

DILLON
CONSULTING

FIRST GULF

**Proposed Warehouse Development,
545 Dunlop Street West,
City of Barrie**

Transportation Impact Study



January 27, 2023

First Gulf
351 King Street East, 13th Floor
Toronto, ON M5A 0L6

Attention: Luis Chavez
Manager, Pre-Construction

**545 Dunlop Street West, Barrie, ON
Transportation Impact Study**

Dear Luis Chavez:

Please find enclosed a copy of our transportation impact study prepared for the proposed warehouse development located at 545 Dunlop Street West in the city of Barrie.

Should you have any questions or wish to discuss our findings, please contact me at (416) 229-4647, extension 2376, or at mwalters@dillon.ca.

Yours sincerely,

DILLON CONSULTING LIMITED

Mike Walters, P.Eng.
Project Manager

Our File: 22-5012

235 Yorkland Blvd.
Suite 800
Toronto, Ontario
Canada
M2J 4Y8
Telephone
(416) 229-4646
Fax
(416) 229-4692

Dillon Consulting
Limited

Table of Contents

1.0	Introduction	1
1.1	Purpose.....	1
1.2	Proposed Development.....	2
1.3	Scope of Analysis.....	3
2.0	Existing Conditions	4
2.1	Existing Road Network.....	4
2.1	Existing Active Transportation Facilities	5
2.2	Existing Transit Service	5
2.3	Existing Traffic Volumes	7
2.4	Existing Pedestrian Activity.....	8
2.5	Existing Cycling Activity	8
2.6	Existing Modal Split	9
3.0	Future Background Conditions	10
3.1	Transportation Network Modifications	10
3.2	Background Traffic Growth	10
3.2.1	Background Development Traffic	11
3.2.2	General Background Growth	12
3.3	Future Background Traffic Volumes.....	13
4.0	Total Future Traffic Volumes	15
4.1	Proposed Development.....	15
4.2	Site Trip Generation.....	15
4.3	Site Traffic Distribution	16
4.4	Site Traffic Assignment	16
4.5	Total Future Traffic Volumes	17
5.0	Intersection Operations	20
5.1	Dunlop Street West at Miller Drive / Tiffin Street	21
5.2	Dunlop Street at West Driveway	23
5.3	Dunlop Street at East Driveway	24

5.4	Dunlop Street at Ferndale Drive	25
5.4.1	Signal Timing Mitigation	27
6.0	Site Plan Review	29
6.1	Driveway Location and Configuration	29
6.2	Truck Turning Path Requirements	31
6.3	Transportation Demand Management Measures	31
6.4	Internal Pavement Markings and Traffic Control	31
6.5	Parking Requirements	32
6.5.1	Proposed Parking Supply	32
6.5.2	Zoning By-Law Requirements	32
7.0	Summary	33

Figures

Figure 1:	Site Location	1
Figure 2:	Site Context	2
Figure 3:	Existing Intersection Geometry and Traffic Control	5
Figure 4:	Barrie Transit Service	6
Figure 5:	Existing Traffic Volumes	8
Figure 6:	642 Dunlop Street West Traffic	12
Figure 7:	20 Ferndale Drive Traffic	12
Figure 8:	2024 Future Background Traffic Volumes	13
Figure 9:	2029 Future Background Traffic Volumes	14
Figure 10:	2034 Future Background Traffic Volumes	14
Figure 11:	Site Traffic Volumes	17
Figure 12:	2024 Total Future Traffic Volumes	18
Figure 13:	2029 Total Future Traffic Volumes	18
Figure 14:	2034 Total Future Traffic Volumes	19
Figure 15:	Left Turn Lane Warrant Nomographs	30

Tables

Table 1:	Route 2 Service Schedule	6
Table 2:	Traffic Survey Dates	7
Table 3:	Existing Pedestrian Activity (Commuting Peak Hours)	8
Table 4:	Existing Bicycle Volumes (Commuting Peak Hours)	8
Table 5:	Existing Modal Split	9
Table 6:	20 Ferndale Drive Trip Generation	11
Table 7:	Site Trip Generation	16
Table 8:	Site Trip Distribution	16
Table 9:	Intersection Operations, Dunlop Street West and Miller Drive / Tiffin Street	21
Table 10:	Total Future Intersection Operations, Dunlop Street at West Driveway	23
Table 11:	Total Future Intersection Operations, Dunlop Street (Widened) at West Driveway	24
Table 12:	Total Future Intersection Operations, Dunlop Street at East Driveway	24
Table 13:	Total Future Intersection Operations, Dunlop Street (Widened) at East Driveway	25
Table 14:	Intersection Operations, Dunlop Street and Ferndale Drive	25
Table 15:	Intersection Operations, Dunlop Street and Ferndale Drive – Mitigated Scenario	28

Appendices

A	Proposed Site Plan
B	Traffic Survey Data
C	Background Traffic Growth Data
D	Traffic Signal Timings
E	Level of Service Definitions
F	Synchro Analysis Worksheets
G	Truck Turning Path Diagrams
H	On-Site Traffic Signage and Pavement Marking Plan

1.0

Introduction

1.1

Purpose

Dillon Consulting Limited (Dillon) has been retained by First Gulf to prepare a transportation impact study (TIS) for a development application at 545 Dunlop Street West in the city of Barrie. The application seeks to permit the construction of a multi-unit warehouse building with a total gross floor area (GFA) of 32,301 m² (347,680 sq. ft.), predominantly comprised of warehouse space with ancillary office space.

Figure 1 shows the location of the site, and **Figure 2** presents the existing configuration of the site and surrounding context.

Figure 1: Site Location

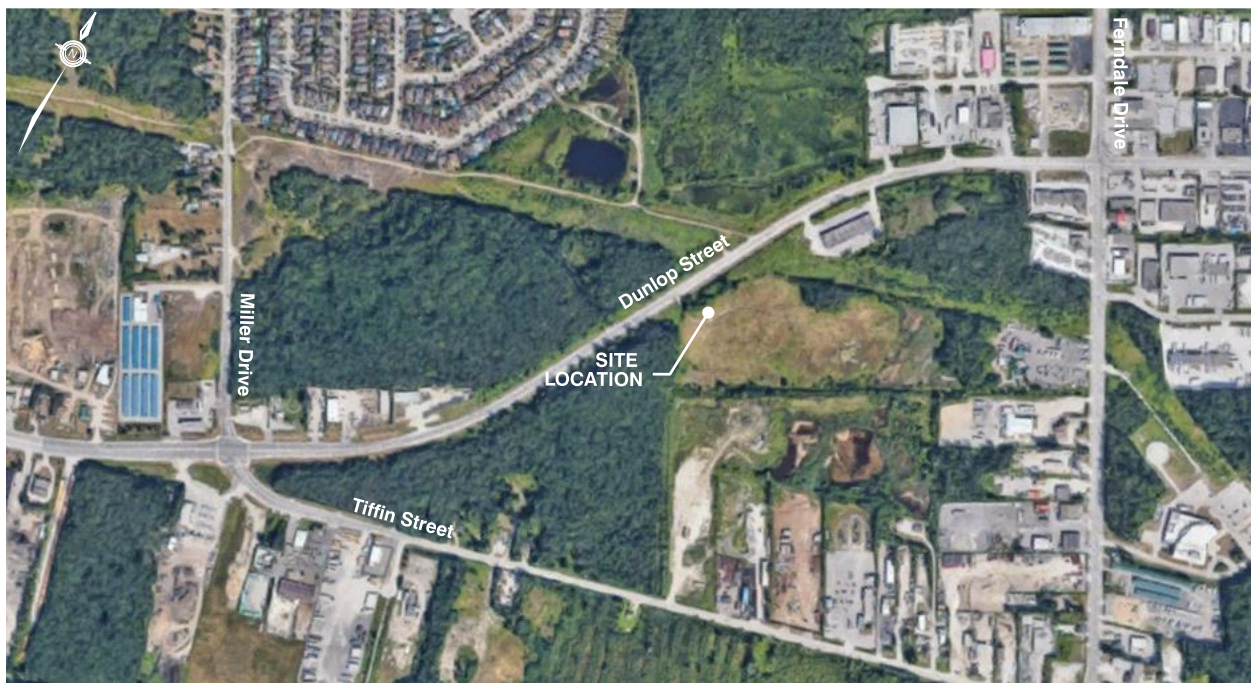


Figure 2: Site Context



1.2

Proposed Development

The site is located on the south side of Dunlop Street, midblock between Miller Drive / Tiffin Street and Ferndale Drive. The subject lands are currently undeveloped.

The application seeks to construct an industrial warehouse which will include some office space. The total building GFA will be 32,301 m² (347,680 sq. ft.), divided into 1,353 m² (14,560 sq. ft.) of office space and 30,948 m² (333,120 sq. ft.) of warehouse space.

Two driveways from Dunlop Street are proposed, referred to throughout the report as the west driveway and the east driveway. The main parking areas will be located along the north side of the building, predominantly located closer to the east driveway. The west driveway will be used predominantly for access to/from the loading area at the rear of the warehouse.

A parking supply of 158 spaces is proposed.

The proposed site plan is provided in **Appendix A**.

1.3

Scope of Analysis

Based on discussions with staff at the City of Barrie, the study area consists of the following intersections:

- Dunlop Street West and Miller Drive / Tiffin Street;
- Dunlop Street West and Ferndale Drive North; and
- Dunlop Street West and the proposed site driveways.

Analyses have been prepared for the weekday AM and PM peak hours.

Three horizon years have been assessed:

- 2024, corresponding to the anticipated site build-out year;
- 2029, corresponding to five years after the site build-out year; and
- 2034, corresponding to ten years after the site build-out year.

2.0

Existing Conditions

2.1

Existing Road Network

The following describes the roadways within the study area. Unless noted, all roads are under the jurisdiction of the City of Barrie.

Dunlop Street is an east-west arterial road that begins in downtown Barrie, extends west across Highway 400 and continues west of Barrie as Simcoe Road 90. (The section east of Miller Avenue is under the jurisdiction of the City of Barrie; the section west of Miller Avenue is under the jurisdiction of Simcoe County.) Dunlop Street has a full interchange at Highway 400, located approximately 1.5 km east of the proposed development site. Adjacent to the development, Dunlop Street has a rural two-lane cross-section with gravel shoulders and with no active transportation facilities. East of the site, Dunlop Street widens to a five-lane urban cross-section with sidewalks on both sides of the road and with a two-way left turn lane facilitating access to numerous commercial driveways. The posted speed limit is 60 km/h throughout the study area.

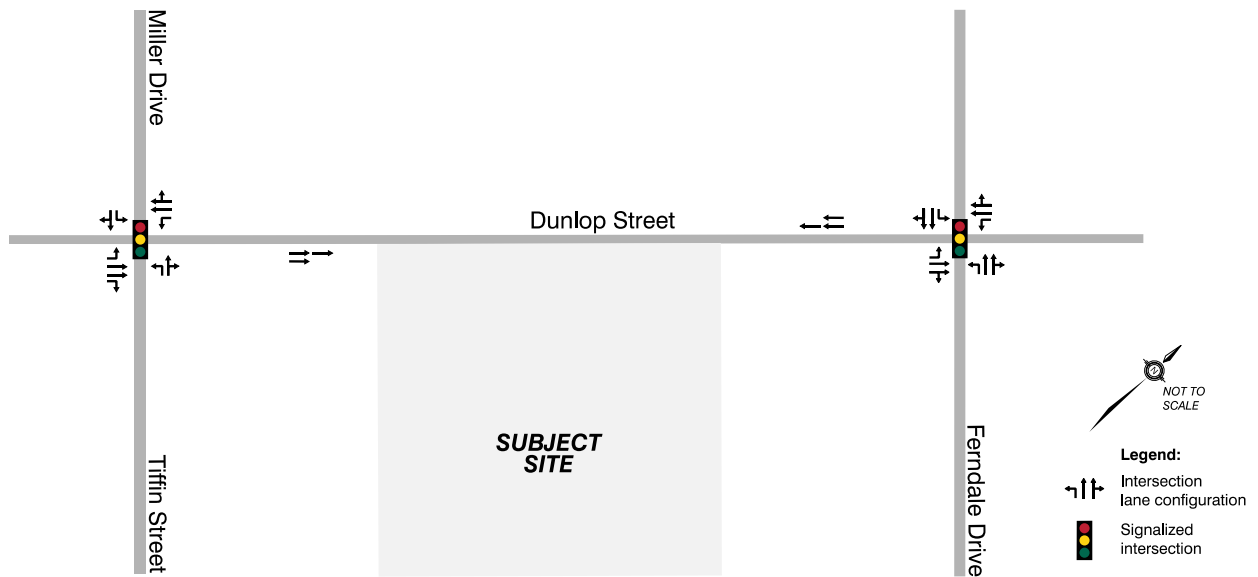
Miller Drive is a north-south, two-lane minor collector roadway, extending 1.3 km north from Dunlop Street adjacent to a residential subdivision and then continuing as a dead-end local road. Within the study area Miller Drive has a rural cross-section with gravel shoulders and no active transportation infrastructure, although a section north of the study area has an urban cross-section with a sidewalk on the east side of the road. Miller Drive has a posted speed limit of 50 km/h.

Tiffin Street is an east-west two-lane arterial road with a rural cross-section, no sidewalks and a mixture of asphalt and gravel shoulders within the study area. Tiffin Street begins as the south leg of the Dunlop Street and Miller Drive intersection, and extends easterly through predominantly undeveloped and industrial lands to the south waterfront area. It has a grade separation but no interchange at Highway 400. It has a posted speed limit of 60km/h within the study area.

