

3882 & 4000 Barnsdale Road

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Strategy Report

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1 Screening

This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines, incorporating the 2023 Revision to Transportation Impact Assessment Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for the TIA Study PM. As shown in the Screening Form, a TIA is required, and this study has been prepared to support a plan of subdivision application.

The subdivision lands are located within the Barrhaven South PH3 Urban Expansion Area Lands (S-1 Lands) outlined in the City's Official Plan Schedule C17. The S-1 Lands related applications have been submitted to lift the Future Neighbourhood Overlay. The transportation report prepared in support of that submission will be the parent transportation study in the process that informs the concept plan for the future neighbourhood. This TIA will assess the plan of subdivision under the typical development review process and assess the impact of any changes between the overall concept plan and any revisions to the plan of subdivision.

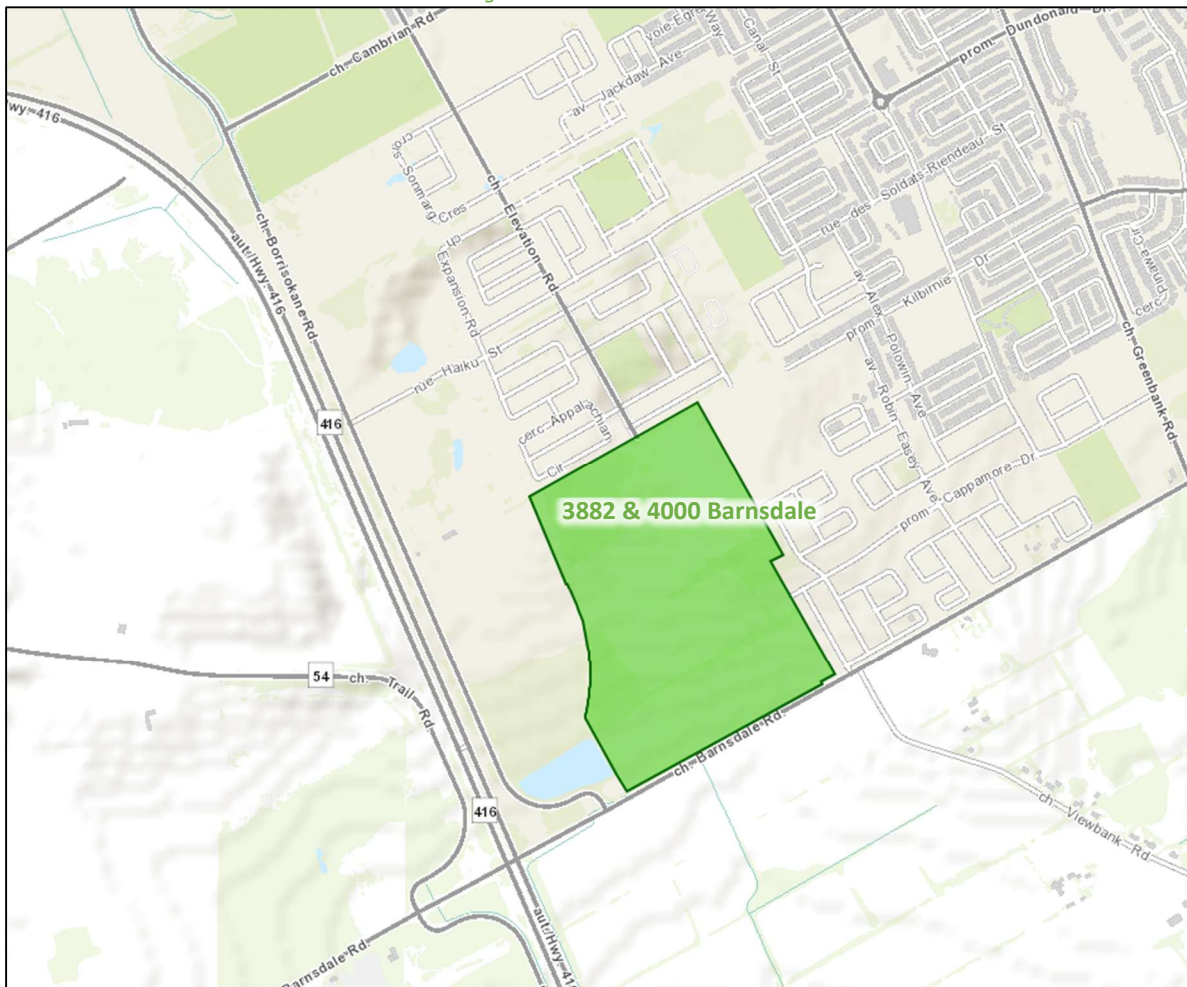
2 Existing and Planned Conditions

2.1 Proposed Development

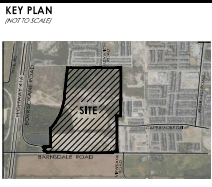
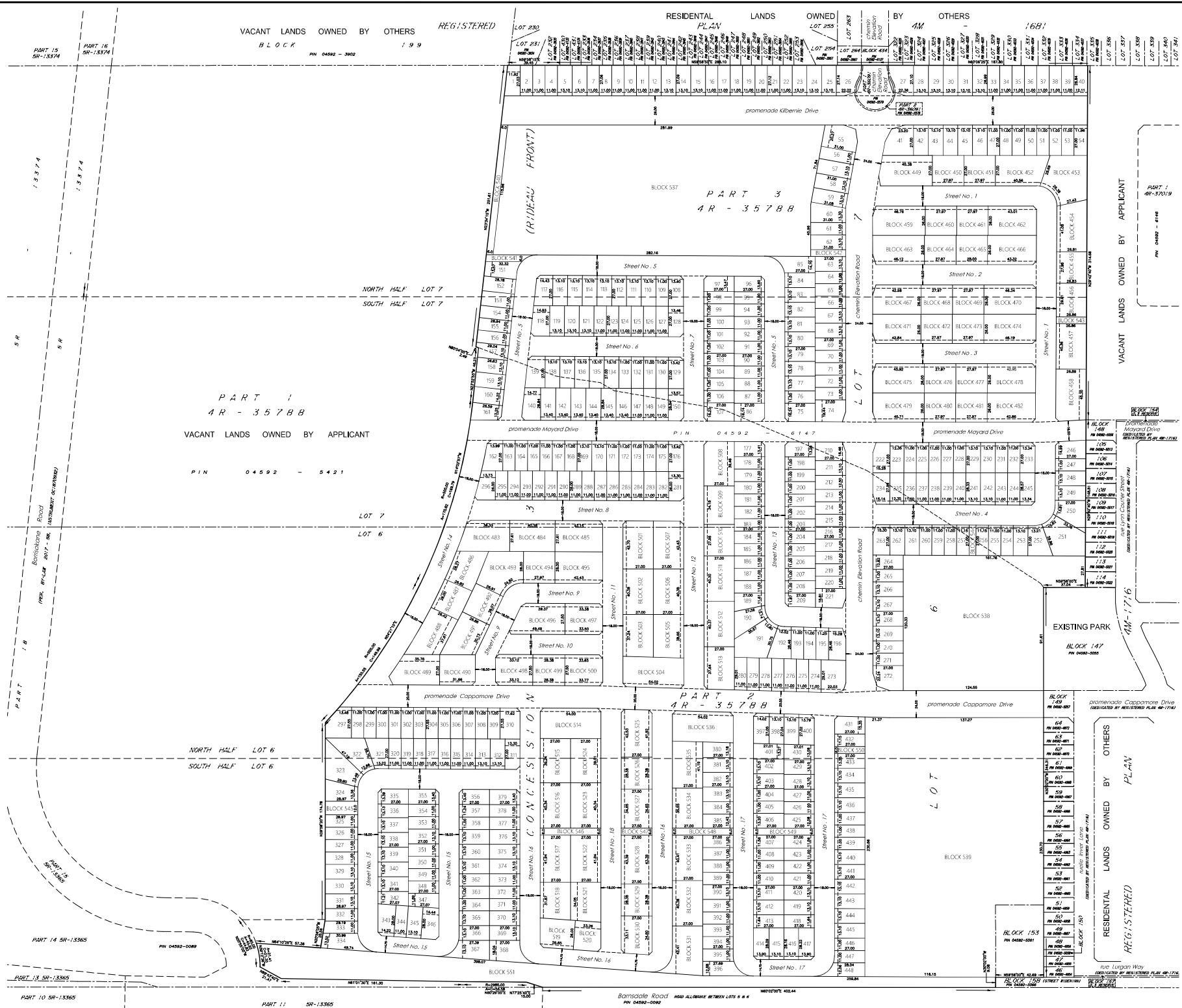
The proposed development situated in the Barrhaven South PH3 Urban Expansion boundary, is located at 3882 and 4000 Barnsdale Road. The development is currently zoned as Development Reserve Zone (DR). The proposed development concept includes a total of 448 single-detached homes, 494 townhouses, park/open space, and a stormwater maintenance pond. The subdivision will connect to the extensions of Elevation Road, Kilbirnie Drive, and Cappamore Drive and new local roads are proposed within the subdivision. The anticipated build-out year is 2031.

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: June 11, 2026



**DRAFT PLAN OF SUBDIVISION
PART OF LOTS 6 AND 7
CONCESSION 3 (RIDEAU FRONT)
(GEOGRAPHIC TOWNSHIP OF HURON)
AND
BLOCK 153
REGISTERED PLAN 4M-1716
CITY OF OTTAWA**

METRIC CONVERSION
DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY MULTIPLYING BY 3.2808

ADDITIONAL INFORMATION REQUIRED
UNDER SECTION 51 OF THE PLANNING ACT.

☐ WAS SHOWN ON DRAFT AND KEY PLANS
☐ RESIDENTIAL
☐ WAS SHOWN ON DRAFT PLAN
☐ WAS SHOWN ON DRAFT PLAN
☐ WAS SHOWN ON DRAFT PLAN

ALL MUNICIPAL SERVICES ARE AVAILABLE
AS SHOWN ON DRAFT PLAN

AREA OF ROW BLOCKS [44] = 8.81 Hectares (21.90 Acres)
 AREA OF PARK BLOCKS [1] = 1.98 Hectares (4.93 Acres)
 AREA OF WOODLOF/O.S. BLOCKS [1] = 3.24 Hectares (8.01 Acres)
 AREA OF POND BLOCKS [1] = 5.69 Hectares (14.04 Acres)
 AREA OF CARRAN ROAD BLOCKS [1] = 0.16 Hectares (0.39 Acres)

TOTAL AREA OF SUBDIVISION = 47,324 hectares (116,85 Acres)

OWNER'S CERTIFICATE

***** ORIGINAL *****
I HAVE THE AUTHORITY TO SIGN THE CORPORATION

DEVEYON'S CERTIFICATE
 HEREBY CERTIFY THAT THE BOUNDARIES OF THE SUBJECT LANDS AND THEIR RELATIONSHIP TO
 SURROUNDING LANDS HAVE BEEN ACCURATELY AND CORRECTLY SHOWN.

DATE _____

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CHEAP AND LAZY SERVER

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2.2 Existing Conditions

2.2.1 Area Road Network

Barnsdale Road: Barnsdale Road is a City of Ottawa arterial road with a two-lane rural cross-section, including gravel shoulders on both sides of the road within the study area. The posted limit is 80 km/h within the study area. The City protected right-of-way is 30.0 metres west of Highway 416 and 39.5 metres between Highway 416 and Prince of Wales Drive, subject to unequal widening with 17.25 metres on the north side and 22.25 metres on the south side.

Borrisokane Road: Borrisokane Road is a City of Ottawa collector road with a two-lane rural cross-section, including gravel shoulders on both sides of the road within the study area. The posted speed is 80 km/h and the City protected right-of-way is 24.0 metres south of Cambrian Road.

Trail Road: Trail Road is a City of Ottawa arterial road with a two-lane cross-section, including gravel shoulders on both sides of the road within the study area. The unposted limit is assumed to be 80 km/h within the study area. The existing right-of-way is 20.0 metres within the study area.

William McEwen Drive: William McEwen Drive is a City of Ottawa collector road with a two-lane cross-section, including gravel shoulders on both sides of the road within the study area. The unposted limit is assumed to be 80 km/h within the study area. The existing right-of-way is 20.0 metres within the study area.

Elevation Road: Elevation Road is a City of Ottawa collector road with a two-lane urban cross-section. Multi-use pathways are anticipated to be on both sides of the road. The unposted limit is assumed to be 50 km/h based on the Highway Traffic Act, and the right-of-way is 24.0 metres.

Dundonald Drive: Dundonald Drive is a City of Ottawa collector road with a two-lane urban cross-section including sidewalks on both sides east of the future Realigned Greenbank Road. To the west of the future Realigned Greenbank Road, Dundonald Road is currently under construction and is anticipated to include multi-use pathways on both sides of the road. The unposted speed limit is assumed to be 40 km/h based on the traffic calming design of new neighborhoods, and the measured right-of-way is 24.0 metres.

Kilbirnie Drive: Kilbirnie Drive is a City of Ottawa collector road with a two-lane urban cross-section, including sidewalks on both sides of the road. The unposted speed limit is assumed to be 50km/h based on the Highway Traffic Act, and the right-of-way is 22.0 metres.

Cappamore Drive: Cappamore Drive is a City of Ottawa collector road with a two-lane urban cross-section, including cycletracks and sidewalks on both sides of the road. The unposted speed limit is assumed to be 50 km/h based on the Highway Traffic Act. The right-of-way is 24.0 metres.

Moyard Drive: Moyard Drive is a City of Ottawa local road with a two-lane urban cross-section. The unposted speed limit is assumed to be 30 km/h based on the traffic calming design of new neighbourhoods, and the right-of-way is 18.0 metres.

2.2.2 Existing Intersections

The key intersections within one kilometre of the site have been summarized below:

<i>Borrisokane Road at Barnsdale Road</i>	The intersection of Borrisokane Road at Barnsdale Road is an unsignalized T-intersection with stop control on the minor approach of Borrisokane Road. The southbound approach consists of a shared left-turn/right-turn lane. The eastbound approach consists of a
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shared left-turn/through lane, and the westbound approach consists of a shared through/right-turn lane. No turn restrictions were noted.

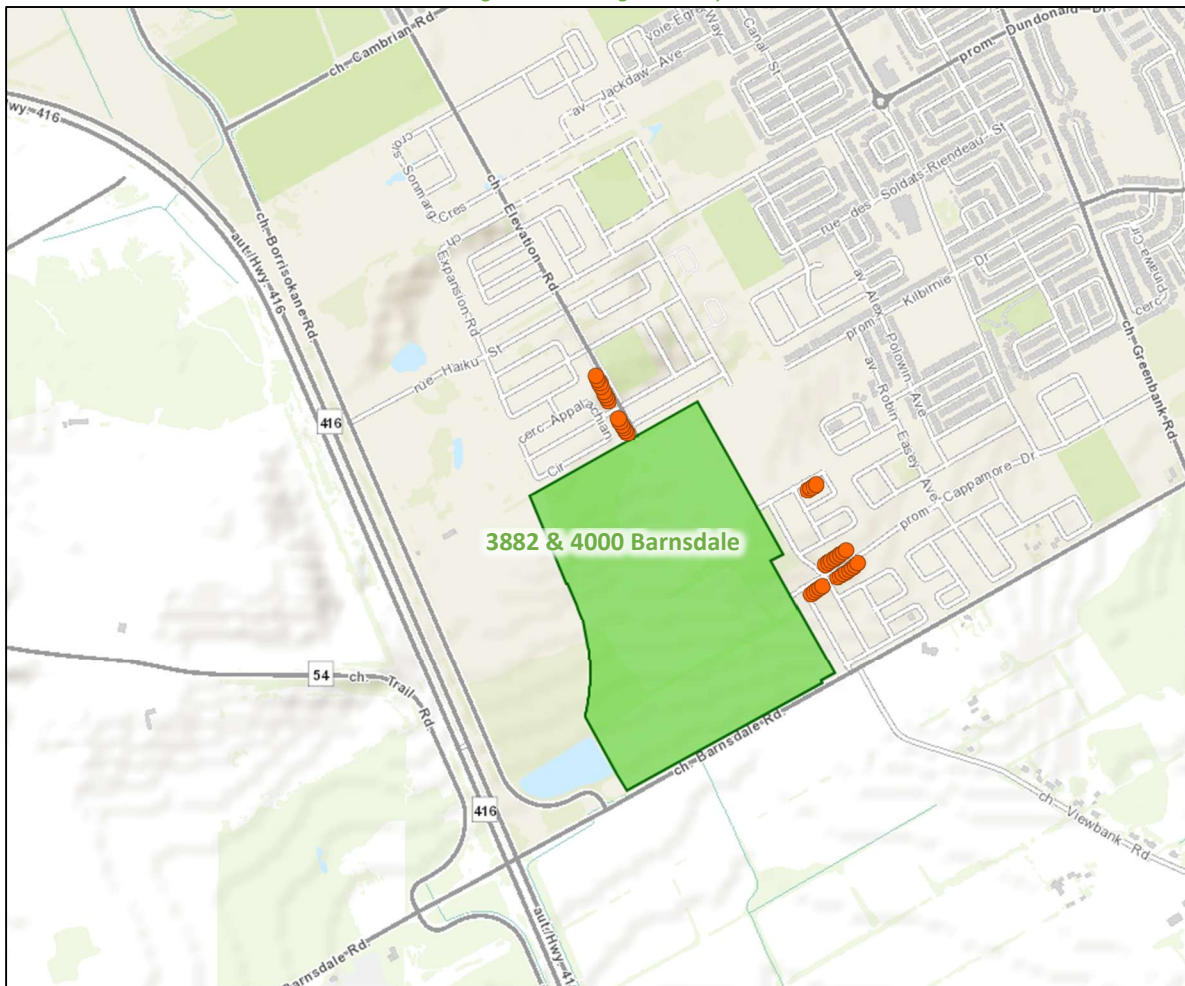
Barnsdale Road at Trail Road/William McEwen Drive

The intersection of Barnsdale Road at Trail Road/William McEwen Drive is an unsignalized intersection with stop control on the minor approaches of Trail Road/William McEwen Drive. Each approach consists of a shared all-movement lane. No turn restrictions were noted.

2.2.3 Existing Driveways

Within 200 metres, driveways are present on the west side of Elevation Road, both sides of Cappamore Drive, and on the south side of Moyard Drive to residential land uses. Figure 3 illustrates the existing driveways.

Figure 3: Existing Driveways



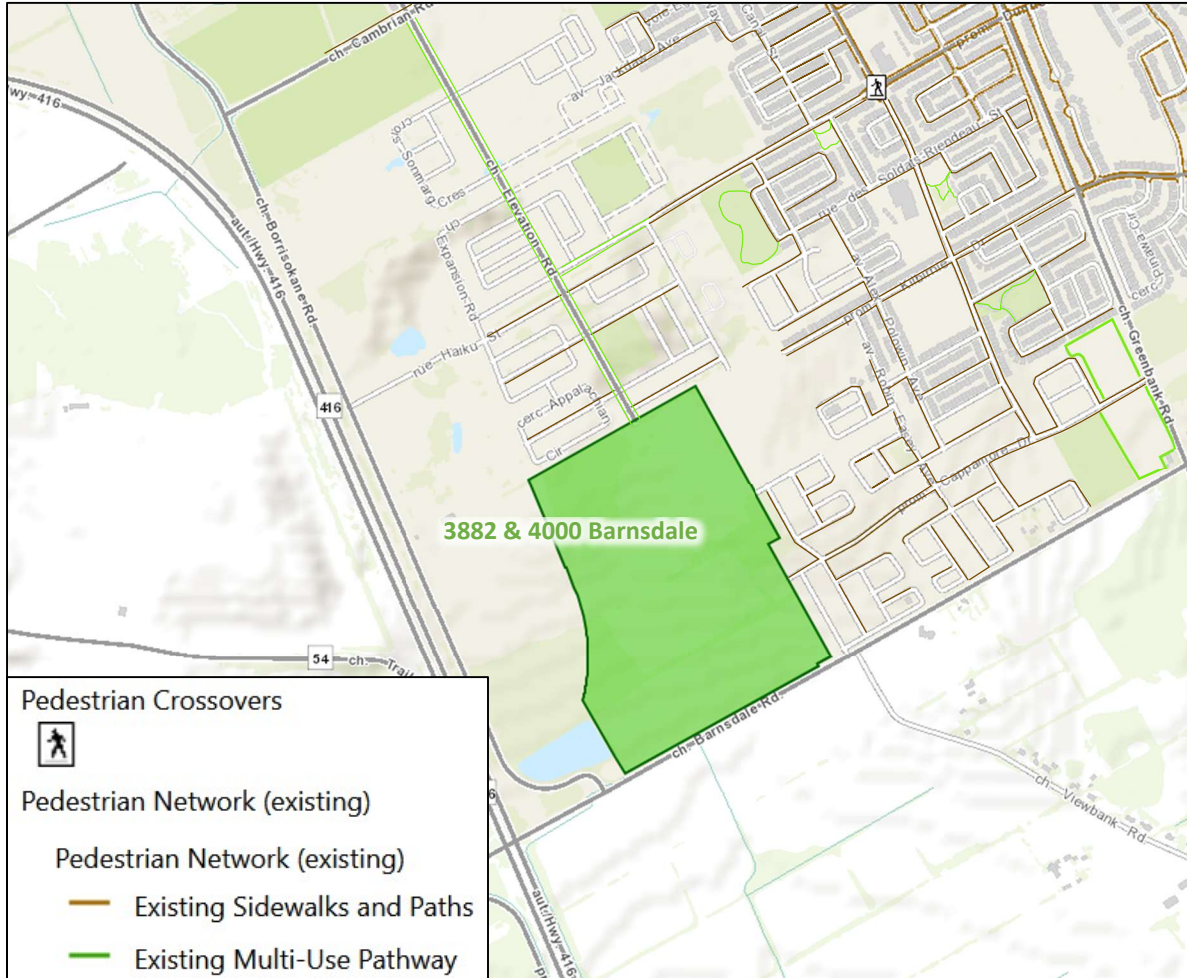
Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: June 11, 2026

2.2.4 Cycling and Pedestrian Facilities

Figure 4 illustrates the pedestrian facilities in the study area and Figure 5 illustrates the cycling facilities. Considering the plans for other developments and the newly constructed pedestrian and cycling facilities, new community sidewalks and cycling pathways have been included in the figure where possible, despite not being formalized within the City's pedestrian network in geoOttawa.

Sidewalks are provided along Cappamore Drive, Kilbirnie Drive, Dundonald Drive east of Realigned Greenbank Road. Multi-use pathways are provided along Elevation Road and Dundonald Drive west of Realigned Greenbank Road. Cycling facilities include cycletracks along both sides of Cappamore Drive. Realigned Greenbank Road is designated as a cross-town bikeway.

Figure 4: Study Area Pedestrian Facilities



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: June 11, 2026

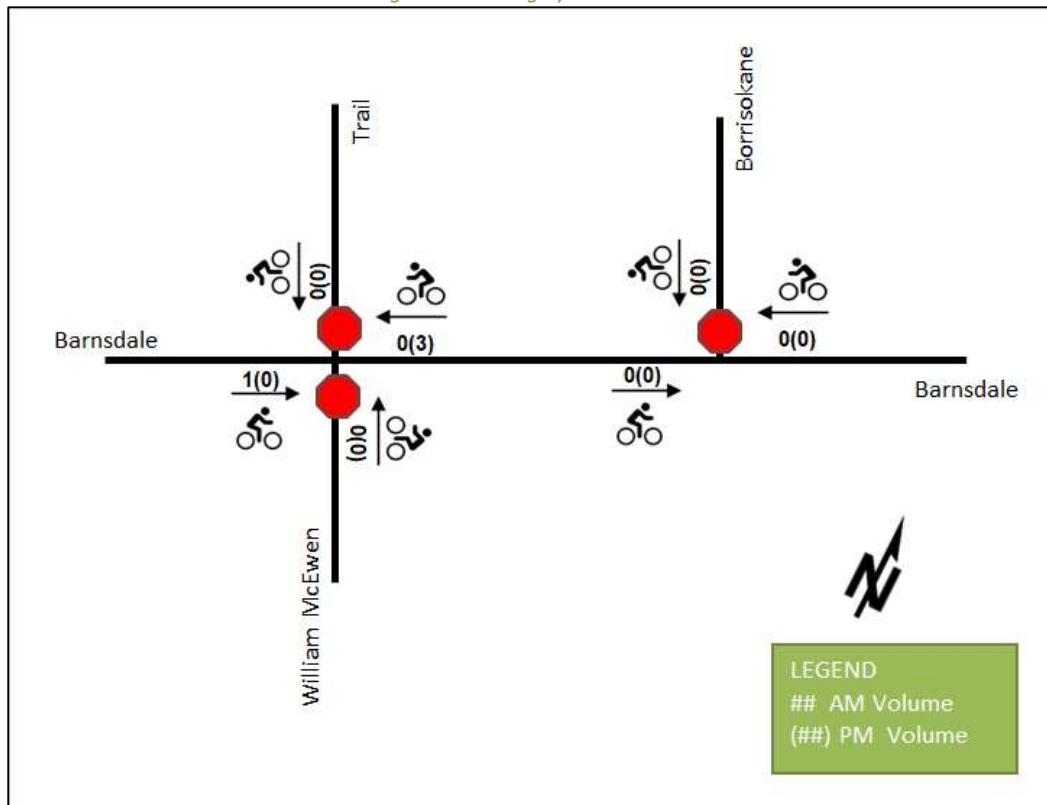
Figure 5: Study Area Cycling Facilities



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: June 11, 2026

No pedestrian volumes are noted on the study area. Cyclist volumes included in study area intersection counts, presented in Section 2.2.7, have been compiled and are illustrated in Figure 6.

Figure 6: Existing Cyclist Volumes



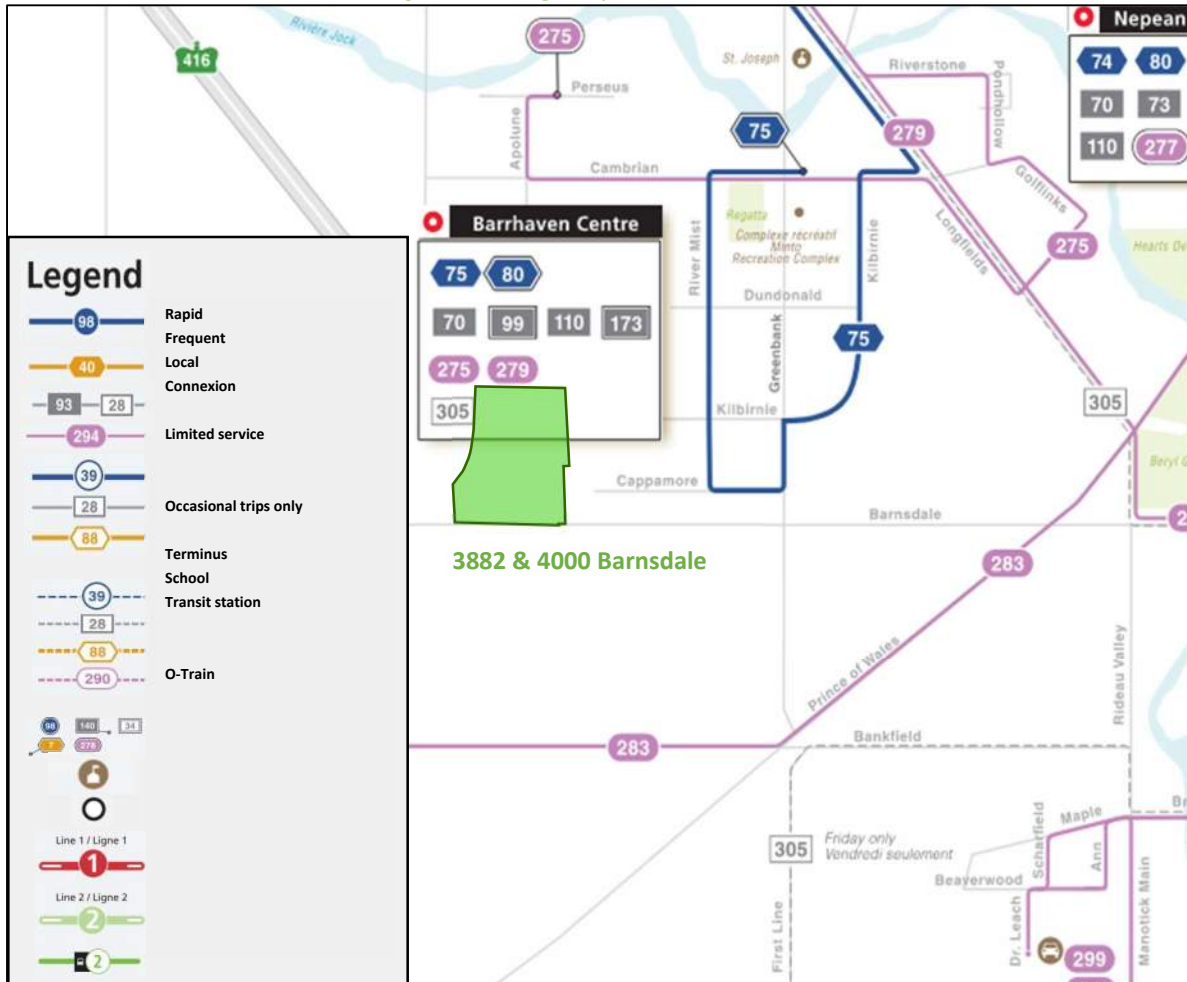
2.2.5 Existing Transit

Figure 7 illustrates the transit system map in the study area and Figure 8 illustrates nearby transit stops. All transit information is from June 11, 2026 and is included for general information purposes and context to the surrounding area.

Within the study area, the route #75 travels along Kilbirnie Drive, Greenbank Road, and Cappamore Drive. It is noted that routes #671, #675, and #683, which are high school routes, travel along Kilbirnie Drive, River Mist Road, and Cambrian Road. The frequency of these routes within proximity of the proposed site based on June 11, 2026, service levels are:

- Route # 75 – 15-minute service in the peak period/direction and 30-minute service all-day

Figure 7: Existing Study Area Transit Service



Source: <http://www.octranspo.com/> Accessed: June 11, 2026

Figure 8: Existing Study Area Transit Stops



Source: <http://www.octranspo.com/> Accessed: June 11, 2026

2.2.6 Existing Area Traffic Management Measures

The existing area traffic management measures consist of bulb-outs framing parking on Elevation Road, Dundonald Drive, Kilbirnie Drive, and Cappamore Drive within the study area.

2.2.7 Existing Peak Hour Travel Demand

Existing turning movement counts have been obtained from the Barrhaven South Future Neighbourhood Phase 3 Transportation Report. Table 1 summarizes the intersection count dates and sources.

Table 1: Intersection Count Date

Intersection	Count Date	Source
Borrisokane Road at Barnsdale Road	Wednesday, Mar 20, 2024	Ontario Traffic Inc.
Barnsdale Road at Trail Road/William McEwen Drive	Monday, July 26, 2021	City of Ottawa

Figure 9 illustrates the existing traffic counts and Table 2 summarizes the existing intersection operations. The level of service based on average delay for unsignalized intersections. Detailed turning movement count data is included in Appendix B and the Synchro worksheets are provided in Appendix C.

Figure 9: Existing Traffic Counts

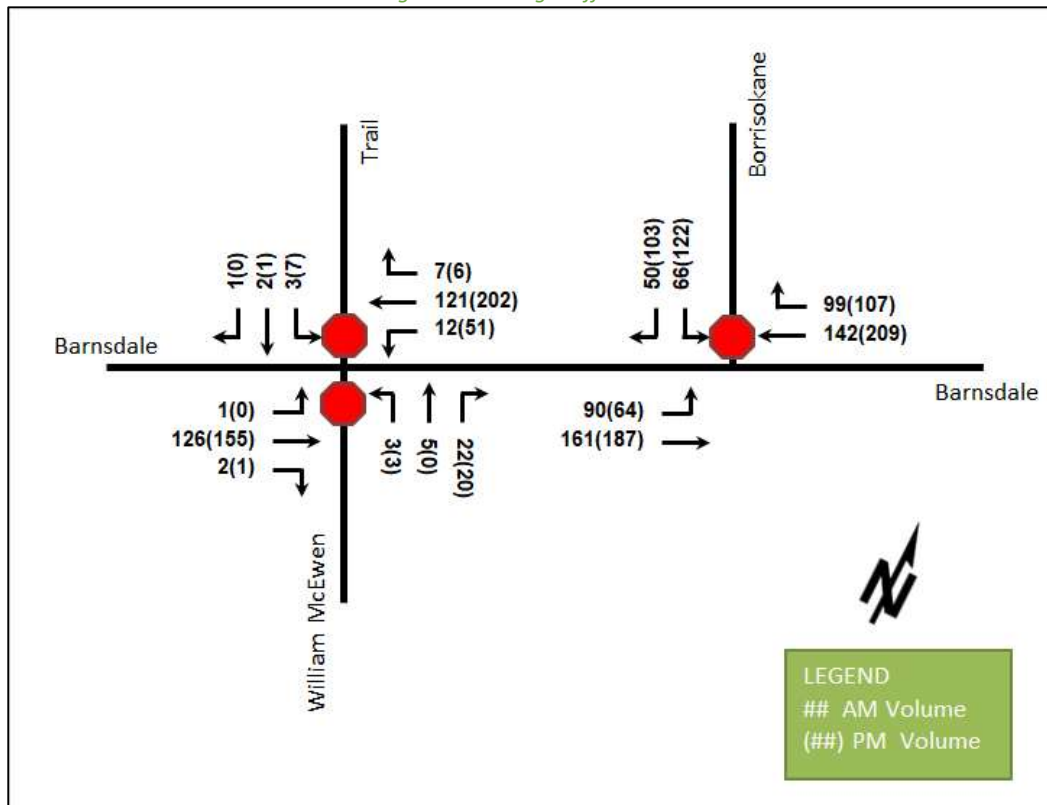


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Borrisokane Road at Barnsdale Road <i>Unsignalized</i>	EBL/T	A	0.08	8.0	1.5	A	0.06	8.2	1.5
	WBT/R	-	-	-	-	-	-	-	-
	SBL/R	B	0.24	13.7	6.8	C	0.49	18.5	19.5
	Overall	A	-	3.8	-	A	-	5.9	-
Barnsdale Road at Trail Road/William McEwen Drive <i>Unsignalized</i>	EBL	A	0.00	7.5	0.0	A	-	0.0	0.0
	WB	A	0.01	8.1	0.0	A	0.05	8.2	1.5
	NB	B	0.05	10.3	0.8	A	0.03	9.9	0.8
	SB	B	0.01	11.7	0.0	B	0.02	14.6	0.8
	Overall	A	-	1.6	-	A	-	1.7	-

Notes: Saturation flow rate of 1800 veh/h/lane
 Queue is measured in metres
 Peak Hour Factor = 0.90

Delay = average vehicle delay in seconds
 m = metered queue
 # = volume for the 95th %ile cycle exceeds capacity

During both the AM and PM peak hours, the study area intersections operate well. No capacity issues are noted.

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 area road network (2018-2022). Table 3 summarizes the collision types and conditions in the study area, Figure 10 illustrates the intersections and segments analyzed, and Table 4 summarizes the total collisions for each of the locations analyzed. Collision data are included in Appendix D.

Table 3: Study Area Collision Summary, 2018-2022

		Number	%
Total Collisions		11	100%
Classification	Fatality	0	0%
	Non-Fatal Injury	5	45%
	Property Damage Only	6	55%
Initial Impact Type	Approaching	0	0%
	Angle	6	55%
	Rear end	1	9%
	Sideswipe	1	9%
	Turning Movement	1	9%
	SMV Unattended	0	0%
	SMV Other	2	18%
	Other	0	0%
Road Surface Condition	Dry	8	73%
	Wet	2	18%
	Loose Snow	1	9%
	Slush	0	0%
	Packed Snow	0	0%
	Ice	0	0%
	Unknown	0	0%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

Figure 10: Study Area Collision Records



Table 4: Summary of Collision Locations, 2018-2022

	Number	%
Intersections / Segments	11	100%
Barnsdale Road at Borrisokane Road	5	45%
Barnsdale Road at Trail Road/William McEwen Drive	3	27%
Barnsdale Road between Viewbank Road and Greenbank Road	2	18%
Barnsdale Road between Borrisokane Road and Viewbank Road	1	9%

Within the study area, there are a total of 11 collisions during the 2018-2022 time period, with six involving property damage only and the remaining five having non-fatal injuries. The collision types are most represented by angle with six collisions, SMV other with two, rear end, sideswipe, and turning movement each with one collision. Weather conditions do not affect collisions at this location. At the intersection of Barnsdale Road at Borrisokane Road, all recorded collisions are angle collisions and are expected to be mitigated by the future intersection improvements planned as part of the Highway 416 at Barnsdale Road interchange project. No further collision review is required as part of this study.

2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

2.3.1.1 Transportation Master Plan (2025)

The recently approved Transportation Master Plan includes a Capital Infrastructure Plan identifying transportation investments to support the forecasted growth and strategic connectivity and livability targets for the City. It also identifies committed projects, and a subset of priority projects that are expected to be implemented by 2046 based on current affordability assumptions. Area projects anticipated to impact travel in the study area that are included within the Capital Infrastructure Plan are:

- Transit Network
 - Priority Network
 - Median bus rapid transit from Barrhaven Centre Station to Kilbirnie Station (Southwest Transitway)
- Road Network
 - Committed
 - Realigned Greenbank Road and Widening between Chapman Mills Drive and Cambrian Road
 - Barnsdale Road /Highway 416 interchange
 - Priority Network
 - Realigned Greenbank Road from Cambrian Road to Kilbirnie Drive, including a two-lane new road
 - Realigned Greenbank Road Extension from Kilbirnie Drive to Barnsdale Road, including a two-lane new road
 - Borrisokane Road Urbanization from Strandherd Drive to Cambrian Road, including implementation of new active transportation facilities on both sides of the road
 - Needs-Based Network
 - Barnsdale Road Widening from two to four lanes between Highway 416 and Realigned Greenbank Road Extension

2.3.1.2 *Greenbank Road Realignment and Southwest Transitway Extension*

The Realigned Greenbank Road includes the design of a new 4-lane arterial roadway with a two-lane separated median Bus Rapid Transit (BRT) and sidewalks and cycletracks on both sides of the road. The BRT will connect from Chapman Mills Drive to the new park-and-ride at Kilbirnie Drive. A park-and-ride facility is anticipated to be located at the southwest corner of the future intersection of the Kilbirnie Drive Extension and Realigned Greenbank Road, providing parking for approximately 400 vehicles at the terminus of the BRT line. Stations will be located at major intersections, including Darjeeling Avenue, Riverboat Heights, River Run Avenue, Cambrian Road, and Dundonald Drive. Local bus routes will also be able to enter and exit the Transitway corridor to service adjacent streets. The project also includes a new bridge over the Jock River. The Greenbank Road Realignment from Marketplace to Cambrian Road is identified in the 2025 TMP Priority Road Network as a committed project, expected to be implemented between 2025 and 2029, and the segments from Cambrian Road to Kilbirnie Drive and from Kilbirnie Drive to Barnsdale Road are identified as Phase 1 projects expected to be implemented between 2029 and 2037. However, the Southwest Transitway is identified in the Priority Transit Network projects as a project anticipated to be implemented by 2046 through Development Charges. The design plan of the Greenbank Road Realignment and Southwest Transitway Extension, from Marketplace Avenue to Barnsdale Road, is included in Appendix E.

2.3.2 *Highway 416 at Barnsdale Road Interchange*

The environmental assessment study and preliminary design for an interchange at the intersection of Highway 416 and Barnsdale Road were completed in September 2023. The ultimate configuration consists of a partial cloverleaf interchange on the south side of Barnsdale Road and a four-lane bridge over Highway 416 with a multi-use pathway. The interim configurations will be subject to traffic demands, and it is expected that the free flow ramps on the north side of Barnsdale Road will not be constructed as part of this configuration and are considered a long-term improvement once warranted. The ramps on the north side of Barnsdale Road will result in the discontinuation of Borrisokane Road and Trail Road. Specific intersection configurations have not been explored as part of the EA and the provision of the ultimate bridge structure may not be provided during the interim configuration. The City of Ottawa included include a preferred solution for a Kilbirnie Drive extension to protect for future demands associated with Borrisokane Road becoming a cul-de-sac in the ultimate interchange configuration. On March 28, 2024, the Government of Ontario committed to constructing the Highway 416/Barnsdale Road interchange, including funding for the interchange planning and design over three years starting in 2025. It is expected that the interim conditions of the interchange will be completed by 2029. The interim and ultimate recommended plan and the Borrisokane realignment options are included in Appendix F.

2.3.3 *Barnsdale Road Widening*

The environmental assessment (EA) study for the Barnsdale Road Widening extends from Highway 416 in the west to Prince of Wales Drive in the east and review the need for widening from 2-lanes to 4-lanes. The complete street design will outline the facilities and right of way requirements for the corridor. It is noted that the Transportation Master Plan only identifies the widening between Highway 417 and Realigned Greenbank Road to be within the 2025 TMP Needs Based Road Network.

2.3.4 *Other Study Area Developments*

Background developments have been obtained from the Barrhaven South Future Neighbourhood Phase 3 Transportation Report. The details of the developments have been included in Appendix G.

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersections of:

- Barnsdale Road at:
 - Borrisokane Road
 - Trail Road/William McEwen Drive
- Realigned Greenbank Road at (Future conditions):
 - Dundonald Drive
 - Kilbirnie Drive
 - Cappamore Drive
 - Barnsdale Road

The boundary road will be Barnsdale Road, Elevation Road, Kilbirnie Drive, and Cappamore Drive. Although screenline 49 is beyond 1km from the site and this will be analyzed as part of this 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 2031. As a result, the full build-out plus five years horizon year is 2036.

4 Development-Generated Travel Demand

4.1 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 5.

Table 5: TRANS Trip Generation Manual Recommended Mode Shares – South Nepean

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%	9%	9%	12%
Total	100%	100%	100%	100%

4.2 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 6 summarizes the person trip rates for the proposed residential land uses for each peak period.

Table 6: Trip Generation Person Trip Rates by Peak Period

Land Use	Land Use Code	Peak Period	Vehicle Trip Rate	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 7 summarizes the total person trip generation for the residential land uses.

Table 7: 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	448	275	643	918	689	422	1111
Multi-Unit Low-Rise	494	200	467	667	437	344	781

Using the above mode share targets, the person trips by mode have been projected. Trip generation by peak hour has been forecasted using the prescribed peak period conversion factors presented in the TRANS Trip Generation Manual (2020) for the residential component. Table 8 summarizes the residential trip generation by mode and peak hour.

Table 8: 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	51%	68	158	225	53%	161	98	259
	Auto Passenger	14%	19	43	62	19%	58	35	93
	Transit	25%	38	89	127	18%	58	36	94
	Cycling	1%	2	4	5	1%	3	2	5
	Walking	9%	14	34	48	10%	36	22	58
	Total	100%	141	328	467	100%	316	193	509
Multi-Unit (Low-Rise)	Auto Driver	49%	47	110	157	49%	95	74	169
	Auto Passenger	13%	13	29	42	13%	25	20	45
	Transit	26%	29	67	95	24%	49	39	88
	Cycling	2%	2	6	8	2%	4	4	8
	Walking	9%	11	25	35	12%	27	22	49
	Total	100%	102	237	337	100%	200	159	359
Total	Auto Driver	-	115	268	382	-	256	172	428
	Auto Passenger	-	32	72	104	-	83	55	138
	Transit	-	67	156	222	-	107	75	182
	Cycling	-	4	10	13	-	7	6	13
	Walking	-	25	59	83	-	63	44	107
	Total	-	243	565	804	-	516	352	868

As shown above, a total of 382 AM and 428 PM new peak hour two-way vehicle trips are projected as a result of the proposed development.

4.3 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, and these patterns were applied based on the build-out of South Nepean. Table 9 below summarizes the distributions.

Table 9: OD Survey Distribution – South Nepean

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

4.4 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. Given that the interim Barnsdale interchange is expected to be implemented by the 2031 build-out horizon and Realigned Greenbank Road is expected to be implemented by the 2036 plus five-year horizon, two proportional assignments have been developed. Table 10 summarizes the proportional assignment to the study area roadways, and Figure 11 illustrates the 2031 site generated volumes and Figure 12 illustrates the 2036 site generated volumes.

Table 10: Trip Assignment

To/From	Via 2031 Horizon	Via 2036 Horizon
North	45% Hwy 416 (N), 10% Borrisokane Rd (N), 5% Elevation Rd (N), 10% Dundonald Dr (E), 10% Kilbirnie Dr (E)	45% Hwy 416 (N), 5% Borrisokane Rd (N), 20% Re-aligned Greenbank Rd (N) 5% Dundonald Dr (E), 5% Kilbirnie Dr (E)
South	5% Hwy 416 (S)	5% Hwy 416 (S)
East	10% Cappamore (E)	10% Cappamore (E)
West	5% Hwy 416 (N)	5% Hwy 416 (N)
Total	100%	100%

Figure 11: New Site Generation Auto Volumes - 2031

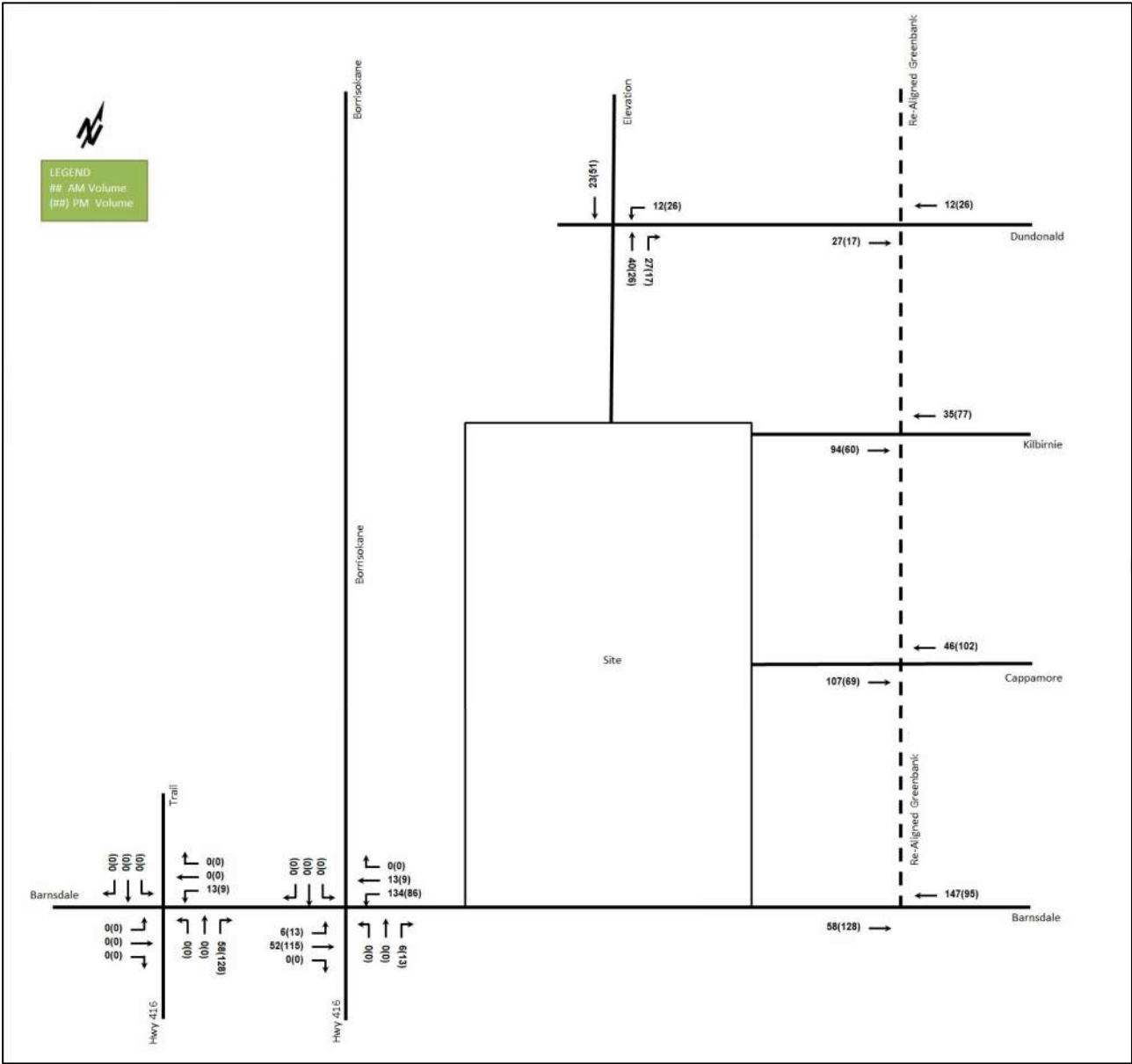
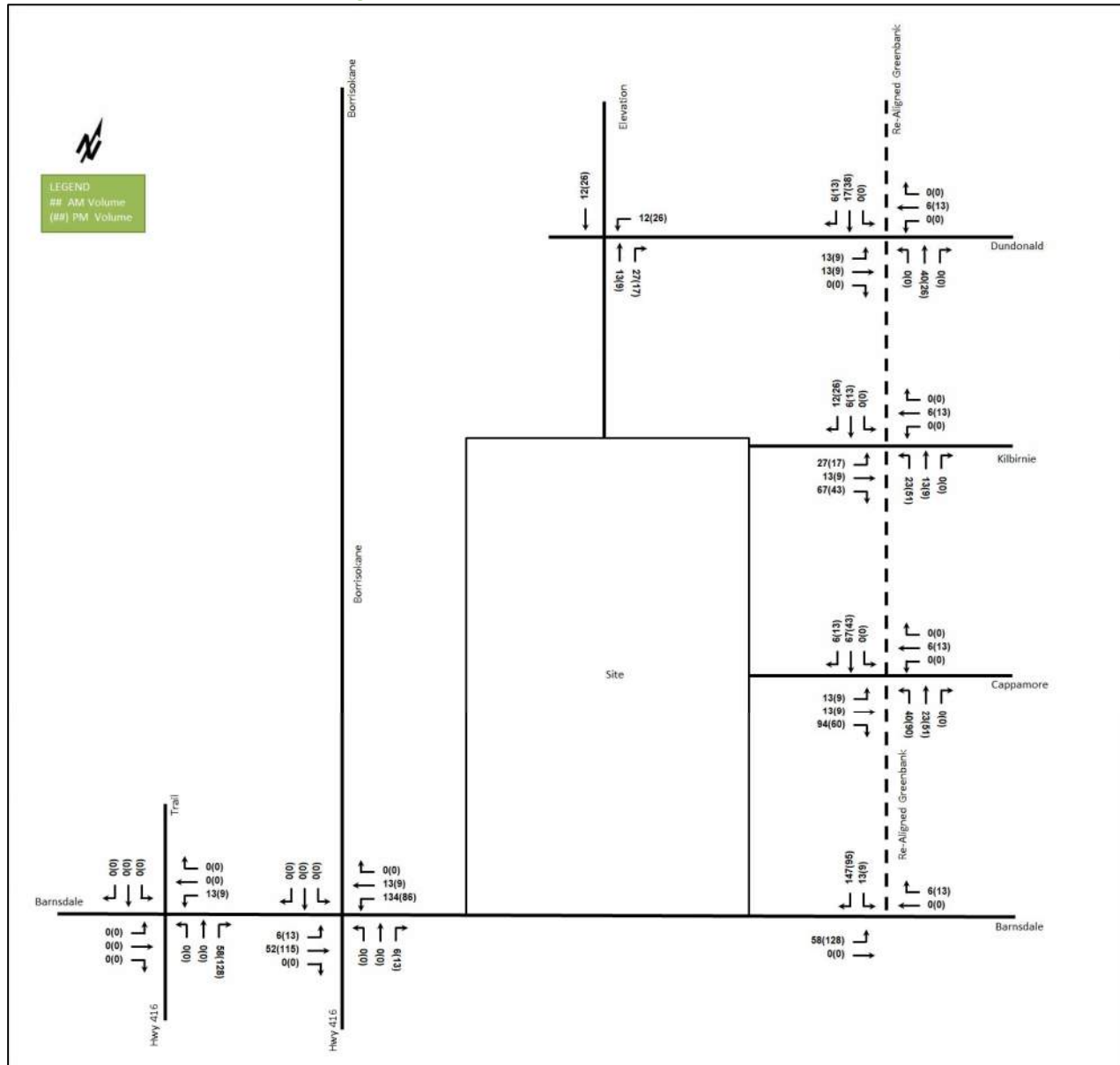


Figure 12: New Site Generation Auto Volumes - 2036



5 Exemption Review

Table 11 summarizes the exemptions for this TIA.

Table 11: Exemption Review

Module	Element	Explanation	Exempt/Required
Site Design and TDM			
Development Design	4.1.2 Circulation and Access	Only required for site plan and zoning by-law applications	Exempt
	4.1.3 New Street Networks	Only required for plans of subdivision	Required
Parking	4.2.1 Parking Supply	Only required for site plan and zoning by-law applications	Exempt

Module	Element	Explanation	Exempt/Required
Boundary Street Design		All applications	Required
Transportation Demand Management	All Elements	Only required when the development generates more than 60 person-trips	Required
Network Impact			
Background Network Travel Demand	All Elements	Only required when one or more other Network Impact Modules are triggered when the development generates more than 75 auto or transit trips	Required
Demand Rationalization		Only required when one or more other Network Impact Modules when the development generates more than 75 auto trips	Required
Neighbourhood Traffic Calming	4.6.1 Adjacent Neighbourhoods	If the development meets all of the following criteria along the route(s) site generated traffic is expected to utilize between an arterial road and the site's access: 1. Access to Collector or Local; 2. "Significant sensitive land use presence" exists, where there is at least two of the following adjacent to the subject street segment: • School (within 250m walking distance); • Park; • Retirement / Older Adult Facility (i.e. long-term care and retirement homes); • Licenced Child Care Centre; • Community Centre; or • 50%, or greater, of adjacent property along the route(s) is occupied by residential lands and a minimum of 10 occupied residential units are present on the route. 3. Application is for Zoning By-Law Amendment or Draft Plan of Subdivision; 4. At least 75 site-generated auto trips; 5. Site Trip Infiltration is expected. Site traffic will increase peak hour vehicle volumes along the route by 50% or more.	Exempt
Transit	4.7.1 Transit Route Capacity	Only required when the development generates more than 75 transit trips	Required
	4.7.2 Transit Priority Requirements	Only required when the development generates more than 75 auto trips	Required
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	Exempt
Intersection Design	4.4.1-2/4.9.1 Intersection Control	Only required when the development generates more than 75 auto trips	Required

Module	Element	Explanation	Exempt/Required
	4.4.3/4.9.2 Intersection Design	Only required when the development generates more than 75 auto trips	Required

6 Development Design

6.1 Design for Sustainable Modes

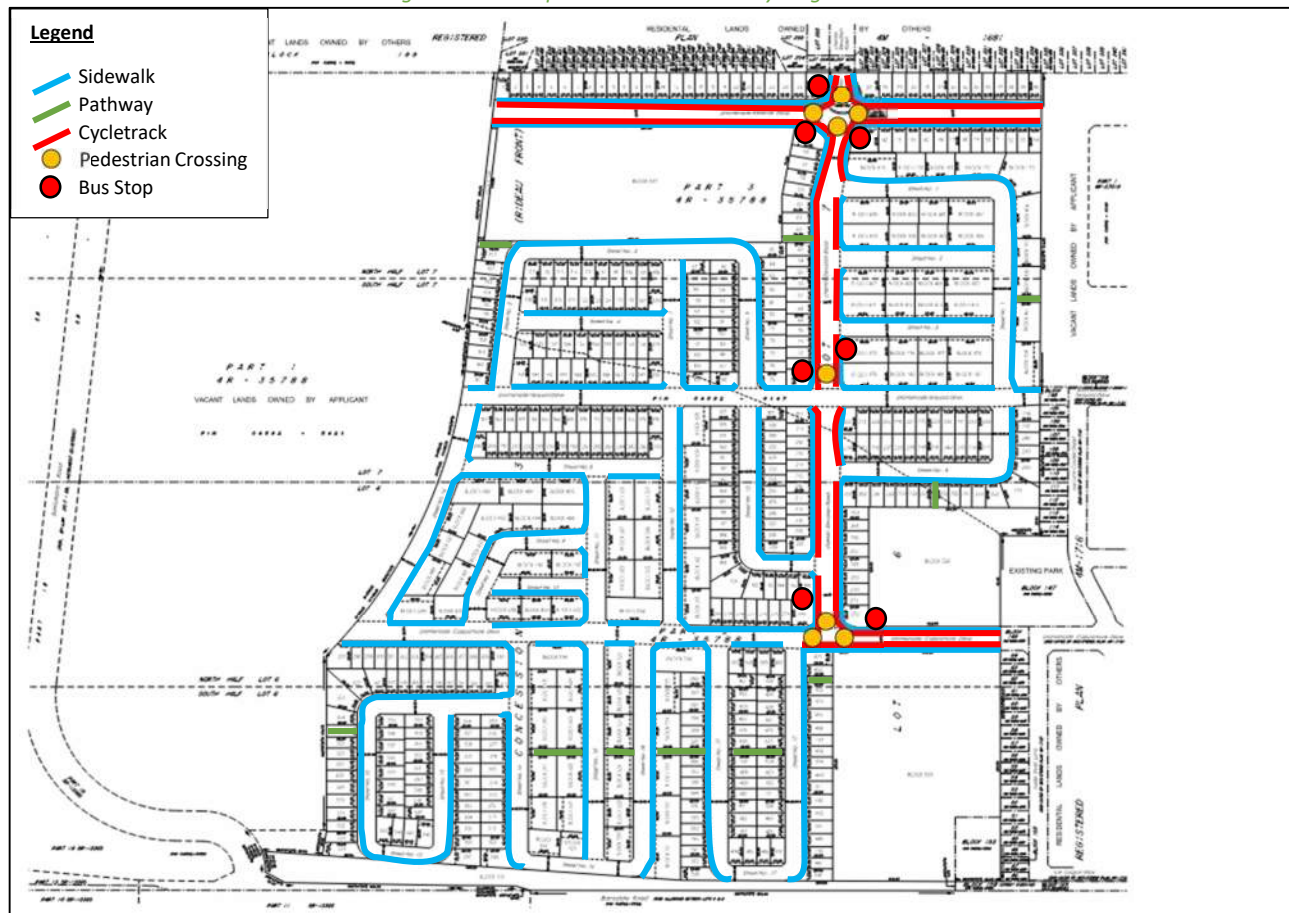
The proposed development is a residential subdivision featuring driveways for each dwelling and garage for typical townhomes. Bicycle parking is assumed to be within the individual units.

A 2.0-metre unidirectional cycletrack and a 2.0-metre sidewalk are proposed on both sides of the extensions of Elevation Road, Kilbirnie Drive, and Cappamore Drive east of Elevation Road, transitioning to a 1.8-metre sidewalk on both sides of the road west of Elevation Road. A 1.8-metre sidewalk is proposed on one side of local roads within the subdivision. Pathway connections are also proposed through walkway blocks through the subdivision. Pedestrian crossings are proposed at the intersections of Elevation Drive at Kilbirnie Drive, and at Cappamore Drive on all approaches, and on a PXO is proposed on Elevation Drive at Moyard Drive.

Bus stops are included on Elevation Road at Kilbirnie Drive, at Moyard Drive, and at Cappamore Drive.

The high-level active mode network is provided in Figure 13, illustrating the elements noted above.

Figure 13: Conceptual Pedestrian and Cycling Network



6.2 New Street Networks

The extension of Elevation Road is proposed to connect to Cappamore Drive and serves as a transit route. The extension of Elevation Road is a 24.0-metre-wide collector road with 2.0-metre sidewalks and 2.0-metre cycletracks. On-street parking is proposed on one side of the road, and the proposed speed limit will be 40 km/h.

The extension of Kilbirnie Road is a 26.0-metre-wide collector road with 2.0-metre sidewalks and 2.0-metre cycletracks. On-street parking is proposed on one side of the road, and the proposed speed limit will be 40 km/h.

The extension of Cappamore Drive is a 24.0-metre-wide collector road with 2.0-metre sidewalks and 2.0-metre cycletracks east of Elevation Road and west of Elevation Road is a 20.0-metre-wide local road with 1.8-metre sidewalks on both side of the road. On-street parking is proposed on one side of the road, and the proposed speed limit will be 40 km/h east of Elevation Road, and 30 km/h west of Elevation Road.

The new local roads, excluding Cappamore Drive west of Elevation Road, include 18.0-metre-wide roads with a 1.8-metre sidewalk on one side of the road and on-street parking along one side of the road as well as 14.75-metre-wide window streets. The proposed speed limit will be 30 km/h.

To support the pedestrian and cycling connectivity within the subdivision, traffic calming elements have been illustrated on the conceptual traffic calming plan, adhering to the philosophies of the Traffic Calming Guidelines and preliminary input from the City. The plan has not been coordinated or reconciled with the civil design, utility requirements, grading requirements or streetscaping elements such as trees. The features include bulb-outs to narrow approaches to intersections (e.g. reduced crossing distance), speed humps, midblock narrowing to reduce vehicle speeds. Traffic calming elements for connections to the existing roadways will be coordinated with the adjacent existing roadway during the detailed design phase. Potential bus stop locations have been drafted for review, following the high-level locations outlined in Section 11.

A conceptual traffic calming plan has been provided in Appendix H.

7 Boundary Street Design

Table 12 summarizes the MMLOS analysis for the boundary streets of Barnsdale Road, the extensions of Elevation Road, Kilbirnie Drive, Cappamore Drive, and the internal local roads. City of Ottawa typical cross-sections have been assumed for all future roadways. Barnsdale Road is within the “Suburban” area, and the internal local and new collector roads are within the “within 600m of a rapid transit station” area. The MMLOS worksheets has been provided in Appendix I.

Table 12: Boundary Street MMLOS Analysis

Segment	Condition	Pedestrian LOS		Bicycle LOS		Transit LOS		Public Realm LOS	
		PLOS	Target	BLOS	Target	TLOS	Target	PRLOS	Target
Barnsdale Road	Existing	F	C	E	C	-	-	E	E
	Future	C	C	C	C	-	-	C	C
Elevation Road	Future	B	A	A	B	-	-	B	B
Kilbirnie Drive	Future	B	A	A	B	C	E	B	B
Cappamore Drive	Future	B	A	A	B	C	E	B/C	C
New local road	Future	B	A	A	B	-	-	C	C

Barnsdale Road will not meet the pedestrian and bicycle LOS targets in the existing conditions due to the roadway volumes and posted speed limits. Assuming a typical arterial cross-section for the future improvements, Barnsdale Road is expected to meet the pedestrian and bicycle LOS targets in the future conditions.

Elevation Road, Kilbirnie Drive, and Cappamore Drive will not meet the pedestrian LOS targets in the future conditions. The maximum distance between controlled crossings needs to be between 231 and 260 metres.

The local roads will not meet the pedestrian LOS targets in the future conditions. While the standard local road cross-section reaching a PLOS of B, to meet a PLOS of A, 1.50-2.99-metre boulevards would be required.

8 Transportation Demand Management

8.1 Context for TDM

The mode shares used within the TIA represent the unmodified district mode shares for South Nepean. These mode shares include a maximum of 26% for transit, 2% for cycling, and 12% for walking. Considering the context of the proposed development, post-occupancy TDM measure will be recommended to support achieving the mode share targets for the proposed development.

8.2 Need and Opportunity

The subject site has been assumed to rely predominantly on auto travel, followed by transit, walking and cycling and those assumptions have been carried through the analysis. It is anticipated that future pedestrian and cycling facilities provided within the subdivision to connect to northern and eastern communities, along with transit service providing and adjacent park and ride facility, and local service through the subject site, will be the primary methods of supporting the community. Supporting TDM measures are recommended to encourage shifts toward sustainable modes and mitigate the risks associated with failing to meet mode share targets.

8.3 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 J. The key TDM measures recommended include:

- Provide a multimodal travel option information package to new residents
- Provide transit incentives for new residents
- Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels

9 Background Network Travel Demands

9.1 Transportation Network Plans

The transportation network plans were discussed in Section 2.3. At the 2031 build-out horizon, the interim Barnsdale interchange is expected to be implemented. At the 2036 plus five-year horizon, Realigned Greenbank Road is expected to be implemented. These are the road network conditions that will be considered at the study horizons.

9.2 Background Growth

Given that all background developments within Barrhaven South have been included in the Barrhaven South Future Neighbourhood Phase 3 Transportation Report and would account for the majority of growth in the area, the growths along study area roadways are assumed to be captured within the background development; therefore, no annual growth rate will be applied on study area roadways.

9.3 Other Developments

The background developments explicitly considered in the background conditions have been obtained from the Barrhaven South Future Neighbourhood Phase 3 Transportation Report. The report has been used to account for

the reassignment of background development trips resulting from the implementation of the Barnsdale interchange and Realigned Greenbank Road. In addition, changes in the travel patterns of existing traffic volumes have been taken into account in the report.

The background development volumes, and the 2031 and 2036 reassigned background volumes obtained from the Barrhaven South Future Neighbourhood Phase 3 Transportation Report have been provided in Appendix G. It should be noted that industrial components located in the western portion of Barrhaven South Future Neighbourhood Phase 3 has been included in the background development volumes for this study.

10 Demand Rationalization

10.1 Intersection Control

Signal warrant analysis of Justification 7 was performed for the study area intersections for the 2031 future background conditions. Based on the July 2024 Ontario Traffic Manual (OTM) Book 12, the intersection of Barnsdale Road at Borrisokane Road/Highway 416 falls within the Case 2 signal warrant category, indicating that traffic signal might be warranted. The signalized conditions were reviewed for the 2031 and 2036 future background horizons, and cycle lengths of 75 seconds for the AM peak hour and 90 seconds during the PM peak hour were assumed for the intersection of Barnsdale Road at Borrisokane Road/Highway 416. No additional signal warrants were met at the 2036 future background conditions and remain the same as the 2031 future background conditions. The signal warrant calculation sheets are provided in Appendix K.

All-way stop-controlled warrants analysis was performed for the study area intersections for the 2031 future background conditions. The intersection of Barnsdale Road at Trail Road/Highway 416 met the warrants in the 2031 future background conditions and was reviewed for the 2031 and 2036 future background horizons. No additional all-way stop warrants were met at the 2036 future background conditions and remain the same as the 2031 future background conditions. The all-way stop-controlled warrants are provided in Appendix L.

10.2 Intersection Design

The left turn warrant analysis was performed for the study area intersections for the 2031 future background conditions. The eastbound, westbound, and southbound lanes at the intersection of Barnsdale Road at Borrisokane Road/Highway 416 met the warrants during both peak hours. Therefore, the implementation of these lanes was reviewed for the 2031 and 2036 future background horizons, including the storage lengths calculated based on TIA guidelines and TAC. No additional left turn warrants were identified for the 2036 future background conditions. The left-turn warrant calculation sheets are provided in Appendix M.

The westbound left turn lane at the intersection of Barnsdale Road at Trail Road/Highway 416 met the warrant during both peak hours at the 2031 future background conditions. The westbound left turn lane was reviewed as part of the interim conditions for the 2031 and 2036 future background horizons and the storage lengths were assessed based on TIA guidelines and TAC. No additional left turn warrants were identified for the 2036 future background conditions. The left-turn warrant calculation sheets are provided in Appendix M.

