59		0.56	0.43	0.13	0.24	0.74	0.53	0.59	0.60	0.29
Control Delay	35.5	21.9		56.7	31.7	0.4	29.4	55.6	8.6	42.0	47.3	2.4
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.5	21.9		56.7	31.7	0.4	29.4	55.6	8.6	42.0	47.3	2.4
LOS	D	С		E	С	A	С	E	A	D	D	A
Approach Delay		24.6			33.8			31.4			33.1	
Approach LOS		С			С			С			С	
Queue Length 50th (m)	19.4	76.7		20.0	46.5	0.0	9.9	55.4	1.1	21.8	49.0	0.0
Queue Length 95th (m)	21,9	107.0		32.0	70.1	0.0	18.0	76.4	21.2	33.6	68.8	3.2
nterna Link Dist (m)		229.0			410.3			90,3			231.1	
Turn Bay Length (m)	96,9			132,9		246.9	46,9	540	64.9	89.0	5.40	
Base Capacity (vph)	410	1445		320	1184	670	249	518	629	220	518	591
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.59		0.56	0.43	0.13	0.24	0.50	0.43	0.59	0.45	0.25
ntersection Summary												
Cycle Length: 115												

Lanes, Volumes, Timings 1: Iber Rd/Huntmar Dr & Hazeldean	Rd			20 Cedarow Ct 2019 Existing AM
Natural Cycle: 110				
Control Type: Actuated Coordinated				
Maximum v/c Ratio: 0.74				
ntersection Signal Delay: 29.9	ntersect	tion LOS: C		
ntersection Capacity Utilization 69.1%	CU Leve	el of Service C		
Analysis Period (min) 15				
Splits and Phases: 1: Iber Rd/Huntmar Dr & Haze	dean Rd	1 03	\$ Ø4	
14 s 49 s		12s	40 s	
≠ Ø5 ₩ Ø6 (R)	▲ @9	₩ø7	1 _{Ø8}	
14s 37s	12 s	12s	40 s	

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBF
Lane Configurations	7	≜ ↑		1	††	1		\$			\$	
Traffic Volume (vph)	0	903	20	21	628	0	22	0	68	0	0	(
Future Volume (vph)	0	903	20	21	628	0	22	0	68	0	0	(
Satd. Flow (prot)	1784	3380	0	1695	3390	1784	0	1790	0	0	1961	(
Fit Permitted				0.235				0.917				
Satd. Flow (perm)	1784	3380	0	419	3390	1784	0	1661	0	0	1961	(
Satd. Flow (RTOR)		3						88				
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1025	0	23	698	0	0	100	0	0	0	(
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA				
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	2	2		1	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	32,2	32.2		11.2	32.2	32,2	32,9	32,9		32.9	32.9	
Total Split (s)	64.0	64.0		15.0	79.0	79.0	36.0	36.0		36.0	36.0	
Total Split (%)	55.7%	55.7%		13.0%	68.7%	68.7%	31.3%	31.3%		31.3%	31.3%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.5	2.5		2.4	2.5	2.5	3.9	3.9		3.9	3.9	
Lost Time Adjust (s)	0.0	0.0		0.0 6.1	0.0	0.0		0.0			0.0	
Total Lost Time (s)	6.2	6.2		Lead	6.2	6.2		6.9			6.9	
Lead/Lag Lead-Lag Optimize?	Lag Yes	Lag Yes		Yes								
Recall Mode	res C-Max	C-Max		None	C-Max	C-Max	None	None		None	None	
Act Effct Green (s)	CHNax	64.4		91.7	91.6	C-Max	None	10.3		None	None	
Actuated g/C Ratio		0.73		0.80	0.80			0.09				
v/c Ratio		0.73		0.00	0.26			0.09				
Control Delav		7.1		1.0	1.2			19.5				
Queue Delay		0.0		0.0	0.0			0.0				
Total Delay		7.1		1.0	1.2			19.5				
LOS		A		A	Ā			B				
Approach Delay		7.1		~ ~	1.2			19.5				
Approach LOS		A			A			B				
Queue Length 50th (m)		47.2		0.3	8.5			2.5				
Queue Length 95th (m)		62.5		m0.7	8.6			18,5				
nterna Link Dist (m)		192.4		1110.1	229.0			159.2			123.2	
Turn Bay Length (m)		102.1		95.1	220.0			100.2			120.2	
Base Capacity (vph)		2480		432	2701			486				
Starvation Cap Reductn		0		0	0			0				
Spillback Cap Reductn		0		0	0			0				
Storage Cap Reductn		0		0	0			0				
Reduced v/c Ratio		0.41		0.05	0.26			0.21				
ntersection Summary												
Cvole Length: 115	_											_

Natural Cycle: 80		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.44		
ntersection Signal Delay: 5.5	Intersection LOS: A	
ntersection Capacity Utilization 46.3%	CU Level of Service A	
Analysis Period (min) 15		
m Volume for 95th percentile queue is metered by	y upstream signal.	

¥ Ø1	→ 102 (R)	₩04	
15 s	64s	36 s	
€ Ø6 (R)		1 de	
79.0		36 c	

20 Cedarow Ct 2019 Existing AM

ntersection												
nt Delay, s/veh	0.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	5	1	2011	TIDE	412	11011	1101	4.	THE T	000	4.	ODIT
Traffic Vol, veh/h	12	919	0	0	632	18	0	0	0	4	0	9
Future Vol. veh/h	12	919	0	0	632	18	0	0	0	4	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Contro	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	701		-	-		-	-	-	-		-	-
Veh in Median Storage	# -	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-		0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mymt Flow	13	1021	0	0	702	20	0	0	0	4	0	10
Major/Minor M	/lajor1		1	Major2		1	/linor1		1	Minor2		
Conflicting Flow All	722	0	0	1021	0	0	1398	1769	511	1249	1759	361
Stage 1	-	-	-	-	-	-	1047	1047	-	712	712	-
Stage 2	-	-		-	-	-	351	722	-	537	1047	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-		-	-	-	6.54	5,54	-	6.54	5,54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3,32	3,52	4.02	3,32
Pot Cap-1 Maneuver	876	-	-	675	-	-	100	83	508	129	84	636
Stage 1	-	-	-	-	-	-	244	303	-	389	434	-
Stage 2	-	-	-	-	-	-	639	429	-	496	303	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	876	-	-	675	-	-	97	82	508	128	83	636
Mov Cap-2 Maneuver	-	-	-	-	-	-	97	82	-	128	83	-
Stage 1	-	-	-	-	-	-	240	298	-	383	434	-
Stage 2	-	-	-	-	-	-	629	429	-	489	298	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0			0			18.3		
HCM LOS							A			С		
Minor Lane/Major Mvm	t I	VBLn1	EBL	EBT	EBR	WBL	WBT		SBLn1			
Capacity (veh/h)		-	876	-	-	675	-	-	286			
HCM Lane V/C Ratio			0.015	-	-	-	-		0.051			
HCM Control Delay (s)		0	9.2	-	-	0	-	-	18.3			
HCM Lane LOS		Α	A	-	-	A	-	-	С			
HCM 95th %tile Q(veh)		-	0	-	-	0	-	-	0.2			

Lanes, Volumes,	Timings

	٨	120	1	1	ŧ	~	•	1	1	5	3	7
			•				San	-			*	-
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ካካ	≜ ↑	400	ካካ	<u>†</u> †	1	٦	4	1	٦	+	7
Traffic Volume (vph)	205	655	123	314	1017	207	138	270 270	237	137 137	332	391 391
Future Volume (vph)	205	655	123	314	1017	207	138				332	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)	000	005	0	040	4400	000	450	000	000	450	000	40.4
Lane Group Flow (vph)	228	865	U	349	1130	230	153	300	263	152	369	434
Tum Type	Prot 5	NA 2		Prot 1	NA 6	Perm	pm+pt 3	NA 8	Perm	pm+pt 7	NA 4	Perm
Protected Phases Permitted Phases	5	2		1	ь	6		ð	8		4	4
Permitted Phases	5	2		1	6	6	8	8	8	4	4	4
Switch Phase	5	2			0	0	3	0	0		4	4
	5.0	5.0		5.0	5.0	5.0	5.0	10.0	10.0	5.0	40.0	40.0
Minimum Initial (s) Minimum Solit (a)	5.0				5.0 36.3	5.0 36.3		39.6	39.6		10.0 39.6	10.0
Minimum Split (s) Total Split (s)	22.0	36.3 44.0		11.6 22.0	36.3 44.0	36.3 44.0	11.3 12.0	42.0	39.6 42.0	11.3 12.0	42.0	39.6 42.0
Total Split (%)	18.3%	44.0 36.7%		18.3%	36.7%	36.7%	10.0%	42.0	42.0	10.0%	42.0	35.0%
	3.7	30.7%		3.7	30.7%	30.7%	3.7	35.0%	35.0%	3.7	35.0%	35.0%
Yellow Time (s) All-Red Time (s)	2.8	2.6		2.8	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2.9
Lost Time Adjust (s)	2.0	2.0		0.0	0.0	0.0	2.0	2.9	2.9	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.3		6.5	6.3	6.3	6.3	6.6	6.6	6.3	6.6	6.6
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lao	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	13.2	42.4		15.9	45.1	45.1	36.3	30.3	30,3	36.3	30.3	30.3
Actuated q/C Ratio	0.11	42.4		0.13	0.38	0.38	0.30	0.25	0.25	0.30	0.25	0.25
v/c Ratio	0.63	0.35		0.13	0.89	0.30	0.30	0.25	0.25	0.50	0.25	0.20
Control Delay	80.2	30.7		65.3	46,1	5.1	59.3	47.3	6.5	40.8	57.0	17.3
Queue Delay	0.0	0.0		0.0	40.1	0.0	0.0	0.0	0.0	40.0	0.0	0.0
Total Delay	80.2	30.7		65.3	46.1	5.1	59.3	47.3	6.5	40.8	57.0	17.3
LOS	50.2 F	30.7 C		00.5 E	40.1 D	J.1 A	55.5 E	47.5 D	0.5 A	40.0 D	57.0 E	- 17.3 B
Approach Delay	F	41.0		C	44.5	M	C	34,9	A	U	36.4	D
Approach LOS		41.0 D			44.5 D			34.5 C			30.4 D	
Queue Length 50th (m)	29.6	95.7		40.6	132.7	0.0	24.9	62.8	0.0	24.8	81.1	23.9
Queue Length 95th (m)	42.7	122.5		#63.8	#195.3	17.3	#46.1	88.3	18.7	38.6	111.5	58.7
nternal Link Dist (m)	42.7	229.0		#05.0	410.3	17.5	#40.1	90.3	10.7	50.0	231.1	50.7
Turn Bay Length (m)	96.9	220.0		132.9	410.0	246.9	46.9	30.5	64.9	89.0	201.1	
Base Capacity (vph)	424	1181		444	1273	713	192	526	632	245	526	668
Starvation Cap Reductn	424	0		0	0	0	0	0	0.02	240	0	000
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.73		0,79	0.89	0,32	0.80	0.57	0.42	0,62	0.70	0,65
ntersection Summary												
Cycle Length: 120												
Actuated Cycle Length: 120												
Offset: 32 (27%), Reference		2 FRT a	nd 6·WP1	Start o	f Green							
Natural Cycle: 100	o to pridat	L.LDI di	14 U.11D	, 010110	01001							
Control Type: Actuated Coc	rdinated											
Maximum v/c Ratio: 0.89	anatod											
ntersection Signal Delay: 4	0.4				ntersectio	-100-D						

	anes, Volumes, Timings : Iber Rd/Huntmar Dr & Hazeldean Rd									
Intersection Capa	city Utilization 83.8%	CU Level of Service E								
Analysis Period (min) 15									
# 95th percenti	e volume exceeds capacity, queu	e may be longer.								
Queue shown	is maximum after two cycles.	, ,								
Splits and Phase	s: 1: Iber Rd/Huntmar Dr & Haz	zeldean Rd	↓ <i>Q</i> 4							
22 s	44 s	125	42 s							
	● Ø6 (R)	07	1ø8							
22 s	44 s	12 s	42 s							