Ferndale Drive is a north-south arterial that crosses the west side of the city, then continues farther to the north and south as Simcoe Road 53. Within the study area, it has a four-lane urban cross-section with sidewalks on both sides of the road. On-street bicycle lanes exist south of Dunlop Street. It has a posted speed limit of 50 km/h.

Figure 3 illustrates the existing traffic control and lane configuration at the primary intersections within the study area.

Figure 3: Existing Intersection Geometry and Traffic Control



2.1 Existing Active Transportation Facilities

The following active transportation facilities currently exist in the study area:

- **Dunlop Street**
 - There are no active transportation facilities in the vicinity of the site.
 - East of Ferndale Drive, there are sidewalks on both sides of the road.
 - West of the site, there are paved shoulders that would accommodate cycling, beginning 250 metres east of Miller Drive and continuing westerly beyond the study area.
- **Miller Drive**
 - There are no active transportation facilities within the study area.
 - There is a 450-metre section of sidewalk on the east side of the road, beginning approximately 500 metres north of Dunlop Street.
- **Tiffin Street**
 - No active transportation facilities are present.
- **Ferndale Drive**
 - There are sidewalks on both sides of the road. There are bicycle lanes south of the study area, beginning/ending approximately 125 metres south of Dunlop Street.

2.2 Existing Transit Service

Transit service in the study area is operated by Barrie Transit. The service described below relates to schedules and routes operating as of September 2022.

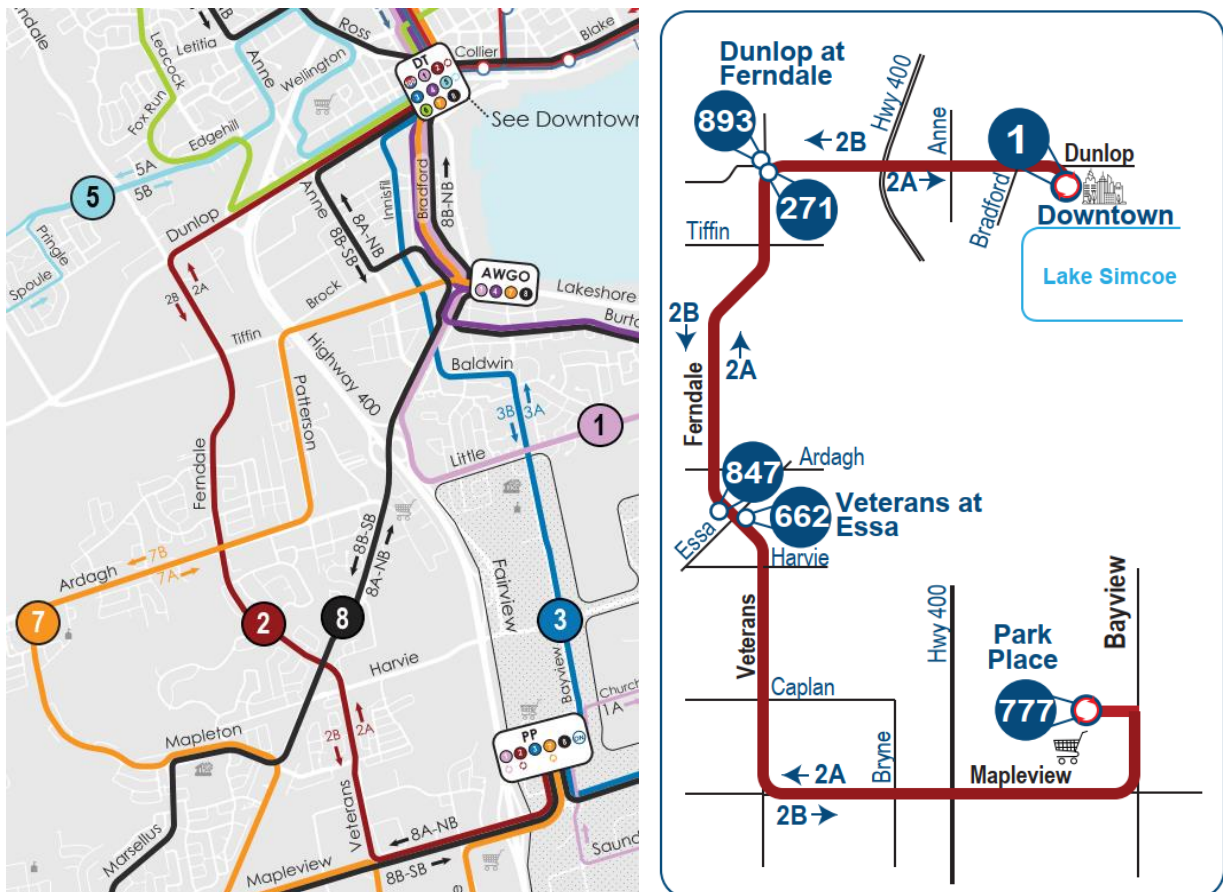
Route 2 is a local route that runs mainly north-south between Park Place and downtown Barrie. This route operates east of the proposed development site along Ferndale Drive and Dunlop Street. The closest stop to the site is at the intersection of Dunlop Street and Ferndale Drive. Route 2 operates on weekdays, Saturdays and Sundays according to the route schedule and frequencies shown in **Table 1**.

Table 1: Route 2 Service Schedule

	Weekday Schedule	Saturday Schedule	Sunday Schedule
Route 2A (northbound)	6:15 AM to 11:12 PM	7:15 AM to 11:12 PM	9:45 AM to 10:12 PM
Route 2B (southbound)	6:15 AM to 10:42 PM	7:15 AM to 10:42 PM	9:15 AM to 9:42 PM
Headways	30 minutes	30 minutes	60 minutes

No transit routes operate on Dunlop Street adjacent to the development site. **Figure 4** illustrates Route 2 within the context of Barrie Transit's system map.

Figure 4: Barrie Transit Service



2.3

Existing Traffic Volumes

Traffic counts at the study area intersections were obtained from the City of Barrie. The traffic counts date from 2019 and therefore predate the COVID-19 pandemic. **Table 2** lists the survey dates at each intersection, as well as the source of the counts. The detailed count data are provided in **Appendix B**.

Table 2: Traffic Survey Dates

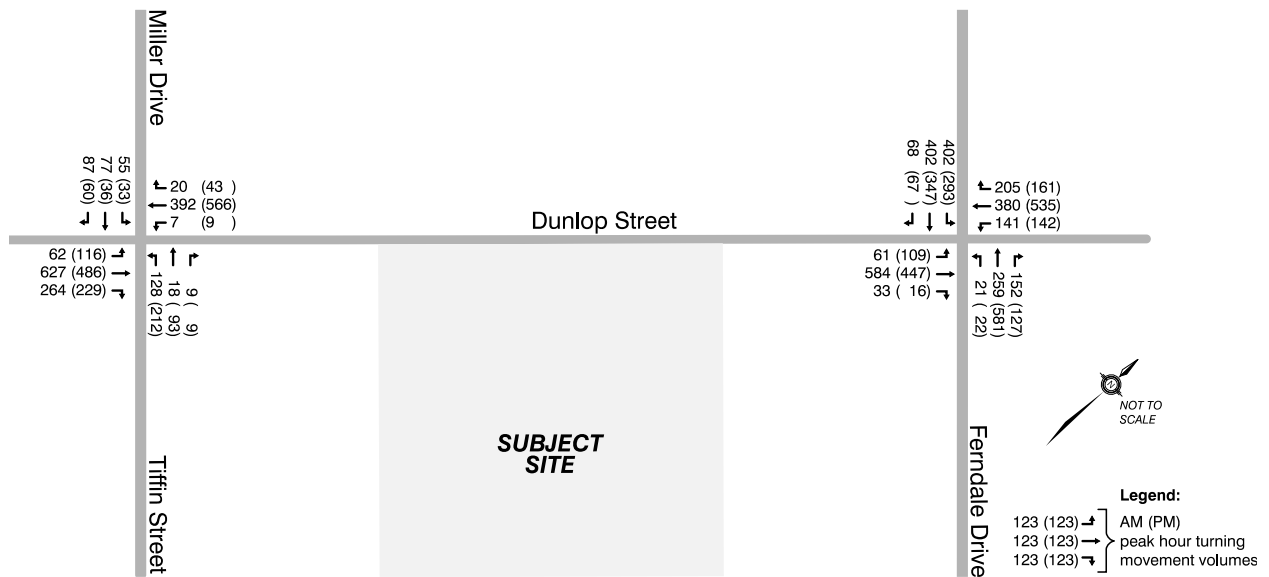
Location	Date	Source
Dunlop Street and Miller Drive / Tiffin Street	Thursday April 11, 2019	City of Barrie
Dunlop Street and Ferndale Drive	Thursday April 11, 2019	City of Barrie

The 2019 survey data were adjusted to reflect 2022 conditions by applying an annual growth rate. As outlined in **Section 3.2.2**, EMM model output from the 2019 Transportation Master Plan were used to derive future background growth rates of 4% per year on Dunlop Street and 1% per year on Ferndale Drive, Miller Drive and Tiffin Street. The 4% annual growth rate on Dunlop Street is likely overly conservative when considering the limited amount of development that has occurred in the surrounding area since 2019, and the site's location on the outskirts of the urban area. Instead, 2022 volumes were estimated by applying the 1% annual growth rate throughout the study area.

The eastbound and westbound traffic volumes at the site driveway intersections were calculated by balancing with the intersection of Miller Drive / Tiffin Street, since there are few intermediate driveways or intersections on Dunlop Street between Miller Drive / Tiffin Street and the subject site that would affect midblock demand.

Figure 5 illustrates the existing peak hour traffic volumes after accounting for the adjustments outlined above.

Figure 5: Existing Traffic Volumes



2.4 Existing Pedestrian Activity

Pedestrian volumes were recorded as part of the traffic surveys referenced in **Section 2.3**. **Table 3** documents the number of pedestrian crossings at each intersection during the AM and PM peak hours. Pedestrian activity was generally observed to be minimal to negligible at both intersections.

Table 3: Existing Pedestrian Activity (Commuting Peak Hours)

Intersection	AM peak hour					PM peak hour				
	North leg	South leg	West leg	East leg	Total	North leg	South leg	West leg	East leg	Total
Dunlop Street and Miller Drive / Tiffin Street.	0	0	0	0	0	0	0	0	1	1
Dunlop Street and Ferndale Drive	0	1	2	0	3	0	3	1	5	9

2.5 Existing Cycling Activity

Cyclists were counted as part of the intersection turning movement counts undertaken by the City of Barrie. **Table 4** documents the number of cyclists entering those intersection from each direction during the AM and PM peak hours. The level of cycling activity in the study area is generally negligible.

Table 4: Existing Bicycle Volumes (Commuting Peak Hours)

Intersection	AM peak hour					PM peak hour				
	SB	NB	EB	WB	Total	SB	NB	EB	WB	Total
Dunlop Street and Miller Drive / Tiffin Street.	0	0	0	0	0	0	0	1	0	1
Dunlop Street and Ferndale Drive	0	0	0	0	0	0	0	2	0	2

First Gulf

Proposed Warehouse Development, 545 Dunlop Street West, City of Barrie —
Transportation Impact Study
January 2023 — 22-5012

2.6

Existing Modal Split

The existing modal split for employment trips in the surrounding area was determined from data in the 2016 Transportation Tomorrow Survey (TTS) database. The modal split was calculated for AM and PM peak period trips destined to/from the employment lands along the Highway 400 corridor within Barrie, where the trip purpose of the origin or destination was work.

Table 5 presents the modal split for the peak commuting direction. Approximately 97% of trips are auto-oriented (either as driver or passenger). Very few trips were reported as being made by walking or cycling.

Table 5: Existing Modal Split

Travel mode	AM inbound	PM outbound
Auto driver	92%	90%
Auto passenger	5%	7%
Motorcycle	1%	0%
Local transit	2%	1%
Walk	0%	1%
Cycle	0%	1%

3.0

Future Background Conditions

This section establishes the transportation network and traffic volumes under future background conditions (i.e., without the proposed development in place).

Three horizon years have been assessed:

- 2024, corresponding to the anticipated site build-out year;
- 2029, corresponding to five years after the site build-out year; and
- 2034, corresponding to ten years after the site build-out year.

3.1

Transportation Network Modifications

The following transportation network modifications were identified in or near the study area through a review of the City's 2019 Transportation Master Plan and discussions with City of Barrie staff.

- Dunlop Street is scheduled to be widened to a five-lane cross-section between Miller Drive and Ferndale Drive, and will include a two-way left turn lane. Sidewalks will also be constructed on both sides of the road. This work is anticipated to be completed between 2031 and 2041; the exact timing is unknown. Intersection modifications at the intersection of Dunlop Street and Miller Drive / Tiffin Street are also expected to occur in conjunction with this road widening; the exact modifications are unknown at this time.
- The Dunlop Street interchange at Highway 400 is planned to be replaced; construction is expected to begin in 2025 and be completed near 2028. The project also includes Dunlop Street between Ferndale Drive and Anne Street, but is not anticipated to affect the configuration of the Dunlop Street and Ferndale Drive intersection.

The future background and total future analyses assumed the existing road network would remain in place through 2034, recognizing that the Dunlop Street widening may occur beyond this study's 2034 horizon and the impact on the intersection at Miller Drive / Tiffin Street is unknown, and recognizing that the Dunlop Street interchange project is not anticipated to affect the study area intersections. Sensitivity testing was undertaken to consider the potential effect of a five-lane cross-section on site access operations.