The right turn warrant analysis was performed for the study area intersections for the 2031 future background conditions. According to TAC, a right-turn auxiliary lane is suggested at signalized locations when the volume of right-turning traffic is 10% to 20% of the total approaching volume. At the intersection of Barnsdale Road at Borrisokane Road/Highway 416, the westbound, northbound, and southbound right turn volumes exceed 20% of the total approaching volume and the eastbound right turn volume exceeds 10% of the total approaching volume.

The operational need of the right-turn lanes was reviewed as part of the analysis for the 2031 and 2036 future background horizons. No additional right-turn lanes have been noted for the 2036 future background conditions.

At the Barnsdale Road at Trail Road/Highway 416 intersection, the northbound right turn volumes exceed 20% of the total approaching volume, therefore was reviewed for the 2031 and 2036 future background horizons. No additional right-turn lanes were noted for the 2036 future background conditions.

10.3 2031 Future Background Intersection Operations

The interim conditions for the interchange at Barnsdale Road have been assumed to be completed by 2031. The warrant analysis noted above has been included in the operational review.

Figure 14 illustrates the 2031 background volumes and Table 13 summarizes the 2031 background intersection operations. The level of service for signalized intersections is based on volume to capacity ratio (v/c) calculations for individual lane movements and MMLOS Guidelines weighted v/c methodology for the overall intersection, as per direction from Transportation Engineering Services, and average delay for unsignalized intersections. The synchro worksheets for the 2031 future background horizon are provided in Appendix N.

Figure 14: 2031 Future Background Volumes

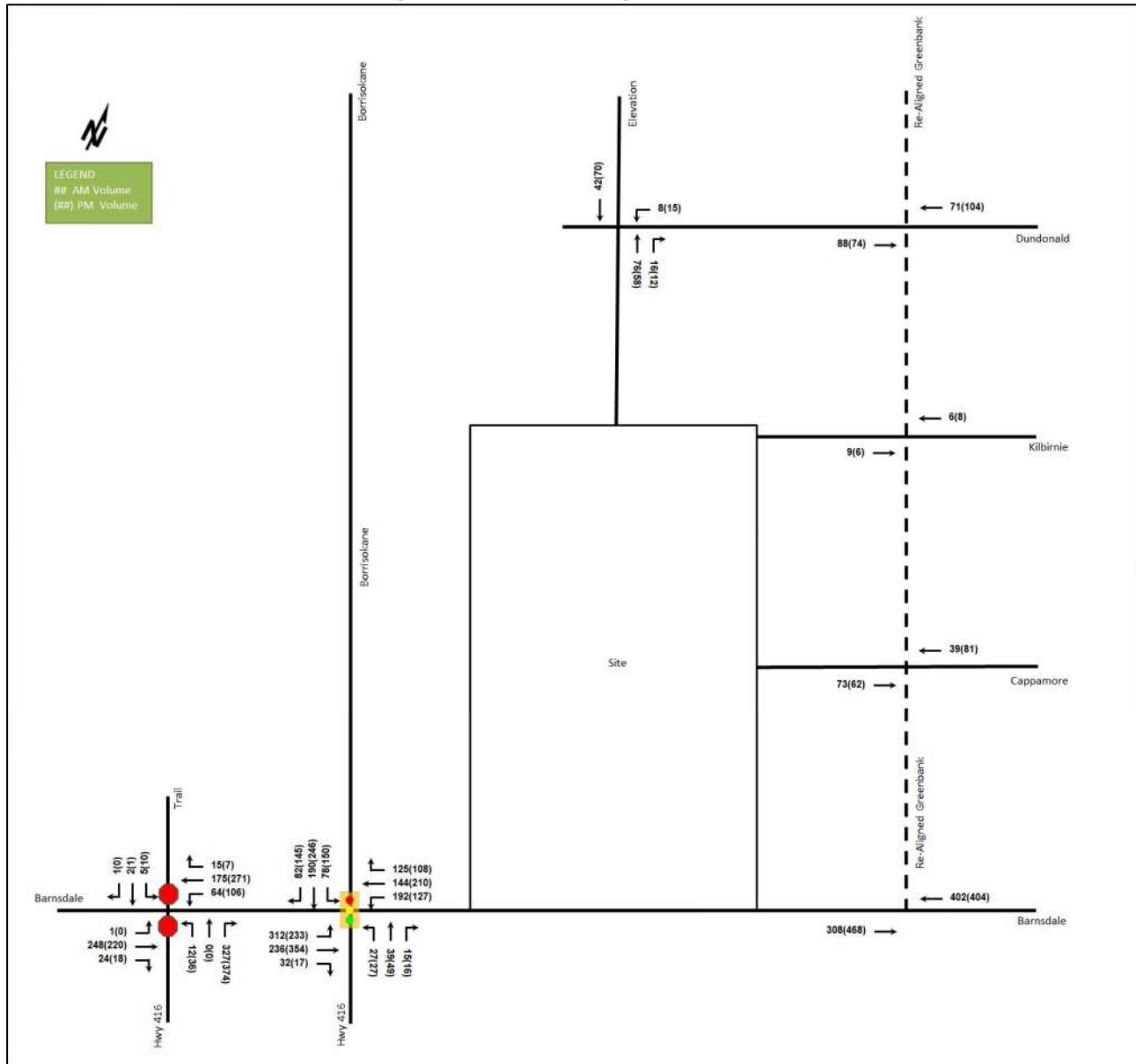


Table 13: 2031 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Barnsdale Road at Borrisokane Road/Highway 416 <i>Signalized</i>	EB	E	0.91	38.9	#160.1	E	0.99	63.6	#215.6
	WB	C	0.71	19.5	91.2	C	0.71	28.2	115.2
	NB	A	0.23	23.7	20.4	A	0.18	24.3	25.1
	SB	D	0.88	54.6	#99.1	E	0.99	74.2	#196.0
	Overall	D	0.90	35.7	-	E	0.99	55.5	-
	Mitigation Measure: with SBL								
	EB	D	0.86	29.1	#159.5	D	0.85	32.6	#208.4
	WB	B	0.67	16.4	91.7	B	0.61	19.2	111.0
	NB	A	0.31	26.2	20.6	A	0.30	28.7	26.2
	SBL	A	0.27	29.0	21.5	A	0.43	34.7	42.7
	SBT/R	C	0.75	40.8	61.8	D	0.84	49.7	104.7
	Overall	D	0.83	27.1	-	D	0.85	33.0	-
	Mitigation Measure: with EBL, WBL, and SBL								
	EBL	A	0.58	14.4	38.9	A	0.45	13.2	33.8
	EBT/R	A	0.43	18.3	45.8	A	0.51	23.9	81.3
	WBL	A	0.41	12.6	23.6	A	0.26	11.6	19.1
	WBT/R	A	0.50	18.3	43.7	A	0.53	24.5	67.3
	NB	A	0.24	17.6	15.1	A	0.29	23.3	22.1
	SBL	A	0.27	21.4	16.6	A	0.41	28.0	35.7
	SBT/R	B	0.66	26.9	45.1	D	0.83	41.9	86.8
	Overall	A	0.58	18.4	-	B	0.63	26.1	-
Barnsdale Road/ Trail Road/ Highway 416 <i>Unsignalized</i>	EB	A	0.00	7.6	0.0	A	-	0.0	0.0
	WB	A	0.06	8.6	1.5	A	0.10	8.6	2.3
	NB	C	0.50	15.6	21.0	C	0.66	21.0	36.0
	SB	D	0.05	27.6	0.8	F	0.13	53.6	3.0
	Overall	A	-	6.9	-	A	-	9.7	-
	Mitigation Measure: with WBL and NBR								
	EB	A	0.00	7.6	0.0	A	-	0.0	0.0
	WBL	A	0.06	8.6	1.5	A	0.10	8.6	2.3
	WBT/R	-	-	-	-	-	-	-	-
	NBL/T	C	0.04	16.4	0.8	C	0.14	21.6	3.8
	NBR	B	0.47	14.5	18.8	B	0.51	14.9	21.8
	SB	D	0.05	27.6	0.8	F	0.13	52.9	3.0
	Overall	A	-	6.6	-	A	-	7.5	-
	Mitigation Measure: All-way stop controlled								
	EB	B	0.42	12.4	15.0	C	0.45	15.3	17.3
	WB	B	0.45	14.4	17.3	D	0.73	25.6	44.3
	NB	C	0.57	16.7	26.3	D	0.75	26.6	48.0
	SB	B	0.02	11.2	0.8	B	0.03	12.4	0.8
	Overall	B	-	14.6	-	C	-	23.5	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Barnsdale Road/ Trail Road/ Highway 416 Unsignalized	Mitigation Measure: All-way stop controlled with WBL and NBR								
	EB	B	0.47	14.4	18.0	C	0.48	17.0	19.5
	WBL	B	0.13	11.4	3.8	B	0.23	13.0	6.8
	WBT/R	B	0.35	12.7	11.3	C	0.54	17.5	23.3
	NBL/T	B	0.03	10.7	0.8	B	0.08	11.7	2.3
	NBR	C	0.59	17.9	28.5	C	0.71	24.9	42.8
	SB	B	0.02	11.9	0.8	B	0.03	12.9	0.8
	Overall	B	-	15.0	-	C	-	19.3	-

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00

m = metered queue
= queue exceeds storage or mid-block length

At the 2031 future background conditions, the new signalized interchange intersection at Barnsdale Road at Borrisokane Road/Highway 416 is expected to have queueing concerns during both peak hours. The inclusion of the 40-metre auxiliary southbound left-turn lane will alleviate the capacity constraints, although queueing concerns may remain on the eastbound approach. Given that the intersection is intended to be operational as constructed for the foreseeable future, it is recommended the warranted eastbound and westbound left-turn lanes also be implemented as part of the initial construction. Therefore, a 75-metre auxiliary eastbound left-turn lane and a 45-metre auxiliary westbound left-turn lane are recommended for inclusion. The addition of a southbound right turn-lane is not required operationally, although it should be considered as part of the design/construction of the initial intersection. At this horizon, a 15-metre auxiliary southbound right-turn lane is recommended.

While the intersection of Barnsdale Road at Trail Road/Highway 416 is expected to operate acceptably with shared all movement approaches and as a two-way stop-control, the turn lane warrants have been met, and it is recommended to be implement as part of the initial construction of the interchange. Therefore, a 25-metre auxiliary westbound left-turn lane and a 45-metre auxiliary northbound right-turn lane are recommended. The implementation would limit additional improvements being required in the future. The all-way stop-control is not required operationally and can be implemented as required for operations.

10.4 2036 Future Background Intersection Operations

Similar to the 2031 future background conditions, the interim Barnsdale Road interchange has been assumed to be completed. Additionally, Realigned Greenbank Road is assumed to be completed for the 2036 horizon and has been incorporated into the analysis. As Realigned Greenbank Road will change the travel patterns in the area, the mitigation measures recommended at the 2031 future background conditions have been reassessed to determine whether they are still required. The warrant analysis noted in Sections 10.1 and 10.2 has been included in the operational review.

Figure 15 illustrates the 2036 background volumes and Table 14 summarizes the 2036 background intersection operations. The level of service for signalized intersections is based on volume to capacity ratio (v/c) calculations for individual lane movements and MMLOS Guidelines weighted v/c methodology for the overall intersection, as per direction from Transportation Engineering Services, and average delay for unsignalized intersections. The synchro worksheets for the 2036 future background horizon are provided in Appendix O.

Figure 15: 2036 Future Background Volumes

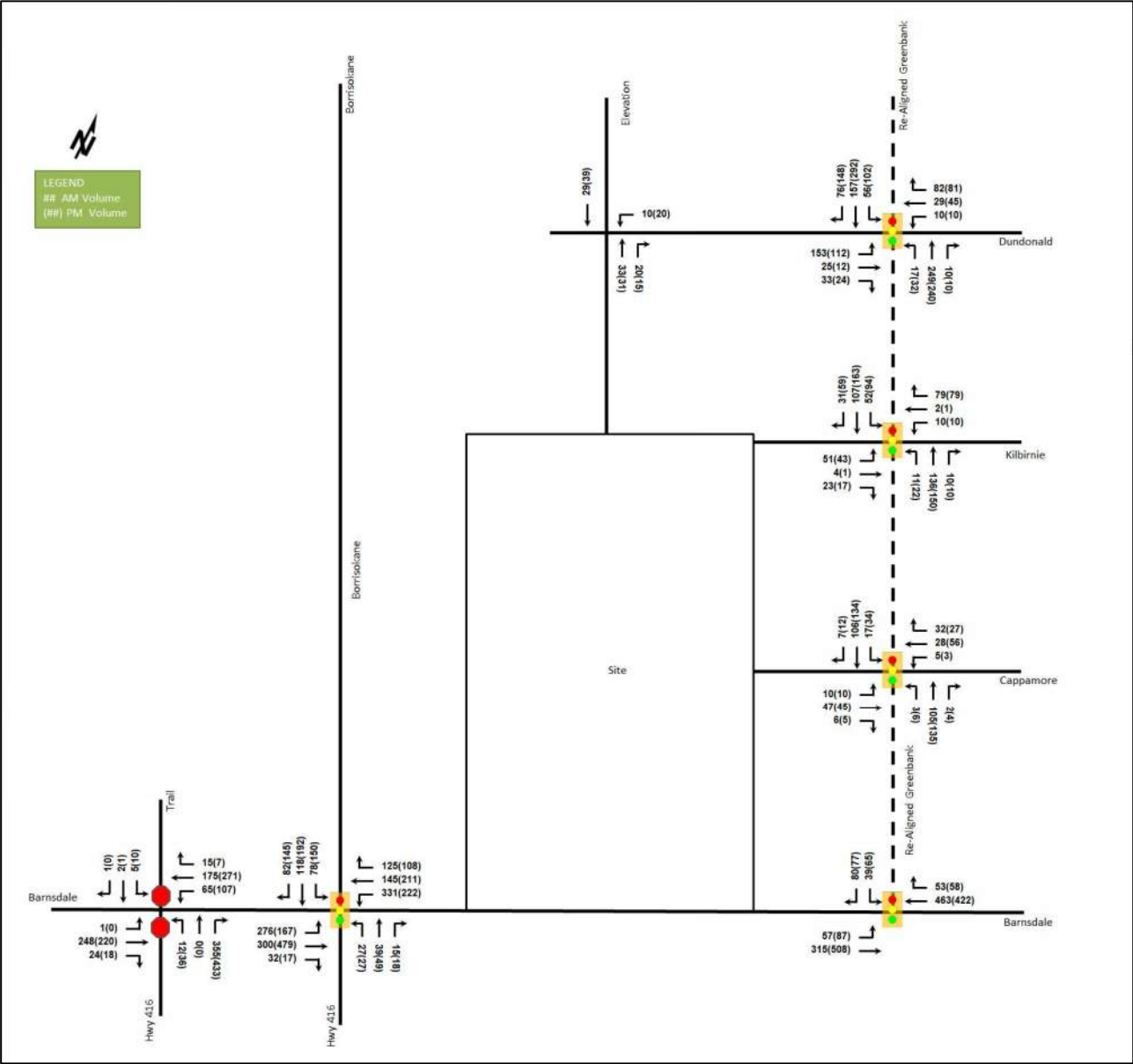


Table 14: 2036 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Barnsdale Road at Borrisokane Road/Highway 416 <i>Signalized</i>	EB	D	0.89	31.8	#161.2	E	0.92	44.6	#219.3
	WB	E	0.97	47.3	#168.2	E	0.99	63.9	#197.0
	NB	A	0.29	28.8	22.5	A	0.21	26.8	26.9
	SB	D	0.88	61.2	#85.0	E	1.00	78.8	#180.2
	Overall	E	0.94	42.8	-	E	1.00	58.8	-
	Mitigation Measure: SBL								
	EB	D	0.85	25.4	#161.7	D	0.81	26.0	#210.1
	WB	E	0.92	35.6	#168.1	D	0.85	31.9	#185.8
	NB	A	0.38	32.0	22.7	A	0.35	32.3	28.1
	SBL	A	0.34	35.3	23.5	A	0.50	40.0	45.5
	SBT/R	B	0.68	40.0	46.5	D	0.82	50.8	91.3
	Overall	D	0.86	32.0	-	D	0.84	34.0	-
	Mitigation Measure: with EBL, WBL, and SBL								
	EBL	A	0.47	10.5	29.7	A	0.32	11.5	24.5
	EBT/R	A	0.54	22.5	63.9	B	0.65	23.7	106.3
	WBL	A	0.57	11.1	36.2	A	0.59	18.7	32.2
	WBT/R	A	0.41	14.2	39.7	A	0.42	17.0	58.1
	NB	A	0.29	22.7	17.7	A	0.31	23.7	22.0
	SBL	A	0.34	28.0	19.4	A	0.45	30.2	35.6
	SBT/R	A	0.59	26.9	36.1	C	0.79	38.7	70.7
	Overall	A	0.56	17.4	-	B	0.68	24.1	-
Barnsdale Road at Trail Road/ Highway 416 <i>Unsignalized</i>	EB	A	0.00	7.6	0.0	A	-	0.0	0.0
	WB	A	0.06	8.6	1.5	A	0.10	8.7	2.3
	NB	C	0.54	16.4	24.8	C	0.74	24.8	48.0
	SB	D	0.05	30.0	1.5	F	0.16	69.0	3.8
	Overall	A	-	7.6	-	B	-	12.1	-
	Mitigation Measure: with WBL and NBR								
	EB	A	0.00	7.6	0.0	A	-	0.0	0.0
	WBL	A	0.06	8.6	1.5	A	0.10	8.7	2.3
	WBT/R	-	-	-	-	-	-	-	-
	NBL/T	C	0.04	16.4	0.8	C	0.14	21.7	3.8
	NBR	C	0.51	15.2	21.8	C	0.59	16.7	29.3
	SB	D	0.05	30.0	1.5	F	0.16	67.9	3.8
	Overall	A	-	7.1	-	A	-	8.8	-
	Mitigation Measure: All-way stop controlled								
	EB	B	0.42	12.7	15.8	C	0.47	16.5	18.8
	WB	B	0.46	14.8	18.0	D	0.76	29.5	49.5
	NB	C	0.61	18.4	31.5	E	0.86	40.6	73.5
	SB	B	0.02	11.3	0.8	B	0.03	12.8	0.8
	Overall	C	-	15.6	-	D	-	31.2	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Barnsdale Road at Trail Road/ Highway 416 <i>Unsignalized</i>	Mitigation Measure: All-way stop controlled with WBL and NBR								
	EB	B	0.47	14.8	18.8	C	0.50	18.0	20.3
	WBL	B	0.14	11.6	3.8	B	0.24	13.5	6.8
	WBT/R	B	0.35	13.0	12.0	C	0.56	18.7	24.8
	NBL/T	B	0.03	10.8	0.8	B	0.08	11.8	2.3
	NBR	C	0.64	20.0	33.8	E	0.83	35.2	62.3
	SB	B	0.02	12.1	0.8	B	0.03	13.2	0.8
	Overall	C	-	16.1	-	C	-	24.3	-
Dundonald Drive at Realigned Greenbank Road <i>Signalized</i>	EBL	B	0.64	50.5	41.7	A	0.54	48.3	31.3
	EBT/R	A	0.17	17.1	12.2	A	0.12	16.6	8.4
	WBL	A	0.04	29.4	5.1	A	0.04	31.2	5.1
	WBT/R	A	0.30	12.6	15.8	A	0.37	16.8	19.2
	NBL	A	0.02	13.2	8.5	A	0.05	7.8	8.3
	NBT/R	A	0.12	10.4	33.7	A	0.11	6.5	20.0
	SBL	A	0.08	9.6	12.7	A	0.14	8.9	21.3
	SBT/R	A	0.11	5.9	15.0	A	0.20	6.3	30.0
	Overall	A	0.31	17.0	-	A	0.27	12.6	-
Kilbirnie Drive at Realigned Greenbank Road <i>Signalized</i>	EBL	A	0.25	51.2	11.3	A	0.21	51.0	10.1
	EBT/R	A	0.07	9.5	4.6	A	0.05	9.2	3.6
	WBL	A	0.05	34.1	4.9	A	0.05	34.0	4.9
	WBT/R	A	0.29	9.9	9.8	A	0.28	9.7	9.7
	NBL	A	0.01	9.3	3.2	A	0.03	11.2	5.0
	NBT	A	0.06	7.0	10.3	A	0.07	8.7	10.6
	NBR	A	0.01	0.1	0.0	A	0.01	0.0	0.0
	SBL	A	0.07	15.9	19.0	A	0.12	10.0	14.0
	SBT	A	0.05	13.6	16.3	A	0.07	8.8	11.0
	SBR	A	0.03	2.3	0.0	A	0.06	0.2	0.0
	Overall	A	0.22	14.4	-	A	0.19	11.4	-
Cappamore Drive at Realigned Greenbank Road <i>Signalized</i>	EBL	A	0.07	40.0	6.1	A	0.07	39.8	6.1
	EBT/R	A	0.25	40.7	18.2	A	0.23	40.5	17.5
	WBL	A	0.03	39.0	3.9	A	0.02	37.7	2.8
	WBT/R	A	0.28	25.8	15.4	A	0.37	33.9	22.3
	NBL	A	0.00	2.3	m0.6	A	0.01	2.7	1.7
	NBT/R	A	0.04	1.7	5.6	A	0.05	2.0	9.1
	SBL	A	0.02	3.4	1.9	A	0.04	2.1	1.9
	SBT/R	A	0.04	2.7	3.6	A	0.06	1.5	2.5
	Overall	A	0.12	13.2	-	A	0.17	12.6	-
Barnsdale Road at Realigned Greenbank Road <i>Signalized</i>	EBL	A	0.33	28.1	16.3	A	0.35	24.8	20.4
	EBT	A	0.51	29.3	62.3	C	0.74	34.2	99.7
	WBT	C	0.74	37.7	98.4	B	0.61	29.4	78.5
	WBR	A	0.09	5.1	6.4	A	0.09	4.1	6.0
	SBL	A	0.05	17.3	11.4	A	0.08	10.9	6.7
	SBR	A	0.10	8.4	8.5	A	0.10	2.3	0.2
	Overall	B	0.65	29.7	-	B	0.66	27.2	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00

Delay = average vehicle delay in seconds
m = metered queue
= volume for the 95th %ile cycle exceeds capacity

The signalized interchange intersection at Barnsdale Road at Borrisokane Road/Highway 416 is expected to have queueing concerns during both peaks. The inclusion of the 40-metre auxiliary southbound left-turn lane will alleviate the capacity constraints, although queueing concerns may remain on the eastbound and westbound approaches during both peak hours. Given that the intersection is intended to be operational as constructed for the foreseeable future, it is recommended the warranted eastbound and westbound left-turn lanes also be implemented as part of the initial construction. Therefore, a 65-metre auxiliary eastbound left-turn lane and an 80-metre auxiliary westbound left-turn lane are recommended for the inclusion. The addition of a southbound right turn-lane is not required operationally, although it should be considered as part of the design/construction of the initial intersection. This was identified as a 2031 future background condition. At this horizon, a 15-metre auxiliary southbound right-turn lane is recommended.

For the Barnsdale Road at Trail Road/Highway 416, the southbound approach is expected to have high delays due to the two-way stop control. The implementation of the all-way stop-control would address the operational constraints for the southbound approach. The auxiliary turn lanes remain the same as identified in the 2031 future background conditions. At this horizon, a 25-metre auxiliary westbound left-turn lane and a 65-metre auxiliary northbound right-turn lane are recommended.

The remaining intersections are expected to operate acceptably in the 2036 future background conditions.

11 Transit

11.1 Route Capacity

In Section 4.2 the trip generation by mode was estimated, including an estimate of the number of transit trips that will be generated by the proposed development. Table 15 summarizes the transit trip generation.

Table 15: Trip Generation by Transit Mode

Travel Mode	Mode Share	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Transit	Varies	67	156	222	107	75	182

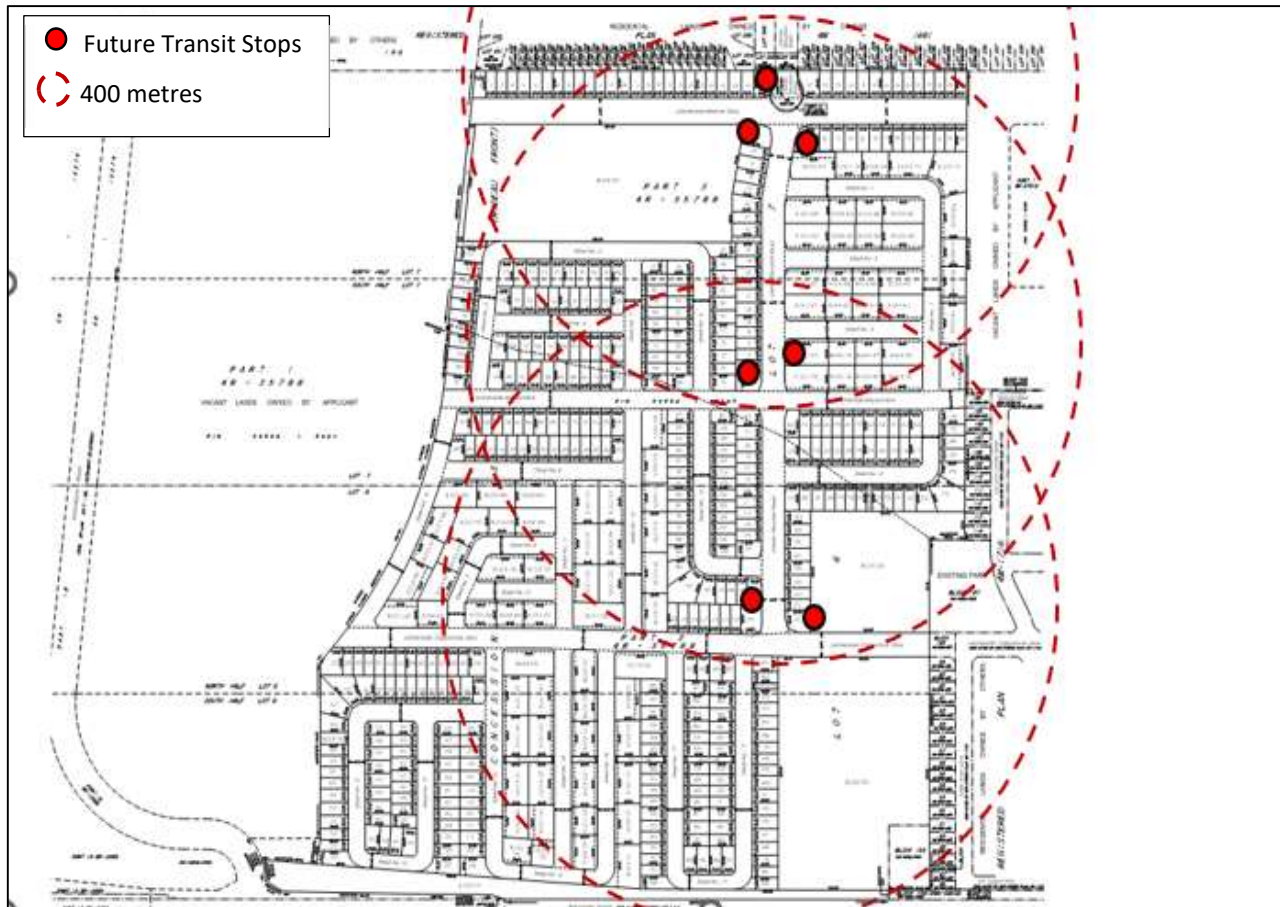
The proposed development is anticipated to generate an additional 222 AM peak hour transit trips and 182 PM peak hour transit trips. From the trip distribution found in Section 4.3, these values can be further broken down. A standard bus capacity of 45 passengers was assumed. Table 16 summarizes forecasted site-generated transit ridership trips by direction and the equivalent bus loads.

Table 16: Forecasted Site-Generated Transit Ridership

Direction	AM Peak Hour		PM Peak Hour		Service Type	Approximate Equivalent Peak Hour/Direction Bus Loads
	In	Out	In	Out		
North	60	140	96	68	Bus	Three standard buses
East	7	16	11	8	Bus	One-third of a standard bus

In total, a 15-20-minute AM peak hour service level is estimated to be required for the proposed subdivision to meet the transit demand, and a 30-minute PM peak hour service level. Ultimately these routes are expected to form local service extending from the future BRT along Re-Aligned Greenbank Road, the Kilbirnie park and ride. In the near term, the local service would have connectivity to the existing BRT stations at Barrhaven Towncentre and Marketplace. The current route in Barrhaven South is not expected to provide the service required for the subdivision or the ongoing developments to the west of the Re-Aligned Greenbank Road corridor. A new dedicated route with peak hour service of 15–20-minute would meet the forecasted transit demand for the community. The future transit stops are proposed within the subdivision, as illustrated in Figure 16.

Figure 16: Conceptual Subdivision Transit Stop Locations



11.2 Transit Priority

No transit priority is required along the boundary or within the subdivision. Ultimately, the median BRT along the Realigned Greenbank Road corridor and park and ride facility at Kilbirnie Drive will reduce traffic demands and increase the sustainable travel mode targets for the City.

12 Intersection Design

12.1 Intersection Control

Signal warrant analysis of Justification 7 was performed for the study area intersections for the 2031 and 2036 future total conditions. No additional signal warrants were met and remain the same as the corresponding future background conditions. The signal warrant calculation sheets are provided in Appendix K.

All-way stop-controlled warrants analysis was performed for the study area intersections for the 2031 and 2036 future total conditions. No additional all-way stop warrants were met and remain the same as the corresponding future background conditions. The all-way stop-controlled warrants are provided in Appendix L.

12.2 Intersection Design

The left turn warrant analysis was performed for the study area intersections for the 2031 and 2036 future total conditions. No additional left turn warrants were identified and remain the same as the corresponding future

background conditions. The storage lengths were adjusted for the 2031 and 2036 future total volumes, based on TIA guidelines and TAC. The left turn warrants are provided in Appendix M.

The right turn warrant analysis was performed for the study area intersections for the 2031 and 2036 future total conditions. No additional right-turn lanes were noted and remain the same as the corresponding future background conditions.

12.3 2031 Future Total Intersection Operations

As noted in the 2031 future background conditions, the interim conditions for the interchange at Barnsdale Road have been assumed to be completed by 2031. The warrant analysis noted in Sections 10.1 and 10.2 has been included in the operational review.

The 2031 future total intersection volumes are illustrated in Figure 17 and the intersection operations are summarized below in Table 17. The level of service for signalized intersections is based on volume to capacity ratio (v/c) calculations for individual lane movements and MMLOS Guidelines weighted v/c methodology for the overall intersection, as per direction from Transportation Engineering Services, and average delay for unsignalized intersections. The synchro worksheets have been provided in Appendix P.

Figure 17: 2031 Future Total Volumes

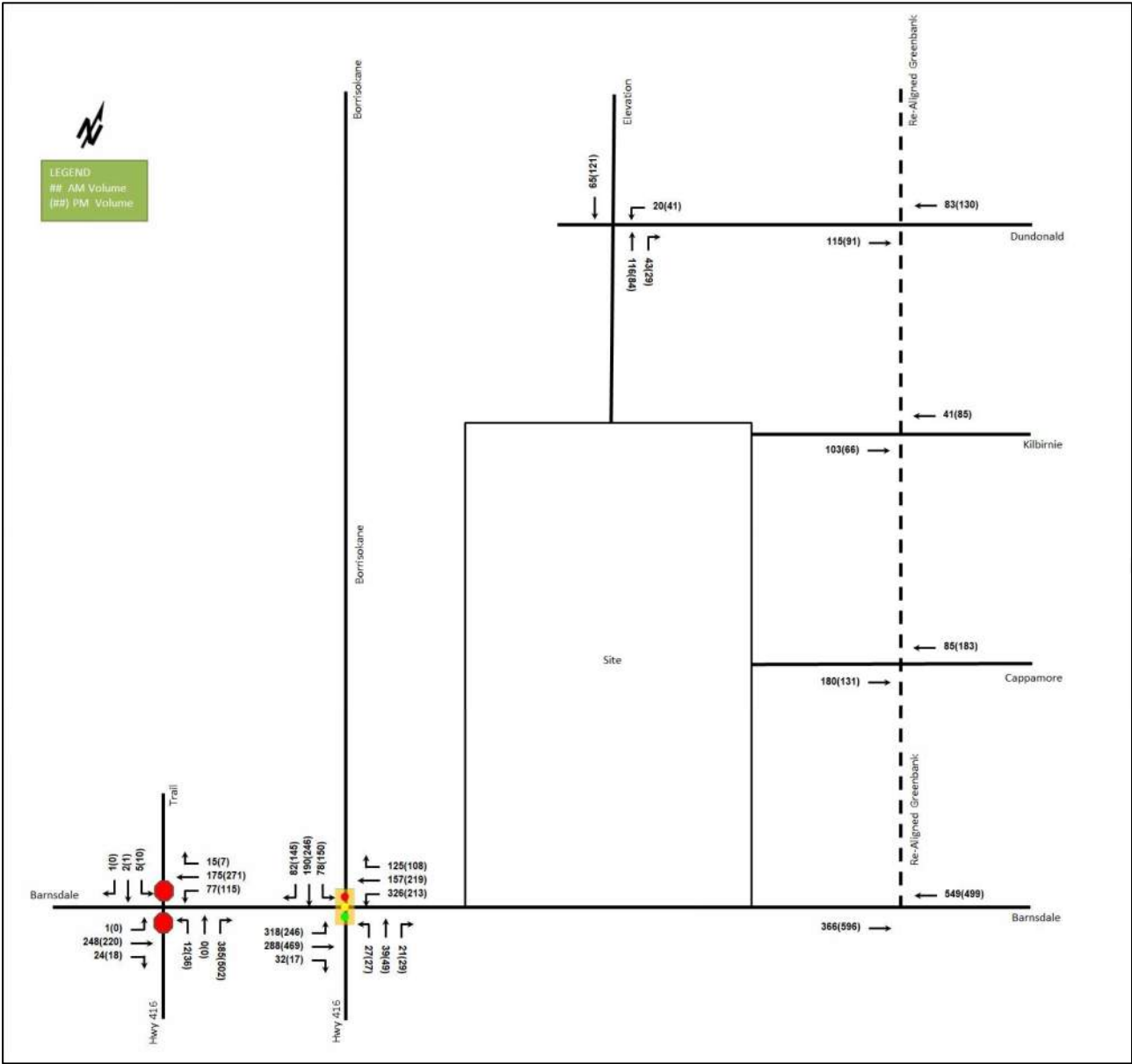


Table 17: 2031 Future Total Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Barnsdale Road at Borrisokane Road/Highway 416 <i>Signalized</i>	EB	E	0.96	47.7	#220.0	F	1.07	84.2	#282.4
	WB	E	0.98	52.2	#213.0	E	0.95	53.9	#203.0
	NB	A	0.29	35.8	29.4	A	0.24	29.2	31.6
	SB	E	0.97	86.4	#139.3	F	1.14	123.8	#227.5
	Overall	E	0.98	56.8	-	F	1.10	83.8	-
	Mitigation Measure: with SBL								
	EB	E	0.97	45.1	#179.4	E	0.98	48.0	#197.2
	WB	E	0.98	48.5	#172.9	D	0.87	30.2	#141.0
	NB	A	0.38	30.2	23.7	A	0.50	33.4	29.1
	SBL	A	0.30	32.9	23.4	A	0.51	37.3	41.3
	SBT/R	C	0.80	49.7	#73.5	E	0.98	75.4	#119.5
	Overall	E	0.93	45.7	-	E	0.98	46.9	-
	Mitigation Measure: with EBL, WBL, and SBL								
	EBL	A	0.54	12.5	36.9	A	0.47	12.7	32.7
	EBT/R	A	0.57	25.4	64.8	C	0.71	29.7	107.9
	WBL	A	0.59	12.9	38.0	A	0.54	15.2	28.3
	WBT/R	A	0.49	19.1	47.7	A	0.51	22.9	65.4
	NB	A	0.29	20.6	18.0	A	0.35	24.3	25.1
	SBL	A	0.29	25.7	19.3	A	0.44	31.0	37.9
	SBT/R	C	0.71	33.6	53.2	D	0.87	48.5	#102.5
	Overall	B	0.62	20.6	-	C	0.73	28.4	-
	Mitigation Measure: with EBL, WBL, and SBL and SBR								
	EBL	A	0.49	8.9	30.4	A	0.40	8.9	31.0
	EBT/R	A	0.47	19.7	66.3	A	0.59	22.2	97.0
	WBL	A	0.53	10.4	36.1	A	0.43	9.8	24.0
	WBT/R	A	0.41	16.4	46.7	A	0.41	17.3	60.3
	NB	A	0.32	23.3	18.5	A	0.43	30.4	26.8
	SBL	A	0.30	28.4	19.4	B	0.63	44.8	41.4
	SBT	A	0.60	35.6	40.6	C	0.74	48.0	62.2
	SBR	A	0.21	1.7	1.5	A	0.39	10.7	16.9
	Overall	A	0.52	16.8	-	A	0.59	22.9	-
Barnsdale Road/ Trail Road/ Highway 416 <i>Unsignalized</i>	EB	A	0.00	7.6	0.0	A	-	0.0	0.0
	WB	A	0.07	8.7	1.5	A	0.11	8.7	3.0
	NB	C	0.59	17.6	28.5	D	0.84	32.5	67.5
	SB	D	0.06	34.5	1.5	F	0.23	101.0	6.0
	Overall	A	-	8.4	-	B	-	16.6	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Barnsdale Road/ Trail Road/ Highway 416 <i>Unsignalized</i>	Mitigation Measure: with WBL and NBR								
	EB	A	0.00	7.6	0.0	A	-	0.0	0.0
	WBL	A	0.07	8.7	1.5	A	0.11	8.7	3.0
	WBT/R	-	-	-	-	-	-	-	-
	NBL/T	C	0.04	17.0	0.8	C	0.15	22.3	3.8
	NBR	C	0.55	16.1	25.5	C	0.69	19.9	41.3
	SB	D	0.06	34.0	1.5	F	0.23	101.0	6.0
	Overall	A	-	7.8	-	B	-	10.9	-
	Mitigation Measure: All-way stop controlled								
	EB	B	0.44	13.2	16.5	C	0.50	17.6	19.5
	WB	C	0.49	15.8	20.3	D	0.81	34.1	55.5
	NB	C	0.67	20.9	38.3	F	1.00	69.9	111.0
	SB	B	0.02	11.5	0.8	B	0.03	13.2	0.8
	Overall	C	-	17.2	-	E	-	46.9	-
	Mitigation Measure: All-way stop controlled with WBL and NBR								
	EB	C	0.49	15.3	19.5	C	0.53	19.6	22.5
	WBL	B	0.17	12.1	4.5	B	0.27	14.5	8.3
	WBT/R	B	0.36	13.4	12.0	C	0.59	20.8	27.8
	NBL/T	B	0.03	10.8	0.8	B	0.08	11.9	2.3
	NBR	C	0.70	23.1	41.3	F	0.97	63.8	100.5
	SB	B	0.02	12.2	0.8	B	0.03	13.7	0.8
	Overall	C	-	17.7	-	E	-	37.9	-
	Mitigation Measure: Signalized with WBL and NBR								
	EB	A	0.32	7.7	37.4	A	0.27	8.5	41.8
	WBL	A	0.17	3.5	4.6	A	0.23	7.9	15.1
	WBT/R	A	0.22	3.0	8.5	A	0.30	7.0	29.9
	NBL/T	A	0.09	23.8	4.7	A	0.25	31.9	10.4
	NBR	C	0.75	12.8	21.4	D	0.82	14.6	25.9
	SB	A	0.05	21.4	3.5	A	0.08	26.0	4.6
	Overall	A	0.57	8.8	-	B	0.63	11.6	-

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00

m = metered queue
= queue exceeds storage or mid-block length

The new signalized interchange intersection at Barnsdale Road at Borrisokane Road/Highway 416 is expected to have queueing concerns during both peak hours and the eastbound and southbound approaches are expected to be over capacity during the PM peak. The inclusion of the 40-metre auxiliary southbound left-turn lane will alleviate the capacity constraints, although queueing concerns may remain on the eastbound, westbound, and southbound approaches. Given the intersection is intended to be operational as constructed for the foreseeable future, it is recommended the warranted eastbound and westbound left-turn lanes also be implemented as part of the initial construction. Therefore, a 75-metre auxiliary eastbound left-turn lane and an 80-metre auxiliary westbound left-turn lane are recommended for inclusion. The addition of a southbound right turn-lane should be considered as part of the design/construction of the initial intersection. This was identified as a 2031 future background condition. At this horizon, a 20-metre auxiliary southbound right-turn lane is recommended.

For the Barnsdale Road at Trail Road/Highway 416, the southbound approach is expected to have high delays due to the two-way stop control. Given the low volumes along Trail Road, it is recommended that the warranted auxiliary lanes be provided and the southbound approach remain with the high delay. Therefore, a 30-metre auxiliary westbound left-turn lane and a 30-metre auxiliary northbound right-turn lane are recommended. Should

the southbound delay need to be addressed, the resulting mitigation would require signalization of the intersection to ensure the northbound approach maintain acceptable operations. The turn lanes and all-way stop-control mitigation measures were identified as a 2031 future background condition and the signalization noted in the 2031 future total conditions. If the signalization is considered, it should be implemented during the initial construction of the interchange.

12.3.1 2036 Future Total Intersection Operations

As noted in the 2036 future background conditions, the interim Barnsdale Road interchange has been assumed to be completed. Additionally, Realigned Greenbank Road is assumed to be completed for the 2036 horizon and will be considered in the analysis. The warrant analysis noted in Sections 10.1 and 10.2 has been included in the operational review.

The 2036 future total intersection volumes are illustrated in Figure 18 and the intersection operations are summarized below in Table 18. The level of service for signalized intersections is based on volume to capacity ratio (v/c) calculations for individual lane movements and MMLOS Guidelines weighted v/c methodology for the overall intersection, as per direction from Transportation Engineering Services, and average delay for unsignalized intersections. The synchro worksheets have been provided in Appendix Q.

Figure 18: 2036 Future Total Volumes

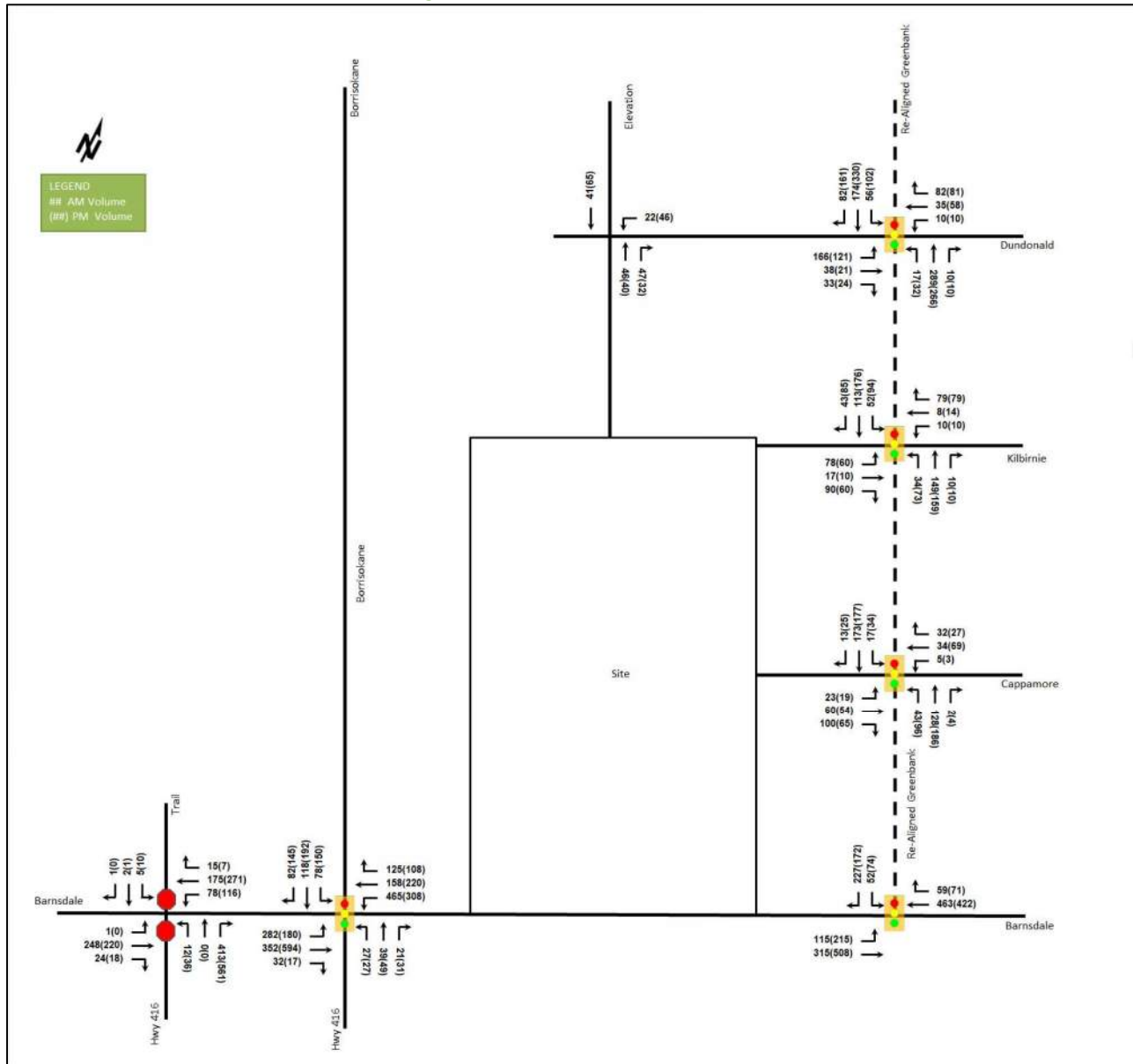


Table 18: 2036 Future Total Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Barnsdale Road at Borrisokane Road/Highway 416 <i>Signalized</i>	EB	E	0.99	52.9	#240.6	E	0.99	53.6	#283.1
	WB	F	1.31	173.2	#177.9	F	1.22	140.6	#271.0
	NB	A	0.29	33.6	27.9	A	0.29	33.9	34.5
	SB	D	0.84	62.7	87.5	F	1.22	157.9	#216.6
	Overall	F	1.18	104.1	-	F	1.22	105.1	-
	Mitigation Measure: with EBL, WBL, and SBL								
	EBL	A	0.46	10.0	30.9	A	0.32	9.2	19.7
	EBT/R	A	0.60	27.2	89.3	D	0.83	35.2	#155.0
	WBL	C	0.76	16.1	57.3	C	0.79	27.1	#58.2
	WBT/R	A	0.38	15.2	48.9	A	0.41	15.4	51.6
	NB	A	0.36	29.6	23.0	A	0.49	33.0	29.2
	SBL	A	0.33	33.7	23.3	A	0.56	40.2	42.0
	SBT/R	B	0.65	36.4	45.9	E	0.91	60.7	#98.2
	Overall	B	0.68	21.1	-	D	0.84	32.9	-
	Mitigation Measure: with EBL, WBL, and SBL and SBR								
	EBL	A	0.44	7.6	22.8	A	0.30	7.0	m16.4
	EBT/R	A	0.52	18.9	92.5	C	0.78	31.2	#161.6
	WBL	B	0.68	10.8	47.4	B	0.69	16.7	43.3
	WBT/R	A	0.32	12.1	44.6	A	0.38	13.9	51.9
	NB	A	0.42	35.2	24.2	A	0.42	30.8	27.0
	SBL	A	0.43	42.9	24.9	B	0.70	51.9	42.1
	SBT	A	0.50	43.5	34.0	B	0.64	44.1	49.5
	SBR	A	0.22	1.4	0.0	A	0.35	3.7	4.9
	Overall	A	0.59	16.6	-	C	0.74	24.8	-
Barnsdale Road at Trail Road/ Highway 416 <i>Unsignalized</i>	EB	A	0.00	7.6	0.0	A	-	0.0	0.0
	WB	A	0.07	8.7	1.5	A	0.11	8.7	3.0
	NB	C	0.63	18.8	33.0	E	0.92	42.9	89.3
	SB	E	0.07	38.0	1.5	F	0.32	155.1	8.3
	Overall	A	-	9.2	-	F	-	22.9	-
	Mitigation Measure: All-way stop controlled								
	EB	B	0.45	13.5	17.3	C	0.51	18.1	19.5
	WB	C	0.50	16.3	20.3	D	0.83	35.0	55.5
	NB	C	0.72	23.7	45.0	F	1.11	101.6	145.5
	SB	B	0.02	11.6	0.8	B	0.03	13.4	0.8
	Overall	C	-	18.7	-	F	-	63.6	-
	Mitigation Measure: All-way stop controlled with WBL and NBR								
	EB	C	0.50	15.8	20.3	C	0.54	19.8	21.8
	WBL	B	0.17	12.3	4.5	B	0.28	14.8	8.3
	WBT/R	B	0.37	13.7	12.8	C	0.60	21.0	27.0
	NBL/T	B	0.03	10.9	0.8	B	0.08	11.9	2.3
	NBR	D	0.75	26.7	49.5	F	1.09	94.3	133.5
	SB	B	0.02	12.4	0.8	B	0.03	13.8	0.8
	Overall	C	-	19.7	-	F	-	53.0	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Barnsdale Road at Trail Road/ Highway 416 <i>Unsignalized</i>	Mitigation Measure: Signalized with WBL and NBR								
	EB	A	0.52	24.0	57.3	A	0.53	27.8	54.4
	WBL	A	0.29	22.1	22.6	A	0.50	25.5	28.0
	WBT/R	A	0.35	20.8	42.8	A	0.58	23.3	51.0
	NBL/T	A	0.03	13.8	4.1	A	0.09	11.9	7.9
	NBR	A	0.56	4.9	16.5	B	0.69	7.6	36.9
	SB	A	0.02	12.8	3.0	A	0.03	11.1	3.4
	Overall	A	0.54	14.9	-	B	0.65	16.8	-
Dundonald Drive at Realigned Greenbank Road <i>Signalized</i>	EBL	B	0.67	51.2	45.3	A	0.57	49.3	33.8
	EBT/R	A	0.20	19.4	15.0	A	0.15	18.8	10.5
	WBL	A	0.04	28.8	5.1	A	0.04	30.8	5.1
	WBT/R	A	0.30	13.1	17.1	A	0.39	18.5	21.9
	NBL	A	0.03	5.1	3.0	A	0.06	3.8	3.6
	NBT/R	A	0.14	4.0	12.5	A	0.12	3.1	9.2
	SBL	A	0.09	10.0	12.7	A	0.15	9.1	21.4
	SBT/R	A	0.12	6.3	16.8	A	0.23	6.8	34.8
	Overall	A	0.33	15.3	-	A	0.30	12.3	-
Kilbirnie Drive at Realigned Greenbank Road <i>Signalized</i>	EBL	A	0.33	51.8	15.5	A	0.28	51.5	12.8
	EBT/R	A	0.23	7.4	9.6	A	0.16	7.7	7.6
	WBL	A	0.06	34.2	4.9	A	0.05	34.1	4.9
	WBT/R	A	0.31	11.4	11.1	A	0.32	12.9	12.3
	NBL	A	0.05	6.4	6.3	A	0.10	6.7	10.7
	NBT	A	0.07	5.3	9.9	A	0.07	5.0	10.1
	NBR	A	0.01	0.1	0.0	A	0.01	0.0	0.0
	SBL	A	0.08	12.7	11.5	A	0.13	12.4	17.9
	SBT	A	0.06	11.2	10.5	A	0.08	10.9	15.0
	SBR	A	0.05	0.4	0.0	A	0.09	0.7	1.6
	Overall	A	0.26	13.3	-	A	0.23	11.6	-
Cappamore Drive at Realigned Greenbank Road <i>Signalized</i>	EBL	A	0.15	41.9	10.6	A	0.13	41.4	9.3
	EBT/R	A	0.57	25.3	28.1	A	0.47	26.6	24.5
	WBL	A	0.04	38.6	3.9	A	0.02	37.3	2.8
	WBT/R	A	0.29	26.9	16.8	A	0.42	38.2	26.6
	NBL	A	0.05	13.3	17.6	A	0.12	11.5	28.2
	NBT/R	A	0.05	12.2	19.5	A	0.08	9.8	21.4
	SBL	A	0.02	6.3	4.2	A	0.04	5.9	9.2
	SBT/R	A	0.08	4.9	15.4	A	0.08	4.6	18.0
	Overall	A	0.31	16.1	-	A	0.32	15.6	-
Barnsdale Road at Realigned Greenbank Road <i>Signalized</i>	EBL	B	0.69	50.2	36.2	D	0.85	56.2	60.2
	EBT	A	0.51	29.9	63.7	C	0.73	33.1	97.3
	WBT	C	0.76	38.8	100.7	A	0.60	28.6	76.7
	WBR	A	0.11	5.0	6.8	A	0.11	3.7	6.3
	SBL	A	0.06	14.0	13.8	A	0.09	20.1	18.3
	SBR	A	0.26	4.2	20.5	A	0.22	7.1	18.0
	Overall	A	0.60	28.5	-	A	0.57	30.1	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00

Delay = average vehicle delay in seconds
m = metered queue
= volume for the 95th %ile cycle exceeds capacity

The signalized interchange intersection at Barnsdale Road at Borrisokane Road/Highway 416 is expected to have queueing concerns during both peaks, the westbound approach is expected to be over capacity during the AM peak, and the westbound and southbound approaches are expected to be over capacity during the PM peak. The inclusion of eastbound, westbound and southbound left-turn lanes will alleviate the capacity constraints. Therefore, a 40-metre auxiliary southbound left-turn lane, a 75-metre auxiliary eastbound left-turn lane, and a 125-metre auxiliary westbound left-turn lane are recommended for inclusion. The addition of a southbound right turn-lane is not required operationally, although it should be considered as part of the design/construction of the initial intersection. This was identified as a 2036 future background condition. At this horizon, a 15-metre auxiliary southbound right-turn lane is recommended.

For the Barnsdale Road at Trail Road/Highway 416, the southbound approach is expected to have high delays due to the two-way stop control. Given the low volumes along Trail Road, it is recommended that the warranted auxiliary lanes be provided and the southbound approach remain with the high delay. Therefore, a 30-metre auxiliary westbound left-turn lane and a 40-metre auxiliary northbound right-turn lane are recommended. Should the southbound delay need to be addressed, the resulting mitigation would require signalization of the intersection to ensure the northbound approach maintain acceptable operations. The turn lanes and all-way stop-control mitigation measures were identified as a 2031 future background condition and the signalization noted in the 2031 future total conditions. If the signalization is considered, it should be implemented during the initial construction of the interchange.

The remaining intersections are expected to operate acceptably in the 2036 future total conditions.

12.3.2 Intersection MMLOS

Table 19 summarizes the MMLOS analysis for the signalized intersections in the future conditions. The intersection of Barnsdale Road at Borrisokane Road/Highway 416 is within the “Suburban” area, and all other intersections are within “600 metres from a rapid transit station”. The MMLOS worksheets has been provided in Appendix I.

Table 19: Study Area Intersection MMLOS Analysis

Intersection	Conditions	Pedestrian LOS		Bicycle LOS		Transit LOS		Auto LOS	
		PLOS	Target	BLOS	Target	TLOS	Target	ALOS	Target
Barnsdale Road at Borrisokane Road/Highway 416	Future	B	C	F	C	-	-	C	E
Dundonald Drive at Realigned Greenbank Road	Future	C	A	C	A	A	B	A	E
Kilbirnie Drive at Realigned Greenbank Road	Future	C	A	B	A	A	B	A	E
Cappamore Drive at Realigned Greenbank Road	Future	B	A	A	A	B	B	A	E
Barnsdale Road at Realigned Greenbank Road	Future	B	A	A	A	B	B	A	E

The bicycle LOS target will not be met at the intersection of Barnsdale Road at Borrisokane Road/Highway 416 in the future conditions. To meet the bicycle LOS target either unidirectional crossriders or bike lanes with protected corners would be required.

The pedestrian and bicycle LOS targets will not be met at the intersection of Dundonald Drive at Realigned Greenbank Road in the future conditions. To meet the pedestrian LOS target, the maximum number of travel lane crossed at each pedestrian crossing would need to be reduced to four lanes, with fully protected right-turn and left-turn signal phasing. To meet the bicycle LOS target, either unidirectional crossriders on the east and west legs of the intersection with fully protected left-turn signal phasing for the southbound and northbound movements

would be required or unidirectional crossrides with fully protected right-turn signal phasing on the same approaches.

The pedestrian and bicycle LOS targets will not be met at the intersection of Kilbirnie Drive at Realigned Greenbank Road in the future conditions. To meet the pedestrian LOS target, the maximum number of travel lane crossed at each pedestrian crossing would need to be reduced to three lanes, with fully protected right-turn and left-turn signal phasing and at least 18.0 seconds effective walk time. To meet the bicycle LOS target, a bike lane on the east leg of the intersection would be required.

The pedestrian LOS targets will not be met at the intersection of Cappamore Drive at Realigned Greenbank Road in the future conditions. To meet the pedestrian LOS target, the maximum number of travel lane crossed at each pedestrian crossing would need to be reduced to three lanes, with fully protected right-turn signal phasing.

The pedestrian LOS targets will not be met at the intersection of Barnsdale Road at Realigned Greenbank Road in the future conditions. To meet the pedestrian LOS target, the maximum number of travel lane crossed at each pedestrian crossing would need to be reduced to three lanes, with fully protected eastbound left-turn signal phasing and at least 50.0 seconds effective walk time.

12.3.3 Recommended Design Elements

The recommended interim conditions for the Highway 416 at Barnsdale Road interchange are under the purview of Ministry of Transportation of Ontario, and no additional study area intersection design elements are proposed for the network intersections as part of this study.

13 Summary of Improvements Indicated and Modifications Options

The following summarizes the analysis and results presented in this TIA report:

Proposed Site and Screening

- The proposed development includes a total of 448 single-detached homes and 494 townhouses
- The subdivision will connect to the extensions of Elevation Road, Kilbirnie Drive, and Cappamore Drive and new local roads are proposed within the subdivision
- The anticipated build-out year is assumed to be 2031

TIA Screening and Exemptions

- The TIA Screening form indicated a full TIA was required due to trip generation and safety triggers
- The exemption review for the TIA did not require circulation and access, parking supply, and neighbourhood traffic calming review

Existing Conditions

- Barnsdale Road, Borrisokane Road, and Trail Road are arterial roads, and William McEwen Drive, Elevation Road, Dundonald Drive, Kilbirnie Drive, and Cappamore Drive are collector roads, and Moyard Drive is a local road in the study area
- Future roadways include the extensions of Elevation Road, Kilbirnie Drive, and Cappamore Drive as collector roads
- Sidewalks are provided along Cappamore Drive, Kilbirnie Drive, Dundonald Drive east of Realigned Greenbank Road

- Multi-use pathways are provided along Elevation Road and Dundonald Drive west of Realigned Greenbank Road and cycletracks are present along both sides of Cappamore Drive
- No transit stops are currently present within 400 metres of the proposed site
- During both the AM and PM peak hours, the study area intersections operate well
- All recorded collisions at the intersection of Barnsdale Road at Borrisokane Road are angle collisions and are expected to be mitigated by the future intersection improvements planned as part of the Highway 416 at Barnsdale Road interchange project

Planned Conditions

- Median bus rapid transit from Barrhaven Centre Station to Kilbirnie Station (Southwest Transitway) is identified as a transit priority project within the TMP Transit Network
- Realigned Greenbank Road and Widening between Chapman Mills Drive and Cambrian Road and Barnsdale Road /Highway 416 interchange are identified as committed road projects, and Realigned Greenbank Road from Cambrian Road to Kilbirnie Drive, Realigned Greenbank Road Extension from Kilbirnie Drive to Barnsdale Road, and Borrisokane Road Urbanization from Strandherd Drive to Cambrian Road, including implementation of new active transportation facilities on both sides of the road are identified as priority road projects and Barnsdale Road Widening from two to four lanes between Highway 416 and Realigned Greenbank Road Extension is identified as a needs-based road project within the TMP Road Network
- The interim Barnsdale interchange is expected to be implemented by the 2031 build-out horizon and Realigned Greenbank Road is expected to be implemented by the 2036 plus five-year horizon

Development Generated Travel Demand

- The proposed development is forecasted produce 804 two-way people trips during the AM peak hour and 868 two-way people trips during the PM peak hour
- Of the forecasted people trips, 382 two-way trips will be vehicle trips during the AM peak hour, and 428 two-way trips will be vehicle trips during the PM peak hour
- Of the forecasted trips, 80% are anticipated to travel north, 10% to the east, and 5% to both the west and south

Development Design

- The proposed development is a residential subdivision featuring driveways for each dwelling and garage for typical townhomes
- Bicycle parking is assumed to be within the individual units
- The extensions of Elevation Road, Kilbirnie Drive, and Cappamore Drive east of Elevation Road will have a 2.0-metre sidewalk and a 2.0-metre unidirectional cycletrack on both sides of the roadway
- The extension of Cappamore Drive west of Elevation Road will have 1.8-metre sidewalks on both sides of the roadway
- Local roads will have a 1.8-metre sidewalk on one side
- Pathway connections are also proposed through walkway blocks through the subdivision
- Bus stops are included on Elevation Road at Kilbirnie Drive, at Moyard Drive, and at Cappamore Drive

New Street Networks

- The extension of Elevation Road is a 24.0-metre-wide collector road with 2.0-metre sidewalks and 2.0-metre cycletracks
- The extension of Kilbirnie Road is a 26.0-metre-wide collector road with 2.0-metre sidewalks and 2.0-metre cycletracks
- The extension of Cappamore Drive is a 24.0-metre-wide collector road with 2.0-metre sidewalks and 2.0-metre cycletracks east of Elevation Road and a 20.0-metre-wide local road with 1.8-metre sidewalks on both side of the road west of Elevation Road
- The new local roads, excluding Cappamore Drive west of Elevation Road, include 18.0-metre-wide road with a 1.8-metre sidewalk on one side of the road, as well as 14.75-metre-wide window streets
- The proposed speed limit for new collector roads will be 40 km/h and for new local roads will be 30 km/h

Boundary Street Design

- Barnsdale Road will not meet the pedestrian and bicycle LOS targets in the existing conditions due to the roadway volumes and posted speed limits
- Assuming a typical arterial cross-section for the future improvements, Barnsdale Road is expected to meet the pedestrian and bicycle LOS targets in the future conditions
- Elevation Road, Kilbirnie Drive, and Cappamore Road will not meet the pedestrian LOS targets in the future conditions and the maximum distance between controlled crossings needs to be between 231 and 260 metres
- The local roads will not meet the pedestrian LOS targets in the future conditions and to meet the pedestrian LOS, a 1.50-2.99-metre boulevard would be required

TDM

- Supportive TDM measures to be included within the proposed development should include:
 - Provide a multimodal travel option information package to new residents
 - Provide transit incentives for new residents
 - Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels

Background Conditions

- The background developments explicitly considered in the background conditions have been obtained from the Barrhaven South Future Neighbourhood Phase 3 Transportation Report
- The report has been used to account for the reassignment of background development trips resulting from the implementation of the Barnsdale interchange and Realigned Greenbank Road and changes in the travel patterns of existing traffic
- The growths along study area roadways have been assumed to be captured within the background development and no annual growth rate have been applied on study area roadways
- In the 2031 future background conditions, the intersection of Barnsdale Road at Borrisokane Road/Highway 416 falls within the Case 2 signal warrant category, indicating that traffic signal might be warranted and therefore signalized conditions were reviewed for the 2031 and 2036 future background horizons

- The intersection of Barnsdale Road at Trail Road/Highway 416 met the all-way stop-controlled warrants in 2031 future background conditions and were reviewed for the 2031 and 2036 future background horizons
- The eastbound, westbound, and southbound left turn lanes at the intersection of Barnsdale Road at Borrisokane Road/Highway 416 met the warrants during both peak hours at the 2031 future background conditions
- The westbound left turn lane at the intersection of Barnsdale Road at Trail Road/Highway 416 met the warrant during both peak hours at the 2031 future background conditions
- At the intersection of Barnsdale Road at Borrisokane Road/Highway 416, the westbound, northbound, and southbound right turn volumes exceed 20% of the total approaching volume and the eastbound right turn volume exceeds 10% of the total approaching volume
- At the Barnsdale Road at Trail Road/Highway 416 intersection, the northbound right turn volumes exceed 20% of the total approaching volume
- The operational need of the right-turn lanes was reviewed as part of the 2031 and 2036 future background horizons
- The 2031 and 2036 future background operational analysis identified the recommended interim conditions at the intersections of Barnsdale Road at Borrisokane Road/Highway 416 and Barnsdale Road at Trail Road/Highway 416

Transit

- The proposed development is anticipated to generate an additional 222 AM and 182 PM peak hour two-way
- It is noted that future transit stops will be planned within the subdivision, which will be the primary bus stops for residents within the subdivision
- The current route in Barrhaven South is not expected to provide the service required for the subdivision or the ongoing developments to the west of the Re-Aligned Greenbank Road corridor
- A new dedicated route with peak hour service of 15–20-minute would meet the forecasted transit demand for the community

Intersection Design

- No additional signal, all-way stop, left turn lane warrants, and right-turn lane warrants were met at the future total conditions and remain the same as the corresponding future background conditions
- The 2031 and 2036 future total operational analysis identified the recommended interim conditions at the intersections of Barnsdale Road at Borrisokane Road/Highway 416 and Barnsdale Road at Trail Road/Highway 416
- The bicycle LOS target will not be met at the intersection of Barnsdale Road at Borrisokane Road/Highway 416 in the future conditions
- To meet the bicycle LOS target either unidirectional crossrides or bike lanes with protected corners would be required
- The pedestrian and bicycle LOS targets will not be met at the intersection of Dundonald Drive at Realigned Greenbank Road in the future conditions
- To meet the pedestrian LOS target, the maximum number of travel lane crossed at each pedestrian crossing would need to be reduced to four lanes, with fully protected right-turn and left-turn signal phasing

- To meet the bicycle LOS target, either unidirectional crossrides on the east and west legs of the intersection with fully protected left-turn signal phasing for the southbound and northbound movements would be required or unidirectional crossrides with fully protected right-turn signal phasing on the same approaches
- The pedestrian and bicycle LOS targets will not be met at the intersection of Kilbirnie Drive at Realigned Greenbank Road in the future conditions
- To meet the pedestrian LOS target, the maximum number of travel lane crossed at each pedestrian crossing would need to be reduced to three lanes, with fully protected right-turn and left-turn signal phasing and at least 18.0 seconds effective walk time and to meet the bicycle LOS target, a bike lane on the east leg of the intersection would be required
- The pedestrian LOS targets will not be met at the intersection of Cappamore Drive at Realigned Greenbank Road in the future conditions and to meet the pedestrian LOS target, the maximum number of travel lane crossed at each pedestrian crossing would need to be reduced to three lanes, with fully protected right-turn signal phasing.
- The pedestrian LOS targets will not be met at the intersection of Barnsdale Road at Realigned Greenbank Road in the future conditions and to meet the pedestrian LOS target, the maximum number of travel lane crossed at each pedestrian crossing would need to be reduced to three lanes, with fully protected eastbound left-turn signal phasing and at least 50.0 seconds effective walk time.