2: Fringewood Dr &	& Haze	dean F	d								2019 Exist	ting PN
	هر	-+	$\mathbf{\tilde{z}}$	4	+	A.	1	Ť	r	\$	ŧ	4
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBF
Lane Configurations	1	≜ î≽		ĥ	† †	1		4			4.	
Traffic Volume (vph)	0	935	33	83	1463	0	33	0	48	0	0	(
Future Volume (vph)	0	935	33	83	1463	0	33	0	48	0	0	(
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1076	0	92	1626	0	0	90	0	0	0	(
Tum Type	Perm	NA		pm+pt	NA	Perm	Perm	NA				
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	2	2		1	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	32,2	32,2		11,2	32.2	32.2	32,9	32.9		32,9	32,9	
Tota Spit (s)	64.0	64.0		20.0	84.0	84.0	36.0	36.0		36.0	36.0	
Tota Split (%)	53,3%	53,3%		16,7%	70.0%	70.0%	30.0%	30.0%		30.0%	30.0%	
Yellow Time (s)	3,7	3,7		3.7	3.7	3.7	3.0	3.0		3.0	3.0	
All-Red Time (s)	2,5	2,5		2.4	2.5	2,5	3,9	3.9		3,9	3,9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Tota Lost Time (s)	6.2	6.2		6.1	6.2	6.2		6.9			6.9	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Recall Mode	C-Max	C-Max		None	C-Max	C-Max	None	None		None	None	
Act Effct Green (s)		83.8		96.8	96.7			10.2				
Actuated q/C Ratio		0.70		0.81	0.81			0.08				
v/c Ratio		0.46		0.24	0.60			0.42				
Contro Delav		8.8		2.4	4.9			18.5				
Queue Delay		0.0		0.0	0.1			0.0				
Total Delay		8.8		2.4	5.0			18.5				
LOS		А		А	A			В				
Approach Delay		8.8			4.8			18.5				
Approach LOS		A			A			В				
Queue Length 50th (m)		52.5		2.8	36.1			1.1				
Queue Length 95th (m)		69.0		m2.8	38,9			16,7				
nterna Link Dist (m)		192,4			229.0			159,2			123.2	
Turn Bay Length (m)				95,1								
Base Capacity (vph)		2356		463	2732			454				
Starvation Cap Reductn		0		0	185			0				
Spillback Cap Reductn		0		0	0			0				
Storage Cap Reductn		0		0	0			0				
Reduced v/c Ratio		0.46		0.20	0.64			0.20				
Intersection Summary												
Cycle Length: 120												
Actuated Cycle Length: 120	ı											
Offset: 35 (29%), Referenc		2'EBTL :	and 6 WF	BTI Start	t of Greer							
Natural Cycle: 80	ou to prido			, otur								
Control Type: Actuated Co	ordinated											
Maximum v/c Ratio: 0.60	oramatou											
Intersection Signal Delay: 6	6.7			h	ntersectio	n LOS ⁻ A						
interestation orginal Delay. C												

Lanes, Volumes, Timings 2: Fringewood Dr & Hazeldean Rd			20 Cedarow Ct 2019 Existing PM
ntersection Capacity Utilization 71.3%	CU Level of Service C		
Analysis Period (min) 15			
Splits and Phases: 2: Fringewood Dr & Hazelde	an Rd		
🖌 Ø1 🕴 💆 Ø2 (R)		Ø4	
20 s 64 s		36 s	
€ Ø6 (R)		₫ ø8	
84 c		36.5	

20 Cedarow Ct 2019 Existing PM

ntersection													
nt Delay, s/veh	5.7												
Novement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
ane Configurations	5	1			412			\$			\$		
raffic Vol, veh/h	16	947	0	0	1477	19	0	0	0	21	0	24	
uture Vol, veh/h	16	947	0	0	1477	19	0	0	0	21	0	24	
onflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	
an Contro	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop	
Channelized	-	-	None	-	-	None	-	-	None	-	-	None	
orage Length	701	-	-	-		-	-	-	-	-	-	-	
h in Median Storage	# -	0	-	-	0	-	-	0	-	-	0	-	
rade, %	-	0	-	-	0	-	-	0	-	-	0	-	
eak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90	
eavv Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2	
vmt Flow	18	1052	0	0	1641	21	0	0	0	23	0	27	
jor/Minor M	ajor1	_	1	Major2	_	1	/linor1	_	Ν	Minor2	_	_	_
	1662	0	0	1052	0	0	1909	2750	526	2214	2740	831	
Stage 1	-					-	1088	1088	-	1652	1652	-	
Stage 2							821	1662	-	562	1088	-	
	4.14	-	-	4.14		-	7.54	6.54	6,94	7.54	6.54	6.94	
itical Hdwy Stg 1	-						6.54	5.54	-	6,54	5.54	-	
itica Hdwy Stg 2	-	-	-	-		-	6.54	5.54	-	6.54	5.54	-	
llow-up Hdwy	2,22			2,22			3.52	4.02	3.32	3,52	4.02	3.32	
t Cap-1 Maneuver	383	-	-	657		-	41	20	496	24	20	313	
Stage 1	-	-		-		-	230	290	-	103	154	-	
Stage 2	-	-	-	-	-	-	335	153	-	479	290	-	
atoon blocked, %						-							
ov Cap-1 Maneuver	383	-	-	657	-	-	36	19	496	~ 23	19	313	
ov Cap-2 Maneuver	-			-			36	19	-	~ 23	19	-	
Stage 1	-	-	-	-	-	-	219	276	-	98	154	-	
Stage 2	-	-	-		-		306	153	-	456	276	-	
J.													
proach	EB			WB			NB			SB			
CM Control Delay, s	0.2			0			0		S	311.6			
CMLOS							A		-	F			
inor Lane/Major Mvmt	1	VBLn1	EBL	EBT	EBR	WBL	WBT	WBR:	SBLn1				
apacity (veh/h)		-	383	-	-	657	-	-	45				
CM Lane V/C Ratio		-	0.046			-			1,111				
CM Control Delay (s)		0	14.9	-	-	0	-		311.6				
M Lane LOS		Ā	В	-	-	Ā	-	-	F				
CM 95th %tile Q(veh)		-	0.1	-	-	0	-	-	4.7				
otes													
Volume exceeds capa	nitr	¢ · Dr	av exc	oodo 2	000	+: Com	nutation	Not D	ofined	*: All	moior	(olumo i	in platoon
volume exceeds capa	auny	φ: De	nay exc	eeds 5	005	+. ∪0III	putatio	TNOLD	enned	. All	major	volume	in piatoon

Appendix F Intersection Performance Worksheets October 24, 2019

F.2 2024 FUTURE BACKGROUND CONDITIONS



Lanes, Volumes, Timings 1: Iber Rd/Huntmar Dr & Hazeldean Rd

	٠	-	7	1	+	•	1	Ť	1	1	ŧ	~
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations	ካካ	≜t ≽		ካካ	† †	7	۲	↑	1	٦	↑	
Traffic Volume (vph)	187	612	95	166	444	174	50	224	222	130	252	13
uture Volume (vph)	187	612	95	166	444	174	50	224	222	130	252	13
deal Flow (vphp)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	180
Storage Length (m)	97.0		0.0	133.0		247.0	47.0		65.0	89.0		0
Storage Lanes	2		0	2		1	1		1	1		
Taper Length (m)	53.0			67.0			43.0			26.0		
ane Util, Factor	0.97	0.95	0.95	0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.0
Frt		0.980				0.850			0.850			0.8
Fit Protected	0,950			0.950			0.950			0.950		
Satd, Flow (prot)	3288	3322	0	3288	3390	1517	1695	1784	1517	1695	1784	15
Tt Permitted	0.950			0.950			0.427			0.401		
Satd, Flow (perm)	3288	3322	0	3288	3390	1517	762	1784	1517	716	1784	151
Right Turn on Red			Yes			Yes			Yes			Y
Satd. Flow (RTOR)		16				215			222			2
Link Speed (k/h)		60			60			60			60	
Link Distance (m)		252.9			434.4			114.3			255.0	
Travel Time (s)		15.2			26.1			6.9			15.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
Adi, Flow (vph)	187	612	95	166	444	174	50	224	222	130	252	15
Shared Lane Traffic (%)												
ane Group Flow (vph)	187	707	0	166	444	174	50	224	222	130	252	15
Inter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	1
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Rig
Median Width(m)		9,9			9,9	1.19.11		5.0			5.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		3.0			3.0			3.0			3.0	
Two way Left Turn Lane												
Headway Factor	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.0
Turning Speed (k/h)	24		14	24		14	24		14	24		
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Rig
Leading Detector (m)	6.1	30.5		6.1	30.5	6.1	6.1	30.5	6.1	6.1	30.5	6
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ő
Detector 1 Size(m)	6.1	1.8		6.1	1.8	6.1	6.1	1.8	6.1	6.1	1.8	6
Detector 1 Type	C+Ex	CI+Ex		CI+Ex	C+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+E
Detector 1 Channe	01.54	01.54		01 2.4	01.54	ol cu	of the	o ch	01.64	01.54	01 2.4	01.0
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ő
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ő
Detector 2 Position(m)	0.0	28.7		0.0	28.7	0.0	0.0	28.7	0.0	0.0	28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel		OI LEA			01.54			01.54			01-67	
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Tum Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Per
Protected Phases	5.9	2		1	6	1 3111	3	8	1 GIIII	7	4	1 0
Permitted Phases		2			0	6	8	0	8	4	4	
emmed i nases						0	0		0	- 4		

	٨	-	7	1	+	•	1	Ť	1	1	ŧ	~
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBF
Detector Phase	59	2		1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initia (s)		5.0		5.0	5.0	5.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)		36.3		11.6	36.3	36.3	11.3	39.6	39.6	11.3	39,6	39,6
Tota Split (s)		46.0		17.2	38.0	38.0	11.4	39.6	39.6	12.2	40.4	40.4
Tota Split (%)		40.0%		15.0%	33.0%	33.0%	9.9%	34.4%	34.4%	10.6%	35.1%	35.1%
Maximum Green (s)		39.7		10.7	31.7	31.7	5.1	33.0	33.0	5.9	33.8	33.8
Yellow Time (s)		3.7		3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3,7
All-Red Time (s)		2.6		2.8	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2.9
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tota Lost Time (s)		6.3		6.5	6.3	6.3	6.3	6.6	6.6	6.3	6.6	6.6
Lead/Lag		Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?		Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode		C-Max		None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		7.0			7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		23.0			23.0	23.0		26.0	26.0		26.0	26.0
Pedestrian Calls (#/hr)		0			0	0		0	0		0	C
Act Effct Green (s)	13.1	51.5		11.1	43.0	43.0	26.2	20.8	20.8	28.9	23.9	23.9
Actuated q/C Ratio	0,11	0.45		0,10	0.37	0.37	0.23	0,18	0,18	0,25	0,21	0,21
v/c Ratio	0.50	0.47		0,52	0.35	0.25	0.23	0.70	0.49	0.57	0.68	0,27
Contro Delay	43.3	18.8		55,1	28.4	2.7	30.5	54.9	8.6	41.8	51,9	1.4
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tota Delay	43.3	18.8		55.1	28.4	2.7	30.5	54.9	8.6	41.8	51.9	1.4
LOS	D	В		E	С	А	С	D	А	D	D	A
Approach Delay		23.9			28.4			31.7			36.5	
Approach LOS		С			С			С			D	
Queue Length 50th (m)	16.7	57.7		18.6	37.3	0.0	8.2	47.7	0.0	22.5	54.1	0.0
Queue Length 95th (m)	22.4	88.0		28.7	58.4	8.5	15.9	67.6	18.3	34.7	75.2	0.0
nternal Link Dist (m)		228.9			410.4			90.3			231.0	
Turn Bay Length (m)	97.0			133.0		247.0	47.0		65.0	89.0		
Base Capacity (vph)	379	1496		337	1268	701	214	511	593	230	524	595
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	C
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	C
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	C
Reduced v/c Ratio	0.49	0.47		0.49	0.35	0.25	0.23	0.44	0.37	0.57	0.48	0.22
Intersection Summary												
Area Type: (Other											
Cycle Length: 115												
Actuated Cycle Length: 115												
Offset: 62 (54%), Reference	d to phase	2:EBT ar	nd 6:WB1	, Start of	Green							
Natura Cycle: 110												
Control Type: Actuated-Coor	dinated											
Maximum v/c Ratio: 0.70												
ntersection Signal Delay: 29	.0			Ir	ntersectio	n LOS: C						
ntersection Capacity Utilizat				CU Level of Service C								
Analysis Period (min) 15												

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Lanes, Volumes, Timings 2: Fringewood Dr/Site Access & Hazeldean Rd

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Lanes, Volumes, Timings

1: Iber Rd/Huntmar Dr & Hazeldean Rd

09/27/2019

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09/27/2019

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09/27/2019

Lanes, Volumes, Timings 1: Iber Rd/Huntmar Dr & Hazeldean Rd

Splits and Ph	ases: 1: Iber Rd/Huntmar Dr &	Hazeldean Rd			
√ Ø1	■ → Ø2 (R)		1 Ø3	Ø4	
17,2 s	46 s		11.4 s	40.4 s	
♪ _{Ø5}	👘 Ø6 (R)	♪	1 07	<∎ ¶øs	
145	38 s	11.2 \$	12.2 s	39.6 s	

