3288 and 3300 Borrisokane Road, 4205, 4345 and 4375 McKenna Casey Drive

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Forecasting Report

Step 4 Strategy Report

Prepared for:

Barrhaven Conservancy Development Corporation
2934 Baseline Road, Suite 302
Ottawa, ON K2H 1B2

Prepared by:

CGH TRANSPORTATION
13 Markham Avenue
Ottawa, ON K2G 3Z1

October 2021

PN: 2021-115

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1 Screening

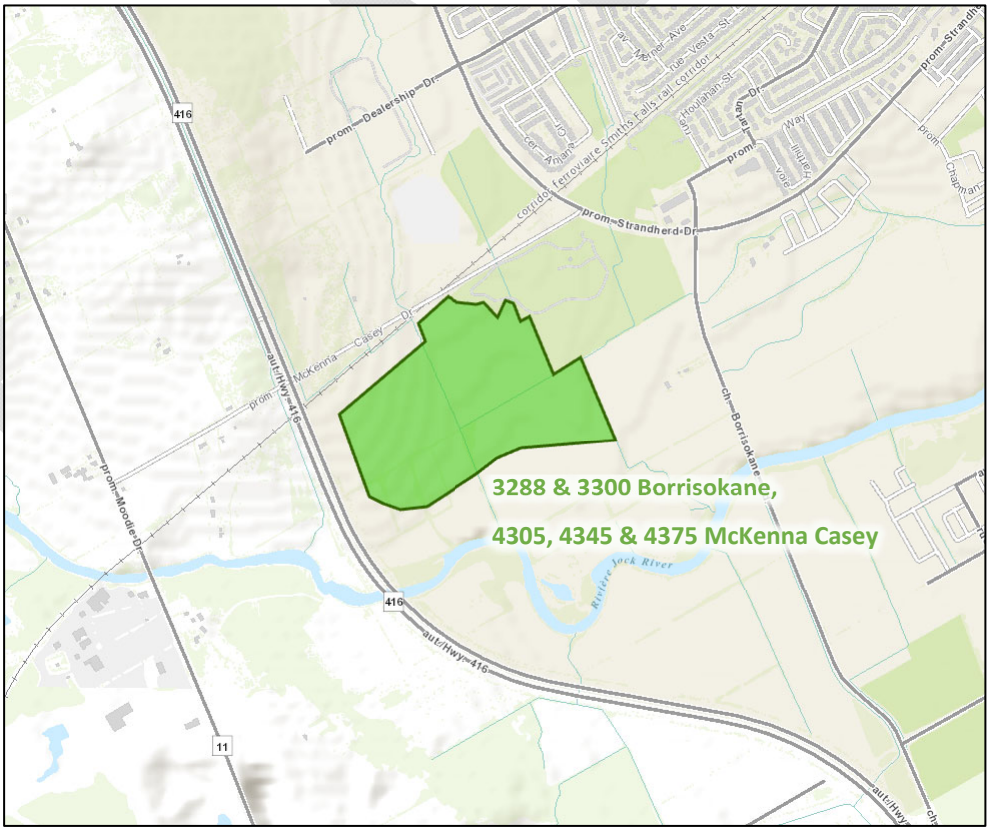
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for TIA Study PM. As shown in the Screening Form, a TIA is required including the Design Review component and the Network Impact Component. This TIA will support a zoning bylaw amendment and a plan of subdivision application.

2 Existing and Planned Conditions

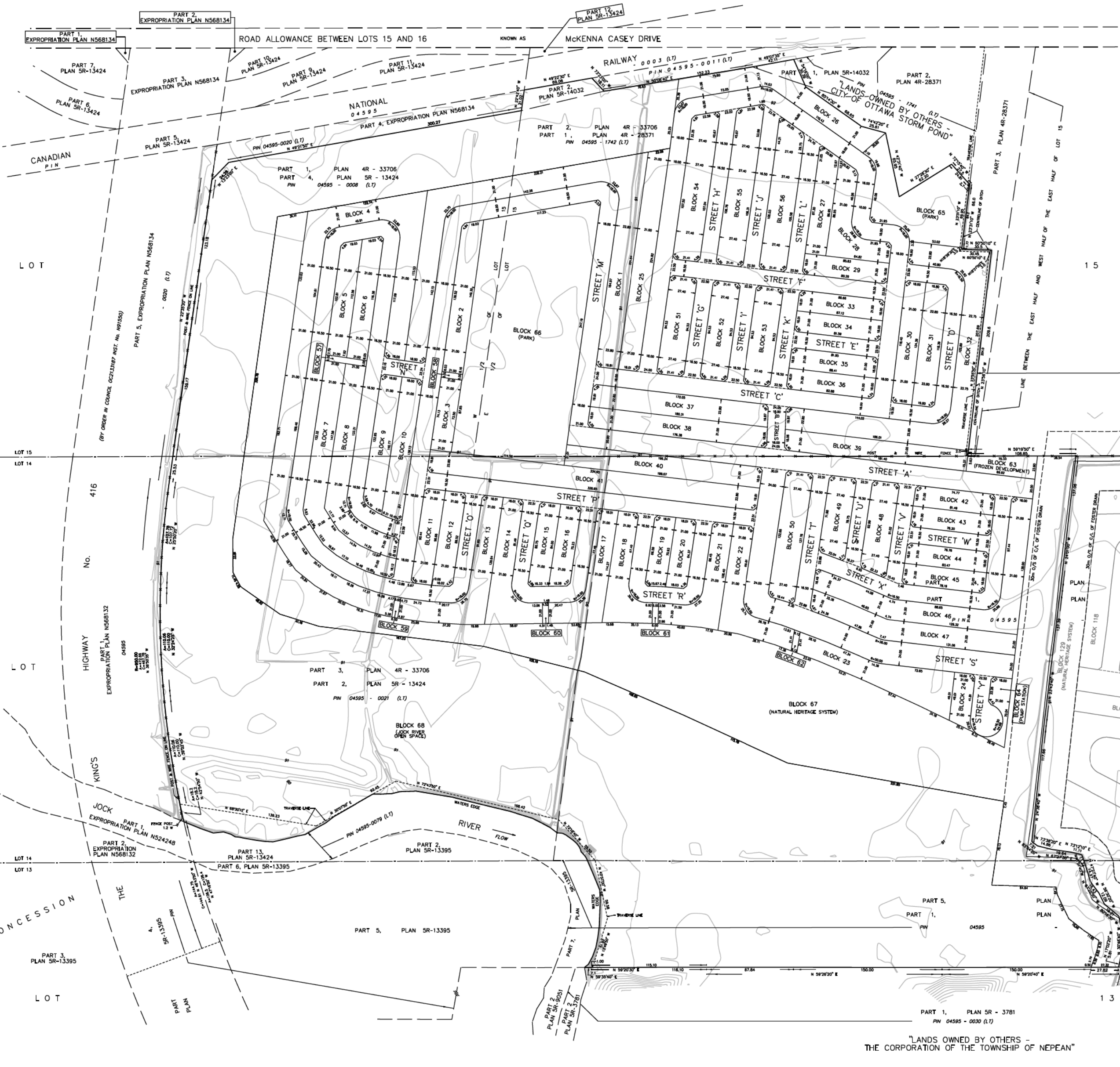
2.1 Proposed Development

The proposed development, located at 3288 and 3300 Borrisokane Road and 4305, 4345 and 4375 McKenna Casey Drive, is zoned as Development Reserve Zone (DR). The proposed development consists of a mix of residential product types, totalling approximately 702 townhomes and 334 single detached homes. The collector roads located within the East Phase will connect the West Phase to the boundary street network on Borrisokane Road. The anticipated full build-out and occupancy horizon is 2030 with construction occurring in a single phase. The site is located within the Nepean South 10 Secondary Plan area. Figure 1 illustrates the Study Area Context. Figure 2 illustrates the proposed concept plan.

Figure 1: Area Context Plan



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: May 24, 2020



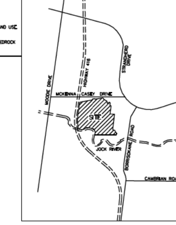
SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED.....................THIS DRAFT PLAN IS APPROVED BY THE CITY OF OTTAWA UNDER SECTION 51 OF THE PLANNING ACT THIS .... DAY OF ...., 2021.

LILY XU, MCIP, RPP, MANAGER
DEVELOPMENT REVIEW SOUTH
PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT,
CITY OF OTTAWA

ADDITIONAL INFORMATION AS REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT R.S.O. 2001

(A)(B)(E)(F)(G)(J) AND (L) - AS SHOWN ON THIS PLAN.
(C) - AS SHOWN ON THIS DRAFT AND KEY PLAN
(D) - LAND TO BE USED IN ACCORDANCE WITH THE SCHEDULE OF LAND USE.
(H)(K) - FULL MUNICIPAL SERVICES
(I) - OFFSHORE MARINE DEPOSITS OF CLAY, SILTY CLAY AND SILT, BEDROCK OTTAWA FORMATION, LIMESTONE

KEY PLAN
(NOT TO SCALE)



SCHEDULE OF LAND USE

LAND USE	BLOCK(S)	AREA (Sq. m)
SINGLES (DETACHED)	1 TO 24, (BOTH INCLUSIVE)	90,580.3
TOWNHOMES	25 TO 47, (BOTH INCLUSIVE)	81,280.9
BACK-TO-BACK TOWNHOMES	48 TO 56, (BOTH INCLUSIVE)	29,101.5
MULTI-USE PATHWAY	57 TO 62, (BOTH INCLUSIVE)	884.5
FROZEN DEVELOPMENT	63	1,362.0
PUMP STATION	64	955.6
PARK	65 AND 66	35,337.9
NATURAL HERITAGE SYSTEM	67	80,201.6
JOCK RIVER OPEN SPACE	68	235,965.0
STREETS	'A' TO 'Y', (BOTH INCLUSIVE)	116,886.0
TOTAL:		672,555.3

DRAFT PLAN OF SUBDIVISION

PART OF LOTS 13, 14 AND 15 CONCESSION 4 (RIDEAU FRONT)

GEOGRAPHIC TOWNSHIP OF NEPEAN

CITY OF OTTAWA

SCALE 1 : 1250

J.D. BARNES LIMITED

METRIC DISTANCES AND/OR COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

NOTES

BOUNDARY INFORMATION IS COMPILED FROM PLAN 4R-33706.

TOPOGRAPHIC DETAIL SHOWN ON THIS PLAN WAS COMPLETED ON THE 15th DAY OF DECEMBER, 2017.

DISTANCES ARE GROUND

ALL DISTANCES ON CURVES ARE ARC DISTANCES UNLESS OTHERWISE SPECIFIED

ELEVATION NOTE

ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM MINISTRY OF TRANSPORTATION CONTROL MONUMENT 0011968U001 HAVING A PUBLISHED ELEVATION OF 78.945 METRES.

LEGEND

CONTOUR INTERVALS ARE SHOWN AS 1.00m FOR MAJOR AND 0.25m FOR MINOR
DENOTES MAJOR CONTOUR
DENOTES MINOR CONTOUR

OWNER'S CERTIFICATE

BARRHAVEN CONSERVANCY DEVELOPMENT CORPORATION, BEING THE REGISTERED OWNER OF THE SUBJECT LANDS HEREBY AUTHORIZES J. D. BARNES LIMITED TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION FOR APPROVAL.

DATE — FOR REVIEW
FRANK CAIRO
PRESIDENT
'I HAVE THE AUTHORITY TO BIND THE CORPORATION'

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED ARE CORRECTLY SHOWN.

DATE — PRELIMINARY
SHAWN LEROUX
ONTARIO LAND SURVEYOR

J.D.BARNES LIMITED
SURVEYING MAPPING GIS
LAND INFORMATION SPECIALISTS
62 STEACIE DRIVE, SUITE 103, KANATA, ON K2K 2A9
T: (613) 731-7244 F: (613) 254-8659 www.jdbarnes.com

DRAWN BY: N.S.	CHECKED BY: S.L.	REFERENCE NO.: 16-10-127-00 (McKenna Casey Dr)
PLOTTED: 10/15/2021		DATED: 10/13/21

JDB V1

FILE: G:\16-10-127\00\Drawings\Draft Plan\McKenna Casey Dr\16-10-127_DPMcKennaCaseyDr.dgn

2.2 Existing Conditions

2.2.1 Area Road Network

Borrisokane Road: Borrisokane Road is a City of Ottawa arterial road with a two-lane rural cross-section including gravel shoulders and an 80 km/h posted speed limit along the frontage of the site. South Cambrian Road, Borrisokane Road becomes a collector road, the cross section does not change. The City-protected right-of-way is 37.5 metres rights through the subject site.

Strandherd Drive: Strandherd Drive is a City of Ottawa arterial road with a two-lane rural cross-section including paved shoulders. The posted speed limit is 80 km/h, and the City-protected right-of-way is 44.5 metres. No sidewalks are provided along the section of Strandherd Drive within the study area.

Kennevale Drive: Kennevale Road is a City of Ottawa collector road with an urban two-lane cross-section permitting parking on both sides of the roadway. Sidewalks are provided on both sides of the road and the posted speed limit is 40 km/h. The existing right-of-way is 20.0 metres.

Dealership Way: Dealership Way is a City of Ottawa collector road with an urban two-lane cross-section permitting parking on both sides of the roadway. Sidewalks are provided on both sides of the road and the posted speed limit is 40 km/h. The existing right-of-way is 24.0 metres.

Tartan Drive: Tartan Drive is a City of Ottawa collector road with a two-lane rural cross-section including gravel shoulders and a 40 km/h posted speed limit, near Strandherd Drive. The existing right-of-way is 26.0 metres.

McKenna Casey Drive: McKenna Casey Drive is a City of Ottawa local road with a two-lane rural cross-section including gravel shoulders. The posted speed limit changed from 60 km/h to 80 km/h at approximately 70 metres west of the Strandherd Drive at McKenna Casey Drive intersection. The existing right-of-way is 20.0 metres.

2.2.2 Existing Intersections

The existing signalized area intersections within approximately one kilometre of the site have been summarized below:

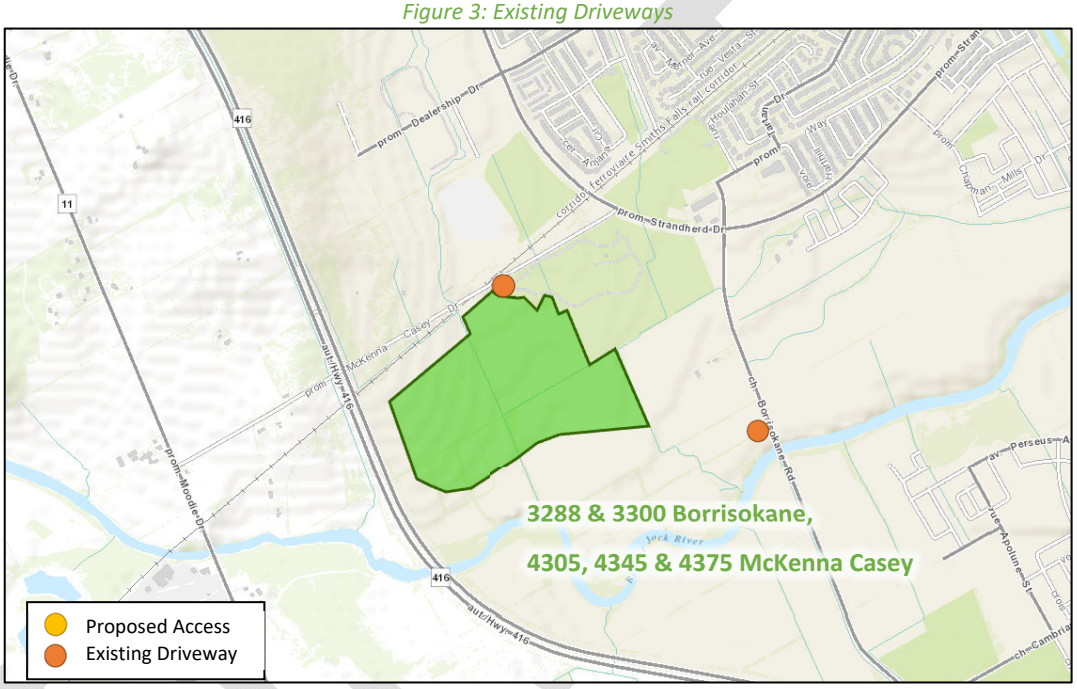
Strandherd Drive at Kennevale Drive/Dealership Way	The intersection of Strandherd Dive and Kennevale Drive/Dealership Way is a signalized intersection. The northbound, southbound, and eastbound approaches consist of an auxiliary left-turn lane, through lane and an auxiliary right-turn lane. The westbound approach consists of an auxiliary left-turn lane and a shared through/right-turn lane. Bike pockets are provided on the north and south bound approaches. No turn restrictions were noted.
Strandherd Drive at Borrisokane Road/Tartan Drive	The intersection of Strandherd Drive at Borrisokane Road/Tartan Drive is a signalized intersection with left turn auxiliary lanes on all approaches. Crosswalks are present on each leg of the intersection; however, these do not connect to sidewalks. West of the intersection an at grade cycling lane is provided alongside an auxiliary right turn lane into an adjacent development. Further east and west of the intersection paved shoulders are provided. No turn restrictions were noted.

Strandherd Drive at McKenna Casey Drive	The intersection of Strandherd Drive at *McKenna Casey Drive* is an unsignalized intersection. The eastbound approach consists of a shared through/right-turn lane, the westbound approach consists of a shared through/left-turn lane, and the northbound approaches consist of a shared left-turn/right-turn lane. No turn restrictions were noted.

2.2.3 Existing Driveways

Within 200 metres of the site accesses, a private driveway on Baycrest Drive and a private driveway on McKenna Casey Drive. None of the driveways within the area of consideration are significant traffic generators. Figure 3 illustrates the existing driveways.

Figure 3: Existing Driveways



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: October 14, 2021

2.2.4 Cycling and Pedestrian Facilities

Strandherd Drive and McKenna Casey Drive is noted on the City of Ottawa's Existing Cycling Network as a "Paved Shoulder". No pedestrian facilities are provided along either Strandherd Drive or Borrisokane Road. Both networks are developing in the area and will include sidewalks and cycling tracks along Strandherd Drive, and future pathways are planned along the Jock River and Chapman Mills BRT corridor.

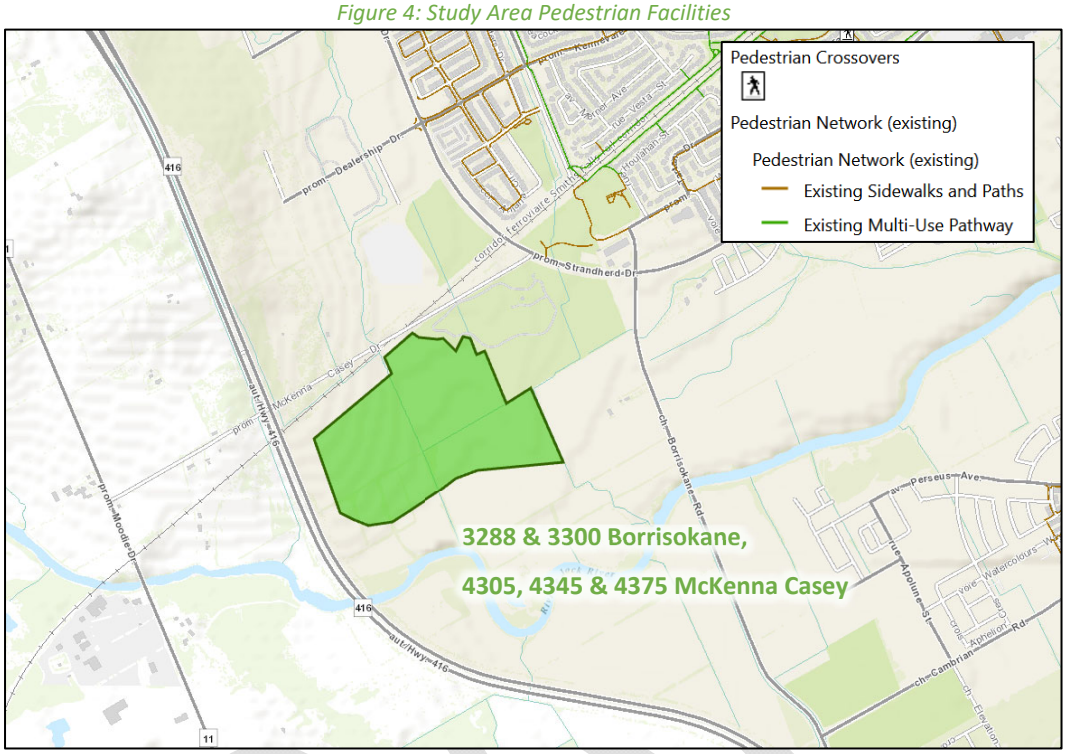
Strandherd Drive is spine route, and Borrisokane Road and McKenna Casey Drive are local routes. Major pathways are provided along rail, Strandherd Drive, Jock River and Highway 416.

Figure 4 illustrates the pedestrian facilities in the study area and Figure 5 illustrates the cycling facilities.

Strandherd Drive and McKenna Casey Drive is noted on the City of Ottawa's Existing Cycling Network as a "Paved Shoulder". No pedestrian facilities are provided along either Strandherd Drive or Borrisokane Road. Both networks are developing in the area and will include sidewalks and cycling tracks along Strandherd Drive, and future pathways are planned along the Jock River and Chapman Mills BRT corridor.

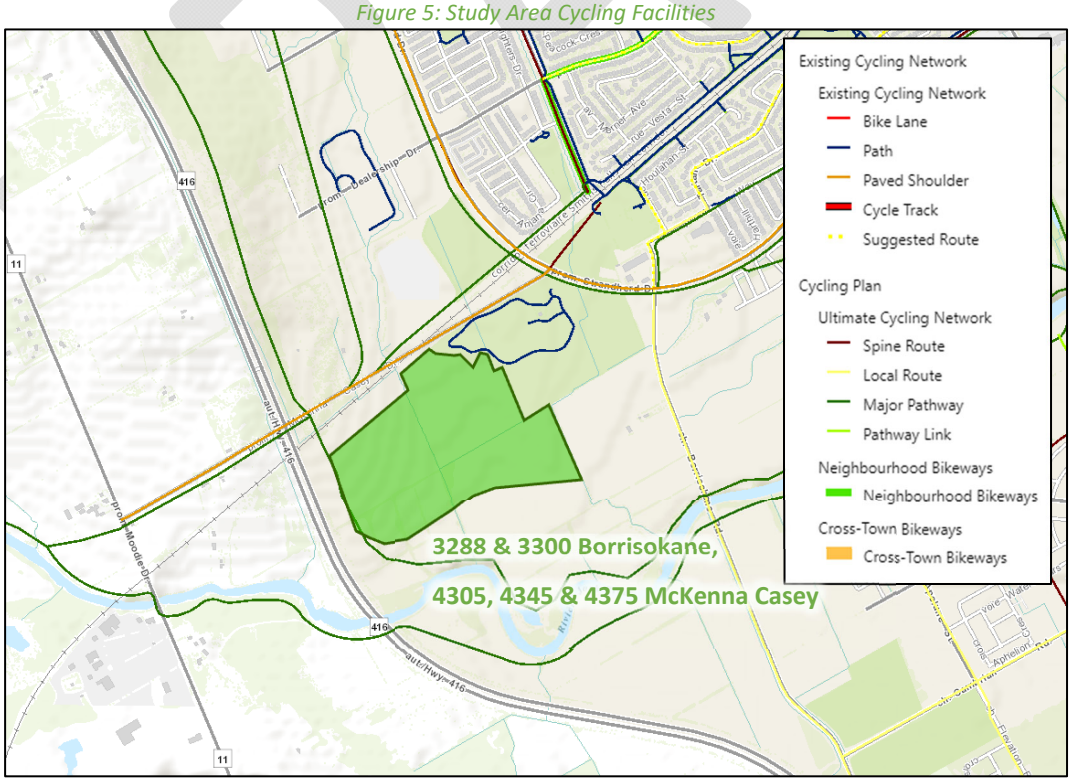
Strandherd Drive is spine route, and Borrisokane Road and McKenna Casey Drive are local routes. Major pathways are provided along rail, Strandherd Drive, Jock River and Highway 416.

Figure 4: Study Area Pedestrian Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: October 14, 2021

Figure 5: Study Area Cycling Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: October 14, 2021

Pedestrian and cyclist volumes included in study area intersection counts, presented in Section 2.2.7, have been compiled and are illustrated in Figure 6 and Figure 7, respectively. Only the intersections of Kennevale at Strandherd, and Borrisokane at Strandherd had pedestrian and cyclist volumes available.

Figure 6: Existing Pedestrian Volumes

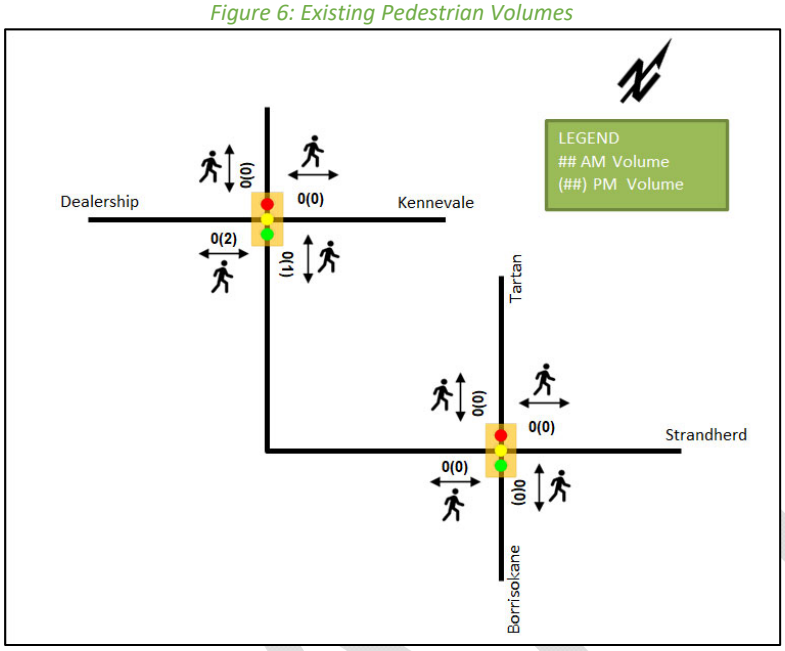
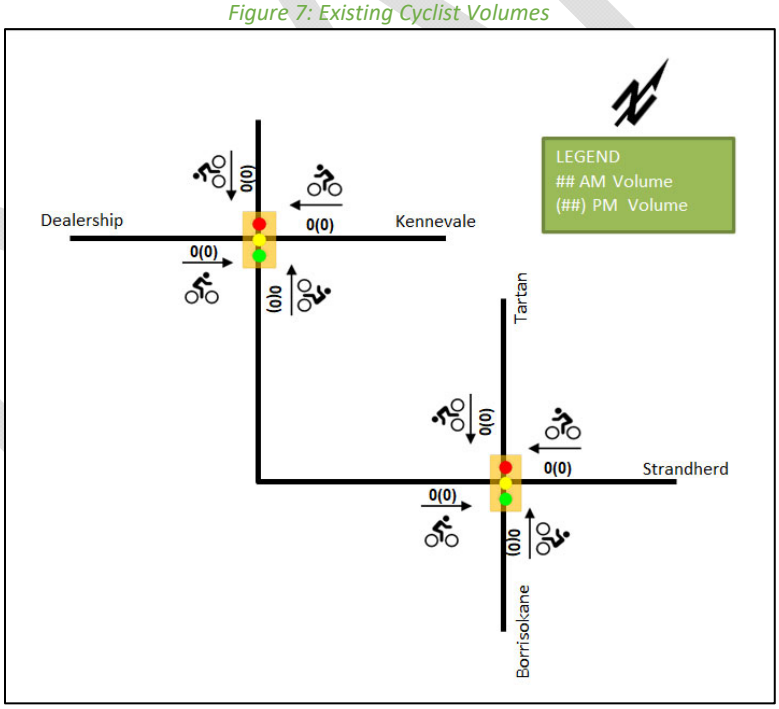


Figure 7: Existing Cyclist Volumes

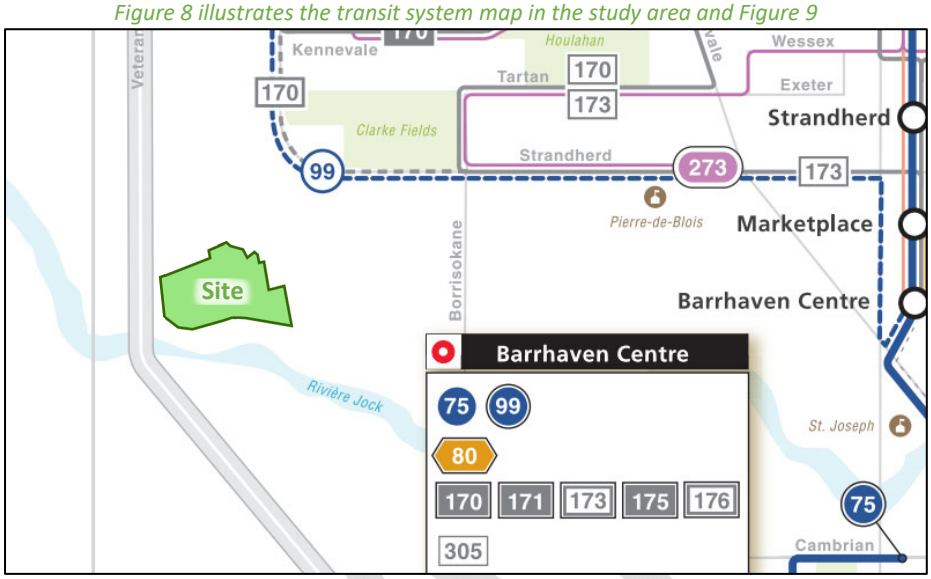


2.2.5 Existing Transit

Within the study area, the routes #170, 173 and 273 provide service within 800 metres of the proposed site. Primary stops are located on Tartan Dive north of Strandherd Drive. The frequency of these routes within proximity of the proposed site currently are:

- Route #170 – 30-minute service during evenings and weekdays
- Route #173 – 1-hour service during the day (assumed reduced service from typical 30-minute service during peak hour)
- Route #273 – Peak hour service only, with trips starting at 6:00 to 8:35 AM every 20-30 minutes to downtown, returned 3:30 to 6:25 PM to Strandherd Drive and Jockvale Road

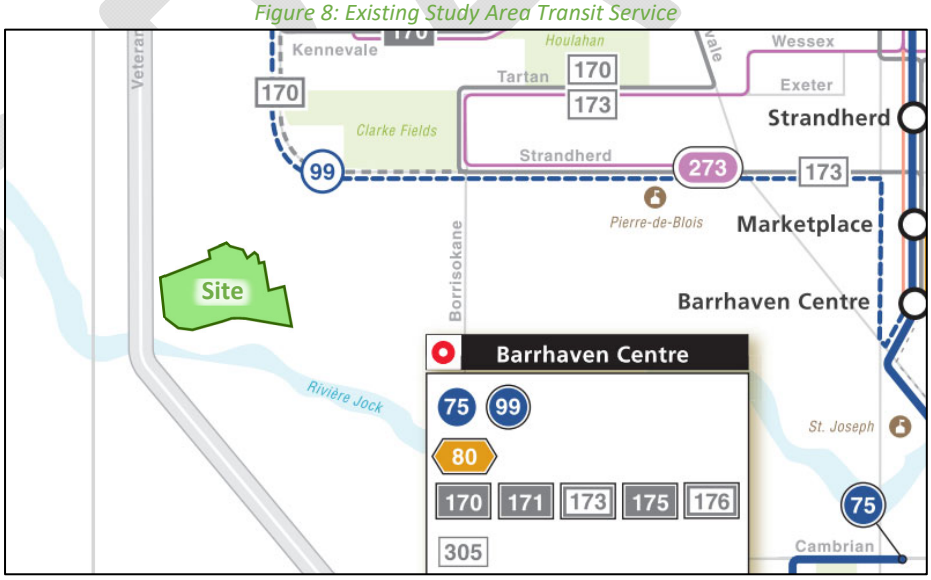
Figure 8 illustrates the transit system map in the study area and Figure 9



Source: http://www.octranspo.com/ Accessed: October 14, 2021

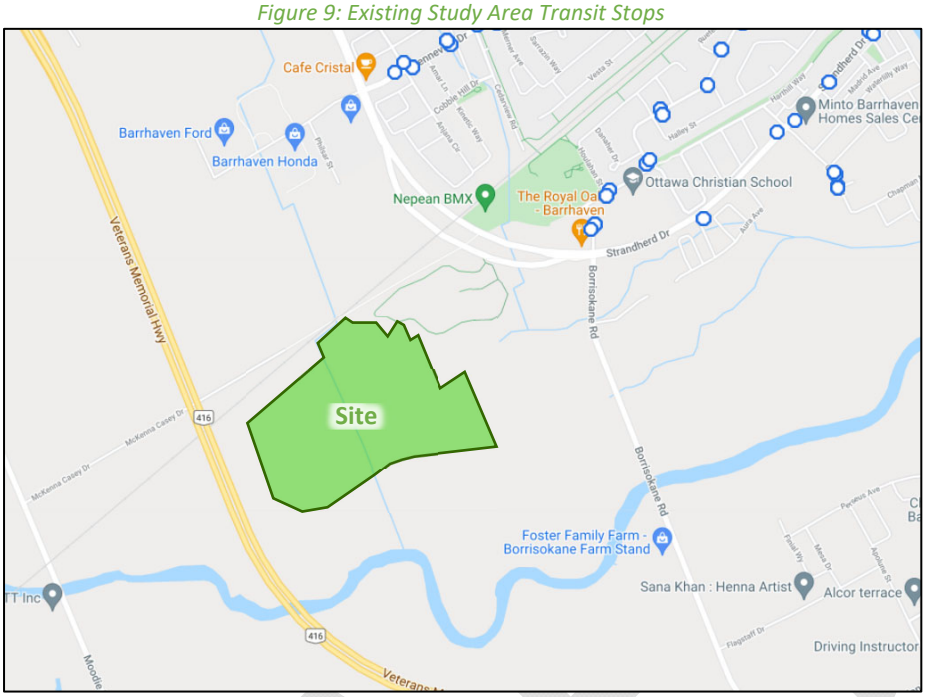
illustrates nearby transit stops.