Recommended Design Elements

- The recommended interim conditions for the Highway 416 at Barnsdale Road interchange are under the purview of Ministry of Transportation of Ontario, and no additional study area intersection design elements are proposed for the network intersections as part of this study

14 Conclusion

It is recommended that, from a transportation perspective, the proposed development applications proceed.

Prepared By:

Reihaneh Azhdar

Reihaneh Azhdar
Transportation Engineering-Intern

Reviewed By:



Andrew Harte, P.Eng.
Senior Transportation Engineer

Appendix A

TIA Screening Form and PM Certification Form

City of Ottawa 2023 Revisions to 2017 TIA Guidelines
Step 1 - Screening Form

Date: 2026-06-24
Project Number: 2026-095
Project Reference: Minto Quinn's Pointe 6-8

1.1 Description of Proposed Development	
Municipal Address	3882 & 4000 Barnsdale Road
Description of Location	North of Barnsdale Road, east of Borrisokane Road
Land Use Classification	Development Reserve Zone (DR)
Development Size	448 single-detached homes and 494 townhouses
Accesses	The subdivision will connect to the extensions of Elevation Road, Kilbirnie Drive, and Cappamore Drive
Phase of Development	Single
Buildout Year	2031
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger	
Land Use Type	Multi-Family (Low-Rise)
Development Size	942 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 Transit Priority Network, Rapid Transit network or Cross-Town Bikeways?	No
Is the development in a Hub, a Protected Major Transit Station Area (PMTSA), or a Design Priority Area (DPA)?	No
Location Trigger	No

1.4. Safety Triggers	
Are posted speed limits on a boundary street 80 km/hr or greater?	Yes
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	Yes



Certification Form for TIA Study PM

TIA Plan Reports

On April 14, 2022, the Province's Bill 109 received Royal Assent providing legislative direction to implement the More Homes for Everyone Act, 2022 aiming to increase the supply of a range of housing options to make housing more affordable. Revisions have been made to the TIA guidelines to comply with Bill 109 and streamline the process for applicants and staff.

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 they meet the four criteria listed below.

CERTIFICATION



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; (Update effective July 2023)



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;



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



I am either a licensed or registered¹ professional in good standing, whose field of expertise



is either transportation engineering



or transportation planning.

¹ 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.

Dated at Ottawa this 17 day of August, 20 23.
(City)

Name : Andrew Harte

Professional title: Senior Transportation Engineer / Vice-President Ottawa



Signature of individual certifier that s/he/they meet the above criteria

Office Contact Information (Please Print)

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Stamp



Revision Date: June 2023

Appendix B

Turning Movement Counts

Project #24-105 - CGH Transportation

Intersection Count Report

Intersection: Borrisokane Rd & Barnsdale Rd

Municipality: Ottawa

Count Date: Wednesday, Mar 20, 2024

Site Code: 2410400005

Count Categories: Cars, Trucks, Bicycles, Pedestrians

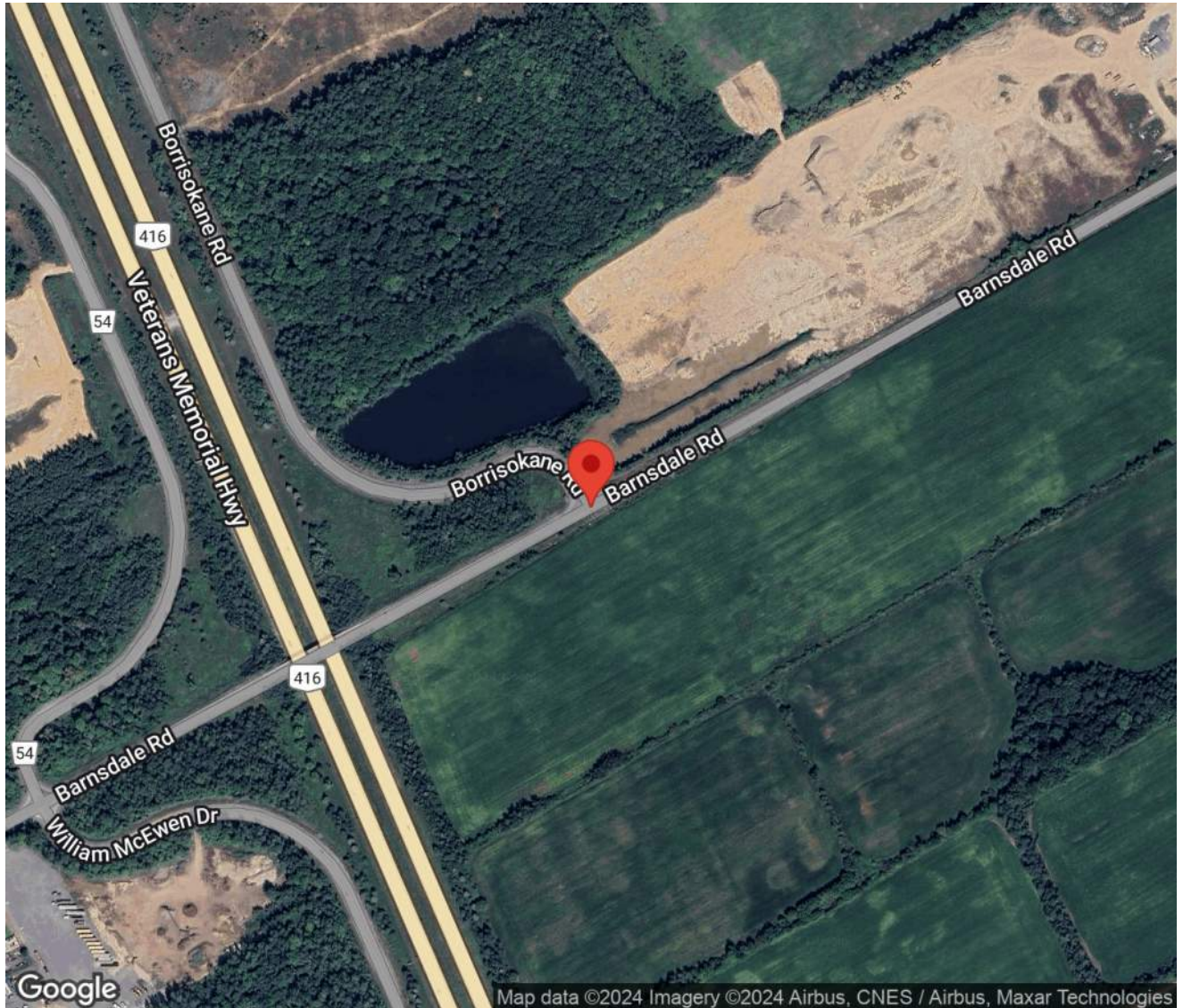
Count Period: 07:00-10:00, 11:30-13:30, 15:00-18:00

Weather: Clear

Comments:

Traffic Count Map

Intersection:	Borrisokane Rd & Barnsdale Rd
Site Code:	2410400005
Municipality:	Ottawa
Count Date:	Mar 20, 2024



Traffic Count Summary

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Municipality: Ottawa
Count Date: Mar 20, 2024

Borrisokane Rd - Traffic Summary

North Approach Totals							South Approach Totals						
Hour	Includes Cars, Trucks, Bicycles						Includes Cars, Trucks, Bicycles						Total
	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	
07:00 - 08:00	58	0	55	0	113	0	0	0	0	0	0	0	113
08:00 - 09:00	67	0	54	0	121	0	0	0	0	0	0	0	121
09:00 - 10:00	52	0	34	0	86	0	0	0	0	0	0	0	86
BREAK													
11:30 - 12:00	31	0	23	1	55	0	0	0	0	0	0	0	55
12:00 - 13:00	54	0	44	0	98	0	0	0	0	0	0	0	98
13:00 - 13:30	50	0	27	1	78	0	0	0	0	0	0	0	78
BREAK													
15:00 - 16:00	104	0	76	0	180	0	0	0	0	0	0	0	180
16:00 - 17:00	110	0	93	0	203	0	0	0	0	0	0	0	203
17:00 - 18:00	93	0	51	0	144	0	0	0	0	0	0	0	144
GRAND TOTAL	619	0	457	2	1078	0	0	0	0	0	0	0	1078

Traffic Count Summary

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Municipality: Ottawa
Count Date: Mar 20, 2024

Barnsdale Rd - Traffic Summary

East Approach Totals							West Approach Totals						
Hour	Includes Cars, Trucks, Bicycles						Includes Cars, Trucks, Bicycles						Total
	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	
07:00 - 08:00	0	146	70	0	216	0	49	181	0	0	230	0	446
08:00 - 09:00	0	150	98	0	248	0	77	150	0	0	227	0	475
09:00 - 10:00	0	115	62	0	177	0	35	80	0	0	115	0	292
BREAK													
11:30 - 12:00	0	33	32	0	65	0	16	31	0	0	47	0	112
12:00 - 13:00	0	71	64	0	135	0	40	63	0	0	103	0	238
13:00 - 13:30	0	33	14	0	47	0	16	43	0	0	59	0	106
BREAK													
15:00 - 16:00	0	171	84	0	255	0	68	171	0	0	239	0	494
16:00 - 17:00	0	216	104	0	320	0	55	194	0	0	249	0	569
17:00 - 18:00	0	155	110	0	265	0	48	157	0	0	205	0	470
GRAND TOTAL	0	1090	638	0	1728	0	404	1070	0	0	1474	0	3202

Traffic Count Data

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Municipality: Ottawa
Count Date: Mar 20, 2024

North Approach - Borrisokane Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
07:00	10	0	9	0	19	0	0	1	0	1	0	0	0	0	0	0
07:15	15	0	14	0	29	1	0	0	0	1	0	0	0	0	0	0
07:30	16	0	20	0	36	1	0	1	0	2	0	0	0	0	0	0
07:45	15	0	9	0	24	0	0	1	0	1	0	0	0	0	0	0
08:00	7	0	14	0	21	0	0	1	0	1	0	0	0	0	0	0
08:15	17	0	12	0	29	1	0	0	0	1	0	0	0	0	0	0
08:30	26	0	13	0	39	0	0	0	0	0	0	0	0	0	0	0
08:45	14	0	13	0	27	2	0	1	0	3	0	0	0	0	0	0
09:00	15	0	13	0	28	1	0	0	0	1	0	0	0	0	0	0
09:15	15	0	10	0	25	0	0	0	0	0	0	0	0	0	0	0
09:30	8	0	3	0	11	0	0	0	0	0	0	0	0	0	0	0
09:45	13	0	8	0	21	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	171	0	138	0	309	6	0	5	0	11	0	0	0	0	0	0

Traffic Count Data

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Municipality: Ottawa
Count Date: Mar 20, 2024

North Approach - Borrisokane Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
11:30	20	0	13	0	33	0	0	1	1	2	0	0	0	0	0	0
11:45	9	0	9	0	18	2	0	0	0	2	0	0	0	0	0	0
12:00	12	0	11	0	23	0	0	0	0	0	0	0	0	0	0	0
12:15	11	0	7	0	18	1	0	2	0	3	0	0	0	0	0	0
12:30	14	0	6	0	20	0	0	1	0	1	0	0	0	0	0	0
12:45	16	0	17	0	33	0	0	0	0	0	0	0	0	0	0	0
13:00	24	0	15	1	40	1	0	0	0	1	0	0	0	0	0	0
13:15	24	0	12	0	36	1	0	0	0	1	0	0	0	0	0	0
SUBTOTAL	130	0	90	1	221	5	0	4	1	10	0	0	0	0	0	0

Traffic Count Data

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Municipality: Ottawa
Count Date: Mar 20, 2024

North Approach - Borrisokane Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
15:00	17	0	11	0	28	0	0	0	0	0	0	0	0	0	0	0
15:15	24	0	17	0	41	2	0	0	0	2	0	0	0	0	0	0
15:30	26	0	21	0	47	2	0	0	0	2	0	0	0	0	0	0
15:45	32	0	26	0	58	1	0	1	0	2	0	0	0	0	0	0
16:00	28	0	16	0	44	1	0	2	0	3	0	0	0	0	0	0
16:15	29	0	25	0	54	0	0	0	0	0	0	0	0	0	0	0
16:30	29	0	30	0	59	2	0	3	0	5	0	0	0	0	0	0
16:45	21	0	17	0	38	0	0	0	0	0	0	0	0	0	0	0
17:00	25	0	22	0	47	0	0	0	0	0	0	0	0	0	0	0
17:15	26	0	12	0	38	0	0	0	0	0	0	0	0	0	0	0
17:30	27	0	7	0	34	0	0	0	0	0	0	0	0	0	0	0
17:45	15	0	10	0	25	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	299	0	214	0	513	8	0	6	0	14	0	0	0	0	0	0
GRAND TOTAL	600	0	442	1	1043	19	0	15	1	35	0	0	0	0	0	0

Traffic Count Data

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Municipality: Ottawa
Count Date: Mar 20, 2024

East Approach - Barnsdale Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
07:00	0	41	11	0	52	0	0	1	0	1	0	0	0	0	0	0
07:15	0	38	14	0	52	0	1	0	0	1	0	0	0	0	0	0
07:30	0	35	20	0	55	0	2	1	0	3	0	0	0	0	0	0
07:45	0	28	22	0	50	0	1	1	0	2	0	0	0	0	0	0
08:00	0	34	17	0	51	0	1	0	0	1	0	0	0	0	0	0
08:15	0	39	32	0	71	0	2	1	0	3	0	0	0	0	0	0
08:30	0	37	26	0	63	0	0	0	0	0	0	0	0	0	0	0
08:45	0	33	22	0	55	0	4	0	0	4	0	0	0	0	0	0
09:00	0	29	22	0	51	0	6	0	0	6	0	0	0	0	0	0
09:15	0	25	21	0	46	0	4	1	0	5	0	0	0	0	0	0
09:30	0	23	8	0	31	0	2	1	0	3	0	0	0	0	0	0
09:45	0	24	9	0	33	0	2	0	0	2	0	0	0	0	0	0
SUBTOTAL	0	386	224	0	610	0	25	6	0	31	0	0	0	0	0	0

Traffic Count Data

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Municipality: Ottawa
Count Date: Mar 20, 2024

East Approach - Barnsdale Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
11:30	0	20	11	0	31	0	0	2	0	2	0	0	0	0	0	0
11:45	0	13	19	0	32	0	0	0	0	0	0	0	0	0	0	0
12:00	0	20	18	0	38	0	4	1	0	5	0	0	0	0	0	0
12:15	0	11	16	0	27	0	1	0	0	1	0	0	0	0	0	0
12:30	0	18	13	0	31	0	2	2	0	4	0	0	0	0	0	0
12:45	0	14	14	0	28	0	1	0	0	1	0	0	0	0	0	0
13:00	0	17	5	0	22	0	0	0	0	0	0	0	0	0	0	0
13:15	0	14	9	0	23	0	2	0	0	2	0	0	0	0	0	0
SUBTOTAL	0	127	105	0	232	0	10	5	0	15	0	0	0	0	0	0

Traffic Count Data

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Municipality: Ottawa
Count Date: Mar 20, 2024

East Approach - Barnsdale Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
15:00	0	32	19	0	51	0	2	1	0	3	0	0	0	0	0	0
15:15	0	31	17	0	48	0	3	1	0	4	0	0	0	0	0	0
15:30	0	44	18	0	62	0	4	1	0	5	0	0	0	0	0	0
15:45	0	52	27	0	79	0	3	0	0	3	0	0	0	0	0	0
16:00	0	56	23	0	79	0	4	0	0	4	0	0	0	0	0	0
16:15	0	46	27	0	73	0	3	0	0	3	0	0	0	0	0	0
16:30	0	45	30	0	75	0	0	0	0	0	0	0	0	0	0	0
16:45	0	60	24	0	84	0	2	0	0	2	0	0	0	0	0	0
17:00	0	42	22	0	64	0	0	0	0	0	0	0	0	0	0	0
17:15	0	43	27	0	70	0	1	0	0	1	0	0	0	0	0	0
17:30	0	37	36	0	73	0	0	0	0	0	0	0	0	0	0	0
17:45	0	32	25	0	57	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	0	520	295	0	815	0	22	3	0	25	0	0	0	0	0	0
GRAND TOTAL	0	1033	624	0	1657	0	57	14	0	71	0	0	0	0	0	0

Traffic Count Data

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Municipality: Ottawa
Count Date: Mar 20, 2024

West Approach - Barnsdale Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
07:00	6	35	0	0	41	0	7	0	0	7	0	0	0	0	0	0
07:15	13	56	0	0	69	0	7	0	0	7	0	0	0	0	0	0
07:30	8	34	0	0	42	0	2	0	0	2	0	0	0	0	0	0
07:45	20	38	0	0	58	2	2	0	0	4	0	0	0	0	0	0
08:00	28	45	0	0	73	0	1	0	0	1	0	0	0	0	0	0
08:15	21	42	0	0	63	0	1	0	0	1	0	0	0	0	0	0
08:30	19	31	0	0	50	0	1	0	0	1	0	0	0	0	0	0
08:45	8	28	0	0	36	1	1	0	0	2	0	0	0	0	0	0
09:00	8	18	0	0	26	1	3	0	0	4	0	0	0	0	0	0
09:15	13	24	0	0	37	0	1	0	0	1	0	0	0	0	0	0
09:30	5	19	0	0	24	0	1	0	0	1	0	0	0	0	0	0
09:45	8	12	0	0	20	0	2	0	0	2	0	0	0	0	0	0
SUBTOTAL	157	382	0	0	539	4	29	0	0	33	0	0	0	0	0	0

Traffic Count Data

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Municipality: Ottawa
Count Date: Mar 20, 2024

West Approach - Barnsdale Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	←	↑	→	↺	Total	
11:30	5	12	0	0	17	1	0	0	0	1	0	0	0	0	0	0
11:45	10	19	0	0	29	0	0	0	0	0	0	0	0	0	0	0
12:00	6	6	0	0	12	1	1	0	0	2	0	0	0	0	0	0
12:15	8	19	0	0	27	0	1	0	0	1	0	0	0	0	0	0
12:30	14	16	0	0	30	1	0	0	0	1	0	0	0	0	0	0
12:45	10	19	0	0	29	0	1	0	0	1	0	0	0	0	0	0
13:00	9	19	0	0	28	0	1	0	0	1	0	0	0	0	0	0
13:15	7	23	0	0	30	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	69	133	0	0	202	3	4	0	0	7	0	0	0	0	0	0

Traffic Count Data

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Municipality: Ottawa
Count Date: Mar 20, 2024

West Approach - Barnsdale Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	←	↑	→	↻	Total	
15:00	14	34	0	0	48	0	2	0	0	2	0	0	0	0	0	0
15:15	16	51	0	0	67	0	2	0	0	2	0	0	0	0	0	0
15:30	14	36	0	0	50	0	0	0	0	0	0	0	0	0	0	0
15:45	24	42	0	0	66	0	4	0	0	4	0	0	0	0	0	0
16:00	11	30	0	0	41	0	0	0	0	0	0	0	0	0	0	0
16:15	14	56	0	0	70	0	6	0	0	6	0	0	0	0	0	0
16:30	15	49	0	0	64	0	0	0	0	0	0	0	0	0	0	0
16:45	15	51	0	0	66	0	2	0	0	2	0	0	0	0	0	0
17:00	13	30	0	0	43	0	1	0	0	1	0	0	0	0	0	0
17:15	9	54	0	0	63	0	0	0	0	0	0	0	0	0	0	0
17:30	11	45	0	0	56	0	0	0	0	0	0	0	0	0	0	0
17:45	15	27	0	0	42	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	171	505	0	0	676	0	17	0	0	17	0	0	0	0	0	0
GRAND TOTAL	397	1020	0	0	1417	7	50	0	0	57	0	0	0	0	0	0

Peak Hour Diagram

Specified Period

From: 07:00:00
To: 10:00:00

One Hour Peak

From: 07:45:00
To: 08:45:00

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Count Date: Mar 20, 2024

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Barnsdale Rd runs E/W

North Approach

	Out	In	Total
	113	185	298
	3	4	7
	0	0	0
Totals	116	189	305

Borrisokane Rd

	0	0	0
	2	1	0
	48	65	0
Totals	50	66	0





East Approach

	Out	In	Total
	235	221	456
	6	6	12
	0	0	0
Totals	241	227	468

Barnsdale Rd

				Totals
	0	0	0	0
	0	2	88	90
	0	5	156	161

Peds: 0

Peds: 0



Peds: 0

Barnsdale Rd

Totals			
	0	0	0
	99	97	2
	142	138	4

Peds: 0

West Approach

	Out	In	Total
	244	186	430
	7	6	13
	0	0	0
Totals	251	192	443

 - Cars

 - Trucks

 - Bicycles

Comments

Peak Hour Summary

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Count Date: Mar 20, 2024
Period: 07:00 - 10:00

Peak Hour Data (07:45 - 08:45)

	North Approach Borrisokane Rd						South Approach						East Approach Barnsdale Rd						West Approach Barnsdale Rd						Total Vehicl es											
Start Time	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total												
07:45	15		10	0	0	25					0			29	23	0	0	52	22	40		0	0	62	139											
08:00	7		15	0	0	22					0															35	17	0	0	52	28	46	0	0	74	148
08:15	18		12	0	0	30					0															41	33	0	0	74	21	43	0	0	64	168
08:30	26		13	0	0	39					0															37	26	0	0	63	19	32	0	0	51	153
Grand Total	66		50	0	0	116					0	0		142	99	0	0	241	90	161		0	0	251	608											
Approach %	56.9		43.1	0	-	-					-	-		58.9	41.1	0	-	-	35.9	64.1		0	-	-												
Totals %	10.9		8.2	0	19.1	0					0			23.4	16.3	0	39.6		14.8	26.5		0	41.3													
PHF	0.63		0.83	0	0.74	0					0			0.87	0.75	0	0.81		0.8	0.88		0	0.85	0.9												
Cars	65		48	0	113	0					0			138	97	0	235		88	156		0	244	592												
% Cars	98.5		96	0	97.4	0					0			97.2	98	0	97.5		97.8	96.9		0	97.2	97.4												
Trucks	1		2	0	3	0					0			4	2	0	6		2	5		0	7	16												
% Trucks	1.5		4	0	2.6	0					0			2.8	2	0	2.5		2.2	3.1		0	2.8	2.6												
Bicycles	0		0	0	0	0					0			0	0	0	0		0	0		0	0	0												
% Bicycles	0		0	0	0	0					0			0	0	0	0		0	0		0	0	0												
Peds					0	-					0	-					0	-					0	-	0											
% Peds					0	-					0	-					0	-					0	-												

Peak Hour Diagram

Specified Period

From: 11:30:00
To: 13:30:00

One Hour Peak

From: 12:30:00
To: 13:30:00

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Count Date: Mar 20, 2024

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Barnsdale Rd runs E/W

North Approach

	Out	In	Total
	129	82	211
	3	3	6
	0	0	0
Totals	132	85	217

Borrisokane Rd

	0	0	0
	1	2	0
	50	78	1
Totals	51	80	1

East Approach

	Out	In	Total
	104	155	259
	7	4	11
	0	0	0
Totals	111	159	270

Barnsdale Rd

				Totals
	0	0	0	0
	0	1	40	41
	0	2	77	79

Peds: 0



Peds: 0

Peds: 0

Peds: 0

Barnsdale Rd

Totals			
0	0	0	0
43	41	2	0
68	63	5	0

West Approach

	Out	In	Total
	117	113	230
	3	6	9
	0	0	0
Totals	120	119	239

 - Cars

 - Trucks

 - Bicycles

Comments

Peak Hour Summary

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Count Date: Mar 20, 2024
Period: 11:30 - 13:30

Peak Hour Data (12:30 - 13:30)

Start Time	North Approach Borrisokane Rd						South Approach						East Approach Barnsdale Rd						West Approach Barnsdale Rd						Total Vehicles
	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	
12:30	14		7	0	0	21					0			20	15	0	0	35	15	16		0	0	31	87
12:45	16		17	0	0	33					0			15	14	0	0	29	10	20		0	0	30	92
13:00	25		15	1	0	41					0			17	5	0	0	22	9	20		0	0	29	92
13:15	25		12	0	0	37					0			16	9	0	0	25	7	23		0	0	30	92
Grand Total	80		51	1	0	132					0	0		68	43	0	0	111	41	79		0	0	120	363
Approach %	60.6		38.6	0.8	-	-					-	-		61.3	38.7	0	-	-	34.2	65.8		0	-	-	-
Totals %	22		14	0.3		36.4					0			18.7	11.8	0		30.6	11.3	21.8		0		33.1	
PHF	0.8		0.75	0.25		0.8					0			0.85	0.72	0		0.79	0.68	0.86		0		0.97	0.99
Cars	78		50	1		129					0			63	41	0		104	40	77		0		117	350
% Cars	97.5		98	100		97.7					0			92.6	95.3	0		93.7	97.6	97.5		0		97.5	96.4
Trucks	2		1	0		3					0			5	2	0		7	1	2		0		3	13
% Trucks	2.5		2	0		2.3					0			7.4	4.7	0		6.3	2.4	2.5		0		2.5	3.6
Bicycles	0		0	0		0					0			0	0	0		0	0	0		0		0	0
% Bicycles	0		0	0		0					0			0	0	0		0	0	0		0		0	0
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	-

Peak Hour Diagram

Specified Period

From: 15:00:00
To: 18:00:00

One Hour Peak

From: 15:45:00
To: 16:45:00

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Count Date: Mar 20, 2024

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Barnsdale Rd runs E/W

North Approach

	Out	In	Total
	215	171	386
	10	0	10
	0	0	0
	225	171	396

Borrisokane Rd

	0	0	0
	6	4	0
	97	118	0
Totals	103	122	0





East Approach

	Out	In	Total
	306	295	601
	10	14	24
	0	0	0
	316	309	625

Barnsdale Rd

				Totals
	0	0	0	0
	0	0	64	64
	0	10	177	187





Peds: 0



Peds: 0

Peds: 0

Barnsdale Rd

Totals			
0	0	0	0
107	107	0	0
209	199	10	0





Peds: 0

West Approach

	Out	In	Total
	241	296	537
	10	16	26
	0	0	0
	251	312	563

 - Cars

 - Trucks

 - Bicycles

Comments

Peak Hour Summary

Intersection: Borrisokane Rd & Barnsdale Rd
Site Code: 2410400005
Count Date: Mar 20, 2024
Period: 15:00 - 18:00

Peak Hour Data (15:45 - 16:45)

	North Approach Borrisokane Rd						South Approach						East Approach Barnsdale Rd						West Approach Barnsdale Rd						Total Vehicl es	
Start Time					Peds	Total					Peds	Total					Peds	Total					Peds	Total		
15:45	33		27	0	0	60					0			55	27	0	0	0	82	24	46		0	0	70	212
16:00	29		18	0	0	47					0			60	23	0	0	83	11	30	0		0	41	171	
16:15	29		25	0	0	54					0			49	27	0	0	76	14	62	0		0	76	206	
16:30	31		33	0	0	64					0			45	30	0	0	75	15	49	0		0	64	203	
Grand Total	122		103	0	0	225					0	0		209	107	0	0	316	64	187		0	0	251	792	
Approach %	54.2		45.8	0	-	-					-	-	66.1	33.9	0	-	-	25.5	74.5		0	-	-	-	-	
Totals %	15.4		13	0	-	28.4					0	-	26.4	13.5	0	-	39.9	8.1	23.6		0	-	31.7	-		
PHF	0.92		0.78	0	-	0.88					0	-	0.87	0.89	0	-	0.95	0.67	0.75		0	-	0.83	0.93		
Cars	118		97	0	-	215					0	-	199	107	0	-	306	64	177		0	-	241	762		
% Cars	96.7		94.2	0	-	95.6					0	-	95.2	100	0	-	96.8	100	94.7		0	-	96	96.2		
Trucks	4		6	0	-	10					0	-	10	0	0	-	10	0	10		0	-	10	30		
% Trucks	3.3		5.8	0	-	4.4					0	-	4.8	0	0	-	3.2	0	5.3		0	-	4	3.8		
Bicycles	0		0	0	-	0					0	-	0	0	0	-	0	0	0		0	-	0	0		
% Bicycles	0		0	0	-	0					0	-	0	0	0	-	0	0	0		0	-	0	0		
Peds					0	-					0	-					0	-				0	-	0	-	
% Peds					0	-					0	-					0	-				0	-	0	-	

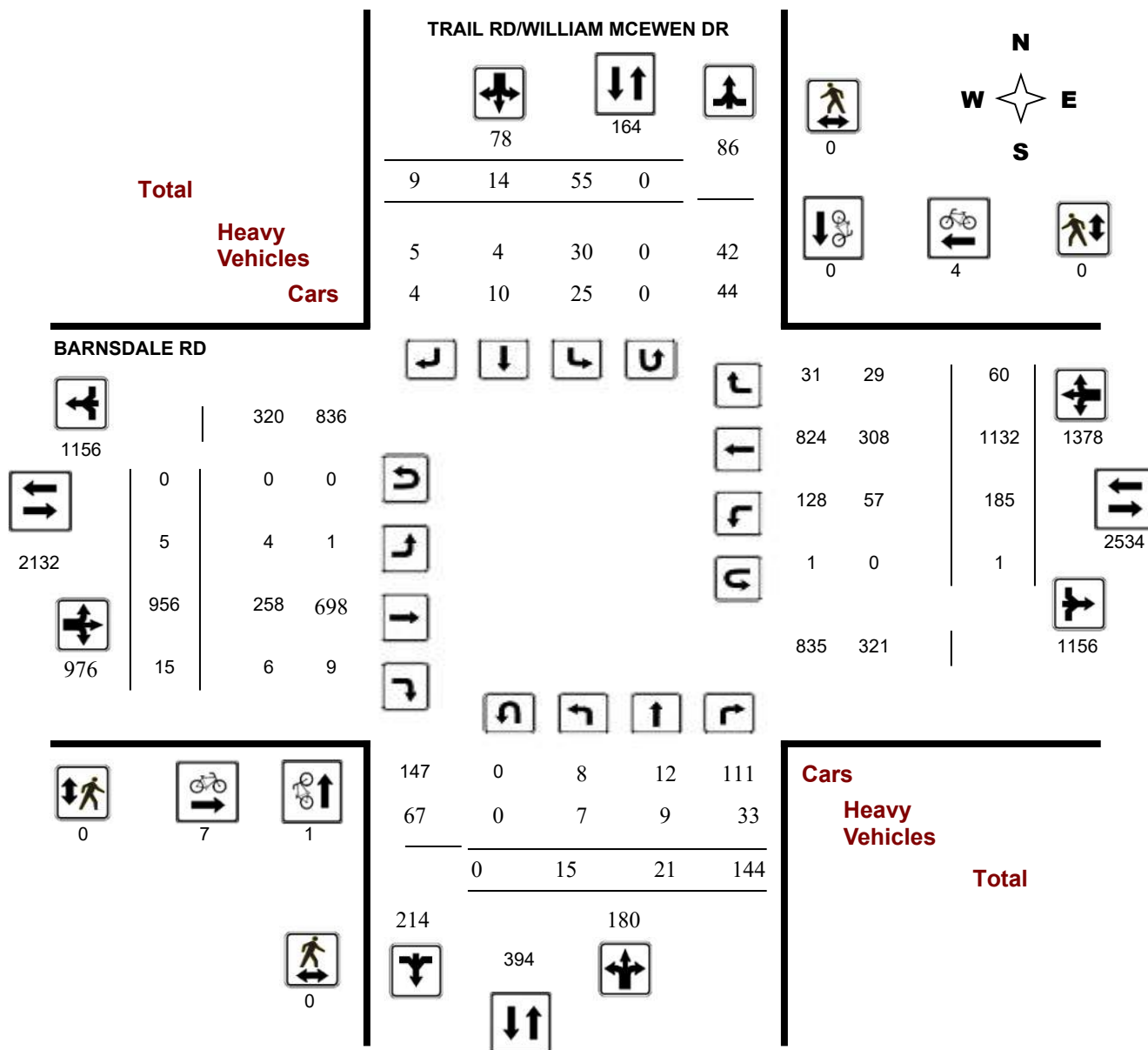
Survey Date: Monday, July 26, 2021

Start Time: 07:00

WO No: 39868

Device: Miovision

Full Study Diagram



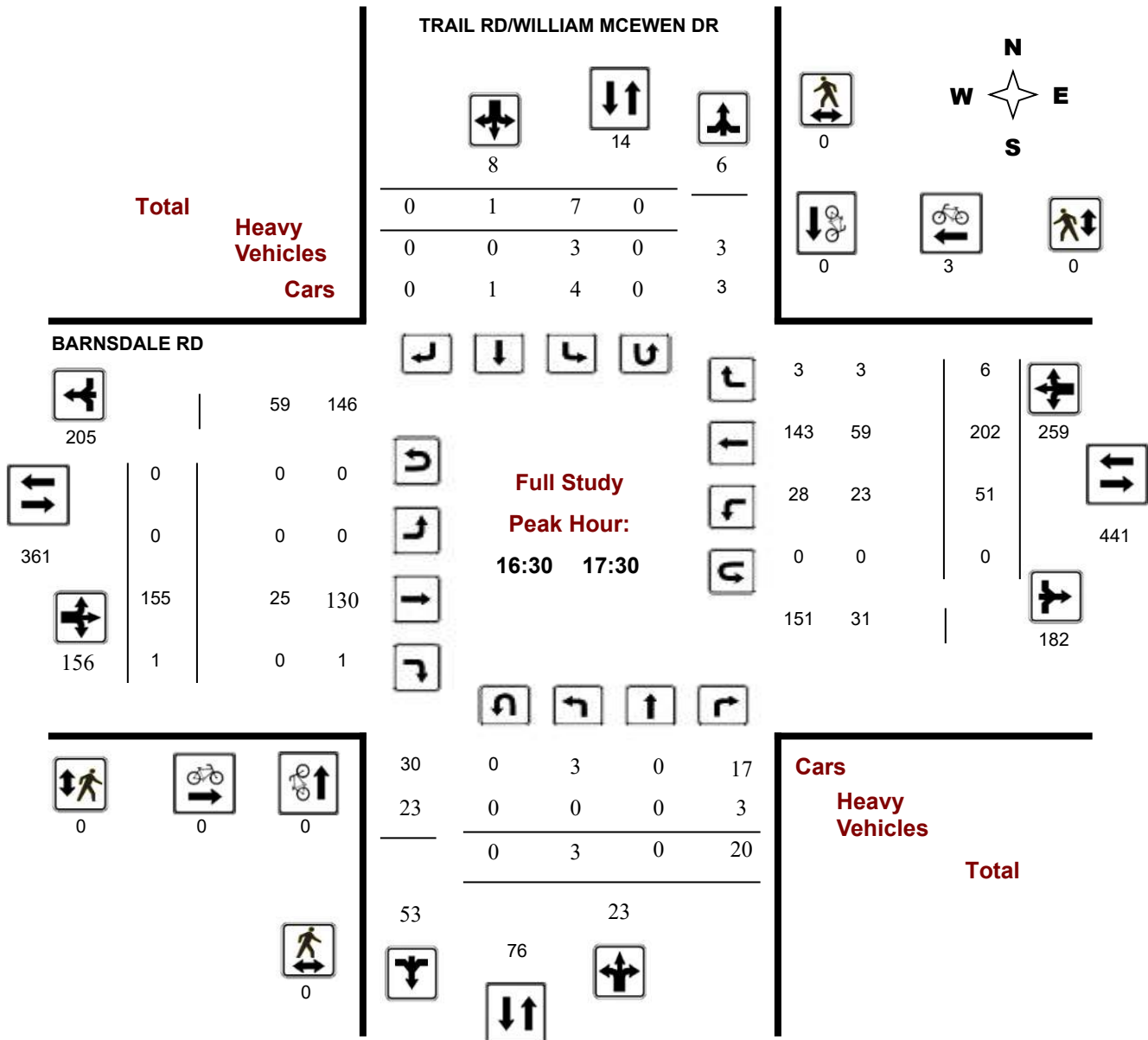
Survey Date: Monday, July 26, 2021

WO No: 39868

Start Time: 07:00

Device: Miovision

Full Study Peak Hour Diagram



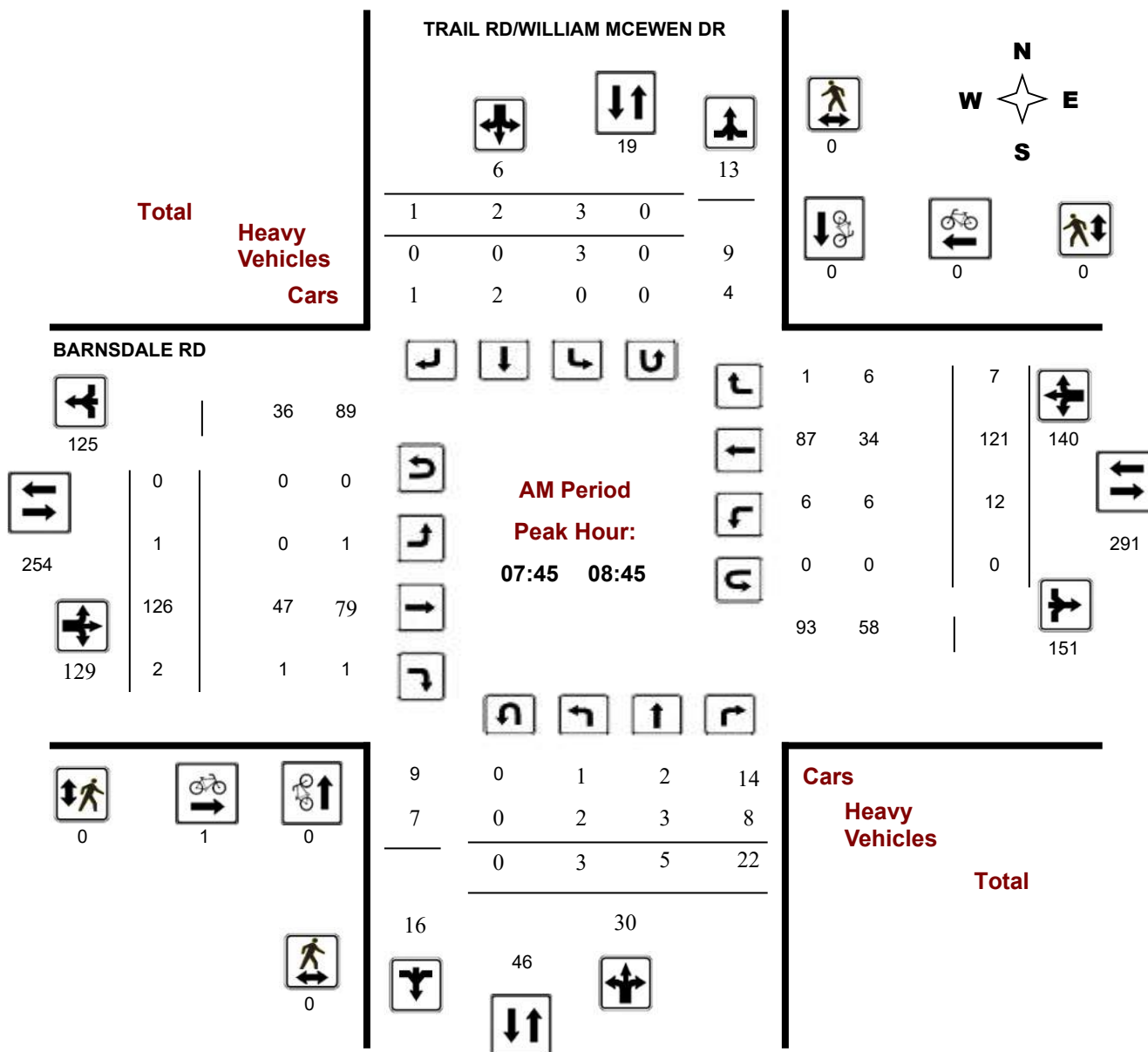
Survey Date: Monday, July 26, 2021

WO No: 39868

Start Time: 07:00

Device: Miovision

AM Period Peak Hour Diagram



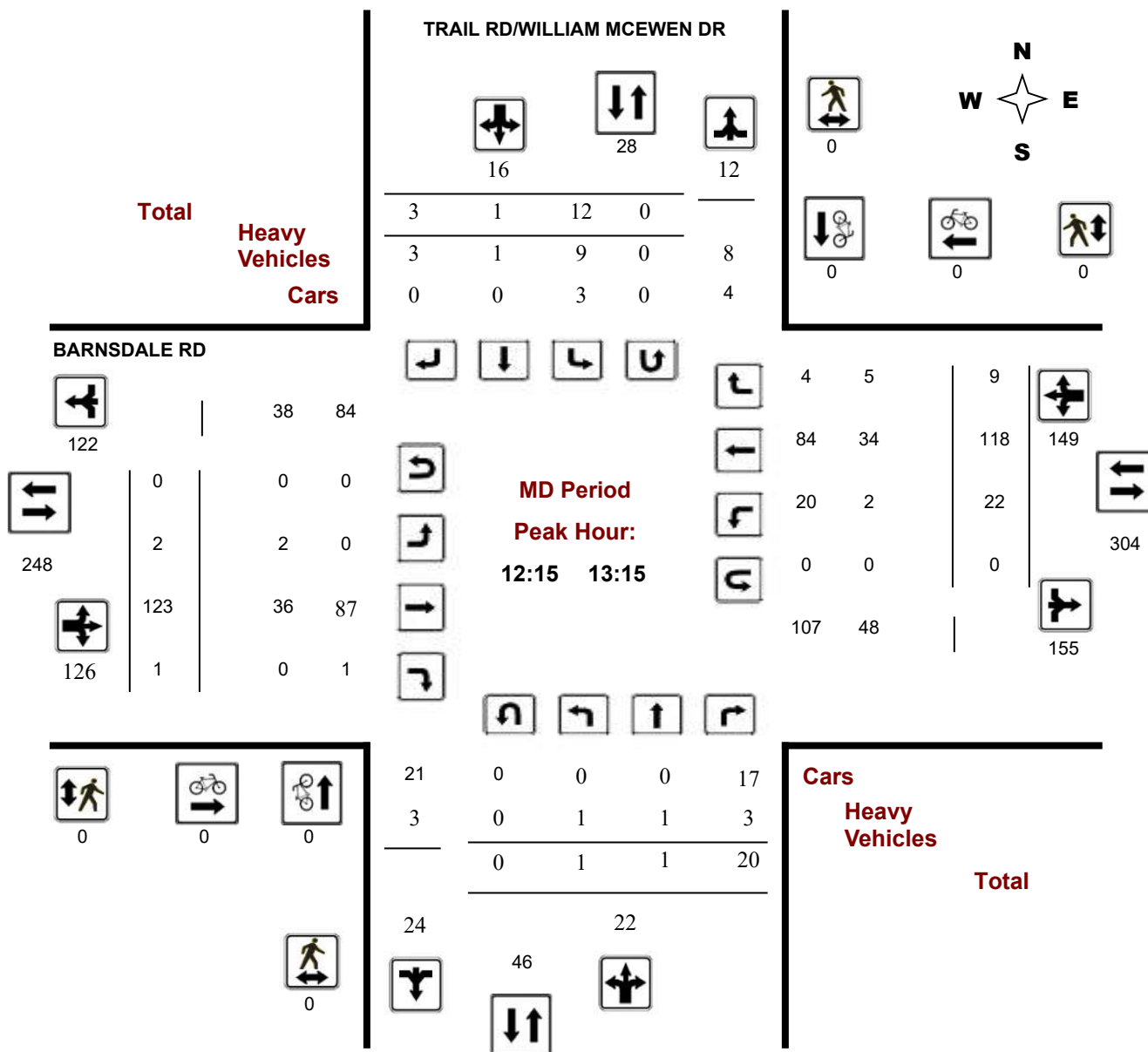
Survey Date: Monday, July 26, 2021

WO No: 39868

Start Time: 07:00

Device: Miovision

MD Period Peak Hour Diagram



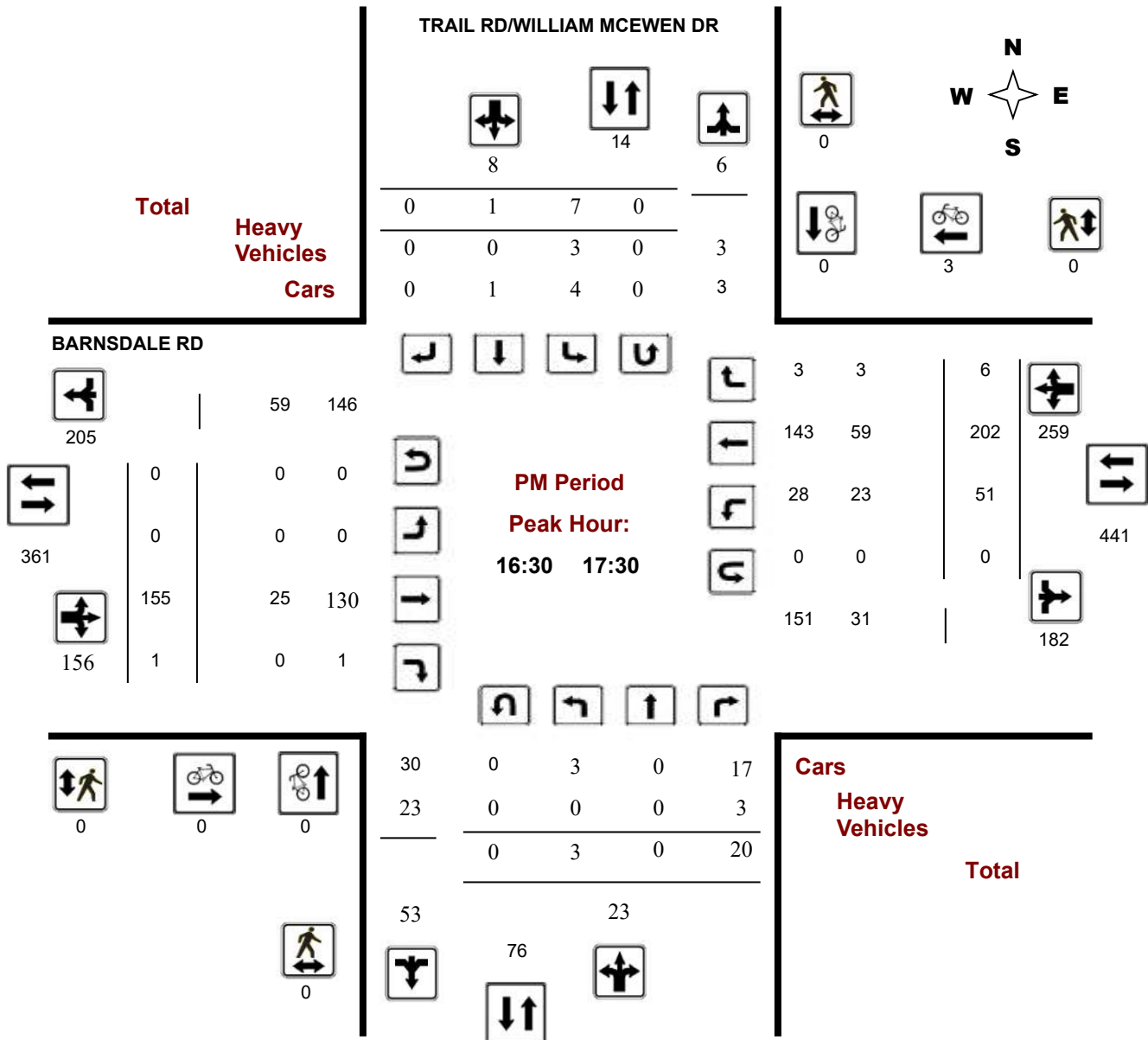
Survey Date: Monday, July 26, 2021

WO No: 39868

Start Time: 07:00

Device: Miovision

PM Period Peak Hour Diagram





Transportation Services - Traffic Services

Turning Movement Count - Study Results

BARNSDALE RD @ TRAIL RD/WILLIAM MCEWEN DR

Survey Date: Monday, July 26, 2021

WO No: 39868

Start Time: 07:00

Device: Miovision

Full Study Summary (8 HR Standard)

Survey Date: Monday, July 26, 2021

Total Observed U-Turns

AADT Factor

Northbound: 0 Southbound: 0

1.00

Eastbound: 0 Westbound: 1

TRAIL RD/WILLIAM MCEWEN DR

BARNSDALE RD

Period	Northbound					Southbound					Eastbound					Westbound					Grand Total
	LT	ST	RT	NB TOT		LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT		LT	ST	RT	WB TOT	STR TOT	
07:00 08:00	2	4	20	26		6	0	1	7	33	1	111	1	113		11	113	5	129	242	275
08:00 09:00	3	6	16	25		0	2	1	3	28	1	119	3	123		13	130	7	150	273	301
09:00 10:00	1	3	24	28		6	3	0	9	37	1	84	2	87		18	105	9	132	219	256
11:30 12:30	2	1	11	14		10	0	3	13	27	0	104	0	104		11	107	6	124	228	255
12:30 13:30	1	3	19	23		8	2	2	12	35	2	118	1	121		27	115	11	153	274	309
15:00 16:00	0	1	23	24		5	3	1	9	33	0	140	3	143		31	196	10	237	380	413
16:00 17:00	5	2	17	24		11	2	0	13	37	0	153	2	155		36	208	7	251	406	443
17:00 18:00	1	1	14	16		9	2	1	12	28	0	127	3	130		38	158	5	201	331	359
Sub Total	15	21	144	180		55	14	9	78	258	5	956	15	976		185	1132	60	1377	2353	2611
U Turns				0					0	0				0					1	1	1
Total	15	21	144	180		55	14	9	78	258	5	956	15	976		185	1132	60	1378	2354	2612
EQ 12Hr	21	29	200	250		76	19	13	108	359	7	1329	21	1357		257	1573	83	1915	3272	3631

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

1.39

AVG 12Hr	21	29	200	250		76	25	16	108	359	7	1329	21	1357		257	1573	83	1915	3272	3631
-----------------	----	----	-----	-----	--	----	----	----	-----	-----	---	------	----	------	--	-----	------	----	------	------	------

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

1.00

AVG 24Hr	28	38	262	328		100	33	21	141	470	9	1741	28	1778		337	2061	109	2509	4286	4757
-----------------	----	----	-----	-----	--	-----	----	----	-----	-----	---	------	----	------	--	-----	------	-----	------	------	------

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

1.31

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



Transportation Services - Traffic Services

Turning Movement Count - Study Results

BARNSDALE RD @ TRAIL RD/WILLIAM MCEWEN DR

Survey Date: Monday, July 26, 2021

WO No: 39868

Start Time: 07:00

Device: Miovision

Full Study 15 Minute Increments

TRAIL RD/WILLIAM MCEWEN DR

BARNSDALE RD

Northbound

Southbound

Eastbound

Westbound

Time Period	LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00 07:15	2	0	6	8	0	0	1	1	9	1	29	0	30	5	29	0	34	64	73
07:15 07:30	0	1	6	7	1	0	0	1	8	0	29	0	29	3	21	2	26	55	63
07:30 07:45	0	2	1	3	2	0	0	2	5	0	23	1	24	1	38	1	40	64	69
07:45 08:00	0	1	7	8	3	0	0	3	11	0	30	0	30	2	25	2	29	59	70
08:00 08:15	3	0	6	9	0	2	0	2	11	0	28	0	28	2	30	2	34	62	73
08:15 08:30	0	0	6	6	0	0	0	0	6	1	39	2	42	5	35	1	41	83	89
08:30 08:45	0	4	3	7	0	0	1	1	8	0	29	0	29	3	31	2	36	65	73
08:45 09:00	0	2	1	3	0	0	0	0	3	0	23	1	24	3	34	2	39	63	66
09:00 09:15	0	0	5	5	2	0	0	2	7	0	20	0	20	8	25	3	36	56	63
09:15 09:30	0	0	7	7	1	0	0	1	8	1	22	1	24	2	31	2	35	59	67
09:30 09:45	0	3	9	12	2	2	0	4	16	0	23	1	24	4	25	4	33	57	73
09:45 10:00	1	0	3	4	1	1	0	2	6	0	19	0	19	4	24	0	28	47	53
11:30 11:45	1	0	3	4	1	0	0	1	5	0	19	0	19	1	24	1	26	45	50
12:00 12:15	0	0	2	2	2	0	1	3	5	0	22	0	22	4	27	1	33	55	60
17:45 18:00	0	0	0	0	5	2	0	7	7	0	28	0	28	0	28	1	29	57	64
17:30 17:45	0	1	2	3	1	0	1	2	5	0	21	2	23	7	40	1	48	71	76
11:45 12:00	1	1	2	4	2	0	0	2	6	0	36	0	36	3	29	2	34	70	76
12:15 12:30	0	0	4	4	5	0	2	7	11	0	27	0	27	3	27	2	32	59	70
12:30 12:45	0	0	4	4	3	0	0	3	7	2	43	0	45	5	34	4	43	88	95
12:45 13:00	1	1	9	11	1	0	0	1	12	0	28	0	28	11	30	2	43	71	83
13:00 13:15	0	0	3	3	3	1	1	5	8	0	25	1	26	3	27	1	31	57	65
13:15 13:30	0	2	3	5	1	1	1	3	8	0	22	0	22	8	24	4	36	58	66
15:00 15:15	0	1	5	6	0	1	1	2	8	0	33	1	34	5	44	1	50	84	92
15:15 15:30	0	0	4	4	0	0	0	0	4	0	34	1	35	7	48	2	57	92	96
15:30 15:45	0	0	6	6	4	1	0	5	11	0	29	1	30	9	59	5	73	103	114
16:15 16:30	1	2	5	8	4	0	0	4	12	0	42	1	43	9	45	1	55	98	110
16:45 17:00	2	0	5	7	2	1	0	3	10	0	51	0	51	9	52	0	61	112	122
17:00 17:15	0	0	7	7	2	0	0	2	9	0	34	0	34	19	41	1	61	95	104
17:15 17:30	1	0	5	6	1	0	0	1	7	0	44	1	45	12	49	2	63	108	115
15:45 16:00	0	0	8	8	1	1	0	2	10	0	44	0	44	10	45	2	57	101	111
16:00 16:15	2	0	4	6	3	1	0	4	10	0	34	1	35	7	51	3	61	96	106
16:30 16:45	0	0	3	3	2	0	0	2	5	0	26	0	26	11	60	3	74	100	105
Total:	15	21	144	180	55	14	9	78	258	5	956	15	976	185	1132	60	1378	2354	2,612

Note: U-Turns are included in Totals.



Transportation Services - Traffic Services

Turning Movement Count - Study Results

BARNSDALE RD @ TRAIL RD/WILLIAM MCEWEN DR

Survey Date: Monday, July 26, 2021

WO No: 39868

Start Time: 07:00

Device: Miovision

Full Study Cyclist Volume

TRAIL RD/WILLIAM MCEWEN DR

BARNSDALE RD

Time Period		Northbound	Southbound	Street Total	Eastbound	Westbound	Street 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	1	0	1	1
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	0	0	0	0	0	0	0
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	1	1	1
09:45	10:00	0	0	0	0	0	0	0
11:30	11:45	1	0	1	1	0	1	2
12:00	12:15	0	0	0	0	0	0	0
17:45	18:00	0	0	0	1	0	1	1
17:30	17:45	0	0	0	0	0	0	0
11:45	12:00	0	0	0	2	0	2	2
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	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
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	1	0	1	1
16:15	16:30	0	0	0	0	0	0	0
16:45	17:00	0	0	0	0	1	1	1
17:00	17:15	0	0	0	0	2	2	2
17:15	17:30	0	0	0	0	0	0	0
15:45	16:00	0	0	0	1	0	1	1
16:00	16:15	0	0	0	0	0	0	0
16:30	16:45	0	0	0	0	0	0	0
Total		1	0	1	7	4	11	12



Transportation Services - Traffic Services

Turning Movement Count - Study Results

BARNSDALE RD @ TRAIL RD/WILLIAM MCEWEN DR

Survey Date: Monday, July 26, 2021

WO No: 39868

Start Time: 07:00

Device: Miovision

Full Study Pedestrian Volume

TRAIL RD/WILLIAM MCEWEN DR

BARNSDALE RD

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	0	0	0	0	0	0	0
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
12:00 12:15	0	0	0	0	0	0	0
17:45 18:00	0	0	0	0	0	0	0
17:30 17:45	0	0	0	0	0	0	0
11:45 12:00	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	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
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
16:15 16:30	0	0	0	0	0	0	0
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
15:45 16:00	0	0	0	0	0	0	0
16:00 16:15	0	0	0	0	0	0	0
16:30 16:45	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0



Transportation Services - Traffic Services

Turning Movement Count - Study Results

BARNSDALE RD @ TRAIL RD/WILLIAM MCEWEN DR

Survey Date: Monday, July 26, 2021

WO No: 39868

Start Time: 07:00

Device: Miovision

Full Study Heavy Vehicles

TRAIL RD/WILLIAM MCEWEN DR

BARNSDALE RD

Northbound

Southbound

Eastbound

Westbound

Time Period	LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00 07:15	1	0	2	3	0	0	1	1	4	1	10	0	11	1	11	0	12	23	27
07:15 07:30	0	0	3	3	1	0	0	1	4	0	11	0	11	0	8	0	8	19	23
07:30 07:45	0	0	0	0	0	0	0	0	0	0	8	0	8	1	14	1	16	24	24
07:45 08:00	0	0	2	2	3	0	0	3	5	0	9	0	9	0	6	2	8	17	22
08:00 08:15	2	0	4	6	0	0	0	0	6	0	11	0	11	2	10	2	14	25	31
08:15 08:30	0	0	2	2	0	0	0	0	2	0	17	1	18	2	12	0	14	32	34
08:30 08:45	0	3	0	3	0	0	0	0	3	0	10	0	10	2	6	2	10	20	23
08:45 09:00	0	1	0	1	0	0	0	0	1	0	8	1	9	0	8	1	9	18	19
09:00 09:15	0	0	1	1	1	0	0	1	2	0	6	0	6	0	9	2	11	17	19
09:15 09:30	0	0	1	1	1	0	0	1	2	1	7	0	8	0	8	1	9	17	19
09:30 09:45	0	2	1	3	1	0	0	1	4	0	10	1	11	0	10	1	11	22	26
09:45 10:00	1	0	1	2	1	1	0	2	4	0	2	0	2	0	5	0	5	7	11
11:30 11:45	0	0	1	1	0	0	0	0	1	0	5	0	5	1	9	1	11	16	17
12:00 12:15	0	0	0	0	0	0	0	0	0	0	5	0	5	0	4	0	4	9	9
17:45 18:00	0	0	0	0	3	0	0	3	3	0	7	0	7	0	4	1	5	12	15
17:30 17:45	0	0	0	0	1	0	1	2	2	0	3	0	3	3	7	1	11	14	16
11:45 12:00	1	0	0	1	1	0	0	1	2	0	9	0	9	1	9	1	11	20	22
12:15 12:30	0	0	0	0	4	0	2	6	6	0	8	0	8	0	7	0	7	15	21
12:30 12:45	0	0	0	0	1	0	0	1	1	2	10	0	12	1	14	4	19	31	32
12:45 13:00	1	1	2	4	1	0	0	1	5	0	13	0	13	1	4	1	6	19	24
13:00 13:15	0	0	1	1	3	1	1	5	6	0	5	0	5	0	9	0	9	14	20
13:15 13:30	0	1	0	1	0	0	0	0	1	0	5	0	5	2	8	1	11	16	17
15:00 15:15	0	0	2	2	0	1	0	1	3	0	9	0	9	2	8	1	11	20	23
15:15 15:30	0	0	0	0	0	0	0	0	0	0	8	1	9	4	8	0	12	21	21
15:30 15:45	0	0	3	3	1	0	0	1	4	0	10	0	10	5	12	2	19	29	33
16:15 16:30	0	1	0	1	2	0	0	2	3	0	9	1	10	2	13	0	15	25	28
16:45 17:00	0	0	0	0	0	0	0	0	0	0	9	0	9	4	11	0	15	24	24
17:00 17:15	0	0	2	2	2	0	0	2	4	0	3	0	3	10	16	0	26	29	33
17:15 17:30	0	0	0	0	1	0	0	1	1	0	9	0	9	5	13	1	19	28	29
15:45 16:00	0	0	3	3	0	0	0	0	3	0	11	0	11	3	10	1	14	25	28
16:00 16:15	1	0	1	2	2	1	0	3	5	0	7	1	8	1	16	0	17	25	30
16:30 16:45	0	0	1	1	0	0	0	0	1	0	4	0	4	4	19	2	25	29	30
Total: None	7	9	33	49	30	4	5	39	88	4	258	6	268	57	308	29	394	662	750



Transportation Services - Traffic Services

Turning Movement Count - Study Results

BARNSDALE RD @ TRAIL RD/WILLIAM MCEWEN DR

Survey Date: Monday, July 26, 2021

WO No: 39868

Start Time: 07:00

Device: Miovision

Full Study 15 Minute U-Turn Total

TRAIL RD/WILLIAM MCEWEN DR

BARNSDALE RD

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	0	0	0
12:00	12:15	0	0	0	1	1
17:45	18:00	0	0	0	0	0
17:30	17:45	0	0	0	0	0
11:45	12:00	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
16:15	16:30	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
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:30	16:45	0	0	0	0	0
Total		0	0	0	1	1

Appendix C

Synchro Intersection Worksheets – Existing Conditions

Intersection						
Int Delay, s/veh	3.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	90	161	142	99	66	50
Future Vol, veh/h	90	161	142	99	66	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	3	3	2	2	4
Mvmt Flow	100	179	158	110	73	56
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	268	0	-	0	592	213
Stage 1	-	-	-	-	213	-
Stage 2	-	-	-	-	379	-
Critical Hdwy	4.12	-	-	-	6.42	6.24
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.336
Pot Cap-1 Maneuver	1296	-	-	-	469	822
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	692	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1296	-	-	-	429	822
Mov Cap-2 Maneuver	-	-	-	-	429	-
Stage 1	-	-	-	-	752	-
Stage 2	-	-	-	-	692	-
Approach	EB	WB		SB		
HCM Control Delay, s	2.9	0		13.7		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1296	-	-	-	540	
HCM Lane V/C Ratio	0.077	-	-	-	0.239	
HCM Control Delay (s)	8	0	-	-	13.7	
HCM Lane LOS	A	A	-	-	B	
HCM 95th %tile Q(veh)	0.2	-	-	-	0.9	

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	126	2	12	121	7	3	5	22	3	2	1
Future Vol, veh/h	1	126	2	12	121	7	3	5	22	3	2	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	140	2	13	134	8	3	6	24	3	2	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	142	0	0	142	0	0	309	311	141	322	308	138
Stage 1	-	-	-	-	-	-	143	143	-	164	164	-
Stage 2	-	-	-	-	-	-	166	168	-	158	144	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1441	-	-	1193	-	-	534	519	824	480	606	910
Stage 1	-	-	-	-	-	-	727	680	-	653	762	-
Stage 2	-	-	-	-	-	-	705	662	-	659	778	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1441	-	-	1193	-	-	527	512	824	457	598	910
Mov Cap-2 Maneuver	-	-	-	-	-	-	527	512	-	457	598	-
Stage 1	-	-	-	-	-	-	726	679	-	652	753	-
Stage 2	-	-	-	-	-	-	694	654	-	634	777	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.7			10.3			11.7		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	712	1441	-	-	1193	-	-	545				
HCM Lane V/C Ratio	0.047	0.001	-	-	0.011	-	-	0.012				
HCM Control Delay (s)	10.3	7.5	0	-	8.1	0	-	11.7				
HCM Lane LOS	B	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0				

Intersection						
Int Delay, s/veh	5.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	64	187	209	107	122	103
Future Vol, veh/h	64	187	209	107	122	103
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	5	5	2	3	6
Mvmt Flow	71	208	232	119	136	114
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	351	0	-	0	642	292
Stage 1	-	-	-	-	292	-
Stage 2	-	-	-	-	350	-
Critical Hdwy	4.12	-	-	-	6.43	6.26
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.218	-	-	-	3.527	3.354
Pot Cap-1 Maneuver	1208	-	-	-	437	738
Stage 1	-	-	-	-	756	-
Stage 2	-	-	-	-	711	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1208	-	-	-	408	738
Mov Cap-2 Maneuver	-	-	-	-	408	-
Stage 1	-	-	-	-	706	-
Stage 2	-	-	-	-	711	-
Approach	EB	WB		SB		
HCM Control Delay, s	2.1	0		18.5		
HCM LOS				C		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1208	-	-	-	513	
HCM Lane V/C Ratio	0.059	-	-	-	0.487	
HCM Control Delay (s)	8.2	0	-	-	18.5	
HCM Lane LOS	A	A	-	-	C	
HCM 95th %tile Q(veh)	0.2	-	-	-	2.6	

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	155	1	51	202	6	3	0	20	7	1	0
Future Vol, veh/h	0	155	1	51	202	6	3	0	20	7	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	16	2	45	29	50	2	2	15	43	2	2
Mvmt Flow	0	172	1	57	224	7	3	0	22	8	1	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	231	0	0	173	0	0	515	518	173	526	515	228
Stage 1	-	-	-	-	-	-	173	173	-	342	342	-
Stage 2	-	-	-	-	-	-	342	345	-	184	173	-
Critical Hdwy	4.12	-	-	4.55	-	-	7.12	6.52	6.35	7.53	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.53	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.53	5.52	-
Follow-up Hdwy	2.218	-	-	2.605	-	-	3.518	4.018	3.435	3.887	4.018	3.318
Pot Cap-1 Maneuver	1337	-	-	1182	-	-	470	462	838	404	464	811
Stage 1	-	-	-	-	-	-	829	756	-	596	638	-
Stage 2	-	-	-	-	-	-	673	636	-	731	756	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1337	-	-	1182	-	-	449	437	838	377	438	811
Mov Cap-2 Maneuver	-	-	-	-	-	-	449	437	-	377	438	-
Stage 1	-	-	-	-	-	-	829	756	-	596	603	-
Stage 2	-	-	-	-	-	-	635	601	-	712	756	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			1.6			9.9			14.6		
HCM LOS							A			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	753	1337	-	-	1182	-	-	384				
HCM Lane V/C Ratio	0.034	-	-	-	0.048	-	-	0.023				
HCM Control Delay (s)	9.9	0	-	-	8.2	0	-	14.6				
HCM Lane LOS	A	A	-	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.1	0	-	-	0.2	-	-	0.1				