Lane Group Lane Configurations Traffic Volume (vph) Future Volume (vph) Ideal Flow (vphpl) EBT EBR ↑↑→ 807 29 807 29 1800 1800 37 37 NBT VBR **↑↑** 555 555 1800 3.7 68 68 1800 45 45 1800 26 1800 10 37 1800 5 1800 4.8 3 1800 1800 4.5 1800 Ideal Flow (vpnp) Lane Width (m) Storage Length (m) Storage Lanes Taper Length (m) Lane Util. Factor Frt Fit Protected Cottol Eleve (next) 3.7 55.0 3.7 3.7 3.7 3.7 3.7 3.7 3.7 183.0 37.5 0.0 95.0 0.0 0.0 0 0 25.0 1.00 2.5 1.00 48.0 1.00 2.5 1.00 1.00 0.917 0.983 0.95 0.995 1.00 1.00 0.957 0.95 0.95 1.00 0.850 PTT PTI Protected Satd, Flow (prot) PTI Permitted Satd, Flow (perm) Right Turn on Red Satd, Flow (RTOR) Link Distance (m) Travel Time (s) Peak Hour Factor Peak Hour Factor Ad, Flow (vph) Shared Lane Traffic (%) Lane Group Flocked Intersection Lane Algment Median Width(m) Link Offset(m) Crosswalk Width(m) Trove way Left Turn Lane Headway Factor Turning Speed (kh) Number of Detectors Detector Template and provide (ch) 0.950 0.950 0.950 1695 3373 0.444 0 1695 3390 1517 0 1695 0.625 1858 0 1803 0.293 0.885 0 523 3390 1517 792 3373 1623 0 1115 1858 0 Yes Yes (es 37 68 40 183.1 2 40 147.4 13.3 4 60 216.4 13.0 1.00 1.00 60 252.9 15.2 16.5 1.00 1.00 68 10 1.00 1.00 29 45 1.00 1.00 26 37 1.00 1.00 1.00 807 555 5 836 No Left 45 No Left 555 No Left 7.4 Ω 26 No 0 110 ٥ 10 No Left No Left No No Left No No Left No Left Right Right Right 7.4 3.7 0.0 0.0 0.0 3.0 3.0 3.0 1.06 24 1 1.06 1.06 1.06 14 24 1.06 1.06 14 1.06 24 0.91 1.06 14 1.06 24 0.95 2 Number of Detectors Detector Template Leading Detector (m) Trailing Detector (m) Detector 1 Position(m) Detector 1 Size(m) Detector 1 Type Detector 1 Channel Detector 1 Channel Detector 1 Extend (s) Detector 1 Queue (s) 2 2 1
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Perm NA 2 -٩.,

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Detector 1 Extend (s) Detector 1 Queue (s) Detector 1 Delay (s) Detector 2 Position(m) Detector 2 Position(m) Detector 2 Size(m) Detector 2 Size(m) Detector 2 Channel Detector 2 Extend (s)

Turn Type Protected Phases

09/27/2019

Lanes, Volumes, Timings 2: Fringewood Dr/Site Access & Hazeldean Rd

Lane Group Permitted Phases Detector Phase Switch Phase	EBL	EBT	EBR	14.000								
Detector Phase	0		EDR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
	2			6		6	8			4		
witch Dhone	2	2		1	6	6	8	8		4	4	
Switch Phase												
/inimum Initial (s)	5.0	5.0		5.0	5.0	5.0	10.0	10.0		10.0	10.0	
linimum Split (s)	32.2	32.2		11.2	32.2	32.2	32.9	32.9		32.9	32.9	
otal Split (s)	62.0	62.0		15.0	77.0	77.0	38.0	38.0		38.0	38.0	
otal Split (%)	53.9%	53.9%		13.0%	67.0%	67.0%	33.0%	33.0%		33.0%	33.0%	
faximum Green (s)	55.8	55.8		8.9	70.8	70.8	31.1	31.1		31.1	31.1	
ellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.0	3.0		3.0	3.0	
II-Red Time (s)	2.5	2.5		2.4	2.5	2.5	3.9	3.9		3.9	3.9	
ost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
otal Lost Time (s)	6.2	6.2		6.1	6.2	6.2		6.9		6.9	6.9	
ead/Lag	Lag	Lag		Lead								
ead-Lag Optimize?	Yes	Yes		Yes								
ehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		None	C-Max	C-Max	None	None		None	None	
Valk Time (s)	7.0	7.0			7.0	7.0	7.0	7.0		7.0	7.0	
ash Dont Walk (s)	19.0	19.0			19.0	19.0	19.0	19.0		19.0	19.0	
edestrian Calls (#/hr)	0	0			0	0	0	0		0	0	
ct Effct Green (s)	81.1	81.1		91.1	91.0	91.0		10,9		10.9	10.9	
ctuated g/C Ratio	0.71	0.71		0.79	0.79	0.79		0.09		0.09	0.09	
/c Ratio	0.01	0.35		0.09	0.21	0.02		0.51		0.10	0.04	
Contro Delay	6.3	7.7		1.4	1.2	0.2		30.0		48.8	40.9	
ueue Delay	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
ota Delay	6.3	7.7		1.4	1.2	0.2		30.0		48.8	40.9	
OS	A	A		А	Α	A		С		D	D	
pproach Delay		7.7			1.2			30.0			45.5	
pproach LOS		A			Α			С			D	
Queue Length 50th (m)	0.2	36.0		0.9	6.6	0.2		9.0		2.1	1.1	
Queue Length 95th (m)	1.3	52.7		2.2	8.6	0.0		25.8		7.3	5.3	
nterna Link Dist (m)		192.4			228.9			159.1			123.4	
um Bay Length (m)	55.0			95.0		183.0				37.5		
lase Capacity (vph)	558	2379		505	2683	1208		488		301	503	
tarvation Cap Reductn	0	0		0	0	0		0		0	0	
pillback Cap Reductn	0	0		0	0	0		0		0	0	
torage Cap Reductn	0	0		0	0	0		0		0	0	
educed v/c Ratio	0.01	0.35		0.09	0,21	0.02		0.23		0.03	0.01	
ntersection Summary												
Area Type:	Other											
Cycle Length: 115												
ctuated Cycle Length: 115												
offset: 52 (45%), Reference	ed to phase	2:EBTL a	and 6:WE	BTL, Star	t of Green							
latura Cycle: 80												
Control Type: Actuated-Coc	rdinated											
faximum v/c Ratio: 0.51												
ntersection Signal Delay: 7	.1			h	ntersectio	n LOS: A						
ntersection Capacity Utiliza				k	CU Leve	of Service	θB					
Analysis Period (min) 15												

Lanes, Volumes, Timings 2: Fringewood Dr/Site Access & Hazeldean Rd

09/27/2019

Splits and Phases: 2: Fringewood Dr/Site Access & Hazeldean Rd		
√ Ø1 • • • Ø2 (R)		
15 s 62 s	38 s	
◆ Ø6 (R) ■	1 08	
77 s	38 s	

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HCM 2010 TWSC 3: Hazeldean Rd & Cedarow Ct

ntersection												
nt Delay, s/veh	0.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	5	≜î ≽			đþ,			4			4	
Traffic Vol, veh/h	10	836	0	0	578	16	0	0	0	3	0	8
Future Vol, veh/h	10	836	0	0	578	16	0	0	0	3	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	700							-			-	
Veh in Median Storage	e, # -	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-		0	-		0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	836	0	0	578	16	0	0	0	3	0	8
Major/Minor I	Major1		1	Major2		1	/linor1		1	Minor2		
Conflicting Flow All	594	0	0	836	0	0	1145	1450	418	1024	1442	297
Stage 1	-	-	-	-	-	-	856	856	-	586	586	-
Stage 2	-	-	-	-	-	-	289	594	-	438	856	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	978	-	-	794	-	-	154	130	584	190	131	699
Stage 1	-	-		-	-	-	319	373	-	463	495	-
Stage 2	-	-	-	-	-		694	491	-	567	373	-
Platoon blocked, %												
Mov Cap-1 Maneuver	978	-	-	794	-	-	151	129	584	188	130	699
Mov Cap-2 Maneuver			-	-	-	-	151	129	-	188	130	-
Stage 1					-		316	369	-	458	495	-
Stage 2				-			686	491	-	561	369	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0			0			14.2		
HCM LOS							A			В		
Minor Lane/Major Mvm	nt I	VBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBI n1			
Capacity (veh/h)			978			794		-	401			
HCM Lane V/C Ratio		_	0.01	-		-	-	-	0.027			
HCM Control Delay (s)		0	8.7	-	-	0	-	-	14.2			
HCM Lane LOS		Ă	A	-		Ă			B			
HCM 95th %tile Q(veh))	-	0	-	-	0	-	-	0.1			
all of a second second second	,								0.1			