Figure 8: Existing Study Area Transit Service



Source: http://www.octranspo.com/ Accessed: October 14, 2021

Figure 9: Existing Study Area Transit Stops



Source: http://www.octranspo.com/ Accessed: October 14, 2021

2.2.6 Existing Area Traffic Management Measures

There are no existing area traffic management measures within the Study Area.

2.2.7 Existing Peak Hour Travel Demand

Existing turning movement counts were acquired from the City of Ottawa for the existing Study Area intersection. The intersections were also balanced, and the adjacent developments completed, such as Minto Harmony and Caivan Conservancy Phase 1, have been included to account for additional volumes along Strandherd Drive. Table 1 summarizes the intersection count dates.

Table 1: Intersection Count Date

Intersection	Count Date
Kennevale Drive at Strandherd Drive	January 18, 2018
Borrisokane Road at Strandherd Drive	January 18, 2018

Figure 10 illustrates the existing traffic counts and Table 2 summarizes the existing intersection operations. The level of service for signalized intersections is based on HCM 2010 calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. Detailed turning movement count data is included in Appendix B and the Synchro worksheets are provided in Appendix C.

Figure 10: Existing Traffic Counts

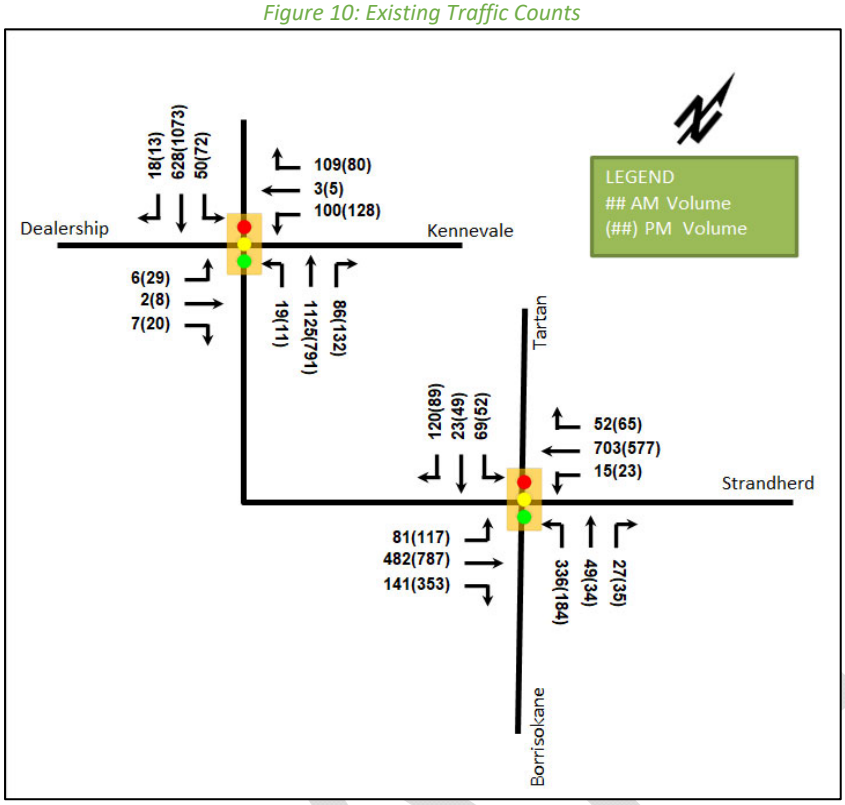


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Dealership Way/Kennevale Drive *Signalized*	EBL	A	0.06	43.5	5.5	A	0.17	42.9	14.6
	EBT	A	0.01	41.5	2.7	A	0.03	39.0	6.0
	EBR	A	0.03	0.1	0.0	A	0.07	0.5	0.0
	WBL	B	0.66	66.8	41.2	C	0.74	70.0	50.3
	WBT/R	A	0.42	12.7	16.4	A	0.32	12.3	14.7
	NBL	A	0.05	10.1	5.8	A	0.11	15.1	5.1
	NBT	**F**	**1.10**	**80.9**	**#447.0**	D	0.82	26.9	**#275.3**
	NBR	A	0.10	2.7	7.5	A	0.16	4.8	14.5
	SBL	A	0.41	20.6	13.8	A	0.29	8.2	11.1
	SBT	A	0.57	9.1	108.2	E	0.96	33.6	**#377.2**
	SBR	A	0.02	0.9	1.3	A	0.01	0.5	0.7
	Overall	**F**	**1.03**	**49.5**	-	**E**	**0.98**	**29.8**	-
Strandherd Drive & Borrisokane Road/Tartan Drive *Signalized*	EBL	E	0.92	**99.9**	**#46.0**	A	0.47	18.8	34.3
	EBT	B	0.63	20.8	102.4	D	0.85	25.9	**#230.3**
	EBR	A	0.20	2.8	9.0	A	0.38	2.4	12.8
	WBL	A	0.06	12.6	4.9	A	0.15	12.6	7.5
	WBT/R	E	0.97	47.3	**#228.5**	C	0.71	18.4	**#154.0**
	NBL	E	0.96	69.3	**#120.8**	C	0.77	47.7	52.2
	NBT/R	A	0.14	15.1	16.3	A	0.19	14.4	13.9
	SBL	A	0.18	22.8	20.0	A	0.21	25.4	16.1
	SBT/R	A	0.26	6.9	15.9	A	0.34	11.8	19.8
	Overall	**E**	**0.96**	**38.8**	-	**D**	**0.82**	**20.4**	-

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 0.90
m = metered queue
# = queue exceeds storage or mid-block length

During both the AM and PM peak hours, the study area intersections are subject to queuing issues generally and capacity issues on various movements.

At the intersection of Strandherd Drive & Dealership Way/Kennevale Drive, the northbound through movement during AM peak hour is over theoretical capacity and may subject to high delays and extended queues. Extended queues may be exhibited on the northbound through and southbound through movements during PM peak hour.

The intersection of Strandherd Drive & Borrisokane Road/Tartan Drive may subject to extended queues on the westbound shared through/right-turn movement, northbound shared through/right-turn movement, and both extended queues and high delay on the eastbound left-turn movement during the AM peak hour. It may also be subject to extended queues on the eastbound through movement and westbound shared through/right-turn movement during PM peak hour.

2.2.8 Collision Analysis

Collision data have been acquired from the City of Ottawa open data website (data.ottawa.ca) for five years prior to the commencement of this TIA for the surrounding study are road network. Table 3 summarizes the collisions types and conditions in the study area, Figure 11 illustrates the intersections and segments analyzed, and Table 4 summarizes the total collisions for each of these locations. Collision data are included in Appendix D.

Table 3: Study Area Collision Summary, 2014-2018

		Number	%
Total Collisions		**42**	100%
Classification	Fatality	0	0%
	Non-Fatal Injury	11	26%
	Property Damage Only	31	74%
Initial Impact Type	Angled	1	2%
	Rear end	2	5%
	Sideswipe	18	43%
	Turning Movement	3	7%
	SMV Unattended	1	2%
	SMV Other	16	38%
	Other	1	2%
Road Surface Condition	Dry	23	55%
	Wet	8	19%
	Loose Snow	4	10%
	Slush	2	5%
	Packed Snow	5	12%
	Ice	23	55%
	Unknown	8	19%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

Figure 11: Study Area Collision Records – Representation of 2015-2019

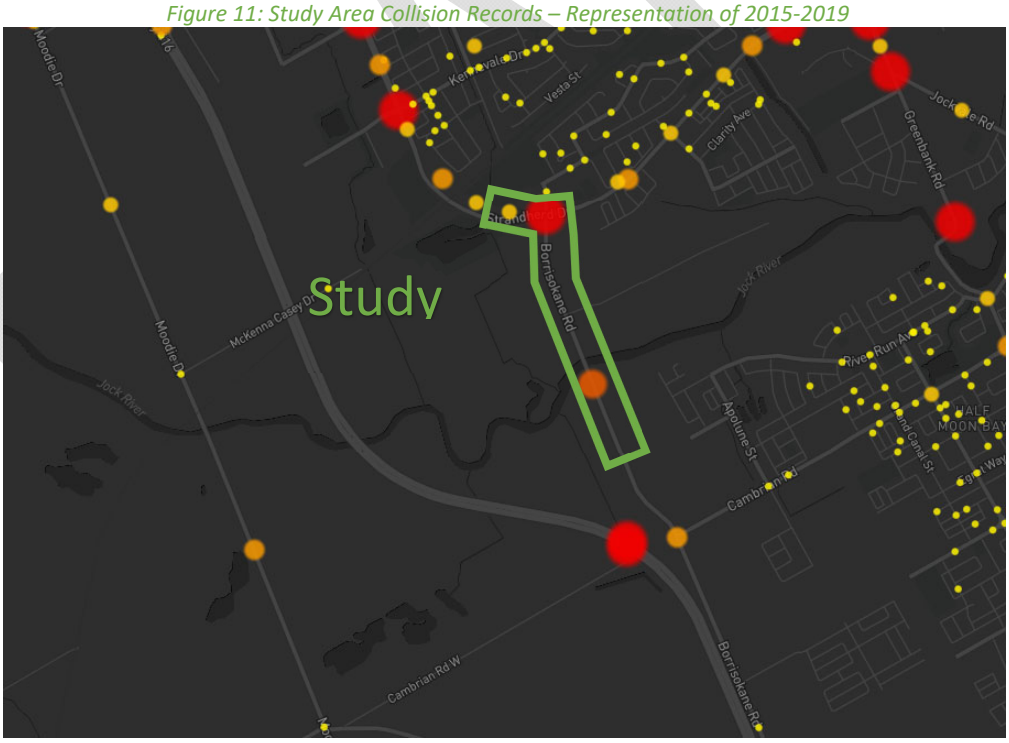


Table 4: Summary of Collision Locations, 2015-2019

	Number	%
Intersections / Segments	**42**	**100%**
Borrisokane Rd/Tartan Dr @ Strandherd Dr	19	45%
Strandherd Dr Btwn Cedarview Rd & Mckenna Casey Dr	5	12%
Borrisokane Rd Btwn Cambrian Rd & Strandherd Dr	18	43%

Within the study area, the intersection of Borrisokane Road/Tartan Drive at Strandherd Drive and Borrisokane Road Between Cambrian Road & Strandherd Drive are noted to have experienced higher collisions than other locations. Table 5 and Table 6 summarize the collision types and conditions for these locations.

Table 5: Borrisokane Road/Tartan Drive at Strandherd Drive Collision Summary

		Number	%
Total Collisions		**19**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	5	26%
	Property Damage Only	14	74%
Initial Impact Type	**Angle**	2	11%
	Rear end	13	68%
	Sideswipe	2	11%
	Turning Movement	1	5%
	SMV Other	1	5%
Road Surface Condition	**Dry**	9	47%
	Wet	5	26%
	Loose Snow	1	5%
	Packed Snow	2	11%
	Ice	2	11%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

The Strandherd Drive and Borrisokane Road intersection had a total of 19 collisions during the 2015-2019 time period, with 14 involving property damage only and the remaining five having non-fatal injuries. The collision types are most represented by rear end with 13 collisions, angle and sideswipe each with two collisions, and the remaining turning movement and SMV Other one collision. The rear end collisions are typical of congested conditions. Weather conditions do not influence collisions at this location.

Table 6: Borrisokane Road Between Cambrian Road and Strandherd Drive Collision Summary

		Number	%
Total Collisions		**18**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	3	17%
	Property Damage Only	15	83%
Initial Impact Type	**Rear end**	2	11%
	SMV Other	15	83%
	Other	1	6%
Road Surface Condition	**Dry**	11	61%
	Wet	2	11%
	Loose Snow	2	11%
	Ice	3	17%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

The segment of Borrisokane Road between Cambrian Road and Strandherd Drive had a total of 18 collisions during the 2015-2019 time period, with a 15-property damage only and three non-fatal injuries. The collision types are most represented by SMV Other with 15 collisions, rear end with two collisions, and a single collision for other. The rural nature of the roadway may be the cause of these collisions, from running off the road or animal strikes. Weather conditions do not influence collisions at this location

2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

Strandherd Drive Widening (Maravista Drive to Jockvale Road)

The widening of Strandherd Drive is underway from two to four lanes is currently underway. It is anticipated that this will be completed by 2022 and include the reconstruction of the Borrisokane Road at Strandherd Drive intersection. The McKenna Casey Drive connection to Strandherd Drive will be removed and it will end to the west of the CN rail line and Gregory Casey stormwater pond.

Chapman Mills Drive Extension

While beyond the study area, the environmental assessment study was completed in 2016 for the Chapman Mills Drive Extensions and Bus Rapid Transit corridor between Strandherd Drive and Longfields Drive, with the BRT corridor continuing separately to Borrisokane Road. As part of the development in the area, Chapman Mills Drive has been completed on the north-south section from Strandherd to Canoe Street, with an interim road east to the Kennedy-Burnett Stormwater Pond. The roadway is included within the Affordable Network for 2031 and the BRT portion is anticipated to be constructed post 2031. It is understood that the design will be initiated for 2023 with construction subsequent to this in an interim configuration.

Greenbank Road Re-Alignment

While not within the study area, Greenbank Road is planned to be re-aligned from near the existing Jockvale Road intersection with a new bridge crossing to the north of the existing Jock River crossing, and loop around Mattamy's Half Moon Bay North development and connect to Cambrian Road approximately 1.1km to the west of the existing alignment. The construction for Greenbank Road has been delayed as to advance the Strandherd Drive widening, likely to beyond 2031.

Barnsdale Road Highway 416 Interchange

A new interchange at Barnsdale Road to Highway 416 is currently being negotiated with the Ministry of Transportation Ontario to support the existing and future growth within Barrhaven, specifically south of the Jock River and adjacent to the Fallowfield Drive interchange. The interchange is anticipated to be completed post 2031.

2.3.2 Other Study Area Developments

3195 Jockvale Road

The development is proposed to be a mix of 210 stacked townhome units and approximately 200,000 sq. ft. of retail space, located between the Barrhaven Towncentre and the On The Green golf range. The development will extend Jockvale Road south of the Barrhaven Towncentre and include a new signalized intersection on Greenbank Road. It is estimated that the development will be constructed by 2026.

Harmony Phase 5 – 3232 Jockvale Road

This development is proposed to include a total of 310 apartment units and 602 townhome units and is located on the west side of Greenbank Road, north of the future Chapman Mills Drive corridor. It is estimated that the development will be constructed by 2025.

3201 Greenbank Road
Recently constructed, approximately 11,000 ft2 of retail and an 8,000 ft2 restaurant space will be incorporated into the existing retail development of the Loblaws and Home Sense.

3288 Greenbank Road
The development is proposed to be a mix of 310 apartment units and 602 townhome units, located between the future Chapman Mills Drive alignment on the north and the Claridge development (3370 Greenbank Road) to the south. It is estimated that the development will be constructed by 2025.

3370 Greenbank Road
This development is proposed to include 177 townhomes in Phase 1, 70 townhomes in Phase 2 and 720 condo units in Phase 3. Originally proposed to be completed by 2020, the plan of subdivision application is currently pending, and the Official Plan and Zoning By-Law Amendment have been adopted.

Riversbend – 3311 Greenbank Road
A residential subdivision is under construction south of St Joseph High School, in conjunction with the City of Ottawa. A total 144 townhome units (25 within City lands), and 64 mid-rise units (City) will ultimately be constructed within the proposed lands.

Half Moon Bay South Phase 5
The Mattamy Development of Half Moon Bay South Phase 5 is located east of Re-Aligned Greenbank Road and south of Dundonald Drive and is expected to be built-out during 2020. The development will consist of 164 single detached home units and 97 townhouse units. This development is expected to produce 180 two-way AM peak period auto trips and 207 two-way PM peak period auto trips. (CGH 2019)

Half Moon Bay West
The Mattamy Development of Half Moon Bay West is located north of Cambrian Road and east of Borrisokane Road and is expected to be built-out during 2024. This development will include 552 single family homes and 464 townhomes. This development is expected to produce 786 two-way AM peak period auto trips and 1193 two-way PM peak period auto trips. (Stantec 2016)

Half Moon Bay North Phase 9- 2444 Watercolours Way
North of the proposed development is the Half Moon Bay North Phase 9 development which is expected to be built-out during 2019. This development will consist of 60 stacked townhouses. This development is expected to produce 74 two-way AM peak period auto trips and 80 two-way PM peak period auto trips. (Stantec 2018)

Quinn's Pointe 2- 3882 Barnsdale and 3960 Greenbank Road
The Minto Development of Quinn's Pointe 2 is located west of Greenbank Road and north of Barnsdale Road. This development will include 536 single-family dwelling units, 493 townhomes, 100 apartment units, and two elementary schools, anticipated over 2 phases of construction for the horizon year of 2024. A total of 749 two-way AM peak period auto trips and 813 two-way PM peak period auto trips are expected from this development (Stantec 2018)

The Meadows Phase 4
Phase 4 of the Meadows Tamarack Development was expected to be built out during 2019 and is located south of Cambrian Road on the east side of Re-Aligned Greenbank Road. Phase 4 will have 136 townhouse units and 50 single family units This development is anticipated to produce 142 two-way AM peak period auto trips and 171 two-way PM peak period auto trips. (IBI 2018)

The Meadows Phase 5

Phase 5 of the Meadows Tamarack Development is located south of Cambrian Road on the west side of Re-Aligned Greenbank Road. However, it is understood that while this application is on the City of Ottawa's Development Applications site, the TIA has not been approved.

3387 Borrisokane Road

North of Cambrian Road is the Glenview Development of 3387 Borrisokane Road which is expected to be built-out during 2022. The development is expected to have 179 single family units and 109 townhouses. The development is anticipated to produce 137 two-way AM peak period auto trips and 174 two-way PM peak period auto trips. (Stantec 2016)

Citi-Gate Development

North of the proposed development is the Citi Gate Corporate Campus. This development will include 32,516 square metres allocated towards a shopping centre, 165,600 square metres allocated towards business parks and 105,000 square metres allocated towards car dealerships. The full build-out year is 2029 and is expected to produce 4,267 two-way AM peak period auto trips and 4,848 two-way PM peak period auto trips. (Novatech 2012)

The new phase of CitiGate has not been incorporated as it will address the issues north of Kennevale Drive to the Highway 416 interchange as part of its scope.

4401 Fallowfield Road Development

This development will not have shared accesses or traffic cross-over but will impact the Study Area intersections. The site trips generated by this site will be accounted for in the traffic projections using the 3285 Borrisokane Road TIS for Phase 1 of the Conservancy Development documenting the 4401 Fallowfield Road traffic volumes.

Harmony Development – 4025 Strandherd Drive

The Minto Communities development of 4025 Strandherd Drive has been constructed and the traffic for this site has been included within the existing conditions.

Conservancy Phase 1 – 3285 Borrisokane Road

On the south side of the Chapman Mills Drive corridor is 3285 Borrisokane Road which is expected to be built-out during 2020. This development will include 125 single family homes and 75 townhouses. This development is expected to produce 129 two-way AM peak period auto trips and 146 two-way PM peak period auto trips. (Parsons 2018)

The Ridge/Brazeau – 3809 Borrisokane Road

The proposed development includes 590 residential units, split between townhouse units and detached home units. The site is located on the west side of Re-Aligned Greenbank Road and is expected to produce 401 two-way AM peak period auto trips and 457 two-way PM peak period auto trips. (CGH 2019)

Drummond Subdivision – 3713 Borrisokane Road

Located west of Re-Aligned Greenbank Road is the proposed residential development of 3713 Borrisokane Road. The development will include approximately 123 detached homes and 439 townhouses and is expected to be built-out during 2024. This development is expected to produce 349 two-way AM peak period auto trips and 407 two-way PM peak period auto trips. (CGH 2020)

ABIC Manufacturing – 3713 Borrisokane Road

A light industrial parcel will be developed at 3713 Borrisokane Road along Borrisokane Road and include approximately 3,250 square metres of general office space and 9,385 square metres of industrial buildings and is

expected to be built-out during 2022. This development is expected to produce 122 two-way AM peak period auto trips and 172 two-way PM peak period auto trips. (CGH 2020)

Conservancy East – 3285, 3288 & 3305 Borrisokane Road
The proposed residential development includes approximately 1,300 units, with split of 600 single detached homes, 600 rear lane/townhomes and 100 apartments. The anticipated full build-out and occupancy horizon is 2029. The resulting auto trips for these two scenarios were 849 AM and 968 PM peak two-way trips for the existing mode shares and 637 AM and 726 PM peak for the BRT mode shares. (CGH 2021).

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersection will include:

- Strandherd Drive
  - Dealership Way/Kennevale Drive
  - Tartan Road/Borrisokane Road
- Borrisokane Road
  - Access #1
  - Access #2

No boundary roads are located adjacent to the development. No screenlines are present near the proposed site and any screenline analysis would need extend across Barrhaven to capture each of the north/south or east-west corridors. Therefore, no screenline analysis is included within this TIA study

3.2 Time Periods

As the proposed development is composed entirely of residential units the AM and PM peak hours will be examined.

3.3 Horizon Years

The anticipated build-out year is 2030. As a result, the full build-out plus five years horizon year is 2035.

4 Exemption Review

Table 7 summarizes the exemptions for this TIA.

Table 7: Exemption Review

Module	Element	Explanation	Exempt/Required
Design Review Component			
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plans	Exempt
	4.2.3 New Street Networks	Only required for plans of subdivision	Required
4.2 Parking	4.2.1 Parking Supply	Only required for site plans	Exempt
	4.2.2 Spillover Parking	Only required for site plans where parking supply is 15% below unconstrained demand	Exempt

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	Required
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	Required
4.8 Network Concept		Only required when proposed development generates more than 200 person-trips during the peak hour in excess of equivalent volume permitted by established zoning	Required

5 Development-Generated Travel Demand

5.1 Mode Shares

Examining the mode shares recommended in the TRANS Trip Generation Manual (2020) for the subject district, derived from the most recent National Capital Region Origin-Destination survey (OD Survey), the existing average district mode shares by land use for South Nepean have been summarized in Table 8.

Table 8: TRANS Trip Generation Person Trip Rates

Travel Mode	Single Detached		Multi-Unit (Low-Rise)	
	AM	PM	AM	PM
Auto Driver	51%	53%	49%	49%
Auto Passenger	14%	19%	13%	13%
Transit	25%	18%	26%	24%
Cycling	1%	1%	2%	2%
Walking	9%	10%	9%	12%
Total	**100%**	**100%**	**100%**	**100%**

The widening of Strandherd Drive and the construction of Chapman Mills Drive are scheduled to be constructed within the Study Area by the future horizons of this TIA. The BRT lanes within Chapman Mills Drive are not included in the Affordable Network (2031) and no bus facilities are proposed along Strandherd Drive. Beyond the 2031 horizon, the Chapman Mills BRT is assumed to be in place and the terminus station located on the southwest corner of the Strandherd Drive and Borrisokane Road intersection. As transit will be located in proximity to the proposed subdivision, an increase in transit trips is proposed for the development as a whole. The modified mode share targets are proposed for the development and are summarized in Table 9.

Table 9: Proposed Development Mode Shares

Travel Mode	Single-Detached		Multi-Unit (Low-Rise)	
	AM	PM	AM	PM
Auto Driver	41%	43%	39%	39%
Auto Passenger	14%	19%	13%	13%
Transit	35%	28%	36%	34%
Cycling	1%	1%	2%	2%
Walking	9%	10%	9%	12%
Total	**100%**	**100%**	**100%**	**100%**

5.2 Trip Generation

This TIA has been prepared using the vehicle and person trip rates for the residential dwellings using the TRANS Trip Generation Manual (2020). Table 10 summarizes the person trip rates for the proposed residential land uses for each peak period.

Table 10: Generation Person Trip Rates by Peak Period

Land Use	Land Use Code	Peak Period	Person Trip Rates
Single-Detached	210 (TRANS)	AM	2.05
		PM	2.48
Multi-Unit Low-Rise	220 (TRANS)	AM	1.35
		PM	1.58

Using the above person trip rates, the total person trip generation has been estimated. Table 11 summarizes the total person trip generation for the residential land uses.

Table 11: Total Residential Person Trip Generation by Peak Period

Land Use	Units	AM Peak Period			PM Peak Period		
		In	Out	Total	In	Out	Total
Single-Detached	334	206	480	685	513	315	828
Multi-Unit Low-Rise	702	284	664	948	621	488	1109

Using the above mode share targets for a BRT area, the person trip rates, the person trips by mode have been projected. Table 12 summarizes the trip generation by mode and peak hour using the residential peak hour adjustment factor.

Table 12: Trip Generation by Mode

Travel Mode		AM Peak Hour				PM Peak Hour			
		Mode Share	In	Out	Total	Mode Share	In	Out	Total
Single-Detached	Auto Driver	**46%**	40	95	135	**41%**	97	59	157
	Auto Passenger	**14%**	14	32	46	**19%**	43	26	69
	Transit	**30%**	40	92	132	**30%**	68	41	109
	Cycling	**1%**	1	3	4	**1%**	2	1	4
	Walking	**9%**	11	25	36	**10%**	27	17	43
	Total	**100%**	**103**	**240**	**343**	**100%**	**226**	**139**	**364**
Multi-Unit (Low-Rise)	Auto Driver	**45%**	53	124	178	**43%**	106	84	191
	Auto Passenger	**13%**	18	41	59	**13%**	36	28	63
	Transit	**30%**	56	131	188	**30%**	99	78	177
	Cycling	**2%**	3	8	11	**2%**	6	5	11
	Walking	**9%**	15	35	49	**12%**	39	31	69
	Total	**100%**	**142**	**332**	**474**	**100%**	**273**	**215**	**488**
Total	Auto Driver	-	93	219	313	-	203	143	348
	Auto Passenger	-	32	73	105	-	79	54	132
	Transit	-	96	223	320	-	167	119	286
	Cycling	-	4	11	15	-	8	6	15
	Walking	-	26	60	85	-	66	48	112
	Total	-	**245**	**572**	**817**	-	**499**	**354**	**852**

As shown above, a total of 313 AM and 348 PM new peak hour two-way vehicle trips are projected as a result of the proposed development.

5.3 Trip Distribution

To understand the travel patterns of the subject development the OD Survey has been reviewed to determine the travel for the residential component patterns were applied based on the build-out of South Nepean. Table 13 below summarizes the distributions.

Table 13: OD Survey Distribution – South Nepean

To/From	Residential % of Trips
North	80%
South	5%
East	10%
West	5%
Total	100%

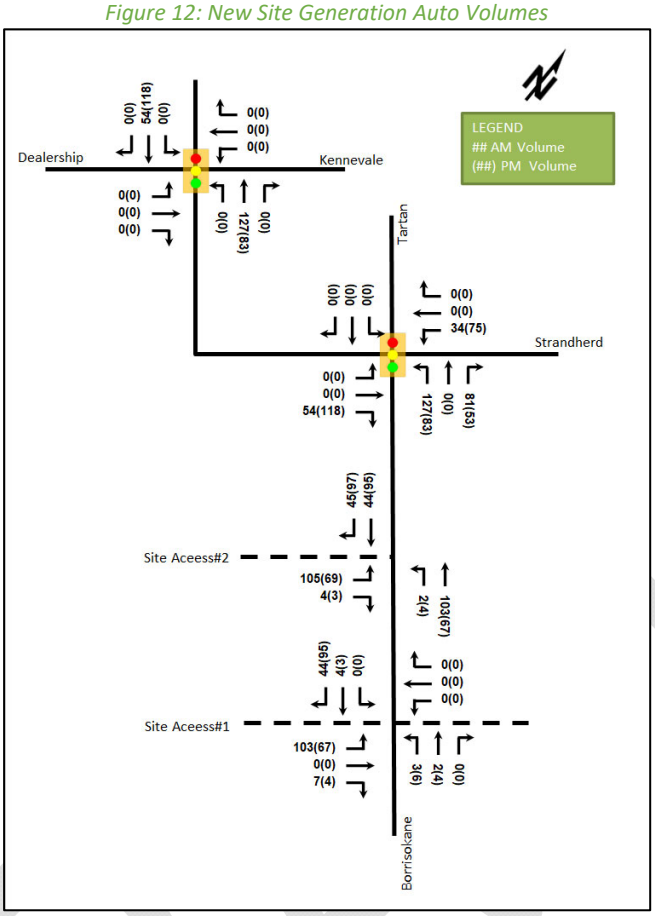
5.4 Trip Assignment

Using the distribution outlined above, turning movement splits, and access to major transportation infrastructure, the trips generated by the site have been assigned to the study area road network. Table 14 summarizes the proportional assignment to the study area roadways, and Figure 12 illustrates the new site generated volumes

Table 14: Trip Assignment

To/From	Via
North	27% Strandherd (E), 53% Strandherd (N)
South	5% Borrisokane (S)
East	10% Strandherd (E)
West	5% Strandherd (N)
Total	**100%**

Figure 12: New Site Generation Auto Volumes



6 Background Network Travel Demands

6.1 Transportation Network Plans

The study area transportation network plans were discussed in Section 2.3.1.

For the future horizons, the Strandherd Drive widening and Chapman Mills Drive extension have been assumed in all horizons and is assumed within the traffic model and background development volumes/assignment. As Re-Aligned Greenbank Road has an undetermined construction date, it has not been explicitly included in the analysis. Should it be completed, it will have minimal impact on the study area intersections as it occurs south of Chapman Mills Drive.

6.2 Background Growth

A large amount of background traffic has been accounted for through the other developments that have been documented in Section 2.3.2. This is particularly important along Cambrian Road, where most of the developments have been built or planned. This growth around results in over 11% annual growth along Borrisokane Road, or 320% of the existing volumes. Therefore, a nominal amount of additional background growth has been accounted for along Strandherd Drive, Borrisokane Road and Cambrian Road. To account for background growth along this corridor a 1.5%/annum background growth rate has been applied for the primary intersection movements.