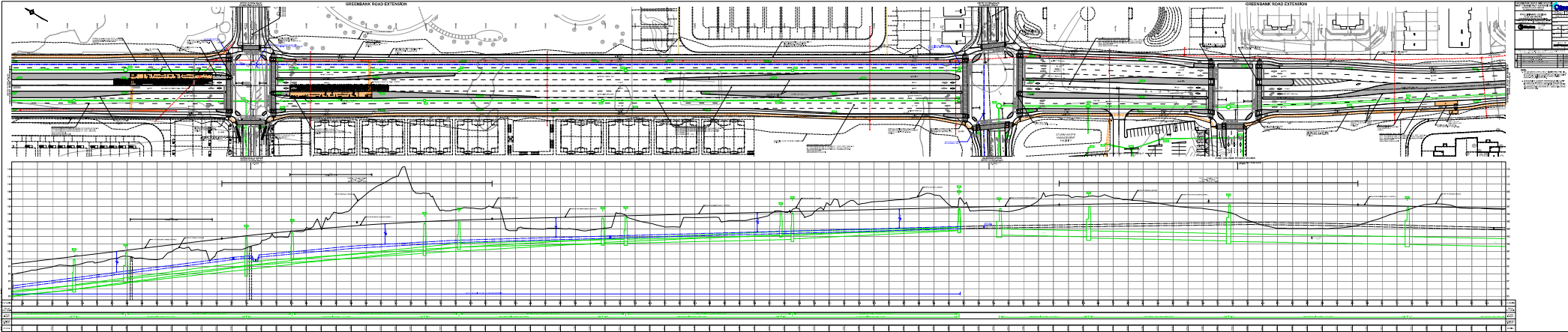
Appendix D

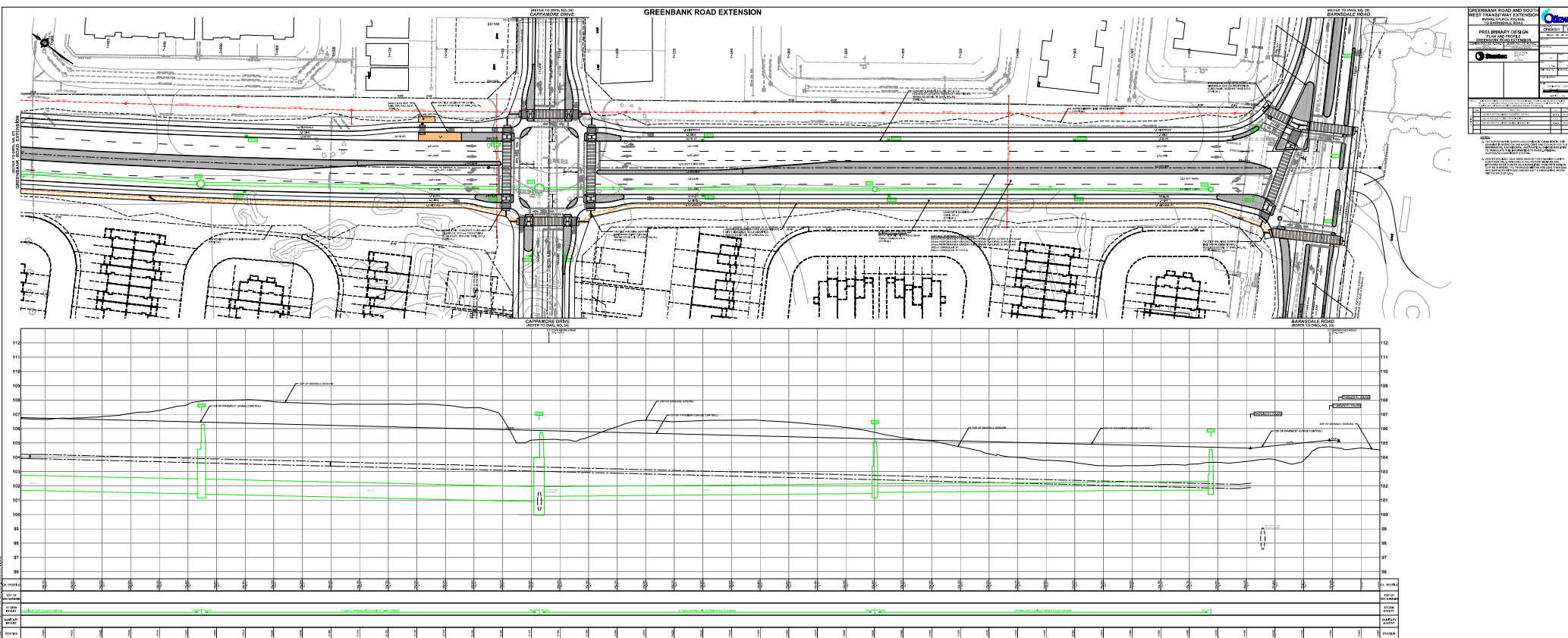
Collision Data

Accident Date	Accident Year	Accident Time	Location	Environment Condition	Light	Traffic Control	Traffic Control Condition	Classification Of Accident	Initial Impact Type	Road Surface Condition	# Vehicles	# Motorcycles	# Bicycles	# Pedestrians
2018-01-10	2018	12:13	BARNSDALE RD @ BORRISOKANE RD (0001077)	01 - Clear	01 - Daylight	02 - Stop sign	0	02 - Non-fatal injury	02 - Angle	01 - Dry	2	0	0	0
2018-04-08	2018	0:20	BARNSDALE RD @ BORRISOKANE RD (0001077)	01 - Clear	07 - Dark	02 - Stop sign	0	02 - Non-fatal injury	02 - Angle	01 - Dry	2	0	0	0
2019-10-25	2019	15:10	BARNSDALE RD @ BORRISOKANE RD (0001077)	01 - Clear	01 - Daylight	02 - Stop sign	0	03 - P.D. only	02 - Angle	01 - Dry	2	0	0	0
2020-07-13	2020	18:41	BARNSDALE RD @ BORRISOKANE RD (0001077)	01 - Clear	01 - Daylight	02 - Stop sign	0	02 - Non-fatal injury	02 - Angle	01 - Dry	2	0	0	0
2022-11-15	2022	11:45	BARNSDALE RD @ BORRISOKANE RD (0001077)	01 - Clear	01 - Daylight	02 - Stop sign	0	02 - Non-fatal injury	02 - Angle	01 - Dry	2	0	0	0
2019-10-11	2019	13:49	BARNSDALE RD @ TRAIL RD/WILLIAM MCEWEN DR (0001066)	01 - Clear	01 - Daylight	02 - Stop sign	0	02 - Non-fatal injury	05 - Turning movement	01 - Dry	3	0	0	0
2019-12-31	2019	16:43	BARNSDALE RD @ TRAIL RD/WILLIAM MCEWEN DR (0001066)	03 - Snow	05 - Dusk	02 - Stop sign	0	03 - P.D. only	04 - Sideswipe	03 - Loose snow	2	0	0	0
2022-04-19	2022	8:45	BARNSDALE RD @ TRAIL RD/WILLIAM MCEWEN DR (0001066)	02 - Rain	01 - Daylight	02 - Stop sign	0	03 - P.D. only	02 - Angle	02 - Wet	2	0	0	0
2022-10-26	2022	15:45	BARNSDALE RD btwn BORRISOKANE RD & VIEWBANK RD (_32077D)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2019-05-21	2019	10:31	BARNSDALE RD btwn VIEWBANK RD & GREENBANK RD (_320635)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	07 - SMV other	01 - Dry	1	0	0	0
2020-11-03	2020	18:45	BARNSDALE RD btwn VIEWBANK RD & GREENBANK RD (_320635)	01 - Clear	07 - Dark	10 - No control	0	03 - P.D. only	07 - SMV other	02 - Wet	1	0	0	0

Appendix E

Realigned Greenbank Road Preliminary Design





Appendix F

Interim and Ultimate Recommended Plan and Borrisokane Realignment Options

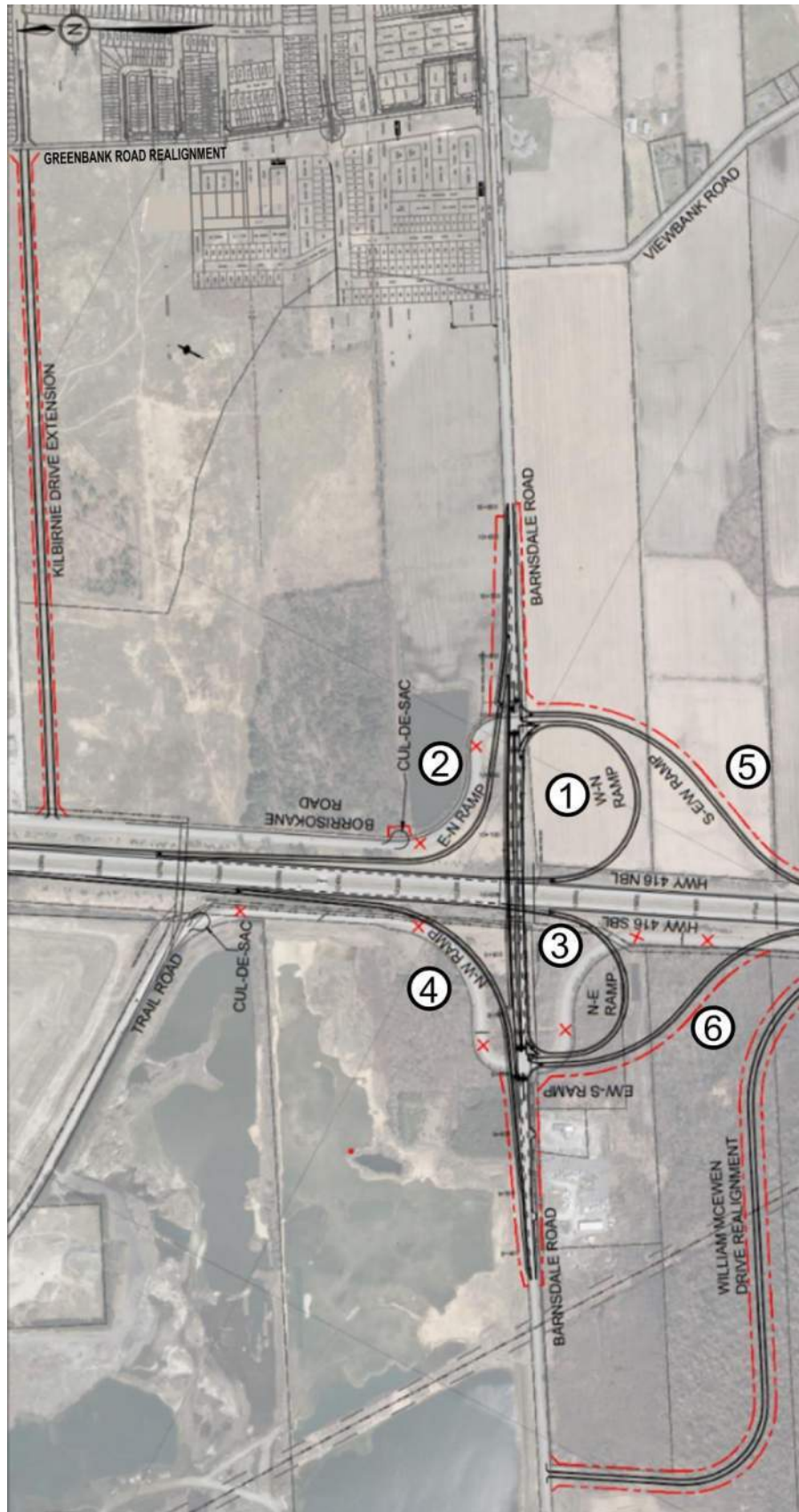


Figure 3: Ultimate Recommended Plan



Figure 6: Interim Recommended Plan

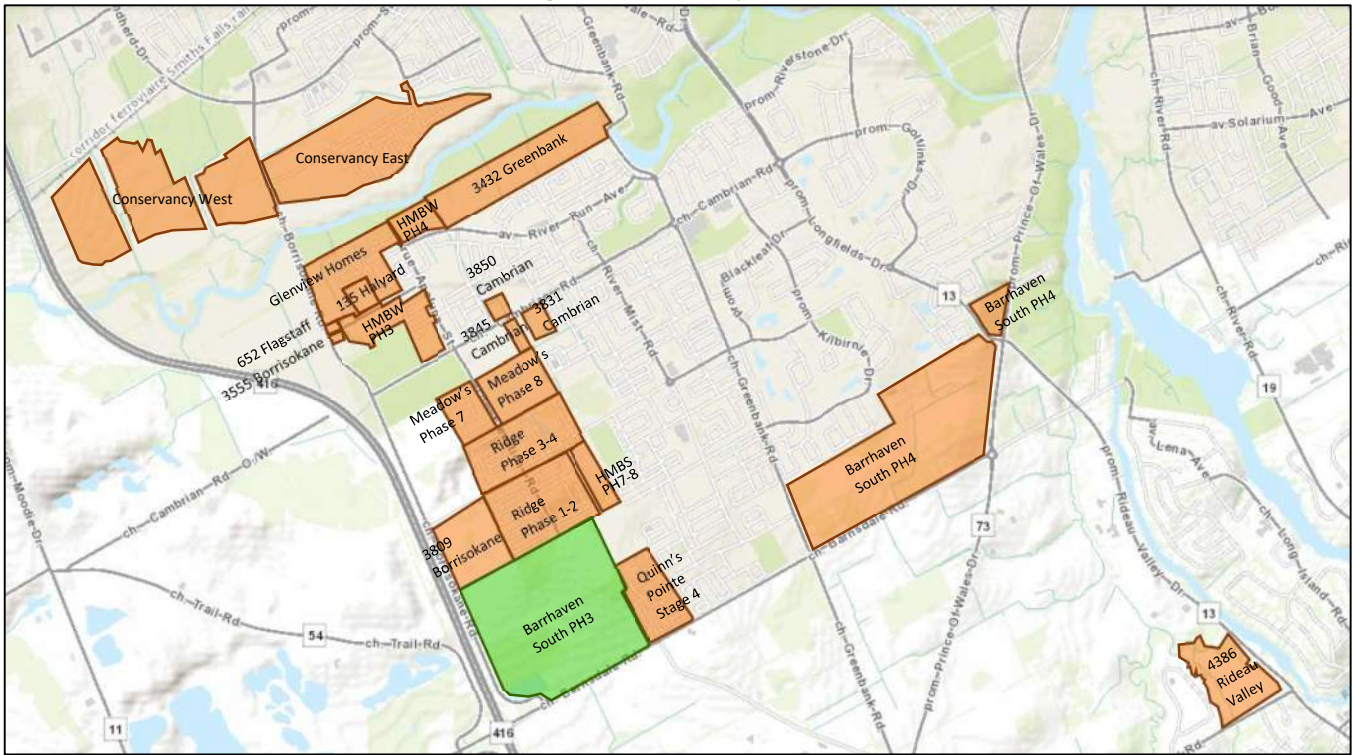


Figure 7: Borrisokane Realignment Options

Appendix G

Study Area Developments

Figure 2: Area Developments



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: March 15, 2024

Table D1: Area Development Details

#	Development	Application Type	Size	Build-Out Date	Estimated Completion	TIA Author
1	Caivan's Conservancy East	- ZBA - PoS	600 single family homes 600 townhouses 100 mid-rise dwelling units	2029	0%	CGH Transportation, 2021
2	Caivan's Conservancy West	- ZBA - PoS	462 single family homes 499 townhouses	2030	0%	CGH Transportation, 2022
3	Glenview Homes	PoS	116 single family homes 92 townhomes	2024	90%	Stantec, 2017 Addendum, 2017
4	652 Flagstaff Drive	SPA	14,631 sq. ft of commercial space	2025	0%	CGH Transportation, 2024
5	Mattamy's Half Moon Bay West Phase 4	PoS	59 detached single-family homes	2026	0%	Stantec, 2016 Addendum, 2019
6	3432 Greenbank Road	PoS	100 single family homes 425 townhomes	2024	0%	CGH Transportation, 2022
7	3555 Borrisokane Road	SPA	a car wash	2024	0%	D. J. Halpenny & Associates Ltd, 2022
8	Mattamy's Half Moon Bay West Phase 3	PoS	38 detached single-family homes 190 townhomes 0.43-hectare commercial block	2025	80%	CGH Transportation, 2021
9	3850 Cambrian Road	SPA	17,000 sq. ft pharmacy 18,781 sq. ft retail	2024	0%	CGH Transportation, 2023
10	3845 Cambrian Road	SPA	28,000 sq. ft. grocery store 5,430 sq. ft. retail store	2025	0%	CGH Transportation, 2025
11	3831 Cambrian Road	SPA	4,024 sq. m supermarket 929 sq. m retail store 830 sq. m retail building 1,060 sq. m mixed-use building	2023	0%	CGH Transportation, 2021
12	Meadow's Phase 7-8	PoS	221 townhouses 125 single family units	2025	20%	IBI, 2018
13	Caivan's Ridge Phases 1-2	- ZBA - PoS	279 townhouse units 311 detached home units	2025	75%	CGH Transportation, 2019
14	Caivan's Ridge Phase 3-4	- ZBA - PoS	642 townhome units 61 detached dwellings	2025	0%	CGH Transportation, 2021 Addendum, 2023

#	Development	Application Type	Size	Build-Out Date	Estimated Completion	TIA Author
15	Mattamy's Half Moon Bay South Phase 8	• SPA	• 228 stacked townhouse units	2024	0%	CGH Transportation, 2022
16	Mattamy's Half Moon Bay South Phase 7	• SPA	• 90 stacked townhouse units	2028	0%	CGH Transportation, 2025
17	Minto's Quinn's Pointe Stage 4	• PoS	• 536 single-family dwelling units • 493 townhomes • 100 apartment units • two elementary schools	2025	50%	Stantec, 2018
18	4386 Rideau Valley Drive	• ZBA • PoS	• 62 single detached houses • 16 semi-detached houses • 69 townhouses	2028	0%	Novatech, 2022
19	3809 Borrisokane	• ZBA	• 705,037 sq. ft light industrial campus	2031	0%	CGH Transportation, 2024
20	135 Halyard Lane	• SPA	• 800 students • 2,970 sq. ft of childcare centre	2024	0%	Dillon Consulting, 2022
21	3555 Borrisokane	• SPA	• 31,360 sq. ft Korean Community Church	2024	0%	Castleglenn Consultants, 2024
22	Barrhaven South Future Neighbourhoods Phase 4	• ZBA • PoS	• Up to 1400 units	2035	0%	CGH Transportation, Ongoing

Road and Haiku Street modifications are expected to be implemented. At the 2036 plus five-year horizon, Realigned Greenbank Road is expected to be implemented. These are the road network conditions that will be considered at the study horizons.

Based on these changes, the existing volumes are expected to change their travel patterns to use the interchange. A 5% shift of the existing volumes to/from the north along Greenbank Road, a 5% shift to/from the north along Prince of Wales Drive, a 5% shift to/from the north along Longfield Drive, and a 10% shift to/from the north along Borrisokane Road have been assigned to the Barnsdale interchange. It is also assumed that 10% of the existing volumes from the rural area west of Highway 416 from Eagleson Road will shift to the Barnsdale interchange.

Once Realigned Greenbank Road has been completed, the remaining 95% shift of the existing volumes to/from the north along Greenbank Road is expected to shift to the new corridor. In addition, based on the review of the TRANS Regional Model, a 30% shift of existing volumes to/from the north along Borrisokane Road have also been assigned to the Realigned Greenbank Road.

7.2.2 Background Growth

Given that all background developments within Barrhaven South have been included in this TIA and would account for the majority of growth in the area, the growths along study area roadways are assumed to be captured within the background development; therefore, no annual growth rate will be applied on study area roadways.

7.2.3 Other Developments

The study area developments were discussed in Section 2.2 and will be considered in the analysis. The developments at Glenview Homes (3387 Borrisokane Road), Mattamy's Half Moon Bay West Phase 4, Meadow's Phase 7-8 (3640 Greenbank Road), Mattamy's Half Moon Bay South Phase 7/8, Minto's Quinn's Pointe Stages 4 (3882 Barnsdale Road and 3960 Greenbank Road), and Caivan's The Ridge Phase 3-4 (3717 Borrisokane Road) trip generation are noted to be updated to the TRANS 2020 methodology.

Given that the interim conditions of the Barnsdale Road interchange are assumed to be completed by 2029, it is anticipated that trips from the background developments will need to be reassigned to this new facility. A total of 30% of the trips assigned to the north from the background developments have been re-assigned to the Barnsdale Road interchange. Due to the closure of Haiku Street, 50% of trips from Caivan's The Ridge Phase 1-2 (3809 Borrisokane Road) have been re-assigned to the Apolune Street /Elevation Road at Cambrian Road intersection, and the resulting trip reduction of previously assigned trips has been reflected in the network. It is noted that 50% of the trips generated by Barrhaven South Phase 4 have been considered at the 2031 build-out horizon and 100% at the 2036 plus five-year horizon. The Barnsdale interchange has been accounted for in the trip distribution of Barrhaven South Phase 4 and 3809 Borrisokane Road development.

Given that Realigned Greenbank Road is assumed to be completed between 2029 and 2037, it is anticipated that trips from the background developments will need to be reassigned to this new facility in the 2036 horizon. Trips from background developments that were previously assigned to the Barnsdale Road interchange are expected to use the Realigned Greenbank Road to access the interchange. Therefore, 70% of the previously assigned trips are reassigned to use Realigned Greenbank and the remaining 30% are assumed to continue using Borrisokane Road to access the interchange.

Trips from background developments that will have direct access to the Realigned Greenbank Road in their ultimate conditions have either been reduced from the network (Mattamy's Half Moon Bay West Phase 4, Mattamy's Half Moon Bay West Phase 3, and Glenview Homes), or reassigned to use Realigned Greenbank Road (3845 Cambrian Road, 3850 Cambrian Road, 3831 Cambrian Road).

Regarding the other background developments within the study area, trips originally assigned to the existing Greenbank Road have been reassigned to the Realigned Greenbank Road, and 30% of the trips originally assigned to Borrisokane Road have been reassigned to the Realigned Greenbank Road.

Figure 22 illustrates the background volumes and Figure 23 and Figure 24 illustrated the re-assignment of the background volumes in the 2031 and 2036 horizons.

Figure 22: Background Volumes

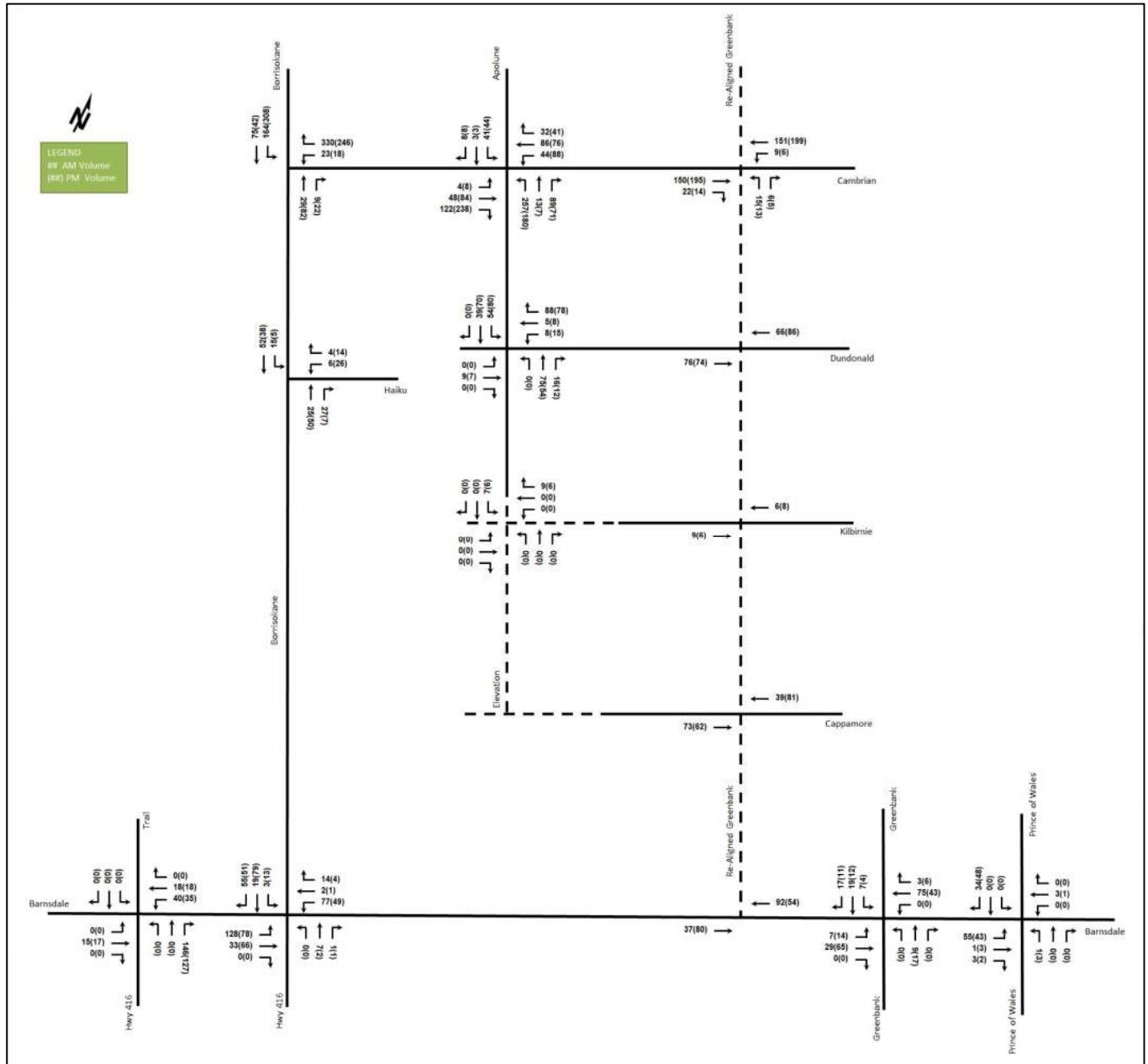


Figure 23: Reassigned Background Volumes-2031

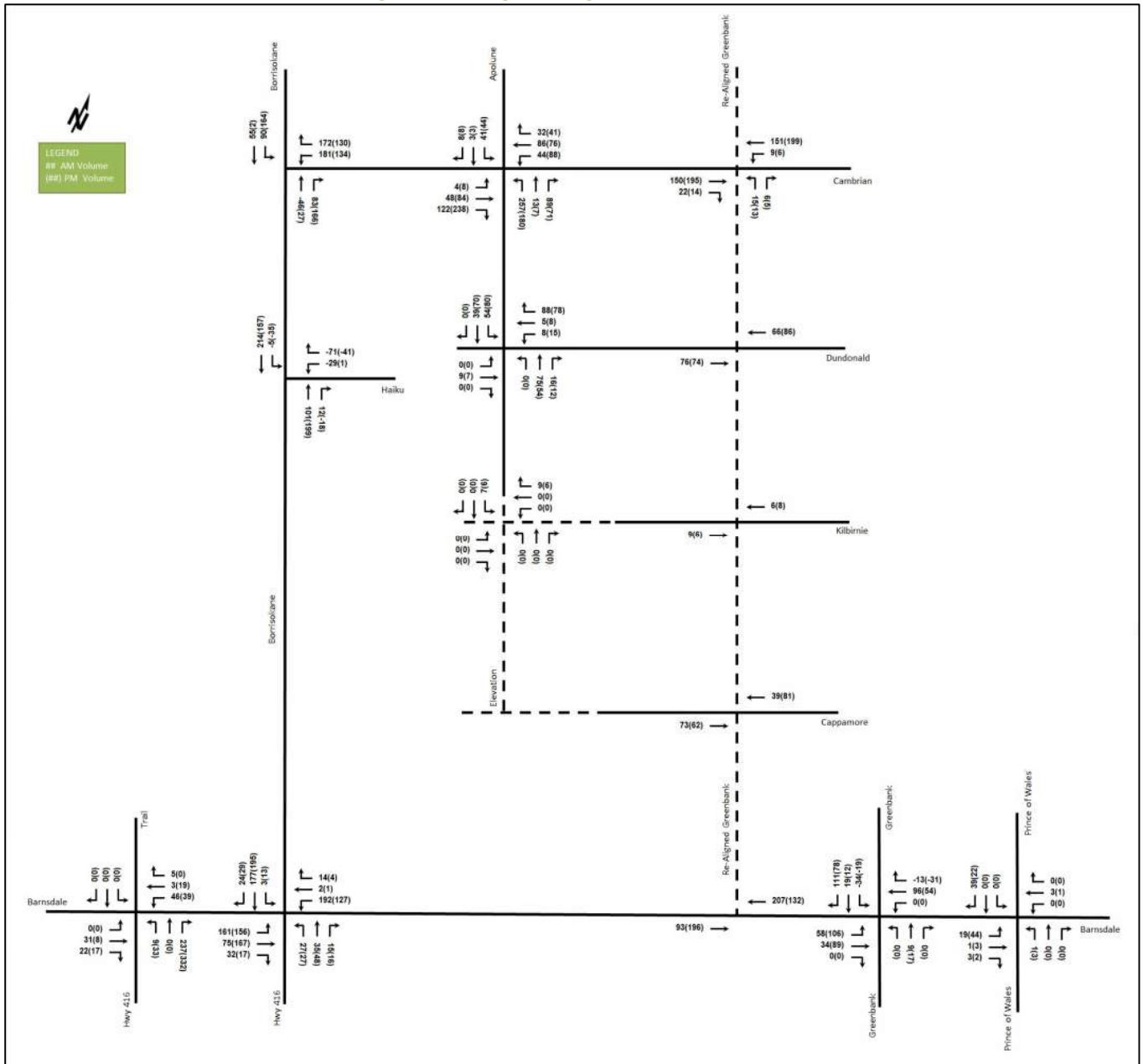
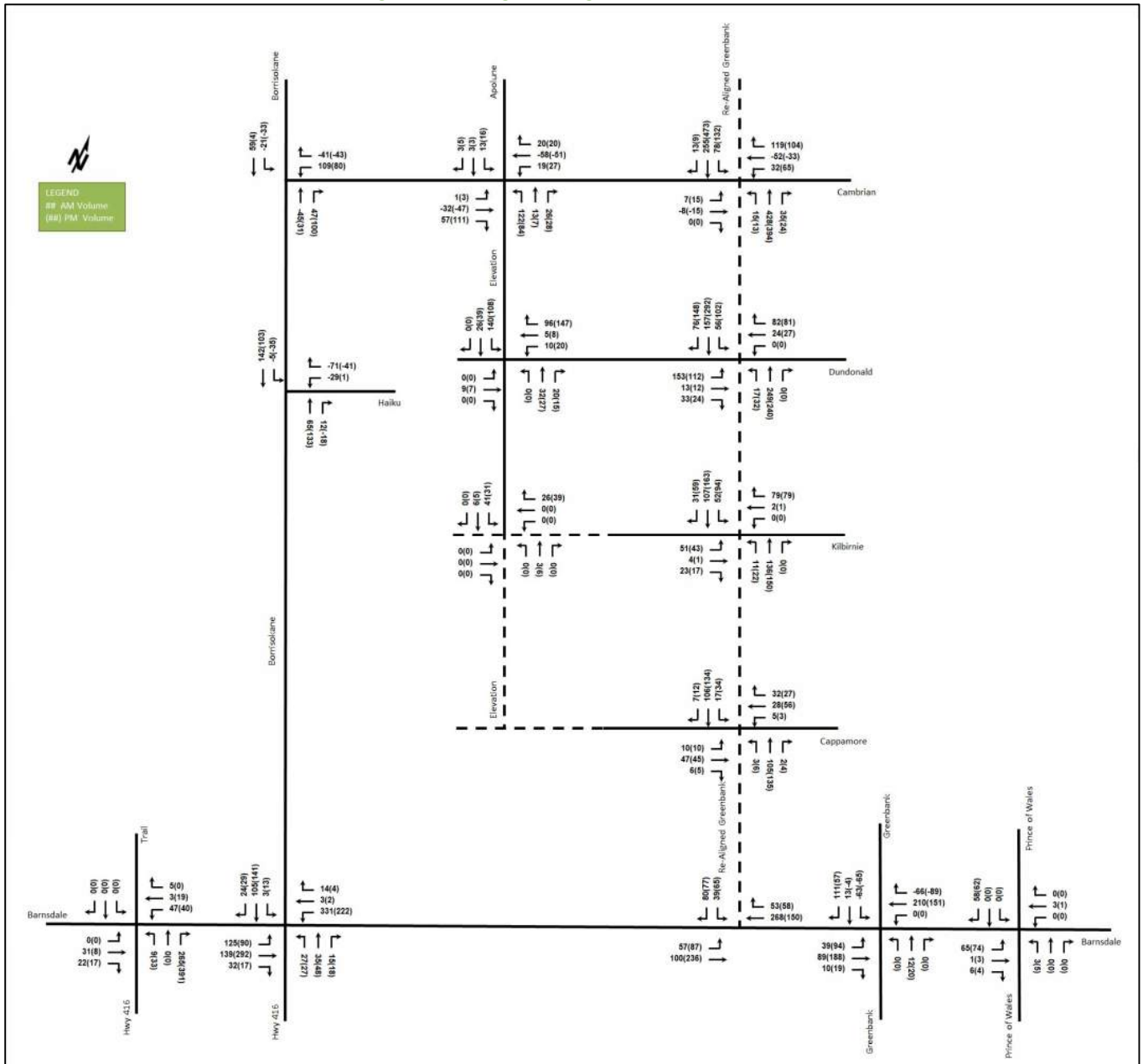
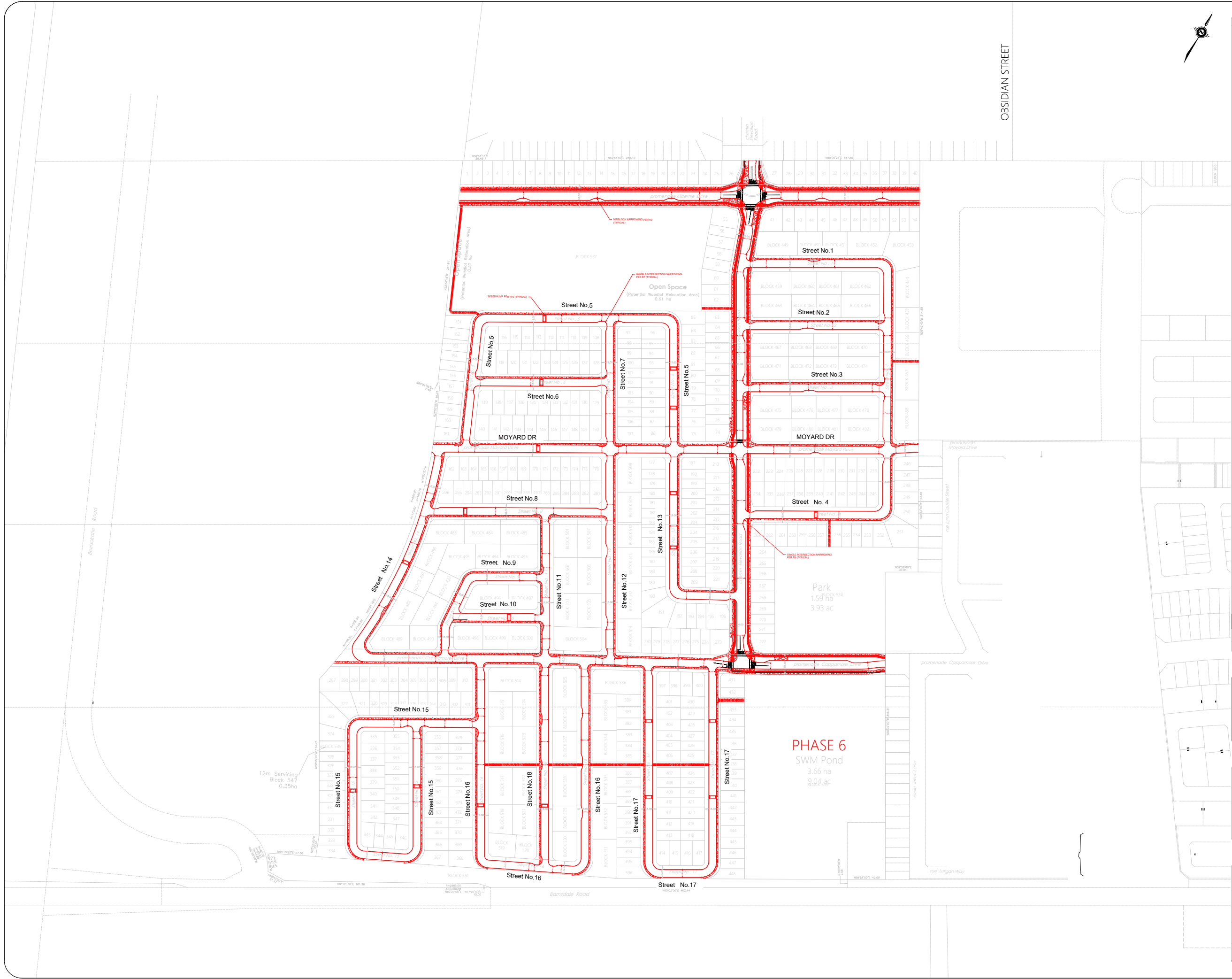


Figure 24: Reassigned Background Volumes-2036



Appendix H

Conceptual Traffic Calming Plan



Notes:

NOTES:
1. THE LOCATION OF TRAFFIC CALMING ELEMENTS ARE APPROXIMATE AND ARE SUBJECT TO CHANGE UPON COORDINATION WITH CIVIL.

01	Issued for Review	CH	2026-06-25
REV:	DESCRIPTION:	BY:	DATE:
STATUS:			



CGH Transportation
6 Plaza Court
Ottawa, ON
K2H 7W1
(343) 999-9117

CLIENT:

Minto Communities Inc.
200-180 Kent Street
Ottawa, ON
K1P 0B6

ARCHITECT:

SITE:

Barrhaven South S1 Lands

TITLE:

Geometric Road Design
Draft

SCALE AT A3:	DATE:	DRAWN:	CHECKED:
1:4000	2026-06-25	CH	AL
PROJECT NO:	DRAWING NO:	REVISION:	
2023-126	001	01	

Appendix I

MMLOS Analysis

Multi-Modal Level of Service - Segments Form

Project:

3882 & 4000 Barnsdale Road

Consultant:

CGH Transportation

Date:

2026-06-18

Scenario:

Existing/Future

Segment Name		Barnsdale (Existing)		Barnsdale (Future)		Elevation (Future)		Kilbirnie (Future)		Cappamore (Future)		Locals (Future)														
OP Transect / Policy Area		Outer Urban or Suburban		Outer Urban or Suburban		Within 600m of a rapid transit station		Within 600m of a rapid transit station		Within 600m of a rapid transit station		Within 600m of a rapid transit station														
Segment Component		Majority (>50%)		Majority (>50%)		Majority (>50%)		Majority (>50%)		Majority (>50%)		Majority (>50%)														
Side of Street		N		N		W E		N S		N S		W or N E or S														
Pedestrian	PLOS Inputs																									
	Posted Speed (km/h)	80 km/h		80 km/h		40 km/h		40 km/h		30 km/h		30 km/h														
	Two-Way ADT	5,800		11,850		2,200		3,000		3,400		300														
	Pedestrian Facility	None		Sidewalk		Sidewalk Sidewalk		Sidewalk Sidewalk		Sidewalk Sidewalk		Sidewalk Sidewalk														
	Does the facility meet the TMP Sidewalk or MUP Policy? If not, for MUPs, does the location have a low volume of peak daily users AND are pedestrian volumes likely less than 20% of total users?	No		Yes		Yes Yes		Yes Yes		Yes Yes		Yes Yes														
	Facility Width (m)	-		2.00m		2.00m 2.00m		2.00m 2.00m		2.00m 2.00m		1.80m 1.80m														
	Offset from Motor Vehicle	-		≥ 3.0m		≥ 3.0m ≥ 3.0m		≥ 3.0m ≥ 3.0m		≥ 3.0m 0.5-1.49m		< 0.5m < 0.5m														
	Travel Lanes (m)	-		No		Yes Yes		Yes Yes		Yes -		- -														
	Presence of Adjacent Parking?	-		-		≤ 3000 ≤ 3000		≤ 3000 ≤ 3000		≤ 3000 ≤ 3000		≤ 3000 ≤ 3000														
	General Purpose Curb Lane ADT	-		> 400m		261-290m 261-290m		291-400m 291-400m		291-400m 291-400m		- -														
Max. Distance between Controlled Crossings (m)																										
Score		-		0.00		-		3.00		4.25		4.25		4.00		4.00		4.00		3.50		3.50				
PLOS		-		F		-		C		B		B		B		B		B		B		B				
Target PLOS		C		C		A		A		A		A		A		A										
Bicycle	BLOS Inputs																									
	Cycling Route Classification	Elsewhere		Elsewhere		Elsewhere		Elsewhere		Elsewhere		Elsewhere														
	Cycling Facility	Input PLOS First	Shared Operating Space	Input PLOS First	Painted or Physically Separated Bike Lanes	Cycle Track	Cycle Track	Cycle Track	Cycle Track	Cycle Track	Cycle Track	Shared Operating Space	Shared Operating Space													
	Is the minimum level of separation provided according to OTM Book 18 Pre-Selection Nomograph - Rural Context (Figure 5.6)? (for paved shoulders)	-		-		-		-		-		-														
	Facility Operation	-		Unidirectional		-		-		-		-														
	Pedestrian/Cyclist Volume	-		-		-		-		-		-														
	Facility Width	-		2.0-2.5m		-		-		-		-														
	Boulevard/Buffer Width (excluding curb)	-		-		-		-		-		-														
	Unsignalized Roadway Crossing Type (where cyclists are required to yield)	Cross-Street		Cross-Street		Cross-Street		Cross-Street		Cross-Street		Cross-Street														
	Number of Travel Lanes at Crossing	≤ 2		≤ 2		≤ 2		≤ 2		≤ 2		≤ 2														
Crossing includes Median Refuge (≥ 2.7m)	No		Yes		No		No		Yes		Yes															
Cross-street Posted Speed (km/h)	≥ 60 km/h		≥ 60 km/h		40 km/h		40 km/h		40 km/h		40 km/h															
Cycling Path Blockages (e.g. bus stops and/or loading zones)	Rare		Rare		-		-		-		-															
Score		-		0.90		-		2.80		4.85		4.85		5.00		5.00		4.85		4.85		4.55		4.55		
BLOS		-		E		-		C		A		A		A		A		A		A		A				
Target BLOS		C		C		B		B		B		B														
Transit	TLOS Inputs																									
	Transit Facility	Select Transit Designation		Select Transit Designation		Select Transit Designation		Mixed Traffic		Mixed Traffic		Select Transit Designation														
	Facility Type							Mixed Traffic		Mixed Traffic																
	Expected Transit Running Time							Slightly Impeded		Slightly Impeded																
	Transit Travel Speed (if available)							Enter Speed (if available)		Enter Speed (if available)																
TLOS		-		-		-		-		C		C		C		C		-		-						
Target TLOS		-		-		-		E (D for frequent transit routes)		E (D for frequent transit routes)		-														
Public Realm	PRLOS Inputs																									
	Context	Input PLOS and BLOS First	Other Streets	Input PLOS and BLOS First	Other Streets	Other Streets	Other Streets	Other Streets	Other Streets	Other Streets	Other Streets	Other Streets	Other Streets													
	Inner Boulevard Width	≤ 0.6m		≤ 0.6m		1.5-1.99m		1.5-1.99m		1.5-1.99m		1.5-1.99m														
	Middle Boulevard Width	≤ 0.5m		≥ 3.0m		≤ 0.5m		≤ 0.5m		≤ 0.5m		≤ 0.5m														
	Outer Boulevard (Frontage) Width	1.5-1.99m		2.0-2.99m		≤ 0.5m		≤ 0.5m		≤ 0.5m		≤ 0.5m														
	Transit Route on Segment?	No		No		No		No		Yes		Yes														
	Bus Stop Elements	-		-		-		-		Curbside landing zone with no shelter		Curbside landing zone with no shelter														
	Number of Midblock Traffic Lanes (both travel directions)	≤ 2		4		≤ 2		≤ 2		≤ 2		≤ 2														
	Score		-		8.70		-		17.70		24.00		24.00		21.30		21.30		22.20		18.60		19.50		19.50	
	PRLOS		-		E		-		C		B		B		B		B		B		C		C			
		E		C		B		B		B		C		C		C										

Multi-Modal Level of Service - Intersections Form

Project: 3882 & 4000 Barnsdale Road
Consultant: CGH Transportation
Date: 2026-06-18
Scenario: Future Total 2036

Intersection Name		Barnsdale Road at Borrisokane Road/Highway 416				Dundonald Drive at Realigned Greenbank Road				Kilbirnie Drive at Realigned Greenbank Road			
OP Transect / Policy Area		Outer Urban or Suburban				Within 600m of a rapid transit station				Within 600m of a rapid transit station			
Pedestrian	PLOS Inputs												
	Pedestrians Crossing the	North Leg	South Leg	East Leg	West Leg	North Leg	South Leg	East Leg	West Leg	North Leg	South Leg	East Leg	West Leg
	Number of Travel Lanes Crossed	4	1-3	1-3	1-3	7	7	1-3	1-3	8	8	1-3	4
	Median Refuge (≥2.7m)	No	No	No	No	Yes	Yes	No	No	No	Yes	No	No
	Crosswalk Treatment	Std Transverse Markings	Std Transverse Markings	Std Transverse Markings	Std Transverse Markings	Zebra Stripe Hi-Vis Markings	Zebra Stripe Hi-Vis Markings	Zebra Stripe Hi-Vis Markings	Zebra Stripe Hi-Vis Markings	Zebra Stripe Hi-Vis Markings	Zebra Stripe Hi-Vis Markings	Zebra Stripe Hi-Vis Markings	Zebra Stripe Hi-Vis Markings
	Signal Cycle Length (sec)	90.0				110.0				110.0			
	Effective Walk Time (sec)	8.0	8.0	30.0	12.0	32.0	32.0	21.0	21.0	18.0	18.0	10.0	27.0
	Conflict with Right-Turn Vehicles (For PLOS & BLOS)	WBR	EBR	NBR	SBR	WBR	EBR	NBR	SBR	WBR	EBR	NBR	SBR
	Right-Turn Geometry	Right-Turn With No Channel	Conventional Right-Turn Channel	Right-Turn With No Channel	Right-Turn With No Channel	Right-Turn With No Channel	Right-Turn With No Channel	Right-Turn With No Channel	Right-Turn With No Channel	Right-Turn With No Channel	Right-Turn With No Channel	Right-Turn With No Channel	Right-Turn With No Channel
	Right-Turn Signal Phasing	Permissive	-	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
	Right-Turn Volume	≤ 150 veh/h	≤ 150 veh/h	≤ 150 veh/h	≤ 150 veh/h	≤ 150 veh/h	≤ 150 veh/h	≤ 150 veh/h	≤ 150 veh/h	≤ 150 veh/h	≤ 150 veh/h	≤ 150 veh/h	≤ 150 veh/h
	Right-Turn Effective Corner Radius	> 8m	-	> 8m	> 8m	> 8m	> 8m	> 8m	> 8m	≤ 8m	> 8m	≤ 8m	> 8m
	Cross-street Posted Speed (km/h)	80 km/h		80 km/h		40 km/h		60 km/h		40 km/h		60 km/h	
	Conflict with Left-Turn Vehicles (For PLOS & BLOS)	EBL	WBL	SBL	NBL	EBL	WBL	SBL	NBL	EBL	WBL	SBL	NBL
Pedestrian	Left-Turn Signal Phasing	Perm or Prot+Perm	Perm or Prot+Perm	Perm or Prot+Perm	Perm or Prot+Perm	Perm or Prot+Perm	Perm or Prot+Perm	Perm or Prot+Perm	Perm or Prot+Perm	Fully Protected	Perm or Prot+Perm	Perm or Prot+Perm	Perm or Prot+Perm
	Left-Turn Volume	> 100 veh/h	> 100 veh/h	> 100 veh/h	≤ 50 veh/h	> 100 veh/h	≤ 50 veh/h	> 100 veh/h	≤ 50 veh/h	-	≤ 50 veh/h	> 50 to 100 veh/h	≤ 50 veh/h
	Left-Turn Opposing Lanes	-	-	-	-	-	-	-	-	-	-	≥ 2	-
	Score	3.35	3.65	4.10	4.15	2.50	2.70	4.00	4.20	1.35	1.95	4.00	3.60
	PLOS	C	B	B	B	C	C	B	B	E	D	B	B
Target PLOS		C				A				A			
Bicycle	BLOS Inputs												
	Cycling Route Classification	Elsewhere				Cross-Town Bikeway				Cross-Town Bikeway			
	Cyclists Crossing the	North Leg	South Leg	East Leg	West Leg	North Leg	South Leg	East Leg	West Leg	North Leg	South Leg	East Leg	West Leg
	Type of Cycling Facility Across Leg	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Crossside	Crossside	Mixed Traffic	Mixed Traffic	Crossside	Crossside	Mixed Traffic	Crossside
	Two-Way ADT (in Cyclist Travel Direction)	6,000		14,300		9,000		3,150		6,000		2,350	
	Floating Bike Lane or Right-Turn Lane Crossover Approaching the Crossing?	No	No	No	No	No	No	No	No	No	No	No	No
	Crossside Operation	-	-	-	-	Unidirectional	Unidirectional	-	-	Unidirectional	Unidirectional	-	Unidirectional
	Target Crossside Setback Met?	-	-	-	-	Yes	Yes	-	-	Yes	Yes	-	Yes
	Right-Turn Vehicle Volume from Adjacent Roadway > 100 veh/h?	-	-	-	-	-	-	-	-	-	-	-	-
	Cyclist Left-Turn Operation	WBL	EBL	NBL	SBL	WBL	EBL	NBL	SBL	WBL	EBL	NBL	SBL
	Cyclist Left-Turn Treatment Type	General Purpose Through-Left or Single Left-Turn Lane	General Purpose Through-Left or Single Left-Turn Lane	General Purpose Through-Left or Single Left-Turn Lane	General Purpose Through-Left or Single Left-Turn Lane	Protected Corner	Protected Corner	Protected Corner	Protected Corner	Protected Corner	Protected Corner	Protected Corner	Protected Corner
	Vehicle Lanes Crossed by Cyclists	No Lane Crossed	No Lane Crossed	No Lane Crossed	One Lane Crossed	-	-	-	-	-	-	-	-
Bicycle	Score	10	-10	10	40	100	140	40	80	140	140	50	140
	BLOS	F	F	F	D	B	A	D	C	A	A	D	A
	Target BLOS	C				A				A			
Transit	TLOS Inputs												
	Transit Facility	Select Transit Designation				TP - Continuous Lanes				TP - Continuous Lanes			
	Vehicles Travelling	Southbound	Northbound	Westbound	Eastbound	Southbound	Northbound	Westbound	Eastbound	Southbound	Northbound	Westbound	Eastbound
	Average Transit Delay (if available)					≤ 10 sec	≤ 10 sec			11-20 sec	≤ 10 sec		
	Example Transit Priority Treatment					-	-			-	-		
	TLOS	-	-	-	-	A	A	-	-	B	A	-	-
	Target TLOS	-				B				B			
Auto	AutoLOS Inputs												
	Overall Intersection Volume to Capacity Ratio	0.71 to 0.80				0 to 0.60				0 to 0.60			
	Individual Movements V/C Ratios and Queue Lengths	See Separate Traffic Operations Table				See Separate Traffic Operations Table				See Separate Traffic Operations Table			
	AutoLOS	C				A				A			
	Target AutoLOS	E				E				E			

Multi-Modal Level of Service - Intersections Form

Project: 3882 & 4000 Barnsdale Road
Consultant: CGH Transportation
Date: 2026-06-18
Scenario: Future Total 2036

Intersection Name		Cappamore Drive at Realigned Greenbank Road				Barnsdale Road at Realigned Greenbank Road			
OP Transect / Policy Area		Within 600m of a rapid transit station				Within 600m of a rapid transit station			
Pedestrian	PLOS Inputs								
	Pedestrians Crossing the	North Leg	South Leg	East Leg	West Leg	North Leg	South Leg	East Leg	West Leg
	Number of Travel Lanes Crossed	5	5	1-3	1-3	4	No Crosswalk	1-3	1-3
	Median Refuge (≥2.7m)	No	No	No	No	No	-	No	No
	Crosswalk Treatment	Zebra Stripe Hi-Vis Markings	Zebra Stripe Hi-Vis Markings	Zebra Stripe Hi-Vis Markings	Zebra Stripe Hi-Vis Markings	Zebra Stripe Hi-Vis Markings	-	Zebra Stripe Hi-Vis Markings	Zebra Stripe Hi-Vis Markings
	Signal Cycle Length (sec)	110.0				110.0			
	Effective Walk Time (sec)	42.0	42.0	26.0	26.0	-	-	59.0	59.0
	Conflict with Right-Turn Vehicles (For PLOS & BLOS)	WBR	EBR	NBR	SBR	WBR	EBR	NBR	SBR
	Right-Turn Geometry	Right-Turn With No Channel	Right-Turn With No Channel	Right-Turn With No Channel	Right-Turn With No Channel	Smart Channel w/ Raised Crossing	No Right-Turn / Prohib.	No Right-Turn / Prohib.	Right-Turn With No Channel
	Right-Turn Signal Phasing	Permissive	Permissive	Permissive	Permissive	-	-	-	Permissive
	Right-Turn Volume	≤ 150 veh/h	≤ 150 veh/h	≤ 150 veh/h	≤ 150 veh/h	≤ 150 veh/h	-	-	> 150 to 300 veh/h
	Right-Turn Effective Corner Radius	> 8m	> 8m	> 8m	> 8m	-	-	-	> 8m
	Cross-street Posted Speed (km/h)	40 km/h		60 km/h		80 km/h		60 km/h	
	Conflict with Left-Turn Vehicles (For PLOS & BLOS)	EBL	WBL	SBL	NBL	EBL	WBL	SBL	NBL
	Left-Turn Signal Phasing	Perm or Prot+Perm	Perm or Prot+Perm	Perm or Prot+Perm	Perm or Prot+Perm	Perm or Prot+Perm	No Left-Turn / Prohib.	Perm or Prot+Perm	No Left-Turn / Prohib.
Bicycle	Left-Turn Volume	≤ 50 veh/h	≤ 50 veh/h	≤ 50 veh/h	> 50 to 100 veh/h	> 100 veh/h	-	> 50 to 100 veh/h	-
	Left-Turn Opposing Lanes	-	-	-	≥ 2	-	-	≤ 1	-
	Score	3.30	3.30	4.20	4.00	3.25	-	4.80	4.20
	PLOS	C	C	B	B	C	-	A	B
		B				B			
	Target PLOS	A				A			
	BLOS Inputs								
	Cycling Route Classification	Cross-Town Bikeway				Cross-Town Bikeway			
	Cyclists Crossing the	North Leg	South Leg	East Leg	West Leg	North Leg	South Leg	East Leg	West Leg
	Type of Cycling Facility Across Leg	Crossride	Crossride	Crossride	Crossride	Crossride		Crossride	Crossride
	Two-Way ADT (in Cyclist Travel Direction)	5,250		2,400		2,500		12,150	
	Floating Bike Lane or Right-Turn Lane Crossover Approaching the Crossing?	No	No	No	No	No	No	No	No
	Crossride Operation	Unidirectional	Unidirectional	Unidirectional	Unidirectional	Unidirectional	-	Unidirectional	Unidirectional
	Target Crossride Setback Met?	Yes	Yes	Yes	Yes	-	-	-	Yes
	Right-Turn Vehicle Volume from Adjacent Roadway > 100 veh/h?	-	-	-	-	-	-	-	-
	Cyclist Left-Turn Operation	WBL	EBL	NBL	SBL	WBL	EBL	NBL	SBL
	Cyclist Left-Turn Treatment Type	Protected Corner	Protected Corner	Protected Corner	Protected Corner	No Left-Turn	Protected Corner	No Left-Turn	Protected Corner
	Vehicle Lanes Crossed by Cyclists	-	-	-	-	-	-	-	-
	Score	140	140	140	100	90	-	150	130
	BLOS	A	A	A	B	C	-	A	A
		A				A			
	Target BLOS	A				A			
Transit	TLOS Inputs								
	Transit Facility	TP - Continuous Lanes				TP - Continuous Lanes			
	Vehicles Travelling	Southbound	Northbound	Westbound	Eastbound	Southbound	Northbound	Westbound	Eastbound
	Average Transit Delay (if available)	≤ 10 sec	11-20 sec	36-55 sec		11-20 sec			
	Example Transit Priority Treatment	-	-	-		-			
	TLOS	A	B	D	-	B	-	-	-
	Target TLOS	B				B			
Auto	AutoLOS Inputs								
	Overall Intersection Volume to Capacity Ratio	0 to 0.60				0 to 0.60			
	Individual Movements V/C Ratios and Queue Lengths	See Separate Traffic Operations Table				See Separate Traffic Operations Table			
	AutoLOS	A				A			
	Target AutoLOS	E				E			

Appendix J

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	☐
1.2 Travel surveys		
BETTER	1.2.1 Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐
2. WALKING AND CYCLING		
2.1 Information on walking/cycling routes & destinations		
BASIC	2.1.1 Display local area maps with walking/cycling access routes and key destinations at major entrances (<i>multi-family, condominium</i>)	☐
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 (<i>multi-family, condominium</i>)	☐
BETTER	3.1.2 Provide real-time arrival information display at entrances (<i>multi-family, condominium</i>)	☐
3.2 Transit fare incentives		
BASIC ★	3.2.1 Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	☐
BETTER	3.2.2 Offer at least one year of free monthly transit passes on residence purchase/move-in	☒
3.3 Enhanced public transit service		
BETTER ★	3.3.1 Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels (<i>subdivision</i>)	☒
3.4 Private transit service		
BETTER	3.4.1 Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	☐
4. CARSHARING & BIKESHARING		
4.1 Bikeshare stations & memberships		
BETTER	4.1.1 Contract with provider to install on-site bikeshare station (<i>multi-family</i>)	☐
BETTER	4.1.2 Provide residents with bikeshare memberships, either free or subsidized (<i>multi-family</i>)	☐
4.2 Carshare vehicles & memberships		
BETTER	4.2.1 Contract with provider to install on-site carshare vehicles and promote their use by residents	☐
BETTER	4.2.2 Provide residents with carshare memberships, either free or subsidized	☐
5. PARKING		
5.1 Priced parking		
BASIC ★	5.1.1 Unbundle parking cost from purchase price (<i>condominium</i>)	☐
BASIC ★	5.1.2 Unbundle parking cost from monthly rent (<i>multi-family</i>)	☐

TDM measures: <i>Residential developments</i>		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 K

Signal Warrant Calculation Sheets

Borrisokane Road/Highway 416 @Barnsdale Road
2031 Future Background

Justification #7

Justification	Description	Minimum Requirement		Minimum Requirement		Compliance		Entire %	Signal
		1 Lane Highway		2 or More Lanes		Sectional			
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	789	131%	131%	Maybe (Case 2)
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	266	222%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	523	87%	87%	No (Case 3)
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	248	495%		

Notes

1. Refer to OTM Book 12, pg 125, July 2024
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, $AHV = PM/2$ or $(AM + PM) / 4$, including amplification 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

Borrisokane Road/Highway 416 @Barnsdale Road
2036 Future Background

Justification #7

Justification	Description	Minimum Requirement		Minimum Requirement		Compliance		Entire %	Signal
		1 Lane Highway		2 or More Lanes		Sectional			
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	838	140%	140%	Maybe (Case 2)
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	235	196%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	603	101%	101%	Maybe (Case 2)
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	217	434%		

Notes

1. Refer to OTM Book 12, pg 125, July 2024
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, $AHV = PM/2$ or $(AM + PM) / 4$, including amplification 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

Borrisokane Road/Highway 416 @Barnsdale Road
2031 Future Total

Justification #7

Justification	Description	Minimum Requirement		Minimum Requirement		Compliance		Entire %	Signal
		1 Lane Highway		2 or More Lanes		Sectional			
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	900	150%	150%	Maybe (Case 2)
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	271	226%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	630	105%	105%	Maybe (Case 2)
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	250	500%		

Notes

1. Refer to OTM Book 12, pg 125, July 2024
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, $AHV = PM/2 \text{ or } (AM + PM) / 4$, including amplification 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

Borrisokane Road/Highway 416 @Barnsdale Road
2036 Future Total

Justification #7

Justification	Description	Minimum Requirement		Minimum Requirement		Compliance		Entire %	Signal
		1 Lane Highway		2 or More Lanes		Sectional			
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	950	158%	158%	Maybe (Case 2)
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	240	200%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	710	118%	118%	Maybe (Case 2)
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	245	489%		

Notes

1. Refer to OTM Book 12, pg 125, July 2024
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, $AHV = PM/2 \text{ or } (AM + PM) / 4$, including amplification 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

Trail Road/Highway 416 @Barnsdale Road
2031 Future Background

Justification #7

Justification	Description	Minimum Requirement		Minimum Requirement		Compliance		Entire %	Signal
		1 Lane Highway		2 or More Lanes		Sectional			
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	479	80%	80%	No (Case 3)
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	192	160%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	287	48%	33%	No (Case 3)
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	17	33%		

Notes

1. Refer to OTM Book 12, pg 125, July 2024
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, $AHV = PM/2$ or $(AM + PM) / 4$, including amplification 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

Trail Road/Highway 416 @Barnsdale Road
2036 Future Background

Justification #7

Justification	Description	Minimum Requirement		Minimum Requirement		Compliance		Entire %	Signal
		1 Lane Highway		2 or More Lanes		Sectional			
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	502	84%	84%	No (Case 3)
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	214	178%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	288	48%	33%	No (Case 3)
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	17	33%		

Notes

1. Refer to OTM Book 12, pg 125, July 2024
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, $AHV = PM/2$ or $(AM + PM) / 4$, including amplification 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

Trail Road/Highway 416 @ Barnsdale Road
2031 Future Total

Justification #7

Assessment 11:

Justification	Description	Minimum Requirement		Minimum Requirement		Compliance		Entire %	Signal
		1 Lane Highway		2 or More Lanes		Sectional			
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	531	89%	89%	No (Case 3)
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	239	199%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	293	49%	33%	No (Case 3)
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	17	33%		

Notes

1. Refer to OTM Book 12, pg 125, July 2024
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, $AHV = PM/2$ or $(AM + PM) / 4$, including amplification 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

Trail Road/Highway 416 @ Barnsdale Road
2036 Future Total

Justification #7

Justification	Description	Minimum Requirement		Minimum Requirement		Compliance		Entire %	Signal
		1 Lane Highway		2 or More Lanes		Sectional			
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	554	92%	92%	No (Case 3)
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	260	217%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	293	49%	33%	No (Case 3)
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	17	33%		

Notes

1. Refer to OTM Book 12, pg 125, July 2024
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, $AHV = PM/2$ or $(AM + PM) / 4$, including amplification 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 L

All-Way Stop-Controlled Warrants

**Warrants for AWSC on Collector Roads and Rural Arterial
Roads (Trail Road/Highway 416 at Barnsdale Road)-FB2031**

Volume Criteria		
Major Street 2-Way Hourly Volume (per 8-hr period)	Minor Street 2-Way Hourly Volume (per 8-hr period)	Minor Street Pedestrian 2-Way Hourly Volume (per 8-hr period)
3701	2707	0
Control Required		
Total Vehicle Volume	YES	
Minor Street Volume & Pedestrian Volume	YES	
	3-Way Stop	4-Way Stop
Vehicle Split	YES	YES

**Warrants for AWSC on Collector Roads and Rural Arterial
Roads (Trail Road/Highway 416 at Barnsdale Road)-FB2036**

Volume Criteria		
Major Street 2-Way Hourly Volume (per 8-hr period)	Minor Street 2-Way Hourly Volume (per 8-hr period)	Minor Street Pedestrian 2-Way Hourly Volume (per 8-hr period)
3708	2996	0
Control Required		
Total Vehicle Volume	YES	
Minor Street Volume & Pedestrian Volume	YES	
	3-Way Stop	4-Way Stop
Vehicle Split	YES	YES

Appendix M

Left Turn Warrants Calculation Sheets

Barnsdale Road at Borrisokane Road/Highway 416

Existing																		
Design Speed		Yes																
90 km/h		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing		
AM			94	161	0	0	142	103	0	0	0	73	0	56	36.9%	255	245	
PM			61	187	0	0	209	102	0	0	0	130	0	109	24.6%	248	311	
Future Background 2031																		
Design Speed			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM			312	236	32	192	144	125	27	39	15	78	190	82	53.8%	580	461	
PM			233	354	17	127	210	108	27	49	16	150	246	145	38.6%	604	445	
Future Background 2036																		
Design Speed			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM			276	300	32	331	145	125	27	39	15	78	118	82	45.4%	608	601	
PM			167	479	17	222	211	108	27	49	18	150	192	145	25.2%	663	541	
Future Total 2031																		
Design Speed			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM			318	288	32	326	157	125	27	39	21	78	190	82	49.8%	638	608	
PM			246	469	17	213	219	108	27	49	29	150	246	145	33.6%	732	540	
Future Total 2036																		
Design Speed			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM			282	352	32	465	158	125	27	39	21	78	118	82	42.3%	666	748	
PM			180	594	17	308	220	108	27	49	31	150	192	145	22.8%	791	636	

Existing																		
Design Speed																		
90	km/h	EBL	EBT	EBR	Yes WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing		
AM		94	161	0	0	142	103	0	0	0	73	0	56	0.0%	245	255		
PM		61	187	0	0	209	102	0	0	0	130	0	109	0.0%	311	248		
Future Background 2031																		
Design Speed																		
90	km/h	EBL	EBT	EBR	Yes WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing		
AM		312	236	32	192	144	125	27	39	15	78	190	82	41.6%	461	580		
PM		233	354	17	127	210	108	27	49	16	150	246	145	28.5%	445	604		
Future Background 2036																		
Design Speed																		
90	km/h	EBL	EBT	EBR	Yes WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing		
AM		276	300	32	331	145	125	27	39	15	78	118	82	55.1%	601	608		
PM		167	479	17	222	211	108	27	49	18	150	192	145	41.0%	541	663		
Future Total 2031																		
Design Speed																		
90	km/h	EBL	EBT	EBR	Yes WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing		
AM		318	288	32	326	157	125	27	39	21	78	190	82	53.6%	608	638		
PM		246	469	17	213	219	108	27	49	29	150	246	145	39.4%	540	732		
Future Total 2036																		
Design Speed																		
90	km/h	EBL	EBT	EBR	Yes WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing		
AM		282	352	32	465	158	125	27	39	21	78	118	82	62.2%	748	666		
PM		180	594	17	308	220	108	27	49	31	150	192	145	48.4%	636	791		

Existing																	
Design Speed																	
90	km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	Yes SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		94	161	0	0	142	103	0	0	0	0	73	0	56	56.6%	129	0
PM		61	187	0	0	209	102	0	0	0	0	130	0	109	54.4%	239	0
Future Background 2031																	
Design Speed																	
90	km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	Yes SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		312	236	32	192	144	125	27	39	15	78	190	82	22.3%	350	81	
PM		233	354	17	127	210	108	27	49	16	150	246	145	27.7%	541	92	
Future Background 2036																	
Design Speed																	
90	km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	Yes SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		276	300	32	331	145	125	27	39	15	78	118	82	28.1%	278	81	
PM		167	479	17	222	211	108	27	49	18	150	192	145	30.8%	487	94	
Future Total 2031																	
Design Speed																	
90	km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	Yes SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		318	288	32	326	157	125	27	39	21	78	190	82	22.3%	350	87	
PM		246	469	17	213	219	108	27	49	29	150	246	145	27.7%	541	105	
Future Total 2036																	
Design Speed																	
90	km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	Yes SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		282	352	32	465	158	125	27	39	21	78	118	82	28.1%	278	87	
PM		180	594	17	308	220	108	27	49	31	150	192	145	30.8%	487	107	

Existing

Design Speed		Yes														
70 km/h		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn #DIV/0!	Volume Advancing	Volume Opposing
AM		94	161	0	0	142	103	0	0	0	73	0	56		0	129
PM		61	187	0	0	209	102	0	0	0	130	0	109		0	239