09/27/2019

Lanes, Volumes,	Timings
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Lane Configurations Tarafie Volume (vph) 218 657 108 293 942 239 132 310 230 226 330 Trafie Volume (vph) 218 657 108 293 942 239 132 310 230 226 330 Peak Hour Factor 1,00	Lanes, Volumes, T 1: Iber Rd/Huntmar		lazelde	an Ro	ł						20	Cedar 2024 F	DW Ct BG PM
Lane Configurations Total App Total App		٨	+	1	1	4	•	1	Ť	1	1	ţ	~
Traffic Volume (ph) 218 677 108 293 942 239 132 310 230 226 330 Peak Hour Factor 1,00 1,00 1,00 1,00 1,00 1,00 1,00 1,0	Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Future Volume (vph) 218 657 108 293 942 293 132 310 230 283 333 Pack Hour Factor 1,00<	Lane Configurations	ካካ	≜î ≽		ካካ	^	1	٦	↑	1	1	÷	7
Peak Hour Factor 1,00	Traffic Volume (vph)	218	657	108	293	942	239	132	310	230	226	330	363
Shared Lane Traffic (%) Ide Zosp (Park) Velocities	Future Volume (vph)	218	657	108		942	239	132		230	226	330	363
Lane Group Flow (vph) 218 76 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	Peak Hour 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
Turn Type Prot NA Perm pm-pt NA P Protected Phases 5 2 1 6 8 8 7 4 Detector Phase 5 2 1 6 6 3 8 8 7 4 Minimum Splt (s) 11.5 36.0 5.0 5.0 5.0 10.0	Shared Lane Traffic (%)												
Protected Phases 5 2 1 6 73 88 7 4 Permitted Phases 5 2 1 6 8 8 4 Permitted Phases 6 2 1 6 8 8 8 4 Permitted Phases 6 2 1 6 8 8 8 4 Permitted Phases 6 2 1 6 8 8 8 4 Switch Phase 6 5 2 1 6 6 3 8 8 8 7 4 Switch Phase 6 5 2 1 6 6 3 8 8 7 4 Switch Phase 6 1 15 36.3 11.6 36.3 36.3 11.3 39.6 39.6 11.3 39.6 10.0 10.0 5.0 10.0 10.0 5.0 10.0 10.0 5.0 10.0 10	Lane Group Flow (vph)	218	765	0	293	942	239	132	310	230	226	330	363
Permitted Phases I 6 8 8 4 Switch Phase 5 2 1 6 6 3 8 8 7 4 Switch Phase 5 5 0 5.0 5.0 5.0 5.0 5.0 10.0 10.0 5.0 10.0 10.0 5.0 10.0 10.0 10.0 5.0 10.0 10.0 5.0 10.0					Prot		Perm	pm+pt		Perm	pm+pt		Perm
Dietector Phase 5 2 1 6 6 3 8 8 7 4 Switch Phase Switch Phas		5	2		1	6			8			4	
Switch Phase Switch Phase Minnum Initial (a) 5.0 <													4
Minimum Initial (a) 5.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0		5	2		1	6	6	3	8	8	7	4	4
Minimum Spli (s) 11.5 36.3 11.6 36.3 31.3 31.8 31.6 31.6 10.1 51.6 31.6 10.1 51.6 31.6 10.1 51.6 31.6 10.1 51.6 10.1 51.6 10.1 51.6 10.1 51.6 31.6 10.1 51.6 31.7 3.7 <td></td>													
Total Split (s) 17.2 42.8 20.6 46.2 46.2 14.6 39.6 30.7 42.0 Total Split (s) 14.3% 35.7% 17.2% 38.5% 38.5% 32.9% 33.0% 14.2% 35.0% 32.7 3.8 1.6 6.6 6.6 6.6 6.6 6.6 <td></td> <td>10.0</td>													10.0
Total Spit (%) 14.3% 35.7% 17.2% 38.5% 12.2% 33.0% 32.0% 12.4% 33.0% 12.4% 33.0% 12.4% 33.0% 12.4% 33.0% 12.4% 33.0% 12.4% 33.0% 12.4% 33.0% 12.4% 33.0% 12.4% 33.0% 12.4% 33.0% 12.4% 13.6% 14.7% 13.6% 13.6% 13.6% 13.6% 13.6% 13.6% 13.6% 13.6% 13.6% 13.6% 13.6% 13.6% 13.7% 13.7% 13.7% 13.7% 13.7% 13.7% 13.7% 13.7% 13.7% 13.7% 13.7% 13.7% 13.6% 13.6% 13.6% 13.6% 13.6% 13.7% 13.7% 13.7% 13.7% 13.7% 13.7% 13.7% 13.7%													39.6
Yellow Time (a) 3.7	Total Split (s)												42.0
All-Red Time (c) 2.8 2.6 2.8 2.6 2.6 2.8 2.9 2.8 2.9 Leat Time A(u) 0.0	Total Split (%)		35.7%		17.2%				33.0%	33.0%	14.2%		35.0%
Leas Time Adjuist (s) 0.0													3.7
Total LorTime (s) 6.5 6.3 6.5 6.3 6.4 6.6 6.6 6.6 Lead/Lag Optimize? Yes													2.9
Leading Provide Lead Lag Lead Lag													0.0
Lead-Lag Optimize? Yes			6.3			6.3				6.6			6.6
Read Mode None C-Max None													Lag
Act Efforem (s) 11.9 42.8 14.7 45.6 45.7 26.1 26.1 28.6 28.6 Actunied g/C Ratio 0.10 0.36 0.12 0.38 0.29 0.22 0.22 0.23 0.24 0.45 0.86 0.77 0.33 0.25 0.20 0.22 0.23 0.25 0.90 0.22 0.23 0.25 0.90 0.45 0.85 0.78 0.78 0.33 0.25 0.90 0.0 <td></td> <td>Yes</td>													Yes
Actuated QC Raio 0,10 0,36 0,12 0,38 0,38 0,29 0,22 0,23 0,24 Ver Ratio 0,67 0,64 0,73 0,73 0,33 0,55 0,80 0,45 0,45 Control Delay 76,3 28,0 61,8 37,3 4,9 35,2 59,5 7,4 58,0 55,3 Queue Delay 76,3 28,0 61,8 37,3 4,9 35,2 59,5 7,4 58,0 55,3 LOS E C E D A D E A E E A 59,5 7,4 58,0 55,3 LOS E C E D A D E A E E A B 7,7 36,9 36,9 39,8 A D D D D D D D D D D D D D D 23,0 24,10													None
vic Ratio 0.67 0.64 0.73 0.73 0.73 0.53 0.55 0.80 0.45 0.85 0.78 Control Delay 76.3 28.0 61.8 37.3 4.9 35.2 59.5 7.4 58.0 55.3 Control Delay 76.3 28.0 61.8 37.3 4.9 35.2 59.5 7.4 58.0 55.3 LOS E C E D A 0.2 59.5 7.4 58.0 55.3 LOS E C E D A D E A E E Approach LOS D													28.6
Control Delay 76.3 28.0 61.8 37.3 4.9 35.2 59.5 7.4 65.3 Queue Delay 0.0 </td <td></td> <td>0.24</td>													0.24
Operation O.0 D.0 E A E E A P E A E E Appracath LOS D D D D D O													0.63
Total Delay 76.3 28.0 61.8 37.3 4.9 35.2 59.6 7.4 58.0 55.3 LOS E C E D A D E A E A E A E A E A E A E A E A E A E A E C B D B.0 D <td></td> <td>14.3</td>													14.3
LOS E C E D K D E A E E A E E A E E A E E A P E A E E A F E A F E A P E A E B Approach LOS D													0.0
Approach Delay 38,7 36,9 36,9 36,9 30,8 Approach LOS D													14.3
Approach LOS D D D D D Queue Length S0h (m) 28.3 81.7 34.2 102.6 0.0 21.1 69.0 0.0 38.4 72.4 Queue Length S0h (m) #44.2 85.2 #52.7 133.6 16.9 32.6 94.6 18.3 #63.4 98.4 98.4 72.4 Queue Length S0h (m) #74.0 65.0 89.0 Imamal Link Dist (m) 22.8 9 410.4 90.3 22.5 94.6 18.3 #63.4 98.4 98.4 77.4 70.0 65.0 89.0 Base Capacity (wph) 331 119.3 414 1287 72.4 24.0 490 58.3 265 52.6 Starvation Cap Reductin 0		E			E		A	D		A	E		В
Openet campth 50th (m) 28.3 81.7 34.2 102.6 0.0 21.1 69.0 0.0 38.4 72.4 Queue Length 50th (m) 28.9 #52.7 133.6 16.9 32.6 94.6 18.3 #53.4 98.4 - Tum Burk (bst (m) 228.9 #10.4 90.3 247.0 47.0 65.0 89.0 - Base Capacity (wph) 331 193 414 127.4 724 400 65.0 89.0 - Starvation Cap Reductin 0 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>													
Oneue Length 95h (m) #44.2 85.2 #52.7 133.6 16.9 32.6 94.6 18.3 #53.4 98.4 Immedi Link Object 228.9 410.4 90.3 231.0 231.0 Tum Bay Length (m) 97.0 133.0 247.0 47.0 65.0 89.0 Base Capacity (kph) 331 119.3 414.4 128.7 72.4 240 490 683 265.5 52.6 Stanction Cap Reduch 0													
Internation/Distrip/in/ 228.9 410.4 90.3 231.0 Tum Bay Length (m) 97.0 133.0 247.0 47.0 65.0 89.0 Base Capacity (wh) 331 1193 414 126 724 240 490 65.0 89.0 Starvator Cap Reductn 0													15.3
Turn Bay, Length (m) 97.0 133.0 247.0 47.0 65.0 89.0* Base Capacity (wh) 331 1193 414 1287 724 240 490 583 265 526 Starvation Cap Reductin 0 </td <td></td> <td>#44.2</td> <td></td> <td></td> <td>#52.7</td> <td></td> <td>16.9</td> <td>32.6</td> <td></td> <td>18.3</td> <td>#63.4</td> <td></td> <td>43.4</td>		#44.2			#52.7		16.9	32.6		18.3	#63.4		43.4
Base Capacity (vnh) 331 1193 414 1287 724 240 490 563 265 526 Starvation Cap Reductin 0 <td></td> <td></td> <td>228.9</td> <td></td> <td></td> <td>410.4</td> <td></td> <td></td> <td>90.3</td> <td></td> <td></td> <td>231.0</td> <td></td>			228.9			410.4			90.3			231.0	
Starvation Cap Reductin 0													
Spillback Cap Reductn 0													646
Storage Cap Reductin 0													0
Reduced v/o Ratio 0,66 0,64 0,71 0,73 0,33 0,55 0,63 0,39 0,85 0,63 - Intersection Summary													0
Intersection Summary Cycle Length: 120 Actuated Cycle Length: 120 Offset: 32 (27%), Referenced to phase 2:EBT and 6:WBT, Start of Green Natural Cycle: 100 Control Type: Actuated-Coordinated													0
Cycle Length: 120 Actuated Cycle Length: 120 Offset: 32 (275), Referenced to phase 2:EBT and 6:WBT, Start of Green Natural Cycle: 100 Control Type: Actuated-Coordinated	Reduced v/c Ratio	0.66	0.64		0,71	0.73	0.33	0.55	0.63	0.39	0.85	0.63	0,56
Actuated Cycle Length: 120 Offsel: 32 (27%), Referenced to phase 2:EBT and 6:WBT, Start of Green Natural Cycle: 100 Control Type: Actuated-Coordinated	Intersection Summary												
Offset 32 (27%), Referenced to phase 2:EBT and 6:WBT, Start of Green Natural Cycler. 100 Control Type: Actuated-Coordinated	Cycle Length: 120												
Natural Cycle: 100 Control Type: Actuated-Coordinated													
Control Type: Actuated-Coordinated			e 2:EBT a	nd 6:WB1	Γ, Start o	f Green							
	Natural Cycle: 100												
	Control Type: Actuated Coo	ordinated											
	Maximum v/c Ratio: 0.85												
Intersection Signal Delay: 38.0 Intersection LOS: D	Intersection Signal Delay: 3	8.0			1	ntersectio	n LOS: D						

	lumes, Timings /Huntmar Dr & Hazeldea	n Rd		20 Cedarow Ct 2024 FBG PM
Intersection Ca	apacity Utilization 85.9%	CU Level of Service E		
Analysis Perio				
# 95th perce	ntie volume exceeds capacity, queu	e may be longer.		
Queue sho	wn is maximum after two cycles.	, ,		
Splits and Pha	ses: 1: Iber Rd/Huntmar Dr & Haz	zeldean Rd	₽ Ø4	
20.6 s	42.8 s	14.6 s	42 s	
♪ _{Ø5}	🛑 Ø6 (R)	07	Ø8	
17.2 s	46.2 s	17s	39.6 s	

	۴		3	12	12003	A.	325		22		312	1
	/		¥	1	2000		1	Ť	M	*	ŧ	*
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBF
Lane Configurations	7	≜ †		1	11	1		\$		7	f.	
Traffic Volume (vph)	7	836	49	119	1288	30	69	5	61	42	5	10
Future Volume (vph)	7	836	49	119	1288	30	69	5	61	42	5	10
Peak Hour 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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	885	0	119	1288	30	0	135	0	42	15	(
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	2	2		1	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	32,2	32,2		11.2	32.2	32.2	32,9	32,9		32,9	32,9	
Tota Split (s)	63.0	63.0		20.0	83.0	83.0	37.0	37.0		37.0	37.0	
Tota Split (%)	52,5%	52,5%		16,7%	69.2%	69,2%	30.8%	30,8%		30.8%	30.8%	
Yellow Time (s)	3.7	3.7		3.7	3,7	3,7	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.5	2,5		2.4	2.5	2,5	3,9	3,9		3,9	3,9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Tota Lost Time (s)	6.2	6.2		6.1	6.2	6.2		6.9		6.9	6.9	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Recall Mode	C-Max	C-Max		None	C-Max	C-Max	None	None		None	None	
Act Effct Green (s)	79.2	79.2		93.1	93.0	93.0		13.9		13.9	13.9	
Actuated g/C Ratio	0.66	0.66		0.78	0.78	0.78		0.12		0.12	0.12	
v/c Ratio	0.03	0.40		0.27	0.49	0.03		0.64		0.33	0.07	
Control Delay	9.4	10.6		3.7	3.5	0.5		51.6		54.2	27.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	9.4	10.6		3.7	3.5	0.5		51.6		54.2	27.5	
LOS	А	В		А	А	А		D		D	С	
Approach De l ay		10.6			3.5			51,6			47.2	
Approach LOS		В			А			D			D	
Queue Length 50th (m)	0.5	44.8		4.2	27.0	0.1		23.3		9.3	1.1	
Queue Length 95th (m)	2.7	70.6		m8,2	42.2	m0,3		41.8		19,5	7.1	
nterna Link Dist (m)		192.4			228,9			159,1			123.4	
Turn Bay Length (m)	55.0			95.0		183.0				37.5		
Base Capacity (vph)	253	2222		511	2626	1182		416		276	445	
Starvation Cap Reductn	0	0		0	0	0		0		0	0	
Spillback Cap Reductn	0	0		0	0	0		0		0	0	
Storage Cap Reductn	0	0		0	0	0		0		0	0	
Reduced v/c Ratio	0.03	0.40		0.23	0.49	0.03		0.32		0.15	0.03	
ntersection Summary												
Cycle Length: 120												
Actuated Cycle Length: 120												
Offset: 35 (29%), Referenced	d to phase	2'EBTL a	and 6:WF	RTI Start	of Green							
Natural Cycle: 80	- to pridot				0.000							
Control Type: Actuated Coor	dinated											
Maximum v/c Ratio 0.64												
Intersection Signal Delay: 9.6					ntersectio	- LOC: A						

	mes, Timings od Dr/Site Access & H	azeldean Rd		20 Cedarow Ct 2024 FBG PM
Intersection Capa	acity Utilization 72.8%	CU Level of Service C		
Analysis Period (min) 15			
Splits and Phase	s: 2: Fringewood Dr/Site Acces	s & Hazeldean Rd	↓ Ø4	
20 s	63 s		37 s	
€ Ø6 (R)			<↑ø8	
83 s			37 s	

20 Cedarow Ct 2024 FBG PM

ntersection												
nt Delay, s/veh	1,3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	5	1	2011	TIDE	412	11011	TIDE	4.	THE T	000	4.	0011
Traffic Vol, veh/h	14	874	0	0	1351	17	0	0	0	18	0	21
Future Vol. veh/h	14	874	0	0	1351	17	0	0	0	18	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Contro	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	700		-			-			-			-
Veh in Median Storage	# -	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-		0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mymt Flow	14	874	0	0	1351	17	0	0	0	18	0	21
Major/Minor	Major1	_		Major2	_		Vinor1	_	1	Minor2	_	_
Conflicting Flow All	1368	0	0	874	0	0	1578	2270	437	1825	2262	684
Stage 1	-	-	-	-	-	-	902	902	-	1360	1360	
Stage 2							676	1368	-	465	902	-
Critical Hdwy	4.14	-	-	4,14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6,54	5,54	-	6,54	5,54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6,54	5,54	-	6,54	5,54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3,52	4.02	3,32
Pot Cap-1 Maneuver	498	-	-	768	-	-	74	40	567	48	40	391
Stage 1	-	-	-	-	-	-	299	355	-	156	215	-
Stage 2	-	-	-	-	-	-	409	213	-	547	355	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	498	-	-	768	-	-	69	39	567	47	39	391
Mov Cap-2 Maneuver	-	-	-	-	-	-	69	39	-	47	39	-
Stage 1	-	-	-	-	-	-	291	345	-	152	215	-
Stage 2	-	-	-	-	-	-	387	213	-	532	345	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2	_	_	0	_	_	0	_	_	73.8	_	_
HCMLOS							А			F		
Minor Lane/Major Mvm	t 1	VBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1			
Capacity (veh/h)		-	498	-	-	768	-	-	89			
HCM Lane V/C Ratio		-	0.028	-	-	-	-	-	0.438			
HCM Control Delay (s)		0	12.4	-	-	0	-	-	73.8			
HCM Lane LOS		Α	В	-	-	Α	-	-	F			
HCM 95th %tile Q(veh)	1	-	0.1	-	-	0	-	-	1.8			