3.2

Background Traffic Growth

Future background traffic volumes were calculated by applying a background growth rate to traffic volumes on major roadways in the study area, and adding site-specific traffic volumes generated by developments in the study area.

3.2.1 Background Development Traffic

City of Barrie staff identified two background developments to be included in the background traffic projections:

642 Dunlop Street West: A four-storey mixed-use building is proposed with 779 m² (8,385 sq. ft.) of ground-floor commercial space and 72 residential units. A TIS was prepared for the site in April 2022 by JD Northcote Engineering Inc. The traffic projections from this TIS were applied at the Dunlop Street and Miller Drive / Tiffin Street intersection, and were extrapolated through the Dunlop Street and Ferndale Drive intersection.

20 Ferndale Drive: A one-storey automotive repair establishment is proposed with a GFA of 2,400 sq. ft. No TIS was undertaken for this site, and therefore trips associated with this development were generated based on the site's proposed GFA and assigned to the network based on an estimated catchment area. Trips generated by the proposed development were estimated using trip generation rates published by ITE in the *Trip Generation Manual*, 11th edition, using ITE Land Use Code 942 ("Automobile Care Center"). The trip generation calculations are documented in **Table 6**.

Table 6: 20 Ferndale Drive Trip Generation

	AM peak hour			PM peak hour		
	In	Out	Total	In	Out	Total
Automobile Care Center) (ITE Land Use Code 942)						
Trip generation rate (per unit); % in / out:	66%	34%	2.25	48%	52%	3.11
Total trips:	3	2	5	3	4	7

The traffic volumes associated with these background developments are shown in the following figures:

- **Figure 6** illustrates the traffic generated by 642 Dunlop Street West; and
- **Figure 7** illustrates the traffic generated by 20 Ferndale Drive.

All development traffic was assumed to be in place by the 2024 horizon.

Figure 6: 642 Dunlop Street West Traffic

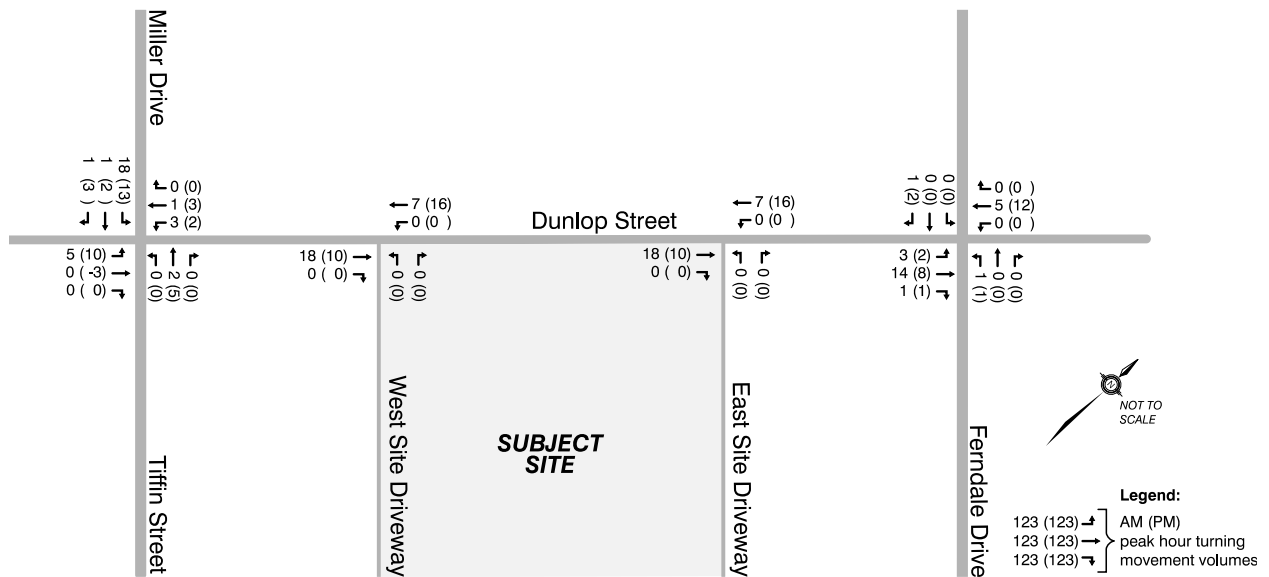
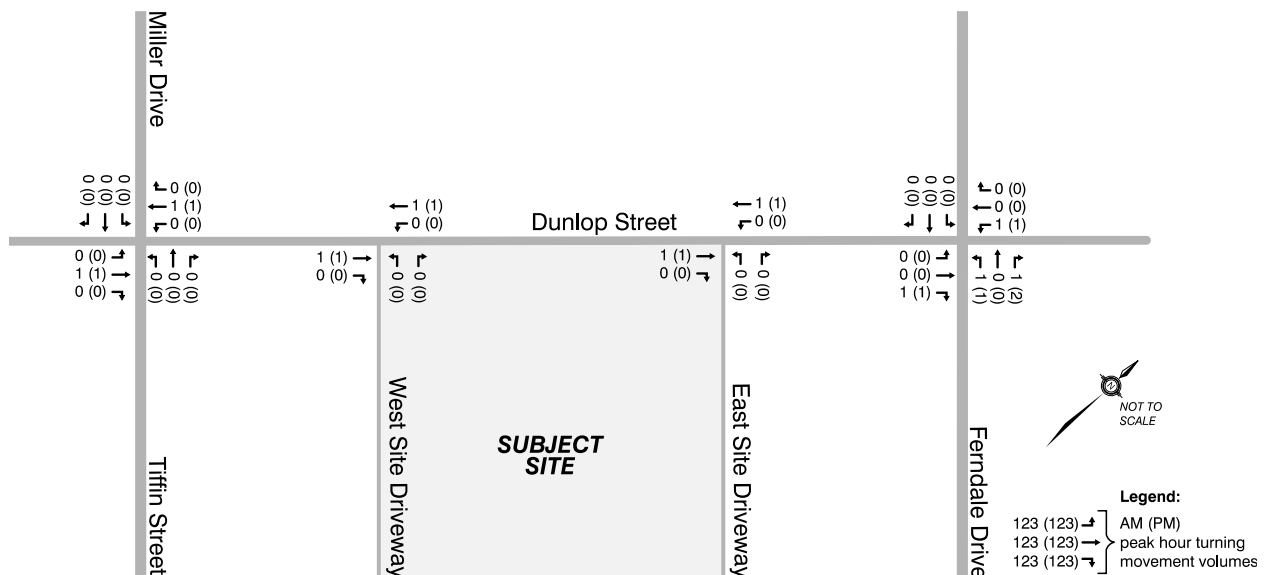


Figure 7: 20 Ferndale Drive Traffic



3.2.2 General Background Growth

Background traffic growth rates were derived from regional modeling data prepared as part of the City of Barrie's 2019 transportation master plan (TMP). The model results were documented in the EMME Macro Modelling and Improvements Rationale Technical Memorandum, Appendix E to the TMP, prepared by WSP in 2019. The model provided projected link volumes under 2016 baseline conditions and for various recommended scenarios at 2031 and 2041 horizons. These existing and future link volumes were used to derive growth rates on the study area road network.

First Gulf

*Proposed Warehouse Development, 545 Dunlop Street West, City of Barrie —
Transportation Impact Study*
January 2023 — 22-5012

Based on the analysis results, the following compound annual growth rates were applied during the AM and PM peak hours:

- Dunlop Street: 4% eastbound and westbound
- Miller Drive, Tiffin Street, Ferndale Drive – including movements to/from Dunlop Street – 1% growth

The full compiled results can be found in **Appendix C**.

3.3 Future Background Traffic Volumes

Future background traffic volumes were calculated by applying the background growth rates to existing volumes up to the 2024, 2029 and 2034 horizon years, and adding traffic generated by the identified background developments. The resulting future background traffic volumes are presented in **Figure 8**, **Figure 9**, and **Figure 10**, respectively.

Figure 8: 2024 Future Background Traffic Volumes

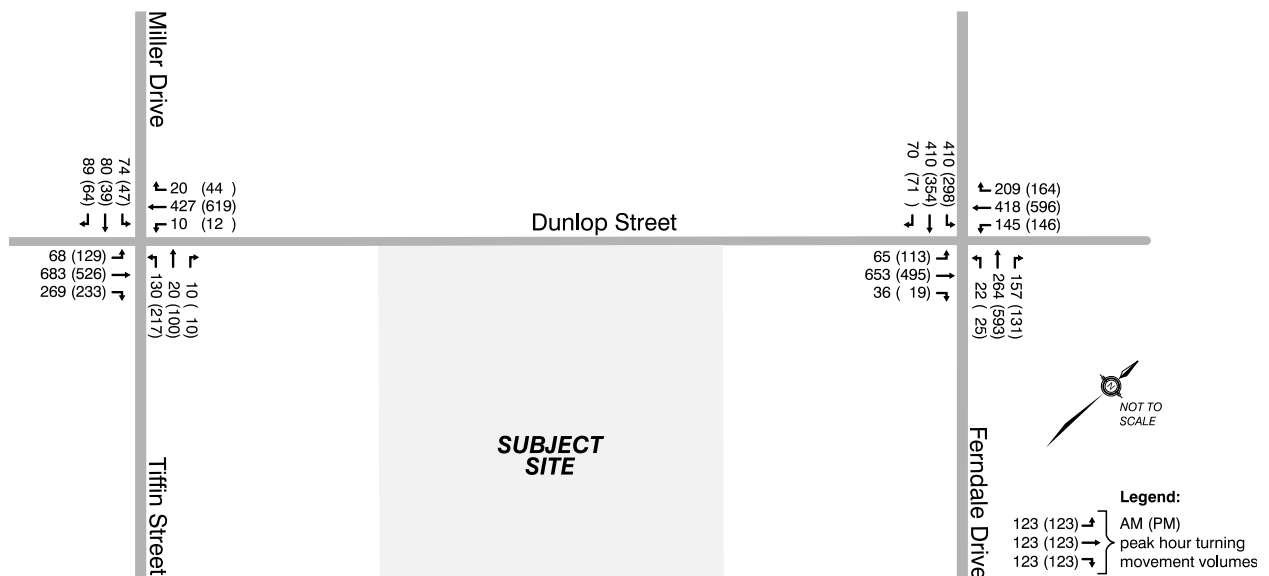


Figure 9: 2029 Future Background Traffic Volumes

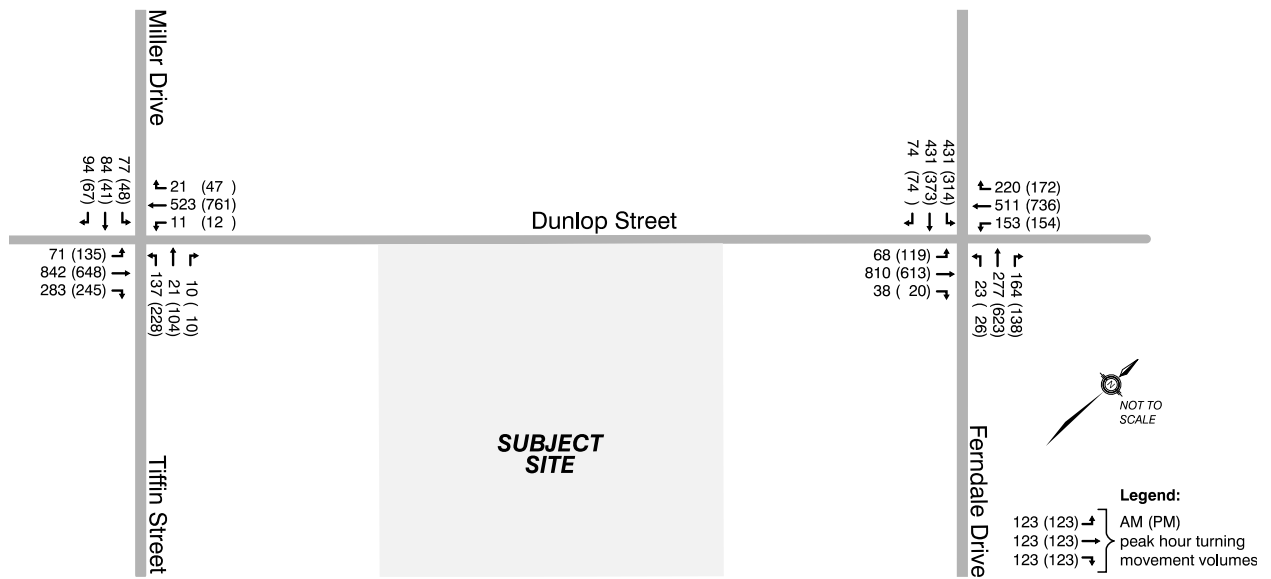
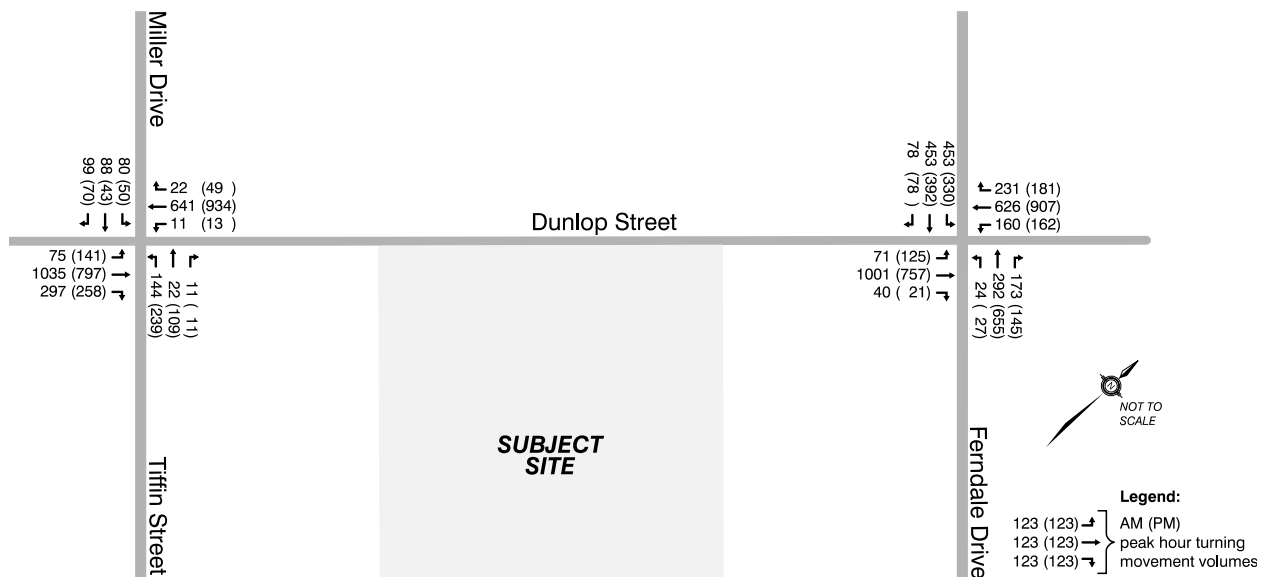


Figure 10: 2034 Future Background Traffic Volumes



4.0

Total Future Traffic Volumes

This section establishes the traffic volumes under total future conditions (i.e., with the proposed development in place).