Future Background 2031

Design Speed		Yes														
70 km/h		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing
AM		312	236	32	192	144	125	27	39	15	78	190	82	33.3%	81	350
PM		233	354	17	127	210	108	27	49	16	150	246	145	29.3%	92	541

Future Background 2036

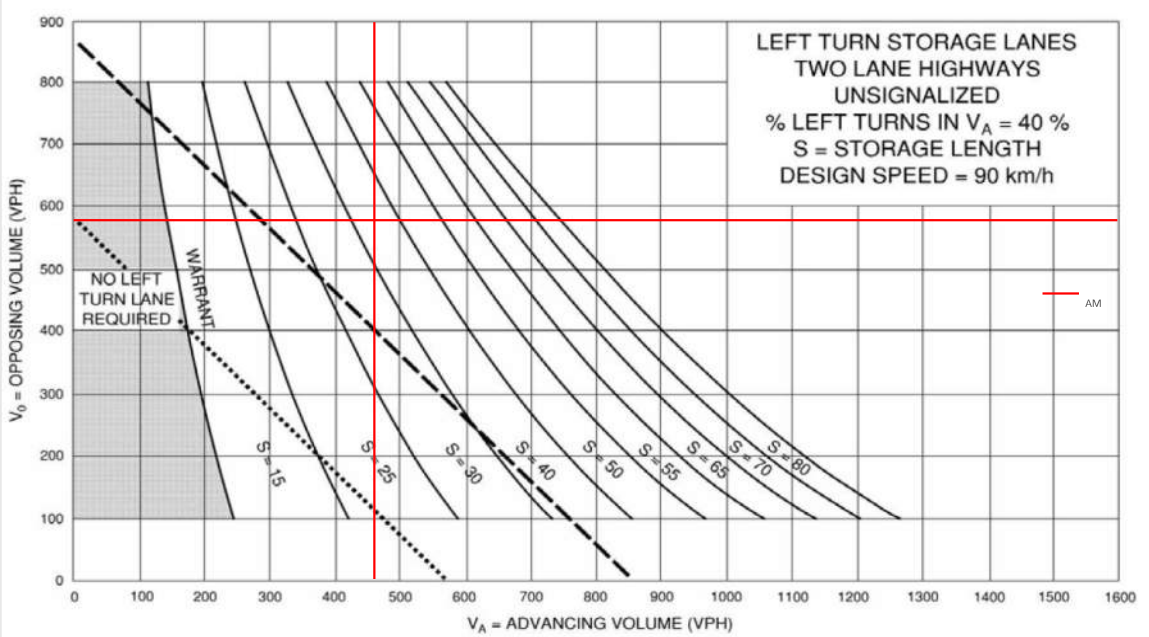
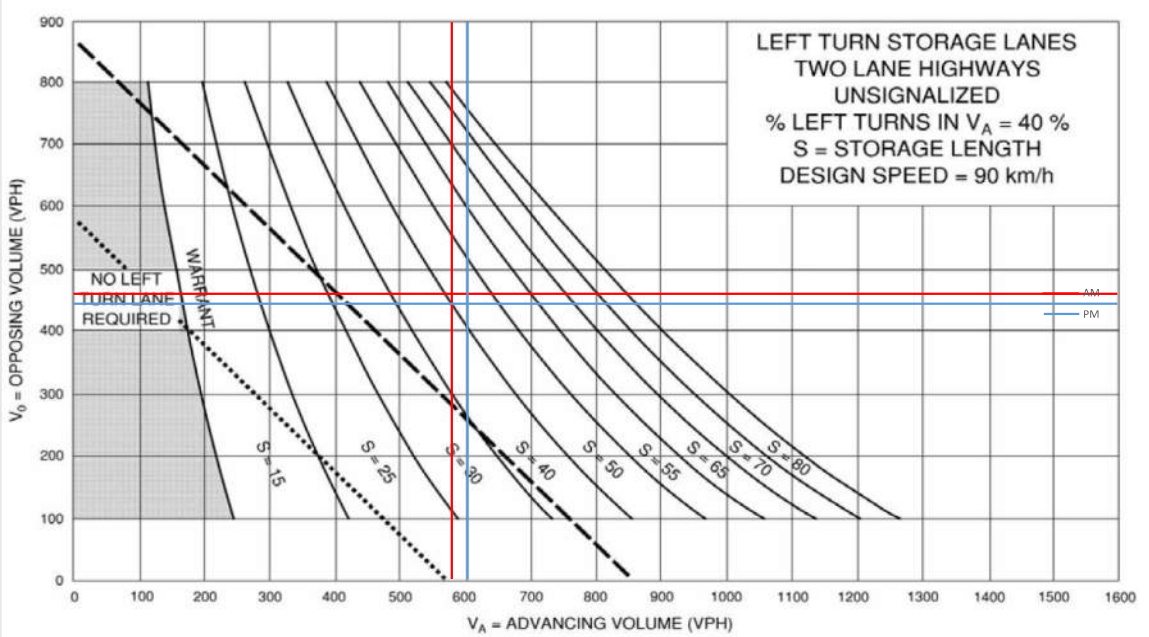
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70 km/h		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing
AM		276	300	32	331	145	125	27	39	15	78	118	82	33.3%	81	278
PM		167	479	17	222	211	108	27	49	18	150	192	145	28.7%	94	487

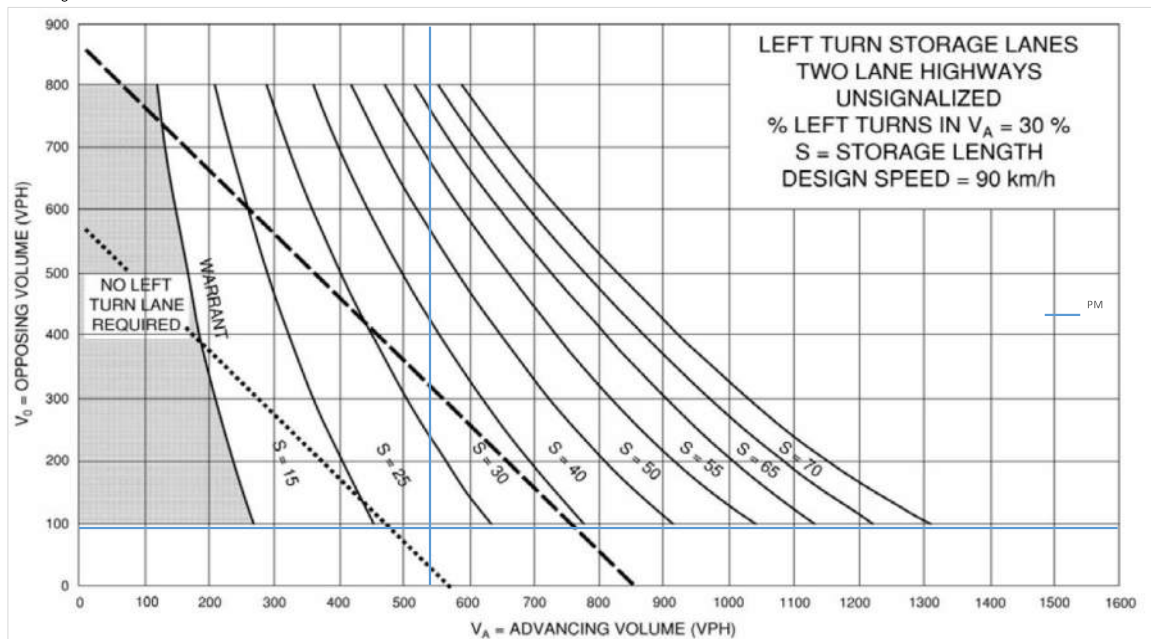
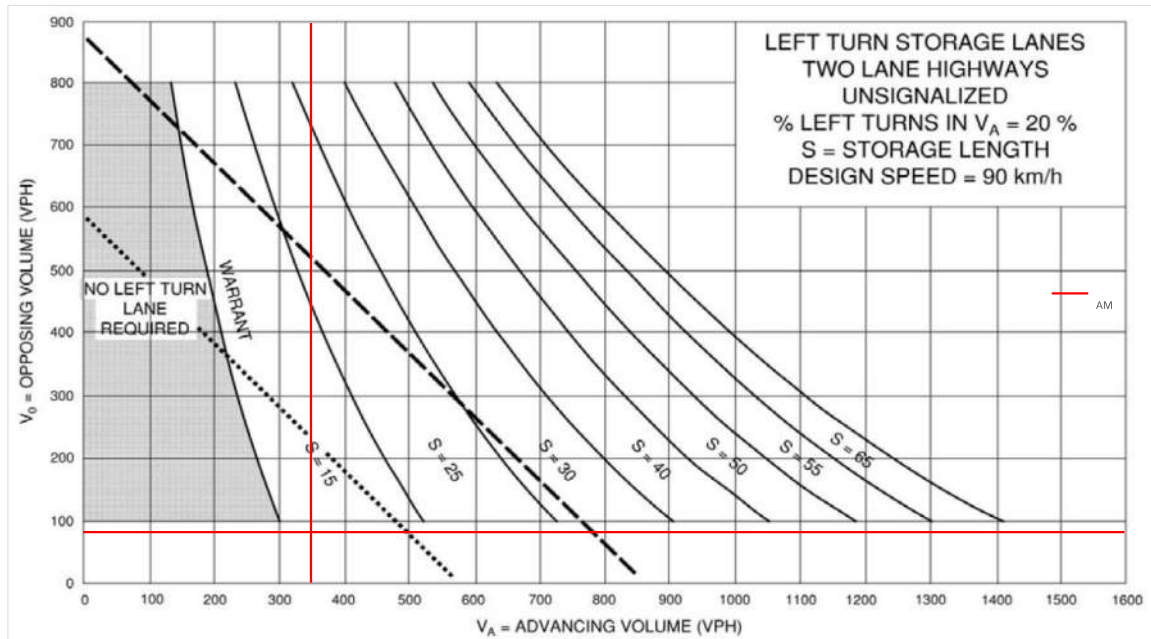
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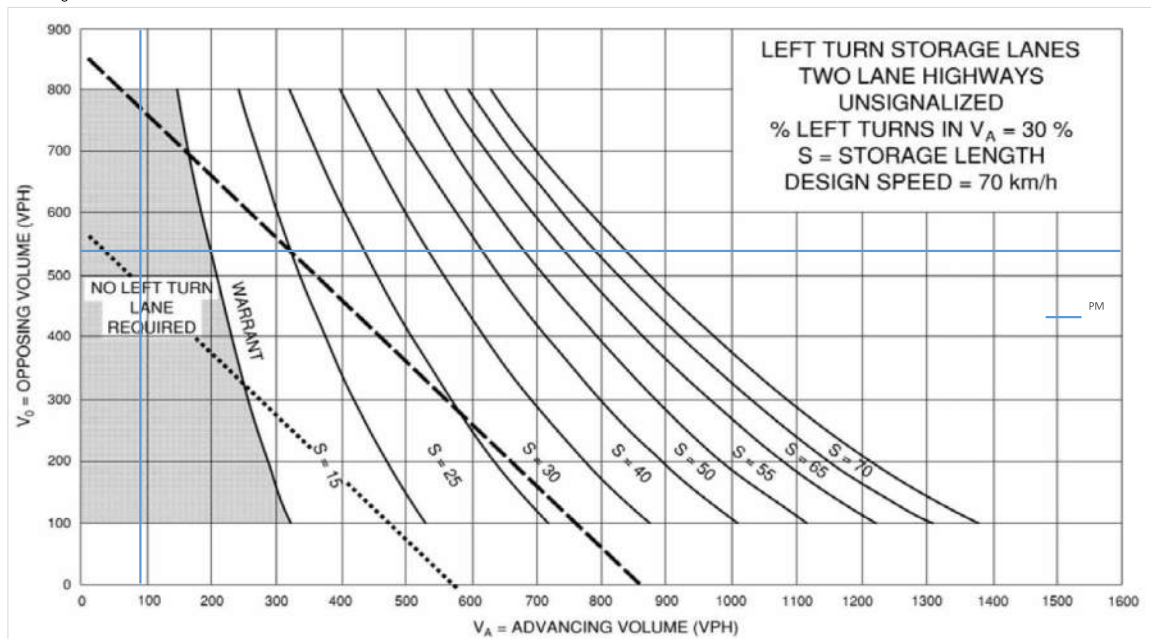
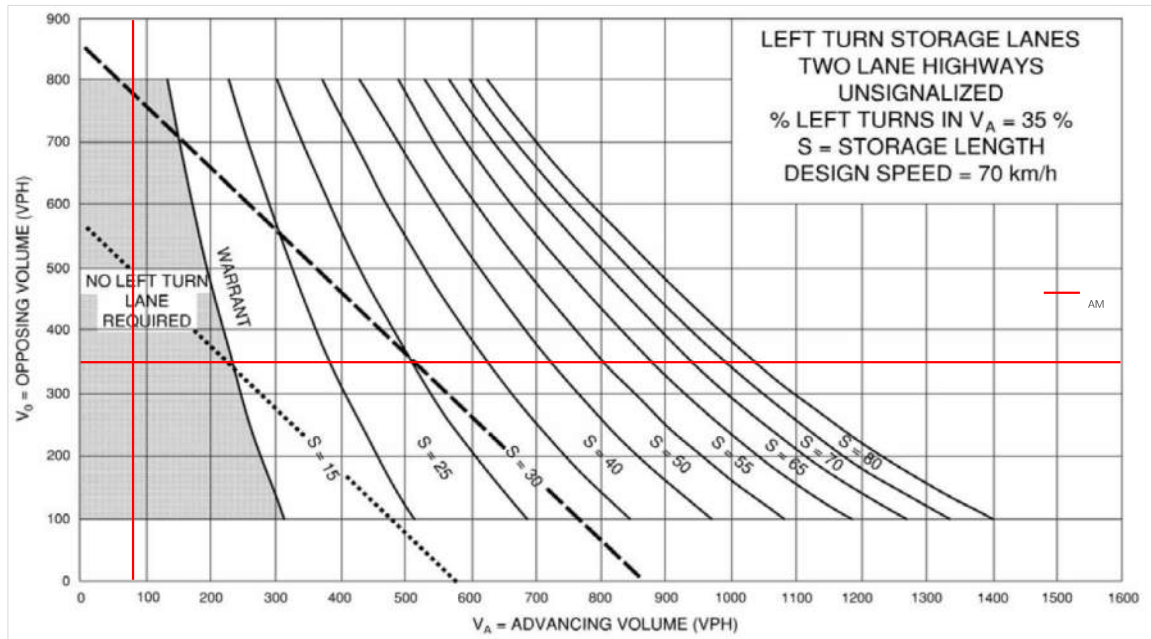
Design Speed		Yes														
70 km/h		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing
AM		318	288	32	326	157	125	27	39	21	78	190	82	31.0%	87	350
PM		246	469	17	213	219	108	27	49	29	150	246	145	25.7%	105	541

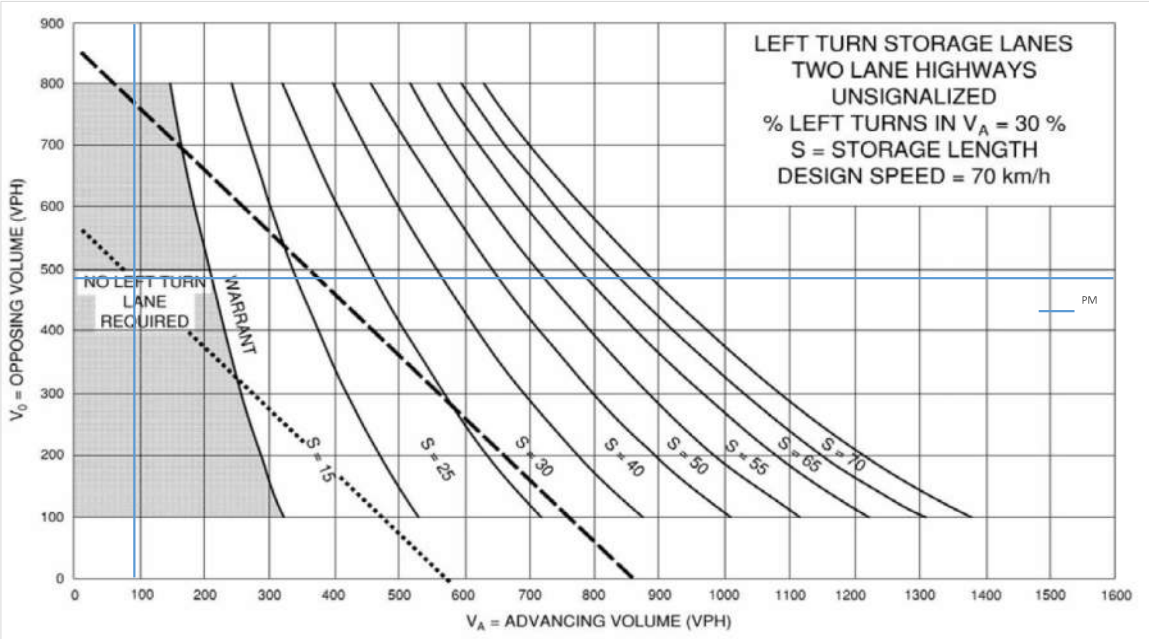
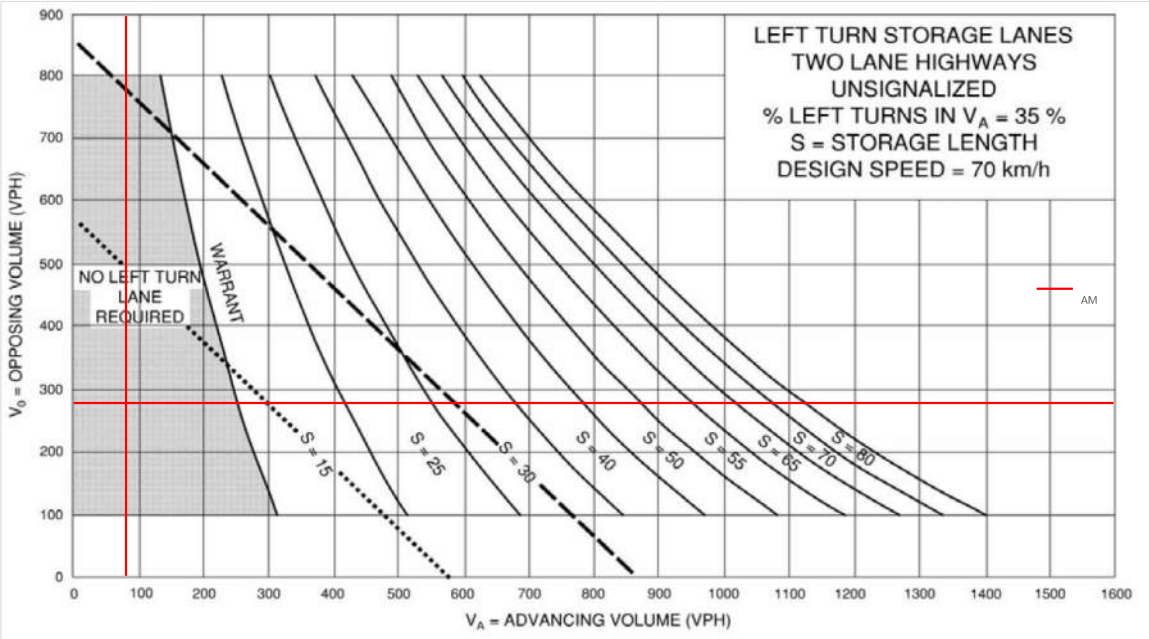
Future Total 2036

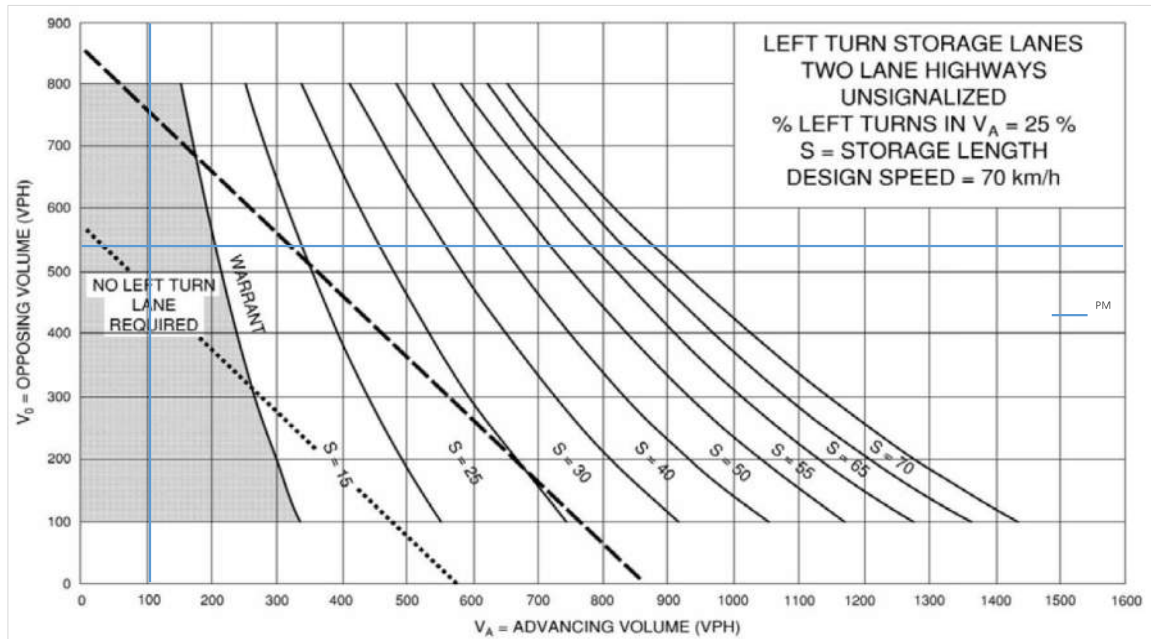
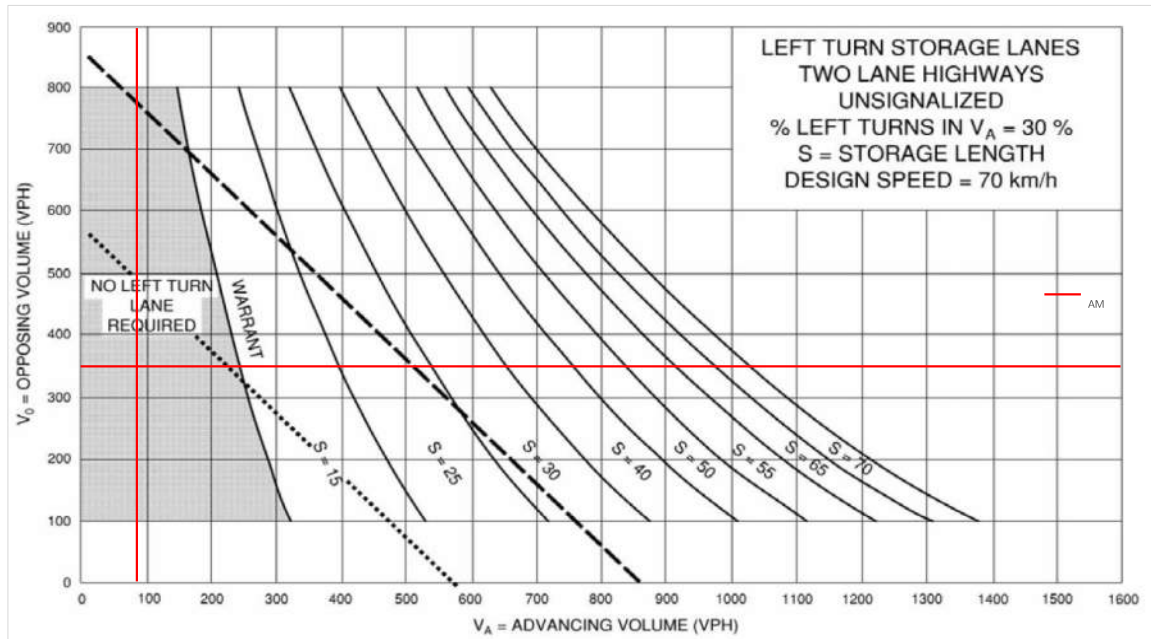
Design Speed		Yes														
70 km/h		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing
AM		282	352	32	465	158	125	27	39	21	78	118	82	31.0%	87	278
PM		180	594	17	308	220	108	27	49	31	150	192	145	25.2%	107	487

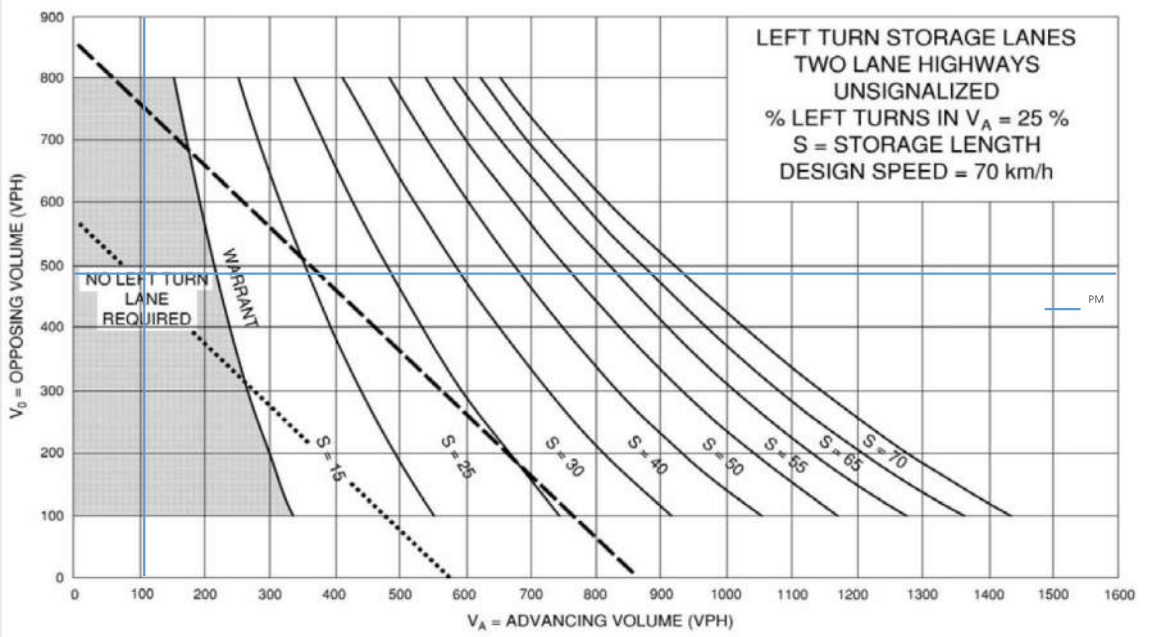
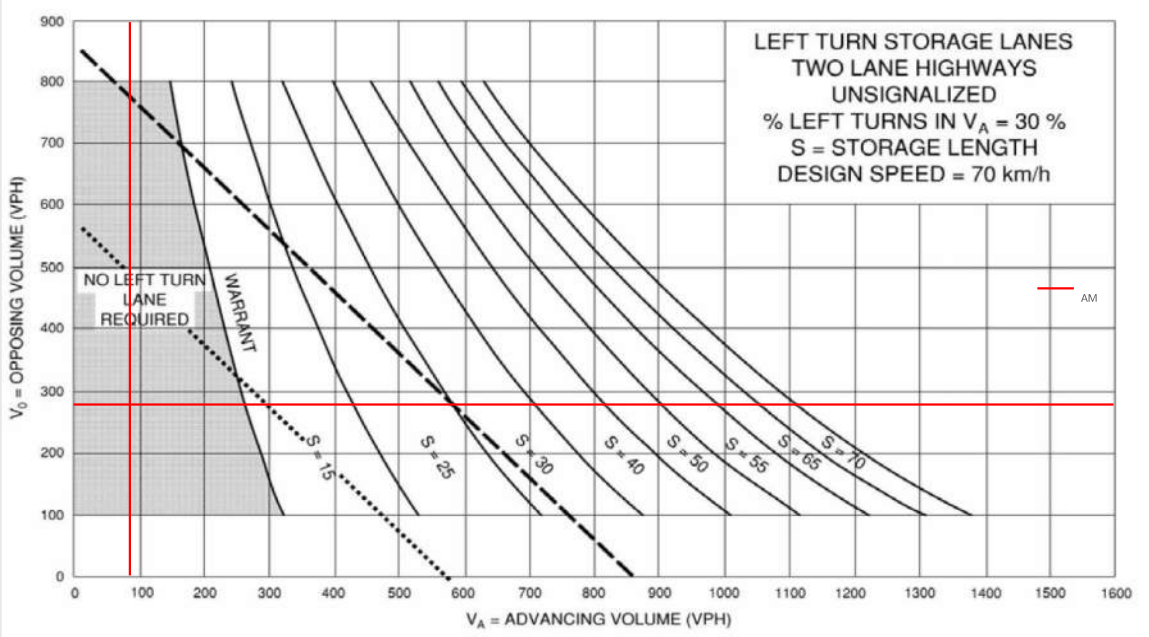












Barnsdale Road at Trail Road/ Highway 416

Existing																		
Design Speed		Yes																
90 km/h		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing		
	AM		1	213	2	17	171	10	3	5	37	5	2	1	0.5%	216	198	
	PM		0	211	1	63	248	7	3	0	27	10	1	0	0.0%	212	318	
Future Background 2031																		
Design Speed		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing		
90 km/h	AM		1	248	24	64	175	15	12	0	327	5	2	1	0.4%	273	254	
	PM		0	220	18	106	271	7	36	0	374	10	1	0	0.0%	238	384	
Future Background 2036																		
Design Speed		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing		
90 km/h	AM		1	248	24	65	175	15	12	0	355	5	2	1	0.4%	273	255	
	PM		0	220	18	107	271	7	36	0	433	10	1	0	0.0%	238	385	
Future Total 2031																		
Design Speed		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing		
90 km/h	AM		1	248	24	77	175	15	12	0	385	5	2	1	0.4%	273	267	
	PM		0	220	18	115	271	7	36	0	502	10	1	0	0.0%	238	393	
Future Total 2036																		
Design Speed		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing		
90 km/h	AM		1	248	24	78	175	15	12	0	413	5	2	1	0.4%	273	268	
	PM		0	220	18	116	271	7	36	0	561	10	1	0	0.0%	238	394	

Existing

Design Speed														Yes			
90	km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
		AM	1	213	2	17	171	10	3	5	37	5	2	1	8.6%	198	216
		PM	0	211	1	63	248	7	3	0	27	10	1	0	19.8%	318	212

Future Background 2031

Design Speed		Yes																						
90 km/h		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing								
AM		1	248	24	64	175	15	12	0	327	5	2	1	25.2%	254	273								
PM		0	220	18	106	271	7	36	0	374	10	1	0	27.6%	384	238								

Future Background 2036

Design Speed		Yes															
90	km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		1	248	24	65	175	15	12	0	355	5	2	1	25.5%	255	273	
PM		0	220	18	107	271	7	36	0	433	10	1	0	27.8%	385	238	

Future Total 2031

Design Speed														Yes					
90	km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing			
		AM	1	248	24	77	175	15	12	0	385	5	2	1	28.8%	267	273		
		PM	0	220	18	115	271	7	36	0	502	10	1	0	29.3%	393	238		

Future Total 2036

Design Speed														Yes			
90	km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		1	248	24	78	175	15	12	0	413	5	2	1	29.1%	268	273	
PM		0	220	18	116	271	7	36	0	561	10	1	0	29.4%	394	238	

Existing

Design Speed													Yes				
90 km/h		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	Yes SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		1	213	2	17	171	10	3	5	37	5	2	1	62.5%	8	45	
PM		0	211	1	63	248	7	3	0	27	10	1	0	90.9%	11	30	

Future Background 2031

Design Speed													Yes				
90	km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		1	248	24	64	175	15	12	0	327	5	2	1	62.5%	8	339	
PM		0	220	18	106	271	7	36	0	374	10	1	0	90.9%	11	410	

Future Background 2036

Design Speed													Yes				
90	km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		1	248	24	65	175	15	12	0	355	5	2	1	62.5%	8	367	
PM		0	220	18	107	271	7	36	0	433	10	1	0	90.9%	11	469	

Future Total 2031

Design Speed													Yes				
90	km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		1	248	24	77	175	15	12	0	385	5	2	1	62.5%	8	397	
PM		0	220	18	115	271	7	36	0	502	10	1	0	90.9%	11	538	

Future Total 2036

Design Speed													Yes				
90	km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		1	248	24	78	175	15	12	0	413	5	2	1	62.5%	8	425	
PM		0	220	18	116	271	7	36	0	561	10	1	0	90.9%	11	597	

Existing

Design Speed		Yes															
70 km/h		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		1	213	2	17	171	10	3	5	37	5	2	1	6.7%	45	8	
PM		0	211	1	63	248	7	3	0	27	10	1	0	10.0%	30	11	

Future Background 2031

Design Speed		Yes															
70 km/h		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		1	248	24	64	175	15	12	0	327	5	2	1	3.5%	339	8	
PM		0	220	18	106	271	7	36	0	374	10	1	0	8.8%	410	11	

Future Background 2036

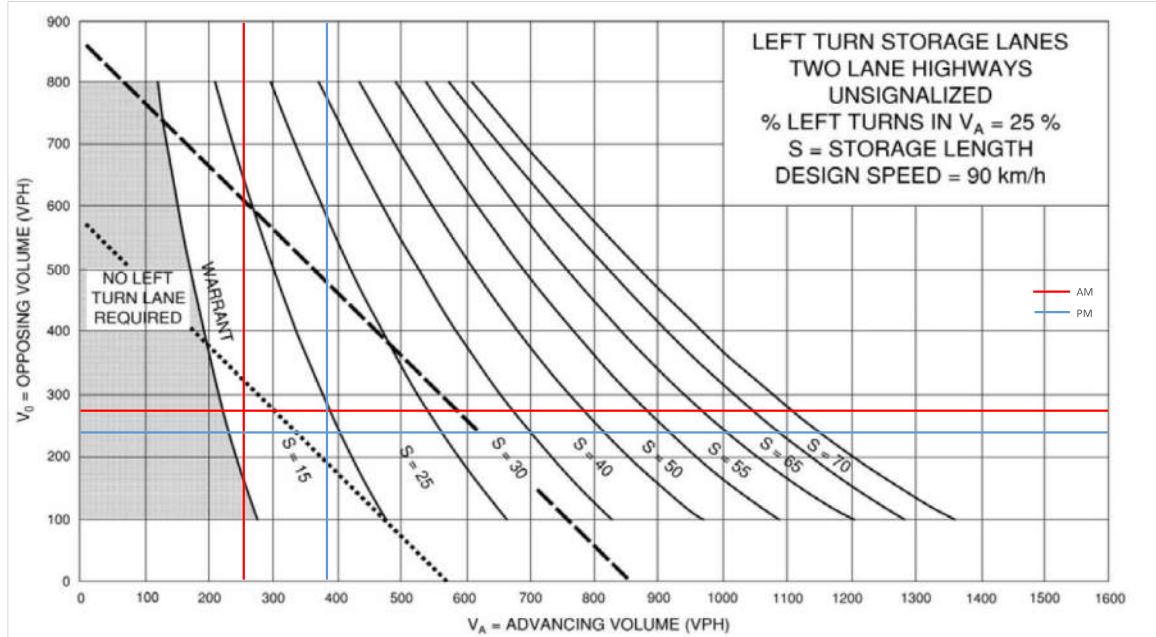
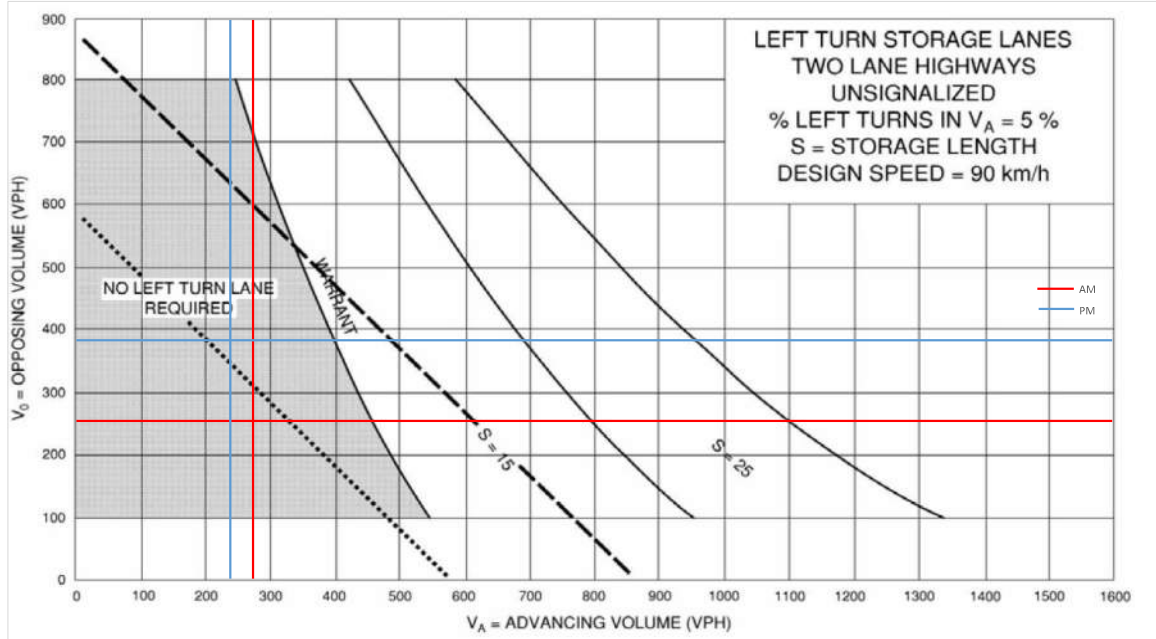
Design Speed		Yes															
70 km/h		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		1	248	24	65	175	15	12	0	355	5	2	1	3.3%	367	8	
PM		0	220	18	107	271	7	36	0	433	10	1	0	7.7%	469	11	

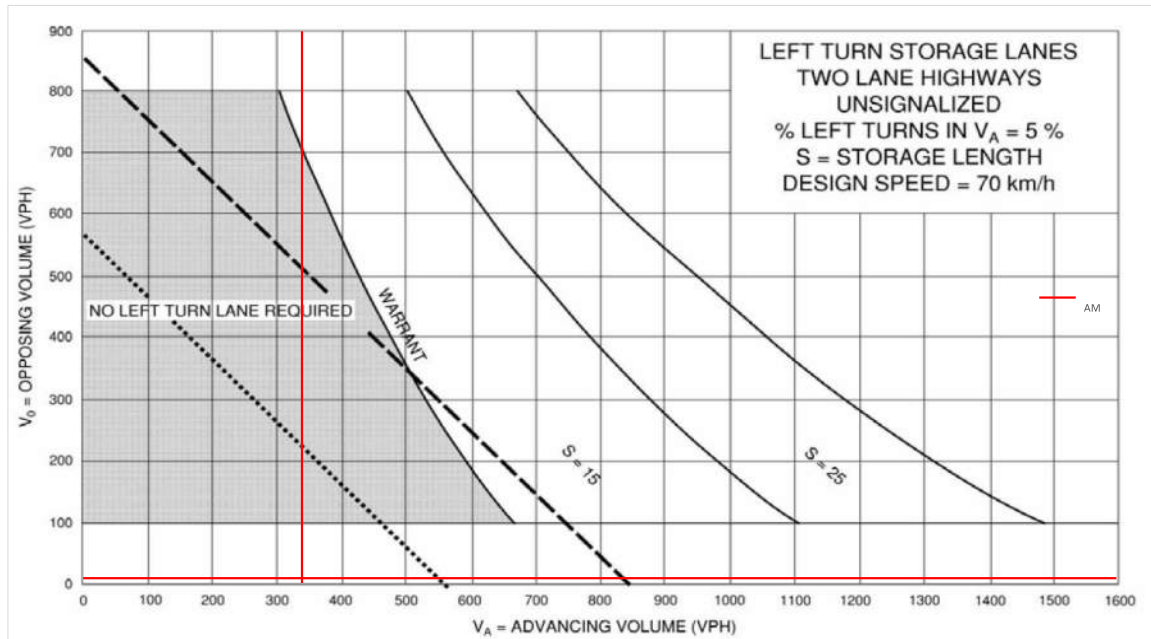
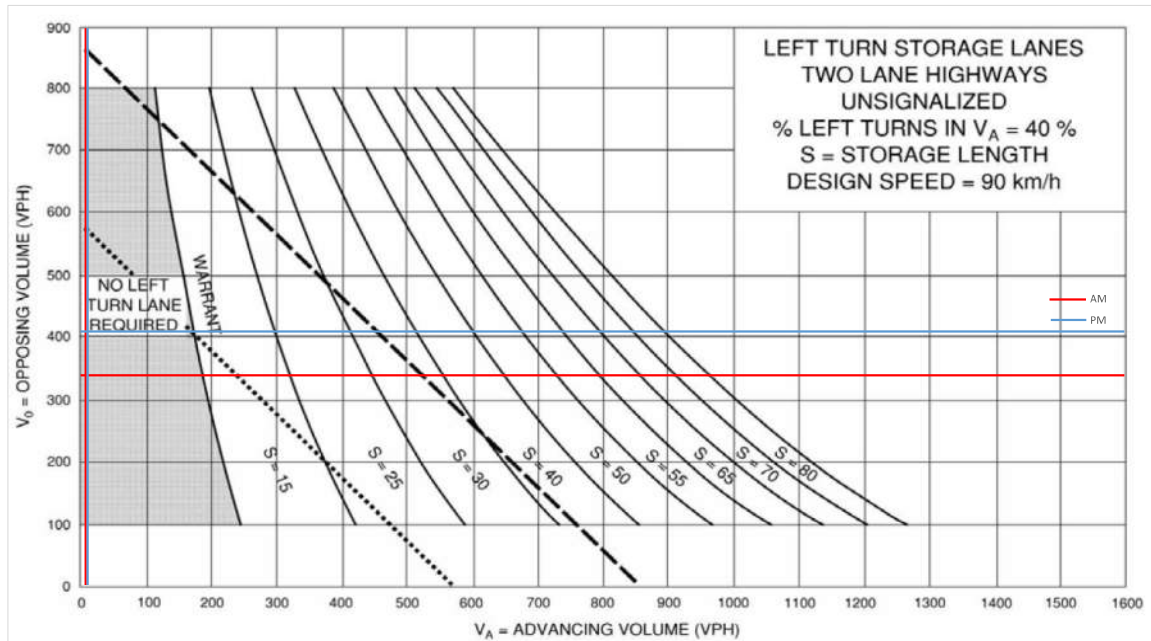
Future Total 2031

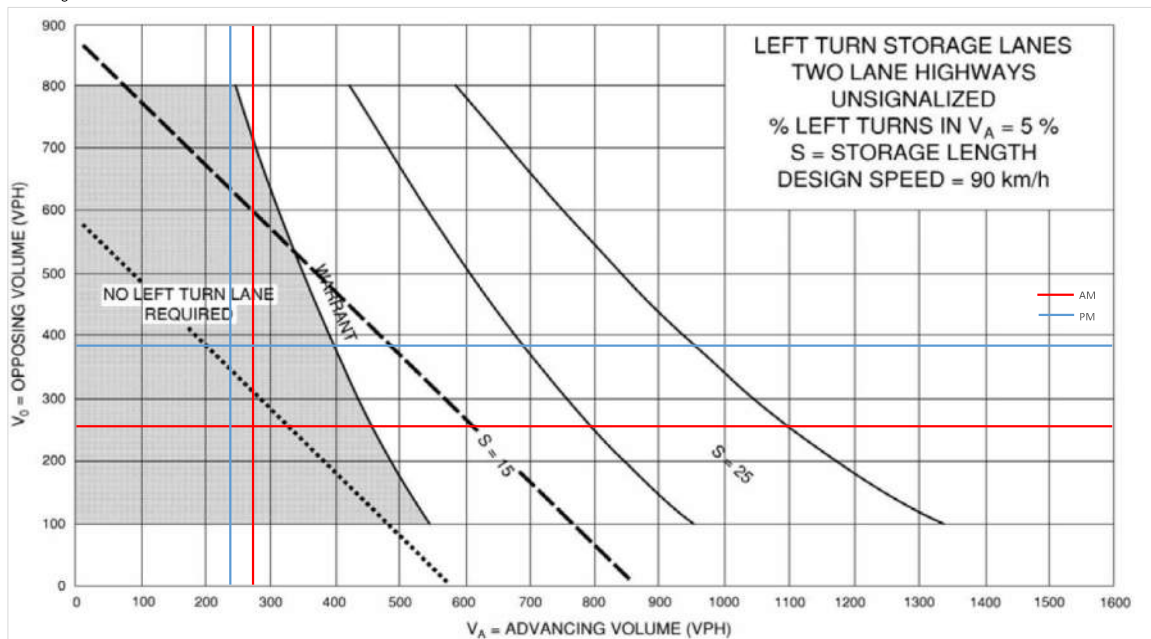
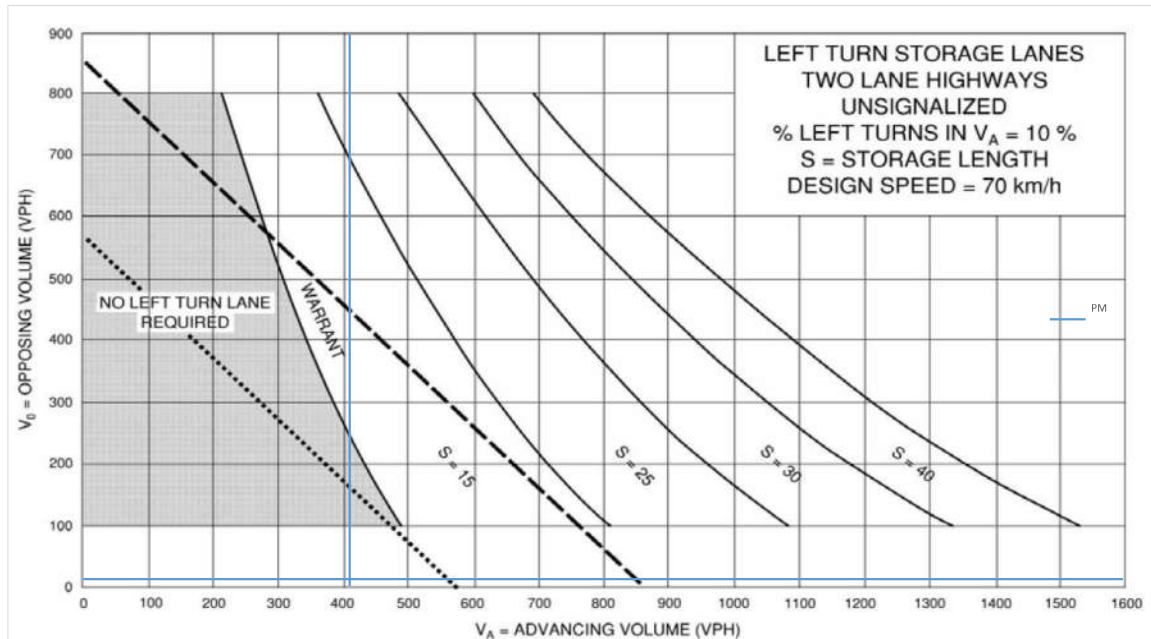
Design Speed		Yes															
70 km/h		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		1	248	24	77	175	15	12	0	385	5	2	1	3.0%	397	8	
PM		0	220	18	115	271	7	36	0	502	10	1	0	6.7%	538	11	

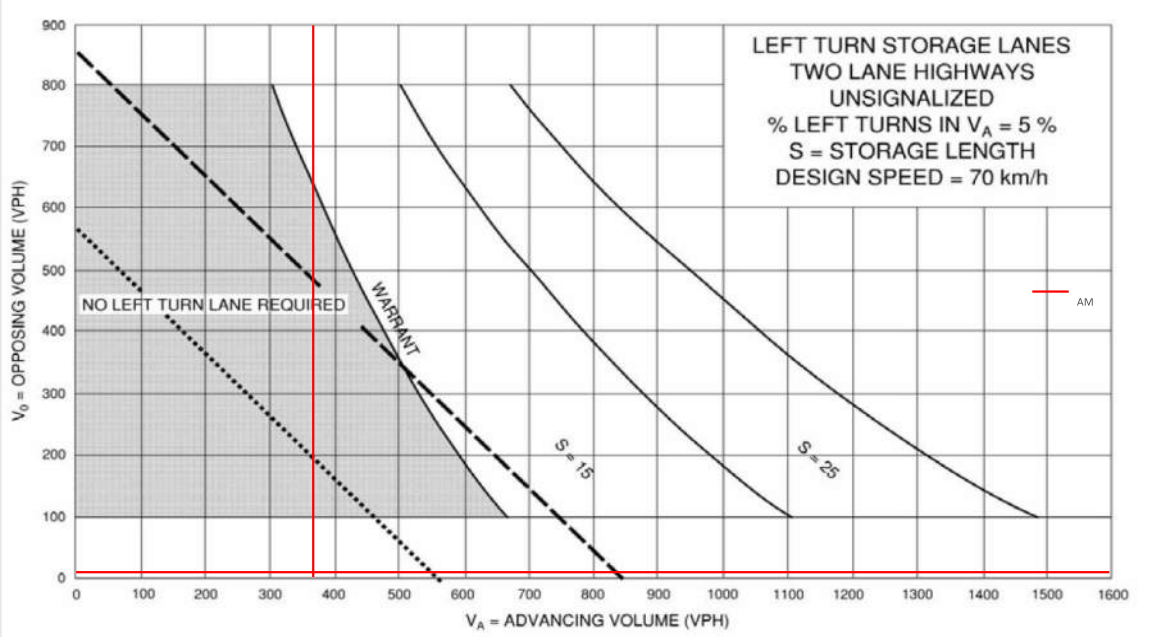
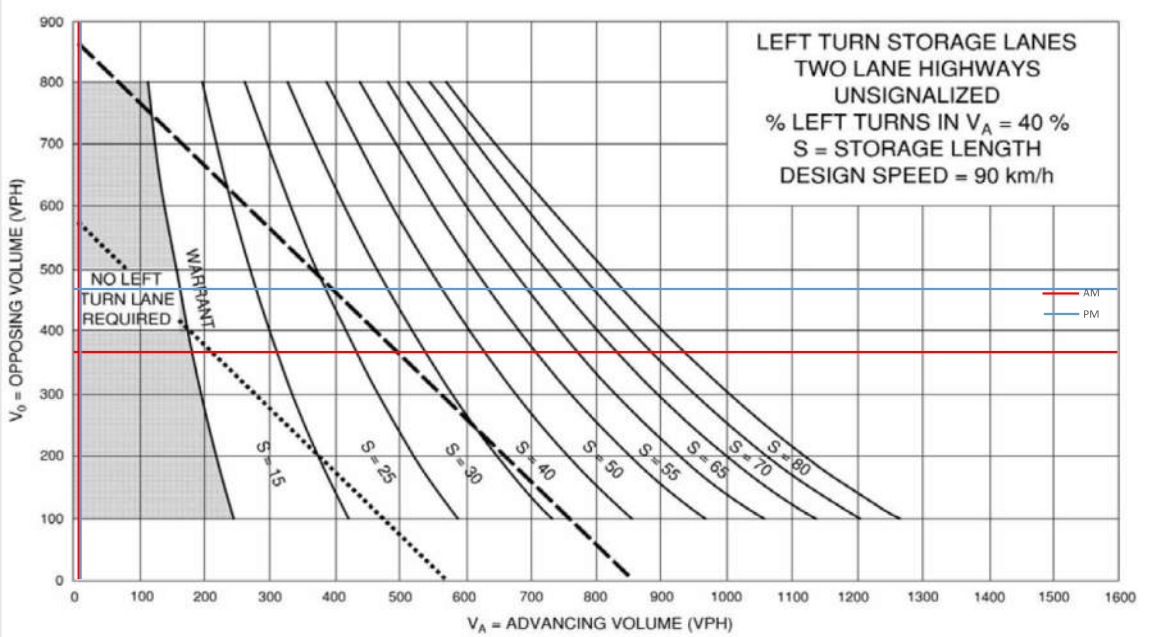
Future Total 2036

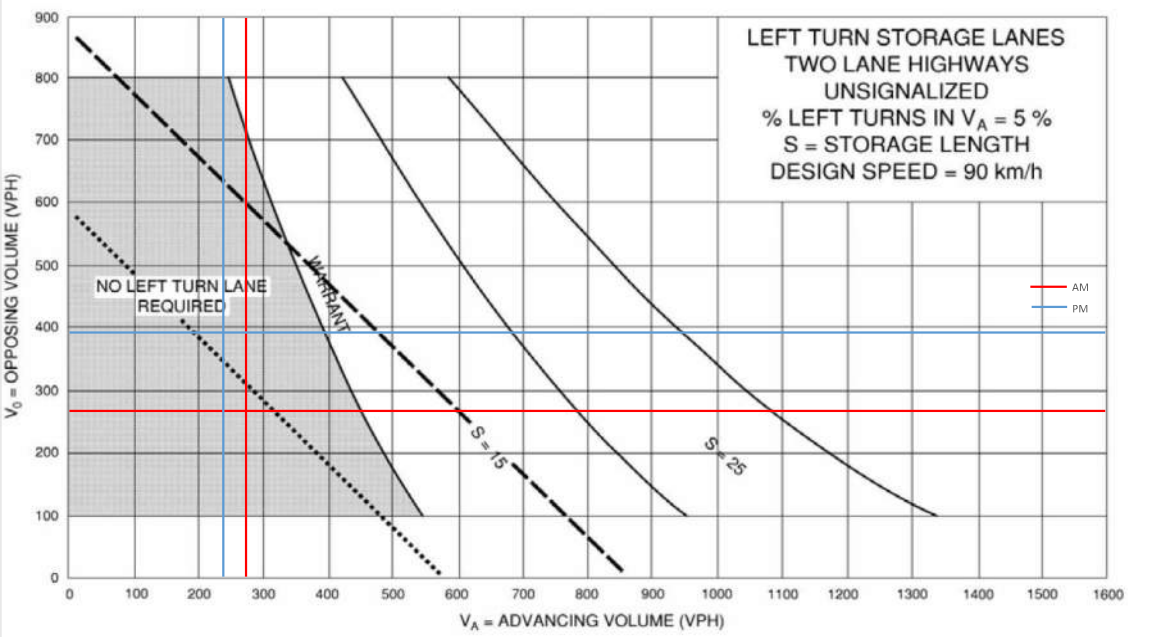
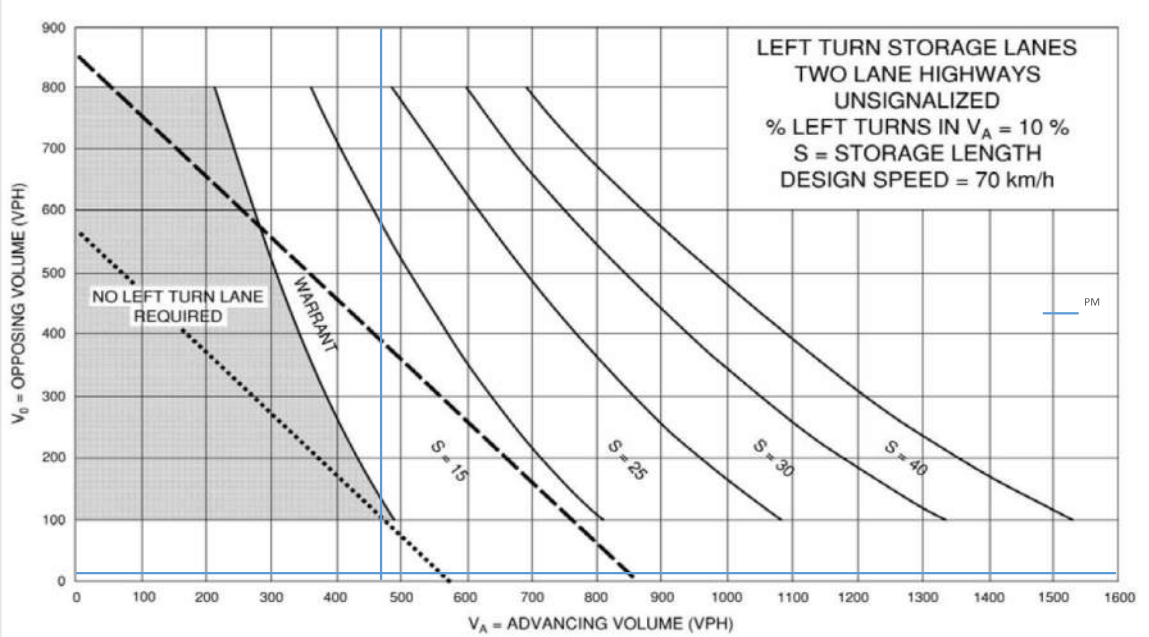
Design Speed		Yes															
70 km/h		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing	
AM		1	248	24	78	175	15	12	0	413	5	2	1	2.8%	425	8	
PM		0	220	18	116	271	7	36	0	561	10	1	0	6.0%	597	11	

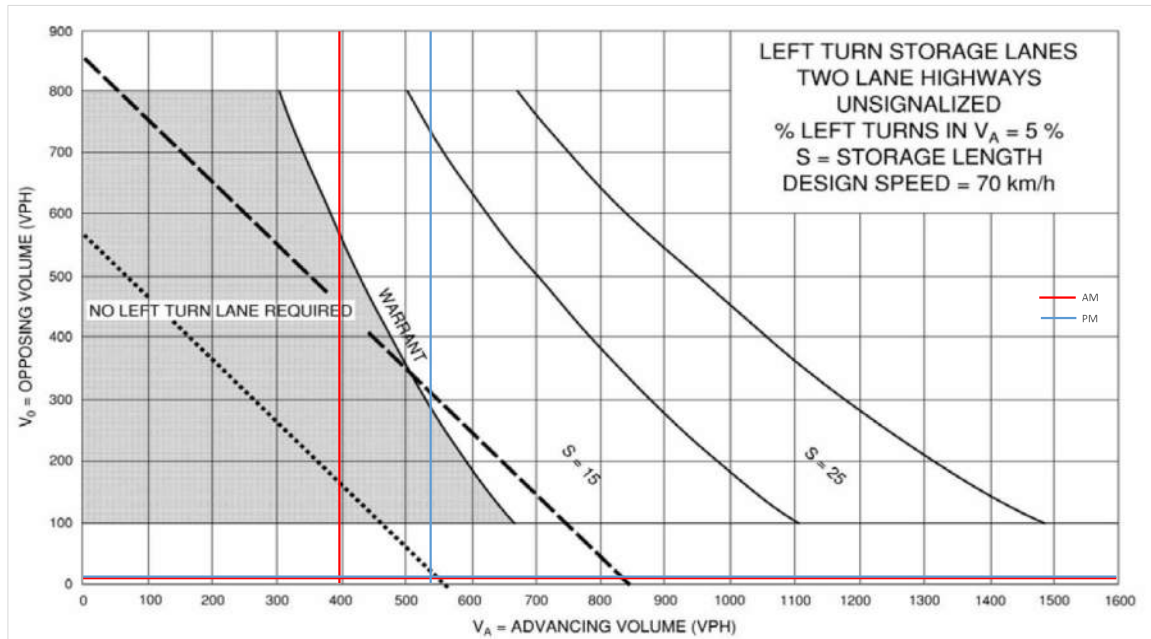
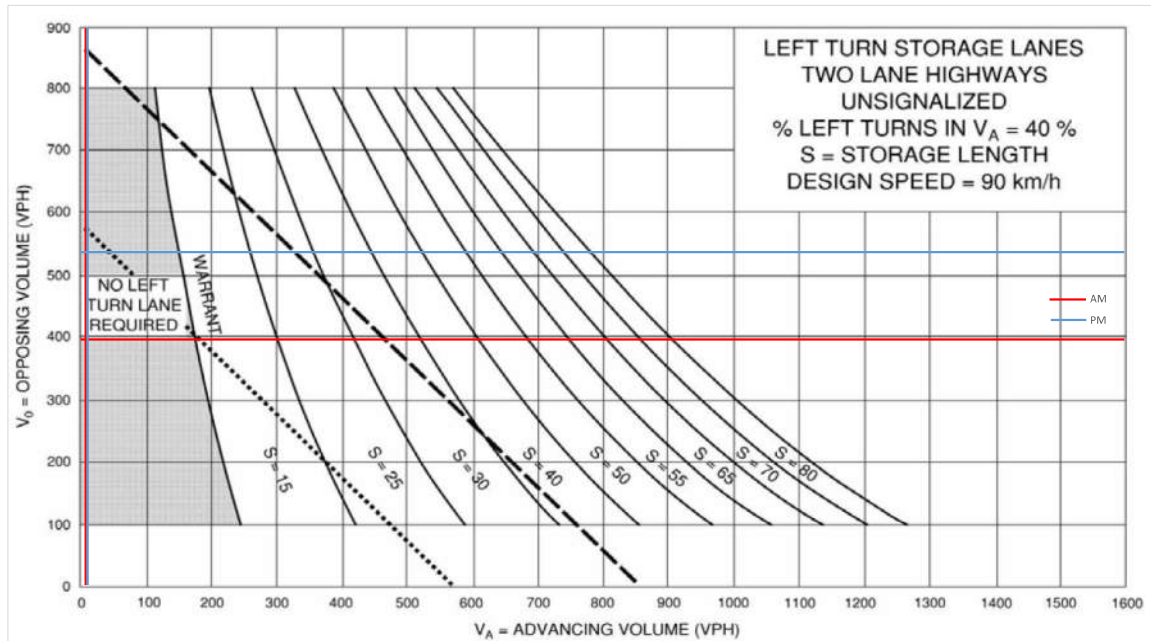


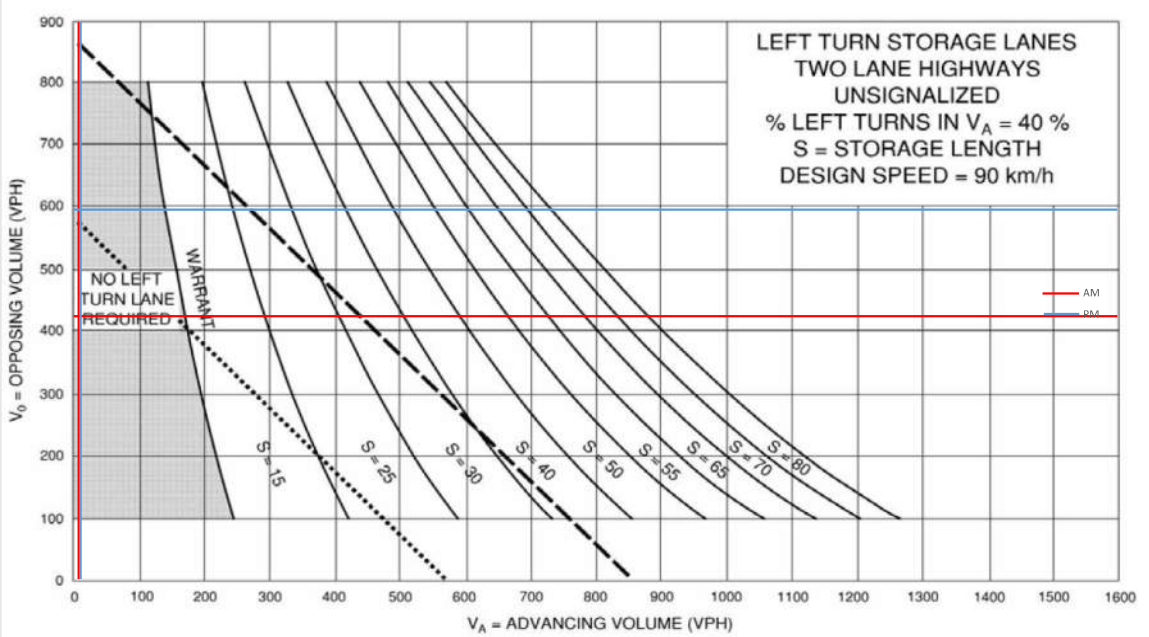
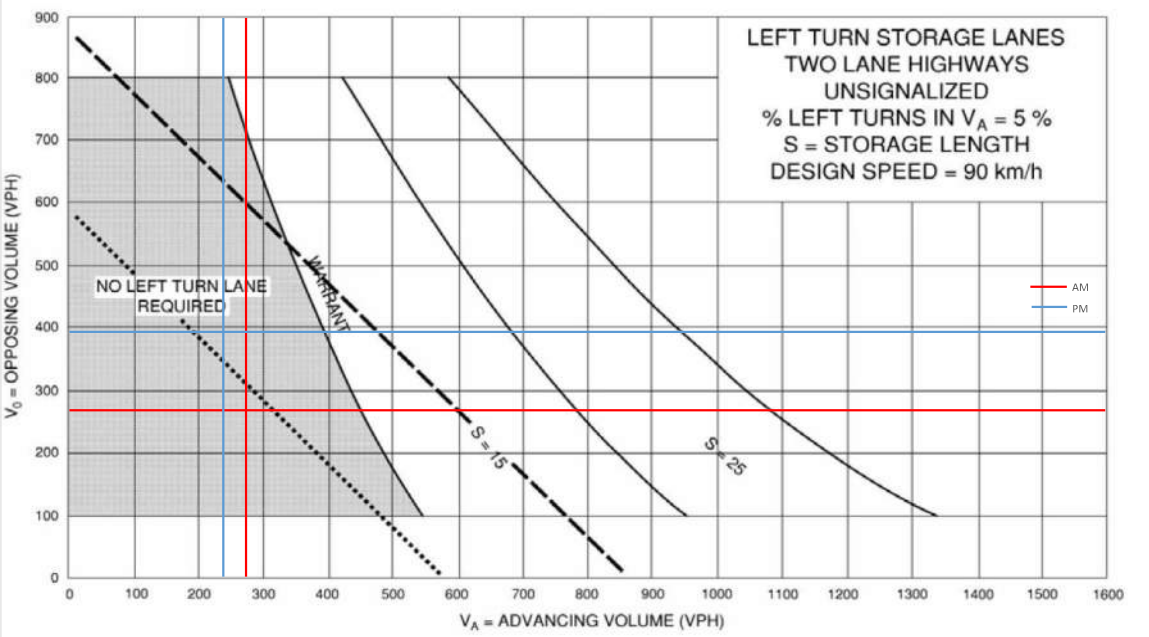