Figure 13: 2030 Background Growth

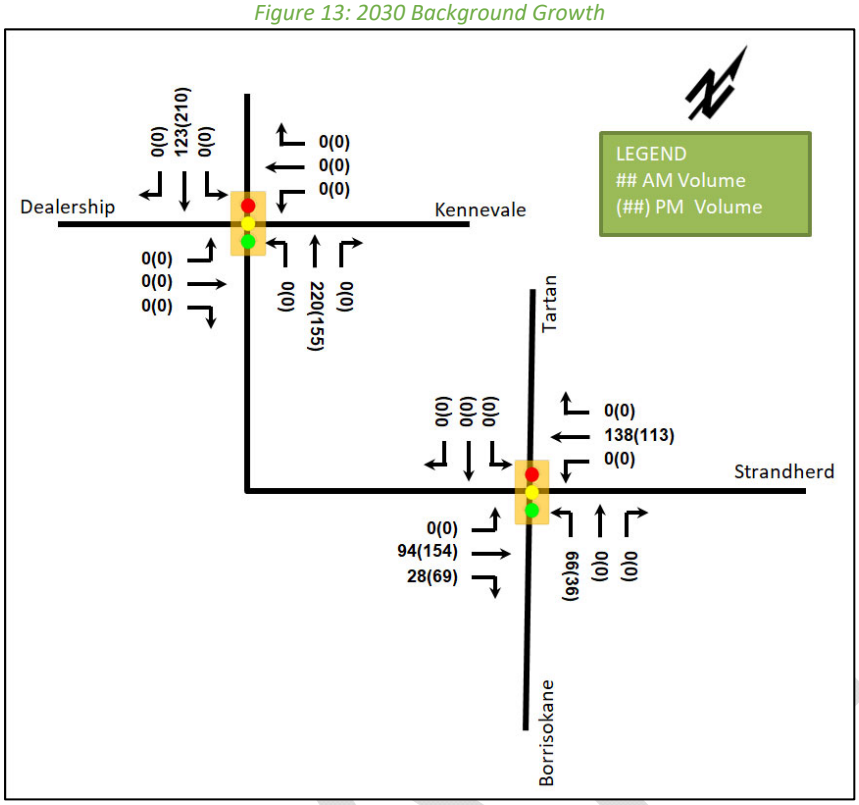
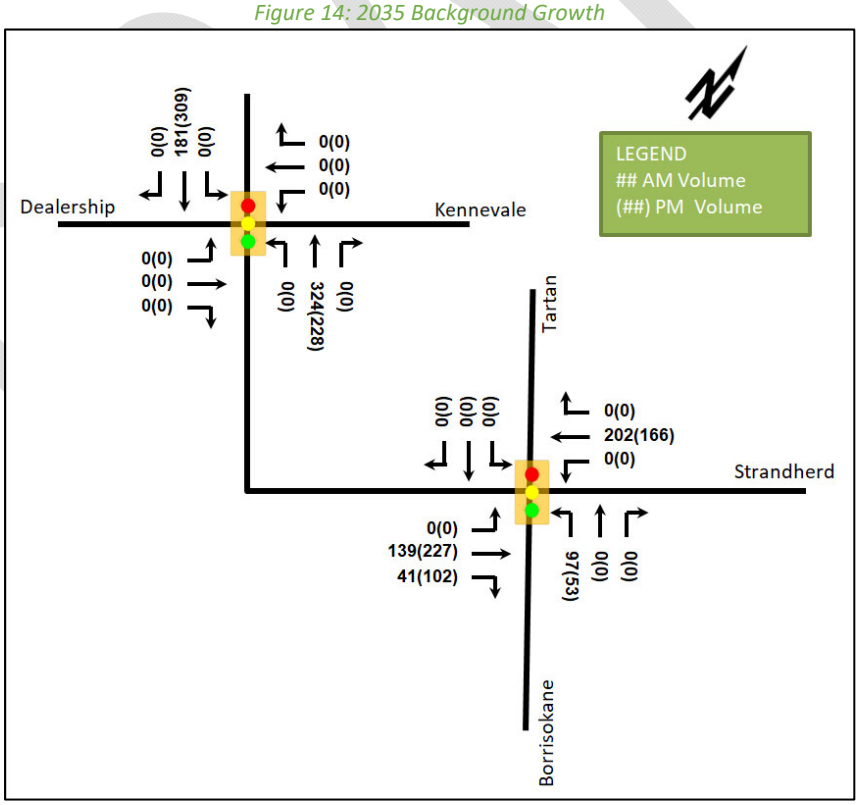


Figure 14: 2035 Background Growth



6.3 Other Developments

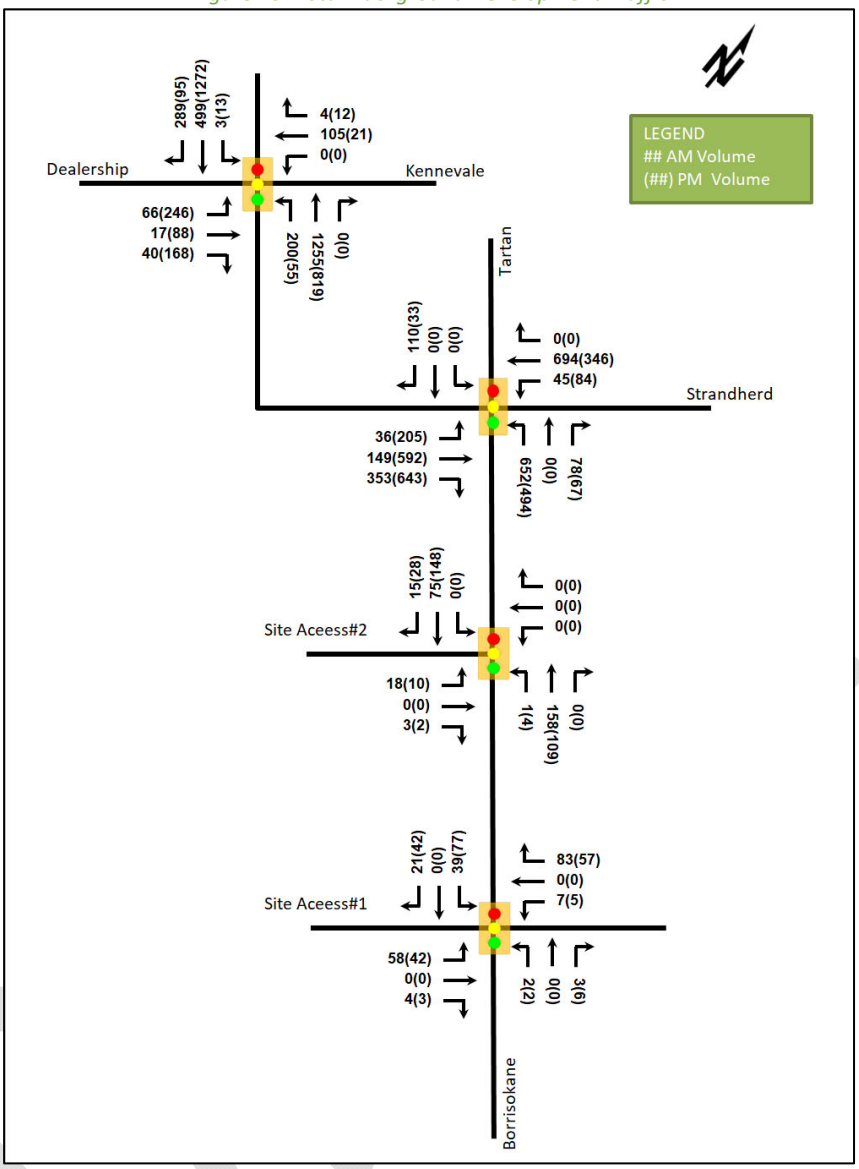
As detailed in Section 2.3.2, the following developments have been included in the background traffic forecast:

- 3195 Jockvale Road
- Harmony Phase 5 – 3232 Jockvale Road
- 3201 Greenbank Road
- 3288 Greenbank Road
- 3370 Greenbank Road
- Riversbend – 3311 Greenbank Road
- Half Moon Bay South Phase 5
- Half Moon Bay West
- Half Moon Bay North Phase 9
- Quinn's Pointe 2
- The Meadows Phase 4
- The Meadows Phase 5
- 3387 Borrisokane Road
- Citi-Gate Development
- 4401 Fallowfield Road Development
- Harmony Development – 4025 Strandherd Drive
- Conservancy Phase 1 – 3285 Borrisokane Road
- The Ridge/Brazeau – 3809 Borrisokane Road
- Drummond Subdivision – 3713 Borrisokane Road
- ABIC Manufacturing – 3713 Borrisokane Road
- Conservancy East – 3285, 3288 & 3305 Borrisokane Road

A review of the TRANS Trip Generation Manual (2020) has illustrated that the prior methodologies for trip generation over estimated trips within the Ottawa context. Specifically for Barrhaven South and within Barrhaven/Nepean, these trips could be between 49% to 89% of the previously generated auto volumes. As such, an overall reduction in forecasted trips has been applied to the subject developments.

Figure 15 illustrates the total background development volumes for the study area, adjusted for the changes in the transportation network and trip generation adjustment.

Figure 15: Total Background Development Traffic



7 Demand Rationalization

7.1 2030 Future Background Operations

The study area intersections have been modified to include the following improvements previously noted in Section 2.3.1 and the new intersections along Borrisokane Road have been included as proposed in the East Phase of Conservancy. All signalized intersections optimized for new lane arrangements, as approximations of future signal coordination and sequencing.

Figure 16 illustrates the 2030 background volumes and Table 15 summarizes the 2030 background intersection operations. The level of service for signalized intersections is based on HCM 2010 calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and HCM average delay for unsignalized intersections. The synchro worksheets for the 2030 future background horizon are provided in Appendix E.

Figure 16: 2030 Future Background Volumes

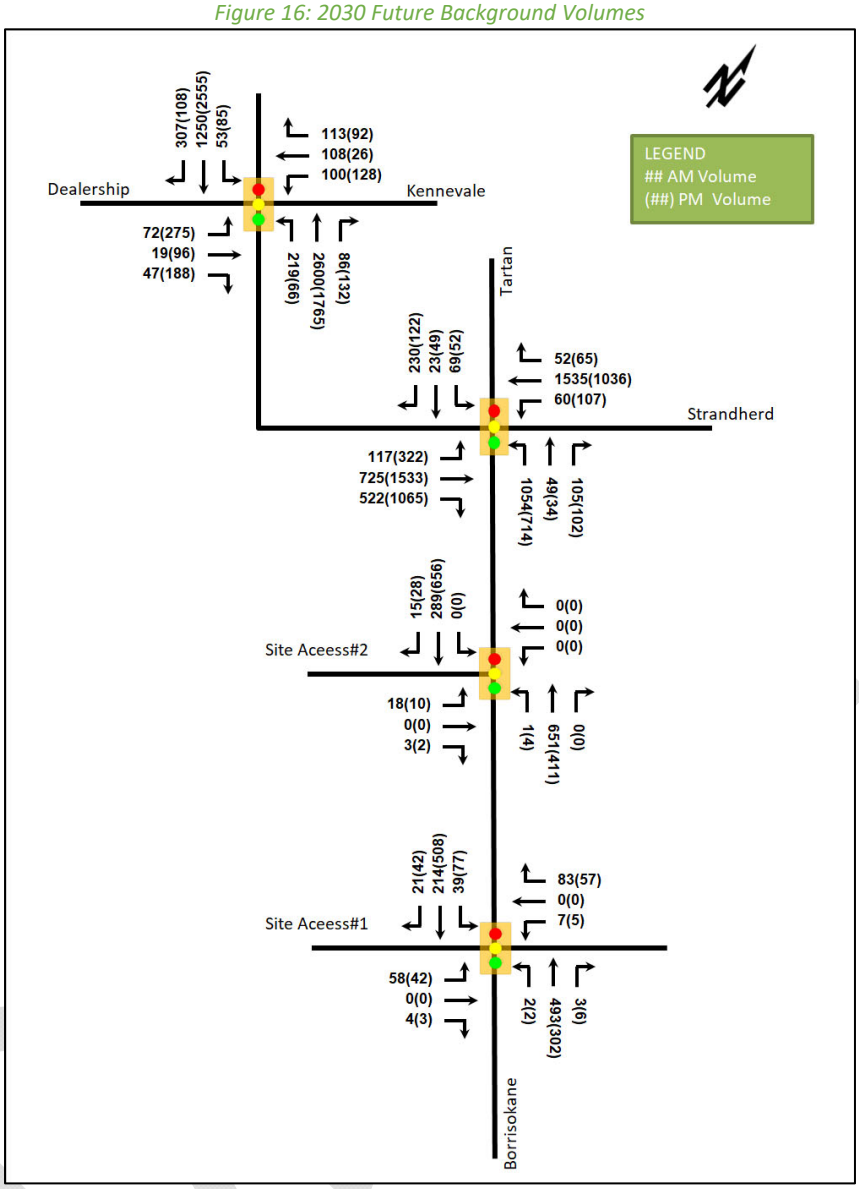


Table 15: 2030 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Dealership Way/Kennevale Drive *Signalized*	EBL	A	0.58	60.0	28.6	D	0.90	72.9	**#101.1**
	EBT	A	0.08	35.6	9.1	A	0.21	34.0	29.9
	EBR	A	0.16	37.4	17.6	A	0.49	41.0	56.8
	WBL	A	0.39	43.8	33.2	A	0.43	40.3	41.3
	WBT/R	C	0.79	64.3	70.2	A	0.31	36.2	36.4
	NBL	B	0.66	64.3	m17.1	A	0.43	69.3	m7.7
	NBT/R	**F**	**1.45**	**221.4**	**m#251.4**	**F**	**1.21**	**117.6**	**m#235.4**
	SBL	A	0.50	69.4	**#32.4**	C	0.71	87.3	**#55.1**
	SBT	C	0.77	28.6	**#169.2**	**F**	**1.46**	**235.6**	**#486.0**
	SBR	A	0.42	21.5	73.9	A	0.14	16.4	23.8
	Overall	**F**	**1.27**	**136.7**	-	**F**	**1.29**	**159.4**	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Borrisokane Road/Tartan Drive *Signalized*	EBL	E	0.96	**128.4**	**m#59.4**	**F**	**2.08**	**518.7**	**m#82.5**
	EBT	A	0.52	10.7	19.6	E	1.00	21.5	m27.0
	EBR	D	0.87	27.6	**#172.8**	**F**	**1.57**	**277.6**	**m#215.8**
	WBL	B	0.64	**85.3**	**#39.6**	**F**	**1.43**	**293.7**	**#68.8**
	WBT/R	**F**	**1.16**	**112.4**	**#271.2**	D	0.82	37.0	145.1
	NBL	**F**	**4.07**	**1404.9**	**#269.7**	**F**	**1.60**	**316.2**	**#158.8**
	NBT/R	A	0.44	44.4	50.8	A	0.42	43.7	46.0
	SBL	A	0.57	72.3	30.7	D	0.84	**132.2**	**#35.6**
	SBT/R	D	0.85	70.4	**#89.0**	E	0.93	**102.6**	**#81.2**
	Overall	**F**	**1.36**	**381.2**	**-**	**F**	**1.59**	**158.4**	**-**
Borrisokane Road & Access 1 *Signalized*	EBL	A	0.33	37.9	17.4	A	0.20	27.3	10.9
	EBT	A	0.02	29.2	3.0	A	0.01	22.3	2.1
	WBL	A	0.04	29.9	4.2	A	0.02	22.8	2.7
	WBT	A	0.39	38.8	22.9	A	0.23	27.6	13.6
	NBL	A	0.02	40.5	2.5	A	0.02	33.0	2.2
	NBT	A	0.42	11.5	88.6	A	0.28	12.5	55.3
	NBR	A	0.00	10.3	1.6	A	0.01	13.3	2.9
	SBL	A	0.31	44.5	17.4	A	0.42	36.6	18.0
	SBT	A	0.17	5.8	23.5	A	0.39	6.3	107.7
	SBR	A	0.02	6.7	4.5	A	0.04	3.0	m5.0
	Overall	**A**	**0.45**	**15.9**	**-**	**A**	**0.49**	**12.4**	**-**
Borrisokane Road & Access 2 *Signalized*	EBL	A	0.08	31.7	7.4	A	0.04	23.3	4.1
	EBR	A	0.01	29.7	2.5	A	0.01	22.0	1.6
	NBL	A	0.00	5.0	m0.1	A	0.01	2.2	m0.5
	NBT	A	0.43	3.8	47.2	A	0.28	3.9	65.3
	SBT	A	0.19	3.5	32.4	A	0.45	6.5	99.3
	SBR	A	0.01	4.1	3.0	A	0.02	4.7	4.9
	Overall	**A**	**0.45**	**4.3**	**-**	**A**	**0.46**	**5.6**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00
m = metered queue
# = queue exceeds storage or mid-block length

The 2030 future background operations summarized above identify significant capacity constraints along Strandherd Drive. High delays and extended queueing are noted for the entire corridor, both along the mainline of Strandherd Drive and on turning movements from that side streets. The volumes illustrated in Figure 16 outline an unconstrained demand for 2-3 lanes in each direction between Borrisokane Road and Greenbank Road, and 4 lanes from Borrisokane Road to Kennevale Road. As this is not a feasible option for Strandherd Drive and accepted City arterial road policies, alternative solutions for Barrhaven will need to be examined by the City.

A number of solutions have been presented in previous TIA studies and will continue to be reviewed as part of the City's new Transportation Master Plan. No mitigation will be proposed as part of this TIA as it is beyond the scope of a specific TIA development and requires a regional solution.

7.2 2035 Future Background Operations

Figure 17 illustrates the 2035 background volumes and Table 16 summarizes the 2035 background intersection operations. The level of service for signalized intersections is based on HCM 2010 calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and HCM average delay for unsignalized intersections. The synchro worksheets for the 2035 future background horizon are provided in Appendix F.

Figure 17: 2035 Future Background Volumes

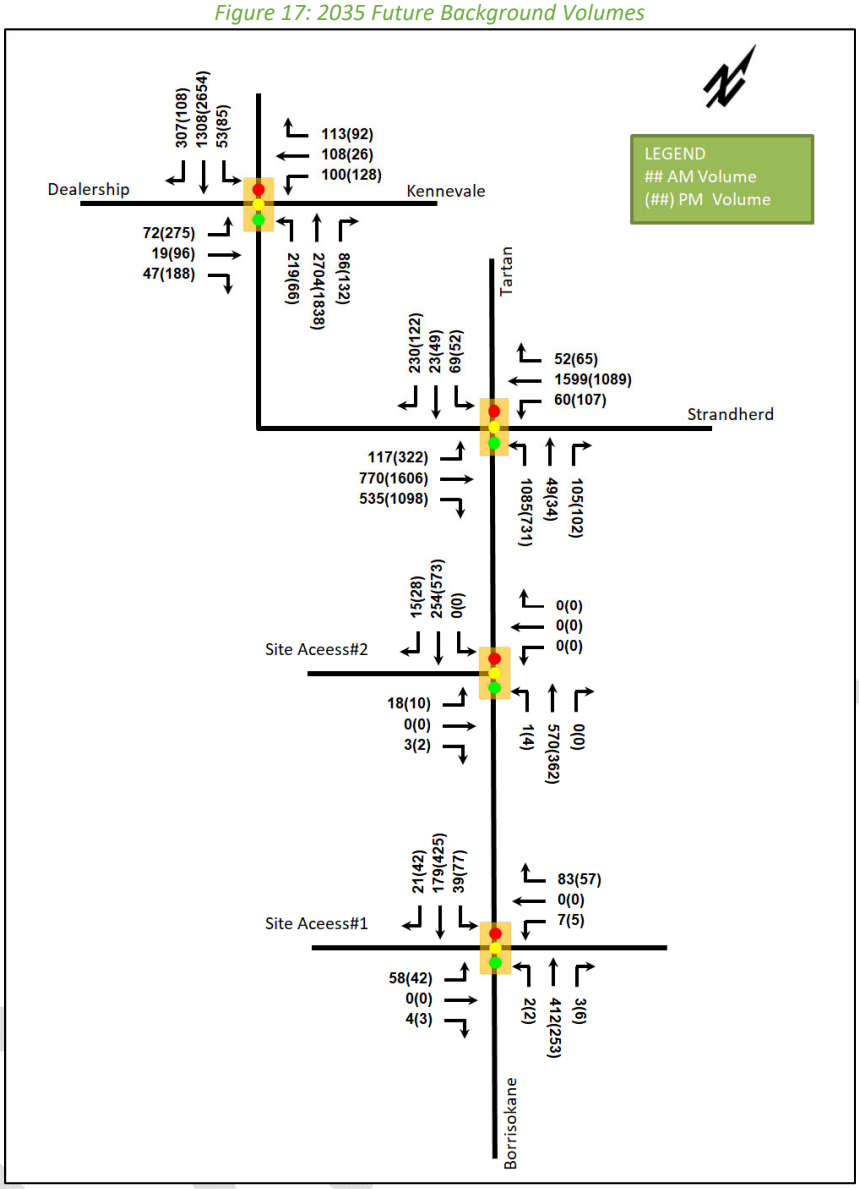


Table 16: 2035 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Dealership Way/Kennevale Drive *Signalized*	EBL	A	0.58	60.0	28.6	E	0.93	79.9	**#108.3**
	EBT	A	0.08	35.6	9.1	A	0.22	35.6	31.1
	EBR	A	0.16	37.4	17.6	A	0.51	42.9	59.0
	WBL	A	0.39	43.8	33.2	A	0.45	42.3	42.9
	WBT/R	C	0.79	64.3	70.2	A	0.32	37.8	37.9
	NBL	B	0.66	64.2	m16.7	A	0.46	70.0	m7.3
	NBT/R	**F**	**1.50**	**246.0**	**m#255.6**	**F**	**1.21**	**119.3**	**m143.4**
	SBL	A	0.50	69.4	**#32.4**	D	0.85	**113.1**	**#55.1**
	SBT	D	0.81	30.1	**#193.4**	**F**	**1.48**	**246.0**	**#500.0**
	SBR	A	0.42	21.4	73.5	A	0.14	15.1	22.4
	Overall	**F**	**1.31**	**151.0**	**-**	**F**	**1.33**	**166.5**	**-**

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Borrisokane Road/Tartan Drive *Signalized*	EBL	E	0.96	**126.2**	**m#55.8**	**F**	**1.75**	**377.7**	**m#93.9**
	EBT	A	0.55	10.9	21.0	**F**	**1.04**	**35.8**	**m46.0**
	EBR	D	0.90	29.2	**m#176.7**	**F**	**1.61**	**292.3**	**m#222.2**
	WBL	B	0.64	**85.3**	**#39.6**	C	0.71	79.7	**#70.7**
	WBT/R	**F**	**1.21**	**131.5**	**#287.5**	C	0.80	33.1	145.7
	NBL	**F**	**4.19**	**1458.2**	**#277.7**	**F**	**3.71**	**1248.1**	**#194.1**
	NBT/R	A	0.44	44.4	50.8	A	0.54	51.5	46.0
	SBL	A	0.57	72.3	30.7	D	0.84	**132.2**	**#35.6**
	SBT/R	D	0.85	70.4	**#89.0**	C	0.74	66.8	58.5
	Overall	**F**	**1.40**	**399.0**	**-**	**F**	**1.68**	**276.1**	**-**
Borrisokane Road & Access 1 *Signalized*	EBL	A	0.33	37.9	17.4	A	0.24	36.0	13.6
	EBT	A	0.02	29.2	3.0	A	0.01	29.7	2.5
	WBL	A	0.04	29.9	4.2	A	0.03	30.0	3.2
	WBT	A	0.39	38.8	22.9	A	0.28	36.4	17.0
	NBL	A	0.02	40.0	2.5	A	0.02	40.0	2.5
	NBT	A	0.35	11.3	75.5	A	0.23	11.7	47.1
	NBR	A	0.00	11.0	1.7	A	0.01	12.3	2.8
	SBL	A	0.28	42.3	16.8	A	0.45	41.7	26.9
	SBT	A	0.14	6.0	22.2	A	0.33	9.3	67.0
	SBR	A	0.02	7.0	4.7	A	0.04	9.8	11.4
	Overall	**A**	**0.39**	**16.6**	**-**	**A**	**0.39**	**15.9**	**-**
Borrisokane Road & Access 2 *Signalized*	EBL	A	0.08	31.7	7.4	A	0.04	30.6	5.1
	EBR	A	0.01	29.7	2.5	A	0.01	29.5	1.9
	NBL	A	0.00	5.0	m0.2	A	0.01	5.2	m1.1
	NBT	A	0.38	3.9	42.8	A	0.24	3.7	28.5
	SBT	A	0.17	3.4	28.2	A	0.38	4.7	75.9
	SBR	A	0.01	4.1	3.0	A	0.02	3.9	4.6
	Overall	**A**	**0.39**	**4.4**	**-**	**A**	**0.39**	**4.7**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00
m = metered queue
# = queue exceeds storage or mid-block length

The 2035 background operations are expected to be similar to the 2030 background operations at most study area intersections. The Strandherd Drive intersections at Kennevale Drive and at Borrisokane Road will continue to have significant capacity constraints, delay, and queuing concerns for many of the movements and will see incremental decrease in operations due to the background growth.

7.3 Demand Rationalization Conclusions

Through the TIA process, the City requires transportation demand measures be considered for each development to ease the burden on the road network. These measures will be included in this development, such as transit ridership, active mode connectivity and supporting programs within the community.

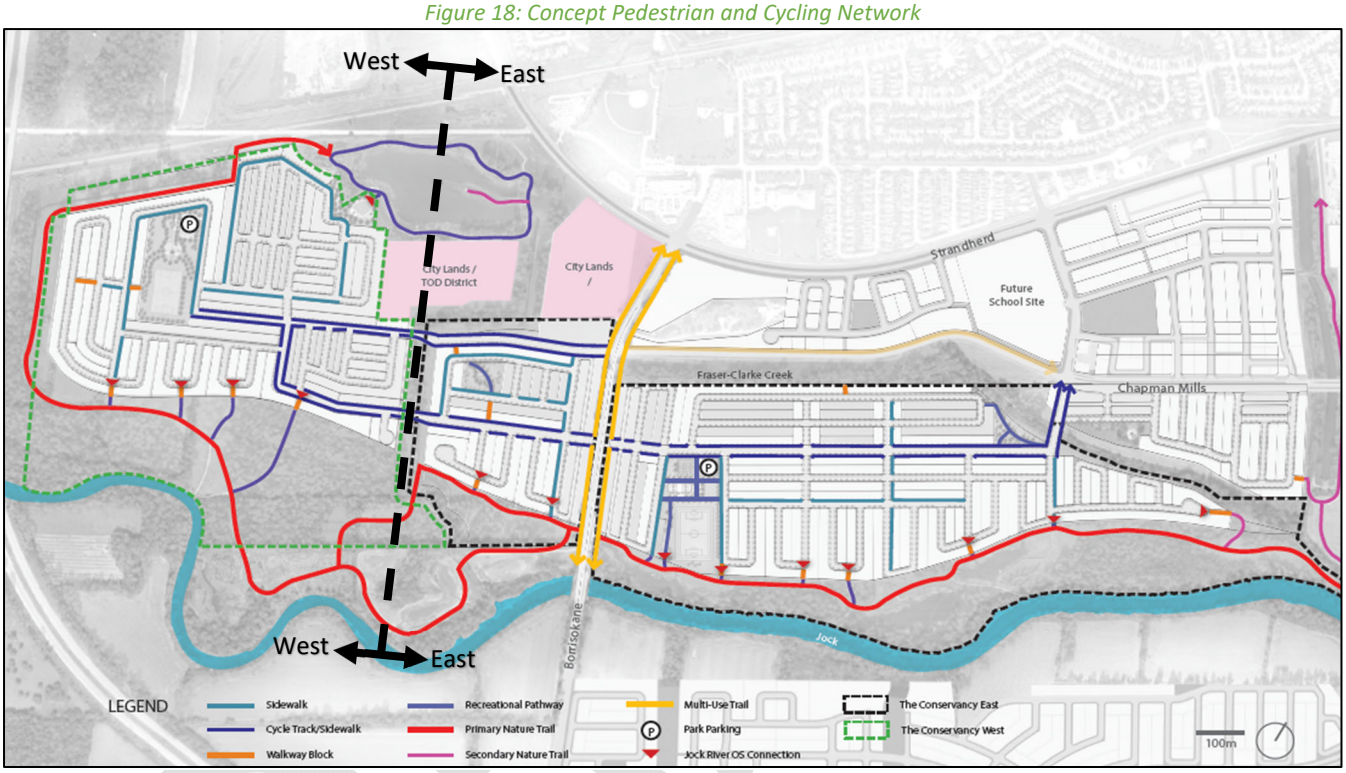
To address the systemic issues noted in the existing and background conditions, the deferral of planned infrastructure, such as the Re-Aligned Greenbank Road corridor being shifted to beyond 2031, will need to be reassessed and additional regional TDM programs or infrastructure will be needed from the City of Ottawa. The minimum needs have been highlighted above with the Chapman Mills BRT corridor, new Barnsdale Road Interchange and transit corridor to Barrhaven South.

8 Development Design

8.1 Design for Sustainable Modes

The proposed development is a residential subdivision, and the auto parking and bicycle parking will be located at each of the individual units. Figure 18 illustrates the proposed pedestrian and cycling network. The plan incorporates the adjacent developments and planned routes on geoOttawa. Street A and S will include cycle tracks.

Figure 18: Concept Pedestrian and Cycling Network



The active mode network will also connect to Borrisokane Road through the East Phase of Conservancy, future park and ride at Strandherd Drive and Borrisokane Road.

8.2 New Street Networks

The new streets proposed as part of the plan of subdivision include 16.5 and 18.0 metre local roads and 20.0 and 22.0 metre collector roads. Traffic calming elements will be included at the pedestrian and cycle track crossing locations, with limited applications within the internal local road intersections. Vertical measures will be explored on the future local roadways, although due to site servicing constraints, cost implications for future City maintenance of underground infrastructure and locations of street elements, such as driveways, fire hydrants, etc., the feasibility of implementation may be restricted.

Once the internal road network is finalized, including input from all disciplines involved in plan of subdivision approvals, include urban planning and parks, a geometric road design drawing will be prepared to outline the above traffic calming measures. The City should endeavour to confirm all input from the various departments is discussed holistically to reduce competing design commentary when preparing the geometric road design.

9 Boundary Street Design

No roadways are located at the boundary of the proposed subdivision. All MMLOS analysis is included in Section 15.2.3.

10 Access Intersections Design

10.1 Location and Design of Access

The residential accesses will connect via new collector roads to Borrisokane Road. The intersections along Borrisokane Road have been proposed as signalized during the East Phase TIA and this assumption has been maintained. The signalization of these intersections is based on the BRT corridor requirements at the northern intersection and need to interconnectivity of active modes across Borrisokane Road. Operational sensitivity was conducted in the East Phase TIA, noting high delays with a minor-stop control may lead to unsafe turning movements as residents attempt to exit the community.

Within the subdivision, no turn lanes are proposed for the intersections and will be controlled by minor stop control.

10.2 Intersection Control

No changes in the area intersection control. Future control under constructed, proposed as City DC upgrades or within adjacent development applications also remain the same.

10.3 Access Intersection Design

The subdivision will use the adjacent development to access Borrisokane Road. Section 15 includes the analysis if the network intersection operations.

Similar to Section 9, the network intersection MMLOS analysis is provided in Section 15.2.3.

11 Transportation Demand Management

11.1 Context for TDM

The mode shares used within the TIA represent this area of the City and typical mode shares for BRT areas. The modal shares are likely to be achieved.

Total bedrooms within the development are subject to the final unit count and product styles selected by purchasers. No age restrictions are noted.

11.2 Need and Opportunity

The subject site has been assumed to rely on a higher transit modal share than typically found within Nepean, requiring increase transit service and rapid adoption of transit ridership. Theses assumptions have been carried through the analysis. The opportunity for the City to extend transit infrastructure elsewhere within Barrhaven and Barrhaven South exists and will help encourage this modal shift to greater areas of Barrhaven than the localized targets for this development. The development can provide the internal connectivity to transit and adjacent non-auto infrastructure, although this will be underutilized until other City infrastructure is constructed to support the development potential in Barrhaven.