20 CEDAROW COURT WELLINGS PHASE 2 TRANSPORTATION IMPACT ASSESSMENT

Appendix F Intersection Performance Worksheets October 24, 2019

F.3 2024 TOTAL FUTURE CONDITIONS



Lanes, Volumes, Timings	
1: Iber Rd/Huntmar Dr & Hazeldean Rd	

1: Iber Rd/Huntmar D						14.1400				10.00	1.0011	
	٠	-	~	1	+	•	1	Ť	1	1	ŧ	1
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ኘኘ	朴		ካካ	<u>†</u> †	7	۲	Ť	1	٦	+	7
Traffic Volume (vph)	195	638	99	166	467	174	52	224	222	130	252	137
Future Volume (vph)	195	638	99	166	467	174	52	224	222	130	252	137
Peak Hour 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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	195	737	0	166	467	174	52	224	222	130	252	137
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	59	2		1	6		3	8		7	4	
Permitted Phases						6	8		8	4		4
Detector Phase	59	2		1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)		5.0		5.0	5.0	5.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Sp i it (s)		36.3		11.6	36.3	36.3	11.3	39.6	39.6	11.3	39.6	39.6
Total Split (s)		46.0		17.2	38.0	38.0	11.4	39.6	39.6	12.2	40.4	40.4
Total Split (%)		40.0%		15.0%	33.0%	33.0%	9.9%	34.4%	34.4%	10.6%	35.1%	35.1%
Yellow Time (s)		3.7		3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)		2.6		2.8	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2.9
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.3		6.5	6.3	6.3	6.3	6.6	6.6	6.3	6.6	6.6
Lead/Lag		Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?		Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode		C-Max		None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	13.2	51.5		11.1	42.9	42.9	26.2	20.8	20.8	28.9	23.9	23.9
Actuated g/C Ratio	0.11	0.45		0.10	0.37	0.37	0.23	0.18	0.18	0.25	0.21	0.21
v/c Ratio	0.52	0.49		0.52	0.37	0.25	0.24	0.70	0.49	0.57	0.68	0.28
Control Delay	43.2	20.1		55.1	28.8	2.8	30.7	54.9	8.6	41.8	51.9	1.9
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tota Delay	43.2	20.1		55.1	28.8	2.8	30.7	54.9	8.6	41.8	51.9	1.9
LOS	D	С		E	С	Α	С	D	Α	D	D	A
Approach Delay		24.9			28.6			31.7			36.2	
Approach LOS		С			С			С			D	
Queue Length 50th (m)	16.7	62.5		18.6	39.7	0.0	8.6	47.7	0.0	22.5	54.1	0.0
Queue Length 95th (m)	22.5	93.5		28.7	61.6	8.5	16.2	67.6	18.3	34.7	75.2	1.5
nterna Link Dist (m)		228.9			410.4			90.3			231.0	
Turn Bay Length (m)	97.0			133.0		247.0	47.0		65.0	89.0		
Base Capacity (vph)	383	1496		337	1263	700	214	511	593	230	524	595
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.49		0.49	0.37	0,25	0.24	0.44	0.37	0.57	0.48	0,23
ntersection Summary												
Cycle Length: 115												
Actuated Cycle Length: 115												
Offset: 62 (54%), Referenced t	to phase	e 2:EBT ar	nd 6:WB1	Γ, Start of	f Green							
Natura Cycle: 110												
Control Type: Actuated-Coordi	inated											
Maximum v/c Ratio: 0.70												
ntersection Signal Delay: 29.3					ntersectio	n LOS: C						

Lanes, Volumes, Timings 1: Iber Rd/Huntmar Dr & Hazeldean R	d	20 Cedarow Ct 2024 TF AM
Intersection Capacity Utilization 68.4%	CU Level of Service C	
Analysis Period (min) 15		

Splits and Phases: 1: Iber Rd/Huntmar Dr & Hazeldean Rd

1 01	● →Ø2 (R)		103		
17.2 s	46 s		11.45	40.4 s	
♪ Ø5	€ Ø6 (R)		₩Ø7	≜ ¶øs	
14 s	38 s	11.2 \$	12.2 s	39.6 s	

2: Fringewood Dr/S			25	8	12005		1265		12	1953	310	24
	٨		\mathbf{F}	1	2007000		1	Ť	r	*	ŧ	*
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBI
Lane Configurations	1	≜ ↑ĵ≽		٦	^	1		4		۲	1.	
Traffic Volume (vph)	10	807	29	45	555	58	37	5	68	48	5	
Future Volume (vph)	10	807	29	45	555	58	37	5	68	48	5	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	10	836	0	45	555	58	0	110	0	48	14	
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	2	2		1	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	32.2	32.2		11.2	32.2	32.2	32,9	32.9		32.9	32.9	
Total Split (s)	62.0	62.0		15.0	77.0	77.0	38.0	38.0		38.0	38.0	
Total Split (%)	53,9%	53,9%		13.0%	67.0%	67.0%	33.0%	33.0%		33.0%	33.0%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.5	2,5		2.4	2,5	2.5	3,9	3,9		3,9	3,9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.2	6.2		6.1	6.2	6.2		6.9		6.9	6.9	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Recall Mode	C-Max	C-Max		None	C-Max	C-Max	None	None		None	None	
Act Effct Green (s)	80.8	80.8		90.8	90.7	90.7		11.2		11.2	11.2	
Actuated g/C Ratio	0.70	0.70		0.79	0.79	0.79		0.10		0.10	0.10	
v/c Ratio	0.02	0.35		0.09	0.21	0.05		0.50		0.44	0.08	
Control Delay	6.8	7.9		1.4	1.2	0.3		29.5		61.6	30.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	6.8	7.9		1.4	1.2	0.3		29.5		61.6	30.1	
LOS	A	A		A	A	A		С		E	С	
Approach Delay		7.8			1.2			29.5			54.5	
Approach LOS		A			A			С			D	
Queue Length 50th (m)	0.6	36.0		0.8	6.6	0.0		9.0		10.5	1.1	
Queue Length 95th (m)	2.7	53.6		2.2	8.5	0.0		25.7		22.2	6.9	
nterna Link Dist (m)		192.4			228.9			159.1			123.4	
Turn Bay Length (m)	55.0			95.0		183.0				37.5		
Base Capacity (vph)	556	2370		502	2674	1208		487		303	481	
Starvation Cap Reductn	0	0		0	0	0		0		0	0	
Spillback Cap Reductn	0	0		0	0	0		0		0	0	
Storage Cap Reductn	0	0		0	0	0		0		0	0	
Reduced v/c Ratio	0.02	0.35		0.09	0.21	0.05		0.23		0.16	0.03	
ntersection Summary												
Cycle Length: 115												
Actuated Cycle Length: 115												
Offset: 52 (45%), Reference	ed to phase	e 2:EBTL a	and 6:WE	BTL, Star	t of Greer	L						
Vatural Cycle: 80												
Control Type: Actuated Co	ordinated											
Maximum v/c Ratio: 0.50												

Lanes, Volumes, Timings 2: Fringewood Dr/Site Access & Ha	zeldean Rd	20 Ced	arow Cl 024 TF AN
Intersection Capacity Utilization 58.2%	CU Level of Service B		
Analysis Period (min) 15			
Splits and Phases: 2: Fringewood Dr/Site Acces:	s & Hazeldean Rd	Ø4	580-e
15 s 62 s	3	s	
🕈 Ø6 (R) 🛛		¶ø8	
77 s	3	e	

ntersection												
nt Delay, s/veh	0.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	5	† 1 ₂			412			\$			4.	
Traffic Vo, veh/h	12	842	0	0	585	16	0	0	0	3	0	10
Future Vol, veh/h	12	842	0	0	585	16	0	0	0	3	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	700	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage,	# -	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mymt Flow	12	842	0	0	585	16	0	0	0	3	0	10
Major/Minor M	ajor1		1	Major2		1	/linor1		1	Minor2		
Conflicting Flow All	601	0	0	842	0	0	1159	1467	421	1038	1459	301
Stage 1	-	-	-	-	-	-	866	866	-	593	593	-
Stage 2		-			-	-	293	601	-	445	866	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-		-	-	6,54	5.54	-	6.54	5,54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2,22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	972	-	-	789	-	-	151	127	581	185	128	695
Stage 1	-	-	-	-	-	-	314	369	-	459	492	-
Stage 2	-	-	-	-	-	-	691	488	-	562	369	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	972	-	-	789	-	-	147	125	581	183	126	695
Mov Cap-2 Maneuver	-	-	-	-	-	-	147	125	-	183	126	-
Stage 1	-	-	-	-	-	-	310	365	-	453	492	-
Stage 2	-	-	-		-	-	681	488	-	555	365	-
Approach	EB	_	_	WB	_	_	NB	_	_	SB	_	_
HCM Control Delay, s	0.1	_	_	0	_	_	0	_	_	13.8	_	_
HCM LOS							Ă			B		
Minor Lane/Major Mvmt	h	VBLn1	EBL	EBT	EBR	WBL	WBT	WBR:	SBLn1			
Capacity (veh/h)		-	972	-		789	-		422			
HCM Lane V/C Ratio		-	0.012			100			0.031			
HCM Control Delay (s)		0	8.8	-		0	-		13.8			
HCM Lane LOS		Ă	A			Ă			B			
HCM 95th %tile Q(veh)		-	0			0	-		0.1			
						•			V.1			