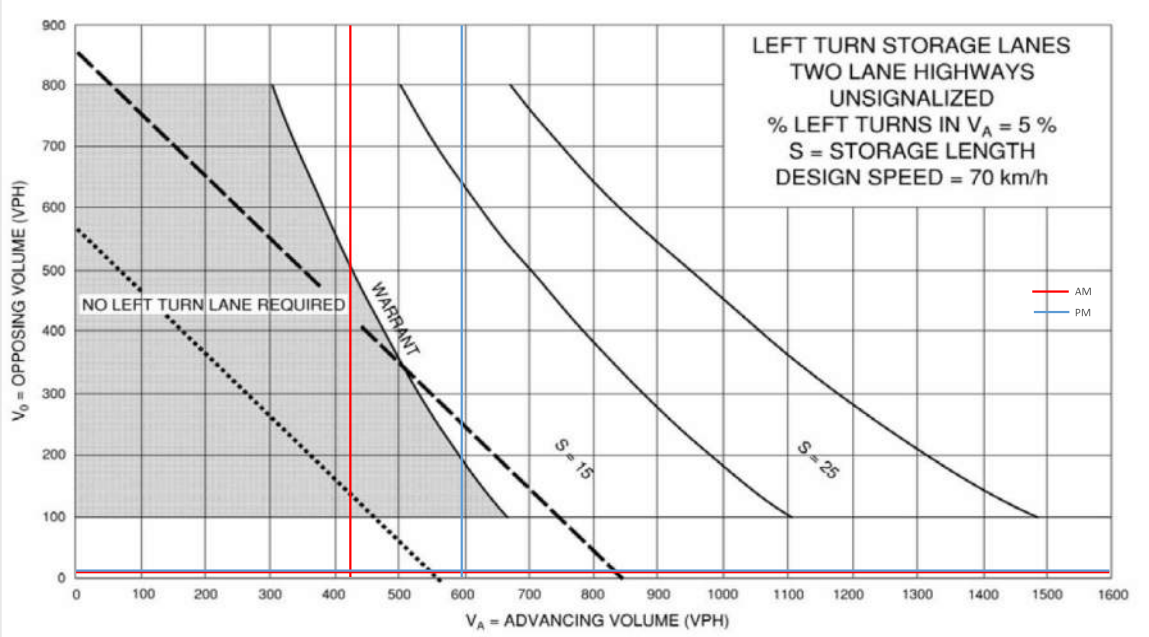












Appendix N

Synchro Intersection Worksheets – 2031 Future Background Conditions

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FB 2031-without Mitigation

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	312	236	32	192	144	125	27	39	15	78	190	82
Future Volume (vph)	312	236	32	192	144	125	27	39	15	78	190	82
Satd. Flow (prot)	0	1681	0	0	1642	0	0	1674	0	0	1653	0
Flt Permitted		0.615			0.638			0.781			0.900	
Satd. Flow (perm)	0	1061	0	0	1069	0	0	1329	0	0	1504	0
Satd. Flow (RTOR)		6			35			13			17	
Lane Group Flow (vph)	0	580	0	0	461	0	0	81	0	0	350	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	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	
Minimum Split (s)	25.8	25.8		25.8	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	59.0	59.0		59.0	59.0		31.0	31.0		31.0	31.0	
Total Split (%)	65.6%	65.6%		65.6%	65.6%		34.4%	34.4%		34.4%	34.4%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.7	1.7		1.7	1.7		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.8			6.8			6.2			6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)		52.3			52.3			22.4			22.4	
Actuated g/C Ratio		0.60			0.60			0.26			0.26	
v/c Ratio		0.91			0.71			0.23			0.88	
Control Delay		38.9			19.5			23.7			54.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		38.9			19.5			23.7			54.6	
LOS		D			B			C			D	
Approach Delay		38.9			19.5			23.7			54.6	
Approach LOS		D			B			C			D	
Queue Length 50th (m)		84.9			49.5			9.0			54.0	
Queue Length 95th (m)		#160.1			91.2			20.4			#99.1	
Internal Link Dist (m)		543.4			745.7			562.8			538.1	
Turn Bay Length (m)												
Base Capacity (vph)		634			651			385			437	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.91			0.71			0.21			0.80	
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 87.7												
Natural Cycle: 90												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.91												

Lanes, Volumes, Timings

3: Hwy 416/Borrisokane & Barnsdale

FB 2031-without Mitigation
AM Peak Hour

Intersection Signal Delay: 35.7

Intersection LOS: D

Intersection Capacity Utilization 82.5%

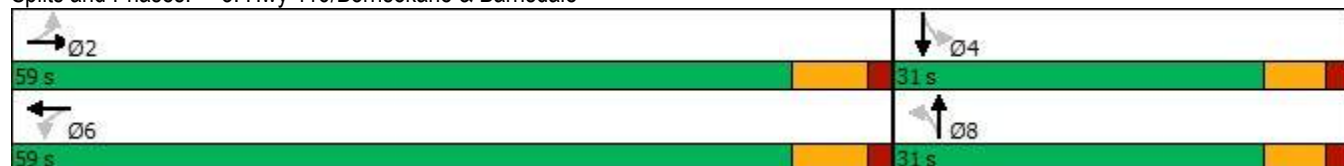
ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FB 2031-without Mitigation
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	64	175	15	12	0	327	5	2	1
Future Volume (vph)	1	248	24	64	175	15	12	0	327	5	2	1
Satd. Flow (prot)	0	1274	0	0	1274	0	0	1127	0	0	1040	0
Flt Permitted					0.988			0.998			0.970	
Satd. Flow (perm)	0	1274	0	0	1274	0	0	1127	0	0	1040	0
Lane Group Flow (vph)	0	273	0	0	254	0	0	339	0	0	8	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 61.7%												
ICU Level of Service B												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	6.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	248	24	64	175	15	12	0	327	5	2	1
Future Vol, veh/h	1	248	24	64	175	15	12	0	327	5	2	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	64	175	15	12	0	327	5	2	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	190	0	0	272	0	0	574	580	260	737	585	183
Stage 1	-	-	-	-	-	-	262	262	-	311	311	-
Stage 2	-	-	-	-	-	-	312	318	-	426	274	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1384	-	-	1059	-	-	346	356	703	236	423	859
Stage 1	-	-	-	-	-	-	620	597	-	533	658	-
Stage 2	-	-	-	-	-	-	580	562	-	453	683	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1384	-	-	1059	-	-	326	331	703	120	394	859
Mov Cap-2 Maneuver	-	-	-	-	-	-	326	331	-	120	394	-
Stage 1	-	-	-	-	-	-	619	596	-	532	613	-
Stage 2	-	-	-	-	-	-	538	524	-	242	682	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.2			15.6			27.6		
HCM LOS							C			D		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	675	1384	-	-	1059	-	-	167				
HCM Lane V/C Ratio	0.502	0.001	-	-	0.06	-	-	0.048				
HCM Control Delay (s)	15.6	7.6	0	-	8.6	0	-	27.6				
HCM Lane LOS	C	A	A	-	A	A	-	D				
HCM 95th %tile Q(veh)	2.8	0	-	-	0.2	-	-	0.1				

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FB 2031-Without Mitigation

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	233	354	17	127	210	108	27	49	16	150	246	145
Future Volume (vph)	233	354	17	127	210	108	27	49	16	150	246	145
Satd. Flow (prot)	0	1695	0	0	1656	0	0	1681	0	0	1639	0
Flt Permitted		0.669			0.698			0.792			0.881	
Satd. Flow (perm)	0	1156	0	0	1172	0	0	1350	0	0	1464	0
Satd. Flow (RTOR)		2			20			10			17	
Lane Group Flow (vph)	0	604	0	0	445	0	0	92	0	0	541	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	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	
Minimum Split (s)	25.8	25.8		25.8	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	70.0	70.0		70.0	70.0		50.0	50.0		50.0	50.0	
Total Split (%)	58.3%	58.3%		58.3%	58.3%		41.7%	41.7%		41.7%	41.7%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.7	1.7		1.7	1.7		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.8			6.8			6.2			6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effect Green (s)		63.2			63.2			43.8			43.8	
Actuated g/C Ratio		0.53			0.53			0.36			0.36	
v/c Ratio		0.99			0.71			0.18			0.99	
Control Delay		63.6			28.2			24.3			74.2	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		63.6			28.2			24.3			74.2	
LOS		E			C			C			E	
Approach Delay		63.6			28.2			24.3			74.2	
Approach LOS		E			C			C			E	
Queue Length 50th (m)		135.3			73.2			13.0			122.8	
Queue Length 95th (m)		#215.6			115.2			25.1			#196.0	
Internal Link Dist (m)		543.4			867.7			562.8			541.1	
Turn Bay Length (m)												
Base Capacity (vph)		609			626			499			545	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.99			0.71			0.18			0.99	
Intersection Summary												
Cycle Length: 120												
Actuated Cycle Length: 120												
Natural Cycle: 110												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.99												

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FB 2031-Without Mitigation
PM Peak Hour

Intersection Signal Delay: 55.5

Intersection LOS: E

Intersection Capacity Utilization 100.9%

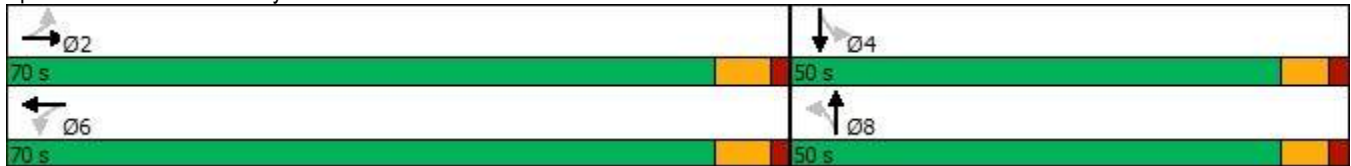
ICU Level of Service G

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FB 2031-Without Mitigation
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	106	271	7	36	0	374	10	1	0
Future Volume (vph)	0	220	18	106	271	7	36	0	374	10	1	0
Satd. Flow (prot)	0	1277	0	0	1296	0	0	1121	0	0	891	0
Flt Permitted					0.986			0.996			0.957	
Satd. Flow (perm)	0	1277	0	0	1296	0	0	1121	0	0	891	0
Lane Group Flow (vph)	0	238	0	0	384	0	0	410	0	0	11	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 70.6%												
ICU Level of Service C												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	9.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	220	18	106	271	7	36	0	374	10	1	0
Future Vol, veh/h	0	220	18	106	271	7	36	0	374	10	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	106	271	7	36	0	374	10	1	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	278	0	0	238	0	0	716	719	229	903	725	275
Stage 1	-	-	-	-	-	-	229	229	-	487	487	-
Stage 2	-	-	-	-	-	-	487	490	-	416	238	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1285	-	-	1093	-	-	274	292	733	177	352	764
Stage 1	-	-	-	-	-	-	648	619	-	416	550	-
Stage 2	-	-	-	-	-	-	458	463	-	459	708	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1285	-	-	1093	-	-	249	258	733	79	312	764
Mov Cap-2 Maneuver	-	-	-	-	-	-	249	258	-	79	312	-
Stage 1	-	-	-	-	-	-	648	619	-	416	487	-
Stage 2	-	-	-	-	-	-	404	410	-	225	708	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.4			21			53.6		
HCM LOS							C			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	626	1285	-	-	1093	-	-	85				
HCM Lane V/C Ratio	0.655	-	-	-	0.097	-	-	0.129				
HCM Control Delay (s)	21	0	-	-	8.6	0	-	53.6				
HCM Lane LOS	C	A	-	-	A	A	-	F				
HCM 95th %tile Q(veh)	4.8	0	-	-	0.3	-	-	0.4				

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FB 2031- Borrisokane(SBL)-Trail (WBL & NBR)

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	312	236	32	192	144	125	27	39	15	78	190	82
Future Volume (vph)	312	236	32	192	144	125	27	39	15	78	190	82
Satd. Flow (prot)	0	1681	0	0	1642	0	0	1674	0	1658	1643	0
Flt Permitted		0.618			0.635			0.712		0.797		
Satd. Flow (perm)	0	1067	0	0	1064	0	0	1211	0	1391	1643	0
Satd. Flow (RTOR)		6			35			13			24	
Lane Group Flow (vph)	0	580	0	0	461	0	0	81	0	78	272	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	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	
Minimum Split (s)	25.8	25.8		25.8	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	59.0	59.0		59.0	59.0		31.0	31.0		31.0	31.0	
Total Split (%)	65.6%	65.6%		65.6%	65.6%		34.4%	34.4%		34.4%	34.4%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.7	1.7		1.7	1.7		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		6.8			6.8			6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)		52.9			52.9			17.6		17.6	17.6	
Actuated g/C Ratio		0.63			0.63			0.21		0.21	0.21	
v/c Ratio		0.86			0.67			0.31		0.27	0.75	
Control Delay		29.1			16.4			26.2		29.0	40.8	
Queue Delay		0.0			0.0			0.0		0.0	0.0	
Total Delay		29.1			16.4			26.2		29.0	40.8	
LOS		C			B			C		C	D	
Approach Delay		29.1			16.4			26.2			38.2	
Approach LOS		C			B			C			D	
Queue Length 50th (m)		65.4			38.5			9.0		10.3	36.8	
Queue Length 95th (m)		#159.5			91.7			20.6		21.5	61.8	
Internal Link Dist (m)		543.4			745.7			562.8			538.1	
Turn Bay Length (m)										40.0		
Base Capacity (vph)		678			686			369		414	506	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.86			0.67			0.22		0.19	0.54	
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 83.5												
Natural Cycle: 80												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.86												

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FB 2031- Borrisokane(SBL)-Trail (WBL & NBR)

AM Peak Hour

Intersection Signal Delay: 27.1

Intersection LOS: C

Intersection Capacity Utilization 87.7%

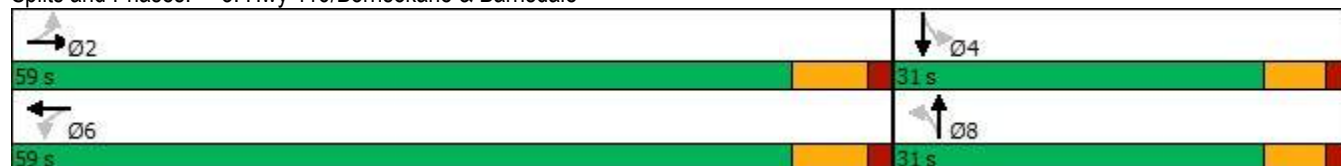
ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FB 2031- Borrisokane(SBL)-Trail (WBL & NBR)

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	64	175	15	12	0	327	5	2	1
Future Volume (vph)	1	248	24	64	175	15	12	0	327	5	2	1
Satd. Flow (prot)	0	1274	0	1127	1326	0	0	1013	1113	0	1040	0
Flt Permitted				0.950				0.950			0.970	
Satd. Flow (perm)	0	1274	0	1127	1326	0	0	1013	1113	0	1040	0
Lane Group Flow (vph)	0	273	0	64	190	0	0	12	327	0	8	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 50.1%												
ICU Level of Service A												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	6.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔			↔	↔		↔	
Traffic Vol, veh/h	1	248	24	64	175	15	12	0	327	5	2	1
Future Vol, veh/h	1	248	24	64	175	15	12	0	327	5	2	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	25	-	-	-	-	45	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	64	175	15	12	0	327	5	2	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	190	0	0	272	0	0	574	580	260	737	585	183
Stage 1	-	-	-	-	-	-	262	262	-	311	311	-
Stage 2	-	-	-	-	-	-	312	318	-	426	274	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1384	-	-	1059	-	-	346	356	703	236	423	859
Stage 1	-	-	-	-	-	-	620	597	-	533	658	-
Stage 2	-	-	-	-	-	-	580	562	-	453	683	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1384	-	-	1059	-	-	328	334	703	120	397	859
Mov Cap-2 Maneuver	-	-	-	-	-	-	328	334	-	120	397	-
Stage 1	-	-	-	-	-	-	619	596	-	532	619	-
Stage 2	-	-	-	-	-	-	543	528	-	242	682	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.2			14.6			27.6		
HCM LOS							B			D		
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1			
Capacity (veh/h)	328	703	1384	-	-	1059	-	-	167			
HCM Lane V/C Ratio	0.037	0.465	0.001	-	-	0.06	-	-	0.048			
HCM Control Delay (s)	16.4	14.5	7.6	0	-	8.6	-	-	27.6			
HCM Lane LOS	C	B	A	A	-	A	-	-	D			
HCM 95th %tile Q(veh)	0.1	2.5	0	-	-	0.2	-	-	0.1			

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FB 2031- Borrisokane(SBL)-Trail (WBL & NBR)

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	233	354	17	127	210	108	27	49	16	150	246	145
Future Volume (vph)	233	354	17	127	210	108	27	49	16	150	246	145
Satd. Flow (prot)	0	1695	0	0	1656	0	0	1681	0	1658	1620	0
Flt Permitted		0.685			0.710			0.630		0.731		
Satd. Flow (perm)	0	1184	0	0	1193	0	0	1074	0	1276	1620	0
Satd. Flow (RTOR)		2			20			10			28	
Lane Group Flow (vph)	0	604	0	0	445	0	0	92	0	150	391	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	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	
Minimum Split (s)	25.8	25.8		25.8	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	70.0	70.0		70.0	70.0		50.0	50.0		50.0	50.0	
Total Split (%)	58.3%	58.3%		58.3%	58.3%		41.7%	41.7%		41.7%	41.7%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.7	1.7		1.7	1.7		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		6.8			6.8			6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effect Green (s)		63.6			63.6			29.0		29.0	29.0	
Actuated g/C Ratio		0.60			0.60			0.27		0.27	0.27	
v/c Ratio		0.85			0.61			0.30		0.43	0.84	
Control Delay		32.6			19.2			28.7		34.7	49.7	
Queue Delay		0.0			0.0			0.0		0.0	0.0	
Total Delay		32.6			19.2			28.7		34.7	49.7	
LOS		C			B			C		C	D	
Approach Delay		32.6			19.2			28.7			45.6	
Approach LOS		C			B			C			D	
Queue Length 50th (m)		92.6			50.7			13.2		25.2	70.5	
Queue Length 95th (m)		#208.4			111.0			26.2		42.7	104.7	
Internal Link Dist (m)		543.4			867.7			562.8			541.1	
Turn Bay Length (m)										40.0		
Base Capacity (vph)		713			725			453		531	691	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.85			0.61			0.20		0.28	0.57	
Intersection Summary												
Cycle Length: 120												
Actuated Cycle Length: 105.7												
Natural Cycle: 80												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.85												

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FB 2031- Borrisokane(SBL)-Trail (WBL & NBR)
PM Peak Hour

Intersection Signal Delay: 33.0

Intersection LOS: C

Intersection Capacity Utilization 91.9%

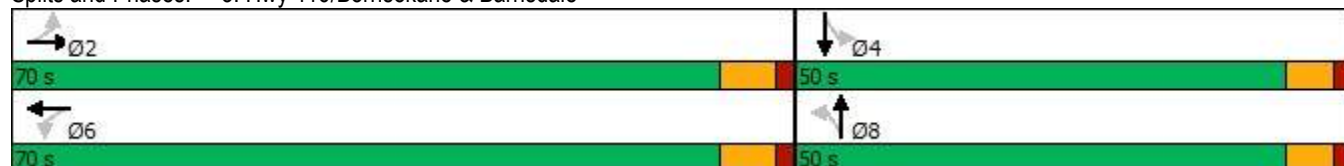
ICU Level of Service F

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FB 2031- Borrisokane(SBL)-Trail (WBL & NBR)

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	106	271	7	36	0	374	10	1	0
Future Volume (vph)	0	220	18	106	271	7	36	0	374	10	1	0
Satd. Flow (prot)	0	1277	0	1127	1369	0	0	1013	1113	0	891	0
Flt Permitted				0.950				0.950			0.957	
Satd. Flow (perm)	0	1277	0	1127	1369	0	0	1013	1113	0	891	0
Lane Group Flow (vph)	0	238	0	106	278	0	0	36	374	0	11	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 51.2%												
ICU Level of Service A												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	7.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔			↔	↔		↔	
Traffic Vol, veh/h	0	220	18	106	271	7	36	0	374	10	1	0
Future Vol, veh/h	0	220	18	106	271	7	36	0	374	10	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	25	-	-	-	-	45	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	106	271	7	36	0	374	10	1	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	278	0	0	238	0	0	716	719	229	903	725	275
Stage 1	-	-	-	-	-	-	229	229	-	487	487	-
Stage 2	-	-	-	-	-	-	487	490	-	416	238	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1285	-	-	1093	-	-	274	292	733	177	352	764
Stage 1	-	-	-	-	-	-	648	619	-	416	550	-
Stage 2	-	-	-	-	-	-	458	463	-	459	708	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1285	-	-	1093	-	-	253	264	733	80	318	764
Mov Cap-2 Maneuver	-	-	-	-	-	-	253	264	-	80	318	-
Stage 1	-	-	-	-	-	-	648	619	-	416	497	-
Stage 2	-	-	-	-	-	-	413	418	-	225	708	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.4			15.5			52.9		
HCM LOS							C			F		
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1			
Capacity (veh/h)	253	733	1285	-	-	1093	-	-	86			
HCM Lane V/C Ratio	0.142	0.51	-	-	-	0.097	-	-	0.128			
HCM Control Delay (s)	21.6	14.9	0	-	-	8.6	-	-	52.9			
HCM Lane LOS	C	B	A	-	-	A	-	-	F			
HCM 95th %tile Q(veh)	0.5	2.9	0	-	-	0.3	-	-	0.4			

Lanes, Volumes, Timings

FB 2031- Borrisokane(EBL,WBL&SBL)-Trail (All-way stop)

3: Hwy 416/Borrisokane & Barnsdale

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	312	236	32	192	144	125	27	39	15	78	190	82
Future Volume (vph)	312	236	32	192	144	125	27	39	15	78	190	82
Satd. Flow (prot)	1658	1699	0	1658	1614	0	0	1674	0	1658	1644	0
Flt Permitted	0.496			0.594				0.819		0.704		
Satd. Flow (perm)	866	1699	0	1037	1614	0	0	1394	0	1229	1644	0
Satd. Flow (RTOR)		9			56			15			33	
Lane Group Flow (vph)	312	268	0	192	269	0	0	81	0	78	272	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	11.7	25.8		11.7	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	15.0	29.0		12.0	26.0		34.0	34.0		34.0	34.0	
Total Split (%)	20.0%	38.7%		16.0%	34.7%		45.3%	45.3%		45.3%	45.3%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.6	1.7		1.6	1.7		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	
Total Lost Time (s)	6.7	6.8		6.7	6.8			6.2		6.2	6.2	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	30.7	22.3		24.7	19.3			14.5		14.5	14.5	
Actuated g/C Ratio	0.50	0.36		0.40	0.31			0.23		0.23	0.23	
v/c Ratio	0.58	0.43		0.41	0.50			0.24		0.27	0.66	
Control Delay	14.4	18.3		12.6	18.3			17.6		21.4	26.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	14.4	18.3		12.6	18.3			17.6		21.4	26.9	
LOS	B	B		B	B			B		C	C	
Approach Delay		16.2			16.0			17.6			25.6	
Approach LOS		B			B			B			C	
Queue Length 50th (m)	17.0	21.4		9.6	18.7			6.0		7.2	24.4	
Queue Length 95th (m)	38.9	45.8		23.6	43.7			15.1		16.6	45.1	
Internal Link Dist (m)		543.4			745.7			562.8			538.1	
Turn Bay Length (m)	75.0			45.0						40.0		
Base Capacity (vph)	536	617		466	540			636		553	758	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.58	0.43		0.41	0.50			0.13		0.14	0.36	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 61.9

Natural Cycle: 65

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 18.4

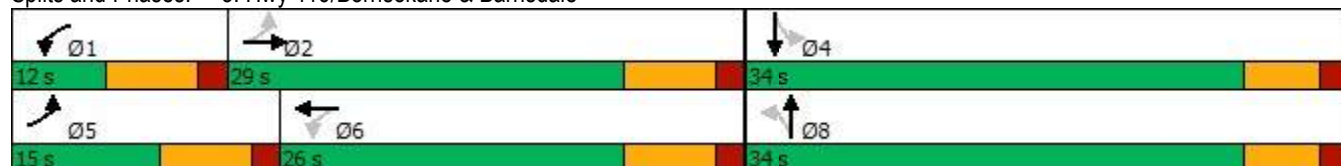
Intersection LOS: B

Intersection Capacity Utilization 79.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	64	175	15	12	0	327	5	2	1
Future Volume (vph)	1	248	24	64	175	15	12	0	327	5	2	1
Satd. Flow (prot)	0	1274	0	0	1274	0	0	1127	0	0	1040	0
Flt Permitted					0.988			0.998			0.970	
Satd. Flow (perm)	0	1274	0	0	1274	0	0	1127	0	0	1040	0
Lane Group Flow (vph)	0	273	0	0	254	0	0	339	0	0	8	0
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 61.7%												
ICU Level of Service B												
Analysis Period (min) 15												

Intersection

Intersection Delay, s/veh 14.6

Intersection LOS B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	248	24	64	175	15	12	0	327	5	2	1
Future Vol, veh/h	1	248	24	64	175	15	12	0	327	5	2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	64	175	15	12	0	327	5	2	1
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12.4	14.4	16.7	11.2
HCM LOS	B	B	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	4%	0%	25%	62%
Vol Thru, %	0%	91%	69%	25%
Vol Right, %	96%	9%	6%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	339	273	254	8
LT Vol	12	1	64	5
Through Vol	0	248	175	2
RT Vol	327	24	15	1
Lane Flow Rate	339	273	254	8
Geometry Grp	1	1	1	1
Degree of Util (X)	0.567	0.415	0.446	0.018
Departure Headway (Hd)	6.02	5.467	6.328	7.965
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	600	658	569	448
Service Time	4.06	3.511	4.373	6.034
HCM Lane V/C Ratio	0.565	0.415	0.446	0.018
HCM Control Delay	16.7	12.4	14.4	11.2
HCM Lane LOS	C	B	B	B
HCM 95th-tile Q	3.5	2	2.3	0.1

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	233	354	17	127	210	108	27	49	16	150	246	145
Future Volume (vph)	233	354	17	127	210	108	27	49	16	150	246	145
Satd. Flow (prot)	1658	1717	0	1658	1645	0	0	1681	0	1658	1620	0
Flt Permitted	0.429			0.504				0.649		0.768		
Satd. Flow (perm)	749	1717	0	880	1645	0	0	1107	0	1340	1620	0
Satd. Flow (RTOR)		3			30			12			35	
Lane Group Flow (vph)	233	371	0	127	318	0	0	92	0	150	391	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	11.7	25.8		11.7	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	19.0	38.0		17.0	36.0		35.0	35.0		35.0	35.0	
Total Split (%)	21.1%	42.2%		18.9%	40.0%		38.9%	38.9%		38.9%	38.9%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.6	1.7		1.6	1.7		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	
Total Lost Time (s)	6.7	6.8		6.7	6.8			6.2		6.2	6.2	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	43.9	34.9		37.9	29.4			22.7		22.7	22.7	
Actuated g/C Ratio	0.53	0.42		0.46	0.36			0.27		0.27	0.27	
v/c Ratio	0.45	0.51		0.26	0.53			0.29		0.41	0.83	
Control Delay	13.2	23.9		11.6	24.5			23.3		28.0	41.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	13.2	23.9		11.6	24.5			23.3		28.0	41.9	
LOS	B	C		B	C			C		C	D	
Approach Delay		19.8			20.8			23.3			38.1	
Approach LOS		B			C			C			D	
Queue Length 50th (m)	17.8	45.8		9.0	36.9			10.0		19.5	53.6	
Queue Length 95th (m)	33.8	81.3		19.1	67.3			22.1		35.7	86.8	
Internal Link Dist (m)		543.4			867.7			562.8			541.1	
Turn Bay Length (m)	75.0			45.0						40.0		
Base Capacity (vph)	539	724		521	604			395		470	590	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.43	0.51		0.24	0.53			0.23		0.32	0.66	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 82.8

Natural Cycle: 65

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 26.1

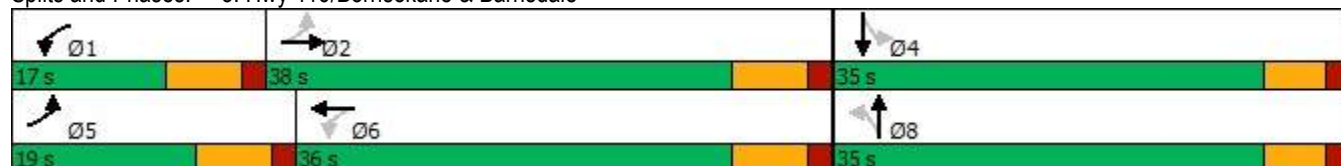
Intersection LOS: C

Intersection Capacity Utilization 78.1%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	106	271	7	36	0	374	10	1	0
Future Volume (vph)	0	220	18	106	271	7	36	0	374	10	1	0
Satd. Flow (prot)	0	1277	0	0	1296	0	0	1121	0	0	891	0
Flt Permitted					0.986			0.996			0.957	
Satd. Flow (perm)	0	1277	0	0	1296	0	0	1121	0	0	891	0
Lane Group Flow (vph)	0	238	0	0	384	0	0	410	0	0	11	0
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 70.6%												
ICU Level of Service C												
Analysis Period (min) 15												

Intersection

Intersection Delay, s/veh 23.5

Intersection LOS C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	220	18	106	271	7	36	0	374	10	1	0
Future Vol, veh/h	0	220	18	106	271	7	36	0	374	10	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	106	271	7	36	0	374	10	1	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	15.3	25.6	26.6	12.4
HCM LOS	C	D	D	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	9%	0%	28%	91%
Vol Thru, %	0%	92%	71%	9%
Vol Right, %	91%	8%	2%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	410	238	384	11
LT Vol	36	0	106	10
Through Vol	0	220	271	1
RT Vol	374	18	7	0
Lane Flow Rate	410	238	384	11
Geometry Grp	1	1	1	1
Degree of Util (X)	0.746	0.447	0.721	0.028
Departure Headway (Hd)	6.554	6.761	6.763	9.137
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	549	528	530	394
Service Time	4.635	4.859	4.847	7.137
HCM Lane V/C Ratio	0.747	0.451	0.725	0.028
HCM Control Delay	26.6	15.3	25.6	12.4
HCM Lane LOS	D	C	D	B
HCM 95th-tile Q	6.4	2.3	5.9	0.1

Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FB 2031- Trail (All-way stop & WBL-NBR)

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	64	175	15	12	0	327	5	2	1
Future Volume (vph)	1	248	24	64	175	15	12	0	327	5	2	1
Satd. Flow (prot)	0	1274	0	1127	1326	0	0	1013	1113	0	1040	0
Flt Permitted				0.950				0.950			0.970	
Satd. Flow (perm)	0	1274	0	1127	1326	0	0	1013	1113	0	1040	0
Lane Group Flow (vph)	0	273	0	64	190	0	0	12	327	0	8	0
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 50.1%												
ICU Level of Service A												
Analysis Period (min) 15												

Intersection												
Intersection Delay, s/veh	15											
Intersection LOS	B											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	248	24	64	175	15	12	0	327	5	2	1
Future Vol, veh/h	1	248	24	64	175	15	12	0	327	5	2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	64	175	15	12	0	327	5	2	1
Number of Lanes	0	1	0	1	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	1
HCM Control Delay	14.4	12.4	17.6	11.9
HCM LOS	B	B	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	100%	0%	0%	100%	0%	62%
Vol Thru, %	0%	0%	91%	0%	92%	25%
Vol Right, %	0%	100%	9%	0%	8%	12%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	12	327	273	64	190	8
LT Vol	12	0	1	64	0	5
Through Vol	0	0	248	0	175	2
RT Vol	0	327	24	0	15	1
Lane Flow Rate	12	327	273	64	190	8
Geometry Grp	5	5	4b	5	5	4b
Degree of Util (X)	0.026	0.586	0.464	0.133	0.345	0.019
Departure Headway (Hd)	7.782	6.446	6.122	7.488	6.545	8.7
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	461	559	587	479	549	411
Service Time	5.52	4.183	4.165	5.236	4.292	6.77
HCM Lane V/C Ratio	0.026	0.585	0.465	0.134	0.346	0.019
HCM Control Delay	10.7	17.9	14.4	11.4	12.7	11.9
HCM Lane LOS	B	C	B	B	B	B
HCM 95th-tile Q	0.1	3.8	2.4	0.5	1.5	0.1

Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FB 2031- Trail (All-way stop & WBL-NBR)

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	106	271	7	36	0	374	10	1	0
Future Volume (vph)	0	220	18	106	271	7	36	0	374	10	1	0
Satd. Flow (prot)	0	1277	0	1127	1369	0	0	1013	1113	0	891	0
Flt Permitted				0.950				0.950			0.957	
Satd. Flow (perm)	0	1277	0	1127	1369	0	0	1013	1113	0	891	0
Lane Group Flow (vph)	0	238	0	106	278	0	0	36	374	0	11	0
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 51.2%												
ICU Level of Service A												
Analysis Period (min) 15												

Intersection	
Intersection Delay, s/veh	19.3
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	220	18	106	271	7	36	0	374	10	1	0
Future Vol, veh/h	0	220	18	106	271	7	36	0	374	10	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	106	271	7	36	0	374	10	1	0
Number of Lanes	0	1	0	1	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	1
HCM Control Delay	17	16.3	23.7	12.9
HCM LOS	C	C	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	100%	0%	0%	100%	0%	91%
Vol Thru, %	0%	0%	92%	0%	97%	9%
Vol Right, %	0%	100%	8%	0%	3%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	36	374	238	106	278	11
LT Vol	36	0	0	106	0	10
Through Vol	0	0	220	0	271	1
RT Vol	0	374	18	0	7	0
Lane Flow Rate	36	374	238	106	278	11
Geometry Grp	5	5	4b	5	5	4b
Degree of Util (X)	0.082	0.712	0.481	0.231	0.536	0.029
Departure Headway (Hd)	8.192	6.851	7.279	7.844	6.936	9.648
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	437	527	493	457	517	373
Service Time	5.956	4.614	5.354	5.616	4.708	7.648
HCM Lane V/C Ratio	0.082	0.71	0.483	0.232	0.538	0.029
HCM Control Delay	11.7	24.9	17	13	17.5	12.9
HCM Lane LOS	B	C	C	B	C	B
HCM 95th-tile Q	0.3	5.7	2.6	0.9	3.1	0.1

Appendix O

Synchro Intersection Worksheets – 2036 Future Background Conditions

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FB 2036-Without Mitigation
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	276	300	32	331	145	125	27	39	15	78	118	82
Future Volume (vph)	276	300	32	331	145	125	27	39	15	78	118	82
Satd. Flow (prot)	0	1687	0	0	1647	0	0	1674	0	0	1628	0
Flt Permitted		0.607			0.553			0.769			0.886	
Satd. Flow (perm)	0	1047	0	0	936	0	0	1308	0	0	1463	0
Satd. Flow (RTOR)		6			29			12			21	
Lane Group Flow (vph)	0	608	0	0	601	0	0	81	0	0	278	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	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	
Minimum Split (s)	25.8	25.8		25.8	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	64.5	64.5		64.5	64.5		25.5	25.5		25.5	25.5	
Total Split (%)	71.7%	71.7%		71.7%	71.7%		28.3%	28.3%		28.3%	28.3%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.7	1.7		1.7	1.7		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.8			6.8			6.2			6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effect Green (s)		58.3			58.3			18.3			18.3	
Actuated g/C Ratio		0.65			0.65			0.20			0.20	
v/c Ratio		0.89			0.97			0.29			0.88	
Control Delay		31.8			47.3			28.8			61.2	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		31.8			47.3			28.8			61.2	
LOS		C			D			C			E	
Approach Delay		31.8			47.3			28.8			61.2	
Approach LOS		C			D			C			E	
Queue Length 50th (m)		79.5			87.8			9.9			43.0	
Queue Length 95th (m)		#161.2			#168.2			22.5			#85.0	
Internal Link Dist (m)		543.4			978.4			562.8			531.1	
Turn Bay Length (m)												
Base Capacity (vph)		683			618			290			331	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.89			0.97			0.28			0.84	
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 89.6												
Natural Cycle: 90												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.97												

Lanes, Volumes, Timings 3: Hwy 416/Borrisokane & Barnsdale

FB 2036-Without Mitigation
AM Peak Hour

Intersection Signal Delay: 42.8

Intersection LOS: D

Intersection Capacity Utilization 79.9%

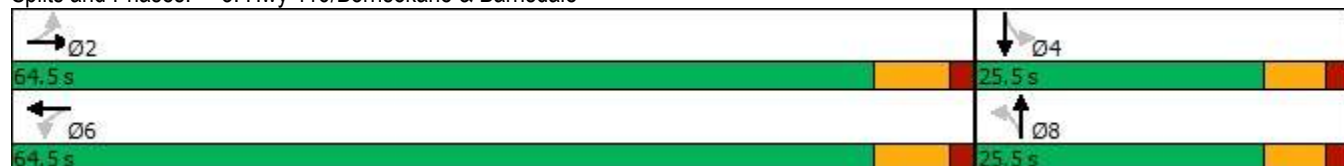
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FB 2036-Without Mitigation
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	65	175	15	12	0	355	5	2	1
Future Volume (vph)	1	248	24	65	175	15	12	0	355	5	2	1
Satd. Flow (prot)	0	1274	0	0	1272	0	0	1127	0	0	1040	0
Flt Permitted					0.987			0.998			0.970	
Satd. Flow (perm)	0	1274	0	0	1272	0	0	1127	0	0	1040	0
Lane Group Flow (vph)	0	273	0	0	255	0	0	367	0	0	8	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 63.6%												
ICU Level of Service B												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	7.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	248	24	65	175	15	12	0	355	5	2	1
Future Vol, veh/h	1	248	24	65	175	15	12	0	355	5	2	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	65	175	15	12	0	355	5	2	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	190	0	0	272	0	0	576	582	260	753	587	183
Stage 1	-	-	-	-	-	-	262	262	-	313	313	-
Stage 2	-	-	-	-	-	-	314	320	-	440	274	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1384	-	-	1059	-	-	345	355	703	230	422	859
Stage 1	-	-	-	-	-	-	620	597	-	531	657	-
Stage 2	-	-	-	-	-	-	578	560	-	444	683	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1384	-	-	1059	-	-	325	330	703	108	392	859
Mov Cap-2 Maneuver	-	-	-	-	-	-	325	330	-	108	392	-
Stage 1	-	-	-	-	-	-	619	596	-	530	612	-
Stage 2	-	-	-	-	-	-	536	521	-	220	682	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.2			16.4			30		
HCM LOS							C			D		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	677	1384	-	-	1059	-	-	152				
HCM Lane V/C Ratio	0.542	0.001	-	-	0.061	-	-	0.053				
HCM Control Delay (s)	16.4	7.6	0	-	8.6	0	-	30				
HCM Lane LOS	C	A	A	-	A	A	-	D				
HCM 95th %tile Q(veh)	3.3	0	-	-	0.2	-	-	0.2				

Lanes, Volumes, Timings
13: Realigned Geenbank & Dundonald

FB 2036-Without Mitigation
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	153	25	33	10	29	82	17	249	10	56	157	76
Future Volume (vph)	153	25	33	10	29	82	17	249	10	56	157	76
Satd. Flow (prot)	1658	1582	0	1658	1533	0	1658	3291	0	1658	3117	0
Flt Permitted	0.685			0.719			0.607			0.592		
Satd. Flow (perm)	1191	1582	0	1250	1533	0	1048	3291	0	1022	3117	0
Satd. Flow (RTOR)		33			82			4			76	
Lane Group Flow (vph)	153	58	0	10	111	0	17	259	0	56	233	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	46.8	46.8		46.8	46.8		24.4	24.4		24.4	24.4	
Total Split (s)	68.0	68.0		68.0	68.0		42.0	42.0		42.0	42.0	
Total Split (%)	61.8%	61.8%		61.8%	61.8%		38.2%	38.2%		38.2%	38.2%	
Yellow Time (s)	3.3	3.3		3.3	3.3		4.2	4.2		4.2	4.2	
All-Red Time (s)	4.5	4.5		4.5	4.5		2.2	2.2		2.2	2.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.8	7.8		7.8	7.8		6.4	6.4		6.4	6.4	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	22.1	22.1		22.1	22.1		73.7	73.7		73.7	73.7	
Actuated g/C Ratio	0.20	0.20		0.20	0.20		0.67	0.67		0.67	0.67	
v/c Ratio	0.64	0.17		0.04	0.30		0.02	0.12		0.08	0.11	
Control Delay	50.5	17.1		29.4	12.6		13.2	10.4		9.6	5.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	50.5	17.1		29.4	12.6		13.2	10.4		9.6	5.9	
LOS	D	B		C	B		B	B		A	A	
Approach Delay		41.3			14.0			10.6			6.6	
Approach LOS		D			B			B			A	
Queue Length 50th (m)	31.1	4.5		1.8	5.2		1.2	9.5		3.6	5.2	
Queue Length 95th (m)	41.7	12.2		5.1	15.8		8.5	33.7		12.7	15.0	
Internal Link Dist (m)		191.3			523.4			466.1			376.6	
Turn Bay Length (m)	38.0			38.0			38.0			50.0		
Base Capacity (vph)	651	880		684	876		702	2206		684	2113	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.24	0.07		0.01	0.13		0.02	0.12		0.08	0.11	
Intersection Summary												
Cycle Length: 110												
Actuated Cycle Length: 110												
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green												
Natural Cycle: 75												
Control Type: Actuated-Coordinated												

Lanes, Volumes, Timings
13: Realigned Geenbank & Dundonald

FB 2036-Without Mitigation
AM Peak Hour

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 17.0

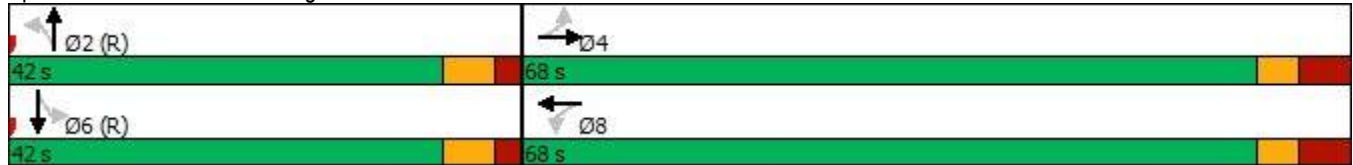
Intersection LOS: B

Intersection Capacity Utilization 58.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 13: Realigned Geenbank & Dundonald



Lanes, Volumes, Timings
14: Realigned Geenbank & Kilbirnie

FB 2036-Without Mitigation
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	51	4	23	10	2	79	11	136	10	52	107	31
Future Volume (vph)	51	4	23	10	2	79	11	136	10	52	107	31
Satd. Flow (prot)	3216	1501	0	1658	1467	0	1658	3316	1483	1658	3316	1483
Flt Permitted	0.950			0.740			0.684			0.666		
Satd. Flow (perm)	3197	1501	0	1286	1467	0	1181	3316	1436	1151	3316	1436
Satd. Flow (RTOR)		23			79				123			123
Lane Group Flow (vph)	51	27	0	10	81	0	11	136	10	52	107	31
Turn Type	Prot	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4			8			2			6	
Permitted Phases				8			2		2	6		6
Detector Phase	7	4		8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	12.4	48.7		48.7	48.7		29.8	29.8	29.8	29.8	29.8	29.8
Total Split (s)	18.0	70.0		52.0	52.0		40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	16.4%	63.6%		47.3%	47.3%		36.4%	36.4%	36.4%	36.4%	36.4%	36.4%
Yellow Time (s)	3.7	3.7		3.7	3.7		4.2	4.2	4.2	4.2	4.2	4.2
All-Red Time (s)	3.7	4.0		4.0	4.0		2.6	2.6	2.6	2.6	2.6	2.6
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)	7.4	7.7		7.7	7.7		6.8	6.8	6.8	6.8	6.8	6.8
Lead/Lag	Lag			Lead	Lead							
Lead-Lag Optimize?	Yes			Yes	Yes							
Recall Mode	None	None		None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	7.1	28.2		16.2	16.2		72.2	72.2	72.2	72.2	72.2	72.2
Actuated g/C Ratio	0.06	0.26		0.15	0.15		0.66	0.66	0.66	0.66	0.66	0.66
v/c Ratio	0.25	0.07		0.05	0.29		0.01	0.06	0.01	0.07	0.05	0.03
Control Delay	51.2	9.5		34.1	9.9		9.3	7.0	0.1	15.9	13.6	2.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.2	9.5		34.1	9.9		9.3	7.0	0.1	15.9	13.6	2.3
LOS	D	A		C	A		A	A	A	B	B	A
Approach Delay		36.8			12.5			6.7			12.4	
Approach LOS		D			B			A			B	
Queue Length 50th (m)	5.4	0.7		2.0	0.4		0.4	2.5	0.0	5.1	5.5	0.0
Queue Length 95th (m)	11.3	4.6		4.9	9.8		3.2	10.3	0.0	19.0	16.3	0.0
Internal Link Dist (m)		474.8			483.3			501.2			466.1	
Turn Bay Length (m)	25.0			15.0			35.0		84.0	57.0		75.0
Base Capacity (vph)	309	860		517	637		775	2177	985	755	2177	985
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	0.03		0.02	0.13		0.01	0.06	0.01	0.07	0.05	0.03

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 37 (34%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 95

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings 14: Realigned Geenbank & Kilbirnie

FB 2036-Without Mitigation
AM Peak Hour

Maximum v/c Ratio: 0.29

Intersection Signal Delay: 14.4

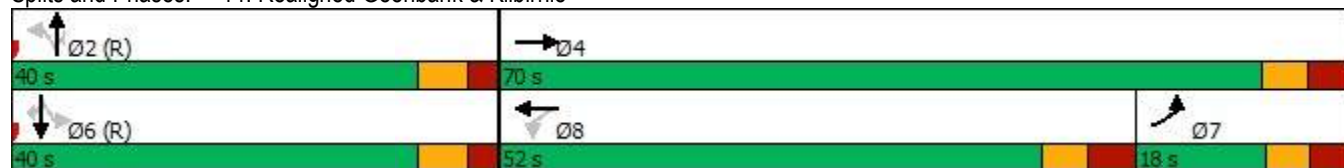
Intersection LOS: B

Intersection Capacity Utilization 57.5%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 14: Realigned Geenbank & Kilbirnie



Lanes, Volumes, Timings
15: Realigned Geenbank & Cappamore

FB 2036-Without Mitigation
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	47	6	5	28	32	3	105	2	17	106	7
Future Volume (vph)	10	47	6	5	28	32	3	105	2	17	106	7
Satd. Flow (prot)	1658	1712	0	1658	1590	0	1658	3304	0	1658	3279	0
Flt Permitted	0.718			0.722			0.681			0.684		
Satd. Flow (perm)	1246	1712	0	1253	1590	0	1172	3304	0	1177	3279	0
Satd. Flow (RTOR)		6			32			2			7	
Lane Group Flow (vph)	10	53	0	5	60	0	3	107	0	17	113	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	32.7	32.7		32.7	32.7		23.4	23.4		23.4	23.4	
Total Split (s)	59.0	59.0		59.0	59.0		51.0	51.0		51.0	51.0	
Total Split (%)	53.6%	53.6%		53.6%	53.6%		46.4%	46.4%		46.4%	46.4%	
Yellow Time (s)	3.7	3.7		3.7	3.7		4.2	4.2		4.2	4.2	
All-Red Time (s)	3.0	3.0		3.0	3.0		2.2	2.2		2.2	2.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.7	6.7		6.7	6.7		6.4	6.4		6.4	6.4	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effect Green (s)	13.2	13.2		13.2	13.2		88.3	88.3		88.3	88.3	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.80	0.80		0.80	0.80	
v/c Ratio	0.07	0.25		0.03	0.28		0.00	0.04		0.02	0.04	
Control Delay	40.0	40.7		39.0	25.8		2.3	1.7		3.4	2.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	40.0	40.7		39.0	25.8		2.3	1.7		3.4	2.7	
LOS	D	D		D	C		A	A		A	A	
Approach Delay		40.6			26.8			1.8			2.8	
Approach LOS		D			C			A			A	
Queue Length 50th (m)	2.0	9.6		1.0	5.7		0.0	0.9		0.5	1.6	
Queue Length 95th (m)	6.1	18.2		3.9	15.4		m0.6	5.6		1.9	3.6	
Internal Link Dist (m)		431.8			441.9			239.7			501.2	
Turn Bay Length (m)	30.0			30.0			38.0			38.0		
Base Capacity (vph)	592	817		595	772		940	2653		944	2633	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.02	0.06		0.01	0.08		0.00	0.04		0.02	0.04	
Intersection Summary												
Cycle Length: 110												
Actuated Cycle Length: 110												
Offset: 28 (25%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green												
Natural Cycle: 60												
Control Type: Actuated-Coordinated												

Lanes, Volumes, Timings 15: Realigned Geenbank & Cappamore

FB 2036-Without Mitigation
AM Peak Hour

Maximum v/c Ratio: 0.28

Intersection Signal Delay: 13.2

Intersection LOS: B

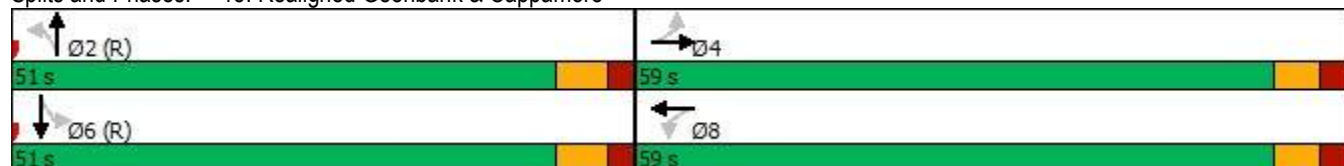
Intersection Capacity Utilization 35.5%

ICU Level of Service A

Analysis Period (min) 15

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

Splits and Phases: 15: Realigned Geenbank & Cappamore



Lanes, Volumes, Timings
16: Barnsdale & Realigned Geenbank

FB 2036-Without Mitigation
AM Peak Hour



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	57	315	463	53	39	80
Future Volume (vph)	57	315	463	53	39	80
Satd. Flow (prot)	1658	1745	1745	1483	1658	1483
Flt Permitted	0.277				0.950	
Satd. Flow (perm)	483	1745	1745	1483	1658	1483
Satd. Flow (RTOR)				53		80
Lane Group Flow (vph)	57	315	463	53	39	80
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases		4	8			
Permitted Phases	4			8	6	6
Detector Phase	4	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	5.0
Minimum Split (s)	32.2	32.2	32.2	32.2	11.5	11.5
Total Split (s)	80.0	80.0	80.0	80.0	30.0	30.0
Total Split (%)	72.7%	72.7%	72.7%	72.7%	27.3%	27.3%
Yellow Time (s)	5.1	5.1	5.1	5.1	4.2	4.2
All-Red Time (s)	2.1	2.1	2.1	2.1	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.2	7.2	7.2	7.2	6.5	6.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	C-Max	C-Max
Act Effect Green (s)	39.2	39.2	39.2	39.2	57.1	57.1
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.52	0.52
v/c Ratio	0.33	0.51	0.74	0.09	0.05	0.10
Control Delay	28.1	29.3	37.7	5.1	17.3	8.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.1	29.3	37.7	5.1	17.3	8.4
LOS	C	C	D	A	B	A
Approach Delay		29.1	34.3		11.3	
Approach LOS		C	C		B	
Queue Length 50th (m)	8.9	52.8	86.7	0.0	3.8	0.0
Queue Length 95th (m)	16.3	62.3	98.4	6.4	11.4	8.5
Internal Link Dist (m)		978.4	366.5		239.7	
Turn Bay Length (m)	83.0			91.0		
Base Capacity (vph)	319	1154	1154	999	860	807
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	0.27	0.40	0.05	0.05	0.10

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 59 (54%), Referenced to phase 6:SBL, Start of Green

Natural Cycle: 45

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
16: Barnsdale & Realigned Geenbank

FB 2036-Without Mitigation
AM Peak Hour

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 29.7

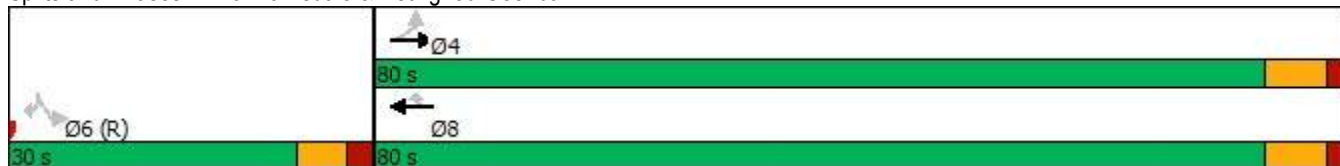
Intersection LOS: C

Intersection Capacity Utilization 55.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 16: Barnsdale & Realigned Geenbank



Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FB 2036-Without Mitigation
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	167	479	17	222	211	108	27	49	18	150	192	145
Future Volume (vph)	167	479	17	222	211	108	27	49	18	150	192	145
Satd. Flow (prot)	0	1707	0	0	1658	0	0	1676	0	0	1628	0
Flt Permitted		0.742			0.567			0.798			0.870	
Satd. Flow (perm)	0	1282	0	0	959	0	0	1356	0	0	1438	0
Satd. Flow (RTOR)		2			17			11			19	
Lane Group Flow (vph)	0	663	0	0	541	0	0	94	0	0	487	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	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	
Minimum Split (s)	25.8	25.8		25.8	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	74.0	74.0		74.0	74.0		46.0	46.0		46.0	46.0	
Total Split (%)	61.7%	61.7%		61.7%	61.7%		38.3%	38.3%		38.3%	38.3%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.7	1.7		1.7	1.7		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.8			6.8			6.2			6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effect Green (s)		67.2			67.2			39.8			39.8	
Actuated g/C Ratio		0.56			0.56			0.33			0.33	
v/c Ratio		0.92			0.99			0.21			1.00	
Control Delay		44.6			63.9			26.8			78.8	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		44.6			63.9			26.8			78.8	
LOS		D			E			C			E	
Approach Delay		44.6			63.9			26.8			78.8	
Approach LOS		D			E			C			E	
Queue Length 50th (m)		135.2			118.3			13.9			110.5	
Queue Length 95th (m)		#219.3			#197.0			26.9			#180.2	
Internal Link Dist (m)		543.4			978.4			562.8			538.5	
Turn Bay Length (m)												
Base Capacity (vph)		718			544			457			489	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.92			0.99			0.21			1.00	
Intersection Summary												
Cycle Length: 120												
Actuated Cycle Length: 120												
Natural Cycle: 110												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 1.00												

Lanes, Volumes, Timings

3: Hwy 416/Borrisokane & Barnsdale

FB 2036-Without Mitigation
PM Peak Hour

Intersection Signal Delay: 58.8

Intersection LOS: E

Intersection Capacity Utilization 98.7%

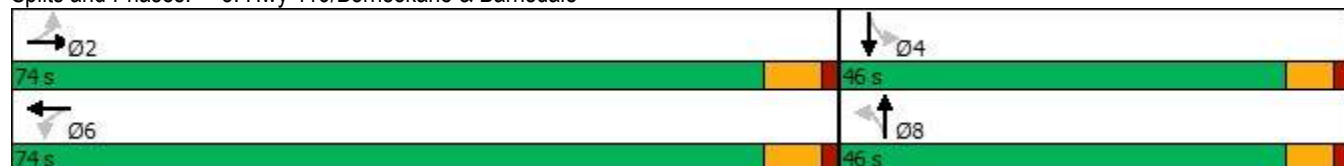
ICU Level of Service F

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FB 2036-Without Mitigation
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	107	271	7	36	0	433	10	1	0
Future Volume (vph)	0	220	18	107	271	7	36	0	433	10	1	0
Satd. Flow (prot)	0	1277	0	0	1296	0	0	1121	0	0	891	0
Flt Permitted					0.986			0.996			0.957	
Satd. Flow (perm)	0	1277	0	0	1296	0	0	1121	0	0	891	0
Lane Group Flow (vph)	0	238	0	0	385	0	0	469	0	0	11	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 74.5%												
ICU Level of Service D												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	12.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	220	18	107	271	7	36	0	433	10	1	0
Future Vol, veh/h	0	220	18	107	271	7	36	0	433	10	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	107	271	7	36	0	433	10	1	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	278	0	0	238	0	0	718	721	229	935	727	275
Stage 1	-	-	-	-	-	-	229	229	-	489	489	-
Stage 2	-	-	-	-	-	-	489	492	-	446	238	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1285	-	-	1093	-	-	273	291	733	167	351	764
Stage 1	-	-	-	-	-	-	648	619	-	414	549	-
Stage 2	-	-	-	-	-	-	456	462	-	440	708	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1285	-	-	1093	-	-	248	257	733	62	310	764
Mov Cap-2 Maneuver	-	-	-	-	-	-	248	257	-	62	310	-
Stage 1	-	-	-	-	-	-	648	619	-	414	485	-
Stage 2	-	-	-	-	-	-	402	408	-	180	708	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.4			24.8			69		
HCM LOS							C			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	637	1285	-	-	1093	-	-	67				
HCM Lane V/C Ratio	0.736	-	-	-	0.098	-	-	0.164				
HCM Control Delay (s)	24.8	0	-	-	8.7	0	-	69				
HCM Lane LOS	C	A	-	-	A	A	-	F				
HCM 95th %tile Q(veh)	6.4	0	-	-	0.3	-	-	0.5				

Lanes, Volumes, Timings
13: Realigned Geenbank & Dundonald

FB 2036-Without Mitigation
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	112	12	24	10	45	81	32	240	10	102	292	148
Future Volume (vph)	112	12	24	10	45	81	32	240	10	102	292	148
Satd. Flow (prot)	1658	1554	0	1658	1561	0	1658	3291	0	1658	3113	0
Flt Permitted	0.676			0.734			0.497			0.597		
Satd. Flow (perm)	1175	1554	0	1276	1561	0	861	3291	0	1031	3113	0
Satd. Flow (RTOR)		24			81			4			94	
Lane Group Flow (vph)	112	36	0	10	126	0	32	250	0	102	440	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	46.8	46.8		46.8	46.8		24.4	24.4		24.4	24.4	
Total Split (s)	61.0	61.0		61.0	61.0		49.0	49.0		49.0	49.0	
Total Split (%)	55.5%	55.5%		55.5%	55.5%		44.5%	44.5%		44.5%	44.5%	
Yellow Time (s)	3.3	3.3		3.3	3.3		4.2	4.2		4.2	4.2	
All-Red Time (s)	4.5	4.5		4.5	4.5		2.2	2.2		2.2	2.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.8	7.8		7.8	7.8		6.4	6.4		6.4	6.4	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	19.4	19.4		19.4	19.4		76.4	76.4		76.4	76.4	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.69	0.69		0.69	0.69	
v/c Ratio	0.54	0.12		0.04	0.37		0.05	0.11		0.14	0.20	
Control Delay	48.3	16.6		31.2	16.8		7.8	6.5		8.9	6.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	48.3	16.6		31.2	16.8		7.8	6.5		8.9	6.3	
LOS	D	B		C	B		A	A		A	A	
Approach Delay		40.6			17.8			6.7			6.7	
Approach LOS		D			B			A			A	
Queue Length 50th (m)	23.0	2.3		1.9	8.6		2.0	9.0		5.8	10.5	
Queue Length 95th (m)	31.3	8.4		5.1	19.2		8.3	20.0		21.3	30.0	
Internal Link Dist (m)		191.3			523.4			466.1			376.6	
Turn Bay Length (m)	38.0			38.0			38.0			50.0		
Base Capacity (vph)	568	763		617	796		597	2285		715	2189	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.20	0.05		0.02	0.16		0.05	0.11		0.14	0.20	
Intersection Summary												
Cycle Length: 110												
Actuated Cycle Length: 110												
Offset: 32 (29%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green												
Natural Cycle: 75												
Control Type: Actuated-Coordinated												

Lanes, Volumes, Timings 13: Realigned Geenbank & Dundonald

FB 2036-Without Mitigation
PM Peak Hour

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 12.6

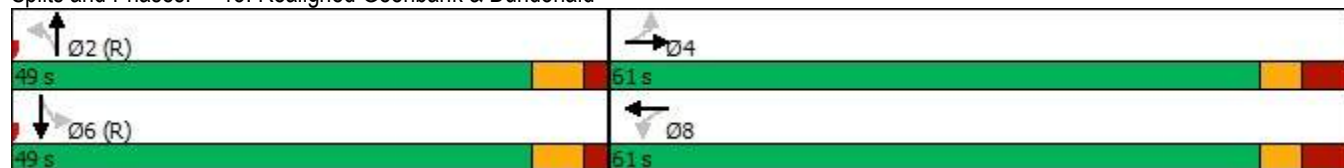
Intersection LOS: B

Intersection Capacity Utilization 67.4%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 13: Realigned Geenbank & Dundonald



Lanes, Volumes, Timings
14: Realigned Geenbank & Kilbirnie

FB 2036-Without Mitigation
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	1	17	10	1	79	22	150	10	94	163	59
Future Volume (vph)	43	1	17	10	1	79	22	150	10	94	163	59
Satd. Flow (prot)	3216	1475	0	1658	1463	0	1658	3316	1483	1658	3316	1483
Flt Permitted	0.950			0.746			0.649			0.657		
Satd. Flow (perm)	3197	1475	0	1297	1463	0	1122	3316	1436	1135	3316	1436
Satd. Flow (RTOR)		17			79				123			123
Lane Group Flow (vph)	43	18	0	10	80	0	22	150	10	94	163	59
Turn Type	Prot	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4			8			2			6	
Permitted Phases				8			2		2	6		6
Detector Phase	7	4		8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	12.4	48.7		48.7	48.7		29.8	29.8	29.8	29.8	29.8	29.8
Total Split (s)	17.0	68.0		51.0	51.0		42.0	42.0	42.0	42.0	42.0	42.0
Total Split (%)	15.5%	61.8%		46.4%	46.4%		38.2%	38.2%	38.2%	38.2%	38.2%	38.2%
Yellow Time (s)	3.7	3.7		3.7	3.7		4.2	4.2	4.2	4.2	4.2	4.2
All-Red Time (s)	3.7	4.0		4.0	4.0		2.6	2.6	2.6	2.6	2.6	2.6
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)	7.4	7.7		7.7	7.7		6.8	6.8	6.8	6.8	6.8	6.8
Lead/Lag	Lag			Lead	Lead							
Lead-Lag Optimize?	Yes			Yes	Yes							
Recall Mode	None	None		None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	6.9	25.2		16.2	16.2		75.2	75.2	75.2	75.2	75.2	75.2
Actuated g/C Ratio	0.06	0.23		0.15	0.15		0.68	0.68	0.68	0.68	0.68	0.68
v/c Ratio	0.21	0.05		0.05	0.28		0.03	0.07	0.01	0.12	0.07	0.06
Control Delay	51.0	9.2		34.0	9.7		11.2	8.7	0.0	10.0	8.8	0.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.0	9.2		34.0	9.7		11.2	8.7	0.0	10.0	8.8	0.2
LOS	D	A		C	A		B	A	A	B	A	A
Approach Delay		38.6			12.4			8.5			7.6	
Approach LOS		D			B			A			A	
Queue Length 50th (m)	4.5	0.2		2.0	0.2		1.2	4.2	0.0	6.3	5.6	0.0
Queue Length 95th (m)	10.1	3.6		4.9	9.7		5.0	10.6	0.0	14.0	11.0	0.0
Internal Link Dist (m)		485.7			483.3			501.2			466.1	
Turn Bay Length (m)	25.0			15.0			35.0		84.0	57.0		75.0
Base Capacity (vph)	280	816		510	623		767	2266	1020	775	2266	1020
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	0.15	0.02		0.02	0.13		0.03	0.07	0.01	0.12	0.07	0.06

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 44 (40%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 95

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings 14: Realigned Geenbank & Kilbirnie

FB 2036-Without Mitigation
PM Peak Hour

Maximum v/c Ratio: 0.28

Intersection Signal Delay: 11.4

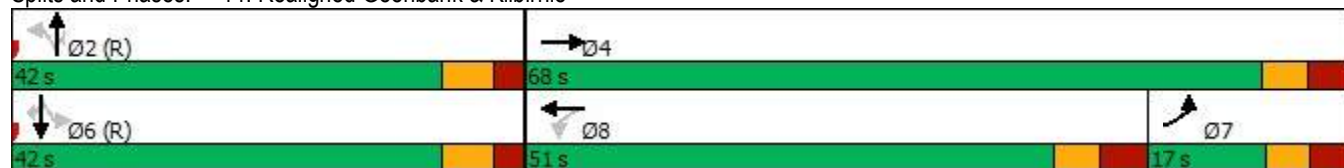
Intersection LOS: B

Intersection Capacity Utilization 57.5%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 14: Realigned Geenbank & Kilbirnie



Lanes, Volumes, Timings
15: Realigned Geenbank & Cappamore

FB 2036-Without Mitigation
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	45	5	3	56	27	6	135	4	34	134	12
Future Volume (vph)	10	45	5	3	56	27	6	135	4	34	134	12
Satd. Flow (prot)	1658	1716	0	1658	1650	0	1658	3299	0	1658	3266	0
Flt Permitted	0.703			0.724			0.659			0.664		
Satd. Flow (perm)	1220	1716	0	1256	1650	0	1135	3299	0	1143	3266	0
Satd. Flow (RTOR)		5			27			3			10	
Lane Group Flow (vph)	10	50	0	3	83	0	6	139	0	34	146	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	32.7	32.7		32.7	32.7		23.4	23.4		23.4	23.4	
Total Split (s)	58.0	58.0		58.0	58.0		52.0	52.0		52.0	52.0	
Total Split (%)	52.7%	52.7%		52.7%	52.7%		47.3%	47.3%		47.3%	47.3%	
Yellow Time (s)	3.7	3.7		3.7	3.7		4.2	4.2		4.2	4.2	
All-Red Time (s)	3.0	3.0		3.0	3.0		2.2	2.2		2.2	2.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.7	6.7		6.7	6.7		6.4	6.4		6.4	6.4	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	13.4	13.4		13.4	13.4		88.1	88.1		88.1	88.1	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.80	0.80		0.80	0.80	
v/c Ratio	0.07	0.23		0.02	0.37		0.01	0.05		0.04	0.06	
Control Delay	39.8	40.5		37.7	33.9		2.7	2.0		2.1	1.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	39.8	40.5		37.7	33.9		2.7	2.0		2.1	1.5	
LOS	D	D		D	C		A	A		A	A	
Approach Delay		40.4			34.0			2.0			1.6	
Approach LOS		D			C			A			A	
Queue Length 50th (m)	2.0	9.2		0.6	11.5		0.1	1.0		0.5	1.0	
Queue Length 95th (m)	6.1	17.5		2.8	22.3		1.7	9.1		1.9	2.5	
Internal Link Dist (m)		431.8			441.9			239.7			501.2	
Turn Bay Length (m)	30.0			30.0			38.0			38.0		
Base Capacity (vph)	568	802		585	783		909	2643		915	2618	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.02	0.06		0.01	0.11		0.01	0.05		0.04	0.06	
Intersection Summary												
Cycle Length: 110												
Actuated Cycle Length: 110												
Offset: 67 (61%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green												
Natural Cycle: 60												
Control Type: Actuated-Coordinated												

Lanes, Volumes, Timings
15: Realigned Geenbank & Cappamore

FB 2036-Without Mitigation
PM Peak Hour

Maximum v/c Ratio: 0.37

Intersection Signal Delay: 12.6

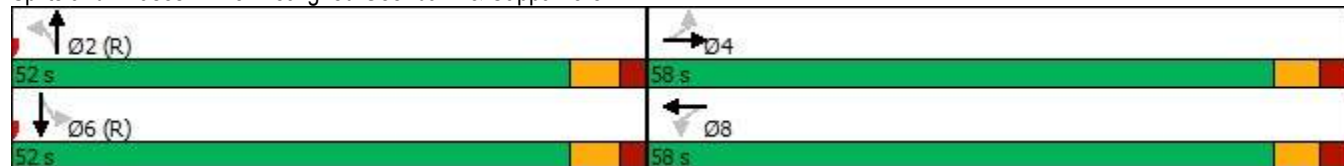
Intersection LOS: B

Intersection Capacity Utilization 49.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 15: Realigned Geenbank & Cappamore