11.3 TDM Program

The “suite of post occupancy TDM measures” has been summarized in the TDM checklists for the residential land uses. The checklist is provided in Appendix G. The key TDM measures recommended include:

- Enhanced connectivity of pedestrians and cyclists to the adjacent network
- Posting of pedestrian and cycling wayfinding signage within the community
- Organize community cycling course for new residents
- Early service agreement with OC Transpo to support higher adoption of transit ridership
- Inclusion of a 6-month Presto card for first time new townhome purchase, with a set time frame for this offer (e.g., 6-months) from the initial offering of the site
- Conduct semi-annual community surveys for 2 years to collect travel pattern and behaviour data (in conjunction with City TDM coordinator)

12 Neighbourhood Traffic Management

The proposed development will connect to the arterial road network at Borrisokane Road through the collector roads proposed as part of the East Phase of Conservancy. The two collector roads were forecasted to convey between 200-290 two-way vehicle trips as part of the East Phase and an additional 300-350 vehicles trips from the West Phase. The total 500-640 vehicle trips are within the range of two minor collector roads volumes thresholds, 300 two-way vehicles during a peak hour, as outlined within the City of Ottawa TIA Guidelines. No change to the adjacent neighbourhood roadways is required to support the West Phase of Conservancy.

13 Transit

13.1 Route Capacity

The proposed development will require additional transit service to be provided to support the area. It is forecasted that approximately 286-320 two-way peak hour transit trips will be generated with the proposed transit increase with the Chapman Mills BRT and park and ride. Table 17 summarizes the forecasted peak direction transit trips to estimate the minimum bus type and service required to support the West Phase of Conservancy.

Table 17: Forecasted Transit Service – Minimum Bus Requirements

Phase	Trips in Peak Direction	Minimum Buses Required By Type		
		Single Capacity: 55	Articulated Capacity: 75	Double Decker Capacity: 95
West – Transit Trips	167-223	4-5 buses	3-4 buses	2-3 buses

Note: capacity assessed at 80% for bus number calculations

With the numbers above, the route frequencies would be required to achieve the forecasted transit mode shares would require 15–20-minute service. If the higher adoption of transit is to be achieved, it is recommended that the higher service is provided prior to the implementation of the Chapman Mills BRT.

13.2 Transit Priority

A transit signal will need to be incorporated into the signalized intersection once the BRT is extended to Borrisokane Road.

14 Network Concept

The existing and background volumes forecasted along Strandherd Drive and accessing Strandherd Drive from the south, are exceeding the existing lane capacities and will continue to do so once the widening is completed. Extensive infrastructure projects have been planned for Barrhaven, and overall, a minimum number of these projects have been implemented and many continue to be pushed farther into the future. As identified previously, the following projects are required to support Barrhaven as a whole, and additional projects that would begin to

bring the transportation network to the level of other suburban areas of Ottawa are also listed and support the growth potential of Barrhaven:

- Currently required projects:
  - Barnsdale-Highway 417 interchange (interim)
  - Chapman Mills BRT extension to Borrisokane Road
  - Re-Aligned Greenbank Road BRT Corridor, Towncentre to Kilbirnie Drive
- Barrhaven supportive projects:
  - Re-Aligned Greenbank Road, to Cambrian Road
  - LRT extension to the Towncentre

15 Network Intersection Design

15.1 Network Intersection Control

The study area intersections are all assumed to be signalized, through the Strandherd Drive widening, extension of Chapman Mills Drive and the BRT corridor, and development related improvements along Borrisokane Road. These changes have been noted in Section 7.1.

Updated signal warrants for the Borrisokane Road intersections are provided in Appendix H.

15.2 Network Intersection Design

15.2.1 2030 Future Total Network Intersection Operations

The 2030 future total network intersection operations are summarized below in Table 18. The level of service for signalized intersections is based on HCM 2010 v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and HCM average delay for unsignalized intersections. The synchro worksheets have been provided in Appendix I.

Figure 19: 2030 Future Total Volumes

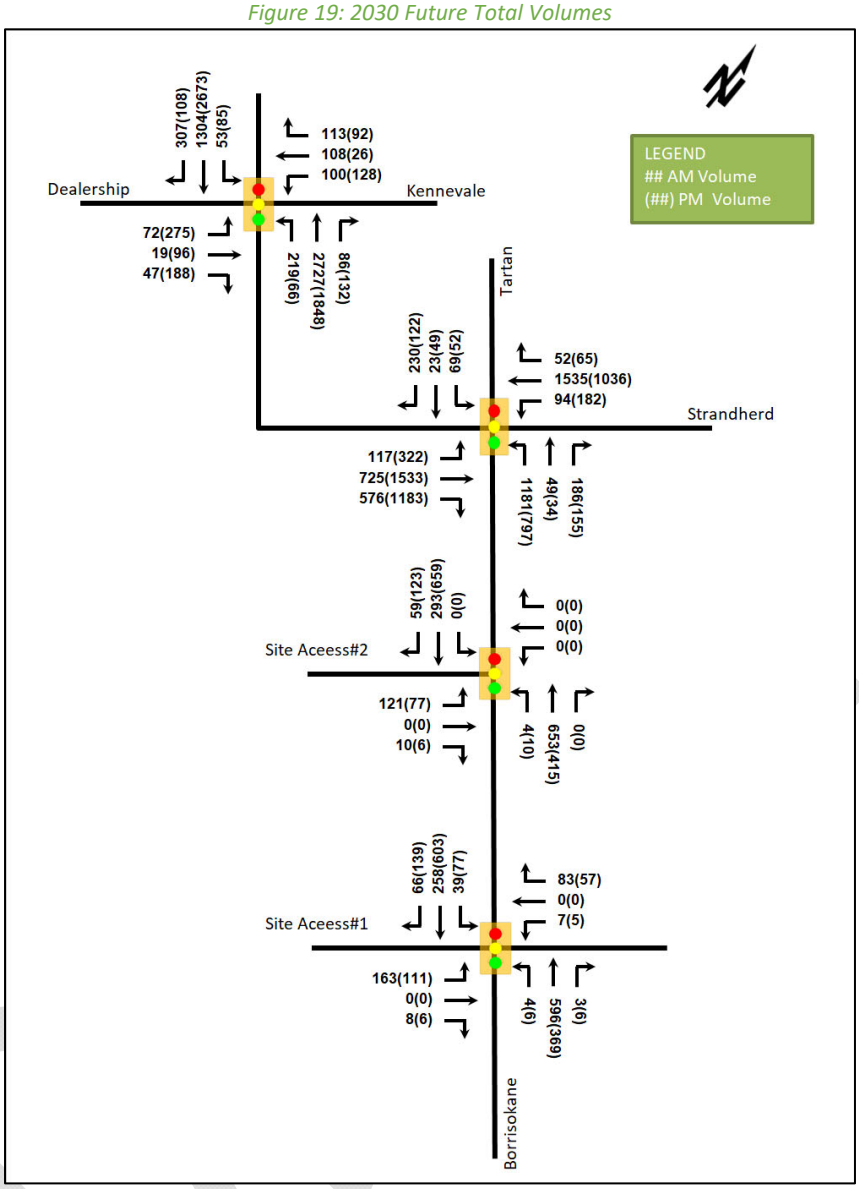


Table 18: 2030 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Dealership Way/Kennevale Drive *Signalized*	EBL	A	0.58	60.0	28.6	E	0.92	78.9	**#107.5**
	EBT	A	0.08	35.6	9.1	A	0.22	35.6	31.1
	EBR	A	0.16	37.4	17.6	A	0.51	43.0	59.0
	WBL	A	0.39	43.8	33.2	A	0.42	41.2	42.3
	WBT/R	C	0.79	64.3	70.2	A	0.30	37.5	37.6
	NBL	B	0.66	64.3	m16.5	A	0.46	69.0	m7.6
	NBT/R	**F**	**1.51**	**252.6**	**m#252.7**	**F**	**1.20**	**119.9**	**m137.1**
	SBL	A	0.50	69.4	**#32.4**	D	0.82	**106.1**	**#54.7**
	SBT	D	0.81	30.0	**#192.2**	**F**	**1.49**	**249.8**	**#504.8**
	SBR	A	0.42	21.4	73.5	A	0.13	15.1	22.4
	Overall	**F**	**1.31**	**155.1**	-	**F**	**1.33**	**168.5**	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Borrisokane Road/Tartan Drive *Signalized*	EBL	E	0.96	**126.5**	**m#55.9**	**F**	**1.83**	**410.1**	**m#96.8**
	EBT	A	0.53	11.5	19.9	E	1.00	23.5	m48.0
	EBR	E	0.99	47.9	**#200.2**	**F**	**1.73**	**349.5**	**m#252.7**
	WBL	D	0.81	**100.2**	**#62.5**	**F**	**1.12**	**156.4**	**#114.2**
	WBT/R	**F**	**1.16**	**112.4**	**#271.2**	C	0.74	30.1	132.6
	NBL	**F**	**4.56**	**1623.7**	**#302.1**	**F**	**3.81**	**1293.1**	**#209.6**
	NBT/R	B	0.65	50.4	75.8	B	0.64	54.7	62.2
	SBL	B	0.67	84.8	**#37.0**	C	0.78	**116.4**	**#34.4**
	SBT/R	D	0.85	70.4	**#89.0**	C	0.73	65.4	58.2
	Overall	**F**	**1.42**	**453.1**	**-**	**F**	**1.74**	**307.6**	**-**
Borrisokane Road & Access 1 *Signalized*	EBL	C	0.72	51.3	43.5	A	0.56	44.3	30.2
	EBT	A	0.03	26.8	4.3	A	0.03	28.2	3.6
	WBL	A	0.03	26.9	4.2	A	0.02	28.2	3.2
	WBT	A	0.30	32.6	22.9	A	0.24	33.3	17.0
	NBL	A	0.04	40.8	3.9	A	0.06	41.3	4.7
	NBT	A	0.58	16.5	113.1	A	0.35	13.4	66.7
	NBR	A	0.00	11.3	1.6	A	0.01	12.3	2.6
	SBL	A	0.33	47.6	17.3	A	0.48	44.1	27.7
	SBT	A	0.23	7.5	28.5	A	0.48	10.5	86.3
	SBR	A	0.07	7.5	9.8	A	0.13	8.6	24.8
	Overall	**B**	**0.62**	**21.0**	**-**	**A**	**0.57**	**16.9**	**-**
Borrisokane Road & Access 2 *Signalized*	EBL	A	0.49	40.3	31.0	A	0.33	37.1	21.2
	EBR	A	0.05	29.3	5.1	A	0.03	29.8	3.6
	NBL	A	0.01	5.0	m0.5	A	0.02	5.0	m1.9
	NBT	A	0.53	7.4	66.0	A	0.31	5.5	38.3
	SBT	A	0.24	5.4	32.8	A	0.49	7.2	94.7
	SBR	A	0.06	4.8	8.0	A	0.11	4.5	14.6
	Overall	**A**	**0.52**	**10.4**	**-**	**A**	**0.49**	**8.3**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00
m = metered queue
# = queue exceeds storage or mid-block length

The study area network intersections operate with similar capacity constraints, delays, and queuing as the 2030 future background conditions.

As noted in the background conditions, a commitment from the City is required to advance new infrastructure within Barrhaven and continue to look for continual mode shifting to further reduce the auto dependency currently observed.

15.2.2 2035 Future Total Network Intersection Operations

The 2035 future total network intersection operations are summarized below in Table 19. The level of service for signalized intersections is based on HCM 2010 v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and HCM average delay for unsignalized intersections. The synchro worksheets have been provided in Appendix J.

Figure 20: 2035 Future Total Volumes

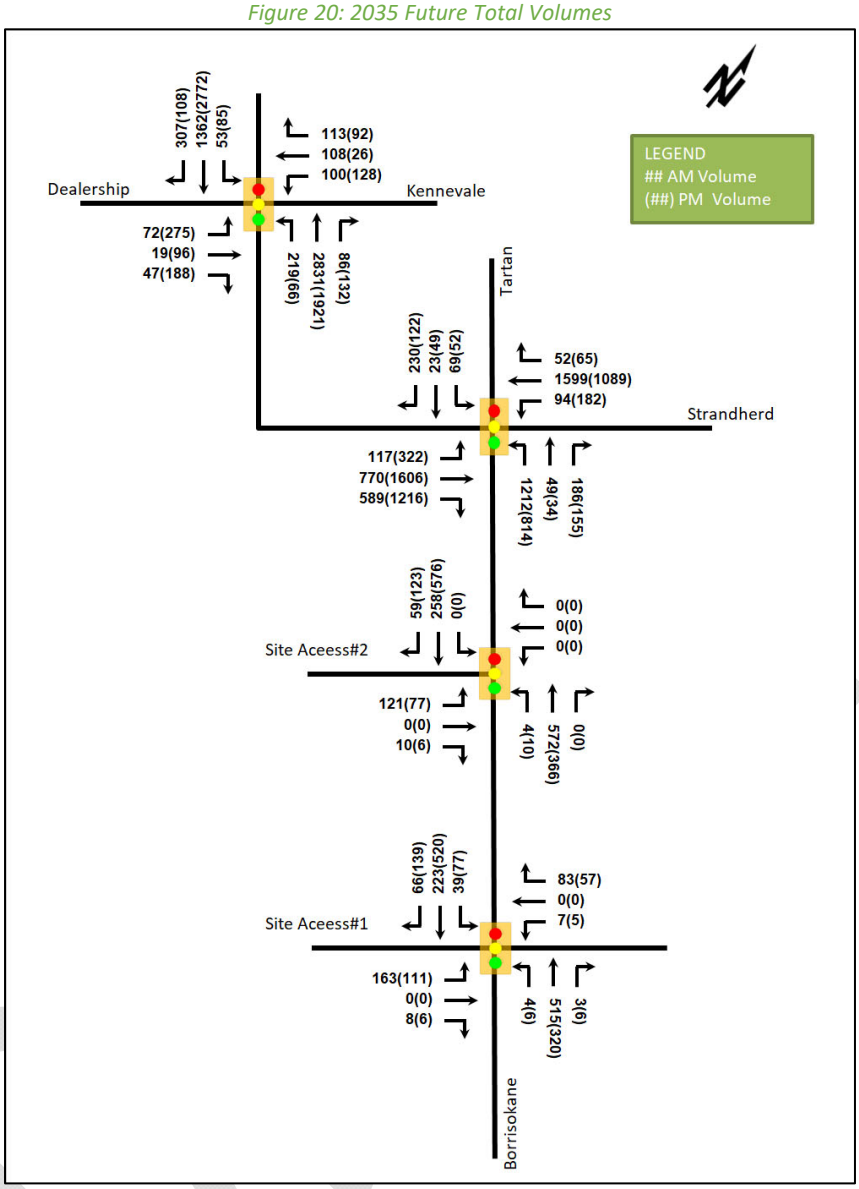


Table 19: 2035 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Dealership Way/Kennevale Drive ***Signalized***	EBL	A	0.58	60.0	28.6	E	0.92	78.9	**#107.5**
	EBT	A	0.08	35.6	9.1	A	0.22	35.6	31.1
	EBR	A	0.16	37.4	17.6	A	0.51	43.0	59.0
	WBL	A	0.39	43.8	33.2	A	0.42	41.2	42.3
	WBT/R	C	0.79	64.3	70.2	A	0.30	37.5	37.6
	NBL	B	0.66	63.9	m16.2	A	0.46	69.6	m7.4
	NBT/R	**F**	**1.57**	**276.9**	**m#260.6**	**F**	**1.25**	**139.1**	**m142.5**
	SBL	A	0.50	69.4	**#32.4**	D	0.82	**106.1**	**#54.7**
	SBT	D	0.84	31.9	**#206.1**	**F**	**1.55**	**274.2**	**#529.2**
	SBR	A	0.42	21.4	72.9	A	0.13	15.1	22.4
	Overall	**F**	**1.35**	**169.4**	-	**F**	**1.37**	**187.4**	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Borrisokane Road/Tartan Drive *Signalized*	EBL	**F**	**1.03**	**140.3**	**m#55.6**	**F**	**1.72**	**364.9**	**m#92.5**
	EBT	A	0.57	11.8	m20.2	**F**	**1.05**	**41.4**	m49.0
	EBR	**F**	**1.02**	**52.6**	**m#195.6**	**F**	**1.78**	**371.1**	**m#251.0**
	WBL	D	0.81	100.2	#62.5	**F**	**1.05**	**133.1**	**#113.6**
	WBT/R	**F**	**1.19**	**125.4**	**#285.5**	C	0.78	31.4	142.4
	NBL	**F**	**4.68**	**1677.2**	**#309.8**	**F**	**4.45**	**1577.5**	**#217.4**
	NBT/R	B	0.65	50.4	75.8	B	0.66	56.8	62.4
	SBL	B	0.67	**84.8**	**#37.0**	C	0.78	**116.4**	**#34.4**
	SBT/R	D	0.85	70.4	**#89.0**	C	0.72	64.6	57.6
	Overall	**F**	**1.46**	**469.2**	**-**	**F**	**1.79**	**351.8**	**-**
Borrisokane Road & Access 1 *Signalized*	EBL	C	0.72	50.9	43.3	A	0.56	44.3	30.2
	EBT	A	0.03	26.6	4.3	A	0.03	28.2	3.6
	WBL	A	0.03	26.7	4.2	A	0.02	28.2	3.2
	WBT	A	0.30	32.4	22.8	A	0.24	33.3	17.0
	NBL	A	0.04	40.8	3.9	A	0.06	41.2	4.7
	NBT	A	0.50	15.2	94.0	A	0.30	13.0	57.2
	NBR	A	0.00	11.7	1.6	A	0.01	12.5	2.7
	SBL	A	0.31	47.8	16.9	A	0.47	44.7	27.8
	SBT	A	0.20	7.4	24.9	A	0.41	9.2	68.7
	SBR	A	0.07	7.5	9.8	A	0.13	8.0	22.5
	Overall	**A**	**0.56**	**21.1**	**-**	**A**	**0.51**	**16.8**	**-**
Borrisokane Road & Access 2 *Signalized*	EBL	A	0.49	40.3	31.0	A	0.33	37.1	21.2
	EBR	A	0.05	29.3	5.1	A	0.03	29.8	3.6
	NBL	A	0.01	4.2	m0.5	A	0.02	5.3	m2.3
	NBT	A	0.46	6.5	57.3	A	0.27	5.6	37.6
	SBT	A	0.21	5.3	28.8	A	0.43	6.5	76.6
	SBR	A	0.06	4.8	8.0	A	0.11	4.5	14.6
	Overall	**A**	**0.47**	**10.3**	**-**	**A**	**0.44**	**8.1**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00
m = metered queue
# = queue exceeds storage or mid-block length

The operations noted are similar to the 2030 future total conditions with a slight decrease in network operations due to background growth. The need for the City to provide wider Barrhaven improvements continues to be the major constraint to decrease the impact on Strandherd Drive.

15.2.3 Network Intersection MMLOS

Table 20 summarizes the MMLOS analysis for the network intersections. The existing and future conditions for both intersections will be the same and are considered in one row. The intersection analysis is based on the policy area of employment area (Kennevale), developing community (existing Borrisokane) and within 600m of a rapid transit station. The MMLOS worksheets has been provided in Appendix K.

Table 20: Study Area Intersection MMLOS Analysis

Intersection	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS		Auto LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target	ALOS	Target
Strandherd Drive & Kennevale Drive/Dealership Way (existing)	F	C	E	C	F	D	E	B	E	D
Strandherd Drive & Kennevale Drive/Dealership Way (future)	F	C	E	C	F	D	E	B	F	D
Strandherd Drive & Borrisokane Road/Tartan Drive (existing)	F	C	F	C	E	D	E	D	E	D
Strandherd Drive & Borrisokane Road/Tartan Drive (future)	F	A	A	C	F	A	E	D	F	E
Borrisokane Road & Access #1/BRT	C	A	A	B	D	A	-	N/A	A	E
Borrisokane Road & Access #2	D	A	A	B	D	A	-	N/A	A	E

The MMLOS targets for the pedestrian and transit LOS are currently note met and will continue to not meet the targets at the network intersections. The pedestrian level of service would require a maximum of four lanes at a crossing to meet a LOS C or two lanes to achieve a level of service A. This is a limitation of the MMLOS framework. For example, the protected intersections proposed for the Strandherd Drive widening will be comfortable for pedestrians but still result in a level of service F. Due to the traffic congestion in Barrhaven, the intersection delays cannot be reduced to increase the transit level of service. It is assumed that the BRT will pre-empt the signal timing to allow transit to proceed and would operate closer to the targets. It is noted that transit LOS A requires zero seconds average delay for the approach, which is not achievable. A LOS B with less than 10 seconds delay may be a more realistic target for the Chapman Mills Drive corridor.

The bicycle LOS will not meet targets along Strandherd Drive due to the side street geometry having mixed use operations and lacking separated crossings for left turns. The incorporation of bike boxes or protected crossings at the intersections would improve the operations and meet the targets. It is assumed that the City conducted a MMLOS assessment of the Strandherd Drive widening and is providing a balanced solution weighing the trade-offs on all the intersections.

The truck LOS will not be met on Borrisokane Road from Strandherd Drive due to a single receiving lane, as typical of the MMLOS framework but is not considered a cause for mitigation.

The auto level of service will not be met along Strandherd Drive as the area congestion will have high-capacity constraints. The signal timing will require a corridor study along the widened Strandherd Drive to balance the demands of the mainline, turning movements at Borrisokane Road, and side street operations.

Overall, the study area network intersections highlight limitations in the MMLOS framework that require no mitigation as part of this plan of subdivision, illustrate that transit services along Strandherd Drive will result in poor service times, and high congestion is anticipated and reflected in the capacity constraints. The auto level of service will require investment in Barrhaven, beyond the transit and interchange options already assumed to be

in place, to mitigate the demands on the network, and BRT corridors and park and rides will be required to remove the need for transit to operate on Strandherd Drive.

15.2.4 Recommended Design Elements

No study area intersection design elements are proposed as part of this study.

16 Next Steps

Following the circulation and review of the TIA, any outstanding comments will be documents within the context of the zoning bylaw application and plan of subdivision application. Once remaining TIA Steps are completed and sign-off has been received from City Transportation Project Manager, a signed and stamped final report will be provided to City staff.

Appendix A

TIA Screening Form and PM Certification Form

13 Markham Avenue
Ottawa ON K2G 3Z1

City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

Date: 30-Sep-21
Project Number: 2021-115
Project Reference: Caivan Conservancy West

1.1 Description of Proposed Development	
Municipal Address	3288 & 3300 Borrisokane, 4205, 4345 & 4375 McKenna Casey.
Description of Location	Vacant farm fields
Land Use Classification	Development Reserve (DR)
Development Size	1036 residential units total; 702 townhomes and 334 single detached homes
Accesses	Two new intersections with Borrisokane, part of previous East Phase
Phase of Development	TBD - Zoning and Draft Plan only
Buildout Year	TBD
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger		
Land Use Type	Townhomes or apartments	
Development Size	1036	Units
Trip Generation Trigger	Yes	

1.3 Location Triggers		
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?	No	Access through previous phase .
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?	No	Located within 800 metres of BRT
Location Trigger	No	

1.4. Safety Triggers	
Are posted speed limits on a boundary street 80 km/hr or greater?	No
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?	No
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)?	No
Is the proposed driveway within auxiliary lanes of an intersection?	No
Does the proposed driveway make use of an existing median break that serves an existing site?	No
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?	No
Does the development include a drive-thru facility?	No
Safety Trigger	No

TIA Plan Reports

On 14 June 2017, the Council of the City of Ottawa adopted new Transportation Impact Assessment (TIA) Guidelines. In adopting the guidelines, Council established a requirement for those preparing and delivering transportation impact assessments and reports to sign a letter of certification.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associated documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below.

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed[1] or registered[2] professional in good standing, whose field of expertise [check √ appropriate field(s)] is either transportation engineering √ or transportation planning ☐.

[1,2] **License of registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.**

City Of Ottawa
Infrastructure Services and Community Sustainability
Planning and Growth Management
110 Laurier Avenue West, 4th fl.
Ottawa, ON K1P 1J1
Tel. : 613-580-2424
Fax: 613-560-6006

Ville d'Ottawa
Services d 'infrastructure et Viabilité des collectivités
Urbanisme et Gestion de la croissance
110, avenue Laurier Ouest
Ottawa (Ontario) K1P 1J1
Tél. : 613-580-2424
Télécopieur: 613-560-6006

Dated at Ottawa (City) this 20 day of September, 2018.

Name: Andrew Harte
(Please Print)

Professional Title: Professional Engineer

Signature of Individual certifier that s/he meets the above four criteria

Office Contact Information (Please Print)
Address: 13 Markham Avenue
City / Postal Code: Ottawa / K2G 3Z1
Telephone / Extension: (613) 697-3797
E-Mail Address: Andrew.Harte@CGHTransportation.com

Appendix B

Turning Movement Counts

Transportation Services - Traffic Services

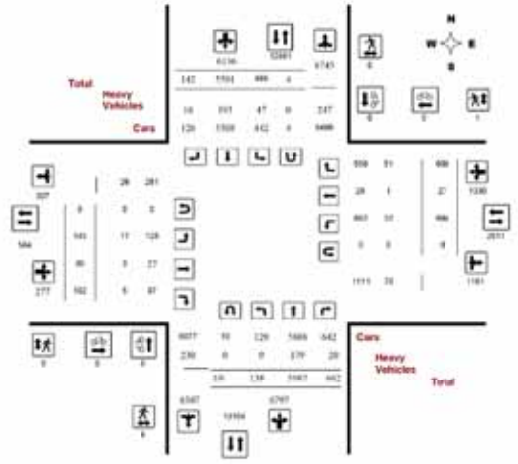
Turning Movement Count - Study Results

KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 16, 2018 WO No: 37427

Start Time: 07:00 Device: Miovision

Full Study Diagram



Transportation Services - Traffic Services

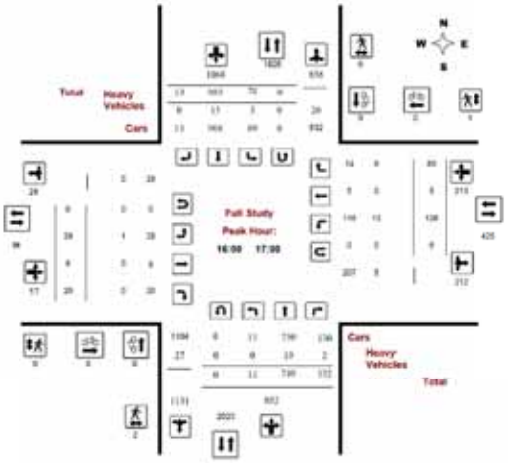
Turning Movement Count - Study Results

KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 16, 2018 WO No: 37427

Start Time: 07:00 Device: Miovision

Full Study Peak Hour Diagram



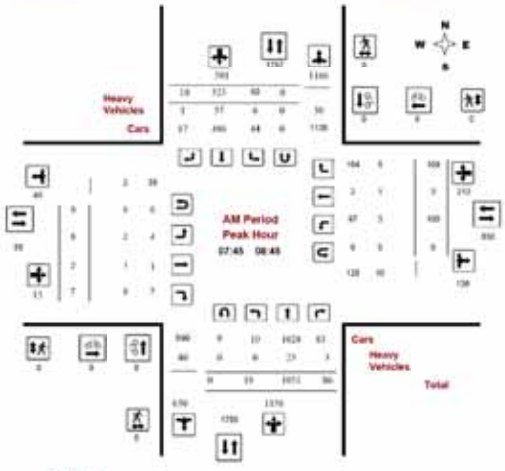
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 16, 2018 WO No: 37427

Start Time: 07:00 Device: Miovision



Comments

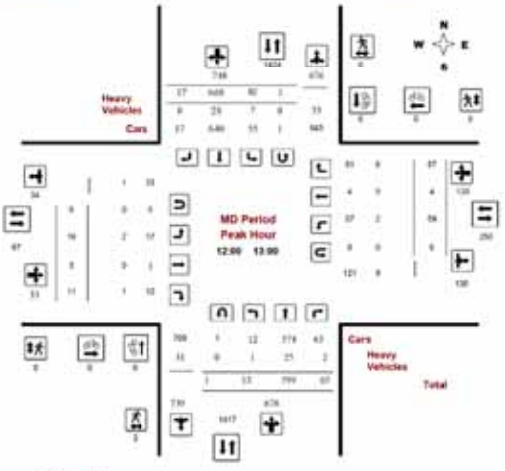
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 16, 2018 WO No: 37427

Start Time: 07:00 Device: Miovision



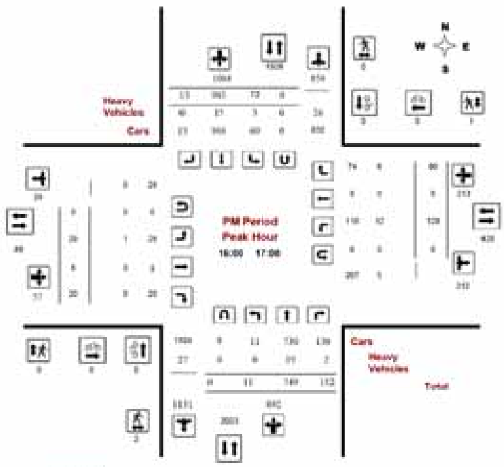
Comments

Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37427
Start Time: 07:00 **Device:** Miovision



Comments

Transportation Services - Traffic Services

Turning Movement Count - Study Results

KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37427
Start Time: 07:00 **Device:** Miovision

Full Study Summary (8 HR Standard)

Survey Date: Thursday, January 18, 2018

Total Observed U-Turns
Northbound [illegible] Southbound [illegible]
Eastbound [illegible] Westbound [illegible]

AADT Factor [illegible]

Period	Northbound LT	ST	RT	NB TOT	Southbound LT	ST	RT	SB TOT	STR TOT	Eastbound LT	ST	RT	EB TOT	Westbound LT	ST	RT	WB TOT	STR TOT	Grand Total
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sub Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
U Turns				[illegible]				[illegible]	[illegible]				[illegible]				[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
EQ 12Hr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVG 12Hr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVG 24Hr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Note: These values are calculated by multiplying the totals by the appropriate expansion factor. [illegible]

Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor. [illegible]

Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor. [illegible]

Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37427
Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute Increments

Time Period	Northbound LT	ST	RT	N TOT	Southbound LT	ST	RT	S TOT	STR TOT	Eastbound LT	ST	RT	E TOT	Westbound LT	ST	RT	W TOT	STR TOT	Grand Total
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37427
Start Time: 07:00 **Device:** Miovision

Full Study Cyclist Volume

Time Period	Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Transportation Services - Traffic Services

Turning Movement Count - Study Results

KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 | WO No: 37427
Start Time: 07:00 | Device: Miovision

Full Study Pedestrian Volume

Time Period		NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00	07:15	0	0	0	0	0	0	0
07:15	07:30	0	0	0	0	0	0	0
07:30	07:45	0	0	0	0	0	0	0
07:45	08:00	0	0	0	0	0	0	0
08:00	08:15	0	0	0	0	0	0	0
08:15	08:30	0	0	0	0	0	0	0
08:30	08:45	0	0	0	0	0	0	0
08:45	09:00	1	0	1	0	0	0	1
09:00	09:15	0	0	0	0	0	0	0
09:15	09:30	0	0	0	0	0	0	0
09:30	09:45	0	0	0	0	0	0	0
09:45	10:00	0	0	0	0	0	0	0
11:30	11:45	0	0	0	0	0	0	0
11:45	12:00	0	0	0	0	0	0	0
12:00	12:15	0	0	0	0	0	0	0
12:15	12:30	0	0	0	0	0	0	0
12:30	12:45	0	0	0	0	0	0	0
12:45	13:00	2	0	2	0	0	0	2
13:00	13:15	0	0	0	0	0	0	0
13:15	13:30	0	0	0	0	0	0	0
15:00	15:15	0	0	0	0	0	0	0
15:15	15:30	0	0	0	0	0	0	0
15:30	15:45	0	0	0	0	0	0	0
15:45	16:00	1	0	1	0	0	0	1
16:00	16:15	0	0	0	0	0	0	0
16:15	16:30	1	0	1	0	0	0	1
16:30	16:45	1	0	1	0	1	1	2
16:45	17:00	0	0	0	0	0	0	0
17:00	17:15	0	0	0	0	0	0	0
17:15	17:30	0	0	0	0	0	0	0
17:30	17:45	0	0	0	0	0	0	0
17:45	18:00	0	0	0	0	0	0	0
Total		6	0	6	0	1	1	7