Lanes,	٧	οlι	ım	ies,	Timir	١g	s			

Lane Group EBL EBL EBR WBL WBT WBT NBL NBT NBR SBL		٨		1	1	+	•	۲	Ť	1	1	a constantes de la cons	1
Lane Configurations Y A B A B A B A B A B A B A B A B B C 239 135 310 230 228 330 2 Traffic Valume (vph) 226 680 112 239 968 239 135 310 230 226 330 3 Peak Hour Factor 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.0	1 C		CDT		. T	WDT		ALDI.			0.01	•	SBR
Traffic Valume (vph) 226 660 112 233 968 239 135 310 230 226 330 2 Peak Hour Factor 1,00 1,00 1,00 1,00 1,00 1,00 1,00 1,0				EDK									SDR
Fulure Volume (vph) 226 680 112 233 968 239 135 310 230 226 330 2 Park Hour Factor 1,00 1,00 1,00 1,00 1,00 1,00 1,00 1,0				110									373
Peak Hour Factor 1,00													373
Shared Lane Traffic (%) 226 792 0 293 968 239 135 310 230 226 330 2 Lane Group Flow (vph) 226 792 0 293 968 239 135 310 230 226 330 2 Tim Type Prot NA Perd NA Perd Protected Phases 5 2 1 6 3 8 7 4 Permited Phase 5 2 1 6 6 3 8 8 7 4 Detector Phase 5 2 1 6 6 3 8 7 4 Detector Phase 5 2 1 6 6 3 8 7 4 Detector Phase 5 2 1 6 6 3 8 7 4 Detector Phase 5 2 1 7 3 3 33.0% 13.8% 44.6% 44 Total Split(s) 114.7% 36.0% 17.2%													1.00
Lane Group Flow (vph) 226 792 0 293 968 239 135 310 220 220 330 25 Tum Type Protected Phases 5 2 1 6 3 8 7 4 Perm pm-pt NA Perm pm-pt NA Perm protected Phases 5 2 1 6 8 8 4 Protected Phases 5 2 1 6 8 8 7 4 Switch Phase 6 5 2 1 6 8 8 8 7 4 Switch Phase 6 5 2 1 6 8 8 8 7 4 Switch Phase 6 5 2 1 6 8 8 8 7 4 Switch Phase 8 7 8 4 7 9 8 8 7 4 Switch Phase 8 7 8 4 7 9 8 8 7 4 7 9 9 8 9 8 6 8 7 4 7 9 9 6 9 8 6 8 7 4 7 9 9 6 9 8 6 8 7 4 7 9 9 6 9 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7		1,00	1.00	1.00	1.00	1,00	1.00	1,00	1.00	1.00	1.00	1.00	1.00
Turn Type Prot NA Prot NA Prot NA Prot NA Prot NA Prot NA Perm pm-pt NA Perm pm-pt NA Perm Protested Phases 5 2 1 6 3 8 8 7 4 Detactor Phase 5 2 1 6 6 3 8 8 7 4 Minimum Initial (s) 5.0 5.0 5.0 5.0 5.0 10.0 10.0 5.0 10.0 10.0 5.0 10.0 10.0 5.0 10.0 10.0 5.0 10.0 10.0 5.0 10.0 10.0 5.0 10.0		226	702	0	202	069	220	125	210	220	226	220	373
Protected Phases 5 2 1 6 3 8 7 4 Detector Phase 6 8 8 4 Detector Phase 5 2 1 6 6 3 8 8 7 4 Detector Phase 5 2 1 6 6 3 8 8 7 4 Switch Phase 7 2 1 6 6 3 8 8 7 4 Minimum Initia (s) 5.0 5.0 5.0 5.0 5.0 10.0 10.0 5.0 10.0 10				U									Perm
Permitted Phases 5 2 1 6 6 3 8 8 7 4 Switch Phase 5 2 1 6 6 3 8 8 7 4 Switch Phase 5 2 1 6 6 3 8 8 7 4 Switch Phase 5 2 1 6 6 3 8 8 7 4 Switch Phase 5 2 1 6 6 3 8 8 7 4 Switch Phase 5 2 1 6 6 3 8 8 7 4 Switch Phase 5 0 5.0 5.0 5.0 5.0 10.0 10.0 5.0 10.0 1 Minimum Split (s) 11.5 36.3 11.6 36.3 36.3 11.3 39.6 39.6 11.3 39.6 3 Total Split (s) 17.6 43.2 20.6 46.2 46.2 14.7 39.6 39.6 11.3 39.6 45 Total Split (s) 17.6 43.2 20.6 46.2 46.2 14.7 39.6 39.6 11.8 45.6 44.5 44.6 14.7 49.6 39.6 13.3 7.3 7.3 7.3 7.3 7.3 7.3 7.3 7.3 7.3							Perm			rem			Pem
Detector Phase 5 2 1 6 6 3 8 8 7 4 Switch Phase 50 5.0 5.0 5.0 5.0 5.0 10.0 10.0 10.0 5.0 10.0 11 Minimum Insplit (s) 11.5 36.3 11.6 30.4 31.1 30.6 30.6 11.3 30.6 30.6 11.3 30.6 30.6 11.3 30.6 30.6 11.3 30.6 30.6 11.5 31.6 31.4 30.6 30.6 31.6 31.4 30.6 30.6 31.6 31.4 30.6 30.6 31.6 31.4 30.6 31.6 31.4 30.6 31.6 31.4 31.4 30.6 31.6 31.6 31.4 31.6 31.6 31.4 31.6 31.6 31.6 31.6 31.6 31.6 31.6 31.6 31.6 33.6 32.6 22.6 2.9 2.9 2.6 2.0 2.6 2.8		5	2		- I	0	6		0	0		4	4
Switch Phase 5 5 5 5 5 0 5 0 <t< td=""><td></td><td>5</td><td>2</td><td></td><td>1</td><td>c</td><td></td><td></td><td>0</td><td></td><td></td><td>4</td><td>4</td></t<>		5	2		1	c			0			4	4
Minimum Initial (a) 5.0 1.0.0 1.0.0 5.0 1.0.0 1.0.0 5.0 1.0.0 1.1.3 38.6 38.5 11.5 38.5 38.5 13.5 38.6 13.3 38.6 38.5 15.5 41.5 4 Total Split (*) 11.7.5 43.2 2.0.5 46.2 46.2 14.7 39.6 39.6 13.5 41.5 4 Cotal Split (*) 1.4.7 30.5 3.7 <t< td=""><td></td><td>J</td><td>2</td><td></td><td></td><td>Ų</td><td>0</td><td>3</td><td>0</td><td>0</td><td>1</td><td>4</td><td>-</td></t<>		J	2			Ų	0	3	0	0	1	4	-
Minimum Split (s) 11.5 36.3 11.8 32.6 31.3 39.6 33.6 11.3 39.6 33.6 11.3 39.6 33.6 11.3 39.6 33.6 11.3 39.6 33.6 11.5 34.6 11.5 35.6 11.6 41.5 4 7 35.6 33.0% 33.0% 13.8% 34.6% 34.6% 34.4% 34.6% 34.7 3.7 <t< td=""><td></td><td>E O</td><td>EO</td><td></td><td>E O</td><td>E O</td><td>E O</td><td>5.0</td><td>40.0</td><td>10.0</td><td>5.0</td><td>40.0</td><td>10.0</td></t<>		E O	EO		E O	E O	E O	5.0	40.0	10.0	5.0	40.0	10.0
Total Split (s) 17.6 43.2 20.6 46.2 46.2 14.7 39.6 39.6 16.8 41.5 4 Total Split (s) 14.7% 36.0% 17.2% 38.6% 38.5% 12.3% 33.0% 13.8% 34.6% 34.7 Total Split (s) 3.7 3.7 3.7 3.7 3.7 3.7 3.7 3.7 3.7 3.7													39.6
Traial Split (%) 14.7% 36.0% 17.2% 38.5% 85% 12.3% 33.0% 33.0% 13.0% 13.8% 34.6% 34.5% 34.6% 34.5% 34.6% 34.5% 34.													41.5
Yellow Time(f) 3.7													
All-Red Time (c) 2.8 2.8 2.8 2.6 2.6 2.6 2.9 2.9 2.8 2.8 2.8 Leat Time Adjust (s) 0.0													34.0%
Lead Lang Adjugt (s) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.													2.9
Total Lorf Time (s) 6.5 6.3 6.5 6.3 6.3 6.6 6.6 6.3 6.6 LeadLag Lead Lag Lead Lag Lag <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2.8</td></t<>													2.8
Leadd, ag Dimine? Yes													6.6
Lead-Lag Optimize? Yes													
Recall Mode None C-Max None C-Max None													Lag Yes
Act Effort Green (p) 12,1 43,1 14,6 45,6 45,6 35,0 26,3 28,3 28,2 2,2 Actuated g/C Ratio 0,10 0,36 0,12 0,38 0,29 0,22 0,22 0,32 0,24 0 Veratio 0,68 0,66 0,73 0,75 0,33 0,57 0,79 0,45 0,67 0,79 0 Control Delay 0,0 <td></td> <td>None</td>													None
Actualed goC Raino 0,10 0,36 0,12 0,38 0,38 0,29 0,22 0,22 0,22 0,22 0,22 0,22 0,24 0,07 0,075 0,33 0,75 0,73 0,05 0,77 0,79 0,05 0,07 0,79 0,05 0,07 0,79 0,05 0,07 0,07 0,00 0,													
wic Ratio 0.68 0.66 0.73 0.75 0.79 0.45 0.79 0.79 0.45 0.79 0.73 60.8 7.3 60.8 7.3 60.8 7.3 60.8 7.3 60.8 7.3 60.8 7.3 60.8 7.3 60.8 7.3 60.8 66.3 11 Los E C E D A D E A E E Apprach LOS D													28.2
Control Delay 75.5 29.1 62.1 38.1 4.9 68.1 68.8 7.3 60.8 56.3 1 Total Delay 0.0 <td></td> <td>0.65</td>													0.65
Ouceue Delay 0.0 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>15.6</td></t<>													15.6
Total Delay 75.5 29.1 62.1 38.1 4.9 36.1 88.8 7.3 60.8 56.3 1 LOS E C D A D E A E E C Approach Delay 39.4 37.5 36.7 41.1 D A1.1 Image Approximation of the approximation of t													15.6
LOS E C E D A D E A E E E Approach D A D E A E E Approach D 39,4 37,5 36,7 41,1 Approach LOS D Main Main T63,0 93,6 44,13 13,3 163,3 63,6 16,8 0,0 88,5 72,6 13,3 163,3 63,6 16,8 13,3 16,9 36,0 48,0 34,2 10,7 13,3 14,13 12,87 72,4 72,4 73,8 90,0 43 14,13 12,87 72,4 23,8 490 583 260 518 65 510,90,0 10 0 0 0 0 0 0 0 0													15.6
Approach Deley 39.4 37.5 36.7 41.1 Approach LOS D D D D Approach LOS D D D D D Queue Length 50th (m) 29.3 86.4 34.2 106.7 0.0 21.6 68.8 0.0 38.5 72.6 1 Queue Length 50th (m) 29.3 86.4 34.2 106.7 0.0 21.6 68.8 0.0 38.5 72.6 1 Queue Length 50th (m) 29.3 86.4 142.7 133.3 16.9 33.6 94.6 163.3 #50.0 83.0 Base Capacity (vph) 33.8 120.1 1413 132.8 490.6 83.2 260.5 18 65.0 80.0 50.8 50.8 50.8 50.8 50.8 50.8 50.8 50.8 50.6 50.8 50.8 50.8 50.8 50.8 50.8 50.8 50.8 50.8 50.8 50.8 50.8 50.8 50.8													15.0
Áproach LOS D D D D D D D Queue Length 50th (m) 29.3 86.4 34.2 106.7 0.0 21.6 68.8 0.0 38.5 72.6 1 Queue Length 50th (m) ##5.3 104.8 ##52.7 138.3 16.9 33.6 94.6 18.3 #53.0 98.0 4 Internal Link Dist (m) 228.9 410.4 90.3 231.0 231.0 Base Capacity (wph) 33.8 1201 413 1287 724 28.8 490 58.3 260 518 65 Starvation Cap Reductin 0 <		C			c		А	U		A	E		C
Ourse Length 50th (m) 29.3 86.4 34.2 106.7 0.0 21.6 68.8 0.0 35.5 72.6 1 Ourse Length 50th (m) 445.3 104.8 ##52.7 138.3 16.9 33.6 04.6 18.3 #53.0 99.0 4 Itemal Link Dist (m) 228.9 410.4 90.3 32.6 04.6 18.3 #53.0 99.0 4 Turm Bay Length (m) 07.0 133.0 247.0 47.0 65.0 80.0 38.8 2011 413 128.7 72.4 23.4 490 65.0 80.0 51.8 65.0 80.0 51.8 65.0 80.2 51.8 65.0 80.2 51.8 65.0 80.2 51.8 65.0 80.0 0.0 0.0 0.0 0.0 0.0 51.8 65.0 80.2 50.8 65.0 80.0 51.8 65.0 80.0 51.8 65.0 80.0 51.8 65.0 80.0 51.8 60.0													
Outcue Length 95h (m) ##45.3 104.8 #52.7 138.3 16.9 33.6 94.6 18.3 #53.0 99.0 49.0 Turn Bay Length (m) 97.0 133.0 247.0 47.0 65.0 80.0 Turn Bay Length (m) 97.0 133.0 247.0 47.0 65.0 80.0 Stavaton Cap Reducth 0		00.0						04.0			00.5		
Internet Link Dist (m) 228.9 410.4 90.3 231.0 Turn Bay Length (m) 97.0 133.0 247.0 47.0 65.0 89.0 Bay Length (m) 338 1201 413 1287 724 238 490 583 260 518 65.0 89.0 Starvation Cap Reductin 0 <td></td> <td>17.4</td>													17.4
Turn Bay, Length (m) 97,0 133,0 247,0 47,0 65,0 65,0 58,0 Base Capacity (mh) 338 1201 413 1287 724 238 490 583 260 518 65 Starvation Cap Reductin 0		#45.3			#52./		16.9	33.6		18.3	#53.0		46.6
Base Capacity (vph) 338 1201 413 1287 724 238 490 563 260 518 60 Starvation Cap Reductin 0 </td <td></td> <td>07.0</td> <td>228.9</td> <td></td> <td>400.0</td> <td>410.4</td> <td>047.0</td> <td>47.0</td> <td>90.3</td> <td>05.0</td> <td></td> <td>231.0</td> <td></td>		07.0	228.9		400.0	410.4	047.0	47.0	90.3	05.0		231.0	
Stanation Cap Reductin 0			1001			1007			100			540	
Spillback Cap Reductn 0													641
Storage Cap Reducth 0													0
Reduced v/c Ratio 0,67 0,68 0,71 0,75 0,33 0,57 0,83 0,39 0,87 0,64 0 Intersection Summary Cycle Longth: 120 120 120 120 120 120 121 120 12													0
Intersection Summary Cycle Length: 120 Actuated Cycle Length: 120 Offset: 32 (27%), Referenced to phase 2:EBT and 6:WBT, Start of Green Natural Cycle: 100 Control Type: Actuated-Coordinated													
Cycle Length: 120 Actuated Cycle Length: 120 Offset: 32 (27%), Referenced to phase 2:EBT and 6:WBT, Start of Green Natural Cycle: 100 Control Type: Actuated-Coordinated	Reduced V/c Ratio	0.67	0,66		0,/1	0./5	0,33	0.57	0,63	0,39	0.87	0.64	0.58
Actuated Cycle Length: 120 Offset: 32 (27%), Referenced to phase 2:EBT and 6:WBT, Start of Green Natural Cycle: 100 Control Type: Actuated-Coordinated													
Offset 32 (27%), Referenced to phase 2:EBT and 6:WBT, Start of Green Natural Cycler 100 Control Type: Actuated-Coordinated													
Natural Cycle: 100 Control Type: Actuated-Coordinated													
Control Type: Actuated-Coordinated		ed to phase	e 2:EBT ar	d 6:WB1	, Start of	f Green							
Maximum v/c Ratio: 0.87		rdinated											
Intersection Signal Delay; 38.6 Intersection LOS; D	Maximum v/c Ratio: 0.87												

Lanes, Vo	umes, Timings			20 Cedarow Ct
1: ber Rd/	Huntmar Dr & Hazeldea	n Rd		2024 TF PM
Intersection Ca	pacity Utilization 86.9%	CU Level of Service E		
Analysis Period	(min) 15			
# 95th percer	tile volume exceeds capacity, queu	e may be longer.		
Queue show	n is maximum after two cycles			
Splits and Phase	es: 1: Iber Rd/Huntmar Dr & Haz	eldean Rd		
1 Ø1	• -• Ø2 (R)	1 03	₽ Ø4	
20.6 s	43.2 s	14.7s	41.5 s	
♪ _{Ø5}	🗲 Ø6 (R)	1 07	1 Ø8	
17.6 s	46.2 s	16.6s	39.6 s	