Lanes, Volumes, Timings
16: Barnsdale & Realigned Geenbank

FB 2036-Without Mitigation
PM Peak Hour



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	87	508	422	58	65	77
Future Volume (vph)	87	508	422	58	65	77
Satd. Flow (prot)	1658	1745	1745	1483	1658	1483
Flt Permitted	0.359				0.950	
Satd. Flow (perm)	626	1745	1745	1483	1658	1483
Satd. Flow (RTOR)				58		77
Lane Group Flow (vph)	87	508	422	58	65	77
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases		4	8			
Permitted Phases	4			8	6	6
Detector Phase	4	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	5.0
Minimum Split (s)	32.2	32.2	32.2	32.2	11.5	11.5
Total Split (s)	82.0	82.0	82.0	82.0	28.0	28.0
Total Split (%)	74.5%	74.5%	74.5%	74.5%	25.5%	25.5%
Yellow Time (s)	5.1	5.1	5.1	5.1	4.2	4.2
All-Red Time (s)	2.1	2.1	2.1	2.1	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.2	7.2	7.2	7.2	6.5	6.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	C-Max	C-Max
Act Effect Green (s)	43.4	43.4	43.4	43.4	52.9	52.9
Actuated g/C Ratio	0.39	0.39	0.39	0.39	0.48	0.48
v/c Ratio	0.35	0.74	0.61	0.09	0.08	0.10
Control Delay	24.8	34.2	29.4	4.1	10.9	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.8	34.2	29.4	4.1	10.9	2.3
LOS	C	C	C	A	B	A
Approach Delay		32.8	26.3		6.3	
Approach LOS		C	C		A	
Queue Length 50th (m)	13.0	92.2	71.6	0.0	6.8	0.0
Queue Length 95th (m)	20.4	99.7	78.5	6.0	6.7	0.2
Internal Link Dist (m)		978.4	366.5		239.7	
Turn Bay Length (m)	83.0			91.0		
Base Capacity (vph)	425	1186	1186	1027	797	753
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	0.20	0.43	0.36	0.06	0.08	0.10

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 97 (88%), Referenced to phase 6:SBL, Start of Green

Natural Cycle: 45

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings 16: Barnsdale & Realigned Geenbank

FB 2036-Without Mitigation
PM Peak Hour

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 27.2

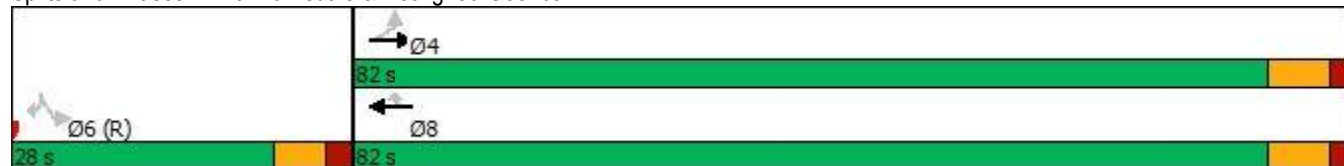
Intersection LOS: C

Intersection Capacity Utilization 53.4%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 16: Barnsdale & Realigned Geenbank



Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FB 2036-Borrisokane(SBL)-Trail (WBL & NBR)

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	276	300	32	331	145	125	27	39	15	78	118	82
Future Volume (vph)	276	300	32	331	145	125	27	39	15	78	118	82
Satd. Flow (prot)	0	1687	0	0	1647	0	0	1674	0	1658	1605	0
Flt Permitted		0.605			0.554			0.729		0.795		
Satd. Flow (perm)	0	1043	0	0	937	0	0	1240	0	1387	1605	0
Satd. Flow (RTOR)		6			29			12			35	
Lane Group Flow (vph)	0	608	0	0	601	0	0	81	0	78	200	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	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	
Minimum Split (s)	25.8	25.8		25.8	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	64.5	64.5		64.5	64.5		25.5	25.5		25.5	25.5	
Total Split (%)	71.7%	71.7%		71.7%	71.7%		28.3%	28.3%		28.3%	28.3%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.7	1.7		1.7	1.7		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		6.8			6.8			6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)		60.0			60.0			14.3		14.3	14.3	
Actuated g/C Ratio		0.69			0.69			0.16		0.16	0.16	
v/c Ratio		0.85			0.92			0.38		0.34	0.68	
Control Delay		25.4			35.6			32.0		35.3	40.0	
Queue Delay		0.0			0.0			0.0		0.0	0.0	
Total Delay		25.4			35.6			32.0		35.3	40.0	
LOS		C			D			C		D	D	
Approach Delay		25.4			35.6			32.0			38.7	
Approach LOS		C			D			C			D	
Queue Length 50th (m)		63.9			69.7			10.0		11.3	25.3	
Queue Length 95th (m)		#161.7			#168.1			22.7		23.5	46.5	
Internal Link Dist (m)		543.4			978.4			562.8			531.1	
Turn Bay Length (m)										40.0		
Base Capacity (vph)		718			652			283		307	382	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.85			0.92			0.29		0.25	0.52	
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 87.3												
Natural Cycle: 90												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.92												

Lanes, Volumes, Timings 3: Hwy 416/Borrisokane & Barnsdale

FB 2036-Borrisokane(SBL)-Trail (WBL & NBR)
AM Peak Hour

Intersection Signal Delay: 32.0

Intersection LOS: C

Intersection Capacity Utilization 84.9%

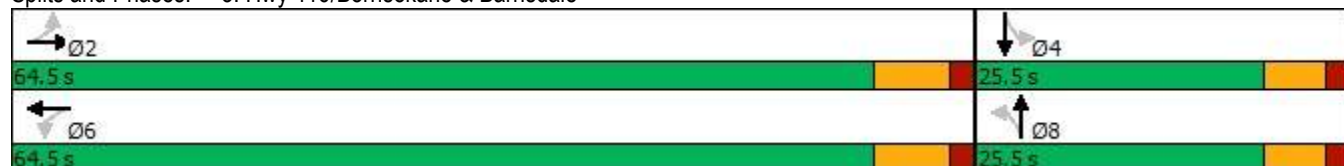
ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FB 2036-Borrisokane(SBL)-Trail (WBL & NBR)

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	65	175	15	12	0	355	5	2	1
Future Volume (vph)	1	248	24	65	175	15	12	0	355	5	2	1
Satd. Flow (prot)	0	1274	0	1127	1326	0	0	1013	1113	0	1040	0
Flt Permitted				0.950				0.950			0.970	
Satd. Flow (perm)	0	1274	0	1127	1326	0	0	1013	1113	0	1040	0
Lane Group Flow (vph)	0	273	0	65	190	0	0	12	355	0	8	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 51.9%												
ICU Level of Service A												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	7.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔			↔	↔		↔	
Traffic Vol, veh/h	1	248	24	65	175	15	12	0	355	5	2	1
Future Vol, veh/h	1	248	24	65	175	15	12	0	355	5	2	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	25	-	-	-	-	65	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	65	175	15	12	0	355	5	2	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	190	0	0	272	0	0	576	582	260	753	587	183
Stage 1	-	-	-	-	-	-	262	262	-	313	313	-
Stage 2	-	-	-	-	-	-	314	320	-	440	274	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1384	-	-	1059	-	-	345	355	703	230	422	859
Stage 1	-	-	-	-	-	-	620	597	-	531	657	-
Stage 2	-	-	-	-	-	-	578	560	-	444	683	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1384	-	-	1059	-	-	327	333	703	108	396	859
Mov Cap-2 Maneuver	-	-	-	-	-	-	327	333	-	108	396	-
Stage 1	-	-	-	-	-	-	619	596	-	530	617	-
Stage 2	-	-	-	-	-	-	540	526	-	220	682	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.2			15.2			30		
HCM LOS							C			D		
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1			
Capacity (veh/h)	327	703	1384	-	-	1059	-	-	152			
HCM Lane V/C Ratio	0.037	0.505	0.001	-	-	0.061	-	-	0.053			
HCM Control Delay (s)	16.4	15.2	7.6	0	-	8.6	-	-	30			
HCM Lane LOS	C	C	A	A	-	A	-	-	D			
HCM 95th %tile Q(veh)	0.1	2.9	0	-	-	0.2	-	-	0.2			

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FB 2036-Borrisokane(SBL)-Trail (WBL & NBR)

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	167	479	17	222	211	108	27	49	18	150	192	145
Future Volume (vph)	167	479	17	222	211	108	27	49	18	150	192	145
Satd. Flow (prot)	0	1707	0	0	1658	0	0	1676	0	1658	1600	0
Flt Permitted		0.745			0.585			0.635		0.724		
Satd. Flow (perm)	0	1287	0	0	990	0	0	1079	0	1263	1600	0
Satd. Flow (RTOR)		2			17			11			34	
Lane Group Flow (vph)	0	663	0	0	541	0	0	94	0	150	337	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	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	
Minimum Split (s)	25.8	25.8		25.8	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	74.0	74.0		74.0	74.0		46.0	46.0		46.0	46.0	
Total Split (%)	61.7%	61.7%		61.7%	61.7%		38.3%	38.3%		38.3%	38.3%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.7	1.7		1.7	1.7		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		6.8			6.8			6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)		67.5			67.5			25.4		25.4	25.4	
Actuated g/C Ratio		0.64			0.64			0.24		0.24	0.24	
v/c Ratio		0.81			0.85			0.35		0.50	0.82	
Control Delay		26.0			31.9			32.3		40.0	50.8	
Queue Delay		0.0			0.0			0.0		0.0	0.0	
Total Delay		26.0			31.9			32.3		40.0	50.8	
LOS		C			C			C		D	D	
Approach Delay		26.0			31.9			32.3			47.5	
Approach LOS		C			C			C			D	
Queue Length 50th (m)		93.0			78.3			14.1		26.7	59.6	
Queue Length 95th (m)		#210.1			#185.8			28.1		45.5	91.3	
Internal Link Dist (m)		543.4			978.4			562.8			538.5	
Turn Bay Length (m)										40.0		
Base Capacity (vph)		820			636			413		476	624	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.81			0.85			0.23		0.32	0.54	
Intersection Summary												
Cycle Length: 120												
Actuated Cycle Length: 106												
Natural Cycle: 80												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.85												

Lanes, Volumes, Timings 3: Hwy 416/Borrisokane & Barnsdale

FB 2036-Borrisokane(SBL)-Trail (WBL & NBR)
PM Peak Hour

Intersection Signal Delay: 34.0

Intersection LOS: C

Intersection Capacity Utilization 92.9%

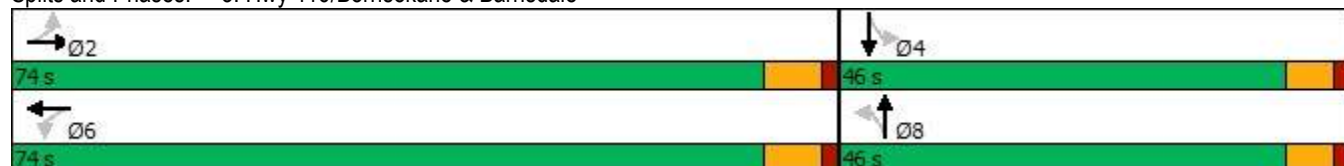
ICU Level of Service F

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FB 2036-Borrisokane(SBL)-Trail (WBL & NBR)

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	107	271	7	36	0	433	10	1	0
Future Volume (vph)	0	220	18	107	271	7	36	0	433	10	1	0
Satd. Flow (prot)	0	1277	0	1127	1369	0	0	1013	1113	0	891	0
Flt Permitted				0.950				0.950			0.957	
Satd. Flow (perm)	0	1277	0	1127	1369	0	0	1013	1113	0	891	0
Lane Group Flow (vph)	0	238	0	107	278	0	0	36	433	0	11	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 55.0%												
ICU Level of Service B												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	8.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔			↔	↔		↔	
Traffic Vol, veh/h	0	220	18	107	271	7	36	0	433	10	1	0
Future Vol, veh/h	0	220	18	107	271	7	36	0	433	10	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	25	-	-	-	-	65	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	107	271	7	36	0	433	10	1	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	278	0	0	238	0	0	718	721	229	935	727	275
Stage 1	-	-	-	-	-	-	229	229	-	489	489	-
Stage 2	-	-	-	-	-	-	489	492	-	446	238	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1285	-	-	1093	-	-	273	291	733	167	351	764
Stage 1	-	-	-	-	-	-	648	619	-	414	549	-
Stage 2	-	-	-	-	-	-	456	462	-	440	708	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1285	-	-	1093	-	-	252	262	733	63	317	764
Mov Cap-2 Maneuver	-	-	-	-	-	-	252	262	-	63	317	-
Stage 1	-	-	-	-	-	-	648	619	-	414	495	-
Stage 2	-	-	-	-	-	-	411	417	-	180	708	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.4			17.1			67.9		
HCM LOS							C			F		
Minor Lane/Major Mvmt	NBLn1		NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1		
Capacity (veh/h)	252		733	1285	-	-	1093	-	-	68		
HCM Lane V/C Ratio	0.143		0.591	-	-	-	0.098	-	-	0.162		
HCM Control Delay (s)	21.7		16.7	0	-	-	8.7	-	-	67.9		
HCM Lane LOS	C		C	A	-	-	A	-	-	F		
HCM 95th %tile Q(veh)	0.5		3.9	0	-	-	0.3	-	-	0.5		

Lanes, Volumes, Timings

FB 2036-Borrisokane(EBL, WBL & SBL)-Trail (All-way stop)

3: Hwy 416/Borrisokane & Barnsdale

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	276	300	32	331	145	125	27	39	15	78	118	82
Future Volume (vph)	276	300	32	331	145	125	27	39	15	78	118	82
Satd. Flow (prot)	1658	1706	0	1658	1616	0	0	1674	0	1658	1613	0
Flt Permitted	0.593			0.451				0.827		0.704		
Satd. Flow (perm)	1035	1706	0	787	1616	0	0	1407	0	1229	1613	0
Satd. Flow (RTOR)		7			64			15			45	
Lane Group Flow (vph)	276	332	0	331	270	0	0	81	0	78	200	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	11.7	25.8		11.7	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	16.0	29.0		20.0	33.0		26.0	26.0		26.0	26.0	
Total Split (%)	21.3%	38.7%		26.7%	44.0%		34.7%	34.7%		34.7%	34.7%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.6	1.7		1.6	1.7		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	
Total Lost Time (s)	6.7	6.8		6.7	6.8			6.2		6.2	6.2	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	33.2	24.1		37.5	26.3			12.7		12.7	12.7	
Actuated g/C Ratio	0.49	0.36		0.55	0.39			0.19		0.19	0.19	
v/c Ratio	0.47	0.54		0.57	0.41			0.29		0.34	0.59	
Control Delay	10.5	22.5		11.1	14.2			22.7		28.0	26.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	10.5	22.5		11.1	14.2			22.7		28.0	26.9	
LOS	B	C		B	B			C		C	C	
Approach Delay		17.1			12.5			22.7			27.2	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	13.1	31.5		16.3	17.4			7.2		8.7	17.8	
Queue Length 95th (m)	29.7	63.9		36.2	39.7			17.7		19.4	36.1	
Internal Link Dist (m)		543.4			978.4			562.8			531.1	
Turn Bay Length (m)	65.0			80.0						40.0		
Base Capacity (vph)	598	612		633	666			423		360	505	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.46	0.54		0.52	0.41			0.19		0.22	0.40	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 67.7

Natural Cycle: 65

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.59

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FB 2036-Borrisokane(EBL, WBL & SBL)-Trail (All-way stop)
AM Peak Hour

Intersection Signal Delay: 17.4
Intersection LOS: B

Intersection Capacity Utilization 79.8%
ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	65	175	15	12	0	355	5	2	1
Future Volume (vph)	1	248	24	65	175	15	12	0	355	5	2	1
Satd. Flow (prot)	0	1274	0	0	1272	0	0	1127	0	0	1040	0
Flt Permitted					0.987			0.998			0.970	
Satd. Flow (perm)	0	1274	0	0	1272	0	0	1127	0	0	1040	0
Lane Group Flow (vph)	0	273	0	0	255	0	0	367	0	0	8	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 63.6%

ICU Level of Service B

Analysis Period (min) 15

Intersection

Intersection Delay, s/veh 15.6

Intersection LOS C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	248	24	65	175	15	12	0	355	5	2	1
Future Vol, veh/h	1	248	24	65	175	15	12	0	355	5	2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	65	175	15	12	0	355	5	2	1
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12.7	14.8	18.4	11.3
HCM LOS	B	B	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	3%	0%	25%	62%
Vol Thru, %	0%	91%	69%	25%
Vol Right, %	97%	9%	6%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	367	273	255	8
LT Vol	12	1	65	5
Through Vol	0	248	175	2
RT Vol	355	24	15	1
Lane Flow Rate	367	273	255	8
Geometry Grp	1	1	1	1
Degree of Util (X)	0.616	0.423	0.456	0.018
Departure Headway (Hd)	6.045	5.578	6.438	8.065
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	598	644	558	442
Service Time	4.089	3.628	4.489	6.143
HCM Lane V/C Ratio	0.614	0.424	0.457	0.018
HCM Control Delay	18.4	12.7	14.8	11.3
HCM Lane LOS	C	B	B	B
HCM 95th-tile Q	4.2	2.1	2.4	0.1

Lanes, Volumes, Timings

FB 2036-Borrisokane(EBL, WBL & SBL)-Trail (All-way stop)

3: Hwy 416/Borrisokane & Barnsdale

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	167	479	17	222	211	108	27	49	18	150	192	145
Future Volume (vph)	167	479	17	222	211	108	27	49	18	150	192	145
Satd. Flow (prot)	1658	1720	0	1658	1645	0	0	1676	0	1658	1600	0
Flt Permitted	0.522			0.345				0.696		0.772		
Satd. Flow (perm)	911	1720	0	602	1645	0	0	1183	0	1347	1600	0
Satd. Flow (RTOR)		2			34			14			44	
Lane Group Flow (vph)	167	496	0	222	319	0	0	94	0	150	337	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	11.7	25.8		11.7	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	12.0	43.0		12.0	43.0		35.0	35.0		35.0	35.0	
Total Split (%)	13.3%	47.8%		13.3%	47.8%		38.9%	38.9%		38.9%	38.9%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.6	1.7		1.6	1.7		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	
Total Lost Time (s)	6.7	6.8		6.7	6.8			6.2		6.2	6.2	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	41.8	36.4		41.8	36.4			20.0		20.0	20.0	
Actuated g/C Ratio	0.51	0.45		0.51	0.45			0.25		0.25	0.25	
v/c Ratio	0.32	0.65		0.59	0.42			0.31		0.45	0.79	
Control Delay	11.5	23.7		18.7	17.0			23.7		30.2	38.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	11.5	23.7		18.7	17.0			23.7		30.2	38.7	
LOS	B	C		B	B			C		C	D	
Approach Delay		20.6			17.7			23.7			36.1	
Approach LOS		C			B			C			D	
Queue Length 50th (m)	10.6	57.5		14.7	28.8			10.0		19.7	42.5	
Queue Length 95th (m)	24.5	106.3		32.2	58.1			22.0		35.6	70.7	
Internal Link Dist (m)		543.4			978.4			562.8			538.5	
Turn Bay Length (m)	65.0			80.0						40.0		
Base Capacity (vph)	516	768		377	752			429		478	596	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.32	0.65		0.59	0.42			0.22		0.31	0.57	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 81.5

Natural Cycle: 70

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.79

Lanes, Volumes, Timings

3: Hwy 416/Borrisokane & Barnsdale

FB 2036-Borrisokane(EBL, WBL & SBL)-Trail (All-way stop)

PM Peak Hour

Intersection Signal Delay: 24.1

Intersection LOS: C

Intersection Capacity Utilization 86.7%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	107	271	7	36	0	433	10	1	0
Future Volume (vph)	0	220	18	107	271	7	36	0	433	10	1	0
Satd. Flow (prot)	0	1277	0	0	1296	0	0	1121	0	0	891	0
Flt Permitted					0.986			0.996			0.957	
Satd. Flow (perm)	0	1277	0	0	1296	0	0	1121	0	0	891	0
Lane Group Flow (vph)	0	238	0	0	385	0	0	469	0	0	11	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Control Type: Unsignalized

Intersection Capacity Utilization 74.5%

ICU Level of Service D

Analysis Period (min) 15

Intersection

Intersection Delay, s/veh 31.2

Intersection LOS D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	220	18	107	271	7	36	0	433	10	1	0
Future Vol, veh/h	0	220	18	107	271	7	36	0	433	10	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	107	271	7	36	0	433	10	1	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	16.5	29.5	40.6	12.8
HCM LOS	C	D	E	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	8%	0%	28%	91%
Vol Thru, %	0%	92%	70%	9%
Vol Right, %	92%	8%	2%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	469	238	385	11
LT Vol	36	0	107	10
Through Vol	0	220	271	1
RT Vol	433	18	7	0
Lane Flow Rate	469	238	385	11
Geometry Grp	1	1	1	1
Degree of Util (X)	0.877	0.473	0.761	0.029
Departure Headway (Hd)	6.733	7.158	7.119	9.445
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	544	502	508	378
Service Time	4.733	5.211	5.166	7.519
HCM Lane V/C Ratio	0.862	0.474	0.758	0.029
HCM Control Delay	40.6	16.5	29.5	12.8
HCM Lane LOS	E	C	D	B
HCM 95th-tile Q	9.8	2.5	6.6	0.1

Intersection	
Intersection Delay, s/veh	16.1
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	248	24	65	175	15	12	0	355	5	2	1
Future Vol, veh/h	1	248	24	65	175	15	12	0	355	5	2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	65	175	15	12	0	355	5	2	1
Number of Lanes	0	1	0	1	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	1
HCM Control Delay	14.8	12.6	19.7	12.1
HCM LOS	B	B	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	100%	0%	0%	100%	0%	62%
Vol Thru, %	0%	0%	91%	0%	92%	25%
Vol Right, %	0%	100%	9%	0%	8%	12%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	12	355	273	65	190	8
LT Vol	12	0	1	65	0	5
Through Vol	0	0	248	0	175	2
RT Vol	0	355	24	0	15	1
Lane Flow Rate	12	355	273	65	190	8
Geometry Grp	5	5	4b	5	5	4b
Degree of Util (X)	0.026	0.638	0.473	0.137	0.352	0.02
Departure Headway (Hd)	7.806	6.47	6.237	7.611	6.667	8.803
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	459	557	576	471	538	405
Service Time	5.552	4.215	4.286	5.365	4.42	6.885
HCM Lane V/C Ratio	0.026	0.637	0.474	0.138	0.353	0.02
HCM Control Delay	10.8	20	14.8	11.6	13	12.1
HCM Lane LOS	B	C	B	B	B	B
HCM 95th-tile Q	0.1	4.5	2.5	0.5	1.6	0.1

Intersection	
Intersection Delay, s/veh	24.3
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	220	18	107	271	7	36	0	433	10	1	0
Future Vol, veh/h	0	220	18	107	271	7	36	0	433	10	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	107	271	7	36	0	433	10	1	0
Number of Lanes	0	1	0	1	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	1
HCM Control Delay	18	17.3	33.4	13.2
HCM LOS	C	C	D	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	100%	0%	0%	100%	0%	91%
Vol Thru, %	0%	0%	92%	0%	97%	9%
Vol Right, %	0%	100%	8%	0%	3%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	36	433	238	107	278	11
LT Vol	36	0	0	107	0	10
Through Vol	0	0	220	0	271	1
RT Vol	0	433	18	0	7	0
Lane Flow Rate	36	433	238	107	278	11
Geometry Grp	5	5	4b	5	5	4b
Degree of Util (X)	0.082	0.83	0.498	0.241	0.555	0.03
Departure Headway (Hd)	8.245	6.904	7.533	8.102	7.193	9.92
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	433	524	476	441	498	363
Service Time	6.02	4.677	5.626	5.894	4.984	7.92
HCM Lane V/C Ratio	0.083	0.826	0.5	0.243	0.558	0.03
HCM Control Delay	11.8	35.2	18	13.5	18.7	13.2
HCM Lane LOS	B	E	C	B	C	B
HCM 95th-tile Q	0.3	8.3	2.7	0.9	3.3	0.1

Appendix P

Synchro Intersection Worksheets – 2031 Future Total Conditions

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FT 2031-Without Mitigation

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	318	288	32	326	157	125	27	39	21	78	190	82
Future Volume (vph)	318	288	32	326	157	125	27	39	21	78	190	82
Satd. Flow (prot)	0	1684	0	0	1648	0	0	1662	0	0	1652	0
Flt Permitted		0.580			0.549			0.733			0.905	
Satd. Flow (perm)	0	1001	0	0	929	0	0	1237	0	0	1512	0
Satd. Flow (RTOR)		5			23			12			12	
Lane Group Flow (vph)	0	638	0	0	608	0	0	87	0	0	350	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	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	
Minimum Split (s)	25.8	25.8		25.8	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	86.0	86.0		86.0	86.0		34.0	34.0		34.0	34.0	
Total Split (%)	71.7%	71.7%		71.7%	71.7%		28.3%	28.3%		28.3%	28.3%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.7	1.7		1.7	1.7		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.8			6.8			6.2			6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)		79.2			79.2			27.8			27.8	
Actuated g/C Ratio		0.66			0.66			0.23			0.23	
v/c Ratio		0.96			0.98			0.29			0.97	
Control Delay		47.7			52.2			35.8			86.4	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		47.7			52.2			35.8			86.4	
LOS		D			D			D			F	
Approach Delay		47.7			52.2			35.8			86.4	
Approach LOS		D			D			D			F	
Queue Length 50th (m)		128.3			123.8			14.6			79.9	
Queue Length 95th (m)		#220.0			#213.0			29.4			#139.3	
Internal Link Dist (m)		543.4			745.7			562.8			538.1	
Turn Bay Length (m)												
Base Capacity (vph)		662			620			295			359	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.96			0.98			0.29			0.97	
Intersection Summary												
Cycle Length: 120												
Actuated Cycle Length: 120												
Natural Cycle: 110												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.98												

Lanes, Volumes, Timings

3: Hwy 416/Borrisokane & Barnsdale

FT 2031-Without Mitigation
AM Peak Hour

Intersection Signal Delay: 56.8

Intersection LOS: E

Intersection Capacity Utilization 81.3%

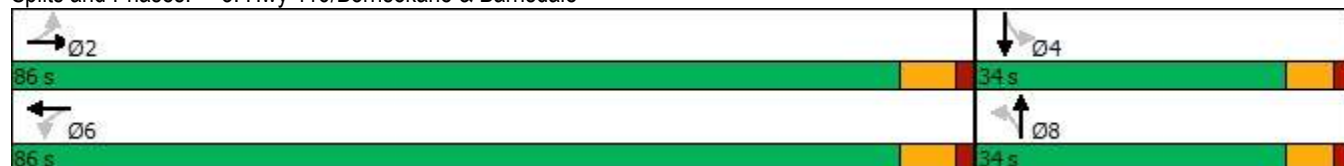
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FT 2031-Without Mitigation
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	77	175	15	12	0	385	5	2	1
Future Volume (vph)	1	248	24	77	175	15	12	0	385	5	2	1
Satd. Flow (prot)	0	1274	0	0	1265	0	0	1127	0	0	1040	0
Flt Permitted					0.986			0.998			0.970	
Satd. Flow (perm)	0	1274	0	0	1265	0	0	1127	0	0	1040	0
Lane Group Flow (vph)	0	273	0	0	267	0	0	397	0	0	8	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 66.2%												
ICU Level of Service C												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	8.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	248	24	77	175	15	12	0	385	5	2	1
Future Vol, veh/h	1	248	24	77	175	15	12	0	385	5	2	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	77	175	15	12	0	385	5	2	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	190	0	0	272	0	0	600	606	260	792	611	183
Stage 1	-	-	-	-	-	-	262	262	-	337	337	-
Stage 2	-	-	-	-	-	-	338	344	-	455	274	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1384	-	-	1059	-	-	332	343	703	215	409	859
Stage 1	-	-	-	-	-	-	620	597	-	514	641	-
Stage 2	-	-	-	-	-	-	560	546	-	435	683	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1384	-	-	1059	-	-	309	315	703	91	375	859
Mov Cap-2 Maneuver	-	-	-	-	-	-	309	315	-	91	375	-
Stage 1	-	-	-	-	-	-	619	596	-	513	589	-
Stage 2	-	-	-	-	-	-	512	502	-	197	682	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.5			17.6			34.5		
HCM LOS							C			D		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	677	1384	-	-	1059	-	-	130				
HCM Lane V/C Ratio	0.586	0.001	-	-	0.073	-	-	0.062				
HCM Control Delay (s)	17.6	7.6	0	-	8.7	0	-	34.5				
HCM Lane LOS	C	A	A	-	A	A	-	D				
HCM 95th %tile Q(veh)	3.8	0	-	-	0.2	-	-	0.2				

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FT 2031-Without Mitigation
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	246	469	17	213	219	108	27	49	29	150	246	145
Future Volume (vph)	246	469	17	213	219	108	27	49	29	150	246	145
Satd. Flow (prot)	0	1700	0	0	1659	0	0	1659	0	0	1639	0
Flt Permitted		0.681			0.573			0.778			0.873	
Satd. Flow (perm)	0	1177	0	0	969	0	0	1307	0	0	1451	0
Satd. Flow (RTOR)		2			16			16			15	
Lane Group Flow (vph)	0	732	0	0	540	0	0	105	0	0	541	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	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	
Minimum Split (s)	25.8	25.8		25.8	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	82.0	82.0		82.0	82.0		48.0	48.0		48.0	48.0	
Total Split (%)	63.1%	63.1%		63.1%	63.1%		36.9%	36.9%		36.9%	36.9%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.7	1.7		1.7	1.7		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.8			6.8			6.2			6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effect Green (s)		75.2			75.2			41.8			41.8	
Actuated g/C Ratio		0.58			0.58			0.32			0.32	
v/c Ratio		1.07			0.95			0.24			1.14	
Control Delay		84.2			53.9			29.2			123.8	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		84.2			53.9			29.2			123.8	
LOS		F			D			C			F	
Approach Delay		84.2			53.9			29.2			123.8	
Approach LOS		F			D			C			F	
Queue Length 50th (m)		~208.4			121.6			16.6			~158.8	
Queue Length 95th (m)		#282.4			#203.0			31.6			#227.5	
Internal Link Dist (m)		543.4			867.7			562.8			541.1	
Turn Bay Length (m)												
Base Capacity (vph)		681			567			431			476	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		1.07			0.95			0.24			1.14	
Intersection Summary												
Cycle Length: 130												
Actuated Cycle Length: 130												
Natural Cycle: 130												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 1.14												

Lanes, Volumes, Timings

3: Hwy 416/Borrisokane & Barnsdale

FT 2031-Without Mitigation
PM Peak Hour

Intersection Signal Delay: 83.8

Intersection LOS: F

Intersection Capacity Utilization 100.2%

ICU Level of Service G

Analysis Period (min) 15

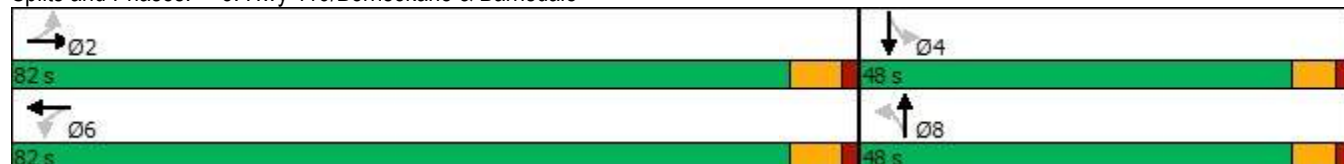
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FT 2031-Without Mitigation
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	115	271	7	36	0	502	10	1	0
Future Volume (vph)	0	220	18	115	271	7	36	0	502	10	1	0
Satd. Flow (prot)	0	1277	0	0	1293	0	0	1123	0	0	891	0
Flt Permitted					0.986			0.997			0.957	
Satd. Flow (perm)	0	1277	0	0	1293	0	0	1123	0	0	891	0
Lane Group Flow (vph)	0	238	0	0	393	0	0	538	0	0	11	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 79.5%												
ICU Level of Service D												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	16.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	220	18	115	271	7	36	0	502	10	1	0
Future Vol, veh/h	0	220	18	115	271	7	36	0	502	10	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	115	271	7	36	0	502	10	1	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	278	0	0	238	0	0	734	737	229	985	743	275
Stage 1	-	-	-	-	-	-	229	229	-	505	505	-
Stage 2	-	-	-	-	-	-	505	508	-	480	238	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1285	-	-	1093	-	-	266	285	733	153	343	764
Stage 1	-	-	-	-	-	-	648	619	-	405	540	-
Stage 2	-	-	-	-	-	-	446	454	-	420	708	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1285	-	-	1093	-	-	240	249	733	44	300	764
Mov Cap-2 Maneuver	-	-	-	-	-	-	240	249	-	44	300	-
Stage 1	-	-	-	-	-	-	648	619	-	405	473	-
Stage 2	-	-	-	-	-	-	389	397	-	132	708	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.5			32.5			101		
HCM LOS							D			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	644	1285	-	-	1093	-	-	48				
HCM Lane V/C Ratio	0.835	-	-	-	0.105	-	-	0.229				
HCM Control Delay (s)	32.5	0	-	-	8.7	0	-	101				
HCM Lane LOS	D	A	-	-	A	A	-	F				
HCM 95th %tile Q(veh)	9	0	-	-	0.4	-	-	0.8				

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FT 2031-Borrisokane (SBL)-Trail (WBL&NBR)

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	318	288	32	326	157	125	27	39	21	78	190	82
Future Volume (vph)	318	288	32	326	157	125	27	39	21	78	190	82
Satd. Flow (prot)	0	1684	0	0	1648	0	0	1662	0	1658	1643	0
Flt Permitted		0.582			0.552			0.656		0.774		
Satd. Flow (perm)	0	1004	0	0	934	0	0	1107	0	1351	1643	0
Satd. Flow (RTOR)		6			28			16			22	
Lane Group Flow (vph)	0	638	0	0	608	0	0	87	0	78	272	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	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	
Minimum Split (s)	25.8	25.8		25.8	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	64.0	64.0		64.0	64.0		26.0	26.0		26.0	26.0	
Total Split (%)	71.1%	71.1%		71.1%	71.1%		28.9%	28.9%		28.9%	28.9%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.7	1.7		1.7	1.7		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		6.8			6.8			6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)		57.7			57.7			17.2		17.2	17.2	
Actuated g/C Ratio		0.66			0.66			0.20		0.20	0.20	
v/c Ratio		0.97			0.98			0.38		0.30	0.80	
Control Delay		45.1			48.5			30.2		32.9	49.7	
Queue Delay		0.0			0.0			0.0		0.0	0.0	
Total Delay		45.1			48.5			30.2		32.9	49.7	
LOS		D			D			C		C	D	
Approach Delay		45.1			48.5			30.2			45.9	
Approach LOS		D			D			C			D	
Queue Length 50th (m)		95.8			~91.3			10.3		11.2	40.3	
Queue Length 95th (m)		#179.4			#172.9			23.7		23.4	#73.5	
Internal Link Dist (m)		543.4			745.7			562.8			538.1	
Turn Bay Length (m)										40.0		
Base Capacity (vph)		661			622			262		304	387	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.97			0.98			0.33		0.26	0.70	
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 87.9												
Natural Cycle: 90												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.98												

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FT 2031-Borrisokane (SBL)-Trail (WBL&NBR)

AM Peak Hour

Intersection Signal Delay: 45.7

Intersection LOS: D

Intersection Capacity Utilization 86.2%

ICU Level of Service E

Analysis Period (min) 15

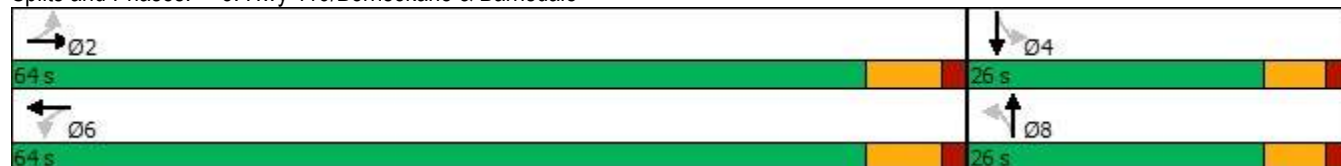
~ Volume exceeds capacity, queue is theoretically infinite.

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: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FT 2031-Borrisokane (SBL)-Trail (WBL&NBR)

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	77	175	15	12	0	385	5	2	1
Future Volume (vph)	1	248	24	77	175	15	12	0	385	5	2	1
Satd. Flow (prot)	0	1274	0	1127	1326	0	0	1013	1113	0	1040	0
Flt Permitted				0.950				0.950			0.970	
Satd. Flow (perm)	0	1274	0	1127	1326	0	0	1013	1113	0	1040	0
Lane Group Flow (vph)	0	273	0	77	190	0	0	12	385	0	8	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 53.9%												
ICU Level of Service A												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	7.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔			↔	↔		↔	
Traffic Vol, veh/h	1	248	24	77	175	15	12	0	385	5	2	1
Future Vol, veh/h	1	248	24	77	175	15	12	0	385	5	2	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	30	-	-	-	-	30	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	77	175	15	12	0	385	5	2	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	190	0	0	272	0	0	600	606	260	792	611	183
Stage 1	-	-	-	-	-	-	262	262	-	337	337	-
Stage 2	-	-	-	-	-	-	338	344	-	455	274	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1384	-	-	1059	-	-	332	343	703	215	409	859
Stage 1	-	-	-	-	-	-	620	597	-	514	641	-
Stage 2	-	-	-	-	-	-	560	546	-	435	683	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1384	-	-	1059	-	-	312	318	703	92	379	859
Mov Cap-2 Maneuver	-	-	-	-	-	-	312	318	-	92	379	-
Stage 1	-	-	-	-	-	-	619	596	-	513	594	-
Stage 2	-	-	-	-	-	-	517	506	-	197	682	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.5			16.1			34		
HCM LOS							C			D		
Minor Lane/Major Mvmt	NBLn1		NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1		
Capacity (veh/h)	312		703	1384	-	-	1059	-	-	132		
HCM Lane V/C Ratio	0.038		0.548	0.001	-	-	0.073	-	-	0.061		
HCM Control Delay (s)	17		16.1	7.6	0	-	8.7	-	-	34		
HCM Lane LOS	C		C	A	A	-	A	-	-	D		
HCM 95th %tile Q(veh)	0.1		3.4	0	-	-	0.2	-	-	0.2		

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FT 2031-Borrisokane (SBL)-Trail (WBL&NBR)

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	246	469	17	213	219	108	27	49	29	150	246	145
Future Volume (vph)	246	469	17	213	219	108	27	49	29	150	246	145
Satd. Flow (prot)	0	1700	0	0	1659	0	0	1659	0	1658	1618	0
Flt Permitted		0.689			0.582			0.507		0.730		
Satd. Flow (perm)	0	1191	0	0	984	0	0	852	0	1274	1618	0
Satd. Flow (RTOR)		3			27			20			31	
Lane Group Flow (vph)	0	732	0	0	540	0	0	105	0	150	391	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	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	
Minimum Split (s)	25.8	25.8		25.8	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	63.0	63.0		63.0	63.0		27.0	27.0		27.0	27.0	
Total Split (%)	70.0%	70.0%		70.0%	70.0%		30.0%	30.0%		30.0%	30.0%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.7	1.7		1.7	1.7		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		6.8			6.8			6.2		6.2	6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)		56.2			56.2			20.8		20.8	20.8	
Actuated g/C Ratio		0.62			0.62			0.23		0.23	0.23	
v/c Ratio		0.98			0.87			0.50		0.51	0.98	
Control Delay		48.0			30.2			33.4		37.3	75.4	
Queue Delay		0.0			0.0			0.0		0.0	0.0	
Total Delay		48.0			30.2			33.4		37.3	75.4	
LOS		D			C			C		D	E	
Approach Delay		48.0			30.2			33.4			64.8	
Approach LOS		D			C			C			E	
Queue Length 50th (m)		111.1			66.0			12.7		22.7	62.9	
Queue Length 95th (m)		#197.2			#141.0			29.1		41.3	#119.5	
Internal Link Dist (m)		543.4			867.7			562.8			541.1	
Turn Bay Length (m)										40.0		
Base Capacity (vph)		744			624			212		294	397	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.98			0.87			0.50		0.51	0.98	
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 90												
Natural Cycle: 90												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.98												

Lanes, Volumes, Timings 3: Hwy 416/Borrisokane & Barnsdale

FT 2031-Borrisokane (SBL)-Trail (WBL&NBR)
PM Peak Hour

Intersection Signal Delay: 46.9

Intersection LOS: D

Intersection Capacity Utilization 92.3%

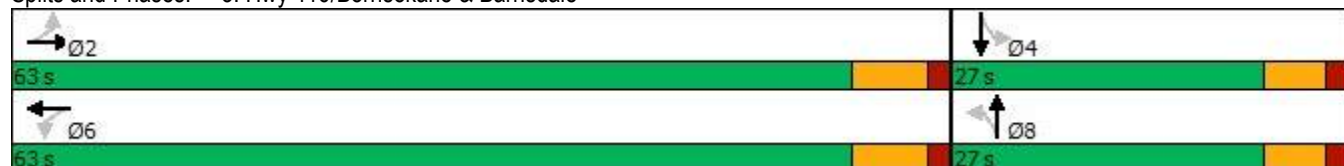
ICU Level of Service F

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FT 2031-Borrisokane (SBL)-Trail (WBL&NBR)

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	115	271	7	36	0	502	10	1	0
Future Volume (vph)	0	220	18	115	271	7	36	0	502	10	1	0
Satd. Flow (prot)	0	1277	0	1127	1369	0	0	1013	1113	0	891	0
Flt Permitted				0.950				0.950			0.957	
Satd. Flow (perm)	0	1277	0	1127	1369	0	0	1013	1113	0	891	0
Lane Group Flow (vph)	0	238	0	115	278	0	0	36	502	0	11	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 59.5%												
ICU Level of Service B												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	10.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔			↔	↔		↔	
Traffic Vol, veh/h	0	220	18	115	271	7	36	0	502	10	1	0
Future Vol, veh/h	0	220	18	115	271	7	36	0	502	10	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	30	-	-	-	-	30	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	115	271	7	36	0	502	10	1	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	278	0	0	238	0	0	734	737	229	985	743	275
Stage 1	-	-	-	-	-	-	229	229	-	505	505	-
Stage 2	-	-	-	-	-	-	505	508	-	480	238	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1285	-	-	1093	-	-	266	285	733	153	343	764
Stage 1	-	-	-	-	-	-	648	619	-	405	540	-
Stage 2	-	-	-	-	-	-	446	454	-	420	708	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1285	-	-	1093	-	-	244	255	733	44	307	764
Mov Cap-2 Maneuver	-	-	-	-	-	-	244	255	-	44	307	-
Stage 1	-	-	-	-	-	-	648	619	-	405	483	-
Stage 2	-	-	-	-	-	-	398	406	-	132	708	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.5			20.1			101		
HCM LOS							C			F		
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1			
Capacity (veh/h)	244	733	1285	-	-	1093	-	-	48			
HCM Lane V/C Ratio	0.148	0.685	-	-	-	0.105	-	-	0.229			
HCM Control Delay (s)	22.3	19.9	0	-	-	8.7	-	-	101			
HCM Lane LOS	C	C	A	-	-	A	-	-	F			
HCM 95th %tile Q(veh)	0.5	5.5	0	-	-	0.4	-	-	0.8			

Lanes, Volumes, Timings

FT 2031-Borrisokane (EBL,WBL&SBL)-Trail (All-way stop)

3: Hwy 416/Borrisokane & Barnsdale

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	318	288	32	326	157	125	27	39	21	78	190	82
Future Volume (vph)	318	288	32	326	157	125	27	39	21	78	190	82
Satd. Flow (prot)	1658	1704	0	1658	1621	0	0	1662	0	1658	1643	0
Flt Permitted	0.557			0.472				0.774		0.701		
Satd. Flow (perm)	972	1704	0	824	1621	0	0	1306	0	1223	1643	0
Satd. Flow (RTOR)		7			55			21			28	
Lane Group Flow (vph)	318	320	0	326	282	0	0	87	0	78	272	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	11.7	25.8		11.7	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	19.0	28.0		21.0	30.0		26.0	26.0		26.0	26.0	
Total Split (%)	25.3%	37.3%		28.0%	40.0%		34.7%	34.7%		34.7%	34.7%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.6	1.7		1.6	1.7		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	
Total Lost Time (s)	6.7	6.8		6.7	6.8			6.2		6.2	6.2	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	33.9	22.7		35.2	23.3			15.2		15.2	15.2	
Actuated g/C Ratio	0.49	0.33		0.51	0.34			0.22		0.22	0.22	
v/c Ratio	0.54	0.57		0.59	0.49			0.29		0.29	0.71	
Control Delay	12.5	25.4		12.9	19.1			20.6		25.7	33.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	12.5	25.4		12.9	19.1			20.6		25.7	33.6	
LOS	B	C		B	B			C		C	C	
Approach Delay		19.0			15.8			20.6			31.9	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	18.8	33.9		19.4	23.4			7.2		8.7	30.0	
Queue Length 95th (m)	36.9	64.8		38.0	47.7			18.0		19.3	53.2	
Internal Link Dist (m)		543.4			745.7			562.8			538.1	
Turn Bay Length (m)	75.0			80.0						40.0		
Base Capacity (vph)	614	561		621	580			389		350	491	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.52	0.57		0.52	0.49			0.22		0.22	0.55	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 69.5

Natural Cycle: 65

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 20.6

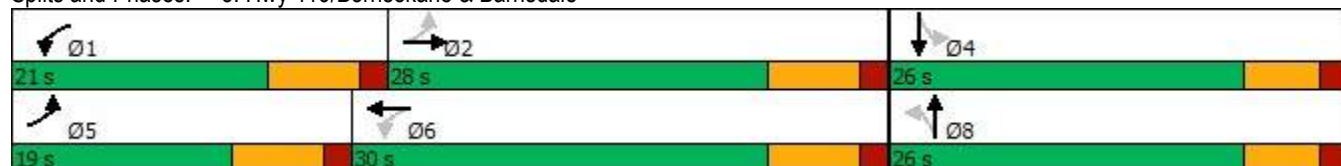
Intersection LOS: C

Intersection Capacity Utilization 82.9%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	77	175	15	12	0	385	5	2	1
Future Volume (vph)	1	248	24	77	175	15	12	0	385	5	2	1
Satd. Flow (prot)	0	1274	0	0	1265	0	0	1127	0	0	1040	0
Flt Permitted					0.986			0.998			0.970	
Satd. Flow (perm)	0	1274	0	0	1265	0	0	1127	0	0	1040	0
Lane Group Flow (vph)	0	273	0	0	267	0	0	397	0	0	8	0
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 66.2%												
ICU Level of Service C												
Analysis Period (min) 15												

Intersection

Intersection Delay, s/veh 17.2

Intersection LOS C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	248	24	77	175	15	12	0	385	5	2	1
Future Vol, veh/h	1	248	24	77	175	15	12	0	385	5	2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	77	175	15	12	0	385	5	2	1
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	13.2	15.8	20.9	11.5
HCM LOS	B	C	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	3%	0%	29%	62%
Vol Thru, %	0%	91%	66%	25%
Vol Right, %	97%	9%	6%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	397	273	267	8
LT Vol	12	1	77	5
Through Vol	0	248	175	2
RT Vol	385	24	15	1
Lane Flow Rate	397	273	267	8
Geometry Grp	1	1	1	1
Degree of Util (X)	0.674	0.434	0.488	0.018
Departure Headway (Hd)	6.11	5.729	6.576	8.229
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	592	625	547	433
Service Time	4.159	3.789	4.635	6.323
HCM Lane V/C Ratio	0.671	0.437	0.488	0.018
HCM Control Delay	20.9	13.2	15.8	11.5
HCM Lane LOS	C	B	C	B
HCM 95th-tile Q	5.1	2.2	2.7	0.1

Lanes, Volumes, Timings

FT 2031-Borrisokane (EBL,WBL&SBL)-Trail (All-way stop)

3: Hwy 416/Borrisokane & Barnsdale

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	246	469	17	213	219	108	27	49	29	150	246	145
Future Volume (vph)	246	469	17	213	219	108	27	49	29	150	246	145
Satd. Flow (prot)	1658	1720	0	1658	1647	0	0	1659	0	1658	1619	0
Flt Permitted	0.458			0.324				0.638		0.741		
Satd. Flow (perm)	799	1720	0	565	1647	0	0	1072	0	1293	1619	0
Satd. Flow (RTOR)		2			31			21			33	
Lane Group Flow (vph)	246	486	0	213	327	0	0	105	0	150	391	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	11.7	25.8		11.7	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	19.0	41.0		17.0	39.0		32.0	32.0		32.0	32.0	
Total Split (%)	21.1%	45.6%		18.9%	43.3%		35.6%	35.6%		35.6%	35.6%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.6	1.7		1.6	1.7		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	
Total Lost Time (s)	6.7	6.8		6.7	6.8			6.2		6.2	6.2	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effct Green (s)	45.3	34.3		42.5	32.9			22.7		22.7	22.7	
Actuated g/C Ratio	0.52	0.40		0.49	0.38			0.26		0.26	0.26	
v/c Ratio	0.47	0.71		0.54	0.51			0.35		0.44	0.87	
Control Delay	12.7	29.7		15.2	22.9			24.3		31.0	48.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	12.7	29.7		15.2	22.9			24.3		31.0	48.5	
LOS	B	C		B	C			C		C	D	
Approach Delay		24.0			19.8			24.3			43.6	
Approach LOS		C			B			C			D	
Queue Length 50th (m)	20.0	70.9		16.9	39.8			11.2		20.9	57.5	
Queue Length 95th (m)	32.7	107.9		28.3	65.4			25.1		37.9	#102.5	
Internal Link Dist (m)		543.4			867.7			562.8			541.1	
Turn Bay Length (m)	75.0			80.0						40.0		
Base Capacity (vph)	556	685		415	647			336		387	509	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.44	0.71		0.51	0.51			0.31		0.39	0.77	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 86.3

Natural Cycle: 75

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 28.4

Intersection LOS: C

Intersection Capacity Utilization 86.5%

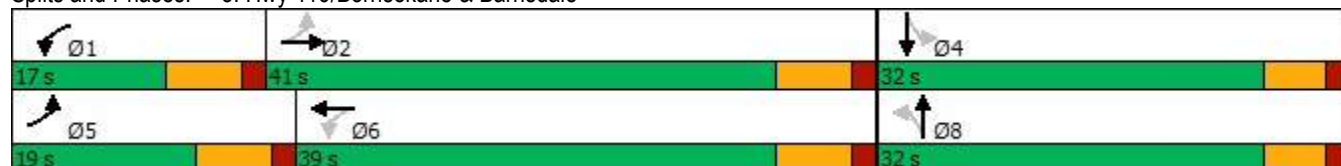
ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	115	271	7	36	0	502	10	1	0
Future Volume (vph)	0	220	18	115	271	7	36	0	502	10	1	0
Satd. Flow (prot)	0	1277	0	0	1293	0	0	1123	0	0	891	0
Flt Permitted					0.986			0.997			0.957	
Satd. Flow (perm)	0	1277	0	0	1293	0	0	1123	0	0	891	0
Lane Group Flow (vph)	0	238	0	0	393	0	0	538	0	0	11	0
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 79.5%												
ICU Level of Service D												
Analysis Period (min) 15												

Intersection

Intersection Delay, s/veh 46.9

Intersection LOS E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	220	18	115	271	7	36	0	502	10	1	0
Future Vol, veh/h	0	220	18	115	271	7	36	0	502	10	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	115	271	7	36	0	502	10	1	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	17.6	34.1	69.9	13.2
HCM LOS	C	D	F	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	0%	29%	91%
Vol Thru, %	0%	92%	69%	9%
Vol Right, %	93%	8%	2%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	538	238	393	11
LT Vol	36	0	115	10
Through Vol	0	220	271	1
RT Vol	502	18	7	0
Lane Flow Rate	538	238	393	11
Geometry Grp	1	1	1	1
Degree of Util (X)	1.018	0.488	0.799	0.029
Departure Headway (Hd)	6.81	7.587	7.496	9.903
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	538	478	487	364
Service Time	4.81	5.587	5.496	7.903
HCM Lane V/C Ratio	1	0.498	0.807	0.03
HCM Control Delay	69.9	17.6	34.1	13.2
HCM Lane LOS	F	C	D	B
HCM 95th-tile Q	14.8	2.6	7.4	0.1

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	77	175	15	12	0	385	5	2	1
Future Volume (vph)	1	248	24	77	175	15	12	0	385	5	2	1
Satd. Flow (prot)	0	1274	0	1127	1326	0	0	1013	1113	0	1040	0
Flt Permitted				0.950				0.950			0.970	
Satd. Flow (perm)	0	1274	0	1127	1326	0	0	1013	1113	0	1040	0
Lane Group Flow (vph)	0	273	0	77	190	0	0	12	385	0	8	0
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 53.9%												
ICU Level of Service A												
Analysis Period (min) 15												

Intersection

Intersection Delay, s/veh 17.7

Intersection LOS C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	248	24	77	175	15	12	0	385	5	2	1
Future Vol, veh/h	1	248	24	77	175	15	12	0	385	5	2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	77	175	15	12	0	385	5	2	1
Number of Lanes	0	1	0	1	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	1
HCM Control Delay	15.3	13	22.7	12.2
HCM LOS	C	B	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	100%	0%	0%	100%	0%	62%
Vol Thru, %	0%	0%	91%	0%	92%	25%
Vol Right, %	0%	100%	9%	0%	8%	12%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	12	385	273	77	190	8
LT Vol	12	0	1	77	0	5
Through Vol	0	0	248	0	175	2
RT Vol	0	385	24	0	15	1
Lane Flow Rate	12	385	273	77	190	8
Geometry Grp	5	5	4b	5	5	4b
Degree of Util (X)	0.026	0.698	0.484	0.166	0.359	0.02
Departure Headway (Hd)	7.868	6.531	6.385	7.752	6.807	8.963
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	455	554	562	462	526	398
Service Time	5.617	4.28	4.442	5.513	4.568	7.054
HCM Lane V/C Ratio	0.026	0.695	0.486	0.167	0.361	0.02
HCM Control Delay	10.8	23.1	15.3	12.1	13.4	12.2
HCM Lane LOS	B	C	C	B	B	B
HCM 95th-tile Q	0.1	5.5	2.6	0.6	1.6	0.1

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	115	271	7	36	0	502	10	1	0
Future Volume (vph)	0	220	18	115	271	7	36	0	502	10	1	0
Satd. Flow (prot)	0	1277	0	1127	1369	0	0	1013	1113	0	891	0
Flt Permitted				0.950				0.950			0.957	
Satd. Flow (perm)	0	1277	0	1127	1369	0	0	1013	1113	0	891	0
Lane Group Flow (vph)	0	238	0	115	278	0	0	36	502	0	11	0
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 59.5%												
ICU Level of Service B												
Analysis Period (min) 15												

Intersection	
Intersection Delay, s/veh	37.9
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	220	18	115	271	7	36	0	502	10	1	0
Future Vol, veh/h	0	220	18	115	271	7	36	0	502	10	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	115	271	7	36	0	502	10	1	0
Number of Lanes	0	1	0	1	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	1
HCM Control Delay	19.6	19	60.3	13.7
HCM LOS	C	C	F	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	100%	0%	0%	100%	0%	91%
Vol Thru, %	0%	0%	92%	0%	97%	9%
Vol Right, %	0%	100%	8%	0%	3%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	36	502	238	115	278	11
LT Vol	36	0	0	115	0	10
Through Vol	0	0	220	0	271	1
RT Vol	0	502	18	0	7	0
Lane Flow Rate	36	502	238	115	278	11
Geometry Grp	5	5	4b	5	5	4b
Degree of Util (X)	0.084	0.99	0.527	0.273	0.589	0.031
Departure Headway (Hd)	8.442	7.098	7.972	8.538	7.625	10.282
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	427	517	452	421	473	348
Service Time	6.142	4.798	6.017	6.284	5.371	8.351
HCM Lane V/C Ratio	0.084	0.971	0.527	0.273	0.588	0.032
HCM Control Delay	11.9	63.8	19.6	14.5	20.8	13.7
HCM Lane LOS	B	F	C	B	C	B
HCM 95th-tile Q	0.3	13.4	3	1.1	3.7	0.1

Lanes, Volumes, Timings

FT 2031-Borrisokane (EBL,WBL&SBL)-Trail (All-way stop)

3: Hwy 416/Borrisokane & Barnsdale

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	318	288	32	326	157	125	27	39	21	78	190	82
Future Volume (vph)	318	288	32	326	157	125	27	39	21	78	190	82
Satd. Flow (prot)	1658	1704	0	1658	1621	0	0	1662	0	1658	1745	1455
Flt Permitted	0.567			0.502				0.842		0.819		
Satd. Flow (perm)	989	1704	0	876	1621	0	0	1421	0	1429	1745	1415
Satd. Flow (RTOR)		8			56			20				153
Lane Group Flow (vph)	318	320	0	326	282	0	0	87	0	78	190	82
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		4
Detector Phase	5	2		1	6		8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.7	25.8		11.7	25.8		25.2	25.2		25.2	25.2	25.2
Total Split (s)	19.0	28.8		21.0	30.8		25.2	25.2		25.2	25.2	25.2
Total Split (%)	25.3%	38.4%		28.0%	41.1%		33.6%	33.6%		33.6%	33.6%	33.6%
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	4.2
All-Red Time (s)	1.6	1.7		1.6	1.7		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
Total Lost Time (s)	6.7	6.8		6.7	6.8			6.2		6.2	6.2	6.2
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	None
Act Effct Green (s)	41.2	29.8		42.2	30.3			13.7		13.7	13.7	13.7
Actuated g/C Ratio	0.55	0.40		0.56	0.40			0.18		0.18	0.18	0.18
v/c Ratio	0.49	0.47		0.53	0.41			0.32		0.30	0.60	0.21
Control Delay	8.9	19.7		10.4	16.4			23.3		28.4	35.6	1.7
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Delay	8.9	19.7		10.4	16.4			23.3		28.4	35.6	1.7
LOS	A	B		B	B			C		C	D	A
Approach Delay		14.3			13.1			23.3			26.1	
Approach LOS		B			B			C			C	
Queue Length 50th (m)	11.4	31.5		17.5	21.6			8.3		9.7	25.1	0.0
Queue Length 95th (m)	30.4	66.3		36.1	46.7			18.5		19.4	40.6	1.5
Internal Link Dist (m)		543.4			745.7			562.8			538.1	
Turn Bay Length (m)	75.0			80.0						40.0		20.0
Base Capacity (vph)	676	681		674	689			374		362	442	472
Starvation Cap Reductn	0	0		0	0			0		0	0	0
Spillback Cap Reductn	0	0		0	0			0		0	0	0
Storage Cap Reductn	0	0		0	0			0		0	0	0
Reduced v/c Ratio	0.47	0.47		0.48	0.41			0.23		0.22	0.43	0.17

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 16.8

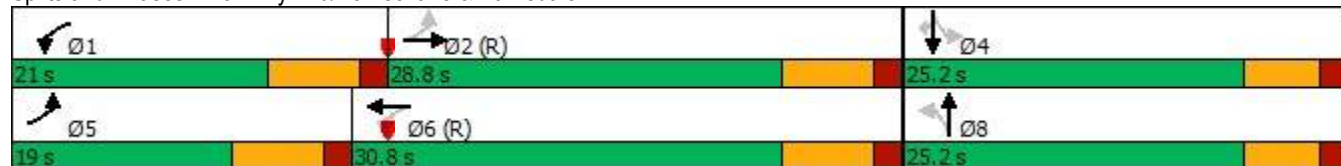
Intersection LOS: B

Intersection Capacity Utilization 77.6%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings

FT 2031-Borrisokane (EBL,WBL&SBL)-Trail (All-way stop)

8: William McEwen/Trail & Barnsdale

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	77	175	15	12	0	385	5	2	1
Future Volume (vph)	1	248	24	77	175	15	12	0	385	5	2	1
Satd. Flow (prot)	0	1272	0	1127	1326	0	0	1013	1113	0	1040	0
Flt Permitted				0.591				0.752			0.879	
Satd. Flow (perm)	0	1272	0	701	1326	0	0	802	1113	0	942	0
Satd. Flow (RTOR)		8			7				385		1	
Lane Group Flow (vph)	0	273	0	77	190	0	0	12	385	0	8	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	2	2		6	6		8	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)	31.3	31.3		31.3	31.3		24.6	24.6	24.6	24.6	24.6	
Total Split (s)	38.0	38.0		38.0	38.0		37.0	37.0	37.0	37.0	37.0	
Total Split (%)	50.7%	50.7%		50.7%	50.7%		49.3%	49.3%	49.3%	49.3%	49.3%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2	4.2	4.2	4.2	
All-Red Time (s)	1.2	1.2		1.2	1.2		1.4	1.4	1.4	1.4	1.4	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		6.3		6.3	6.3			5.6	5.6		5.6	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Act Effct Green (s)		49.9		49.9	49.9			13.2	13.2		13.2	
Actuated g/C Ratio		0.67		0.67	0.67			0.18	0.18		0.18	
v/c Ratio		0.32		0.17	0.22			0.09	0.75		0.05	
Control Delay		7.7		3.5	3.0			23.8	12.8		21.4	
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay		7.7		3.5	3.0			23.8	12.8		21.4	
LOS		A		A	A			C	B		C	
Approach Delay		7.7			3.2			13.2			21.4	
Approach LOS		A			A			B			C	
Queue Length 50th (m)		11.3		1.3	3.0			1.5	0.0		0.9	
Queue Length 95th (m)		37.4		4.6	8.5			4.7	21.4		3.5	
Internal Link Dist (m)		615.4			543.4			486.4			581.6	
Turn Bay Length (m)				30.0					30.0			
Base Capacity (vph)		848		466	883			335	689		394	
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		0.32		0.17	0.22			0.04	0.56		0.02	
Intersection Summary												
Cycle Length: 75												
Actuated Cycle Length: 75												
Offset: 46 (61%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green												
Natural Cycle: 60												
Control Type: Actuated-Coordinated												

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 8.8

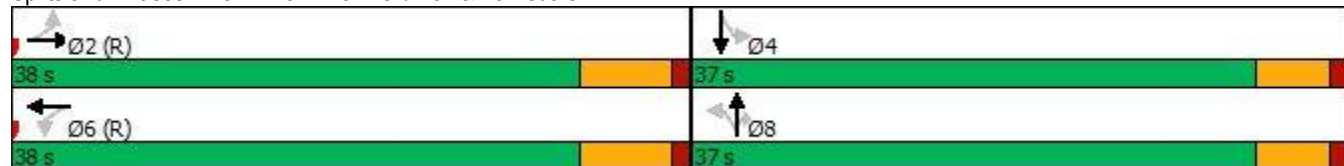
Intersection LOS: A

Intersection Capacity Utilization 63.5%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 8: William McEwen/Trail & Barnsdale



Lanes, Volumes, Timing for 31-Borrisokane (EBL,WBL,SBL&SBR)-Trail (Signalized, WBL & NBR
 3: Hwy 416/Borrisokane & Barnsdale
 PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	246	469	17	213	219	108	27	49	29	150	246	145
Future Volume (vph)	246	469	17	213	219	108	27	49	29	150	246	145
Satd. Flow (prot)	1658	1720	0	1658	1647	0	0	1659	0	1658	1745	1455
Flt Permitted	0.504			0.376				0.721		0.724		
Satd. Flow (perm)	880	1720	0	656	1647	0	0	1212	0	1263	1745	1414
Satd. Flow (RTOR)		2			33			20				127
Lane Group Flow (vph)	246	486	0	213	327	0	0	105	0	150	246	145
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		4
Detector Phase	5	2		1	6		8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.7	25.8		11.7	25.8		25.2	25.2		25.2	25.2	25.2
Total Split (s)	20.2	44.0		19.0	42.8		27.0	27.0		27.0	27.0	27.0
Total Split (%)	22.4%	48.9%		21.1%	47.6%		30.0%	30.0%		30.0%	30.0%	30.0%
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	4.2
All-Red Time (s)	1.6	1.7		1.6	1.7		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
Total Lost Time (s)	6.7	6.8		6.7	6.8			6.2		6.2	6.2	6.2
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	None
Act Effct Green (s)	54.1	43.3		52.5	42.5			17.1		17.1	17.1	17.1
Actuated g/C Ratio	0.60	0.48		0.58	0.47			0.19		0.19	0.19	0.19
v/c Ratio	0.40	0.59		0.43	0.41			0.43		0.63	0.74	0.39
Control Delay	8.9	22.2		9.8	17.3			30.4		44.8	48.0	10.7
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Delay	8.9	22.2		9.8	17.3			30.4		44.8	48.0	10.7
LOS	A	C		A	B			C		D	D	B
Approach Delay		17.7			14.4			30.4			37.1	
Approach LOS		B			B			C			D	
Queue Length 50th (m)	15.4	59.4		12.8	32.2			12.8		23.8	40.0	2.6
Queue Length 95th (m)	31.0	97.0		24.0	60.3			26.8		41.4	62.2	16.9
Internal Link Dist (m)		543.4			867.7			562.8			541.1	
Turn Bay Length (m)	75.0			80.0						40.0		20.0
Base Capacity (vph)	673	828		537	795			295		291	403	424
Starvation Cap Reductn	0	0		0	0			0		0	0	0
Spillback Cap Reductn	0	0		0	0			0		0	0	0
Storage Cap Reductn	0	0		0	0			0		0	0	0
Reduced v/c Ratio	0.37	0.59		0.40	0.41			0.36		0.52	0.61	0.34
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 90												
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection												
Natural Cycle: 70												
Control Type: Actuated-Coordinated												

Lanes, Volumes, Timing 2031-Borrisokane (EBL,WBL,SBL&SBR)-Trail (Signalized, WBL & NBR
3: Hwy 416/Borrisokane & Barnsdale PM Peak Hour

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 22.9

Intersection LOS: C

Intersection Capacity Utilization 83.2%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timing 2031-Borrisokane (EBL,WBL,SBL&SBR)-Trail (Signalized, WBL & NBR
 8: William McEwen/Trail & Barnsdale PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	115	271	7	36	0	502	10	1	0
Future Volume (vph)	0	220	18	115	271	7	36	0	502	10	1	0
Satd. Flow (prot)	0	1275	0	1127	1369	0	0	1013	1113	0	891	0
Flt Permitted				0.611				0.750			0.806	
Satd. Flow (perm)	0	1275	0	725	1369	0	0	799	1113	0	751	0
Satd. Flow (RTOR)		5			2				502			
Lane Group Flow (vph)	0	238	0	115	278	0	0	36	502	0	11	0
Turn Type		NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	2	2		6	6		8	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)	30.6	30.6		30.6	30.6		25.3	25.3	25.3	25.3	25.3	
Total Split (s)	39.0	39.0		39.0	39.0		51.0	51.0	51.0	51.0	51.0	
Total Split (%)	43.3%	43.3%		43.3%	43.3%		56.7%	56.7%	56.7%	56.7%	56.7%	
Yellow Time (s)	4.2	4.2		4.2	4.2		5.1	5.1	5.1	5.1	5.1	
All-Red Time (s)	1.4	1.4		1.4	1.4		1.2	1.2	1.2	1.2	1.2	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		5.6		5.6	5.6			6.3	6.3		6.3	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None	None	None	None	
Act Effct Green (s)		61.9		61.9	61.9			16.2	16.2		16.2	
Actuated g/C Ratio		0.69		0.69	0.69			0.18	0.18		0.18	
v/c Ratio		0.27		0.23	0.30			0.25	0.82		0.08	
Control Delay		8.5		7.9	7.0			31.9	14.6		26.0	
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay		8.5		7.9	7.0			31.9	14.6		26.0	
LOS		A		A	A			C	B		C	
Approach Delay		8.5			7.3			15.7			26.0	
Approach LOS		A			A			B			C	
Queue Length 50th (m)		9.6		4.1	10.1			5.9	0.0		1.8	
Queue Length 95th (m)		41.8		15.1	29.9			10.4	25.9		4.6	
Internal Link Dist (m)		615.4			543.4			486.4			581.6	
Turn Bay Length (m)				30.0					30.0			
Base Capacity (vph)		878		498	942			396	805		372	
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		0.27		0.23	0.30			0.09	0.62		0.03	
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 90												
Offset: 41 (46%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green												
Natural Cycle: 60												
Control Type: Actuated-Coordinated												

Lanes, Volumes, Timing

Scenario 1 3882 & 4000 Barnsdale Road
RA

FT 031-Borrisokane (EBL,WBL,SBL&SBR)-Trail (Signalized, WBL & NBR)

8: William McEwen/Trail & Barnsdale

PM Peak Hour

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 11.6

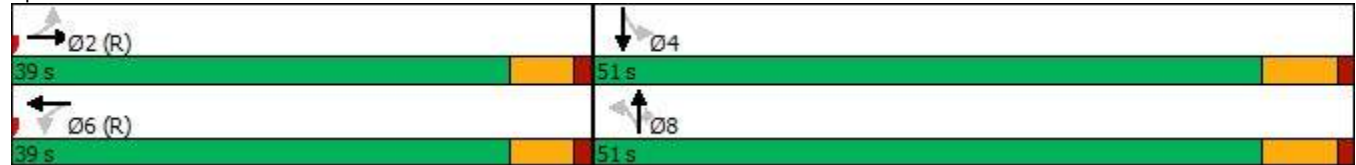
Intersection LOS: B

Intersection Capacity Utilization 69.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: William McEwen/Trail & Barnsdale



Appendix Q

Synchro Intersection Worksheets – 2036 Future Total Conditions

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FT 2036-Without Mitigation
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	282	352	32	465	158	125	27	39	21	78	118	82
Future Volume (vph)	282	352	32	465	158	125	27	39	21	78	118	82
Satd. Flow (prot)	0	1689	0	0	1650	0	0	1662	0	0	1629	0
Flt Permitted		0.583			0.497			0.787			0.885	
Satd. Flow (perm)	0	1006	0	0	846	0	0	1328	0	0	1462	0
Satd. Flow (RTOR)		4			16			13			17	
Lane Group Flow (vph)	0	666	0	0	748	0	0	87	0	0	278	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	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	
Minimum Split (s)	25.8	25.8		25.8	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	83.0	83.0		83.0	83.0		37.0	37.0		37.0	37.0	
Total Split (%)	69.2%	69.2%		69.2%	69.2%		30.8%	30.8%		30.8%	30.8%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.7	1.7		1.7	1.7		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.8			6.8			6.2			6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effct Green (s)		76.4			76.4			24.7			24.7	
Actuated g/C Ratio		0.67			0.67			0.22			0.22	
v/c Ratio		0.99			1.31			0.29			0.84	
Control Delay		52.9			173.2			33.6			62.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		52.9			173.2			33.6			62.7	
LOS		D			F			C			E	
Approach Delay		52.9			173.2			33.6			62.7	
Approach LOS		D			F			C			E	
Queue Length 50th (m)		136.1			~218.6			13.8			56.3	
Queue Length 95th (m)		#240.6			#177.9			27.9			87.5	
Internal Link Dist (m)		543.4			978.4			562.8			531.1	
Turn Bay Length (m)												
Base Capacity (vph)		674			571			368			407	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.99			1.31			0.24			0.68	
Intersection Summary												
Cycle Length: 120												
Actuated Cycle Length: 114.1												
Natural Cycle: 140												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 1.31												

Lanes, Volumes, Timings

3: Hwy 416/Borrisokane & Barnsdale

FT 2036-Without Mitigation
AM Peak Hour

Intersection Signal Delay: 104.1

Intersection LOS: F

Intersection Capacity Utilization 98.9%

ICU Level of Service F

Analysis Period (min) 15

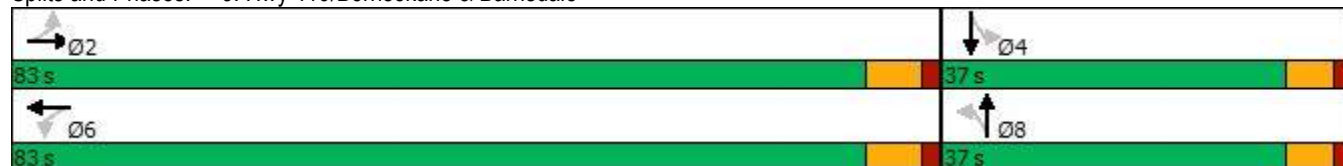
~ Volume exceeds capacity, queue is theoretically infinite.