Transportation Services - Traffic Services

Turning Movement Count - Study Results

KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 | WO No: 37427
Start Time: 07:00 | Device: Miovision

Full Study Heavy Vehicles

Time Period		Northbound LT	ST	RT	N TOT	Southbound LT	ST	RT	S TOT	STR TOT	Eastbound LT	ST	RT	E TOT	Westbound LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	1	2	1	12	1	6	0	12	24	0	0	0	1	0	0	1	2	4	14
07:15	07:30	0	4	1	12	2	7	0	16	28	1	0	0	1	0	0	0	3	4	15
07:30	07:45	2	9	0	11	0	5	0	9	20	1	0	0	0	1	0	0	1	4	12
07:45	08:00	0	4	0	13	1	6	0	15	28	0	0	0	0	0	0	1	2	2	15
08:00	08:15	4	4	2	15	4	7	0	20	35	1	0	0	1	0	0	2	4	6	22
08:15	08:30	0	6	0	15	1	6	0	19	30	0	1	2	2	3	1	2	6	10	24
08:30	08:45	0	6	1	19	6	13	1	20	39	1	0	2	2	0	0	0	1	3	21
08:45	09:00	0	10	4	19	2	5	1	24	43	1	0	0	2	0	0	4	11	13	28
09:00	09:15	1	8	1	18	1	5	2	18	36	0	0	1	4	2	0	2	6	10	23
09:15	09:30	1	6	0	22	1	13	1	25	47	1	0	0	0	0	0	1	2	5	26
09:30	09:45	1	7	0	18	2	11	1	27	46	4	1	0	7	0	0	2	5	12	28
09:45	10:00	0	12	0	16	2	4	1	21	37	0	2	0	1	0	0	2	4	5	21
11:30	11:45	0	6	1	17	3	7	1	24	41	1	0	1	5	0	0	4	6	11	26
11:45	12:00	0	6	0	14	2	7	2	22	36	1	1	0	4	1	0	3	8	12	26
12:00	12:15	1	6	0	16	1	6	0	17	33	1	0	0	0	0	0	0	1	3	19
12:15	12:30	0	6	1	15	1	4	0	18	34	0	0	1	1	1	0	4	9	10	22
12:30	12:45	0	7	1	15	1	6	0	15	30	0	0	0	0	1	0	0	4	4	17
12:45	13:00	0	4	0	13	2	6	0	17	30	1	0	0	1	0	0	1	3	4	17
13:00	13:15	1	7	1	15	1	5	1	20	35	1	0	0	0	1	0	5	6	11	25
13:15	13:30	1	2	1	14	3	7	1	14	28	1	0	2	5	1	0	0	5	10	19
15:00	15:15	0	8	0	18	2	6	1	18	36	0	0	0	1	4	0	1	7	8	22
15:15	15:30	0	6	0	12	2	4	1	15	27	0	0	0	1	0	0	0	6	6	18
15:30	15:45	0	7	5	14	0	3	0	10	24	0	0	0	0	1	0	0	4	4	16
15:45	16:00	0	3	0	11	3	7	2	18	29	0	0	0	2	1	0	0	7	9	18
16:00	16:15	0	6	1	21	1	7	0	17	38	0	0	0	0	7	0	0	12	12	25
16:15	16:30	0	5	0	11	0	3	0	10	21	0	0	0	0	1	0	1	5	5	15
16:30	16:45	0	2	1	6	2	2	0	7	13	1	0	0	1	1	0	0	4	6	8
16:45	17:00	0	6	0	10	0	5	0	10	20	0	0	0	0	1	0	1	2	2	11
17:00	17:15	0	3	0	5	1	2	0	6	11	0	0	0	0	0	0	0	1	1	6
17:15	17:30	0	3	0	6	0	3	0	7	13	0	0	0	0	0	0	1	1	1	7
17:30	17:45	0	3	0	6	1	3	0	7	13	0	0	0	0	0	0	0	1	1	7
17:45	18:00	0	3	0	4	0	1	0	6	10	0	0	0	0	0	0	2	2	2	6
Total	None	9	179	22	338	47	183	18	503	841	17	3	5	81	32	1	51	154	205	573

Transportation Services - Traffic Services

Turning Movement Count - Study Results

KENNEVALE DR @ STRANDHERD DR

Survey Date: Thursday, January 18, 2018 | WO No: 37427
Start Time: 07:00 | Device: Miovision

Full Study 15 Minute U-Turn Total

Time Period		Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	1	0	0	0	1
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	0	0	0	0	0
09:00	09:15	1	0	0	0	1
09:15	09:30	2	0	0	0	2
09:30	09:45	1	0	0	0	1
09:45	10:00	0	0	0	0	0
11:30	11:45	1	0	0	0	1
11:45	12:00	0	0	0	0	0
12:00	12:15	0	0	0	0	0
12:15	12:30	1	0	0	0	1
12:30	12:45	0	0	0	0	0
12:45	13:00	0	1	0	0	1
13:00	13:15	0	0	0	0	0
13:15	13:30	0	0	0	0	0
15:00	15:15	1	1	0	0	2
15:15	15:30	2	0	0	0	2
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	2	0	0	2
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		10	4	0	0	14

Transportation Services - Traffic Services W.O. 37340

Turning Movement Count - 15 Minute Summary Report

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018

Total Observed U-Turns: Northbound 0, Southbound 0, Eastbound 7, Westbound 0

Time Period		CEDARVIEW RD/TARTAN DR Northbound LT	ST	RT	N TOT	Southbound LT	ST	RT	S TOT	STR TOT	STRANDHERD DR Eastbound LT	ST	RT	E TOT	Westbound LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	84	1	3	93	9	2	22	33	126	7	115	23	144	1	124	3	128	234	360
07:15	07:30	81	8	6	93	1	1	15	17	110	14	132	24	171	3	146	4	153	324	434
07:30	07:45	80	3	5	88	11	6	27	44	132	16	109	22	148	1	203	7	211	359	491
07:45	08:00	104	13	7	124	9	4	26	39	163	11	139	25	175	2	148	18	168	338	501
08:00	08:15	85	9	3	97	12	3	26	41	138	22	120	34	181	0	187	16	203	384	522
08:15	08:30	100	27	3	130	27	15	41	83	218	26	111	33	170	1	182	16	212	382	600
08:30	08:45	90	13	4	110	10	3	23	36	153	12	96	28	136	0	184	12	196	332	485
08:45	09:00	82	8	4	94	15	8	21	44	138	16	100	20	136	2	182	12	196	332	473
09:00	09:15	71	10	5	86	6	4	15	25	111	6	93	25	127	2	155	15	172	299	410
09:15	09:30	66	8	1	76	6	3	17	26	102	17	114	20	151	0	160	26	186	311	413
09:30	09:45	47	2	6	55	8	2	12	22	77	21	109	26	156	5	127	14	146	296	373
09:45	10:00	47	8	2	55	14	6	16	36	89	16	100	18	134	4	133	21	158	292	377
11:30	11:45	38	2	5	44	17	1	20	38	82	15	113	38	165	1	126	20	147	312	394
11:45	12:00	35	2	0	37	7	3	13	23	60	21	120	36	177	0	106	15	121	298	358
12:00	12:15	38	2	2	42	14	5	16	35	77	18	127	36	181	1	128	8	137	318	395
12:15	12:30	32	4	3	39	11	2	16	29	68	14	133	29	176	2	136	11	149	325	393
12:30	12:45	40	2	3	45	12	2	11	25	76	18	142	30	190	4	124	14	142	332	402
12:45	13:00	38	5	5	43	13	2	17	32	75	18	162	43	223	0	112	16	136	351	426
13:00	13:15	29	2	1	32	17	2	11	30	62	21	129	37	187	4	129	12	146	332	394
13:15	13:30	33	4	3	42	14	1	14	29	71	16	124	42	182	2	113	7	122	304	375
15:00	15:15	33	5	1	39	13	7	17	37	76	34	147	57	237	2	149	25	176	413	489
15:15	15:30	48	11	2	61	20	17	38	75	136	21	197	56	254	4	160	20	184	438	574
15:30	15:45	36	6	2	44	22	5	32	59	103	25	173	71	269	2	145	15	162	431	534
15:45	16:00	54	3	3	60	15	7	14	36	96	33	168	75	276	2	139	16	157	433	529
16:00	16:15	48	8	6	62	11	14	25	50	112	28	184	75	289	8	159	13	180	475	583
16:15	16:30	47	8	7	63	14	11	21	46	111	16	197	55	327	5	174	16	196	523	634
16:30	16:45	53	5	5	63	13	15	23	49	112	32	173	87	289	3	164	15	182	471	583
16:45	17:00	60	11	7	80	14	9	20	43	111	22	173	89	294	3	161	18	182	476	587
17:00	17:15	38	6	3	47	21	11	16	50	97	28	169	97	294	4	159	15	175	469	566
17:15	17:30	41	11	6	58	17	7	11	35	93	22	160	100	282	3	143	8	156	461	554
17:30	17:45	46	3	2	51	19	8	14	42	93	20	162	80	302	1	144	16	161	467	560
17:45	18:00	45	4	1	50	10	6	12	34	86	24	160	97	291	3	162	19	184	475	555
TOTAL		1778	204	113	2095	440	187	615	1242	3337	672	4442	1373	6487	75	4744	441	5260	11987	15264

Note: U-Turns are included in Totals. Comments

Transportation Services - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order: 37540

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Count Date: Thursday, January 10, 2019 **Start Time:** 07:00

	CEDARVIEW RD/TARTAN DR			STRANDHERD DR			
Time Period	Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00 - 08:00	0	0	0	0	0	0	0
08:00 - 09:00	0	0	0	0	0	0	0
09:00 - 10:00	0	0	0	0	0	0	0
11:00 - 12:00	0	0	0	0	0	0	0
12:00 - 13:00	0	0	0	0	0	0	0
15:00 - 16:00	0	0	0	0	0	0	0
16:00 - 17:00	0	0	0	0	0	0	0
17:00 - 18:00	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Comment:

Note: These volumes consists of bicycles only (no mopeds or motorcycles) and ARE NOT included in the Turning Movement Count Summary

2019-Feb-10 Page 1 of 1

Transportation Services - Traffic Services

Turning Movement Count - Full Study Diagram

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 10, 2019 **WO#:** 37540 **Device:** Miovision

Comments:

2019-Feb-10 Page 1 of 1

Transportation Services - Traffic Services

Turning Movement Count - Heavy Vehicle Report

W.O. 37540

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 10, 2019

	CEDARVIEW RD/TARTAN DR								STRANDHERD DR									
	Northbound			N	Southbound			S	Eastbound			E	Westbound			W		
Time Period	LT	ST	RT	TOT	LT	ST	RT	TOT	STR TOT	LT	ST	RT	TOT	LT	ST	RT	TOT	STR TOT	Grand Total
07:00 - 08:00	6	1	0	7	0	6	1	8	15	0	35	14	47	0	18	8	26	73	94
08:00 - 09:00	20	2	0	22	2	1	5	8	30	1	32	15	48	1	28	5	34	77	107
09:00 - 10:00	27	0	0	27	4	0	1	5	32	1	32	15	48	1	29	4	34	64	116
11:00 - 12:00	22	0	1	23	4	1	3	8	31	1	24	16	41	0	23	5	28	69	100
12:00 - 13:00	17	0	0	17	3	0	1	4	21	1	33	18	52	0	14	2	16	68	88
15:00 - 16:00	10	1	0	11	3	0	2	5	22	7	15	13	35	1	16	4	21	51	73
16:00 - 17:00	15	0	0	15	0	0	0	11	26	4	13	12	29	0	21	2	23	52	81
17:00 - 18:00	4	0	0	4	0	1	0	0	5	68	0	0	2	11	0	0	2	9	15	28
Sub Total	127	4	0	133	23	3	13	51	190	13	193	105	306	3	164	35	195	483	673
U-Turns (Heavy Vehicles)				0				0	0				0				0	0	0
Total	127	4	0	0	23	3	13	51	190	13	193	105	306	3	164	35	195	483	673

Heavy Vehicles include Buses, Single-Unit Trucks and Articulated Trucks. Further they ARE included in the Turning Movement Count Summary

2019-Feb-1 Page 1 of 1

Transportation Services - Traffic Services

Turning Movement Count - Pedestrian Volume Report

Work Order: 37540

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Count Date: Thursday, January 10, 2019 **Start Time:** 07:00

Time Period	NE Approach (E or W Crossing)	SE Approach (E or W Crossing)	Total	ES Approach (N or S Crossing)	WS Approach (N or S Crossing)	Total	Grand Total
07:00 - 07:15	0	0	0	0	0	0	0
07:15 - 07:30	0	0	0	0	0	0	0
07:30 - 07:45	0	0	0	0	0	0	0
07:45 - 08:00	0	0	0	0	0	0	0
11:00 - 11:15	0	0	0	0	0	0	0
11:15 - 11:30	0	0	0	0	0	0	0
11:30 - 11:45	0	0	0	0	0	0	0
11:45 - 12:00	0	0	0	0	0	0	0
12:00 - 12:15	0	0	0	0	0	0	0
12:15 - 12:30	0	0	0	0	0	0	0
11:30 - 12:30	0	0	0	0	0	0	0
12:30 - 12:45	0	0	0	0	0	0	0
12:45 - 13:00	0	0	0	0	0	0	0
13:00 - 13:15	0	0	0	0	0	0	0
13:15 - 13:30	0	0	0	0	0	0	0
12:30 - 13:30	0	0	0	0	0	0	0
15:00 - 15:15	0	0	0	0	0	0	0
15:15 - 15:30	0	0	0	0	0	0	0
15:30 - 15:45	0	0	0	0	0	0	0
15:45 - 16:00	0	0	0	0	0	0	0
15:00 - 16:00	0	0	0	0	0	0	0
16:00 - 16:15	0	0	0	0	0	0	0
16:15 - 16:30	0	0	0	0	0	0	0
16:30 - 16:45	0	0	0	0	0	0	0
16:45 - 17:00	0	0	0	0	0	0	0
16:00 - 17:00	0	0	0	0	0	0	0
17:00 - 17:15	0	0	0	0	0	0	0
17:15 - 17:30	0	0	0	0	0	0	0
17:30 - 17:45	0	0	0	0	0	0	0
17:45 - 18:00	0	0	0	0	0	0	0
17:00 - 18:00	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Comments:

2019-Feb-15 Page 1 of 1

Ottawa

Transportation Services - Traffic Services

Work Order
37540

Turning Movement Count - Full Study Summary Report

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018

Total Observed U-Turns
Northbound 0 Southbound 0
Eastbound 2 Westbound 0

AADT Factor
1.00

Full Study

	CEDARVIEW RD/TARTAN DR									STRANDHERD DR										
	Northbound				Southbound					Eastbound				Westbound						
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
08:00 09:00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
09:00 10:00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11:30 12:30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12:30 13:30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15:00 16:00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16:00 17:00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17:00 18:00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sub Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
U Turns				[illegible]				[illegible]	[illegible]				[illegible]				[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
EQ 12Hr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Note: These values are calculated by multiplying the totals by the appropriate expansion factor. [illegible]

Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
AVG 12Hr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor. [illegible]

Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
AVG 24Hr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor. [illegible]

Comments

Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

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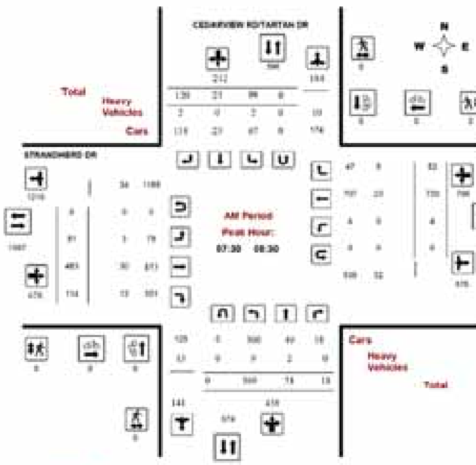
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37540
Start Time: 07:00 **Device:** Miovision



Comments

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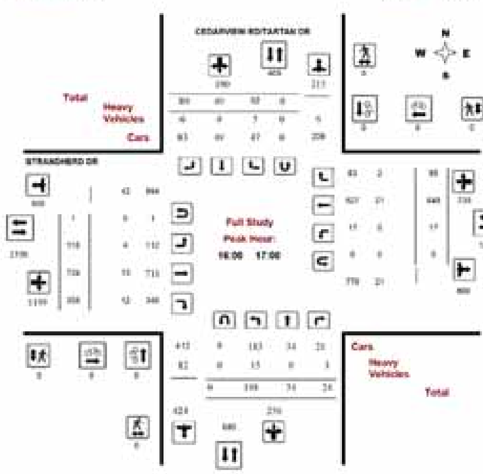
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37540
Start Time: 07:00 **Device:** Miovision



Comments

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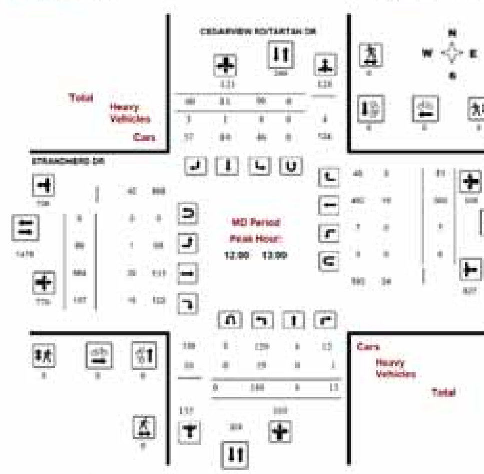
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37540
Start Time: 07:00 **Device:** Miovision



Comments

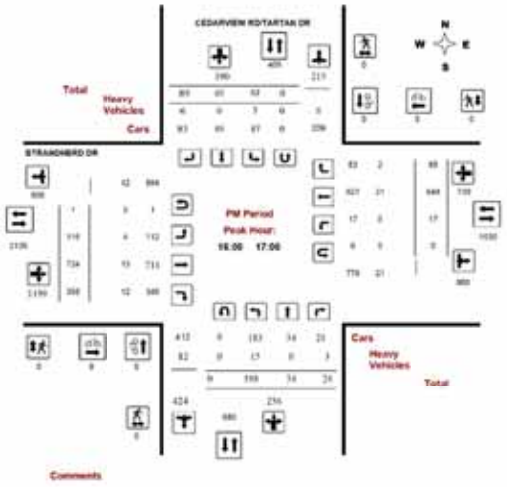
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 10, 2019 WO No: 37540

Start Time: 07:00 Device: Miovision



Transportation Services - Traffic Services

Work Order 37540

Turning Movement Count - 15 Min U-Turn Total Report

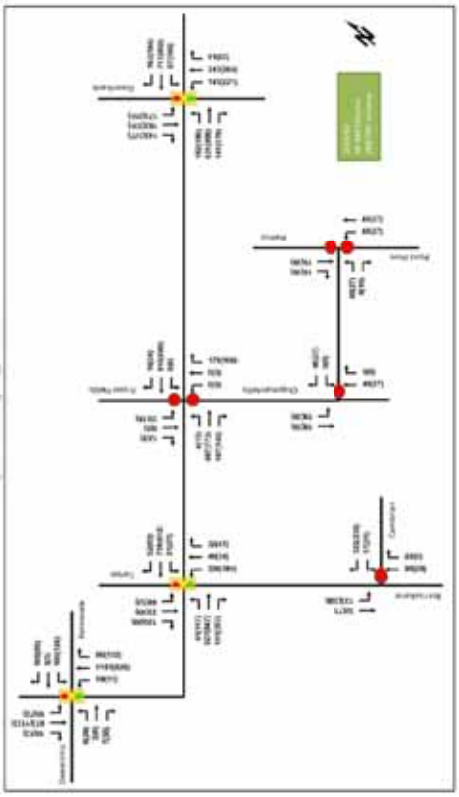
STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 10, 2019

Time Period		Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	0	0
09:15	09:30	0	0	0	0	0
09:30	09:45	0	0	0	0	0
09:45	10:00	0	0	0	0	0
11:30	11:45	0	0	1	0	1
11:45	12:00	0	0	0	0	0
12:00	12:15	0	0	0	0	0
12:15	12:30	0	0	0	0	0
12:30	12:45	0	0	0	0	0
12:45	13:00	0	0	0	0	0
13:00	13:15	0	0	0	0	0
13:15	13:30	0	0	0	0	0
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	1	0	1
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		0	0	2	0	2

3285, 3288 & 3305 Borrisokane Road Transportation Impact Assessment

Figure 2: Existing Traffic Counts



Appendix C

Synchro Intersection Worksheets – Existing Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	2	7	100	3	109	19	1125	86	50	628	18
Future Volume (vph)	6	2	7	100	3	109	19	1125	86	50	628	18
Satd. Flow (prot)	1243	1160	1450	1589	1406	0	1621	1706	1409	1476	1626	1395
Flt Permitted	0.631			0.757			0.400			0.047		
Satd. Flow (perm)	826	1160	1450	1267	1406	0	682	1706	1409	73	1626	1395
Satd. Flow (RTOR)			89		121				91			33
Lane Group Flow (vph)	7	2	8	111	124	0	21	1250	96	56	698	20
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4		4	8			2		2	6		6
Detector Phase	4	4	4	8	8		2	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	32.6	32.6	32.6	32.6	32.6		30.4	30.4	30.4	11.4	30.4	30.4
Total Split (s)	33.0	33.0	33.0	33.0	33.0		75.0	75.0	75.0	12.0	87.0	87.0
Total Split (%)	27.5%	27.5%	27.5%	27.5%	27.5%		62.5%	62.5%	62.5%	10.0%	72.5%	72.5%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3		1.8	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6		6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	None		C-Max	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	16.0	16.0	16.0	16.0	16.0		80.0	80.0	80.0	91.0	91.0	91.0
Actuated g/C Ratio	0.13	0.13	0.13	0.13	0.13		0.67	0.67	0.67	0.76	0.76	0.76
v/c Ratio	0.06	0.01	0.03	0.66	0.42		0.05	1.10	0.10	0.41	0.57	0.02
Control Delay	43.5	41.5	0.1	66.8	12.7		10.1	80.9	2.7	20.6	9.1	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.5	41.5	0.1	66.8	12.7		10.1	80.9	2.7	20.6	9.1	0.9
LOS	D	D	A	E	B		B	F	A	C	A	A
Approach Delay		22.9			38.2			74.3			9.7	
Approach LOS		C			D			E			A	
Queue Length 50th (m)	1.4	0.4	0.0	24.9	0.6		1.6	~335.6	0.4	2.8	58.1	0.0
Queue Length 95th (m)	5.5	2.7	0.0	41.2	16.4		5.8	#447.0	7.5	13.8	108.2	1.3
Internal Link Dist (m)		172.9			177.4			1040.6			345.0	
Turn Bay Length (m)	70.0		150.0	50.0			130.0		60.0	180.0		60.0
Base Capacity (vph)	181	255	388	278	403		454	1137	969	136	1232	1065
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	0.04	0.01	0.02	0.40	0.31		0.05	1.10	0.10	0.41	0.57	0.02

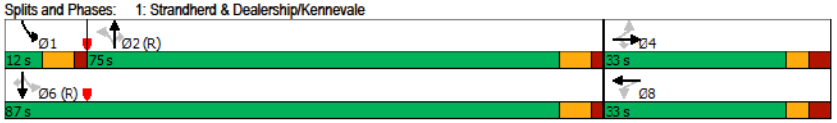
Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 105 (88%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.10
Intersection Signal Delay: 49.5 — Intersection LOS: D
Intersection Capacity Utilization 85.8% — ICU Level of Service E
Analysis Period (min) 15

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

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

Splits and Phases: 1: Strandherd & Dealership/Kennevale



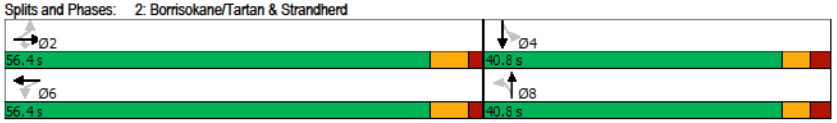
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	482	141	15	703	52	336	49	27	69	23	120
Future Volume (vph)	81	482	141	15	703	52	336	49	27	69	23	120
Satd. Flow (prot)	1589	1642	1332	1621	1665	0	1605	1594	0	1605	1493	0
Flt Permitted	0.113			0.342			0.652			0.702		
Satd. Flow (perm)	189	1642	1332	583	1665	0	1101	1594	0	1186	1493	0
Satd. Flow (RTOR)			157		6			30			133	
Lane Group Flow (vph)	90	536	157	17	839	0	373	84	0	77	159	0
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	56.4	56.4	56.4	56.4	56.4		23.8	23.8		23.8	23.8	
Total Split (s)	56.4	56.4	56.4	56.4	56.4		40.8	40.8		40.8	40.8	
Total Split (%)	58.0%	58.0%	58.0%	58.0%	58.0%		42.0%	42.0%		42.0%	42.0%	
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4		5.8	5.8		5.8	5.8	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max	Max	Max	Max		None	None		None	None	
Act Effct Green (s)	50.0	50.0	50.0	50.0	50.0		33.9	33.9		33.9	33.9	
Actuated g/C Ratio	0.52	0.52	0.52	0.52	0.52		0.35	0.35		0.35	0.35	
v/c Ratio	0.92	0.63	0.20	0.06	0.97		0.96	0.14		0.18	0.26	
Control Delay	99.9	20.8	2.8	12.6	47.3		69.3	15.1		22.8	6.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	99.9	20.8	2.8	12.6	47.3		69.3	15.1		22.8	6.9	
LOS	F	C	A	B	D		E	B		C	A	
Approach Delay		26.3			46.6			59.3			12.1	
Approach LOS		C			D			E			B	
Queue Length 50th (m)	14.8	68.3	0.0	1.5	144.1		66.1	6.6		9.7	3.1	
Queue Length 95th (m)	#46.0	102.4	9.0	4.9	#228.5		#120.8	16.3		20.0	15.9	
Internal Link Dist (m)		1040.6			357.0			275.6			103.1	
Turn Bay Length (m)	140.0		175.0	150.0			70.0			38.0		
Base Capacity (vph)	98	854	768	302	869		400	599		432	628	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.92	0.63	0.20	0.06	0.97		0.93	0.14		0.18	0.25	

Intersection Summary
Cycle Length: 97.2
Actuated Cycle Length: 96.2
Natural Cycle: 95
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.97

Intersection Signal Delay: 38.8 — Intersection LOS: D
Intersection Capacity Utilization 99.8% — ICU Level of Service F
Analysis Period (min) 15

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

Splits and Phases: 2: Borrisokane/Tartan & Strandherd



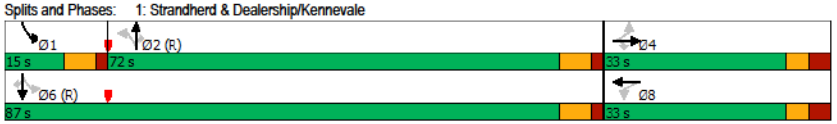
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	8	20	128	5	80	11	791	132	72	1073	13
Future Volume (vph)	29	8	20	128	5	80	11	791	132	72	1073	13
Satd. Flow (prot)	1605	1706	1450	1517	1389	0	1621	1689	1450	1589	1706	1450
Flt Permitted	0.695			0.752			0.104			0.161		
Satd. Flow (perm)	1174	1706	1414	1195	1389	0	177	1689	1417	269	1706	1450
Satd. Flow (RTOR)			89		89				100			33
Lane Group Flow (vph)	32	9	22	142	95	0	12	879	147	80	1192	14
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8			2		1	6	
Permitted Phases	4		4	8			2		2	6		6
Detector Phase	4	4	4	8	8		2	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	32.6	32.6	32.6	32.6	32.6		30.4	30.4	30.4	11.4	30.4	30.4
Total Split (s)	33.0	33.0	33.0	33.0	33.0		72.0	72.0	72.0	15.0	87.0	87.0
Total Split (%)	27.5%	27.5%	27.5%	27.5%	27.5%		60.0%	60.0%	60.0%	12.5%	72.5%	72.5%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3		1.8	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6		6.4	6.4	6.4	6.4	6.4	6.4
Lead/Lag							Lag	Lag	Lag	Lead		
Lead-Lag Optimize?							Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	None		C-Max	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	19.2	19.2	19.2	19.2	19.2		76.6	76.6	76.6	87.8	87.8	87.8
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.64	0.64	0.64	0.73	0.73	0.73
v/c Ratio	0.17	0.03	0.07	0.74	0.32		0.11	0.82	0.16	0.29	0.96	0.01
Control Delay	42.9	39.0	0.5	70.0	12.3		15.1	26.9	4.8	8.2	33.6	0.5
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	42.9	39.0	0.5	70.0	12.3		15.1	26.9	4.8	8.2	33.6	0.5
LOS	D	D	A	E	B		B	C	A	A	C	A
Approach Delay		27.5			46.8			23.7			31.7	
Approach LOS		C			D			C			C	
Queue Length 50th (m)	6.5	1.8	0.0	31.7	1.2		1.1	153.2	4.1	4.7	218.9	0.0
Queue Length 95th (m)	14.6	6.0	0.0	50.3	14.7		5.1	#275.3	14.5	11.1	#377.2	0.7
Internal Link Dist (m)		172.9			177.4			1040.6			345.0	
Turn Bay Length (m)	70.0		150.0	50.0			130.0		60.0	180.0		60.0
Base Capacity (vph)	258	375	380	262	375		113	1078	941	291	1248	1069
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	0.12	0.02	0.06	0.54	0.25		0.11	0.82	0.16	0.27	0.96	0.01

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 57 (48%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96
Intersection Signal Delay: 29.8 — Intersection LOS: C
Intersection Capacity Utilization 93.5% — ICU Level of Service F
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Strandherd & Dealership/Kennevale



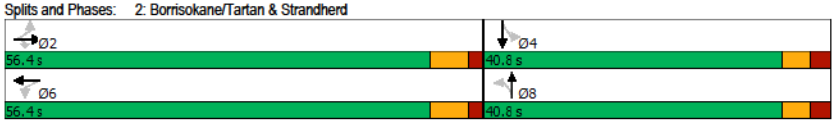
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	787	353	23	577	65	184	34	35	52	49	89
Future Volume (vph)	117	787	353	23	577	65	184	34	35	52	49	89
Satd. Flow (prot)	1605	1706	1436	1621	1664	0	1531	1495	0	1503	1493	0
Flt Permitted	0.274			0.171			0.659			0.707		
Satd. Flow (perm)	463	1706	1436	292	1664	0	1062	1495	0	1118	1493	0
Satd. Flow (RTOR)			392		9			39			99	
Lane Group Flow (vph)	130	874	392	26	713	0	204	77	0	58	153	0
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	56.4	56.4	56.4	56.4	56.4		23.8	23.8		23.8	23.8	
Total Split (s)	56.4	56.4	56.4	56.4	56.4		40.8	40.8		40.8	40.8	
Total Split (%)	58.0%	58.0%	58.0%	58.0%	58.0%		42.0%	42.0%		42.0%	42.0%	
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4		5.8	5.8		5.8	5.8	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max	Max	Max	Max		None	None		None	None	
Act Effct Green (s)	50.3	50.3	50.3	50.3	50.3		21.0	21.0		21.0	21.0	
Actuated g/C Ratio	0.60	0.60	0.60	0.60	0.60		0.25	0.25		0.25	0.25	
v/c Ratio	0.47	0.85	0.38	0.15	0.71		0.77	0.19		0.21	0.34	
Control Delay	18.8	25.9	2.4	12.6	18.4		47.7	14.4		25.4	11.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	18.8	25.9	2.4	12.6	18.4		47.7	14.4		25.4	11.8	
LOS	B	C	A	B	B		D	B		C	B	
Approach Delay		18.6			18.2			38.6			15.5	
Approach LOS		B			B			D			B	
Queue Length 50th (m)	10.2	101.0	0.0	1.6	69.3		29.6	4.6		7.2	6.6	
Queue Length 95th (m)	34.3	#230.3	12.8	7.5	#154.0		52.2	13.9		16.1	19.8	
Internal Link Dist (m)		1040.6			354.9			275.6			103.1	
Turn Bay Length (m)	140.0		175.0	150.0			70.0			38.0		
Base Capacity (vph)	278	1027	1020	175	1005		447	652		471	686	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.47	0.85	0.38	0.15	0.71		0.46	0.12		0.12	0.22	