Three horizon years have been assessed:

- 2024, corresponding to the anticipated site build-out year;
- 2029, corresponding to five years after the site build-out year; and
- 2034, corresponding to ten years after the site build-out year.

4.1

Proposed Development

The application seeks to construct an industrial warehouse which will include some office space. The total building GFA will be 32,301 m² (347,680 sq. ft.), divided into 1,353 m² (14,560 sq. ft.) of office space and 30,948 m² (333,120 sq. ft.) of warehouse space.

Two driveways from Dunlop Street are proposed, referred to throughout the report as the west driveway and the east driveway. The main parking areas will be located along the north side of the building, predominantly located closer to the east driveway. The west driveway will be used predominantly for access to/from the loading area at the rear of the warehouse.

A parking supply of 158 spaces is proposed.

The proposed site plan is provided in **Appendix A**.

4.2

Site Trip Generation

Trips generated by the proposed development were estimated based on trip generation rates published by ITE in the *Trip Generation Manual*, 11th edition. Trips were generated based on ITE Land Use Code (LUC) 150 ("Warehousing").

There is a small amount of ancillary office space proposed within each unit. The ITE trip generation rates for warehouse space account for ancillary office and maintenance areas within the overall warehouse GFA; therefore, trips were generated based on the subject site being a warehouse development, with the proposed office component being reflected in the ITE warehouse trip generation rates.

Table 7 presents the trip generation calculations applied to the subject site.

Table 7: Site Trip Generation

	AM peak hour			PM peak hour		
	In	Out	Total	In	Out	Total
Warehousing (347,680 sq. ft.) (ITE Land Use Code 150)						
Trip generation rate (per 1,000 sq. ft. GFA); % in / out:	77%	23%	0.17	28%	72%	0.18
Total trips:	46	13	59	18	45	63

The site is anticipated to generate approximately 59 vehicle trips during the AM peak hour, and 63 vehicle trips during the PM peak hour.

The site trips were subdivided into automobile trips and truck trips for the purpose of assigning traffic to the two site driveways, since the west driveway will primarily serve trucks and the east driveway will primarily serve automobiles. Based on a review of traffic volumes in a range of industrial areas in southern Ontario, trucks were assumed to comprise 5% of peak direction trips (inbound during the AM peak hour / outbound during the PM peak hour) and 25% of counter-peak direction trips (outbound during the AM peak hour; inbound during the PM peak hour).

4.3 Site Traffic Distribution

The distribution of site traffic is based on data from the 2016 Transportation Tomorrow Survey (TTS). Origin and destination data were extracted for AM and PM peak period trips destined to/from the employment lands along the Highway 400 corridor within Barrie, where the trip purpose of the origin or destination was work. These trips were then assigned to the various approach routes. Consideration was given to factors such as the directness of the travel route, the presence of left vs. right turns on the approach route, etc. **Table 8** presents the trip distribution applied to site traffic.

Table 8: Site Trip Distribution

To/from:	Via:	Inbound trips	Outbound trips
North	Miller Drive	5%	5%
	Ferndale Drive	10%	10%
South	Ferndale Drive	5%	5%
South/east	Tiffin Street	10%	5%
East	Dunlop Street	45%	50%
West	Dunlop Street	25%	25%

4.4 Site Traffic Assignment

The trips were assigned to the two site driveways based on vehicle type. The east driveway is closest to the parking areas in front of the building and was assumed to serve all automobile trips. The west

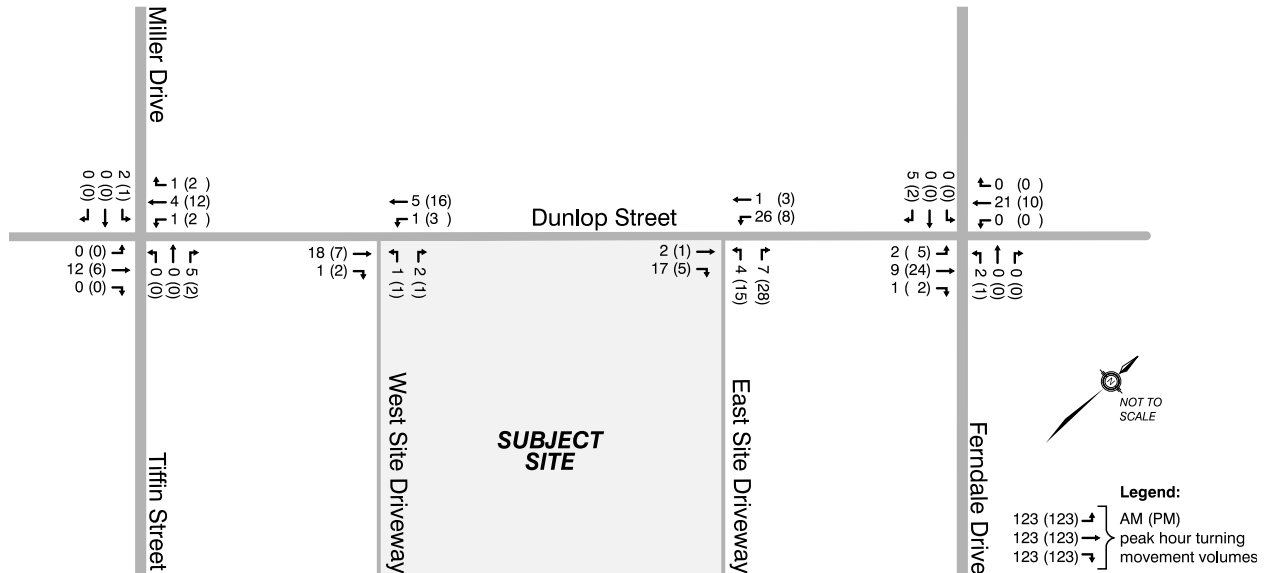
First Gulf

*Proposed Warehouse Development, 545 Dunlop Street West, City of Barrie —
Transportation Impact Study
January 2023 — 22-5012*

driveway provides a direct connection to the truck court at the rear of the building and was assumed to serve all truck trips.

Figure 11 illustrates the site traffic volumes added to the study area road network.

Figure 11: Site Traffic Volumes



4.5

Total Future Traffic Volumes

Total future traffic volumes represent conditions anticipated with the proposed development in place, and are calculated by adding the site traffic volumes to the projected future background traffic volumes.

Figure 12, **Figure 13** and **Figure 14** illustrate the projected total future traffic volumes at the 2024, 2029 and 2034 horizons, respectively.

Figure 12: 2024 Total Future Traffic Volumes

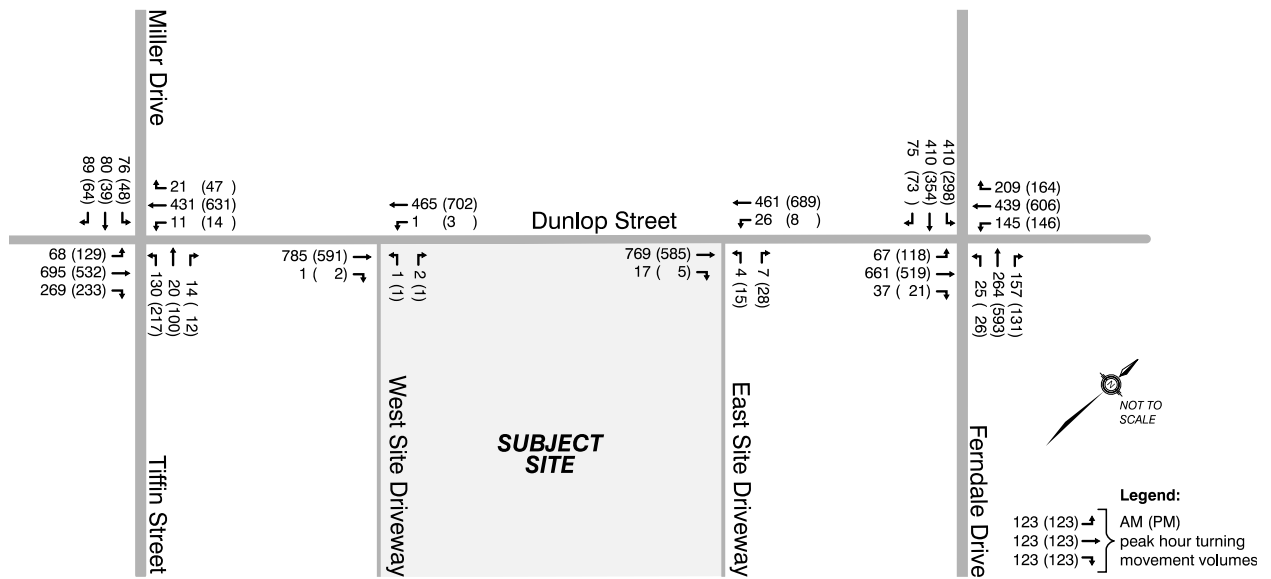


Figure 13: 2029 Total Future Traffic Volumes

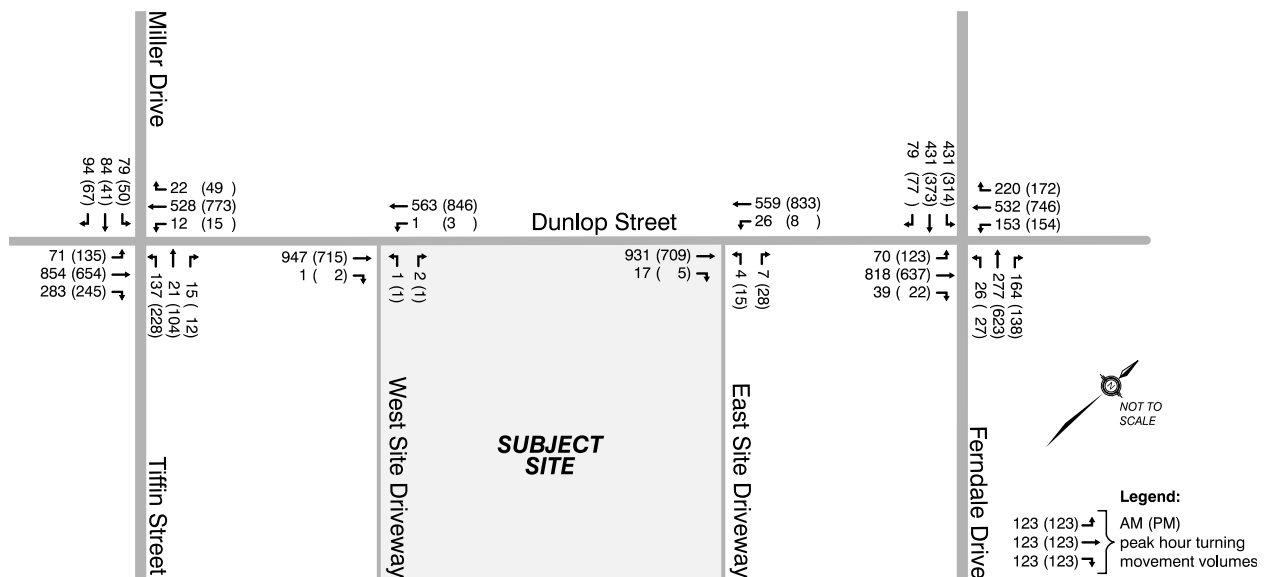
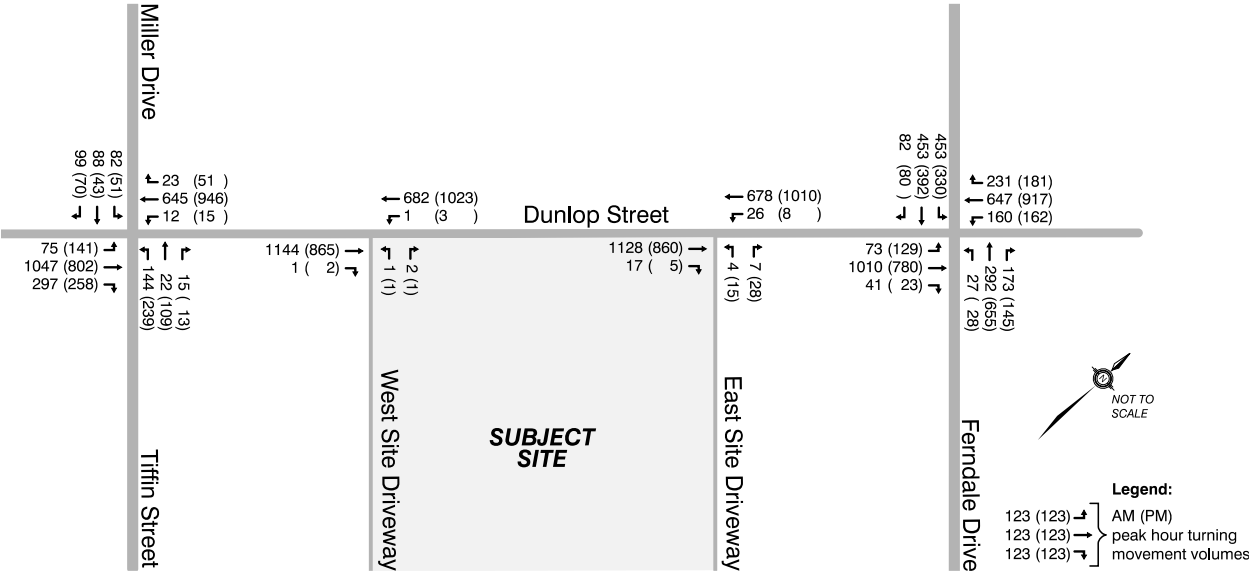