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: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FT 2036-Without Mitigation
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	78	175	15	12	0	413	5	2	1
Future Volume (vph)	1	248	24	78	175	15	12	0	413	5	2	1
Satd. Flow (prot)	0	1274	0	0	1265	0	0	1129	0	0	1040	0
Flt Permitted					0.986			0.999			0.970	
Satd. Flow (perm)	0	1274	0	0	1265	0	0	1129	0	0	1040	0
Lane Group Flow (vph)	0	273	0	0	268	0	0	425	0	0	8	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 68.1%												
ICU Level of Service C												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	9.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	248	24	78	175	15	12	0	413	5	2	1
Future Vol, veh/h	1	248	24	78	175	15	12	0	413	5	2	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	78	175	15	12	0	413	5	2	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	190	0	0	272	0	0	602	608	260	808	613	183
Stage 1	-	-	-	-	-	-	262	262	-	339	339	-
Stage 2	-	-	-	-	-	-	340	346	-	469	274	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1384	-	-	1059	-	-	331	342	703	209	408	859
Stage 1	-	-	-	-	-	-	620	597	-	512	640	-
Stage 2	-	-	-	-	-	-	558	544	-	426	683	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1384	-	-	1059	-	-	308	313	703	81	374	859
Mov Cap-2 Maneuver	-	-	-	-	-	-	308	313	-	81	374	-
Stage 1	-	-	-	-	-	-	619	596	-	511	587	-
Stage 2	-	-	-	-	-	-	509	499	-	176	682	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.5			18.8			38		
HCM LOS							C			E		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	678	1384	-	-	1059	-	-	117				
HCM Lane V/C Ratio	0.627	0.001	-	-	0.074	-	-	0.068				
HCM Control Delay (s)	18.8	7.6	0	-	8.7	0	-	38				
HCM Lane LOS	C	A	A	-	A	A	-	E				
HCM 95th %tile Q(veh)	4.4	0	-	-	0.2	-	-	0.2				

Lanes, Volumes, Timings
13: Realigned Geenbank & Dundonald

FT 2036-Without Mitigation
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	166	38	33	10	35	82	17	289	10	56	174	82
Future Volume (vph)	166	38	33	10	35	82	17	289	10	56	174	82
Satd. Flow (prot)	1658	1611	0	1658	1544	0	1658	3295	0	1658	3121	0
Flt Permitted	0.682			0.711			0.593			0.569		
Satd. Flow (perm)	1186	1611	0	1236	1544	0	1024	3295	0	983	3121	0
Satd. Flow (RTOR)		33			82			3			75	
Lane Group Flow (vph)	166	71	0	10	117	0	17	299	0	56	256	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	46.8	46.8		46.8	46.8		24.4	24.4		24.4	24.4	
Total Split (s)	68.0	68.0		68.0	68.0		42.0	42.0		42.0	42.0	
Total Split (%)	61.8%	61.8%		61.8%	61.8%		38.2%	38.2%		38.2%	38.2%	
Yellow Time (s)	3.3	3.3		3.3	3.3		4.2	4.2		4.2	4.2	
All-Red Time (s)	4.5	4.5		4.5	4.5		2.2	2.2		2.2	2.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.8	7.8		7.8	7.8		6.4	6.4		6.4	6.4	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	23.1	23.1		23.1	23.1		72.7	72.7		72.7	72.7	
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.66	0.66		0.66	0.66	
v/c Ratio	0.67	0.20		0.04	0.30		0.03	0.14		0.09	0.12	
Control Delay	51.2	19.4		28.8	13.1		5.1	4.0		10.0	6.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	51.2	19.4		28.8	13.1		5.1	4.0		10.0	6.3	
LOS	D	B		C	B		A	A		A	A	
Approach Delay		41.7			14.3			4.1			7.0	
Approach LOS		D			B			A			A	
Queue Length 50th (m)	33.6	6.8		1.8	6.3		0.5	4.2		3.7	6.3	
Queue Length 95th (m)	45.3	15.0		5.1	17.1		3.0	12.5		12.7	16.8	
Internal Link Dist (m)		191.3			523.4			466.1			376.6	
Turn Bay Length (m)	38.0			38.0			38.0			50.0		
Base Capacity (vph)	649	896		676	882		676	2177		649	2087	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.26	0.08		0.01	0.13		0.03	0.14		0.09	0.12	
Intersection Summary												
Cycle Length: 110												
Actuated Cycle Length: 110												
Offset: 37 (34%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green												
Natural Cycle: 75												
Control Type: Actuated-Coordinated												

Lanes, Volumes, Timings 13: Realigned Geenbank & Dundonald

FT 2036-Without Mitigation
AM Peak Hour

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 15.3

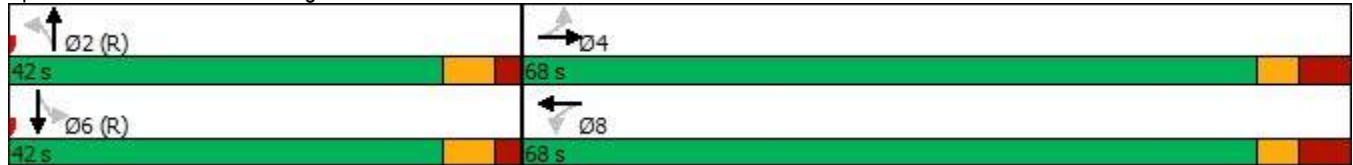
Intersection LOS: B

Intersection Capacity Utilization 59.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 13: Realigned Geenbank & Dundonald



Lanes, Volumes, Timings
14: Realigned Geenbank & Kilbirnie

FT 2036-Without Mitigation
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 			 			 	 			 	
Traffic Volume (vph)	78	17	90	10	8	79	34	149	10	52	113	43
Future Volume (vph)	78	17	90	10	8	79	34	149	10	52	113	43
Satd. Flow (prot)	3216	1505	0	1658	1486	0	1658	3316	1483	1658	3316	1483
Flt Permitted	0.950			0.688			0.681			0.658		
Satd. Flow (perm)	3197	1505	0	1196	1486	0	1176	3316	1436	1137	3316	1436
Satd. Flow (RTOR)		90			79				123			123
Lane Group Flow (vph)	78	107	0	10	87	0	34	149	10	52	113	43
Turn Type	Prot	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4			8			2			6	
Permitted Phases				8			2		2	6		6
Detector Phase	7	4		8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	12.4	48.7		48.7	48.7		29.8	29.8	29.8	29.8	29.8	29.8
Total Split (s)	19.0	71.0		52.0	52.0		39.0	39.0	39.0	39.0	39.0	39.0
Total Split (%)	17.3%	64.5%		47.3%	47.3%		35.5%	35.5%	35.5%	35.5%	35.5%	35.5%
Yellow Time (s)	3.7	3.7		3.7	3.7		4.2	4.2	4.2	4.2	4.2	4.2
All-Red Time (s)	3.7	4.0		4.0	4.0		2.6	2.6	2.6	2.6	2.6	2.6
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)	7.4	7.7		7.7	7.7		6.8	6.8	6.8	6.8	6.8	6.8
Lead/Lag	Lag			Lead	Lead							
Lead-Lag Optimize?	Yes			Yes	Yes							
Recall Mode	None	None		None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	8.0	29.0		16.2	16.2		66.5	66.5	66.5	66.5	66.5	66.5
Actuated g/C Ratio	0.07	0.26		0.15	0.15		0.60	0.60	0.60	0.60	0.60	0.60
v/c Ratio	0.33	0.23		0.06	0.31		0.05	0.07	0.01	0.08	0.06	0.05
Control Delay	51.8	7.4		34.2	11.4		6.4	5.3	0.1	12.7	11.2	0.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.8	7.4		34.2	11.4		6.4	5.3	0.1	12.7	11.2	0.4
LOS	D	A		C	B		A	A	A	B	B	A
Approach Delay		26.1			13.8			5.2			9.3	
Approach LOS		C			B			A			A	
Queue Length 50th (m)	8.3	2.9		2.0	1.6		0.9	2.0	0.0	3.0	3.4	0.0
Queue Length 95th (m)	15.5	9.6		4.9	11.1		6.3	9.9	0.0	11.5	10.5	0.0
Internal Link Dist (m)		474.8			483.3			501.2			466.1	
Turn Bay Length (m)	25.0			15.0			35.0		84.0	57.0		75.0
Base Capacity (vph)	339	904		481	645		711	2006	917	687	2006	917
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	0.23	0.12		0.02	0.13		0.05	0.07	0.01	0.08	0.06	0.05

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 41 (37%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 95

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings 14: Realigned Geenbank & Kilbirnie

FT 2036-Without Mitigation
AM Peak Hour

Maximum v/c Ratio: 0.33

Intersection Signal Delay: 13.3

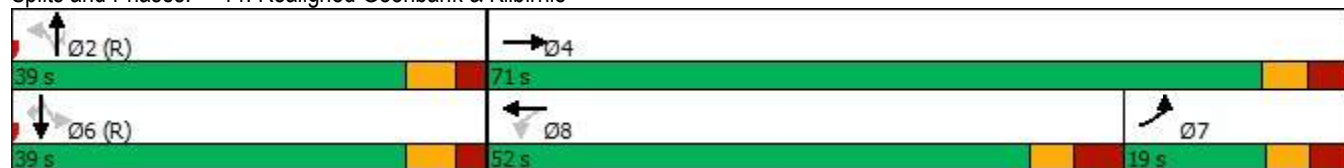
Intersection LOS: B

Intersection Capacity Utilization 58.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 14: Realigned Geenbank & Kilbirnie



Lanes, Volumes, Timings
15: Realigned Geenbank & Cappamore

FT 2036-Without Mitigation
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	60	100	5	34	32	43	128	2	17	173	13
Future Volume (vph)	23	60	100	5	34	32	43	128	2	17	173	13
Satd. Flow (prot)	1658	1563	0	1658	1603	0	1658	3307	0	1658	3274	0
Flt Permitted	0.714			0.528			0.635			0.670		
Satd. Flow (perm)	1239	1563	0	917	1603	0	1094	3307	0	1153	3274	0
Satd. Flow (RTOR)		100			32			2			8	
Lane Group Flow (vph)	23	160	0	5	66	0	43	130	0	17	186	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	32.7	32.7		32.7	32.7		23.4	23.4		23.4	23.4	
Total Split (s)	64.0	64.0		64.0	64.0		46.0	46.0		46.0	46.0	
Total Split (%)	58.2%	58.2%		58.2%	58.2%		41.8%	41.8%		41.8%	41.8%	
Yellow Time (s)	3.7	3.7		3.7	3.7		4.2	4.2		4.2	4.2	
All-Red Time (s)	3.0	3.0		3.0	3.0		2.2	2.2		2.2	2.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.7	6.7		6.7	6.7		6.4	6.4		6.4	6.4	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effect Green (s)	13.8	13.8		13.8	13.8		83.1	83.1		83.1	83.1	
Actuated g/C Ratio	0.13	0.13		0.13	0.13		0.76	0.76		0.76	0.76	
v/c Ratio	0.15	0.57		0.04	0.29		0.05	0.05		0.02	0.08	
Control Delay	41.9	25.3		38.6	26.9		13.3	12.2		6.3	4.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	41.9	25.3		38.6	26.9		13.3	12.2		6.3	4.9	
LOS	D	C		D	C		B	B		A	A	
Approach Delay		27.4			27.7			12.4			5.0	
Approach LOS		C			C			B			A	
Queue Length 50th (m)	4.7	12.4		1.0	6.9		5.1	8.1		0.5	2.8	
Queue Length 95th (m)	10.6	28.1		3.9	16.8		17.6	19.5		4.2	15.4	
Internal Link Dist (m)		431.8			441.9			239.7			501.2	
Turn Bay Length (m)	30.0			30.0			38.0			38.0		
Base Capacity (vph)	645	862		477	850		827	2499		871	2476	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.04	0.19		0.01	0.08		0.05	0.05		0.02	0.08	
Intersection Summary												
Cycle Length: 110												
Actuated Cycle Length: 110												
Offset: 38 (35%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green												
Natural Cycle: 60												
Control Type: Actuated-Coordinated												

Lanes, Volumes, Timings
15: Realigned Geenbank & Cappamore

FT 2036-Without Mitigation
AM Peak Hour

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 16.1

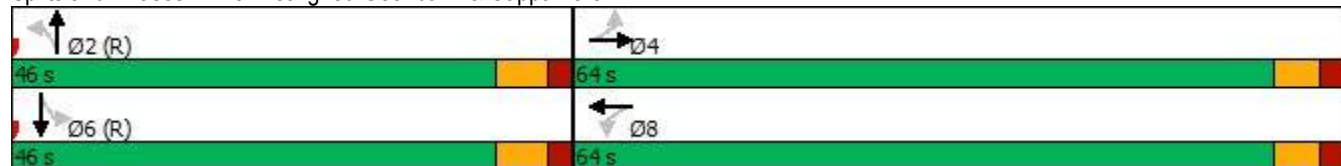
Intersection LOS: B

Intersection Capacity Utilization 50.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 15: Realigned Geenbank & Cappamore



Lanes, Volumes, Timings
16: Barnsdale & Realigned Geenbank

FT 2036-Without Mitigation
AM Peak Hour



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	115	315	463	59	52	227
Future Volume (vph)	115	315	463	59	52	227
Satd. Flow (prot)	1658	1745	1745	1483	1658	1483
Flt Permitted	0.272				0.950	
Satd. Flow (perm)	475	1745	1745	1483	1658	1483
Satd. Flow (RTOR)				59		227
Lane Group Flow (vph)	115	315	463	59	52	227
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases		4	8			
Permitted Phases	4			8	6	6
Detector Phase	4	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	5.0
Minimum Split (s)	32.2	32.2	32.2	32.2	11.5	11.5
Total Split (s)	76.0	76.0	76.0	76.0	34.0	34.0
Total Split (%)	69.1%	69.1%	69.1%	69.1%	30.9%	30.9%
Yellow Time (s)	5.1	5.1	5.1	5.1	4.2	4.2
All-Red Time (s)	2.1	2.1	2.1	2.1	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.2	7.2	7.2	7.2	6.5	6.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	38.7	38.7	38.7	38.7	57.6	57.6
Actuated g/C Ratio	0.35	0.35	0.35	0.35	0.52	0.52
v/c Ratio	0.69	0.51	0.76	0.11	0.06	0.26
Control Delay	50.2	29.9	38.8	5.0	14.0	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.2	29.9	38.8	5.0	14.0	4.2
LOS	D	C	D	A	B	A
Approach Delay		35.4	35.0		6.0	
Approach LOS		D	C		A	
Queue Length 50th (m)	21.0	53.2	87.3	0.0	5.5	0.0
Queue Length 95th (m)	36.2	63.7	100.7	6.8	13.8	20.5
Internal Link Dist (m)		978.4	366.5		239.7	
Turn Bay Length (m)	83.0			91.0		
Base Capacity (vph)	297	1091	1091	949	868	885
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	0.39	0.29	0.42	0.06	0.06	0.26

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 29 (26%), Referenced to phase 6:SBL, Start of Green

Natural Cycle: 45

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings 16: Barnsdale & Realigned Geenbank

FT 2036-Without Mitigation
AM Peak Hour

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 28.5

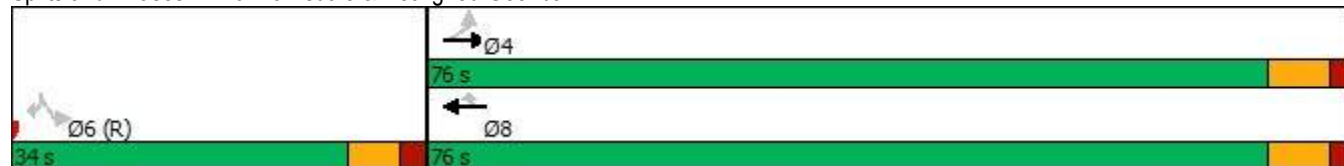
Intersection LOS: C

Intersection Capacity Utilization 55.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 16: Barnsdale & Realigned Geenbank



Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FT 2036-Without Mitigation
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	594	17	308	220	108	27	49	31	150	192	145
Future Volume (vph)	180	594	17	308	220	108	27	49	31	150	192	145
Satd. Flow (prot)	0	1708	0	0	1658	0	0	1657	0	0	1628	0
Flt Permitted		0.742			0.486			0.775			0.855	
Satd. Flow (perm)	0	1282	0	0	826	0	0	1300	0	0	1413	0
Satd. Flow (RTOR)		2			15			16			16	
Lane Group Flow (vph)	0	791	0	0	636	0	0	107	0	0	487	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	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	
Minimum Split (s)	25.8	25.8		25.8	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	88.0	88.0		88.0	88.0		42.0	42.0		42.0	42.0	
Total Split (%)	67.7%	67.7%		67.7%	67.7%		32.3%	32.3%		32.3%	32.3%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.7	1.7		1.7	1.7		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.8			6.8			6.2			6.2	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None		None	None	
Act Effect Green (s)		81.2			81.2			35.8			35.8	
Actuated g/C Ratio		0.62			0.62			0.28			0.28	
v/c Ratio		0.99			1.22			0.29			1.22	
Control Delay		53.6			140.6			33.9			157.9	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		53.6			140.6			33.9			157.9	
LOS		D			F			C			F	
Approach Delay		53.6			140.6			33.9			157.9	
Approach LOS		D			F			C			F	
Queue Length 50th (m)		186.3			~199.1			18.3			~150.1	
Queue Length 95th (m)		#283.1			#271.0			34.5			#216.6	
Internal Link Dist (m)		543.4			978.4			562.8			538.5	
Turn Bay Length (m)												
Base Capacity (vph)		801			521			369			400	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.99			1.22			0.29			1.22	
Intersection Summary												
Cycle Length: 130												
Actuated Cycle Length: 130												
Natural Cycle: 140												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 1.22												

Lanes, Volumes, Timings

3: Hwy 416/Borrisokane & Barnsdale

FT 2036-Without Mitigation
PM Peak Hour

Intersection Signal Delay: 105.1

Intersection LOS: F

Intersection Capacity Utilization 118.5%

ICU Level of Service H

Analysis Period (min) 15

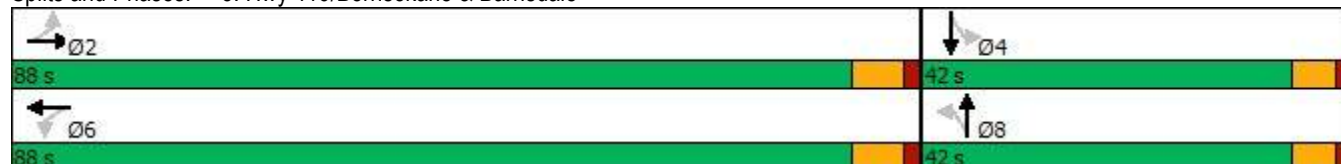
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FT 2036-Without Mitigation
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	116	271	7	36	0	561	10	1	0
Future Volume (vph)	0	220	18	116	271	7	36	0	561	10	1	0
Satd. Flow (prot)	0	1277	0	0	1291	0	0	1124	0	0	891	0
Flt Permitted					0.985			0.997			0.957	
Satd. Flow (perm)	0	1277	0	0	1291	0	0	1124	0	0	891	0
Lane Group Flow (vph)	0	238	0	0	394	0	0	597	0	0	11	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 83.4%												
ICU Level of Service E												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	22.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	220	18	116	271	7	36	0	561	10	1	0
Future Vol, veh/h	0	220	18	116	271	7	36	0	561	10	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	116	271	7	36	0	561	10	1	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	278	0	0	238	0	0	736	739	229	1017	745	275
Stage 1	-	-	-	-	-	-	229	229	-	507	507	-
Stage 2	-	-	-	-	-	-	507	510	-	510	238	-
Critical Hdwy	4.12	-	-	4.6	-	-	7.77	7.1	6.56	8.1	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.77	6.1	-	7.1	5.52	-
Follow-up Hdwy	2.218	-	-	2.65	-	-	4.103	4.54	3.624	4.4	4.018	3.318
Pot Cap-1 Maneuver	1285	-	-	1093	-	-	265	284	733	145	342	764
Stage 1	-	-	-	-	-	-	648	619	-	404	539	-
Stage 2	-	-	-	-	-	-	445	453	-	402	708	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1285	-	-	1093	-	-	239	248	733	31	299	764
Mov Cap-2 Maneuver	-	-	-	-	-	-	239	248	-	31	299	-
Stage 1	-	-	-	-	-	-	648	619	-	404	471	-
Stage 2	-	-	-	-	-	-	388	396	-	94	708	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.6			42.9			155.1		
HCM LOS							E			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	652	1285	-	-	1093	-	-	34				
HCM Lane V/C Ratio	0.916	-	-	-	0.106	-	-	0.324				
HCM Control Delay (s)	42.9	0	-	-	8.7	0	-	155.1				
HCM Lane LOS	E	A	-	-	A	A	-	F				
HCM 95th %tile Q(veh)	11.9	0	-	-	0.4	-	-	1.1				

Lanes, Volumes, Timings
13: Realigned Geenbank & Dundonald

FT 2036-Without Mitigation
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	21	24	10	58	81	32	266	10	102	330	161
Future Volume (vph)	121	21	24	10	58	81	32	266	10	102	330	161
Satd. Flow (prot)	1658	1592	0	1658	1578	0	1658	3295	0	1658	3117	0
Flt Permitted	0.668			0.728			0.473			0.582		
Satd. Flow (perm)	1162	1592	0	1265	1578	0	820	3295	0	1005	3117	0
Satd. Flow (RTOR)		24			81			4			89	
Lane Group Flow (vph)	121	45	0	10	139	0	32	276	0	102	491	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	46.8	46.8		46.8	46.8		24.4	24.4		24.4	24.4	
Total Split (s)	61.0	61.0		61.0	61.0		49.0	49.0		49.0	49.0	
Total Split (%)	55.5%	55.5%		55.5%	55.5%		44.5%	44.5%		44.5%	44.5%	
Yellow Time (s)	3.3	3.3		3.3	3.3		4.2	4.2		4.2	4.2	
All-Red Time (s)	4.5	4.5		4.5	4.5		2.2	2.2		2.2	2.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.8	7.8		7.8	7.8		6.4	6.4		6.4	6.4	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	20.1	20.1		20.1	20.1		75.7	75.7		75.7	75.7	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.69	0.69		0.69	0.69	
v/c Ratio	0.57	0.15		0.04	0.39		0.06	0.12		0.15	0.23	
Control Delay	49.3	18.8		30.8	18.5		3.8	3.1		9.1	6.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	49.3	18.8		30.8	18.5		3.8	3.1		9.1	6.8	
LOS	D	B		C	B		A	A		A	A	
Approach Delay		41.0			19.4			3.1			7.2	
Approach LOS		D			B			A			A	
Queue Length 50th (m)	24.8	3.9		1.9	11.1		0.8	3.7		6.1	13.0	
Queue Length 95th (m)	33.8	10.5		5.1	21.9		3.6	9.2		21.4	34.8	
Internal Link Dist (m)		191.3			523.4			466.1			376.6	
Turn Bay Length (m)	38.0			38.0			38.0			50.0		
Base Capacity (vph)	561	782		611	805		564	2269		691	2173	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.22	0.06		0.02	0.17		0.06	0.12		0.15	0.23	
Intersection Summary												
Cycle Length: 110												
Actuated Cycle Length: 110												
Offset: 66 (60%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green												
Natural Cycle: 75												
Control Type: Actuated-Coordinated												

Lanes, Volumes, Timings 13: Realigned Geenbank & Dundonald

FT 2036-Without Mitigation
PM Peak Hour

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 12.3

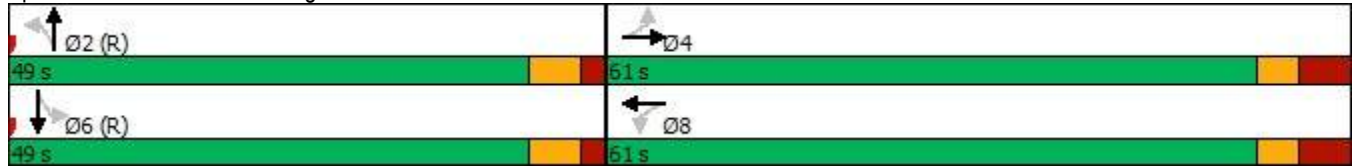
Intersection LOS: B

Intersection Capacity Utilization 68.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 13: Realigned Geenbank & Dundonald



Lanes, Volumes, Timings
14: Realigned Geenbank & Kilbirnie

FT 2036-Without Mitigation
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	10	60	10	14	79	73	159	10	94	176	85
Future Volume (vph)	60	10	60	10	14	79	73	159	10	94	176	85
Satd. Flow (prot)	3216	1499	0	1658	1503	0	1658	3316	1483	1658	3316	1483
Flt Permitted	0.950			0.711			0.641			0.651		
Satd. Flow (perm)	3197	1499	0	1236	1503	0	1108	3316	1436	1125	3316	1436
Satd. Flow (RTOR)		60			79				123			123
Lane Group Flow (vph)	60	70	0	10	93	0	73	159	10	94	176	85
Turn Type	Prot	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4			8			2			6	
Permitted Phases				8			2		2	6		6
Detector Phase	7	4		8	8		2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0		10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	12.4	48.7		48.7	48.7		29.8	29.8	29.8	29.8	29.8	29.8
Total Split (s)	17.0	69.0		52.0	52.0		41.0	41.0	41.0	41.0	41.0	41.0
Total Split (%)	15.5%	62.7%		47.3%	47.3%		37.3%	37.3%	37.3%	37.3%	37.3%	37.3%
Yellow Time (s)	3.7	3.7		3.7	3.7		4.2	4.2	4.2	4.2	4.2	4.2
All-Red Time (s)	3.7	4.0		4.0	4.0		2.6	2.6	2.6	2.6	2.6	2.6
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)	7.4	7.7		7.7	7.7		6.8	6.8	6.8	6.8	6.8	6.8
Lead/Lag	Lag			Lead	Lead							
Lead-Lag Optimize?	Yes			Yes	Yes							
Recall Mode	None	None		None	None		C-Max	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	7.4	28.4		16.2	16.2		72.0	72.0	72.0	72.0	72.0	72.0
Actuated g/C Ratio	0.07	0.26		0.15	0.15		0.65	0.65	0.65	0.65	0.65	0.65
v/c Ratio	0.28	0.16		0.05	0.32		0.10	0.07	0.01	0.13	0.08	0.09
Control Delay	51.5	7.7		34.1	12.9		6.7	5.0	0.0	12.4	10.9	0.7
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.5	7.7		34.1	12.9		6.7	5.0	0.0	12.4	10.9	0.7
LOS	D	A		C	B		A	A	A	B	B	A
Approach Delay		27.9			14.9			5.3			8.8	
Approach LOS		C			B			A			A	
Queue Length 50th (m)	6.4	1.7		2.0	2.8		2.2	2.4	0.0	6.8	6.5	0.0
Queue Length 95th (m)	12.8	7.6		4.9	12.3		10.7	10.1	0.0	17.9	15.0	1.6
Internal Link Dist (m)		485.7			483.3			501.2			466.1	
Turn Bay Length (m)	25.0			15.0			35.0		84.0	57.0		75.0
Base Capacity (vph)	280	861		497	652		725	2169	982	736	2169	982
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	0.21	0.08		0.02	0.14		0.10	0.07	0.01	0.13	0.08	0.09

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 62 (56%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 95

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings 14: Realigned Geenbank & Kilbirnie

FT 2036-Without Mitigation
PM Peak Hour

Maximum v/c Ratio: 0.32

Intersection Signal Delay: 11.6

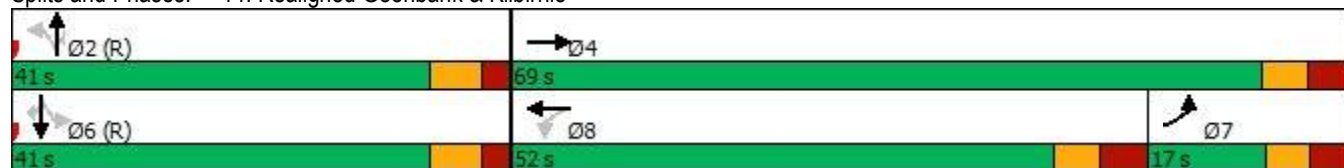
Intersection LOS: B

Intersection Capacity Utilization 57.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 14: Realigned Geenbank & Kilbirnie



Lanes, Volumes, Timings
15: Realigned Geenbank & Cappamore

FT 2036-Without Mitigation
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	19	54	65	3	69	27	96	186	4	34	177	25
Future Volume (vph)	19	54	65	3	69	27	96	186	4	34	177	25
Satd. Flow (prot)	1658	1586	0	1658	1663	0	1658	3303	0	1658	3238	0
Flt Permitted	0.695			0.675			0.625			0.632		
Satd. Flow (perm)	1206	1586	0	1172	1663	0	1077	3303	0	1089	3238	0
Satd. Flow (RTOR)		65			22			3			19	
Lane Group Flow (vph)	19	119	0	3	96	0	96	190	0	34	202	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	32.7	32.7		32.7	32.7		23.4	23.4		23.4	23.4	
Total Split (s)	52.0	52.0		52.0	52.0		58.0	58.0		58.0	58.0	
Total Split (%)	47.3%	47.3%		47.3%	47.3%		52.7%	52.7%		52.7%	52.7%	
Yellow Time (s)	3.7	3.7		3.7	3.7		4.2	4.2		4.2	4.2	
All-Red Time (s)	3.0	3.0		3.0	3.0		2.2	2.2		2.2	2.2	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.7	6.7		6.7	6.7		6.4	6.4		6.4	6.4	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	13.7	13.7		13.7	13.7		83.2	83.2		83.2	83.2	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.76	0.76		0.76	0.76	
v/c Ratio	0.13	0.47		0.02	0.42		0.12	0.08		0.04	0.08	
Control Delay	41.4	26.6		37.3	38.2		11.5	9.8		5.9	4.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	41.4	26.6		37.3	38.2		11.5	9.8		5.9	4.6	
LOS	D	C		D	D		B	A		A	A	
Approach Delay		28.6			38.2			10.4			4.8	
Approach LOS		C			D			B			A	
Queue Length 50th (m)	3.8	11.1		0.6	15.3		11.2	10.5		1.1	3.3	
Queue Length 95th (m)	9.3	24.5		2.8	26.6		28.2	21.4		9.2	18.0	
Internal Link Dist (m)		431.8			441.9			239.7			501.2	
Turn Bay Length (m)	30.0			30.0			38.0			38.0		
Base Capacity (vph)	496	691		482	697		814	2498		823	2453	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.04	0.17		0.01	0.14		0.12	0.08		0.04	0.08	
Intersection Summary												
Cycle Length: 110												
Actuated Cycle Length: 110												
Offset: 48 (44%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green												
Natural Cycle: 60												
Control Type: Actuated-Coordinated												

Lanes, Volumes, Timings 15: Realigned Geenbank & Cappamore

FT 2036-Without Mitigation
PM Peak Hour

Maximum v/c Ratio: 0.47

Intersection Signal Delay: 15.6

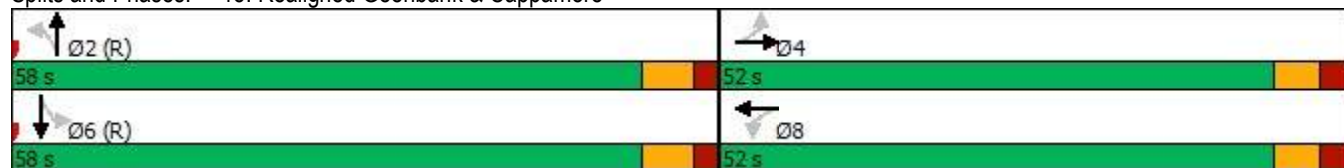
Intersection LOS: B

Intersection Capacity Utilization 49.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 15: Realigned Geenbank & Cappamore



Lanes, Volumes, Timings
16: Barnsdale & Realigned Geenbank

FT 2036-Without Mitigation
PM Peak Hour



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	215	508	422	71	74	172
Future Volume (vph)	215	508	422	71	74	172
Satd. Flow (prot)	1658	1745	1745	1483	1658	1483
Flt Permitted	0.364				0.950	
Satd. Flow (perm)	635	1745	1745	1483	1658	1483
Satd. Flow (RTOR)				71		172
Lane Group Flow (vph)	215	508	422	71	74	172
Turn Type	Perm	NA	NA	Perm	Perm	Perm
Protected Phases		4	8			
Permitted Phases	4			8	6	6
Detector Phase	4	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	5.0	5.0
Minimum Split (s)	32.2	32.2	32.2	32.2	11.5	11.5
Total Split (s)	84.0	84.0	84.0	84.0	26.0	26.0
Total Split (%)	76.4%	76.4%	76.4%	76.4%	23.6%	23.6%
Yellow Time (s)	5.1	5.1	5.1	5.1	4.2	4.2
All-Red Time (s)	2.1	2.1	2.1	2.1	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.2	7.2	7.2	7.2	6.5	6.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	44.1	44.1	44.1	44.1	52.2	52.2
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.47	0.47
v/c Ratio	0.85	0.73	0.60	0.11	0.09	0.22
Control Delay	56.2	33.1	28.6	3.7	20.1	7.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.2	33.1	28.6	3.7	20.1	7.1
LOS	E	C	C	A	C	A
Approach Delay		40.0	25.0		11.0	
Approach LOS		D	C		B	
Queue Length 50th (m)	41.2	90.9	70.5	0.0	10.3	0.0
Queue Length 95th (m)	60.2	97.3	76.7	6.3	18.3	18.0
Internal Link Dist (m)		978.4	366.5		239.7	
Turn Bay Length (m)	83.0			91.0		
Base Capacity (vph)	443	1218	1218	1056	787	794
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	0.49	0.42	0.35	0.07	0.09	0.22

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 54 (49%), Referenced to phase 6:SBL, Start of Green

Natural Cycle: 45

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings 16: Barnsdale & Realigned Geenbank

FT 2036-Without Mitigation
PM Peak Hour

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 30.1

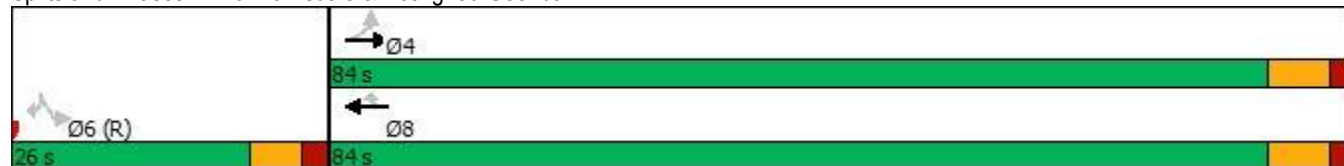
Intersection LOS: C

Intersection Capacity Utilization 57.8%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 16: Barnsdale & Realigned Geenbank



Lanes, Volumes, Timings

FT 2036-Borrisokane (EBL,WBL&SBL)-Trail (All-way stop)

3: Hwy 416/Borrisokane & Barnsdale

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	282	352	32	465	158	125	27	39	21	78	118	82
Future Volume (vph)	282	352	32	465	158	125	27	39	21	78	118	82
Satd. Flow (prot)	1658	1707	0	1658	1621	0	0	1662	0	1658	1605	0
Flt Permitted	0.586			0.348				0.785		0.799		
Satd. Flow (perm)	1023	1707	0	607	1621	0	0	1325	0	1394	1605	0
Satd. Flow (RTOR)		5			52			16			36	
Lane Group Flow (vph)	282	384	0	465	283	0	0	87	0	78	200	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	11.7	25.8		11.7	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	22.0	35.0		29.0	42.0		26.0	26.0		26.0	26.0	
Total Split (%)	24.4%	38.9%		32.2%	46.7%		28.9%	28.9%		28.9%	28.9%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.6	1.7		1.6	1.7		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	
Total Lost Time (s)	6.7	6.8		6.7	6.8			6.2		6.2	6.2	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	41.8	30.3		52.4	35.9			14.0		14.0	14.0	
Actuated g/C Ratio	0.52	0.37		0.65	0.44			0.17		0.17	0.17	
v/c Ratio	0.46	0.60		0.76	0.38			0.36		0.33	0.65	
Control Delay	10.0	27.2		16.1	15.2			29.6		33.7	36.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	10.0	27.2		16.1	15.2			29.6		33.7	36.4	
LOS	B	C		B	B			C		C	D	
Approach Delay		19.9			15.8			29.6			35.6	
Approach LOS		B			B			C			D	
Queue Length 50th (m)	14.7	45.6		28.0	22.1			9.6		10.5	23.4	
Queue Length 95th (m)	30.9	89.3		57.3	48.9			23.0		23.3	45.9	
Internal Link Dist (m)		543.4			978.4			562.8			531.1	
Turn Bay Length (m)	75.0			125.0						40.0		
Base Capacity (vph)	698	640		695	745			337		342	421	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.40	0.60		0.67	0.38			0.26		0.23	0.48	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 81.1

Natural Cycle: 80

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 21.1

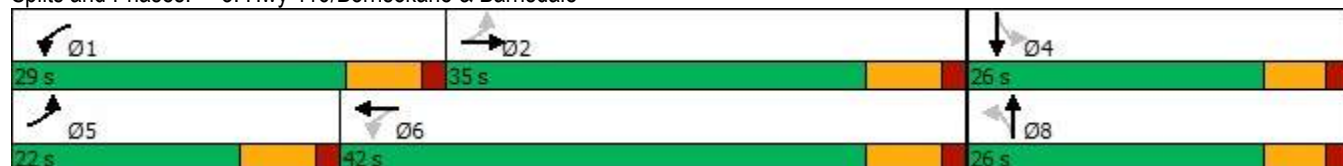
Intersection LOS: C

Intersection Capacity Utilization 90.6%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	78	175	15	12	0	413	5	2	1
Future Volume (vph)	1	248	24	78	175	15	12	0	413	5	2	1
Satd. Flow (prot)	0	1274	0	0	1265	0	0	1129	0	0	1040	0
Flt Permitted					0.986			0.999			0.970	
Satd. Flow (perm)	0	1274	0	0	1265	0	0	1129	0	0	1040	0
Lane Group Flow (vph)	0	273	0	0	268	0	0	425	0	0	8	0
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 68.1%												
ICU Level of Service C												
Analysis Period (min) 15												

Intersection

Intersection Delay, s/veh 18.7

Intersection LOS C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	248	24	78	175	15	12	0	413	5	2	1
Future Vol, veh/h	1	248	24	78	175	15	12	0	413	5	2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	78	175	15	12	0	413	5	2	1
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	13.5	16.3	23.7	11.6
HCM LOS	B	C	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	3%	0%	29%	62%
Vol Thru, %	0%	91%	65%	25%
Vol Right, %	97%	9%	6%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	425	273	268	8
LT Vol	12	1	78	5
Through Vol	0	248	175	2
RT Vol	413	24	15	1
Lane Flow Rate	425	273	268	8
Geometry Grp	1	1	1	1
Degree of Util (X)	0.724	0.443	0.498	0.019
Departure Headway (Hd)	6.136	5.843	6.688	8.44
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	587	614	536	427
Service Time	4.19	3.911	4.757	6.44
HCM Lane V/C Ratio	0.724	0.445	0.5	0.019
HCM Control Delay	23.7	13.5	16.3	11.6
HCM Lane LOS	C	B	C	B
HCM 95th-tile Q	6	2.3	2.7	0.1

Lanes, Volumes, Timings

FT 2036-Borrisokane (EBL,WBL&SBL)-Trail (All-way stop)

3: Hwy 416/Borrisokane & Barnsdale

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	594	17	308	220	108	27	49	31	150	192	145
Future Volume (vph)	180	594	17	308	220	108	27	49	31	150	192	145
Satd. Flow (prot)	1658	1722	0	1658	1649	0	0	1657	0	1658	1598	0
Flt Permitted	0.562			0.189				0.568		0.726		
Satd. Flow (perm)	981	1722	0	330	1649	0	0	953	0	1267	1598	0
Satd. Flow (RTOR)		2			37			21			39	
Lane Group Flow (vph)	180	611	0	308	328	0	0	107	0	150	337	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	11.7	25.8		11.7	25.8		25.2	25.2		25.2	25.2	
Total Split (s)	14.8	43.9		20.1	49.2		26.0	26.0		26.0	26.0	
Total Split (%)	16.4%	48.8%		22.3%	54.7%		28.9%	28.9%		28.9%	28.9%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	
All-Red Time (s)	1.6	1.7		1.6	1.7		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	
Total Lost Time (s)	6.7	6.8		6.7	6.8			6.2		6.2	6.2	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	45.8	37.9		54.9	42.4			18.9		18.9	18.9	
Actuated g/C Ratio	0.52	0.43		0.62	0.48			0.21		0.21	0.21	
v/c Ratio	0.32	0.83		0.79	0.41			0.49		0.56	0.91	
Control Delay	9.2	35.2		27.1	15.4			33.0		40.2	60.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	9.2	35.2		27.1	15.4			33.0		40.2	60.7	
LOS	A	D		C	B			C		D	E	
Approach Delay		29.3			21.0			33.0			54.4	
Approach LOS		C			C			C			D	
Queue Length 50th (m)	11.4	93.5		21.4	31.3			12.8		23.1	50.5	
Queue Length 95th (m)	19.7	#155.0		#58.2	51.6			29.2		42.0	#98.2	
Internal Link Dist (m)		543.4			978.4			562.8			538.5	
Turn Bay Length (m)	75.0			125.0						40.0		
Base Capacity (vph)	569	735		407	806			229		282	386	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.32	0.83		0.76	0.41			0.47		0.53	0.87	
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 88.9												
Natural Cycle: 90												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.91												

Intersection Signal Delay: 32.9

Intersection LOS: C

Intersection Capacity Utilization 99.2%

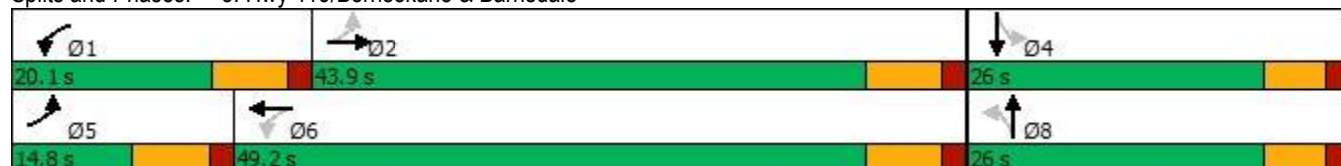
ICU Level of Service F

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	116	271	7	36	0	561	10	1	0
Future Volume (vph)	0	220	18	116	271	7	36	0	561	10	1	0
Satd. Flow (prot)	0	1277	0	0	1291	0	0	1124	0	0	891	0
Flt Permitted					0.985			0.997			0.957	
Satd. Flow (perm)	0	1277	0	0	1291	0	0	1124	0	0	891	0
Lane Group Flow (vph)	0	238	0	0	394	0	0	597	0	0	11	0
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 83.4%												
ICU Level of Service E												
Analysis Period (min) 15												

Intersection

Intersection Delay, s/veh 63.6

Intersection LOS F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	220	18	116	271	7	36	0	561	10	1	0
Future Vol, veh/h	0	220	18	116	271	7	36	0	561	10	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	116	271	7	36	0	561	10	1	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	18.1	35	101.6	13.4
HCM LOS	C	D	F	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	6%	0%	29%	91%
Vol Thru, %	0%	92%	69%	9%
Vol Right, %	94%	8%	2%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	597	238	394	11
LT Vol	36	0	116	10
Through Vol	0	220	271	1
RT Vol	561	18	7	0
Lane Flow Rate	597	238	394	11
Geometry Grp	1	1	1	1
Degree of Util (X)	1.121	0.488	0.8	0.029
Departure Headway (Hd)	6.758	7.828	7.722	10.09
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	537	464	473	357
Service Time	4.807	5.828	5.722	8.09
HCM Lane V/C Ratio	1.112	0.513	0.833	0.031
HCM Control Delay	101.6	18.1	35	13.4
HCM Lane LOS	F	C	D	B
HCM 95th-tile Q	19.4	2.6	7.4	0.1

Lanes, Volumes, Timing 3882-Borrisokane (EBL,WBL,SBL&SBR)-Trail (All-way stop-WBL&NBR)
 8: William McEwen/Trail & Barnsdale AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	78	175	15	12	0	413	5	2	1
Future Volume (vph)	1	248	24	78	175	15	12	0	413	5	2	1
Satd. Flow (prot)	0	1274	0	1127	1326	0	0	1013	1113	0	1040	0
Flt Permitted				0.950				0.950			0.970	
Satd. Flow (perm)	0	1274	0	1127	1326	0	0	1013	1113	0	1040	0
Lane Group Flow (vph)	0	273	0	78	190	0	0	12	413	0	8	0
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 55.7%												
ICU Level of Service B												
Analysis Period (min) 15												

HCM 2010 AWSC FT 2036-Borrisokane (EBL,WBL,SBL&SBR)-Trail (All-way stop-WBL&NBR)
 8: William McEwen/Trail & Barnsdale AM Peak Hour

Intersection	
Intersection Delay, s/veh	19.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	248	24	78	175	15	12	0	413	5	2	1
Future Vol, veh/h	1	248	24	78	175	15	12	0	413	5	2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	1	248	24	78	175	15	12	0	413	5	2	1
Number of Lanes	0	1	0	1	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	1
HCM Control Delay	15.8	13.3	26.3	12.4
HCM LOS	C	B	D	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	100%	0%	0%	100%	0%	62%
Vol Thru, %	0%	0%	91%	0%	92%	25%
Vol Right, %	0%	100%	9%	0%	8%	12%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	12	413	273	78	190	8
LT Vol	12	0	1	78	0	5
Through Vol	0	0	248	0	175	2
RT Vol	0	413	24	0	15	1
Lane Flow Rate	12	413	273	78	190	8
Geometry Grp	5	5	4b	5	5	4b
Degree of Util (X)	0.026	0.752	0.493	0.171	0.366	0.02
Departure Headway (Hd)	7.893	6.555	6.501	7.875	6.929	9.177
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	453	549	551	454	517	392
Service Time	5.649	4.311	4.567	5.647	4.7	7.177
HCM Lane V/C Ratio	0.026	0.752	0.495	0.172	0.368	0.02
HCM Control Delay	10.9	26.7	15.8	12.3	13.7	12.4
HCM Lane LOS	B	D	C	B	B	B
HCM 95th-tile Q	0.1	6.6	2.7	0.6	1.7	0.1

Lanes, Volumes, Timing 3882-Borrisokane (EBL,WBL,SBL&SBR)-Trail (All-way stop-WBL&NBR)
 8: William McEwen/Trail & Barnsdale PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	116	271	7	36	0	561	10	1	0
Future Volume (vph)	0	220	18	116	271	7	36	0	561	10	1	0
Satd. Flow (prot)	0	1277	0	1127	1369	0	0	1013	1113	0	891	0
Flt Permitted				0.950				0.950			0.957	
Satd. Flow (perm)	0	1277	0	1127	1369	0	0	1013	1113	0	891	0
Lane Group Flow (vph)	0	238	0	116	278	0	0	36	561	0	11	0
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Control Type: Unsignalized												
Intersection Capacity Utilization 63.4% ICU Level of Service B												
Analysis Period (min) 15												

HCM 2010 AWSC FT 2036-Borrisokane (EBL,WBL,SBL&SBR)-Trail (All-way stop-WBL&NBR)
 8: William McEwen/Trail & Barnsdale PM Peak Hour

Intersection	
Intersection Delay, s/veh	53
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	220	18	116	271	7	36	0	561	10	1	0
Future Vol, veh/h	0	220	18	116	271	7	36	0	561	10	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	37	50	50	28	86	67	60	36	100	2	2
Mvmt Flow	0	220	18	116	271	7	36	0	561	10	1	0
Number of Lanes	0	1	0	1	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	1
HCM Control Delay	19.8	19.2	89.3	13.8
HCM LOS	C	C	F	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	100%	0%	0%	100%	0%	91%
Vol Thru, %	0%	0%	92%	0%	97%	9%
Vol Right, %	0%	100%	8%	0%	3%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	36	561	238	116	278	11
LT Vol	36	0	0	116	0	10
Through Vol	0	0	220	0	271	1
RT Vol	0	561	18	0	7	0
Lane Flow Rate	36	561	238	116	278	11
Geometry Grp	5	5	4b	5	5	4b
Degree of Util (X)	0.084	1.096	0.519	0.272	0.582	0.031
Departure Headway (Hd)	8.379	7.036	8.233	8.805	7.891	10.487
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	428	516	440	411	461	343
Service Time	6.12	4.776	6.233	6.505	5.591	8.487
HCM Lane V/C Ratio	0.084	1.087	0.541	0.282	0.603	0.032
HCM Control Delay	11.9	94.3	19.8	14.8	21	13.8
HCM Lane LOS	B	F	C	B	C	B
HCM 95th-tile Q	0.3	17.8	2.9	1.1	3.6	0.1

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FT 2036-Trail (Signalized-WBL&NBR)

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	282	352	32	465	158	125	27	39	21	78	118	82
Future Volume (vph)	282	352	32	465	158	125	27	39	21	78	118	82
Satd. Flow (prot)	1658	1707	0	1658	1621	0	0	1662	0	1658	1745	1455
Flt Permitted	0.586			0.371				0.852		0.773		
Satd. Flow (perm)	1023	1707	0	647	1621	0	0	1438	0	1349	1745	1413
Satd. Flow (RTOR)		5			52			16				208
Lane Group Flow (vph)	282	384	0	465	283	0	0	87	0	78	118	82
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		4
Detector Phase	5	2		1	6		8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.7	25.8		11.7	25.8		25.2	25.2		25.2	25.2	25.2
Total Split (s)	22.0	35.0		29.0	42.0		26.0	26.0		26.0	26.0	26.0
Total Split (%)	24.4%	38.9%		32.2%	46.7%		28.9%	28.9%		28.9%	28.9%	28.9%
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	4.2
All-Red Time (s)	1.6	1.7		1.6	1.7		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
Total Lost Time (s)	6.7	6.8		6.7	6.8			6.2		6.2	6.2	6.2
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	None
Act Effct Green (s)	49.6	38.6		64.3	47.3			12.1		12.1	12.1	12.1
Actuated g/C Ratio	0.55	0.43		0.71	0.53			0.13		0.13	0.13	0.13
v/c Ratio	0.44	0.52		0.68	0.32			0.42		0.43	0.50	0.22
Control Delay	7.6	18.9		10.8	12.1			35.2		42.9	43.5	1.4
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Delay	7.6	18.9		10.8	12.1			35.2		42.9	43.5	1.4
LOS	A	B		B	B			D		D	D	A
Approach Delay		14.1			11.3			35.2			30.9	
Approach LOS		B			B			D			C	
Queue Length 50th (m)	7.8	29.1		25.0	20.2			11.5		12.7	19.4	0.0
Queue Length 95th (m)	22.8	92.5		47.4	44.6			24.2		24.9	34.0	0.0
Internal Link Dist (m)		543.4			978.4			562.8			531.1	
Turn Bay Length (m)	75.0			125.0						40.0		15.0
Base Capacity (vph)	721	735		729	877			328		296	383	473
Starvation Cap Reductn	0	0		0	0			0		0	0	0
Spillback Cap Reductn	0	0		0	0			0		0	0	0
Storage Cap Reductn	0	0		0	0			0		0	0	0
Reduced v/c Ratio	0.39	0.52		0.64	0.32			0.27		0.26	0.31	0.17

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection

Natural Cycle: 80

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FT 2036-Trail (Signalized-WBL&NBR)

AM Peak Hour

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 16.6

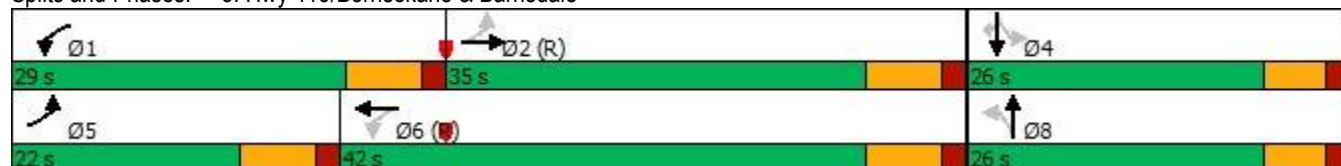
Intersection LOS: B

Intersection Capacity Utilization 77.0%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FT 2036-Trail (Signalized-WBL&NBR)

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	248	24	78	175	15	12	0	413	5	2	1
Future Volume (vph)	1	248	24	78	175	15	12	0	413	5	2	1
Satd. Flow (prot)	0	1272	0	1127	1326	0	0	1013	1113	0	1040	0
Flt Permitted		0.999		0.550				0.752			0.932	
Satd. Flow (perm)	0	1271	0	653	1326	0	0	802	1113	0	999	0
Satd. Flow (RTOR)		7			6				413		1	
Lane Group Flow (vph)	0	273	0	78	190	0	0	12	413	0	8	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8				4
Permitted Phases	2			6			8		8	4		
Detector Phase	2	2		6	6		8	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)	31.3	31.3		31.3	31.3		24.6	24.6	24.6	24.6	24.6	
Total Split (s)	43.0	43.0		43.0	43.0		47.0	47.0	47.0	47.0	47.0	
Total Split (%)	47.8%	47.8%		47.8%	47.8%		52.2%	52.2%	52.2%	52.2%	52.2%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2	4.2	4.2	4.2	
All-Red Time (s)	1.2	1.2		1.2	1.2		1.4	1.4	1.4	1.4	1.4	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		6.3		6.3	6.3			5.6	5.6		5.6	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		Max	Max	Max	None	None	
Act Effct Green (s)		36.7		36.7	36.7			41.4	41.4		41.4	
Actuated g/C Ratio		0.41		0.41	0.41			0.46	0.46		0.46	
v/c Ratio		0.52		0.29	0.35			0.03	0.56		0.02	
Control Delay		24.0		22.1	20.8			13.8	4.9		12.8	
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay		24.0		22.1	20.8			13.8	4.9		12.8	
LOS		C		C	C			B	A		B	
Approach Delay		24.0			21.1			5.2			12.8	
Approach LOS		C			C			A			B	
Queue Length 50th (m)		33.8		9.9	24.4			1.1	0.0		0.6	
Queue Length 95th (m)		57.3		22.6	42.8			4.1	16.5		3.0	
Internal Link Dist (m)		615.4			543.4			486.4			581.6	
Turn Bay Length (m)				30.0								
Base Capacity (vph)		522		266	544			368	735		460	
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		0.52		0.29	0.35			0.03	0.56		0.02	
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 90												
Offset: 55 (61%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green												
Natural Cycle: 60												
Control Type: Actuated-Coordinated												

Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FT 2036-Trail (Signalized-WBL&NBR)

AM Peak Hour

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 14.9

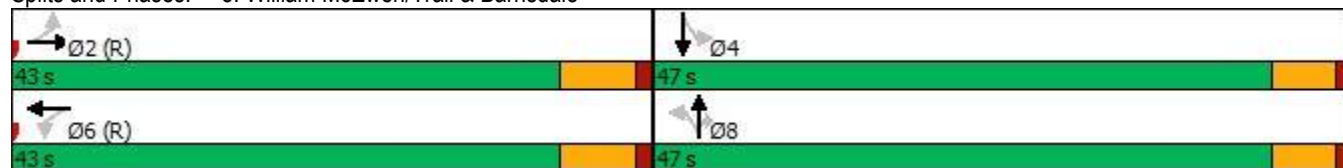
Intersection LOS: B

Intersection Capacity Utilization 65.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: William McEwen/Trail & Barnsdale



Lanes, Volumes, Timings
3: Hwy 416/Borrisokane & Barnsdale

FT 2036-Trail (Signalized-WBL&NBR)

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	594	17	308	220	108	27	49	31	150	192	145
Future Volume (vph)	180	594	17	308	220	108	27	49	31	150	192	145
Satd. Flow (prot)	1658	1722	0	1658	1649	0	0	1657	0	1658	1745	1455
Flt Permitted	0.562			0.209				0.815		0.715		
Satd. Flow (perm)	981	1722	0	365	1649	0	0	1367	0	1248	1745	1413
Satd. Flow (RTOR)		2			37			21				208
Lane Group Flow (vph)	180	611	0	308	328	0	0	107	0	150	192	145
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		4
Detector Phase	5	2		1	6		8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.7	25.8		11.7	25.8		25.2	25.2		25.2	25.2	25.2
Total Split (s)	15.0	42.0		22.0	49.0		26.0	26.0		26.0	26.0	26.0
Total Split (%)	16.7%	46.7%		24.4%	54.4%		28.9%	28.9%		28.9%	28.9%	28.9%
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2		4.2	4.2	4.2
All-Red Time (s)	1.6	1.7		1.6	1.7		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
Total Lost Time (s)	6.7	6.8		6.7	6.8			6.2		6.2	6.2	6.2
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	None
Act Effct Green (s)	49.2	40.9		60.5	46.6			15.5		15.5	15.5	15.5
Actuated g/C Ratio	0.55	0.45		0.67	0.52			0.17		0.17	0.17	0.17
v/c Ratio	0.30	0.78		0.69	0.38			0.42		0.70	0.64	0.35
Control Delay	7.0	31.2		16.7	13.9			30.8		51.9	44.1	3.7
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	0.0
Total Delay	7.0	31.2		16.7	13.9			30.8		51.9	44.1	3.7
LOS	A	C		B	B			C		D	D	A
Approach Delay		25.7			15.3			30.8			34.5	
Approach LOS		C			B			C			C	
Queue Length 50th (m)	9.0	100.1		18.2	29.0			13.2		24.5	31.0	0.0
Queue Length 95th (m)	m16.4	#161.6		43.3	51.9			27.0		42.1	49.5	4.9
Internal Link Dist (m)		543.4			978.4			562.8			538.5	
Turn Bay Length (m)	75.0			125.0						40.0		15.0
Base Capacity (vph)	606	784		474	872			317		274	383	473
Starvation Cap Reductn	0	0		0	0			0		0	0	0
Spillback Cap Reductn	0	0		0	0			0		0	0	0
Storage Cap Reductn	0	0		0	0			0		0	0	0
Reduced v/c Ratio	0.30	0.78		0.65	0.38			0.34		0.55	0.50	0.31

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection

Natural Cycle: 90

Control Type: Actuated-Coordinated

Lanes, Volumes, Timings 3: Hwy 416/Borrisokane & Barnsdale

FT 2036-Trail (Signalized-WBL&NBR)

PM Peak Hour

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 24.8

Intersection LOS: C

Intersection Capacity Utilization 92.7%

ICU Level of Service F

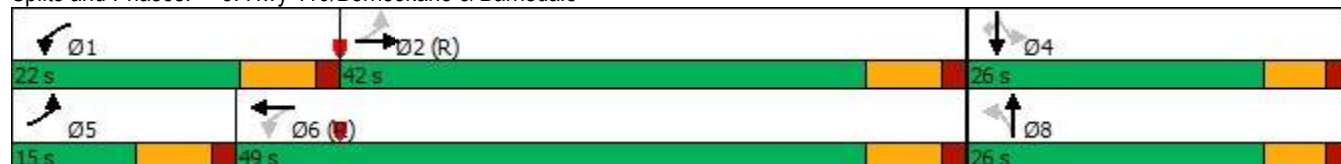
Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 3: Hwy 416/Borrisokane & Barnsdale



Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FT 2036-Trail (Signalized-WBL&NBR)

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	220	18	116	271	7	36	0	561	10	1	0
Future Volume (vph)	0	220	18	116	271	7	36	0	561	10	1	0
Satd. Flow (prot)	0	1275	0	1127	1369	0	0	1013	1113	0	891	0
Flt Permitted				0.561				0.750			0.881	
Satd. Flow (perm)	0	1275	0	666	1369	0	0	799	1113	0	821	0
Satd. Flow (RTOR)		5			2				488			
Lane Group Flow (vph)	0	238	0	116	278	0	0	36	561	0	11	0
Turn Type		NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8		8	4		
Detector Phase	2	2		6	6		8	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)	31.3	31.3		31.3	31.3		24.6	24.6	24.6	24.6	24.6	
Total Split (s)	38.0	38.0		38.0	38.0		52.0	52.0	52.0	52.0	52.0	
Total Split (%)	42.2%	42.2%		42.2%	42.2%		57.8%	57.8%	57.8%	57.8%	57.8%	
Yellow Time (s)	5.1	5.1		5.1	5.1		4.2	4.2	4.2	4.2	4.2	
All-Red Time (s)	1.2	1.2		1.2	1.2		1.4	1.4	1.4	1.4	1.4	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		6.3		6.3	6.3			5.6	5.6		5.6	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max		C-Max	C-Max		Max	Max	Max	Max	Max	
Act Effct Green (s)		31.7		31.7	31.7			46.4	46.4		46.4	
Actuated g/C Ratio		0.35		0.35	0.35			0.52	0.52		0.52	
v/c Ratio		0.53		0.50	0.58			0.09	0.69		0.03	
Control Delay		27.8		25.5	23.3			11.9	7.6		11.1	
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay		27.8		25.5	23.3			11.9	7.6		11.1	
LOS		C		C	C			B	A		B	
Approach Delay		27.8			23.9			7.9			11.1	
Approach LOS		C			C			A			B	
Queue Length 50th (m)		31.6		11.1	31.9			3.0	6.2		0.9	
Queue Length 95th (m)		54.4		28.0	51.0			7.9	36.9		3.4	
Internal Link Dist (m)		615.4			543.4			486.4			581.6	
Turn Bay Length (m)				30.0					40.0			
Base Capacity (vph)		452		234	483			411	810		423	
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		0.53		0.50	0.58			0.09	0.69		0.03	
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 90												
Offset: 31 (34%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green												
Natural Cycle: 60												
Control Type: Actuated-Coordinated												

Lanes, Volumes, Timings
8: William McEwen/Trail & Barnsdale

FT 2036-Trail (Signalized-WBL&NBR)

PM Peak Hour

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 16.8

Intersection LOS: B

Intersection Capacity Utilization 73.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: William McEwen/Trail & Barnsdale