Intersection Summary
Cycle Length: 97.2
Actuated Cycle Length: 83.6
Natural Cycle: 85
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.85

Intersection Signal Delay: 20.4 — Intersection LOS: C
Intersection Capacity Utilization 91.6% — ICU Level of Service F
Analysis Period (min) 15

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

Splits and Phases: 2: Borrisokane/Tartan & Strandherd



Appendix D

Collision Data

LOCATION	X	Y	DATE	TIME	ENVIRONMENT	ROAD_SURFACE_C	TRAFFIC_CONTROL	ACCIDENT_LOCATION	LIGHT	CLASS_OF_ACCIDENT	IMPACT_TYPE
STRANDHERD DR btwn CEDARVIEW RD & MCKENNA CASEY DR	362085.91140	5013560.34736	2015-02-08	8:45	03 - Snow	03 - Loose snow	10 - No control	01 - Non intersection	01 - Daylight	02 - Non-fatal injury	01 - Approaching
STRANDHERD DR btwn CEDARVIEW RD & MCKENNA CASEY DR	362193.20337	5013546.93597	2016-11-26	14:39	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	02 - Non-fatal injury	03 - Rear end
STRANDHERD DR btwn CEDARVIEW RD & MCKENNA CASEY DR	362171.88203	5013550.70423	2017-12-22	16:50	01 - Clear	01 - Dry	10 - No control	04 - At/near private drive	05 - Dusk	03 - P.D. only	04 - Sideswipe
STRANDHERD DR btwn CEDARVIEW RD & MCKENNA CASEY DR (__30IZPQ)	361996.68544	5013584.06782	2018-08-04	14:19	02 - Rain	02 - Wet	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	03 - Rear end
STRANDHERD DR btwn CEDARVIEW RD & MCKENNA CASEY DR (__30IZPQ)	362177.49130	5013549.23000	2019-05-30	20:24	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	05 - Dusk	02 - Non-fatal injury	03 - Rear end
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.21320	5013545.40800	2019-01-21	15:46	05 - Drifting Snov	05 - Packed snow	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.1944	5013545.354	2019-02-04	22:10	04 - Freezing Rair	06 - Ice	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	07 - SMV other
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.1188	5013545.463	2019-03-22	19:20	03 - Snow	02 - Wet	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	03 - Rear end
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.0316	5013545.556	2019-03-25	7:20	01 - Clear	06 - Ice	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.1624	5013545.558	2019-04-26	17:30	02 - Rain	02 - Wet	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.011	5013545.548	2019-04-29	9:22	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.1288	5013545.383	2019-04-01	12:10	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.259	5013545.407	2019-05-17	12:00	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.1625	5013545.383	2019-07-03	10:43	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362289.33910	5013546.28300	2019-07-05	13:50	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.27370	5013545.81700	2019-07-11	16:38	02 - Rain	02 - Wet	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362290.98200	5013545.34400	2019-08-12	13:22	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.17760	5013545.54900	2019-07-29	16:50	02 - Rain	02 - Wet	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.41160	5013545.36800	2019-09-21	19:05	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.00070	5013545.31000	2019-11-11	15:35	03 - Snow	03 - Loose snow	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.32410	5013545.41700	2019-11-11	22:27	03 - Snow	05 - Packed snow	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	02 - Angle
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362291.17090	5013545.41100	2019-12-01	12:15	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362290.46150	5013543.29200	2019-12-11	19:00	03 - Snow	02 - Wet	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	03 - Rear end
BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	362290.45310	5013544.22200	2019-12-23	14:11	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR	362605.01596	5012450.64743	2017-05-23	14:40	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	99 - Other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR	362556.53419	5012615.60065	2017-10-07	10:28	02 - Rain	02 - Wet	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	07 - SMV other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR	362718.30194	5012234.88582	2017-09-23	21:27	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	07 - Dark	03 - P.D. only	07 - SMV other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR	362746.66865	5012158.54310	2017-12-06	8:10	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	02 - Non-fatal injury	07 - SMV other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR	362297.85892	5013339.30775	2017-02-10	22:39	04 - Freezing Rair	06 - Ice	10 - No control	01 - Non intersection	07 - Dark	03 - P.D. only	07 - SMV other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR	362746.72600	5012142.75110	2017-02-06	20:11	03 - Snow	03 - Loose snow	10 - No control	01 - Non intersection	07 - Dark	03 - P.D. only	07 - SMV other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	362753.97986	5012177.86688	2018-03-07	8:37	03 - Snow	03 - Loose snow	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	07 - SMV other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	362313.40329	5013247.03949	2018-05-15	8:26	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	02 - Non-fatal injury	07 - SMV other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	362341.04528	5013160.27695	2018-08-02	16:36	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	07 - SMV other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	362760.24892	5012133.68660	2018-08-15	11:11	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	07 - SMV other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	362756.78968	5012141.91768	2018-08-24	17:17	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	02 - Non-fatal injury	07 - SMV other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	362911.11171	5011954.59242	2018-09-15	17:30	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	07 - SMV other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	362709.35855	5012256.50456	2018-10-08	13:45	02 - Rain	02 - Wet	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	07 - SMV other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	362378.13680	5013066.47697	2018-12-01	22:45	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	07 - Dark	03 - P.D. only	07 - SMV other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	362343.00016	5013155.44267	2018-12-27	12:27	01 - Clear	06 - Ice	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	03 - Rear end
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	362307.85770	5013270.04000	2019-06-04	5:14	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	03 - Dawn	03 - P.D. only	07 - SMV other
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	362336.24850	5013172.04600	2019-10-15	16:11	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	03 - Rear end
BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	362313.14980	5013248.30600	2019-12-30	23:15	04 - Freezing Rair	06 - Ice	10 - No control	01 - Non intersection	07 - Dark	03 - P.D. only	07 - SMV other

Appendix E

Synchro Intersection Worksheets – 2030 Future Background Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	19	47	100	108	113	219	2600	86	53	1250	307
Future Volume (vph)	72	19	47	100	108	113	219	2600	86	53	1250	307
Satd. Flow (prot)	1243	1160	1450	1589	1353	0	3144	3219	0	1476	3090	1395
Flt Permitted	0.460			0.745			0.950			0.950		
Satd. Flow (perm)	602	1160	1431	1245	1353	0	3144	3219	0	1476	3090	1395
Satd. Flow (RTOR)												
Lane Group Flow (vph)	72	19	47	100	221	0	219	2686	0	53	1250	307
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								6
Detector Phase	4	4	4	8	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	39.9	39.9	39.9	32.9	32.9		11.4	30.4		11.4	39.4	39.4
Total Split (s)	41.0	41.0	41.0	41.0	41.0		17.8	66.6		12.4	61.2	61.2
Total Split (%)	34.2%	34.2%	34.2%	34.2%	34.2%		14.8%	55.5%		10.3%	51.0%	51.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6		1.8	1.8		1.8	1.8	1.8
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)	6.9	6.9	6.9	6.9	6.9		6.4	6.4		6.4	6.4	6.4
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	24.8	24.8	24.8	24.8	24.8		12.7	69.3		8.8	62.8	62.8
Actuated g/C Ratio	0.21	0.21	0.21	0.21	0.21		0.11	0.58		0.07	0.52	0.52
v/c Ratio	0.58	0.08	0.16	0.39	0.79		0.66	1.45		0.50	0.77	0.42
Control Delay	60.0	35.6	37.4	43.8	64.3		64.3	221.4		69.4	28.6	21.5
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	60.0	35.6	37.4	43.8	64.3		64.3	221.4		69.4	28.6	21.5
LOS	E	D	D	D	E		E	F		E	C	C
Approach Delay		49.0			57.9			209.5			28.6	
Approach LOS		D			E			F			C	
Queue Length 50th (m)	15.2	3.6	9.0	20.2	49.1		24.6	~472.4		11.9	120.6	43.0
Queue Length 95th (m)	28.6	9.1	17.6	33.2	70.2		m17.1	m#251.4		#32.4	#169.2	73.9
Internal Link Dist (m)		172.9			177.4			1040.6			345.0	
Turn Bay Length (m)	70.0		150.0	50.0			130.0			180.0		60.0
Base Capacity (vph)	171	329	406	353	384		338	1858		107	1618	730
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.42	0.06	0.12	0.28	0.58		0.65	1.45		0.50	0.77	0.42

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 69 (58%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

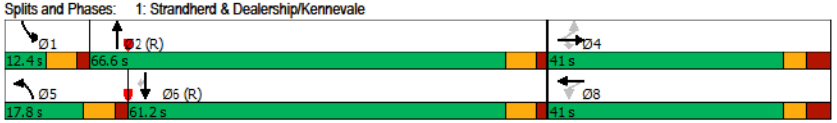
Maximum v/c Ratio: 1.45
Intersection Signal Delay: 136.7 — Intersection LOS: F
Intersection Capacity Utilization 126.7% — ICU Level of Service H
Analysis Period (min) 15

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

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Strandherd & Dealership/Kennevale



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	725	522	60	1535	52	1054	49	105	69	23	230
Future Volume (vph)	117	725	522	60	1535	52	1054	49	105	69	23	230
Satd. Flow (prot)	1589	3119	1332	1621	3187	0	3113	1522	0	1605	1474	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1589	3119	1332	1621	3187	0	3113	1522	0	1605	1474	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	117	725	522	60	1587	0	1054	154	0	69	253	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4		11.0	34.0		11.0	34.0	
Total Split (s)	12.0	58.4	58.4	11.6	58.0		16.0	34.0		16.0	34.0	
Total Split (%)	10.0%	48.7%	48.7%	9.7%	48.3%		13.3%	28.3%		13.3%	28.3%	
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4		6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None		None	None	
Act Effct Green (s)	9.2	53.8	53.8	7.0	51.6		10.0	27.8		9.0	24.4	
Actuated g/C Ratio	0.08	0.45	0.45	0.06	0.43		0.08	0.23		0.08	0.20	
v/c Ratio	0.96	0.52	0.87	0.64	1.16		4.07	0.44		0.57	0.85	
Control Delay	128.4	10.7	27.6	85.3	112.4		1404.9	44.4		72.3	70.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	128.4	10.7	27.6	85.3	112.4		1404.9	44.4		72.3	70.4	
LOS	F	B	C	F	F		F	D		E	E	
Approach Delay		27.2			111.4			1231.4			70.8	
Approach LOS		C			F			F			E	
Queue Length 50th (m)	~33.7	25.3	114.4	13.9	~229.5		~230.3	31.4		15.6	56.0	
Queue Length 95th (m)	m#59.4	19.6	#172.8	#39.6	#271.2		#269.7	50.8		30.7	#89.0	
Internal Link Dist (m)		1040.6			387.1			275.6			103.1	
Turn Bay Length (m)	105.0		110.0	55.0			100.0			38.0		
Base Capacity (vph)	122	1399	597	94	1370		259	368		133	343	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.96	0.52	0.87	0.64	1.16		4.07	0.42		0.52	0.74	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 116 (97%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

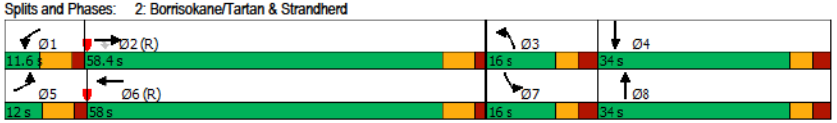
Maximum v/c Ratio: 4.07
Intersection Signal Delay: 381.2 — Intersection LOS: F
Intersection Capacity Utilization 122.1% — ICU Level of Service H
Analysis Period (min) 15

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

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd

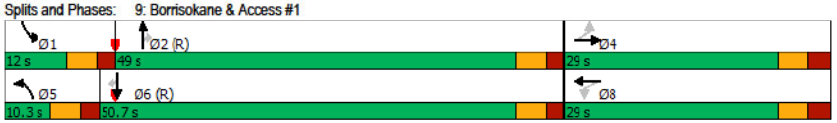


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	58	0	4	7	0	83	2	493	3	39	214	21
Future Volume (vph)	58	0	4	7	0	83	2	493	3	39	214	21
Satd. Flow (prot)	1621	1450	0	1621	1450	0	1621	1706	1450	1621	1706	1450
Flt Permitted	0.703			0.755			0.950			0.950		
Satd. Flow (perm)	1199	1450	0	1288	1450	0	1621	1706	1450	1621	1706	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	58	4	0	7	83	0	2	493	3	39	214	21
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.8	28.8		28.8	28.8		10.3	24.3	24.3	10.3	24.3	24.3
Total Split (s)	29.0	29.0		29.0	29.0		10.3	49.0	49.0	12.0	50.7	50.7
Total Split (%)	32.2%	32.2%		32.2%	32.2%		11.4%	54.4%	54.4%	13.3%	56.3%	56.3%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5		2.5	2.5		2.0	2.0	2.0	2.0	2.0	2.0
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)	5.8	5.8		5.8	5.8		5.3	5.3	5.3	5.3	5.3	5.3
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	13.2	13.2		13.2	13.2		5.5	62.2	62.2	7.0	67.9	67.9
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.06	0.69	0.69	0.08	0.75	0.75
v/c Ratio	0.33	0.02		0.04	0.39		0.02	0.42	0.00	0.31	0.17	0.02
Control Delay	37.9	29.2		29.9	38.8		40.5	11.5	10.3	44.5	5.8	6.7
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.9	29.2		29.9	38.8		40.5	11.5	10.3	44.5	5.8	6.7
LOS	D	C		C	D		D	B	B	D	A	A
Approach Delay		37.3			38.1			11.6			11.4	
Approach LOS		D			D			B			B	
Queue Length 50th (m)	9.3	0.6		1.1	13.5		0.3	41.0	0.2	6.5	7.9	0.7
Queue Length 95th (m)	17.4	3.0		4.2	22.9		2.5	88.6	1.6	17.4	23.5	4.5
Internal Link Dist (m)		145.0			184.4			650.0			273.4	
Turn Bay Length (m)	38.0			38.0			38.0		30.0	38.0		30.0
Base Capacity (vph)	309	373		332	373		99	1178	1001	131	1286	1093
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.01		0.02	0.22		0.02	0.42	0.00	0.30	0.17	0.02

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.42
Intersection Signal Delay: 15.9 — Intersection LOS: B
Intersection Capacity Utilization 53.5% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 9: Borrisokane & Access #1

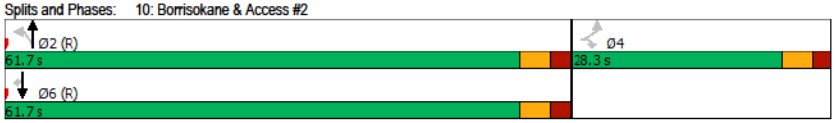


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	18	3	1	651	289	15
Future Volume (vph)	18	3	1	651	289	15
Satd. Flow (prot)	1621	1450	1621	1706	1706	1450
Flt Permitted	0.950		0.583			
Satd. Flow (perm)	1621	1450	995	1706	1706	1450
Satd. Flow (RTOR)						
Lane Group Flow (vph)	18	3	1	651	289	15
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	28.3	28.3	23.8	23.8	23.8	23.8
Total Split (s)	28.3	28.3	61.7	61.7	61.7	61.7
Total Split (%)	31.4%	31.4%	68.6%	68.6%	68.6%	68.6%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.0	2.0	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.6	5.6	5.6	5.6
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	12.6	12.6	79.0	79.0	79.0	79.0
Actuated g/C Ratio	0.14	0.14	0.88	0.88	0.88	0.88
v/c Ratio	0.08	0.01	0.00	0.43	0.19	0.01
Control Delay	31.7	29.7	5.0	3.8	3.5	4.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.7	29.7	5.0	3.8	3.5	4.1
LOS	C	C	A	A	A	A
Approach Delay	31.4			3.8	3.6	
Approach LOS	C			A	A	
Queue Length 50th (m)	2.8	0.5	0.0	0.4	0.0	0.0
Queue Length 95th (m)	7.4	2.5	m0.1	47.2	32.4	3.0
Internal Link Dist (m)	113.8			273.4	275.6	
Turn Bay Length (m)	38.0	30.0	38.0			30.0
Base Capacity (vph)	414	370	874	1498	1498	1273
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.01	0.00	0.43	0.19	0.01

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.43
Intersection Signal Delay: 4.3 — Intersection LOS: A
Intersection Capacity Utilization 53.6% — ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Borrisokane & Access #2



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	275	96	188	128	26	92	66	1765	132	85	2555	108
Future Volume (vph)	275	96	188	128	26	92	66	1765	132	85	2555	108
Satd. Flow (prot)	1605	1706	1450	1517	1440	0	3144	3174	0	1589	3241	1450
Flt Permitted	0.681			0.695			0.950			0.950		
Satd. Flow (perm)	1150	1706	1431	1108	1440	0	3144	3174	0	1589	3241	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	275	96	188	128	118	0	66	1897	0	85	2555	108
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								6
Detector Phase	4	4	4	8	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	39.9	39.9	39.9	32.9	32.9		11.4	30.4		11.4	39.4	39.4
Total Split (s)	43.0	43.0	43.0	43.0	43.0		11.4	65.0		12.0	65.6	65.6
Total Split (%)	35.8%	35.8%	35.8%	35.8%	35.8%		9.5%	54.2%		10.0%	54.7%	54.7%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6		1.8	1.8		1.8	1.8	1.8
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)	6.9	6.9	6.9	6.9	6.9		6.4	6.4		6.4	6.4	6.4
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	32.1	32.1	32.1	32.1	32.1		5.8	59.3		9.0	64.8	64.8
Actuated g/C Ratio	0.27	0.27	0.27	0.27	0.27		0.05	0.49		0.08	0.54	0.54
v/c Ratio	0.90	0.21	0.49	0.43	0.31		0.43	1.21		0.71	1.46	0.14
Control Delay	72.9	34.0	41.0	40.3	36.2		69.3	117.6		87.3	235.6	16.4
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	72.9	34.0	41.0	40.3	36.2		69.3	117.6		87.3	235.6	16.4
LOS	E	C	D	D	D		E	F		F	F	B
Approach Delay		55.5			38.3			115.9			222.4	
Approach LOS		E			D			F			F	
Queue Length 50th (m)	59.6	16.8	35.7	23.9	21.2		7.4	~275.2		20.0	~446.7	13.3
Queue Length 95th (m)	#101.1	29.9	56.8	41.3	36.4		m7.7	m#235.4		#55.1	#486.0	23.8
Internal Link Dist (m)		172.9			177.4			1040.6			345.0	
Turn Bay Length (m)	70.0		150.0	50.0			130.0			180.0		60.0
Base Capacity (vph)	345	513	430	333	433		153	1567		119	1751	783
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.80	0.19	0.44	0.38	0.27		0.43	1.21		0.71	1.46	0.14

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 64 (53%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

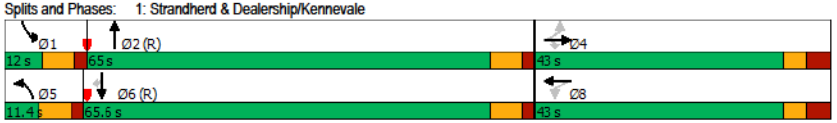
Maximum v/c Ratio: 1.46
Intersection Signal Delay: 159.4 — Intersection LOS: F
Intersection Capacity Utilization 112.6% — ICU Level of Service H
Analysis Period (min) 15

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

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Strandherd & Dealership/Kennevale



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	322	1533	1065	107	1036	65	714	34	102	52	49	122
Future Volume (vph)	322	1533	1065	107	1036	65	714	34	102	52	49	122
Satd. Flow (prot)	1605	3241	1436	1621	3181	0	2969	1400	0	1503	1472	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1605	3241	1436	1621	3181	0	2969	1400	0	1503	1472	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	322	1533	1065	107	1101	0	714	136	0	52	171	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4		11.0	34.0		11.0	16.0	
Total Split (s)	18.0	63.0	63.0	12.0	57.0		24.0	34.0		11.0	21.0	
Total Split (%)	15.0%	52.5%	52.5%	10.0%	47.5%		20.0%	28.3%		9.2%	17.5%	
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4		6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None		None	None	
Act Effct Green (s)	11.6	56.6	56.6	5.6	50.6		18.0	28.0		5.0	15.0	
Actuated g/C Ratio	0.10	0.47	0.47	0.05	0.42		0.15	0.23		0.04	0.12	
v/c Ratio	2.08	1.00	1.57	1.43	0.82		1.60	0.42		0.84	0.93	
Control Delay	518.7	21.5	277.6	293.7	37.0		316.2	43.7		132.2	102.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	518.7	21.5	277.6	293.7	37.0		316.2	43.7		132.2	102.6	
LOS	F	C	F	F	D		F	D		F	F	
Approach Delay		169.8			59.7			272.6			109.5	
Approach LOS		F			E			F			F	
Queue Length 50th (m)	~119.3	~96.2	~348.4	~33.5	117.1		~122.4	27.0		12.3	39.9	
Queue Length 95th (m)	m#82.5	m27.0	m#215.8	#68.8	145.1		#158.8	46.0		#35.6	#81.2	
Internal Link Dist (m)		1040.6			313.4			275.6			103.1	
Turn Bay Length (m)	105.0		110.0	55.0			100.0			38.0		
Base Capacity (vph)	155	1528	677	75	1341		445	326		62	184	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	2.08	1.00	1.57	1.43	0.82		1.60	0.42		0.84	0.93	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

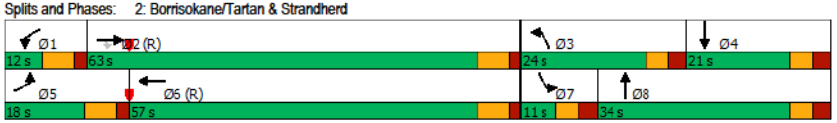
Maximum v/c Ratio: 2.08
Intersection Signal Delay: 158.4 — Intersection LOS: F
Intersection Capacity Utilization 104.0% — ICU Level of Service G
Analysis Period (min) 15

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

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd

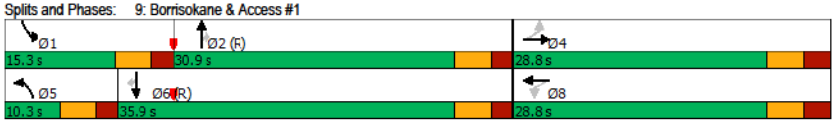


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	0	3	5	0	57	2	302	6	77	508	42
Future Volume (vph)	42	0	3	5	0	57	2	302	6	77	508	42
Satd. Flow (prot)	1621	1450	0	1621	1450	0	1621	1706	1450	1621	1706	1450
Flt Permitted	0.720			0.756			0.950			0.950		
Satd. Flow (perm)	1228	1450	0	1290	1450	0	1621	1706	1450	1621	1706	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	42	3	0	5	57	0	2	302	6	77	508	42
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.8	28.8		28.8	28.8		10.3	24.3	24.3	10.3	24.3	24.3
Total Split (s)	28.8	28.8		28.8	28.8		10.3	30.9	30.9	15.3	35.9	35.9
Total Split (%)	38.4%	38.4%		38.4%	38.4%		13.7%	41.2%	41.2%	20.4%	47.9%	47.9%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5		2.5	2.5		2.0	2.0	2.0	2.0	2.0	2.0
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)	5.8	5.8		5.8	5.8		5.3	5.3	5.3	5.3	5.3	5.3
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	12.6	12.6		12.6	12.6		5.5	47.1	47.1	8.4	57.7	57.7
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.07	0.63	0.63	0.11	0.77	0.77
v/c Ratio	0.20	0.01		0.02	0.23		0.02	0.28	0.01	0.42	0.39	0.04
Control Delay	27.3	22.3		22.8	27.6		33.0	12.5	13.3	36.6	6.3	3.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.3	22.3		22.8	27.6		33.0	12.5	13.3	36.6	6.3	3.0
LOS	C	C		C	C		C	B	B	D	A	A
Approach Delay		27.0			27.2			12.7			9.8	
Approach LOS		C			C			B			A	
Queue Length 50th (m)	5.4	0.4		0.6	7.3		0.3	22.4	0.4	10.1	22.8	1.4
Queue Length 95th (m)	10.9	2.1		2.7	13.6		2.2	55.3	2.9	18.0	107.7	m5.0
Internal Link Dist (m)		154.2			129.4			1276.6			273.4	
Turn Bay Length (m)	38.0			38.0			38.0		30.0	38.0		30.0
Base Capacity (vph)	376	444		395	444		117	1071	910	217	1312	1115
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.01		0.01	0.13		0.02	0.28	0.01	0.35	0.39	0.04

Intersection Summary
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 44 (59%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.42
Intersection Signal Delay: 12.4 — Intersection LOS: B
Intersection Capacity Utilization 55.2% — ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Borrisokane & Access #1



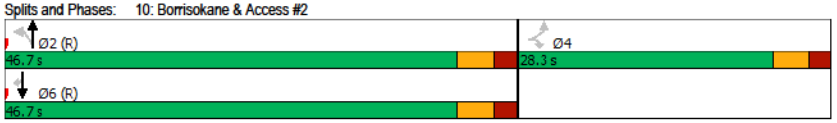
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	10	2	4	411	656	28
Future Volume (vph)	10	2	4	411	656	28
Satd. Flow (prot)	1621	1450	1621	1706	1706	1450
Flt Permitted	0.950		0.384			
Satd. Flow (perm)	1621	1450	655	1706	1706	1450
Satd. Flow (RTOR)						
Lane Group Flow (vph)	10	2	4	411	656	28
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	28.3	28.3	23.6	23.6	23.6	23.6
Total Split (s)	28.3	28.3	46.7	46.7	46.7	46.7
Total Split (%)	37.7%	37.7%	62.3%	62.3%	62.3%	62.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.0	2.0	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.6	5.6	5.6	5.6
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	12.6	12.6	64.0	64.0	64.0	64.0
Actuated g/C Ratio	0.17	0.17	0.85	0.85	0.85	0.85
v/c Ratio	0.04	0.01	0.01	0.28	0.45	0.02
Control Delay	23.3	22.0	2.2	3.9	6.5	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.3	22.0	2.2	3.9	6.5	4.7
LOS	C	C	A	A	A	A
Approach Delay	23.1			3.9	6.4	
Approach LOS	C			A	A	
Queue Length 50th (m)	1.3	0.3	0.0	0.1	0.0	0.0
Queue Length 95th (m)	4.1	1.6	m0.5	65.3	99.3	4.9
Internal Link Dist (m)	209.1			273.4	275.6	
Turn Bay Length (m)	38.0	30.0	38.0			30.0
Base Capacity (vph)	497	444	559	1456	1456	1238
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.00	0.01	0.28	0.45	0.02

Intersection Summary

Cycle Length: 75
Actuated Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.45
Intersection Signal Delay: 5.6 — Intersection LOS: A
Intersection Capacity Utilization 53.9% — ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Borrisokane & Access #2



Appendix F

Synchro Intersection Worksheets – 2035 Future Background Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	19	47	100	108	113	219	2704	86	53	1308	307
Future Volume (vph)	72	19	47	100	108	113	219	2704	86	53	1308	307
Satd. Flow (prot)	1243	1160	1450	1589	1353	0	3144	3220	0	1476	3090	1395
Flt Permitted	0.460			0.745			0.950			0.950		
Satd. Flow (perm)	602	1160	1431	1245	1353	0	3144	3220	0	1476	3090	1395
Satd. Flow (RTOR)												
Lane Group Flow (vph)	72	19	47	100	221	0	219	2790	0	53	1308	307
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								6
Detector Phase	4	4	4	8	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	39.9	39.9	39.9	32.9	32.9		11.4	30.4		11.4	39.4	39.4
Total Split (s)	41.0	41.0	41.0	41.0	41.0		17.4	66.6		12.4	61.6	61.6
Total Split (%)	34.2%	34.2%	34.2%	34.2%	34.2%		14.5%	55.5%		10.3%	51.3%	51.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6		1.8	1.8		1.8	1.8	1.8
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)	6.9	6.9	6.9	6.9	6.9		6.4	6.4		6.4	6.4	6.4
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	24.8	24.8	24.8	24.8	24.8		12.7	69.3		8.8	62.8	62.8
Actuated g/C Ratio	0.21	0.21	0.21	0.21	0.21		0.11	0.58		0.07	0.52	0.52
v/c Ratio	0.58	0.08	0.16	0.39	0.79		0.66	1.50		0.50	0.81	0.42
Control Delay	60.0	35.6	37.4	43.8	64.3		64.2	246.0		69.4	30.1	21.4
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	60.0	35.6	37.4	43.8	64.3		64.2	246.0		69.4	30.1	21.4
LOS	E	D	D	D	E		E	F		E	C	C
Approach Delay		49.0			57.9			232.7			29.8	
Approach LOS		D			E			F			C	
Queue Length 50th (m)	15.2	3.6	9.0	20.2	49.1		24.5	~499.6		11.9	130.5	43.1
Queue Length 95th (m)	28.6	9.1	17.6	33.2	70.2		m16.7	m#255.6		#32.4	#193.4	73.5
Internal Link Dist (m)		172.9			177.4			1040.6			345.0	
Turn Bay Length (m)	70.0		150.0	50.0			130.0			180.0		60.0
Base Capacity (vph)	171	329	406	353	384		336	1859		107	1618	730
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.42	0.06	0.12	0.28	0.58		0.65	1.50		0.50	0.81	0.42

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 69 (58%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

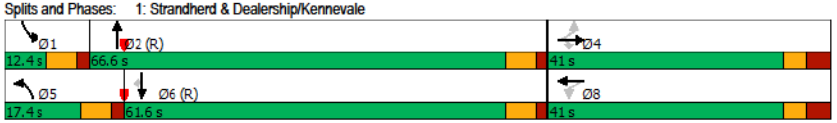
Maximum v/c Ratio: 1.50
Intersection Signal Delay: 151.0 — Intersection LOS: F
Intersection Capacity Utilization 129.8% — ICU Level of Service H
Analysis Period (min) 15

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

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Strandherd & Dealership/Kennevale



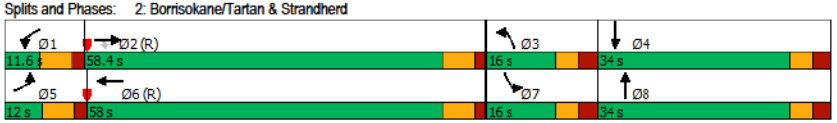
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	770	535	60	1599	52	1085	49	105	69	23	230
Future Volume (vph)	117	770	535	60	1599	52	1085	49	105	69	23	230
Satd. Flow (prot)	1589	3119	1332	1621	3187	0	3113	1522	0	1605	1474	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1589	3119	1332	1621	3187	0	3113	1522	0	1605	1474	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	117	770	535	60	1651	0	1085	154	0	69	253	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4		11.0	34.0		11.0	34.0	
Total Split (s)	12.0	58.4	58.4	11.6	58.0		16.0	34.0		16.0	34.0	
Total Split (%)	10.0%	48.7%	48.7%	9.7%	48.3%		13.3%	28.3%		13.3%	28.3%	
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4		6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None		None	None	
Act Effct Green (s)	9.2	53.8	53.8	7.0	51.6		10.0	27.8		9.0	24.4	
Actuated g/C Ratio	0.08	0.45	0.45	0.06	0.43		0.08	0.23		0.08	0.20	
v/c Ratio	0.96	0.55	0.90	0.64	1.21		4.19	0.44		0.57	0.85	
Control Delay	126.2	10.9	29.2	85.3	131.5		1458.2	44.4		72.3	70.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	126.2	10.9	29.2	85.3	131.5		1458.2	44.4		72.3	70.4	
LOS	F	B	C	F	F		F	D		E	E	
Approach Delay		27.3			129.9			1282.5			70.8	
Approach LOS		C			F			F			E	
Queue Length 50th (m)	~33.8	25.3	108.3	13.9	~245.7		~238.0	31.4		15.6	56.0	
Queue Length 95th (m)	m#55.8	21.0	m#176.7	#39.6	#287.5		#277.7	50.8		30.7	#89.0	
Internal Link Dist (m)		1040.6			387.1			275.6			103.1	
Turn Bay Length (m)	105.0		110.0	55.0			100.0			38.0		
Base Capacity (vph)	122	1399	597	94	1370		259	368		133	343	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.96	0.55	0.90	0.64	1.21		4.19	0.42		0.52	0.74	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 116 (97%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 4.19
Intersection Signal Delay: 399.0 Intersection LOS: F
Intersection Capacity Utilization 124.9% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd

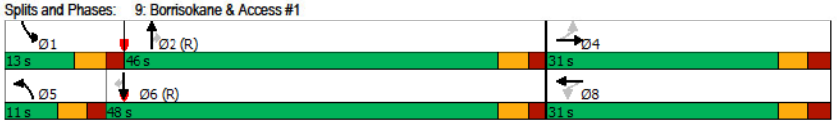


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	58	0	4	7	0	83	2	412	3	39	179	21
Future Volume (vph)	58	0	4	7	0	83	2	412	3	39	179	21
Satd. Flow (prot)	1621	1450	0	1621	1450	0	1621	1706	1450	1621	1706	1450
Flt Permitted	0.703			0.755			0.950			0.950		
Satd. Flow (perm)	1199	1450	0	1288	1450	0	1621	1706	1450	1621	1706	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	58	4	0	7	83	0	2	412	3	39	179	21
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.8	28.8		28.8	28.8		10.3	24.3	24.3	10.3	24.3	24.3
Total Split (s)	31.0	31.0		31.0	31.0		11.0	46.0	46.0	13.0	48.0	48.0
Total Split (%)	34.4%	34.4%		34.4%	34.4%		12.2%	51.1%	51.1%	14.4%	53.3%	53.3%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5		2.5	2.5		2.0	2.0	2.0	2.0	2.0	2.0
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)	5.8	5.8		5.8	5.8		5.3	5.3	5.3	5.3	5.3	5.3
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	13.2	13.2		13.2	13.2		5.7	61.6	61.6	7.6	67.7	67.7
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.06	0.68	0.68	0.08	0.75	0.75
v/c Ratio	0.33	0.02		0.04	0.39		0.02	0.35	0.00	0.28	0.14	0.02
Control Delay	37.9	29.2		29.9	38.8		40.0	11.3	11.0	42.3	6.0	7.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.9	29.2		29.9	38.8		40.0	11.3	11.0	42.3	6.0	7.0
LOS	D	C		C	D		D	B	B	D	A	A
Approach Delay		37.3			38.1			11.4			12.0	
Approach LOS		D			D			B			B	
Queue Length 50th (m)	9.3	0.6		1.1	13.5		0.3	32.2	0.2	6.5	6.4	0.7
Queue Length 95th (m)	17.4	3.0		4.2	22.9		2.5	75.5	1.7	16.8	22.2	4.7
Internal Link Dist (m)		145.0			184.4			650.0			273.4	
Turn Bay Length (m)	38.0			38.0			38.0		30.0	38.0		30.0
Base Capacity (vph)	335	406		360	406		104	1167	991	150	1283	1090
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.01		0.02	0.20		0.02	0.35	0.00	0.26	0.14	0.02

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.39
Intersection Signal Delay: 16.6 — Intersection LOS: B
Intersection Capacity Utilization 50.8% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 9: Borrisokane & Access #1

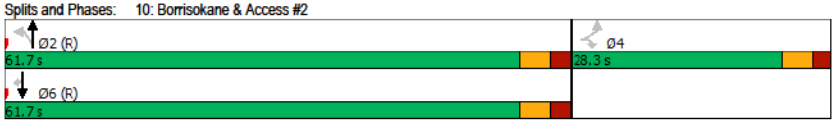


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	18	3	1	570	254	15
Future Volume (vph)	18	3	1	570	254	15
Satd. Flow (prot)	1621	1450	1621	1706	1706	1450
Flt Permitted	0.950		0.602			
Satd. Flow (perm)	1621	1450	1027	1706	1706	1450
Satd. Flow (RTOR)						
Lane Group Flow (vph)	18	3	1	570	254	15
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	28.3	28.3	23.8	23.8	23.8	23.8
Total Split (s)	28.3	28.3	61.7	61.7	61.7	61.7
Total Split (%)	31.4%	31.4%	68.6%	68.6%	68.6%	68.6%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.0	2.0	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.6	5.6	5.6	5.6
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	12.6	12.6	79.0	79.0	79.0	79.0
Actuated g/C Ratio	0.14	0.14	0.88	0.88	0.88	0.88
v/c Ratio	0.08	0.01	0.00	0.38	0.17	0.01
Control Delay	31.7	29.7	5.0	3.9	3.4	4.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.7	29.7	5.0	3.9	3.4	4.1
LOS	C	C	A	A	A	A
Approach Delay	31.4			3.9	3.5	
Approach LOS	C			A	A	
Queue Length 50th (m)	2.8	0.5	0.0	0.2	0.0	0.0
Queue Length 95th (m)	7.4	2.5	m0.2	42.8	28.2	3.0
Internal Link Dist (m)	113.8			273.4	275.6	
Turn Bay Length (m)	38.0	30.0	38.0			30.0
Base Capacity (vph)	414	370	902	1498	1498	1273
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.01	0.00	0.38	0.17	0.01

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.38
Intersection Signal Delay: 4.4 — Intersection LOS: A
Intersection Capacity Utilization 49.1% — ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Borrisokane & Access #2



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	275	96	188	128	26	92	66	1838	132	85	2654	108
Future Volume (vph)	275	96	188	128	26	92	66	1838	132	85	2654	108
Satd. Flow (prot)	1605	1706	1450	1517	1440	0	3144	3174	0	1589	3241	1450
Flt Permitted	0.681			0.695			0.950			0.950		
Satd. Flow (perm)	1150	1706	1431	1108	1440	0	3144	3174	0	1589	3241	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	275	96	188	128	118	0	66	1970	0	85	2654	108
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								6
Detector Phase	4	4	4	8	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	39.9	39.9	39.9	32.9	32.9		11.4	30.4		11.4	39.4	39.4
Total Split (s)	39.9	39.9	39.9	39.9	39.9		11.4	68.1		12.0	68.7	68.7
Total Split (%)	33.3%	33.3%	33.3%	33.3%	33.3%		9.5%	56.8%		10.0%	57.3%	57.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6		1.8	1.8		1.8	1.8	1.8
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)	6.9	6.9	6.9	6.9	6.9		6.4	6.4		6.4	6.4	6.4
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	31.0	31.0	31.0	31.0	31.0		5.5	61.7		7.6	66.2	66.2
Actuated g/C Ratio	0.26	0.26	0.26	0.26	0.26		0.05	0.51		0.06	0.55	0.55
v/c Ratio	0.93	0.22	0.51	0.45	0.32		0.46	1.21		0.85	1.48	0.14
Control Delay	79.9	35.6	42.9	42.3	37.8		70.0	119.3		113.1	246.0	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	79.9	35.6	42.9	42.3	37.8		70.0	119.3		113.1	246.0	15.1
LOS	E	D	D	D	D		E	F		F	F	B
Approach Delay		59.8			40.1			117.7			233.3	
Approach LOS		E			D			F			F	
Queue Length 50th (m)	61.0	17.2	36.5	24.4	21.7		7.5	~301.2		~23.2	~461.3	12.6
Queue Length 95th (m)	#108.3	31.1	59.0	42.9	37.9		m7.3	m143.4		#55.1	#500.0	22.4
Internal Link Dist (m)		172.9			177.4			1040.6			345.0	
Turn Bay Length (m)	70.0		150.0	50.0			130.0			180.0		60.0
Base Capacity (vph)	316	469	393	304	396		143	1631		100	1788	800
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.87	0.20	0.48	0.42	0.30		0.46	1.21		0.85	1.48	0.14

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 64 (53%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

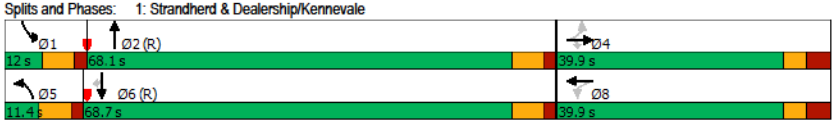
Maximum v/c Ratio: 1.48
Intersection Signal Delay: 166.5 — Intersection LOS: F
Intersection Capacity Utilization 115.4% — ICU Level of Service H
Analysis Period (min) 15

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

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Strandherd & Dealership/Kennevale



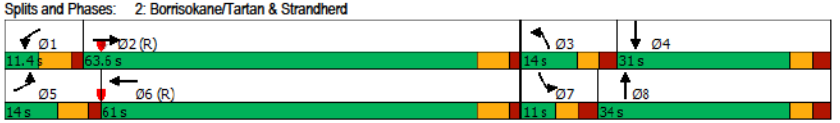
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	322	1606	1098	107	1089	65	731	34	102	52	49	122
Future Volume (vph)	322	1606	1098	107	1089	65	731	34	102	52	49	122
Satd. Flow (prot)	1605	3241	1436	1621	3184	0	2969	1400	0	1503	1472	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1605	3241	1436	1621	3184	0	2969	1400	0	1503	1472	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	322	1606	1098	107	1154	0	731	136	0	52	171	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4		11.0	34.0		11.0	16.0	
Total Split (s)	14.0	63.6	63.6	11.4	61.0		14.0	34.0		11.0	31.0	
Total Split (%)	11.7%	53.0%	53.0%	9.5%	50.8%		11.7%	28.3%		9.2%	25.8%	
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4		6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None		None	None	
Act Effct Green (s)	13.8	57.2	57.2	11.2	54.6		8.0	21.8		5.0	18.8	
Actuated g/C Ratio	0.12	0.48	0.48	0.09	0.46		0.07	0.18		0.04	0.16	
v/c Ratio	1.75	1.04	1.61	0.71	0.80		3.71	0.54		0.84	0.74	
Control Delay	377.7	35.8	292.3	79.7	33.1		1248.1	51.5		132.2	66.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	377.7	35.8	292.3	79.7	33.1		1248.1	51.5		132.2	66.8	
LOS	F	D	F	E	C		F	D		F	E	
Approach Delay		165.3			37.0			1060.4			82.0	
Approach LOS		F			D			F			F	
Queue Length 50th (m)	~113.3	~210.7	~366.6	24.6	117.8		~157.5	28.9		12.3	38.2	
Queue Length 95th (m)	m#93.9	m46.0	m#222.2	#70.7	145.7		#194.1	46.0		#35.6	58.5	
Internal Link Dist (m)		1040.6			371.1			275.6			103.1	
Turn Bay Length (m)	105.0		110.0	55.0			100.0			38.0		
Base Capacity (vph)	184	1544	684	150	1448		197	326		62	306	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	1.75	1.04	1.61	0.71	0.80		3.71	0.42		0.84	0.56	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 3.71
Intersection Signal Delay: 276.1 Intersection LOS: F
Intersection Capacity Utilization 106.4% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd



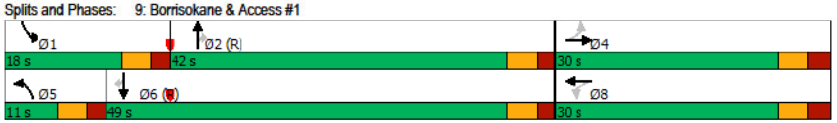
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	0	3	5	0	57	2	253	6	77	425	42
Future Volume (vph)	42	0	3	5	0	57	2	253	6	77	425	42
Satd. Flow (prot)	1621	1450	0	1621	1450	0	1621	1706	1450	1621	1706	1450
Flt Permitted	0.720			0.756			0.950			0.950		
Satd. Flow (perm)	1228	1450	0	1290	1450	0	1621	1706	1450	1621	1706	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	42	3	0	5	57	0	2	253	6	77	425	42
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.8	28.8		28.8	28.8		10.3	24.3	24.3	10.3	24.3	24.3
Total Split (s)	30.0	30.0		30.0	30.0		11.0	42.0	42.0	18.0	49.0	49.0
Total Split (%)	33.3%	33.3%		33.3%	33.3%		12.2%	46.7%	46.7%	20.0%	54.4%	54.4%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5		2.5	2.5		2.0	2.0	2.0	2.0	2.0	2.0
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)	5.8	5.8		5.8	5.8		5.3	5.3	5.3	5.3	5.3	5.3
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	12.7	12.7		12.7	12.7		5.7	57.8	57.8	9.6	68.2	68.2
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.06	0.64	0.64	0.11	0.76	0.76
v/c Ratio	0.24	0.01		0.03	0.28		0.02	0.23	0.01	0.45	0.33	0.04
Control Delay	36.0	29.7		30.0	36.4		40.0	11.7	12.3	41.7	9.3	9.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.0	29.7		30.0	36.4		40.0	11.7	12.3	41.7	9.3	9.8
LOS	D	C		C	D		D	B	B	D	A	A
Approach Delay		35.5			35.9			12.0			14.0	
Approach LOS		D			D			B			B	
Queue Length 50th (m)	6.7	0.5		0.8	9.2		0.3	18.6	0.4	12.5	17.9	1.4
Queue Length 95th (m)	13.6	2.5		3.2	17.0		2.5	47.1	2.8	26.9	67.0	11.4
Internal Link Dist (m)		154.2			129.4			1276.6			273.4	
Turn Bay Length (m)	38.0			38.0			38.0		30.0	38.0		30.0
Base Capacity (vph)	330	389		346	389		104	1094	930	231	1292	1098
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.01		0.01	0.15		0.02	0.23	0.01	0.33	0.33	0.04

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.45
Intersection Signal Delay: 15.9 — Intersection LOS: B
Intersection Capacity Utilization 50.6% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 9: Borrisokane & Access #1



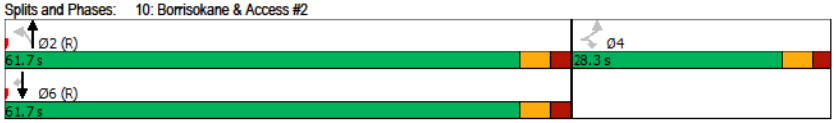
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	10	2	4	362	573	28
Future Volume (vph)	10	2	4	362	573	28
Satd. Flow (prot)	1621	1450	1621	1706	1706	1450
Flt Permitted	0.950		0.433			
Satd. Flow (perm)	1621	1450	739	1706	1706	1450
Satd. Flow (RTOR)						
Lane Group Flow (vph)	10	2	4	362	573	28
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	28.3	28.3	23.6	23.6	23.6	23.6
Total Split (s)	28.3	28.3	61.7	61.7	61.7	61.7
Total Split (%)	31.4%	31.4%	68.6%	68.6%	68.6%	68.6%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.0	2.0	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.6	5.6	5.6	5.6
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	12.6	12.6	79.0	79.0	79.0	79.0
Actuated g/C Ratio	0.14	0.14	0.88	0.88	0.88	0.88
v/c Ratio	0.04	0.01	0.01	0.24	0.38	0.02
Control Delay	30.6	29.5	5.2	3.7	4.7	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.6	29.5	5.2	3.7	4.7	3.9
LOS	C	C	A	A	A	A
Approach Delay	30.4			3.8	4.7	
Approach LOS	C			A	A	
Queue Length 50th (m)	1.6	0.3	0.0	0.1	0.0	0.0
Queue Length 95th (m)	5.1	1.9	m1.1	28.5	75.9	4.6
Internal Link Dist (m)	209.1			273.4	275.6	
Turn Bay Length (m)	38.0	30.0	38.0			30.0
Base Capacity (vph)	414	370	649	1498	1498	1273
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.01	0.01	0.24	0.38	0.02

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.38
Intersection Signal Delay: 4.7 — Intersection LOS: A
Intersection Capacity Utilization 49.3% — ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Borrisokane & Access #2



Appendix G

TDM Checklist

TDM Measures Checklist:
Residential Developments (multi-family, condominium or subdivision)

Legend

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

★ — 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	☐ Community Association may fulfill this role in future.
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☑ Community Association may fulfill this role in future.
	2.	**WALKING AND CYCLING**	
	2.1	**Information on walking/cycling routes & destinations**	
BASIC	2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances *(multi-family, condominium)*	☐ N/A
	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)*	☐ N/A
BETTER	3.1.2	Provide real-time arrival information display at entrances *(multi-family, condominium)*	☐ N/A
	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 *(subdivision)*	☑
	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)	☐ N/A
	4.	**CARSHARING & BIKESHARING**	
	4.1	**Bikeshare stations & memberships**	
BETTER	4.1.1	Contract with provider to install on-site bikeshare station *(multi-family)*	☐
BETTER	4.1.2	Provide residents with bikeshare memberships, either free or subsidized *(multi-family)*	☐
	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)*	☐ N/A
BASIC ★	5.1.2	Unbundle parking cost from monthly rent *(multi-family)*	☐ N/A

			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 H

Justification 7 Signal Warrants

Access #1 @ Borrisokane
FT 2030

Justification #7

Justification	Description	Minimum Requirement 1 Lane Highway		Minimum Requirement 2 or More Lanes		Compliance Sectional		Compliance Entire %	Signal
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	652	90%	65%	No
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	110	65%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	542	75%	75%	No
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	72	95%		

Notes
1. Refer to OTM Book 12, pg 92, Mar 2012
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, AHV = PM/2 or (AM + PM) / 4, including amplifcation factors
4. T-intersection factor corrected, applies only to 1B
5. Correction to 2B, as per MTO and City of Ottawa, for '2 or More Lanes' has been applied

Access #1 @ Borrisokane
FT 2035

Justification #7

Justification	Description	Minimum Requirement 1 Lane Highway		Minimum Requirement 2 or More Lanes		Compliance Sectional		Compliance Entire %	Signal
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	590	82%	65%	No
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	110	65%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	480	67%	67%	No
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	72	95%		

Notes
1. Refer to OTM Book 12, pg 92, Mar 2012
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, AHV = PM/2 or (AM + PM) / 4, including amplifcation factors
4. T-intersection factor corrected, applies only to 1B
5. Correction to 2B, as per MTO and City of Ottawa, for '2 or More Lanes' has been applied

Appendix I

Synchro Intersection Worksheets – 2030 Future Total Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	19	47	100	108	113	219	2727	86	53	1304	307
Future Volume (vph)	72	19	47	100	108	113	219	2727	86	53	1304	307
Satd. Flow (prot)	1243	1160	1450	1589	1353	0	3144	3220	0	1476	3090	1395
Flt Permitted	0.460			0.745			0.950			0.950		
Satd. Flow (perm)	602	1160	1431	1245	1353	0	3144	3220	0	1476	3090	1395
Satd. Flow (RTOR)												
Lane Group Flow (vph)	72	19	47	100	221	0	219	2813	0	53	1304	307
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								6
Detector Phase	4	4	4	8	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	39.9	39.9	39.9	32.9	32.9		11.4	30.4		11.4	39.4	39.4
Total Split (s)	41.0	41.0	41.0	41.0	41.0		17.4	66.6		12.4	61.6	61.6
Total Split (%)	34.2%	34.2%	34.2%	34.2%	34.2%		14.5%	55.5%		10.3%	51.3%	51.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6		1.8	1.8		1.8	1.8	1.8
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)	6.9	6.9	6.9	6.9	6.9		6.4	6.4		6.4	6.4	6.4
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	24.8	24.8	24.8	24.8	24.8		12.7	69.3		8.8	62.8	62.8
Actuated g/C Ratio	0.21	0.21	0.21	0.21	0.21		0.11	0.58		0.07	0.52	0.52
v/c Ratio	0.58	0.08	0.16	0.39	0.79		0.66	1.51		0.50	0.81	0.42
Control Delay	60.0	35.6	37.4	43.8	64.3		64.3	252.6		69.4	30.0	21.4
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	60.0	35.6	37.4	43.8	64.3		64.3	252.6		69.4	30.0	21.4
LOS	E	D	D	D	E		E	F		E	C	C
Approach Delay		49.0			57.9			239.0			29.7	
Approach LOS		D			E			F			C	
Queue Length 50th (m)	15.2	3.6	9.0	20.2	49.1		24.6	~505.7		11.9	130.0	43.1
Queue Length 95th (m)	28.6	9.1	17.6	33.2	70.2		m16.5	m#252.7		#32.4	#192.2	73.5
Internal Link Dist (m)		172.9			171.6			1040.6			345.0	
Turn Bay Length (m)	70.0		150.0	50.0			130.0			180.0		60.0
Base Capacity (vph)	171	329	406	353	384		336	1859		107	1618	730
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.42	0.06	0.12	0.28	0.58		0.65	1.51		0.50	0.81	0.42

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 69 (58%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.51

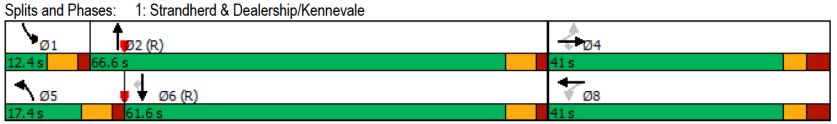
Intersection Signal Delay: 155.1	Intersection LOS: F
Intersection Capacity Utilization 130.4%	ICU Level of Service H
Analysis Period (min) 15	

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

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Strandherd & Dealership/Kennevale



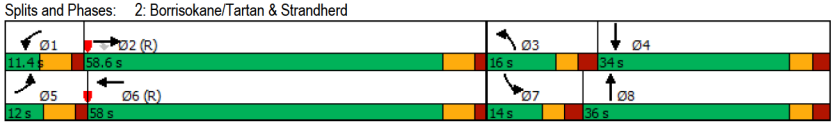
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	725	576	94	1535	52	1181	49	186	69	23	230
Future Volume (vph)	117	725	576	94	1535	52	1181	49	186	69	23	230
Satd. Flow (prot)	1589	3119	1332	1621	3187	0	3113	1497	0	1605	1474	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1589	3119	1332	1621	3187	0	3113	1497	0	1605	1474	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	117	725	576	94	1587	0	1181	235	0	69	253	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4		11.0	34.0		11.0	34.0	
Total Split (s)	12.0	58.6	58.6	11.4	58.0		16.0	36.0		14.0	34.0	
Total Split (%)	10.0%	48.8%	48.8%	9.5%	48.3%		13.3%	30.0%		11.7%	28.3%	
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4		6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None		None	None	
Act Effct Green (s)	9.2	52.2	52.2	8.6	51.6		10.0	29.2		7.7	24.4	
Actuated g/C Ratio	0.08	0.44	0.44	0.07	0.43		0.08	0.24		0.06	0.20	
v/c Ratio	0.96	0.53	0.99	0.81	1.16		4.56	0.65		0.67	0.85	
Control Delay	126.5	11.5	47.9	100.2	112.4		1623.7	50.4		84.8	70.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	126.5	11.5	47.9	100.2	112.4		1623.7	50.4		84.8	70.4	
LOS	F	B	D	F	F		F	D		F	E	
Approach Delay		35.8			111.7			1362.6			73.5	
Approach LOS		D			F			F			E	
Queue Length 50th (m)	~33.7	21.8	133.3	~22.5	~229.5		~262.0	49.9		15.9	56.0	
Queue Length 95th (m)	m#55.9	19.9	#200.2	#62.5	#271.2		#302.1	75.8		#37.0	#89.0	
Internal Link Dist (m)		1040.6			372.4			275.6			103.1	
Turn Bay Length (m)	105.0		110.0	55.0			100.0			38.0		
Base Capacity (vph)	122	1356	579	116	1370		259	382		107	343	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.96	0.53	0.99	0.81	1.16		4.56	0.62		0.64	0.74	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 116 (97%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 4.56
Intersection Signal Delay: 453.1 Intersection LOS: F
Intersection Capacity Utilization 125.9% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd



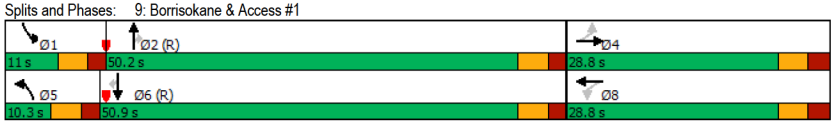
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	163	0	8	7	0	83	4	596	3	39	258	66
Future Volume (vph)	163	0	8	7	0	83	4	596	3	39	258	66
Satd. Flow (prot)	1621	1450	0	1621	1450	0	1621	1706	1450	1621	1706	1450
Flt Permitted	0.703			0.752			0.950			0.950		
Satd. Flow (perm)	1199	1450	0	1283	1450	0	1621	1706	1450	1621	1706	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	163	8	0	7	83	0	4	596	3	39	258	66
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.8	28.8		28.8	28.8		10.3	24.3	24.3	10.3	24.3	24.3
Total Split (s)	28.8	28.8		28.8	28.8		10.3	50.2	50.2	11.0	50.9	50.9
Total Split (%)	32.0%	32.0%		32.0%	32.0%		11.4%	55.8%	55.8%	12.2%	56.6%	56.6%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5		2.5	2.5		2.0	2.0	2.0	2.0	2.0	2.0
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)	5.8	5.8		5.8	5.8		5.3	5.3	5.3	5.3	5.3	5.3
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	17.0	17.0		17.0	17.0		5.5	54.4	54.4	6.7	59.8	59.8
Actuated g/C Ratio	0.19	0.19		0.19	0.19		0.06	0.60	0.60	0.07	0.66	0.66
v/c Ratio	0.72	0.03		0.03	0.30		0.04	0.58	0.00	0.33	0.23	0.07
Control Delay	51.3	26.8		26.9	32.6		40.8	16.5	11.3	47.6	7.5	7.5
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.3	26.8		26.9	32.6		40.8	16.5	11.3	47.6	7.5	7.5
LOS	D	C		C	C		D	B	B	D	A	A
Approach Delay		50.2			32.1			16.6			11.8	
Approach LOS		D			C			B			B	
Queue Length 50th (m)	26.2	1.1		1.0	12.2		0.7	67.4	0.3	6.7	13.9	3.2
Queue Length 95th (m)	43.5	4.3		4.2	22.9		3.9	113.1	1.6	17.3	28.5	9.8
Internal Link Dist (m)		145.0			184.4			619.8			273.4	
Turn Bay Length (m)	38.0			38.0			38.0		30.0	38.0		30.0
Base Capacity (vph)	306	370		327	370		100	1031	876	121	1133	963
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.02		0.02	0.22		0.04	0.58	0.00	0.32	0.23	0.07

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 21.0	Intersection LOS: C
Intersection Capacity Utilization 59.7%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 9: Borrisokane & Access #1



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	121	10	4	653	293	59
Future Volume (vph)	121	10	4	653	293	59
Satd. Flow (prot)	1621	1450	1621	1706	1706	1450
Flt Permitted	0.950		0.581			
Satd. Flow (perm)	1621	1450	991	1706	1706	1450
Satd. Flow (RTOR)						
Lane Group Flow (vph)	121	10	4	653	293	59
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	28.3	28.3	23.8	23.8	23.8	23.8
Total Split (s)	29.0	29.0	61.0	61.0	61.0	61.0
Total Split (%)	32.2%	32.2%	67.8%	67.8%	67.8%	67.8%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.0	2.0	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.6	5.6	5.6	5.6
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	13.8	13.8	65.3	65.3	65.3	65.3
Actuated g/C Ratio	0.15	0.15	0.73	0.73	0.73	0.73
v/c Ratio	0.49	0.05	0.01	0.53	0.24	0.06
Control Delay	40.3	29.3	5.0	7.4	5.4	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.3	29.3	5.0	7.4	5.4	4.8
LOS	D	C	A	A	A	A
Approach Delay	39.5			7.4	5.3	
Approach LOS	D			A	A	
Queue Length 50th (m)	19.6	1.5	0.1	44.9	12.5	2.2
Queue Length 95th (m)	31.0	5.1	m0.5	66.0	32.8	8.0
Internal Link Dist (m)	113.8			273.4	275.6	
Turn Bay Length (m)	38.0	30.0	38.0			30.0
Base Capacity (vph)	426	381	718	1237	1237	1052
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.03	0.01	0.53	0.24	0.06

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.53
Intersection Signal Delay: 10.4 Intersection LOS: B
Intersection Capacity Utilization 53.7% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Borrisokane & Access #2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	275	96	188	128	26	92	66	1848	132	85	2673	108
Future Volume (vph)	275	96	188	128	26	92	66	1848	132	85	2673	108
Satd. Flow (prot)	1621	1706	1450	1621	1506	0	3144	3203	0	1621	3241	1450
Flt Permitted	0.681			0.695			0.950			0.950		
Satd. Flow (perm)	1162	1706	1431	1184	1506	0	3144	3203	0	1620	3241	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	275	96	188	128	118	0	66	1980	0	85	2673	108
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								6
Detector Phase	4	4	4	8	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	39.9	39.9	39.9	32.9	32.9		11.4	30.4		11.4	39.4	39.4
Total Split (s)	39.9	39.9	39.9	39.9	39.9		11.4	68.1		12.0	68.7	68.7
Total Split (%)	33.3%	33.3%	33.3%	33.3%	33.3%		9.5%	56.8%		10.0%	57.3%	57.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6		1.8	1.8		1.8	1.8	1.8
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)	6.9	6.9	6.9	6.9	6.9		6.4	6.4		6.4	6.4	6.4
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	30.9	30.9	30.9	30.9	30.9		5.5	61.7		7.7	66.3	66.3
Actuated g/C Ratio	0.26	0.26	0.26	0.26	0.26		0.05	0.51		0.06	0.55	0.55
v/c Ratio	0.92	0.22	0.51	0.42	0.30		0.46	1.20		0.82	1.49	0.13
Control Delay	78.9	35.6	43.0	41.2	37.5		69.0	119.9		106.1	249.8	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	78.9	35.6	43.0	41.2	37.5		69.0	119.9		106.1	249.8	15.1
LOS	E	D	D	D	D		E	F		F	F	B
Approach Delay		59.4			39.4			118.2			236.7	
Approach LOS		E			D			F			F	
Queue Length 50th (m)	60.8	17.2	36.5	24.2	21.6		7.5	~302.6		~22.8	~466.1	12.6
Queue Length 95th (m)	#107.5	31.1	59.0	42.3	37.6		m7.6	m137.1		#54.7	#504.8	22.4
Internal Link Dist (m)		172.9			177.4			1040.6			345.0	
Turn Bay Length (m)	70.0		150.0	50.0			130.0			180.0		60.0
Base Capacity (vph)	319	469	393	325	414		145	1646		104	1791	801
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.86	0.20	0.48	0.39	0.29		0.46	1.20		0.82	1.49	0.13

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 64 (53%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

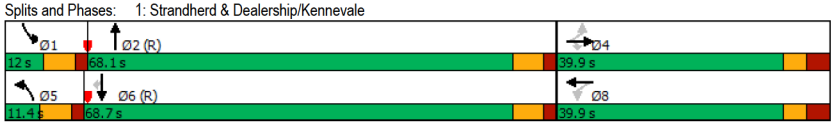
Maximum v/c Ratio: 1.49
Intersection Signal Delay: 168.5 — Intersection LOS: F
Intersection Capacity Utilization 116.0% — ICU Level of Service H
Analysis Period (min) 15

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

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Strandherd & Dealership/Kennevale



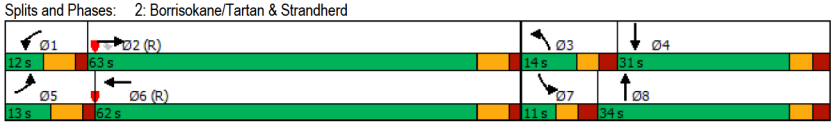
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	322	1533	1183	182	1036	65	797	34	155	52	49	122
Future Volume (vph)	322	1533	1183	182	1036	65	797	34	155	52	49	122
Satd. Flow (prot)	1621	3241	1450	1621	3212	0	3144	1496	0	1621	1523	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1621	3241	1450	1621	3212	0	3144	1496	0	1621	1523	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	322	1533	1183	182	1101	0	797	189	0	52	171	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4		11.0	34.0		11.0	16.0	
Total Split (s)	13.0	63.0	63.0	12.0	62.0		14.0	34.0		11.0	31.0	
Total Split (%)	10.8%	52.5%	52.5%	10.0%	51.7%		11.7%	28.3%		9.2%	25.8%	
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4		6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None		None	None	
Act Effct Green (s)	13.1	56.6	56.6	12.1	55.6		8.0	23.7		5.0	18.5	
Actuated g/C Ratio	0.11	0.47	0.47	0.10	0.46		0.07	0.20		0.04	0.15	
v/c Ratio	1.83	1.00	1.73	1.12	0.74		3.81	0.64		0.78	0.73	
Control Delay	410.1	23.5	349.5	156.4	30.1		1293.1	54.7		116.4	65.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	410.1	23.5	349.5	156.4	30.1		1293.1	54.7		116.4	65.4	
LOS	F	C	F	F	C		F	D		F	E	
Approach Delay		191.4			48.0			1055.7			77.3	
Approach LOS		F			D			F			E	
Queue Length 50th (m)	~114.9	~149.1	~412.6	~49.1	107.2		~172.5	41.6		12.2	38.2	
Queue Length 95th (m)	m#96.8	m48.0	m#252.7	#114.2	132.6		#209.6	62.2		#34.4	58.2	
Internal Link Dist (m)		1040.6			368.4			275.6			103.1	
Turn Bay Length (m)	105.0		110.0	55.0			100.0			38.0		
Base Capacity (vph)	176	1528	683	162	1488		209	349		67	317	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	1.83	1.00	1.73	1.12	0.74		3.81	0.54		0.78	0.54	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 3.81
Intersection Signal Delay: 307.6 Intersection LOS: F
Intersection Capacity Utilization 114.3% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd



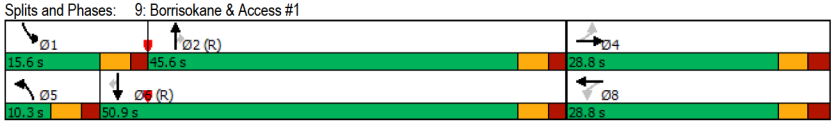
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	111	0	6	5	0	57	6	369	6	77	603	139
Future Volume (vph)	111	0	6	5	0	57	6	369	6	77	603	139
Satd. Flow (prot)	1621	1450	0	1621	1450	0	1621	1706	1450	1621	1706	1450
Flt Permitted	0.720			0.754			0.950			0.950		
Satd. Flow (perm)	1228	1450	0	1286	1450	0	1621	1706	1450	1621	1706	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	111	6	0	5	57	0	6	369	6	77	603	139
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.8	28.8		28.8	28.8		10.3	24.3	24.3	10.3	24.3	24.3
Total Split (s)	28.8	28.8		28.8	28.8		10.3	45.6	45.6	15.6	50.9	50.9
Total Split (%)	32.0%	32.0%		32.0%	32.0%		11.4%	50.7%	50.7%	17.3%	56.6%	56.6%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5		2.5	2.5		2.0	2.0	2.0	2.0	2.0	2.0
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)	5.8	5.8		5.8	5.8		5.3	5.3	5.3	5.3	5.3	5.3
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	14.6	14.6		14.6	14.6		5.6	56.4	56.4	9.0	66.4	66.4
Actuated g/C Ratio	0.16	0.16		0.16	0.16		0.06	0.63	0.63	0.10	0.74	0.74
v/c Ratio	0.56	0.03		0.02	0.24		0.06	0.35	0.01	0.48	0.48	0.13
Control Delay	44.3	28.2		28.2	33.3		41.3	13.4	12.3	44.1	10.5	8.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.3	28.2		28.2	33.3		41.3	13.4	12.3	44.1	10.5	8.6
LOS	D	C		C	C		D	B	B	D	B	A
Approach Delay		43.5			32.9			13.8			13.3	
Approach LOS		D			C			B			B	
Queue Length 50th (m)	18.0	0.9		0.8	8.7		1.0	32.8	0.4	12.5	36.1	5.9
Queue Length 95th (m)	30.2	3.6		3.2	17.0		4.7	66.7	2.6	27.7	86.3	24.8
Internal Link Dist (m)		154.2			129.4			652.0			273.4	
Turn Bay Length (m)	38.0			38.0			38.0		30.0	38.0		30.0
Base Capacity (vph)	313	370		328	370		101	1069	909	188	1259	1070
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.02		0.02	0.15		0.06	0.35	0.01	0.41	0.48	0.13

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 16.9	Intersection LOS: B
Intersection Capacity Utilization 64.5%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 9: Borrisokane & Access #1



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	77	6	10	415	659	123
Future Volume (vph)	77	6	10	415	659	123
Satd. Flow (prot)	1621	1450	1621	1706	1706	1450
Flt Permitted	0.950		0.372			
Satd. Flow (perm)	1621	1450	635	1706	1706	1450
Satd. Flow (RTOR)						
Lane Group Flow (vph)	77	6	10	415	659	123
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	28.3	28.3	23.6	23.6	23.6	23.6
Total Split (s)	29.0	29.0	61.0	61.0	61.0	61.0
Total Split (%)	32.2%	32.2%	67.8%	67.8%	67.8%	67.8%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.0	2.0	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.6	5.6	5.6	5.6
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	12.8	12.8	70.4	70.4	70.4	70.4
Actuated g/C Ratio	0.14	0.14	0.78	0.78	0.78	0.78
v/c Ratio	0.33	0.03	0.02	0.31	0.49	0.11
Control Delay	37.1	29.8	5.0	5.5	7.2	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.1	29.8	5.0	5.5	7.2	4.5
LOS	D	C	A	A	A	A
Approach Delay	36.6			5.5	6.8	
Approach LOS	D			A	A	
Queue Length 50th (m)	12.5	0.9	0.4	27.7	33.4	4.2
Queue Length 95th (m)	21.2	3.6	m1.9	38.3	94.7	14.6
Internal Link Dist (m)	209.1			273.4	275.6	
Turn Bay Length (m)	38.0	30.0	38.0			30.0
Base Capacity (vph)	426	381	497	1335	1335	1134
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.02	0.02	0.31	0.49	0.11

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 8.3	Intersection LOS: A
Intersection Capacity Utilization 54.0%	ICU Level of Service A
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Borrisokane & Access #2

Appendix J

Synchro Intersection Worksheets – 2035 Future Total Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	19	47	100	108	113	219	2831	86	53	1362	307
Future Volume (vph)	72	19	47	100	108	113	219	2831	86	53	1362	307
Satd. Flow (prot)	1243	1160	1450	1589	1353	0	3144	3223	0	1476	3090	1395
Flt Permitted	0.460			0.745			0.950			0.950		
Satd. Flow (perm)	602	1160	1431	1245	1353	0	3144	3223	0	1476	3090	1395
Satd. Flow (RTOR)												
Lane Group Flow (vph)	72	19	47	100	221	0	219	2917	0	53	1362	307
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								6
Detector Phase	4	4	4	8	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	39.9	39.9	39.9	32.9	32.9		11.4	30.4		11.4	39.4	39.4
Total Split (s)	41.0	41.0	41.0	41.0	41.0		17.0	66.6		12.4	62.0	62.0
Total Split (%)	34.2%	34.2%	34.2%	34.2%	34.2%		14.2%	55.5%		10.3%	51.7%	51.7%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6		1.8	1.8		1.8	1.8	1.8
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)	6.9	6.9	6.9	6.9	6.9		6.4	6.4		6.4	6.4	6.4
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	24.8	24.8	24.8	24.8	24.8		12.7	69.3		8.8	62.8	62.8
Actuated g/C Ratio	0.21	0.21	0.21	0.21	0.21		0.11	0.58		0.07	0.52	0.52
v/c Ratio	0.58	0.08	0.16	0.39	0.79		0.66	1.57		0.50	0.84	0.42
Control Delay	60.0	35.6	37.4	43.8	64.3		63.9	276.9		69.4	31.9	21.4
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	60.0	35.6	37.4	43.8	64.3		63.9	276.9		69.4	31.9	21.4
LOS	E	D	D	D	E		E	F		E	C	C
Approach Delay		49.0			57.9			262.0			31.2	
Approach LOS		D			E			F			C	
Queue Length 50th (m)	15.2	3.6	9.0	20.2	49.1		24.6	~532.7		11.9	140.4	43.2
Queue Length 95th (m)	28.6	9.1	17.6	33.2	70.2		m16.2	m#260.6		#32.4	#206.1	72.9
Internal Link Dist (m)		172.9			171.6			1040.6			345.0	
Turn Bay Length (m)	70.0		150.0	50.0			130.0			180.0		60.0
Base Capacity (vph)	171	329	406	353	384		333	1861		107	1618	730
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.42	0.06	0.12	0.28	0.58		0.66	1.57		0.50	0.84	0.42

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 69 (58%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.57

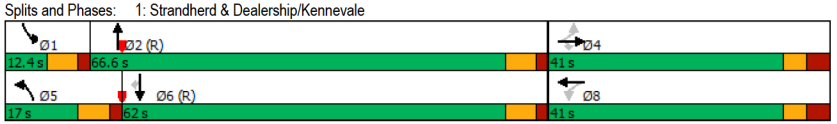
Intersection Signal Delay: 169.4	Intersection LOS: F
Intersection Capacity Utilization 133.5%	ICU Level of Service H
Analysis Period (min) 15	

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

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Strandherd & Dealership/Kennevale



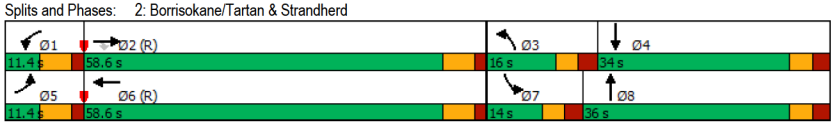
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	770	589	94	1599	52	1212	49	186	69	23	230
Future Volume (vph)	117	770	589	94	1599	52	1212	49	186	69	23	230
Satd. Flow (prot)	1589	3119	1332	1621	3187	0	3113	1497	0	1605	1474	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1589	3119	1332	1621	3187	0	3113	1497	0	1605	1474	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	117	770	589	94	1651	0	1212	235	0	69	253	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4		11.0	34.0		11.0	34.0	
Total Split (s)	11.4	58.6	58.6	11.4	58.6		16.0	36.0		14.0	34.0	
Total Split (%)	9.5%	48.8%	48.8%	9.5%	48.8%		13.3%	30.0%		11.7%	28.3%	
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4		6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None		None	None	
Act Effct Green (s)	8.6	52.2	52.2	8.6	52.2		10.0	29.2		7.7	24.4	
Actuated g/C Ratio	0.07	0.44	0.44	0.07	0.44		0.08	0.24		0.06	0.20	
v/c Ratio	1.03	0.57	1.02	0.81	1.19		4.68	0.65		0.67	0.85	
Control Delay	140.3	11.8	52.6	100.2	125.4		1677.2	50.4		84.8	70.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	140.3	11.8	52.6	100.2	125.4		1677.2	50.4		84.8	70.4	
LOS	F	B	D	F	F		F	D		F	E	
Approach Delay		38.2			124.1			1413.0			73.5	
Approach LOS		D			F			F			E	
Queue Length 50th (m)	~35.8	23.0	~145.7	~22.5	~243.7		~269.7	49.9		15.9	56.0	
Queue Length 95th (m)	m#55.6	m20.2	m#195.6	#62.5	#285.5		#309.8	75.8		#37.0	#89.0	
Internal Link Dist (m)		1040.6			372.4			275.6			103.1	
Turn Bay Length (m)	105.0		110.0	55.0			100.0			38.0		
Base Capacity (vph)	114	1356	579	116	1386		259	382		107	343	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	1.03	0.57	1.02	0.81	1.19		4.68	0.62		0.64	0.74	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 116 (97%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 4.68
Intersection Signal Delay: 469.2 Intersection LOS: F
Intersection Capacity Utilization 128.7% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd



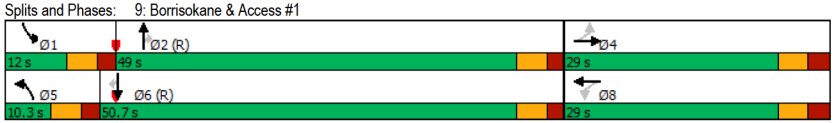
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	163	0	8	7	0	83	4	515	3	39	223	66
Future Volume (vph)	163	0	8	7	0	83	4	515	3	39	223	66
Satd. Flow (prot)	1621	1450	0	1621	1450	0	1621	1706	1450	1621	1706	1450
Flt Permitted	0.703			0.752			0.950			0.950		
Satd. Flow (perm)	1199	1450	0	1283	1450	0	1621	1706	1450	1621	1706	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	163	8	0	7	83	0	4	515	3	39	223	66
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.8	28.8		28.8	28.8		10.3	24.3	24.3	10.3	24.3	24.3
Total Split (s)	29.0	29.0		29.0	29.0		10.3	49.0	49.0	12.0	50.7	50.7
Total Split (%)	32.2%	32.2%		32.2%	32.2%		11.4%	54.4%	54.4%	13.3%	56.3%	56.3%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5		2.5	2.5		2.0	2.0	2.0	2.0	2.0	2.0
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)	5.8	5.8		5.8	5.8		5.3	5.3	5.3	5.3	5.3	5.3
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	17.1	17.1		17.1	17.1		5.5	54.0	54.0	7.0	59.7	59.7
Actuated g/C Ratio	0.19	0.19		0.19	0.19		0.06	0.60	0.60	0.08	0.66	0.66
v/c Ratio	0.72	0.03		0.03	0.30		0.04	0.50	0.00	0.31	0.20	0.07
Control Delay	50.9	26.6		26.7	32.4		40.8	15.2	11.7	47.8	7.4	7.5
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.9	26.6		26.7	32.4		40.8	15.2	11.7	47.8	7.4	7.5
LOS	D	C		C	C		D	B	B	D	A	A
Approach Delay		49.8			32.0			15.4			12.2	
Approach LOS		D			C			B			B	
Queue Length 50th (m)	26.2	1.1		1.0	12.2		0.7	54.2	0.3	6.7	11.7	3.2
Queue Length 95th (m)	43.3	4.3		4.2	22.8		3.9	94.0	1.6	16.9	24.9	9.8
Internal Link Dist (m)		145.0			184.4			619.8			273.4	
Turn Bay Length (m)	38.0			38.0			38.0		30.0	38.0		30.0
Base Capacity (vph)	309	373		330	373		100	1024	870	130	1132	962
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.02		0.02	0.22		0.04	0.50	0.00	0.30	0.20	0.07

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 21.1	Intersection LOS: C
Intersection Capacity Utilization 59.7%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 9: Borrisokane & Access #1



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	121	10	4	572	258	59
Future Volume (vph)	121	10	4	572	258	59
Satd. Flow (prot)	1621	1450	1621	1706	1706	1450
Flt Permitted	0.950		0.600			
Satd. Flow (perm)	1621	1450	1024	1706	1706	1450
Satd. Flow (RTOR)						
Lane Group Flow (vph)	121	10	4	572	258	59
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	28.3	28.3	23.8	23.8	23.8	23.8
Total Split (s)	31.0	31.0	59.0	59.0	59.0	59.0
Total Split (%)	34.4%	34.4%	65.6%	65.6%	65.6%	65.6%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.0	2.0	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.6	5.6	5.6	5.6
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	13.8	13.8	65.3	65.3	65.3	65.3
Actuated g/C Ratio	0.15	0.15	0.73	0.73	0.73	0.73
v/c Ratio	0.49	0.05	0.01	0.46	0.21	0.06
Control Delay	40.3	29.3	4.2	6.5	5.3	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.3	29.3	4.2	6.5	5.3	4.8
LOS	D	C	A	A	A	A
Approach Delay	39.4			6.5	5.2	
Approach LOS	D			A	A	
Queue Length 50th (m)	19.6	1.5	0.1	42.2	10.7	2.2
Queue Length 95th (m)	31.0	5.1	m0.5	57.3	28.8	8.0
Internal Link Dist (m)	113.8			273.4	275.6	
Turn Bay Length (m)	38.0	30.0	38.0			30.0
Base Capacity (vph)	462	414	742	1237	1237	1051
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.02	0.01	0.46	0.21	0.06

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.49
Intersection Signal Delay: 10.3 — Intersection LOS: B
Intersection Capacity Utilization 49.2% — ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Borrisokane & Access #2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	275	96	188	128	26	92	66	1921	132	85	2772	108
Future Volume (vph)	275	96	188	128	26	92	66	1921	132	85	2772	108
Satd. Flow (prot)	1621	1706	1450	1621	1506	0	3144	3203	0	1621	3241	1450
Flt Permitted	0.681			0.695			0.950			0.950		
Satd. Flow (perm)	1162	1706	1431	1184	1506	0	3144	3203	0	1620	3241	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	275	96	188	128	118	0	66	2053	0	85	2772	108
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8								6
Detector Phase	4	4	4	8	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	39.9	39.9	39.9	32.9	32.9		11.4	30.4		11.4	39.4	39.4
Total Split (s)	39.9	39.9	39.9	39.9	39.9		11.4	68.1		12.0	68.7	68.7
Total Split (%)	33.3%	33.3%	33.3%	33.3%	33.3%		9.5%	56.8%		10.0%	57.3%	57.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	3.6	3.6	3.6	3.6	3.6		1.8	1.8		1.8	1.8	1.8
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)	6.9	6.9	6.9	6.9	6.9		6.4	6.4		6.4	6.4	6.4
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	30.9	30.9	30.9	30.9	30.9		5.5	61.7		7.7	66.3	66.3
Actuated g/C Ratio	0.26	0.26	0.26	0.26	0.26		0.05	0.51		0.06	0.55	0.55
v/c Ratio	0.92	0.22	0.51	0.42	0.30		0.46	1.25		0.82	1.55	0.13
Control Delay	78.9	35.6	43.0	41.2	37.5		69.6	139.1		106.1	274.2	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	78.9	35.6	43.0	41.2	37.5		69.6	139.1		106.1	274.2	15.1
LOS	E	D	D	D	D		E	F		F	F	B
Approach Delay		59.4			39.4			137.0			259.9	
Approach LOS		E			D			F			F	
Queue Length 50th (m)	60.8	17.2	36.5	24.2	21.6		7.6	~321.3		~22.8	~491.3	12.6
Queue Length 95th (m)	#107.5	31.1	59.0	42.3	37.6		m7.4	m142.5		#54.7	#529.2	22.4
Internal Link Dist (m)		172.9			177.4			1040.6			345.0	
Turn Bay Length (m)	70.0		150.0	50.0			130.0			180.0		60.0
Base Capacity (vph)	319	469	393	325	414		145	1646		104	1791	801
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.86	0.20	0.48	0.39	0.29		0.46	1.25		0.82	1.55	0.13

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 64 (53%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.55

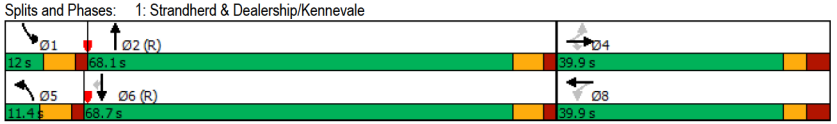
Intersection Signal Delay: 187.4	Intersection LOS: F
Intersection Capacity Utilization 118.9%	ICU Level of Service H
Analysis Period (min) 15	

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

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Strandherd & Dealership/Kennevale

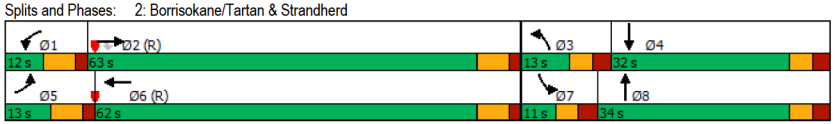


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	322	1606	1216	182	1089	65	814	34	155	52	49	122
Future Volume (vph)	322	1606	1216	182	1089	65	814	34	155	52	49	122
Satd. Flow (prot)	1621	3241	1450	1621	3215	0	3144	1496	0	1621	1523	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1621	3241	1450	1621	3215	0	3144	1496	0	1621	1523	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	322	1606	1216	182	1154	0	814	189	0	52	171	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0		5.0	10.0		5.0	10.0	
Minimum Split (s)	11.4	56.4	56.4	11.4	56.4		11.0	34.0		11.0	16.0	
Total Split (s)	13.0	63.0	63.0	12.0	62.0		13.0	34.0		11.0	32.0	
Total Split (%)	10.8%	52.5%	52.5%	10.0%	51.7%		10.8%	28.3%		9.2%	26.7%	
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6		3.3	3.3		3.3	3.3	
All-Red Time (s)	1.8	1.8	1.8	1.8	1.8		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4		6.0	6.0		6.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Recall Mode	None	C-Max	C-Max	None	C-Max		None	None		None	None	
Act Effct Green (s)	13.9	56.6	56.6	12.9	55.6		7.0	22.9		5.0	18.7	
Actuated g/C Ratio	0.12	0.47	0.47	0.11	0.46		0.06	0.19		0.04	0.16	
v/c Ratio	1.72	1.05	1.78	1.05	0.78		4.45	0.66		0.78	0.72	
Control Delay	364.9	41.4	371.1	133.1	31.4		1577.5	56.8		116.4	64.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	364.9	41.4	371.1	133.1	31.4		1577.5	56.8		116.4	64.6	
LOS	F	D	F	F	C		F	E		F	E	
Approach Delay		202.0			45.3			1291.0			76.7	
Approach LOS		F			D			F			E	
Queue Length 50th (m)	~111.5	~215.8	~429.0	~45.9	115.3		~180.0	42.0		12.2	38.2	
Queue Length 95th (m)	m#92.5	m49.0	m#251.0	#113.6	142.4		#217.4	62.4		#34.4	57.6	
Internal Link Dist (m)		1040.6			368.4			275.6			103.1	
Turn Bay Length (m)	105.0		110.0	55.0			100.0			38.0		
Base Capacity (vph)	187	1528	683	174	1489		183	349		67	329	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	1.72	1.05	1.78	1.05	0.78		4.45	0.54		0.78	0.52	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 4.45
Intersection Signal Delay: 351.8 Intersection LOS: F
Intersection Capacity Utilization 116.4% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd



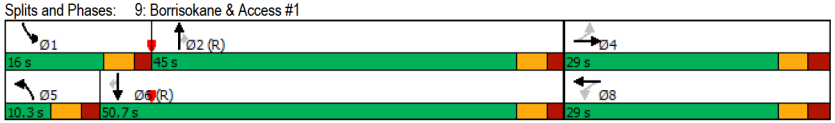
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	111	0	6	5	0	57	6	320	6	77	520	139
Future Volume (vph)	111	0	6	5	0	57	6	320	6	77	520	139
Satd. Flow (prot)	1621	1450	0	1621	1450	0	1621	1706	1450	1621	1706	1450
Flt Permitted	0.720			0.754			0.950			0.950		
Satd. Flow (perm)	1228	1450	0	1286	1450	0	1621	1706	1450	1621	1706	1450
Satd. Flow (RTOR)												
Lane Group Flow (vph)	111	6	0	5	57	0	6	320	6	77	520	139
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	28.8	28.8		28.8	28.8		10.3	24.3	24.3	10.3	24.3	24.3
Total Split (s)	29.0	29.0		29.0	29.0		10.3	45.0	45.0	16.0	50.7	50.7
Total Split (%)	32.2%	32.2%		32.2%	32.2%		11.4%	50.0%	50.0%	17.8%	56.3%	56.3%
Yellow Time (s)	3.3	3.3		3.3	3.3		3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5		2.5	2.5		2.0	2.0	2.0	2.0	2.0	2.0
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)	5.8	5.8		5.8	5.8		5.3	5.3	5.3	5.3	5.3	5.3
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	14.6	14.6		14.6	14.6		5.6	56.3	56.3	9.1	66.4	66.4
Actuated g/C Ratio	0.16	0.16		0.16	0.16		0.06	0.63	0.63	0.10	0.74	0.74
v/c Ratio	0.56	0.03		0.02	0.24		0.06	0.30	0.01	0.47	0.41	0.13
Control Delay	44.3	28.2		28.2	33.3		41.2	13.0	12.5	44.7	9.2	8.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.3	28.2		28.2	33.3		41.2	13.0	12.5	44.7	9.2	8.0
LOS	D	C		C	C		D	B	B	D	A	A
Approach Delay		43.5			32.9			13.5			12.7	
Approach LOS		D			C			B			B	
Queue Length 50th (m)	18.0	0.9		0.8	8.7		1.0	27.4	0.4	12.6	28.9	5.9
Queue Length 95th (m)	30.2	3.6		3.2	17.0		4.7	57.2	2.7	27.8	68.7	22.5
Internal Link Dist (m)		154.2			129.4			652.0			273.4	
Turn Bay Length (m)	38.0			38.0			38.0		30.0	38.0		30.0
Base Capacity (vph)	316	373		331	373		101	1067	907	194	1258	1069
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.02		0.02	0.15		0.06	0.30	0.01	0.40	0.41	0.13

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 16.8	Intersection LOS: B
Intersection Capacity Utilization 59.9%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 9: Borrisokane & Access #1



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	77	6	10	366	576	123
Future Volume (vph)	77	6	10	366	576	123
Satd. Flow (prot)	1621	1450	1621	1706	1706	1450
Flt Permitted	0.950		0.417			
Satd. Flow (perm)	1621	1450	711	1706	1706	1450
Satd. Flow (RTOR)						
Lane Group Flow (vph)	77	6	10	366	576	123
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	28.3	28.3	23.6	23.6	23.6	23.6
Total Split (s)	30.0	30.0	60.0	60.0	60.0	60.0
Total Split (%)	33.3%	33.3%	66.7%	66.7%	66.7%	66.7%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.0	2.0	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3	5.6	5.6	5.6	5.6
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	12.8	12.8	70.4	70.4	70.4	70.4
Actuated g/C Ratio	0.14	0.14	0.78	0.78	0.78	0.78
v/c Ratio	0.33	0.03	0.02	0.27	0.43	0.11
Control Delay	37.1	29.8	5.3	5.6	6.5	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.1	29.8	5.3	5.6	6.5	4.5
LOS	D	C	A	A	A	A
Approach Delay	36.6			5.6	6.1	
Approach LOS	D			A	A	
Queue Length 50th (m)	12.5	0.9	0.5	26.4	27.1	4.2
Queue Length 95th (m)	21.2	3.6	m2.3	37.6	76.6	14.6
Internal Link Dist (m)	209.1			273.4	275.6	
Turn Bay Length (m)	38.0	30.0	38.0			30.0
Base Capacity (vph)	444	397	556	1335	1335	1134
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.02	0.02	0.27	0.43	0.11

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.43

Intersection Signal Delay: 8.1	Intersection LOS: A
Intersection Capacity Utilization 49.4%	ICU Level of Service A
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Borrisokane & Access #2

Appendix K

MMLOS Analysis

Consultant	**CGH Transportation**	**Project**	**Conservancy West**
Scenario	**Existing/Future**	**Date**	**22-Oct-21**
Comments			

INTERSECTIONS		**Strandherd-Kennevale (Existing)**				**Strandherd-Kennevale (Future)**			
	Crossing Side	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Pedestrian	Lanes	4	5	3	5	7	7	3	5
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	Median > 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	Permissive	Permissive	Permissive	Permissive	Protected	Protected	Protected	Protected
	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
	Right Turn Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel
	Corner Radius	10-15m	10-15m	5-10m	15-25m	10-15m	10-15m	15-25m	15-25m
	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	**53**	**37**	**71**	**35**	**18**	**12**	**76**	**43**
	Ped. Exposure to Traffic LoS	**D**	**E**	**C**	**E**	**F**	**F**	**B**	**E**
	Cycle Length								
	Effective Walk Time								
	Average Pedestrian Delay								
	Pedestrian Delay LoS	-	-	-	-	-	-	-	-
	Level of Service	**D**	**E**	**C**	**E**	**F**	**F**	**B**	**E**
		E				**F**			
	Approach From	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Bicycle	Bicycle Lane Arrangement on Approach	Pocket Bike Lane	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic
	Right Turn Lane Configuration	≤ 50 m Introduced right turn lane	> 50 m Introduced right turn lane	≤ 50 m	≤ 50 m	Not Applicable	Not Applicable	≤ 50 m	≤ 50 m
	Right Turning Speed	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	Not Applicable	Not Applicable	≤ 25 km/h	≤ 25 km/h
	Cyclist relative to RT motorists	**B**	**D**	**D**	**D**	**Not Applicable**	**Not Applicable**	**D**	**D**
	Separated or Mixed Traffic	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Separated**	**Mixed Traffic**	**Mixed Traffic**
	Left Turn Approach	1 lane crossed	1 lane crossed	No lane crossed	One lane crossed	2-stage, LT box	2-stage, LT box	No lane crossed	One lane crossed
	Operating Speed	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 50 to < 60 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 50 to < 60 km/h
	Left Turning Cyclist	**E**	**E**	**B**	**E**	**A**	**A**	**B**	**E**
	Level of Service	**E**	**E**	**D**	**E**	**A**	**A**	**D**	**E**
		E				**E**			
Transit	Average Signal Delay	> 40 sec	> 40 sec	≤ 30 sec		> 40 sec	> 40 sec	> 40 sec	
	Level of Service	**F**	**F**	**D**	**-**	**F**	**F**	**F**	**-**
		F				**F**			
Truck	Effective Corner Radius	10 - 15 m	< 10 m		> 15 m	10 - 15 m	10 - 15 m		> 15 m
	Number of Receiving Lanes on Departure from Intersection	1	≥ 2		1	1	≥ 2		≥ 2
	Level of Service	**E**	**D**	**-**	**C**	**E**	**B**	**-**	**A**
		E				**E**			
Auto	Volume to Capacity Ratio	> 1.00				> 1.00			
	Level of Service	**F**				**F**			

Strandherd-Borrisokane (Existing)				Strandherd-Borrisokane (Future)				Access #2-Borrisokane (Future)			
NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
4	3	3	4	3	4	5	6	4	4	3	3
No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	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
Permissive	Permissive	Permissive	Permissive	Protected	Protected	Protected	Protected	Permissive	Permissive	Protected	Protected
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	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
No	No	No	No	No	No	No	No	No	No	No	No
No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel
10-15m	10-15m	5-10m	15-25m	5-10m	5-10m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m
Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
53	**70**	**71**	**51**	**79**	**62**	**45**	**28**	**53**	**53**	**78**	**78**
D	**C**	**C**	**D**	**B**	**C**	**D**	**F**	**D**	**D**	**B**	**B**
-	-	-	-	-	-	-	-	-	-	-	-
D	**C**	**C**	**D**	**B**	**C**	**D**	**F**	**D**	**D**	**B**	**B**
D				**F**				**D**			
NORTH	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP
≤ 50 m	≤ 50 m	≤ 50 m	> 50 m								
≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	>25 km/h								
D	**D**	**D**	**F**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**
Mixed Traffic	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**
One lane crossed	One lane crossed	One lane crossed	≥ 2 lanes crossed	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box
> 50 to < 60 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 50 to < 60 km/h	≥ 60 km/h	≥ 60 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h
E	**D**	**F**	**F**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
E	**D**	**F**	**F**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
F				**A**				**A**			
≤ 30 sec		> 40 sec	≤ 40 sec	> 40 sec		> 40 sec	> 40 sec	≤ 10 sec	≤ 30 sec	≤ 30 sec	≤ 20 sec
D	**-**	**F**	**E**	**F**	**-**	**F**	**F**	**B**	**D**	**D**	**C**
F				**F**				**D**			
	10 - 15 m		> 15 m		< 10 m		10 - 15 m				
	1		1		≥ 2		1				
-	**E**	**-**	**C**	**-**	**D**	**-**	**E**	**-**	**-**	**-**	**-**
E				**E**				**-**			
> 1.00				> 1.00				0.0 - 0.60			
F				**F**				**A**			

Access#1/BRT-Borrisokane (Future)			
NORTH	SOUTH	EAST	WEST
4	3	0 - 2	3
No Median - 2.4 m	No Median - 2.4 m	Median > 2.4 m	No Median - 2.4 m
Permissive	Permissive	No left turn / Prohib.	Permissive
No right turn	Permissive or yield control	No right turn	Permissive or yield control
RTOR allowed	RTOR prohibited	RTOR prohibited	RTOR allowed
No	No	No	No
No Right Turn	No Channel	No Right Turn	No Channel
10-15m	10-15m	10-15m	10-15m
Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
62	**73**	**105**	**70**
C	**C**	**A**	**C**
-	**-**	**-**	**-**
C	**C**	**A**	**C**
C			
NORTH	**SOUTH**	**EAST**	**WEST**
Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP
Not Applicable	**Not Applicable**	**Not Applicable**	**Not Applicable**
Separated	**Separated**	**Separated**	**Separated**
2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box
> 50 to < 60 km/h	> 50 to < 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h
A	**A**	**A**	**A**
A	**A**	**A**	**A**
A			
≤ 10 sec	≤ 20 sec	≤ 30 sec	≤ 30 sec
B	**C**	**D**	**D**
D			
-	**-**	**-**	**-**
-			
0.0 - 0.60			
A			