	٨	20125	2	1	+	A.		t	1	6	T	1
_	1	100.000	*					-		200		199
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBF
Lane Configurations	7	≜ t≽		٦	<u>†</u> †	1		4		<u> </u>	₽	
Traffic Volume (vph)	18	833	49	119	1282	74	69	5	61	78	5	22
Future Volume (vph)	18	833	49	119	1282	74	69	5	61 1.00	78	5	22
Peak Hour 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
Shared Lane Traffic (%)	18	882	0		1000	74	0	135	0	78	07	0
Lane Group Flow (vph)	18 Perm	882 NA	U	119	1282 NA	/4 Perm	Perm	135 NA	U	78 Perm	27 NA	U
Turn Type Protected Phases	Perm	NA 2		pm+pt 1	NA 6	Perm	Perm	NA 8		Perm	NA 4	
Protected Phases Permitted Phases	2	2		6	6	6	8	0		4	4	
Detector Phases	2	2		0	6	6	8	8		4	4	
	2	2		1	6	0	0	0		4	4	
Switch Phase Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	10.0	10.0		10.0	10.0	
Minimum Initial (s) Minimum Split (s)	32.2	5.0 32.2		5.0	5.0 32.2	5.0 32.2	32.9	32.9		32.9	32.9	
	62.0			20.0	32.2 82.0	32.2 82.0		32.9		32.9	32.9	
Total Split (s)	51.7%	62.0 51.7%		20.0	68.3%	68.3%	38.0 31.7%	38.0		31.7%	38.0	
Total Split (%) Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	31,7%	31,7%		31,7%	31.7%	
All-Red Time (s)	2.5	2,5			2.5	2.5	3.9	3.9		3.9	3.9	
Lost Time Adjust (s)	2.0	2.5		2.4 0.0	0.0	2.5	3.9	0.0		0.0	0.0	
Total Lost Time (s)	6.2	6.2		6.1	6.2	6.2		6.9		6.9	6.9	
Lead/Lag	Lag	Lag		Lead	0.2	0.2		0.9		0.9	0.9	
Lead-Lag Optimize?	Yes	Yes		Yes								
Recall Mode	C-Max	C-Max		None	C-Max	C-Max	None	None		None	None	
Act Effct Green (s)	79.2	79.2		93.0	92.9	92.9	None	14.0		14.0	14.0	
Actuated q/C Ratio	0.66	0.66		0.78	0.77	0.77		0.12		0.12	0.12	
v/c Ratio	0.00	0.00		0.78	0.49	0.06		0.64		0.12	0.12	
Control Delav	9.9	10.6		3.9	3.9	0.00		51.6		69.3	21.4	
Queue Delay	9.9 0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	9.9	10.6		3.9	3.9	0.5		51.6		69.3	21.4	
LOS	9.9 A	B		3.9 A	A	A		D		09.3 E	21.4 C	
Approach Delay	А	10.6		A	3.7	A		51.6		E	57.0	
Approach LOS		10.0 B			3./ A			01.0 D			57.0 E	
Queue Length 50th (m)	1.4	44.8		4.7	29.9	0.2		23.3		17.8	1.1	
Queue Length 95th (m)	5.2	70.5		m7.9	44.1	m0.8		41.8		32.4	9.2	
nternal Link Dist (m)	J.2	192.4		111.0	228.9	110.0		159.1		52.4	123.4	
Turn Bay Length (m)	55.0	152,4		95.0	220.0	183.0		100.1		37.5	120,4	
Base Capacity (vph)	253	2220		512	2624	1191		425		285	457	
Starvation Cap Reductn	233	0		0	2024	0		423		205	437	
Spillback Cap Reductn	0	0		0	0	0		0		0	0	
Storage Cap Reductn	0	0		0	0	0		0		0	0	
Reduced v/c Ratio	0.07	0.40		0.23	0.49	0.06		0.32		0.27	0.06	
Intersection Summary Cycle Length: 120 Actuated Cycle Length: 120 Offset: 35 (29%), Reference Natural Cycle: 80		e 2:EBTL a	and 6:WE	3TL, Star	of Green	1						
Control Type: Actuated Co	ordinated											
Maximum v/c Ratio: 0.64												
ntersection Signal Delay: 1	07			h	ntersectio	n I OS [.] B						

Lanes, Volum 2: Fringewood	ies, Timings d Dr/Site Access & Ha	azeldean Rd		20 Cedarow Ct 2024 TF PM
Intersection Capaci	tv Utilization 72.6%	CU Level of Service C		
Analysis Period (mi	n) 15			
m Volume for 95th	n percentile queue is metered by	y upstream signal.		
Splits and Phases:	2: Fringewood Dr/Site Access	& Hazeldean Rd		
√ Ø1	102 (R)		Ø4	
20 s	62.s		38 s	
€ (R)		1413	<s ↑ ø8</s 	
82 s			38.5	

ntersection												
nt Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	5	≜î ≽			412			\$			¢.	
Traffic Vol, veh/h	16	882	0	0	1358	17	0	0	0	18	0	22
Future Vol. veh/h	16	882	0	0	1358	17	0	0	0	18	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	700	-	-			-	-	-	-	-	-	-
Veh in Median Storage.	# -	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-		0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	882	0	0	1358	17	0	0	0	18	0	22
Major/Minor N	Aajor1		1	Major2		1	/linor1		1	Minor2		
Conflicting Flow All	1375	0	0	882	0	0	1593	2289	441	1840	2281	688
Stage 1							914	914	-	1367	1367	-
Stage 2		-	-			-	679	1375	-	473	914	-
Critica Hdwy	4.14	-	-	4,14	-	-	7,54	6,54	6,94	7,54	6,54	6,94
Critica Hdwy Stg 1	-	-	-			-	6,54	5,54	-	6,54	5,54	-
Critica Hdwy Stg 2	-	-	-	-	-	-	6,54	5,54	-	6,54	5,54	-
Follow-up Hdwy	2,22	-	-	2,22	-	-	3,52	4.02	3,32	3,52	4.02	3,32
Pot Cap-1 Maneuver	495	-	-	762	-	-	72	39	564	47	39	389
Stage 1	-	-	-	-	-	-	294	350	-	155	213	-
Stage 2	-	-	-	-	-	-	408	211	-	541	350	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	495	-	-	762	-	-	66	38	564	46	38	389
Mov Cap-2 Maneuver	-	-	-	-	-	-	66	38	-	46	38	-
Stage 1	-	-	-	-	-	-	285	339	-	150	213	-
Stage 2	-	-	-	-	-	-	385	211	-	524	339	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0			0			75		
HCMLOS							A			F		
Minor Lane/Major Mvm	t 1	VBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	_	_	_
Capacity (veh/h)		-	495	-		762	-		89			
HCM Lane V/C Ratio		-	0.032	-		-			0.449			
HCM Control Delay (s)		0	12.5	-	-	0	-	-	75			
HCM Lane LOS		Ă	B	-		Ă	-		F			
HCM 95th %tile Q(veh)		-	0.1	-	-	0	-	-	1.9			

20 CEDAROW COURT WELLINGS PHASE 2 TRANSPORTATION IMPACT ASSESSMENT

Appendix F Intersection Performance Worksheets October 24, 2019

F.4 2029 ULTIMATE CONDITIONS



Lanes, Volumes, Timings
1: Iber Rd/Huntmar Dr & Hazeldean Rd

1: Iber Rd/Huntmar			anne								2029 U l tin	
	٠	-+	\mathbf{r}	1	+	•	1	Î	1	1	ŧ	4
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBF
Lane Configurations	ኘኘ	≜ î⊳		ካካ	^	Č	5	1	1	5	1	ľ
Traffic Volume (vph)	244	690	108	178	504	180	57	243	241	138	269	148
Future Volume (vph)	244	690	108	178	504	180	57	243	241	138	269	148
Satd, Flow (prot)	3288	3322	0	3288	3390	1517	1695	1784	1517	1695	1784	1517
Fit Permitted	0.950			0.950			0.399			0.381		
Satd. Flow (perm)	3288	3322	0	3288	3390	1517	712	1784	1517	680	1784	1517
Satd. Flow (RTOR)		16				215			241			212
Peak Hour 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
Shared Lane Traffic (%)												
Lane Group Flow (vph)	244	798	0	178	504	180	57	243	241	138	269	148
Tum Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	59	2		1	6		3	8		7	4	
Permitted Phases						6	8		8	4		4
Detector Phase	59	2		1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)		5.0		5.0	5.0	5.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Sp li t (s)		36.3		11.6	36.3	36.3	11.3	39.6	39.6	11.3	39.6	39.6
Total Split (s)		45.5		17.9	38.0	38.0	11.4	39.6	39.6	12.0	40.2	40.2
Total Split (%)		39.6%		15.6%	33.0%	33.0%	9.9%	34.4%	34.4%	10.4%	35.0%	35.0%
Yellow Time (s)		3.7		3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)		2.6		2.8	2.6	2.6	2,6	2,9	2,9	2,6	2.9	2.9
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.3		6.5	6.3	6.3	6.3	6,6	6,6	6.3	6.6	6.6
Lead/Lag		Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?		Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode		C-Max		None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	13.9	50.2		11.4	41.2	41.2	27.4	22.0	22.0	29.8	24.9	24.9
Actuated g/C Ratio	0.12	0.44		0.10	0.36	0.36	0.24	0.19	0.19	0.26	0.22	0.22
v/c Ratio	0.62	0.55		0.55	0.42	0.26	0.27	0.71	0.50	0.61	0.70	0.30
Control Delay	49.0	21.7		55.5	30.7	3.2	30.4	54.5	8.1	43.7	51.6	2.5
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.0	21.7		55.5	30.7	3.2	30.4	54.5	8.1	43.7	51.6	2.5
LOS	D	С		E	С	A	С	D	A	D	D	A
Approach De l ay		28.1			30.1			31.3			36.6	
Approach LOS		С			С			С			D	
Queue Length 50th (m)	20.6	70.5		20.0	44.7	0.0	9.3	51.6	0.0	23.7	57.7	0.0
Queue Length 95th (m)	27.6	104.2		30.4	67.7	9.9	17.0	71.7	18,8	35.7	79.2	3.7
nterna Link Dist (m)		228.9			410.4			90.3			231.0	
Turn Bay Length (m)	97.0			133.0		247.0	47.0		65.0	89.0		
Base Capacity (vph)	399	1458		350	1214	681	213	511	607	226	521	593
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.55		0.51	0.42	0.26	0.27	0.48	0.40	0.61	0.52	0.25
Intersection Summary												
Cycle Length: 115												

Lanes, Volumes, Timings 1: Iber Rd/Huntmar Dr & Hazeldean Rd				20 Cedarow Ct 2029 Ultimate AM
Natural Cycle: 110				
Control Type: Actuated-Coordinated				
Maximum v/c Ratio: 0.71				
ntersection Signal Delay: 30.8	ntersecti	on LOS: C		
ntersection Capacity Utilization 72.1%	CU Leve	of Service C		
Analysis Period (min) 15				
Splits and Phases: 1: Iber Rd/Huntmar Dr & Hazeldean F ✓ Ø1 → Ø2 (R)	Rd	1 03	Ø4	
17.9 s 45.5 s		11.45	40.2 s	
▲ Ø5 ● Ø6 (R)	● Ø9	07	A De	
14.2 s 38 s	11.2.8	12 s	39.6 s	

	٨	->	$\mathbf{\tilde{z}}$	4	+	×.	٩	Ť	1	1	ţ	4
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations	٦	≜ †₽		٦	††	1		4		۲	12	
Traffic Volume (vph)	10	880	30	46	606	58	38	5	74	48	5	
Future Volume (vph)	10	880	30	46	606	58	38	5	74	48	5	
Satd. Flow (prot)	1695	3373	0	1695	3390	1517	0	1801	0	1695	1755	
Fit Permitted	0.423			0.267				0.886		0.601		
Satd. Flow (perm)	755	3373	0	476	3390	1517	0	1621	0	1072	1755	
Satd. Flow (RTOR)		4				58		73			9	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
Shared Lane Traffic (%)												
ane Group Flow (vph)	10	910	0	46	606	58	0	117	0	48	14	
Tum Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	2	2		1	6	6	8	8		4	4	
Switch Phase												
Vinimum Initial (s)	5.0	5.0		5.0	5.0	5.0	10.0	10.0		10.0	10.0	
vlinimum Sp l it (s)	32.2	32.2		11.2	32.2	32.2	32,9	32,9		32.9	32.9	
fotal Split (s)	63.0	63.0		15.0	78.0	78.0	37.0	37.0		37.0	37.0	
fotal Split (%)	54.8%	54.8%		13.0%	67.8%	67.8%	32.2%	32.2%		32.2%	32.2%	
/ellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.5	2.5		2.4	2.5	2.5	3.9	3.9		3.9	3.9	
.ost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.2	6.2		6.1	6.2	6.2		6.9		6.9	6.9	
_ead/Lag	Lag	Lag		Lead								
_ead-Lag Optimize?	Yes	Yes		Yes	0.11	~ 11						
Recall Mode	C-Max 80.7	C-Max		None	C-Max 90.7	C-Max 90.7	None	None 11.2		None 11.2	None 11.2	
Act Effct Green (s)		80.7		90.8								
Actuated g/C Ratio	0.70	0.70		0.79	0.79	0.79		0.10		0.10	0.10	
//c Ratio	0.02	0.38 8.2		0.10 1.6	0.23 1.5	0.05		0.52 29.4		0.46 62.9	0.08	
Control Delay	0.0	0.2		0.0	0.0	0.0		29.4		02.9	0.0	
Queue Delay	6.8	8.2		1.6	1.5	0.0		29.4		62.9	30.0	
Total Delay _OS	6.0 A	6.2 A		1.0 A	1,5 A	0.3 A		29.4 C		62.9 E	30.0 C	
Approach Delay	А	8,2		A	1.4	A		29.4		C	55.5	
Approach LOS		0.2 A			A			29,4 C			55,5 E	
Queue Length 50th (m)	0.6	40.3		1.0	7.4	0.0		9.5		10.5	1.1	
Queue Length 95th (m)	2.7	60.3		2.1	9.0	0.0		26.6		22.3	6.9	
nternal Link Dist (m)	2.1	192.4		2.1	228.9	0.0		159.1		22.0	123.4	
Turn Bay Length (m)	55.0	102,4		95.0	220.0	183.0		100,1		37.5	120,4	
Base Capacity (vph)	529	2367		470	2672	1207		478		280	465	
Starvation Cap Reductn	0	2007		470	0	0		0		200	405	
Spillback Cap Reductn	0	0		0	Ő	ő		0		0	0	
Storage Cap Reductn	0	0		0	0	0		0		0	0	
Reduced v/c Ratio	0.02	0.38		0.10	0.23	0.05		0.24		0.17	0.03	
ntersection Summary												
Cycle Length: 115												