Figure 14: 2034 Total Future Traffic Volumes



5.0

Intersection Operations

Intersection operational analyses were completed for the study area intersections using Trafficware's Synchro software (version 10).

At signalized intersections, the volume-to-capacity (v/c) ratio, average vehicular delay, level of service and 95th percentile queue were noted for each individual movement, and the average delay and level of service were noted for the intersection as a whole. At unsignalized (stop-controlled) intersections, the v/c ratio, delay, level of service and 95th percentile queue were noted for any stop-controlled movements. Level of service definitions are provided in **Appendix E**. Synchro analysis worksheets reports are provided in **Appendix F**.

At each intersection, critical movements were identified. At unsignalized intersections, the City of Barrie defines an individual movement or lane group as being critical when it reaches LOS F. At signalized intersections, the City defines an individual movement or lane group as being critical as follows:

- Where the v/c ratio exceeds 0.85; or
- When the LOS reaches LOS E or LOS F.

Unless indicated otherwise, signalized intersection operations reflect existing traffic signal timing plans obtained from the City of Barrie. The traffic signal timing plans can be found in **Appendix D**.

5.1

Dunlop Street West at Miller Drive / Tiffin Street

Table 9 summarizes the operations at Dunlop Street and Miller Drive / Tiffin Street.

Table 9: Intersection Operations, Dunlop Street West and Miller Drive / Tiffin Street

Movement	AM peak hour				PM peak hour			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Existing								
EB left	0.12	A	9.0	12	0.24	A	7.9	17
EB through	0.33	B	12.6	69	0.23	A	9.8	44
EB right	0.28	A	2.3	14	0.23	A	2.0	12
WB left	0.02	A	8.9	3	0.02	A	6.9	3
WB through	0.26	B	15.6	46	0.37	B	16.0	62
NB left	0.52	D	41.4	45	0.74	D	52.5	76
NB through	0.11	C	32.3	13	0.35	D	45.7	42
SB left	0.16	C	31.3	22	0.13	C	33.4	15
SB through	0.72	D	53.3	59	0.48	C	31.6	28
Overall	—	B	18.4	—	—	B	18.9	—
Future Background 2024								
EB left	0.14	A	9.1	13	0.28	A	8.5	20
EB through	0.36	B	13.0	76	0.25	B	10.2	50
EB right	0.29	A	2.3	14	0.23	A	2.0	12
WB left	0.03	A	8.9	3	0.03	A	7.3	3
WB through	0.28	B	16.1	50	0.41	B	17.1	72
NB left	0.53	D	42.1	45	0.77	E	56.0	83
NB through	0.12	C	33.1	14	0.42	D	49.2	45
SB left	0.21	C	32.0	28	0.17	C	34.0	19
SB through	0.73	D	54.4	61	0.50	C	33.0	30
Overall	—	B	18.8	—	—	C	20.1	—
Total Future 2024								
EB left	0.14	A	9.1	13	0.28	A	8.7	21
EB through	0.38	B	14.6	78	0.26	B	11.6	51
EB right	0.29	A	2.5	14	0.24	A	2.3	12
WB left	0.03	A	8.9	4	0.03	A	7.4	4
WB through	0.29	B	16.0	51	0.42	B	17.2	75
NB left	0.53	D	41.9	45	0.77	E	55.3	81
NB through	0.14	C	29.6	15	0.43	D	49.3	46
SB left	0.22	C	32.0	28	0.18	C	33.8	20
SB through	0.73	D	54.3	61	0.49	C	32.6	30
Overall	—	B	19.4	—	—	C	20.4	—
Future Background 2029								
EB left	0.16	A	9.4	14	0.34	A	9.5	21
EB through	0.46	B	15.9	98	0.32	B	12.2	64
EB right	0.31	A	2.5	14	0.25	A	2.3	13
WB left	0.04	A	9.1	4	0.03	A	7.5	4
WB through	0.35	B	17.0	62	0.50	B	18.6	93
NB left	0.57	D	43.5	48	0.82	E	60.9	91
NB through	0.12	C	33.4	15	0.44	D	49.8	47
SB left	0.22	C	31.9	29	0.18	C	33.8	20
SB through	0.75	E	56.2	65	0.52	C	34.3	32
Overall	—	C	20.0	—	—	C	21.2	—

First Gulf

Proposed Warehouse Development, 545 Dunlop Street West, City of Barrie —
Transportation Impact Study
January 2023 — 22-5012

Table 9: Intersection Operations, Dunlop Street West and Miller Drive / Tiffin Street (cont'd)

Movement	AM peak hour				PM peak hour			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Future Background 2029								
EB left	0.16	A	9.4	14	0.34	A	9.5	21
EB through	0.46	B	15.9	98	0.32	B	12.2	64
EB right	0.31	A	2.5	14	0.25	A	2.3	13
WB left	0.04	A	9.1	4	0.03	A	7.5	4
WB through	0.35	B	17.0	62	0.50	B	18.6	93
NB left	0.57	D	43.5	48	0.82	E	60.9	91
NB through	0.12	C	33.4	15	0.44	D	49.8	47
SB left	0.22	C	31.9	29	0.18	C	33.8	20
SB through	0.75	E	56.2	65	0.52	C	34.3	32
Overall	—	C	20.0	—	—	C	21.2	—
Total Future 2029								
EB left	0.16	A	9.5	14	0.35	A	9.6	22
EB through	0.47	B	16.1	100	0.32	B	12.3	65
EB right	0.31	A	2.5	14	0.25	A	2.3	13
WB left	0.05	A	9.2	4	0.04	A	7.6	4
WB through	0.35	B	17.1	63	0.51	B	18.8	96
NB left	0.57	D	43.3	48	0.82	E	60.8	91
NB through	0.14	C	29.9	16	0.44	D	49.6	47
SB left	0.23	C	32.0	29	0.19	C	33.8	20
SB through	0.75	E	56.2	65	0.52	C	34.0	32
Overall	—	C	20.1	—	—	C	21.3	—
Future Background 2034								
EB left	0.19	A	9.9	14	0.43	B	11.2	23
EB through	0.57	B	18.0	130	0.40	B	13.2	83
EB right	0.32	A	2.5	14	0.26	A	2.3	13
WB left	0.05	A	9.4	4	0.04	A	7.8	4
WB through	0.43	B	18.4	79	0.60	C	21.0	123
NB left	0.60	D	45.2	50	0.87	E	67.4	100
NB through	0.13	C	33.1	15	0.46	D	50.0	49
SB left	0.23	C	32.0	30	0.19	C	33.8	20
SB through	0.78	E	58.8	69	0.53	D	35.3	33
Overall	—	C	21.2	—	—	C	22.6	—
Total Future 2034								
EB left	0.19	A	9.9	14	0.43	B	11.5	23
EB through	0.58	B	18.1	132	0.40	B	13.3	84
EB right	0.32	A	2.5	14	0.26	A	2.3	13
WB left	0.06	A	9.4	4	0.05	A	7.9	4
WB through	0.43	B	18.5	80	0.61	C	21.3	126
NB left	0.60	D	45.3	50	0.87	E	67.0	100
NB through	0.15	C	29.9	16	0.46	D	50.3	50
SB left	0.23	C	32.0	30	0.19	C	33.8	20
SB through	0.78	E	58.8	69	0.53	D	35.1	33
Overall	—	C	21.3	—	—	C	22.7	—

Under existing conditions, the intersection of Dunlop Street and Miller Drive / Tiffin Street operates at a good overall level of service (LOS B) with no critical movements.

With background traffic growth, the overall level of service is anticipated to change to LOS C by the 2024 horizon. By 2034, two movements are anticipated to become critical from a level of service perspective (operating at LOS E due to increased delays), and the northbound left turn is anticipated to slightly exceed the critical v/c threshold during the PM peak hour.

The addition of site traffic is not anticipated to significantly affect operations of individual movements or the intersection as a whole. The overall level of service during the AM peak hour in 2034 is anticipated to remain unchanged at LOS C. No new critical movements are identified due to the addition of site traffic, and future background critical movements are expected to be unaffected.

5.2 Dunlop Street at West Driveway

Table 10 summarizes the operations at the proposed west site driveway to Dunlop Street under total future volumes.

Table 10: Total Future Intersection Operations, Dunlop Street at West Driveway

Movement	AM peak hour				PM peak hour			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Total future (2024)								
NB approach	0.01	C	19.6	0	0.01	C	19.8	0
Total future (2029)								
NB approach	0.02	D	25.4	0	0.01	D	26.1	0
Total future (2034)								
NB approach	0.03	E	36.3	1	0.02	E	37.9	0

The proposed west site driveway to Dunlop Street is anticipated to operate at a satisfactory level of service in 2024 (LOS C) and 2029 (LOS D) and a poorer level of service (LOS E) in 2034; queues are not anticipated to exceed a single vehicle. The poorer outbound level of service at the 2034 horizon reflects the high annual background growth rate along Dunlop Street.

The City plans to widen Dunlop Street to a five-lane cross-section through this part of the study area. The specific timing is not currently known but is anticipated to be sometime between 2031 and 2041. Intersection operations were tested with a five-lane cross-section on Dunlop Street to determine the effect of this widening on intersection operations. The results are presented in **Table 11**.

Table 11: Total Future Intersection Operations, Dunlop Street (Widened) at West Driveway

Movement	AM peak hour				PM peak hour			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Total future (2034)								
NB approach	0.02	C	24.1	0	0.01	C	23.1	0

Once Dunlop Street is widened to a five-lane cross-section, the outbound level of service at the east driveway is anticipated to improve to LOS C.

5.3 Dunlop Street at East Driveway

Table 12 summarizes the operations at the proposed east site driveway to Dunlop Street under total future volumes.

Table 12: Total Future Intersection Operations, Dunlop Street at East Driveway

Movement	AM peak hour				PM peak hour			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Total future (2024)								
NB approach	0.05	C	20.9	1	0.16	C	19.8	4
Total future (2029)								
NB approach	0.07	D	27.8	2	0.21	D	26.8	6
Total future (2034)								
NB approach	0.11	E	41.5	3	0.32	E	42.9	10

The proposed east site driveway to Dunlop Street is anticipated to operate at a satisfactory level of service in 2024 (LOS C) and 2029 (LOS D) and a poorer level of service (LOS E) in 2034; queues are not anticipated to exceed two vehicles. The poorer outbound level of service at the 2034 horizon reflects the high annual background growth rate along Dunlop Street.

The City plans to widen Dunlop Street to a five-lane cross-section through this part of the study area. The specific timing is not currently known but is anticipated to be sometime between 2031 and 2041. Intersection operations were tested with a five-lane cross-section on Dunlop Street to determine the effect of this widening on intersection operations. The results are presented in **Table 13**.

Table 13: Total Future Intersection Operations, Dunlop Street (Widened) at East Driveway

Movement	AM peak hour				PM peak hour			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Total future (2034)								
NB approach	0.07	D	27.0	2	0.18	C	22.9	5

Once Dunlop Street is widened to a five-lane cross-section, the outbound level of service at the east driveway is anticipated to improve to LOS C to D.

5.4 Dunlop Street at Ferndale Drive

Table 14 summarizes the operations at Dunlop Street and Ferndale Drive.