Lanes, Volumes, Timings			20 Cedarow Cl
2: Fringewood Dr/Site Access & Ha	zeldean Rd		2029 Ultimate AN
Natural Cycle: 80			
Control Type: Actuated Coordinated			
Maximum v/c Ratio: 0.52			
Intersection Signal Delay: 8.5	Intersection LOS: A		
Intersection Capacity Utilization 60.8%	CU Level of Service B		
Analysis Period (min) 15			
Splits and Phases: 2: Fringewood Dr/Site Access	& Hazeldean Rd	1 1	
🖌 Ø1 🕴 🚽 Ø2 (R)		♥ Ø4	
15 s 63 s		37 s	
◆	Ref - Bar	↑ø8	
78 s		37 s	

20 Cedarow Ct 2029 Ultimate AM

ntersection												
nt Delay, s/veh	0.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	5	≜ ₽			d'b			4			\$	
Traffic Vol, veh/h	13	916	0	0	635	18	0	0	0	4	0	10
Future Vol, veh/h	13	916	0	0	635	18	0	0	0	4	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Contro	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	700	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage,	# -	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	916	0	0	635	18	0	0	0	4	0	10
Major/Minor N	Aajor1		1	Major2			Vinor1		1	Minor2		
Conflicting Flow All	653	0	0	916	0	0	1260	1595	458	1128	1586	327
Stage 1	-	-	-	-	-	-	942	942	-	644	644	-
Stage 2				-			318	653	-	484	942	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-			-			6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2,22	-	-	2,22	-	-	3,52	4.02	3,32	3,52	4,02	3,32
Pot Cap-1 Maneuver	930	-	-	740	-	-	127	106	550	159	107	669
Stage 1	-	-	-	-	-	-	283	340	-	428	466	-
Stage 2	-	-	-	-	-	-	668	462	-	533	340	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	930	-	-	740	-	-	124	105	550	157	106	669
Mov Cap-2 Maneuver	-	-	-	-	-	-	124	105	-	157	106	-
Stage 1	-	-	-	-	-	-	279	335	-	422	466	-
Stage 2	-	-	-	-	-	-	658	462	-	526	335	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1	_	_	0	_	_	0	_	_	15.8	_	_
HCM LOS	0.1						Ă			C		
							~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			Ŭ		
Minor Lane/Major Mvm		VBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBI n1			
Capacity (veh/h)	<u> </u>		930	EDI	CON	740	WDI	WDR	346			
HCM Lane V/C Ratio		-	0.014		-	/40			0.04			
HCM Control Delay (s)		0	8.9	-		- 0			15.8			
HCM Control Delay (s) HCM Lane LOS		A	8.9 A		-	A	-		15,8 C			
		A	A 0	-	-	A 0			0.1			
HCM 95th %tile Q(veh)		-	0	-	-	0	-	-	0.1			

# Lanes, Volumes, Timings 1: Iber Rd/Huntmar Dr & Hazeldean Rd

	٨		$\mathbf{r}$	1	+	•	1	Ť	1	1	ŧ	~
ane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBI
ane Configurations	ካካ	<b>≜î</b> ≽		ካካ	<b>^</b>	1	1	<b>↑</b>	1	٦	↑	1
raffic Volume (vph)	242	732	122	318	1049	255	147	332	248	236	356	40
uture Volume (vph)	242	732	122	318	1049	255	147	332	248	236	356	40
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
Shared Lane Traffic (%)												
ane Group Flow (vph)	242	854	0	318	1049	255	147	332	248	236	356	40
fum Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perr
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6	8		8	4		
Detector Phase	5	2		1	6	6	3	8	8	7	4	
Switch Phase												
dinimum nitia (s)	5.0	5.0		5.0	5.0	5.0	5.0	10.0	10.0	5.0	10.0	10.
viinimum Split (s)	11.5	36.3		11.6	36.3	36.3	11.3	39.6	39.6	11.3	39.6	39.
fotal Split (s)	17.0	40.4		21.6	45.0	45.0	15.3	39.6	39.6	18.4	42.7	42.
otal Split (%)	14.2%	33.7%		18.0%	37.5%	37.5%	12.8%	33.0%	33.0%	15.3%	35.6%	35.69
fellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.
All-Red Time (s)	2.8	2.6		2.8	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2
ost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.
fotal Lost Time (s)	6.5	6.3		6.5	6.3	6.3	6.3	6.6	6.6	6.3	6.6	6.
.ead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	La
ead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Ye
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None	None	None	None	Non
Act Effct Green (s)	12.3	39.7		15.3	42.7	42.7	36.5	27.2	27.2	42.8	30.4	30.
Actuated q/C Ratio	0.10	0.33		0.13	0.36	0.36	0.30	0.23	0.23	0.36	0.25	0.2
/c Ratio	0.72	0.77		0.76	0.87	0.36	0.59	0.82	0.46	0.85	0.79	0.6
Contro Delay	74.0	33.9		63.1	46.1	5.1	35.2	60.4	7.2	54.2	54.4	18.
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.
Total Delay	74.0	33.9		63.1	46.1	5.1	35.2	60.4	7.2	54.2	54.4	18,
OS	E	C		E	D	A	D	E	A	D	D	
Approach Delay		42.7			43.0			37.1			39.6	
Approach LOS		D			D			D			D	
Queue Length 50th (m)	31.3	99.1		37.1	126.4	0.0	22.8	73.9	0.0	38.8	77.5	25.
Queue Lenath 95th (m)	#51.9	#130.3		#56.5	#170.3	17.8	35.0	101.7	18.9	#59.7	105.8	57.
nternal Link Dist (m)		228.9			410.4			90.3			231.0	
Furn Bay Length (m)	97.0	22010		133.0		247.0	47.0		65.0	89.0	20110	
Base Capacity (vph)	335	1108		431	1206	703	249	490	596	278	536	65
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	Ű	0		ů.	Ů	0	Ő	Ő	0	0	ů.	
Storage Cap Reductn	Ő	Ő		0	0	ő	ő	Ő	Ő	Ő	Ő	
Reduced v/c Ratio	0.72	0.77		0.74	0.87	0,36	0,59	0.68	0.42	0.85	0.66	0.6
ntersection Summary												
Cycle Length: 120												
Actuated Cycle Length: 120												
Offset: 32 (27%), Reference		e 2:EBT a	nd 6:WB	T. Start o	f Green							
Vatura Cycle: 100												
Control Type: Actuated Coo	rdinated											
Maximum v/c Ratio: 0.87												
	10			1	ntersectio	n LOS: D						
ntersection Signal Delay; 4												

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Lanes, Volumes, Timing 1: Iber Rd/Huntmar Dr &	azeldean Rd			09/27/2019
Intersection Capacity Utilization 91.6	,	CU Level of Service F	-	
Analysis Period (min) 15				
# 95th percentile volume exceeds	pacity, queue may be long	er.		
Queue shown is maximum after	cycles.			
Splits and Phases: 1: Iber Rd/Hur	nar Dr & Haze <b>l</b> dean Rd			1
✓ Ø1		103	04	
21.6 s 40.4 s		15.3 s	42.7 s	
▶ Ø5 € (R)		27	1 Ø8	
17 s 45 s		18.4 \$	39.6 s	

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#### Lanes, Volumes, Timings 2: Fringewood Dr/Site Access & Hazeldean Rd <del>~</del> ~ ~ ~ ۶ $\mathbf{i}$ 4

	هر		$\mathbf{\hat{z}}$	1	+	×.	٩	t	p	1	ţ	4
ane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SE
ane Configurations	7	<b>≜</b> î≽		5	<b>^</b>	1		4		7	î»	
raffic Volume (vph)	18	907	52	126	1400	74	72	5	65	78	5	
uture Volume (vph)	18	907	52	126	1400	74	72	5	65	78	5	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.
Shared Lane Traffic (%)												
ane Group Flow (vph)	18	959	0	126	1400	74	0	142	0	78	27	
fum Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	2	2		1	6	6	8	8		4	4	
Switch Phase												
viinimum Initial (s)	5.0	5.0		5.0	5.0	5.0	10.0	10.0		10.0	10.0	
viinimum Split (s)	32.2	32.2		11.2	32.2	32.2	32,9	32.9		32,9	32.9	
otal Split (s)	65.0	65.0		19.0	84.0	84.0	36.0	36.0		36.0	36.0	
otal Split (%)	54.2%	54.2%		15.8%	70.0%	70.0%	30.0%	30.0%		30.0%	30.0%	
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.0	3.0		3.0	3.0	
All-Red Time (s)	2,5	2.5		2.4	2.5	2.5	3,9	3.9		3,9	3.9	
ost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
fotal Lost Time (s)	6.2	6.2		6.1	6.2	6.2		6.9		6.9	6.9	
.ead/Lag	Lag	Lag		Lead								
ead Lag Optimize?	Yes	Yes		Yes								
Recall Mode	C-Max	C-Max		None	C-Max	C-Max	None	None		None	None	
Act Effct Green (s)	78.5	78.5		92.5	92.4	92.4		14.5		14.5	14.5	
Actuated g/C Ratio	0.65	0.65		0.77	0.77	0.77		0.12		0.12	0.12	
//c Ratio	80.0	0.44		0.30	0.54	0.06		0.66		0.60	0.12	
Control Delay	10.7	11.4		3.5	3.3	0.4		52.5		67.7	21.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Fotal Delay	10.7	11.4		3.5	3.3	0.4		52.5		67.7	21.0	
.OS	В	В		А	A	Α		D		E	С	
Approach Delay		11.4			3.1			52.5			55.7	
Approach LOS		В			A			D			E	
Queue Length 50th (m)	1.4	51.4		3.8	25.7	0.2		24.9		17.7	1.1	
Queue Length 95th (m)	5.4	80.6		m7.3	44.3	m0.5		43.6		32.2	9.1	
nternal Link Dist (m)		192.4			228.9			159.1			123.4	
furn Bay Length (m)	55.0			95.0		183.0				37.5		
Base Capacity (vph)	224	2201		468	2610	1185		400		263	429	
Starvation Cap Reductn	0	0		0	0	0		0		0	0	
Spillback Cap Reductn	0	0		0	0	0		0		0	0	
Storage Cap Reductn	0	0		0	0	0		0		0	0	
Reduced v/c Ratio	0.08	0.44		0.27	0.54	0.06		0.35		0.30	0.06	
ntersection Summary												
Cycle Length: 120												
Actuated Cycle Length: 120	0											
Offset: 35 (29%), Referenc	ed to phase	e 2:EBTL :	and 6:WE	BTL, Star	t of Greer	1						
Vatural Cycle: 80												
Control Type: Actuated Co	ordinated											
Maximum v/c Ratio: 0.66						n LOS: B						

ntersection Capacity Utilization 76.5%	CU Level of Service D		
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by	y upstream signal.		
Splits and Phases: 2: Fringewood Dr/Site Access	2 Hazaldaan Ed		
opilis and mases. 2. milligewood birolle Access	s a mazejuean r.u	1	
√Ø1 <b>9</b> Ø2 (R)		04	
19 s 65 s		36 s	
19 5 65 5 65 5 65 5 65 5 65 5 65 5 65 5		36 s	

### HCM 2010 TWSC 3: Hazeldean Rd & Cedarow Ct

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ntersection												
nt Delay, s/veh	2,4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	5	<b>≜î</b> ≽			412			\$			\$	
Traffic Vol, veh/h	17	967	0	0	1475	18	0	0	0	20	0	25
Future Vol, veh/h	17	967	0	0	1475	18	0	0	0	20	0	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Contro	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	700	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage	,# -	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mymt Flow	17	967	0	0	1475	18	0	0	0	20	0	25
Major/Minor I	Major1		1	Major2		1	/linor1		1	Minor2		
Conflicting Flow All	1493	0	0	967	0	0	1739	2494	484	2002	2485	747
Stage 1				-			1001	1001		1484	1484	
Stage 2							738	1493	-	518	1001	-
Critical Hdwy	4.14		-	4.14		-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1			-	-		-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2		-	-	-		-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2,22		-	2,22		-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	446	-	-	708		-	56	29	529	35	29	355
Stage 1	-	-	-	-	-	-	260	319	-	131	187	-
Stage 2	-	-	-	-	-	-	376	185	-	509	319	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	446	-	-	708	-	-	51	28	529	34	28	355
Mov Cap-2 Maneuver	-	-	-	-	-	-	51	28	-	34	28	-
Stage 1	-	-	-	-	-	-	250	307	-	126	187	-
Stage 2							350	185	-	490	307	-
ž												
Approach	EB	_	_	WB	_	_	NB	_	_	SB	_	_
HCM Control Delay, s	0.2			0			0			128.7		
HCMLOS							Ā			F		
		VBLn1	EBL	EBT	EBR	WBL	WBT	WBR:	SBLn1			
Minor Lane/Maior Mvm						708			68			
Minor Lane/Major Mvm Canacity (veh/h)		-	446	-								
Capacity (veh/h)		-	446 0.038	-				-	0.662			
Capacity (veh/h) HCM Lane V/C Ratio							-		0.662			
Capacity (veh/h)		-	0.038	-	-	-	-					

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