Table 14: Intersection Operations, Dunlop Street and Ferndale Drive

Movement	AM peak hour				PM peak hour			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Existing								
EB left	0.19	B	16.2	16	0.41	C	23.8	28
EB through	0.64	C	32.3	88	0.49	C	34.3	66
WB left	0.47	C	20.1	32	0.40	C	22.7	35
WB through	0.54	C	24.3	72	0.75	D	39.1	102
NB left	0.09	B	17.8	7	0.07	B	16.0	7
NB through	0.73	D	36.6	52	0.87	D	49.0	104
SB left	0.92	D	48.2	123	0.76	C	34.6	81
SB through	0.40	C	23.8	59	0.29	C	20.5	47
Overall	—	C	31.0	—	—	D	36.0	—
Future Background 2024								
EB left	0.22	B	16.6	17	0.46	C	25.5	28
EB through	0.72	C	34.7	100	0.55	D	35.8	74
WB left	0.54	C	22.2	33	0.44	C	23.8	36
WB through	0.58	C	26.0	81	0.82	D	43.3	124
NB left	0.09	B	17.8	7	0.08	B	16.1	8
NB through	0.73	D	36.6	53	0.87	D	49.6	107
SB left	0.94	D	52.8	129	0.78	D	37.7	87
SB through	0.41	C	23.9	61	0.31	C	22.0	49
Overall	—	C	32.7	—	—	D	38.1	—
Total Future 2024								
EB left	0.23	B	16.7	17	0.49	C	26.4	30
EB through	0.72	D	35.0	102	0.58	D	36.3	78
WB left	0.54	C	22.5	33	0.45	C	24.2	36
WB through	0.61	C	27.0	86	0.84	D	44.5	127
NB left	0.10	B	17.9	8	0.08	B	16.1	8
NB through	0.73	D	36.6	53	0.87	D	49.6	107
SB left	0.94	D	52.8	129	0.78	D	37.7	87
SB through	0.42	C	24.0	61	0.32	C	22.0	49
Overall	—	C	32.9	—	—	D	38.5	—

Table 14: Intersection Operations, Dunlop Street and Ferndale Drive (cont'd)

Movement	AM peak hour				PM peak hour			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Future Background 2029								
EB left	0.26	B	17.7	18	0.53	C	28.3	30
EB through	0.89	D	45.0	146	0.69	D	39.7	93
WB left	0.66	C	31.3	43	0.54	C	27.3	38
WB through	0.69	C	30.1	103	1.00	E	68.6	166
NB left	0.09	B	17.8	8	0.08	B	16.2	8
NB through	0.75	D	37.4	57	0.90	D	52.0	121
SB left	1.01	E	68.0	145	0.84	D	45.5	101
SB through	0.43	C	24.1	64	0.33	C	22.2	52
Overall	—	D	38.9	—	—	D	47.3	—
Total Future 2029								
EB left	0.28	B	17.9	18	0.54	C	28.8	31
EB through	0.90	D	46.1	149	0.72	D	40.7	97
WB left	0.66	C	31.3	43	0.56	C	28.1	38
WB through	0.71	C	31.1	108	1.02	E	72.3	169
NB left	0.11	B	17.9	9	0.08	B	16.1	8
NB through	0.75	D	37.4	57	0.90	D	52.0	121
SB left	1.01	E	70.5	147	0.84	D	45.5	101
SB through	0.46	C	26.1	65	0.33	C	22.2	52
Overall	—	D	40.0	—	—	D	48.5	—
Future Background 2034								
EB left	0.33	B	19.8	19	0.56	C	29.5	31
EB through	1.11	F	96.5	205	0.86	D	48.5	127
WB left	0.68	C	34.2	52	0.70	D	38.5	48
WB through	0.82	D	36.5	149	1.22	F	143.3	216
NB left	0.10	B	17.6	8	0.08	B	16.2	8
NB through	0.75	D	37.8	60	0.93	E	55.6	131
SB left	1.08	F	88.8	161	0.88	D	51.9	112
SB through	0.44	C	24.3	68	0.34	C	22.4	54
Overall	—	E	58.2	—	—	E	73.1	—
Total Future 2034								
EB left	0.35	C	20.2	19	0.57	C	30.1	32
EB through	1.12	F	100.1	208	0.88	D	50.8	134
WB left	0.68	C	34.2	52	0.70	D	38.5	48
WB through	0.84	D	37.9	156	1.23	F	148.9	218
NB left	0.11	B	17.8	9	0.09	B	16.2	8
NB through	0.75	D	37.8	60	0.93	E	55.6	131
SB left	1.08	F	92.1	163	0.88	D	51.9	112
SB through	0.48	C	26.2	68	0.34	C	22.4	55
Overall	—	E	60.2	—	—	E	75.1	—

Under existing conditions, the intersection of Dunlop Street and Ferndale Drive operates at a reasonable overall level of service (LOS C to D). The southbound left turn has a critical v/c ratio during the AM peak hour, and the northbound through movement has a critical v/c ratio during the PM peak hour.

Background traffic growth is projected to result in the overall intersection changing to LOS E during the AM and PM peak hours by 2034. During the AM peak hour, the eastbound through and southbound left

First Gulf

Proposed Warehouse Development, 545 Dunlop Street West, City of Barrie —
Transportation Impact Study
January 2023 — 22-5012



turn movements are anticipated to exceed capacity between 2029 and 2034; during the PM peak hour, several movements are anticipated to reach critical v/c levels by 2034, of which the westbound through movement is anticipated to exceed capacity.

The introduction of site traffic is not anticipated to significantly affect intersection operations. The overall level of service is not anticipated to change from background conditions, and no new critical movements would be introduced. The majority of site traffic will be in the counter-peak direction and would not contribute significantly to background critical movements.

5.4.1 Signal Timing Mitigation

Notwithstanding that site traffic is not anticipated to significantly impact intersection operations, opportunities were tested to improve operations at the Dunlop Street and Ferndale Drive intersection through the implementation of signal timing adjustments. This mitigation was tested under 2034 future background and total future conditions. The following timing adjustments were applied:

AM peak hour:

- Moved 4 seconds from Phases 1 and 5 to Phase 2 (EBT) and 6 (WBT); and
- Moved 1 second from Phase 2 /6 to Phase 7 (SBL).
 - This results in a net result of +3 seconds to Phase 2

PM peak hour:

- Moved 4 seconds from Phases 1 and 5 to Phase 2 (EBT) and 6 (WBT); and
- Moved 4 seconds from Phases 3 and 7 to Phase 2.

Table 15 summarizes the operations under the mitigated scenario.

Table 15: Intersection Operations, Dunlop Street and Ferndale Drive – Mitigated Scenario

Movement	AM peak hour				PM peak hour			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Future Background 2034								
EB left	0.35	C	20.6	19	0.67	D	36.9	38
EB through	1.02	E	66.8	193	0.69	D	35.1	106
WB left	0.85	E	55.5	66	0.67	C	33.6	40
WB through	0.81	D	35.9	142	1.00	E	64.4	186
NB left	0.10	B	17.3	8	0.08	B	17.8	9
NB through	0.76	D	38.4	60	0.93	E	56.0	131
SB left	1.05	F	80.7	158	1.06	F	96.1	128
SB through	0.44	C	23.9	67	0.37	C	25.6	58
Overall	—	D	49.5	—	—	D	52.0	—
Total Future 2034								
EB left	0.37	C	21.1	20	0.69	D	38.3	41
EB through	1.03	E	69.4	196	0.71	D	35.8	110
WB left	0.85	E	55.5	66	0.70	D	35.9	39
WB through	0.83	D	37.2	149	1.01	E	66.9	188
NB left	0.11	B	17.5	8	0.09	B	17.8	9
NB through	0.76	D	38.4	60	0.93	E	56.0	131
SB left	1.06	F	83.7	160	1.06	F	96.1	128
SB through	0.47	C	25.8	67	0.37	C	25.5	58
Overall	—	D	51.1	—	—	D	52.9	—

The timing adjustments would reduce delays during the PM peak hour and improve the overall level of service to LOS D. More modest delay reductions would also be anticipated during the AM peak hour. In particular, additional capacity would be provided on the main eastbound and westbound through movements such that they could operate near or within capacity.

6.0

Site Plan Review

6.1

Driveway Location and Configuration

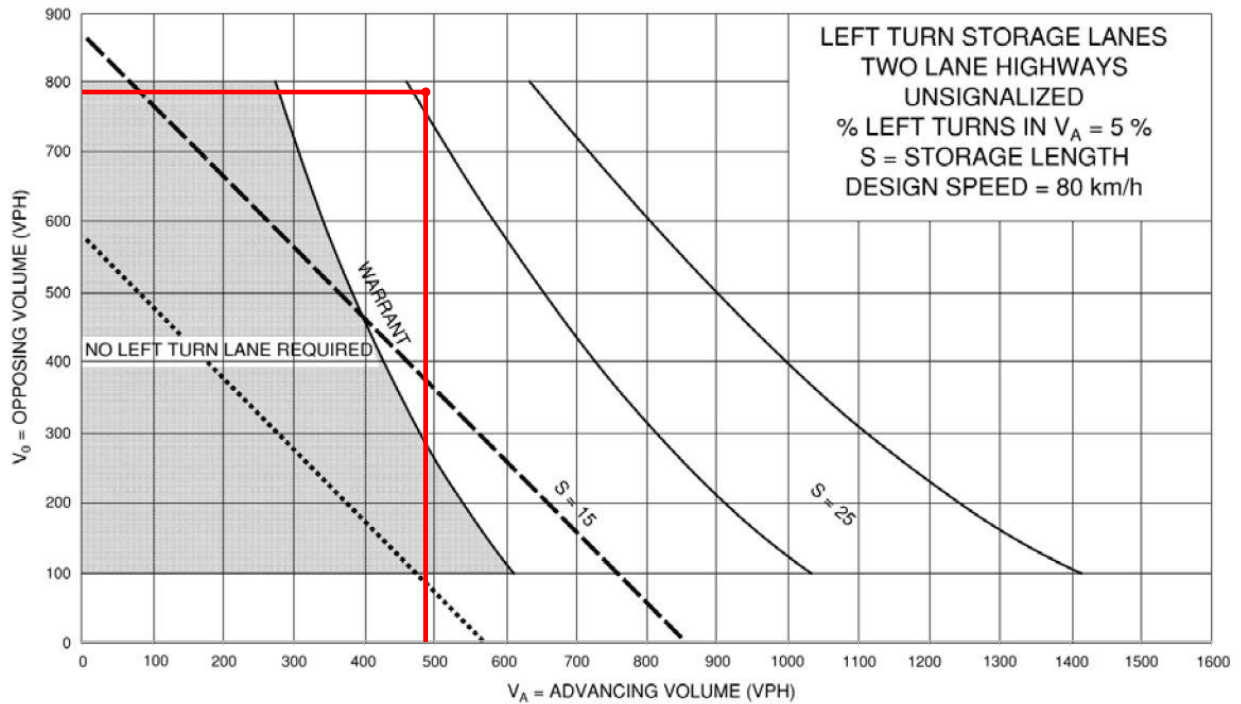
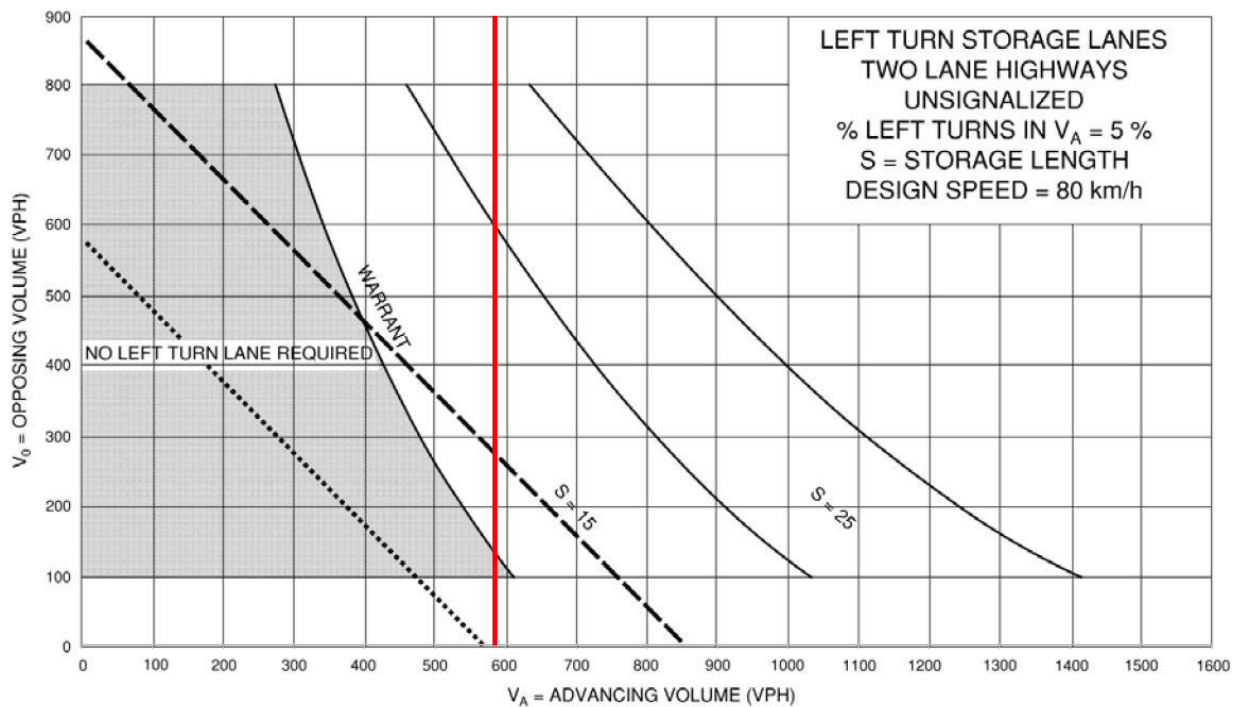
Two access points are proposed on Dunlop Street. The east driveway will serve auto traffic destined to and from the parking area on the north side of the building, which are closer to this driveway. The west driveway will serve truck movements destined to/from the truck court at the rear of the building.

There are no driveways on the north side of Dunlop Street that would need consideration from the perspective of driveway alignment or spacing.

The analyses of the site access intersections found that a single exit lane on each driveway would provide adequate capacity to accommodate the anticipated volumes.

An analysis was undertaken to determine whether a westbound left turn lane would be warranted on Dunlop Street at the east site access. (Very few vehicles are anticipated to make a westbound left turn at the west site access.) The analysis was undertaken using the MTO left turn lane warrant methodology for two-lane highways, using a design speed of 80 km/h. A left turn lane with 25 metres of storage is warranted during the AM peak hour in 2024, increasing to approximately 30 metres of storage in 2029. (The eastbound volumes are out of range for the nomograph from that year onward.)

Figure 15: Left Turn Lane Warrant Nomographs

2024 AM peak hour:**2029 AM peak hour:****First Gulf**

Proposed Warehouse Development, 545 Dunlop Street West, City of Barrie —
Transportation Impact Study
January 2023 — 22-5012

6.2 Truck Turning Path Requirements

Loading docks are to be provided in a truck court at the rear of the building.

Trucks will enter and exit the site via the west access, and will travel along the west and south sides of the building to access the truck court and trailer parking aisle. Swept path analyses for representative movements were undertaken using AutoTURN software to confirm the ability of trucks to circulate within the site. The design vehicle is a WB-20 tractor-trailer unit, from the TAC vehicle library. Drawings illustrating the truck swept paths are provided in **Appendix G**. The analyses indicate that the proposed geometry can accommodate truck movements.

6.3 Transportation Demand Management Measures

Transportation demand management (TDM) refers to the implementation of policies and operational and design measures that collectively effect a reduction in travel during peak hours within an area, particularly the demand for single-occupant vehicle travel. This could be achieved by shifting the demand to alternate modes (transit; walking / cycling; carpooling); by reducing the need to make certain trips; by reducing travel distances needed for certain trips; or by shifting travel to lower-demand times of the day when the transportation network is more likely to have surplus capacity available.

There is limited pedestrian and cycling infrastructure (including sidewalks leading to bus stops at Ferndale Drive) and few employee origins within walking distance. In the longer term, when Dunlop Street is widened, sidewalks will be constructed that will connect to the bus stops located roughly 600 metres east of the main site driveway. In the shorter term, the majority of non-auto driver travel is likely to be as auto passenger. Depending on the nature of the eventual tenants and the travel patterns of their employees, consideration could be given to measures to encourage carpooling (e.g., carpooling board, dedicated carpool space close to business entrance, etc.). These are measures that would be led by the individual tenants but could be supported by the developer (e.g., designation of carpool spaces).

At a more fundamental level, the impact of the site on the road network is mitigated by the relatively low volume of traffic generated by the site (approximately 50 two-way trips per hour, or less than one per minute) and the fact that those trips are largely generated in the counter-peak direction rather than adding to peak direction travel where capacity is more constrained.

6.4 Internal Pavement Markings and Traffic Control

A conceptual pavement marking and signage plan is provided in **Appendix H**, and illustrates recommended pavement markings (centre lines; stop bars) and signage (fire route signs; accessible parking signs; stop signs) within the site.

6.5 Parking Requirements

6.5.1 Proposed Parking Supply

The site plan illustrates a proposed parking supply of 158 spaces, located along the north side of the building.

6.5.2 Zoning By-Law Requirements

The subject site is governed by the City of Barrie Comprehensive Zoning By-law 2009-141 (“the ZBL”).

The proposed development is a multi-unit building primarily consisting of warehouse space, with ancillary office space at the front of each unit. The ZBL parking requirements for these uses are as follows:

- Warehouse space: 1 parking space per 1,000 m² GFA; 30,948 m² requires 31 parking spaces
- Office space: 1 parking space per 30 m² GFA; 1,353 m² requires 46 parking spaces

In total, using the ZBL parking requirements for warehouse and office space, the site would require a parking supply of 77 parking spaces. The proposed parking supply of 158 spaces exceeds this minimum requirement.

At the pre-consultation stage, City planning staff indicated that a different parking rate should be applied to the subject site. The ZBL has a clause specifying that “notwithstanding the parking requirements [noted above], where there are 2 or more permitted uses in any building or on any lot [...] in Industrial Zones, a minimum of 1 parking space per 40 m² of gross floor area shall be required”. This would result in a parking requirement of 808 spaces, which is significantly higher than the proposed parking supply of 158 spaces. This parking requirement is unreasonably high when considering that the units will serve as warehouse space. The parking requirement would be equivalent to what would be required under ZBL rates if 75% of the building was comprised of by significantly more densely occupied uses such as office space, a retail store, a convenience store, or a city hall. Instead, the office component will comprise approximately 4% of the building GFA.

The ZBL requirement for multiple uses is more applicable for smaller multi-unit buildings with smaller individual units, particularly where the tenant mix is unknown, because it provides more flexibility in the event that many units are leased for office, retail etc. uses that might require a greater number of parking spaces. In this case, the proposed building is known to be developed for warehouse space and the higher parking requirement is therefore not applicable. It is appropriate to apply the warehouse and office parking requirements to the subject site, rather than the multi-use industrial requirements.

7.0

Summary

This transportation impact study has been prepared as part of the application for a proposed warehouse development in Barrie on the south side of Dunlop Street, between Miller Drive / Tiffin Street and Ferndale Street. The applicant proposes to construct a multi-unit warehouse development with a total GFA of 32,301 m² (347,680 sq. ft.); this GFA would consist of 1,353 m² (14,560 sq. ft.) of office space and 30,948 m² (333,120 sq. ft.) of warehouse space.

Two accesses are proposed from Dunlop Street; the east driveway would primarily serve the parking area at the north side of the building, and the west driveway would primarily serve truck movements to/from the truck court and trailer parking areas along the south side of the building.

A parking supply of 158 spaces is proposed. Under the City's ZBL, a parking supply of 77 spaces would be required on the basis of the proposed warehouse and office GFA. City staff requested that parking requirements be calculated based on a site-wide parking rate reflecting multiple uses within a building, which would result in a parking requirement of 808 spaces; this parking supply would be unreasonably high when considering that the units will serve as warehouse space. The proposed parking supply of 158 spaces is anticipated to be adequate to accommodate the likely parking demand at the site.

Truck swept path analyses were undertaken using AutoTurn software. There is sufficient space to accommodate truck movements.

The site is anticipated to generate approximately 59 vehicle trips during the AM peak hour, and 63 vehicle trips during the PM peak hour.

Analyses considered two intersections on Dunlop Street (at Miller Drive / Tiffin Street, and at Ferndale Drive), in addition to the two proposed site accesses to Dunlop Street.

Based on model data from the City's 2019 transportation master plan, a 4% annual growth rate was applied to midblock volumes on Dunlop Street, and a 1% annual growth rate was applied to side street volumes.

The intersection of Dunlop Street and Miller Drive / Tiffin Street currently operates at a good overall level of service (LOS B) with no critical movements. The level of service is anticipated to change to LOS C during the PM peak hour by 2029. Two movements are anticipated to become critical from a level of service perspective (operating at LOS E due to increased delays), but all movements are expected to operate at acceptable v/c ratios. Site traffic is not anticipated to significantly affect intersection operations.

The intersection of Dunlop Street and Ferndale Drive currently operates at a reasonable overall level of service (LOS C). The southbound left turn has a critical v/c ratio during the AM peak hour, and the northbound through movement has a critical v/c ratio during the PM peak hour. Background traffic growth will result in the level of service reaching LOS D to E by 2034; the eastbound through and southbound left turn movements are anticipated to exceed capacity During the AM peak hour, and the westbound through movement will exceed capacity during the PM peak hour. Site traffic is not anticipated to significantly affect intersection operations; the majority of site traffic will be in the counter-peak direction and will not contribute to background critical movements. Opportunities exist to reduce intersection delays through signal timing adjustments.

The site accesses are both anticipated to operate at LOS C in 2024, LOS D in 2029, and LOS E in 2034. On both driveways, a single outbound lane will provide adequate capacity to accommodate the anticipated site traffic volumes. A westbound left turn lane with 30 metres of storage is warranted on westbound Dunlop Street at the east site access.

Dunlop Street currently has a four- to five-lane cross-section at the west and east sides of the study area, but narrows to two lanes (one lane per direction) for a distance of approximately 1 km between the Miller Drive / Tiffin Street and Ferndale Drive intersections. The City has plans to widen this section of Dunlop Street to five lanes, including a two-way left turn lane and sidewalks on both sides of the road, sometime between 2031 and 2041. This widening would result in the east driveway level of service improving to LOS C to D, and would provide a pedestrian connection leading to bus stops at Ferndale Drive.



Appendix A

Proposed Site Plan

OVERALL SITE PLAN

SITE AREA = ±19.78 AC (861,592.69 SF / 80,045 M²)

TOTAL BUILDING AREA = 347,680 SF / 32,301 SM

COVERAGE = 40%

CAR PARKING = 158 SPACES PROVIDED

TRUCK PARKING = 22

SITE LEGEND

- EXPOSED FOUNDATION WALL
- DRIP LINE
- LANDSCAPED

PARKING CALCULATION

WAREHOUSE (1 PER 1,000 SM):
30,947.86 SM / 1000 = 31 PARKING REQUIRED

OFFICE (1 PER 30 SM):
1,352.67 SM / 30 = 46 PARKING REQUIRED

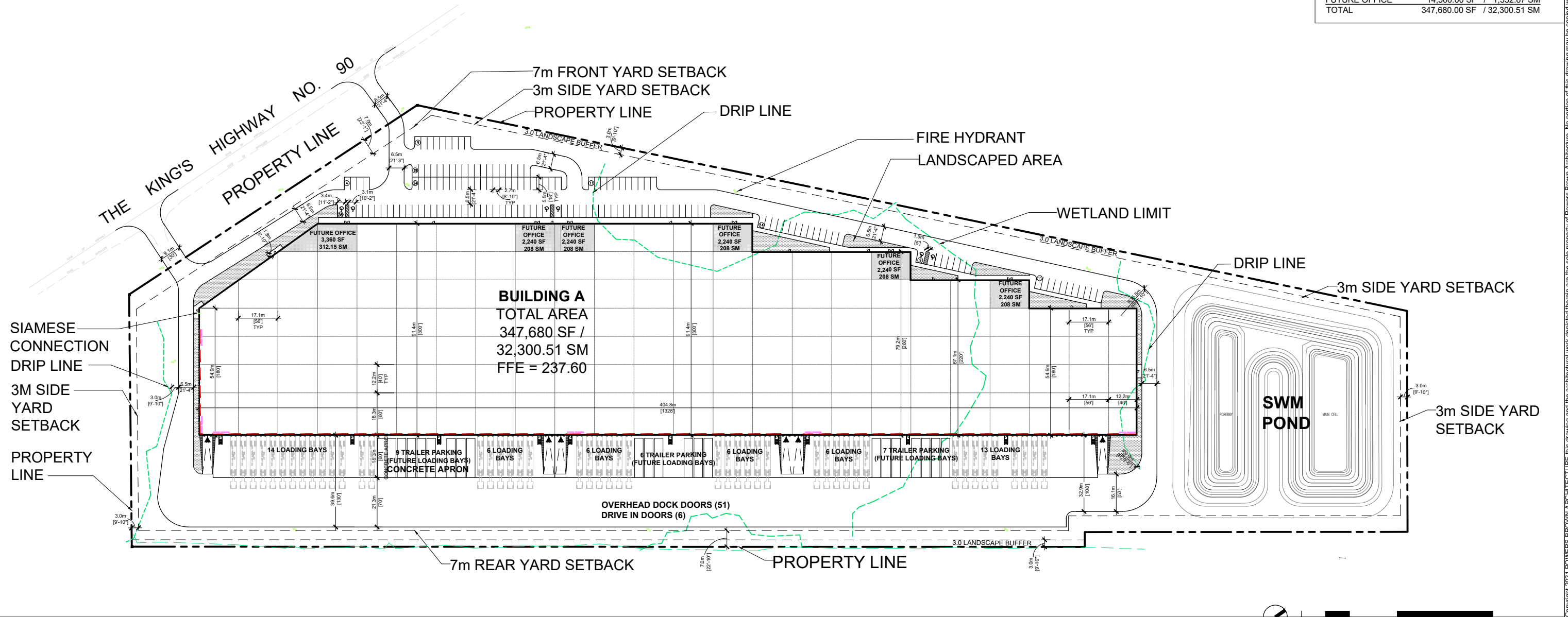
TOTAL PARKING = 77 PARKING REQUIRED

BARRIER FREE PARKING REQUIREMENT:
(76 TO 100 SPACES)

- 2 SPACES OF TYPE A
- 2 SPACES OF TYPE B
- 4 SPACES REQUIRED
- 6 SPACES PROVIDED

TYPE A (WIDTH: 3.4m W / ACCESS AISLE WIDTH OF 1.5M
TYPE B (WIDTH: 3.1m W / ACCESS AISLE WIDTH OF 1.5 M

BUILDING	
WAREHOUSE	333,120.00 SF / 30,947.86 SM
FUTURE OFFICE	14,560.00 SF / 1,352.67 SM
TOTAL	347,680.00 SF / 32,300.51 SM



* PRELIMINARY NOT FOR CONSTRUCTION, PERMIT, OR REGULATORY APPROVAL. * BOUNDARY LINES AND EASEMENTS ARE PRELIMINARY & REQUIRE VERIFICATION - SURVEY NOT PROVIDED. * ALL BUILDING AREAS ARE APPROXIMATE UNTIL BUILDING FOOTPRINT/ ENTRY DESIGNS ARE FINALIZED.

* RENDERING IS REPRESENTATIVE OF DESIGN INTENT ONLY. IT IS NOT A PHOTOREALISTIC REPRESENTATION OF ACTUAL MATERIALS PROPOSED AND SHOULD BE CONSIDERED PRELIMINARY AT ALL STAGES. * PRELIMINARY DETENTION CALCULATIONS. CALCULATIONS ARE SUBJECT TO CHANGE AND NEED TO BE CONFIRMED BY A LICENSED ENGINEER. *

Appendix B

Traffic Survey Data

Trans-Plan Transportation Inc.

Site ID Code:
 Intersection Location: **Dunlop Street & Miller Drive / Tiffin Street**
 Municipality: **Barrie, Ontario**
 Count Date: **Thursday April 11, 2019**
 Weather and Temperature: **Cloudy, 0 Degrees**
 Surveyor: **TP**

AM	NORTH APPROACH										Total	EAST APPROACH										Total	SOUTH APPROACH										Total	WEST APPROACH										Total	Grand Total
	CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds		CAR			TRUCKS			CYCLISTS			Peds													
	L	T	R	L	T	R	L	T	R			L	T	R	L	T	R	L	T	R			L	T	R	L	T	R	L	T	R														
7:00	16	7	15	0	0	0	0	0	0	0	38	3	60	2	0	11	1	0	0	0	0	77	35	4	1	8	0	3	0	0	0	0	51	3	114	50	0	1	1	0	0	0	0	169	335
7:15	12	10	15	0	0	0	0	0	0	0	37	2	93	2	0	9	1	0	1	0	1	109	26	4	1	4	2	1	0	0	0	0	38	8	104	47	1	3	3	0	0	0	0	166	350
7:30	17	22	30	0	3	2	0	0	0	0	74	0	107	3	0	5	0	0	0	0	0	115	34	5	0	6	0	1	0	0	0	0	46	14	154	61	1	4	3	0	0	0	0	237	472
7:45	11	18	30	0	2	0	0	0	0	0	61	0	96	5	0	10	3	0	0	0	0	114	27	7	1	1	0	0	0	0	0	0	36	15	143	81	1	10	6	0	0	0	0	256	467
8:00	11	15	14	1	2	1	0	0	0	0	44	3	83	4	1	15	0	0	0	0	0	106	26	2	4	4	0	0	0	0	0	0	36	21	141	40	0	6	1	0	0	0	0	209	395
8:15	13	13	7	0	0	0	0	0	0	0	33	2	56	3	1	8	1	0	0	0	0	71	22	2	2	4	1	1	0	0	0	0	32	8	146	62	0	5	2	0	0	0	0	223	359
8:30	15	12	8	0	0	1	0	0	0	0	36	3	60	5	0	7	1	0	0	0	0	76	23	7	1	2	3	2	0	0	0	0	38	18	142	40	0	2	2	0	0	0	0	204	354
8:45	17	12	11	0	4	0	0	0	0	0	44	2	49	3	0	8	0	0	0	0	0	62	24	9	4	1	0	0	0	0	0	0	38	8	135	43	1	12	5	0	0	0	0	204	348
MD																																													
11:00	9	7	7	0	0	0	0	0	0	0	23	1	69	4	1	7	0	0	0	0	0	82	15	2	3	1	0	0	0	0	0	0	21	10	91	17	1	8	1	0	0	0	0	128	254
11:15	10	6	6	0	0	0	0	0	0	0	22	2	84	8	1	9	0	0	0	0	0	104	15	8	0	0	0	0	0	0	0	0	23	10	82	33	0	8	1	0	0	0	0	134	283
11:30	5	10	6	0	0	0	0	1	0	0	22	1	80	4	0	8	0	0	0	0	0	93	20	5	2	1	0	2	0	0	0	0	30	9	77	32	1	10	4	0	0	0	0	133	278
11:45	8	8	8	0	1	0	0	0	0	0	25	4	67	8	0	11	1	0	0	0	0	91	21	9	1	2	1	0	0	0	0	0	34	12	105	34	0	6	1	0	0	0	0	158	308
12:00	6	7	10	1	0	1	0	0	0	0	25	1	78	6	0	8	0	0	0	0	0	93	22	10	1	3	0	0	0	0	0	0	36	16	88	15	1	6	2	0	0	0	0	128	282
12:15	9	5	6	1	0	0	0	0	0	0	21	2	76	8	0	7	0	0	0	0	0	93	21	11	0	0	0	1	0	0	0	0	33	13	108	27	0	9	1	0	0	0	0	158	305
12:30	5	8	7	0	0	0	0	0	0	0	20	1	85	8	0	6	0	0	0	0	0	100	19	7	2	1	0	0	0	0	0	0	29	9	84	27	0	10	4	0	0	0	0	134	283
12:45	6	9	5	0	1	0	0	0	0	3	24	0	88	11	0	3	1	0	0	0	0	103	19	6	1	1	0	1	0	0	0	0	28	18	85	20	0	7	3	0	0	0	0	133	288
13:00	6	7	10	0	0	0	0	0	0	0	23	4	92	4	1	7	0	0	0	0	0	108	13	8	0	0	0	2	0	0	0	0	23	14	76	19	0	6	2	0	0	0	0	117	271
13:15	12	9	13	0	0	0	0	0	0	3	37	2	84	7	1	4	0	0	0	0	0	98	27	9	2	4	0	0	0	0	0	0	42	19	73	25	0	3	3	0	0	0	0	123	300
13:30	8	9	8	0	0	0	0	0	0	0	25	0	88	6	0	11	1	0	0	0	0	106	19	8	3	2	0	1	0	0	0	0	33	9	93	31	2	4	1	0	0	0	0	140	304
13:45	9	12	7	0	1	0	0	0	0	0	29	2	92	13	1	9	1	0	0	0	0	118	25	12	2	7	0	2	0	0	0	0	48	11	104	33	1	3	3	0	0	0	0	155	350
PM																																													
15:00	3	8	15	0	1	0	0	0	0	0	27	3	119	6	0	3	0	0	0	0	0	131	37	11	1	3	0	0	0	0	0	0	52	13	111	30	0	8	3	0	0	0	0	165	375
15:15	6	7	14	0	0	0	0	0	0	0	27	1	122	10	0	13	0	0	0	0	0	146	36	17	1	2	1	0	0	0	0	0	57	14	91	33	0	8	3	0	0	0	0	149	379
15:30	7	7	12	0	0	1	0	0	0	1	28	1	128	5	2	4	0	0	0	0	1	141	38	15	1	1	0	0	0	0	0	1	56	23	115	49	0	5	5	0	0	0	0	197	422
15:45	8	7	15	0	1	0	0	0	0	0	31	0	120	10	2	4	0	0	0	0	0	136	28	20	0	0	1	0	0	0	0	0	49	29	108	47	0	5	6	0	0	0	0	195	411
16:00	9	12	13	1	0	1	0	0	0	0	36	1	121	12	1	3	0	0	0	0	0	138	52	18	2	1	0	2	0	0	0	0	75	29	120	45	0	4	6	0	0	0	0	204	453
16:15	2	4	12	0	3	0	0	0	0	0	21	0	134	11	3	5	0	0	0	0	0	153	55	15	0	0	1	0	0	0	0	0	71	27	106	49	0	5	7	0	0	0	0	194	439
16:30	8	6	19	1	0	0	0	0	0	0	34	0	134	6	1	2	0	0	0	0	0	143	54	22	1	0	0	2	0	0	0	0	79	20	113	60	0	7	9	0	0	0	0	209	465
16:45	9	10	13	2	0	0	0	0	0	0	34	2	143	13	1	7	0	0	0	0	1	167	40	34	2	4	0	0	0	0	0	0	80	37	115	39	0	2	7	0	1	0	0	201	482
17:00	5	3	14	0	0	0	0	0	0	0	22	0	125	12	0	4	0	0	0	0	1	142	64	25	1	0	0	0	0	0	0	0	90	25	104	35	1	3	2	0	0	0	0	170	424
17:15	14	9	10	0	0	0	0	0	0	0	33	1	141	17	1	2	0	0	0	0	0	162	50	22	0	0	0	0	0	0	0	0	72	25	110	34	0	1	5	0	0	0	0	175	442
17:30	7	13	16	0	0	0	0	0	0	0	36	0	115	15	0	1	0	0	0	0	0	131	39	19	0	0	0	0	0	0	0	0	58	24	96	29	0	3	3	0	0	0	0	155	380
17:45	9	12	13	0	0	0	0	0	0	0	34	0	101	18	0	2	0	0	0	0	0	121	30	10	2	1	0	0	0	0	0	0	43	26	106	25	0	3	3	0	0	0	0	163	361



Turning Movement Count Diagram

Intersection: Dunlop Street & Miller Drive / Tiffin Street

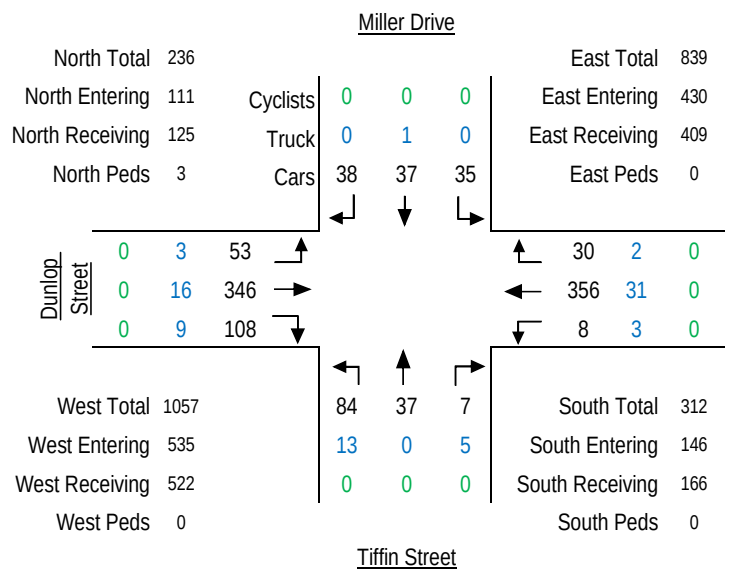
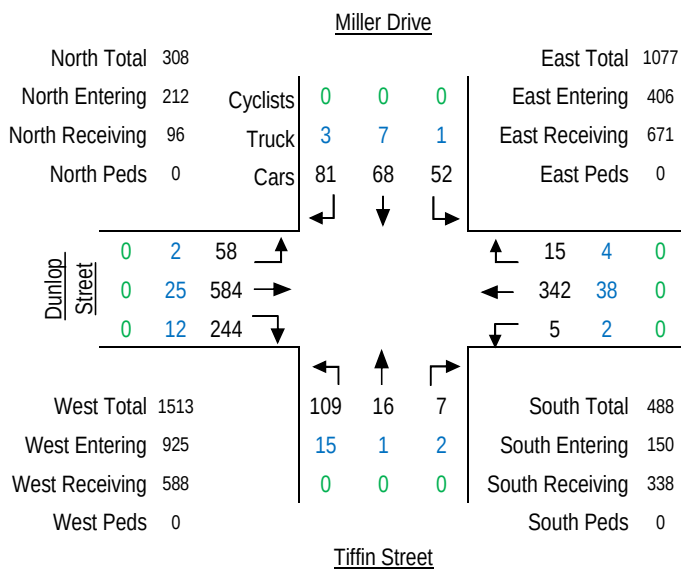
Municipality: Barrie, Ontario

Intersection ID:

Date: Thursday April 11, 2019

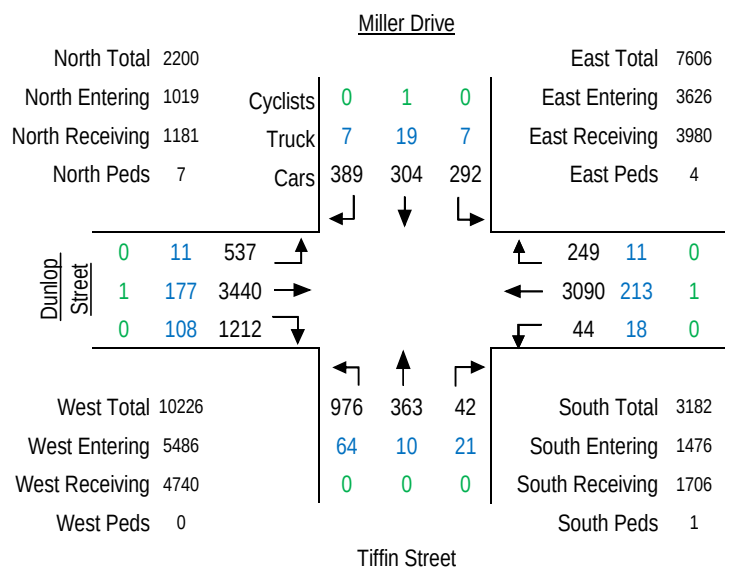
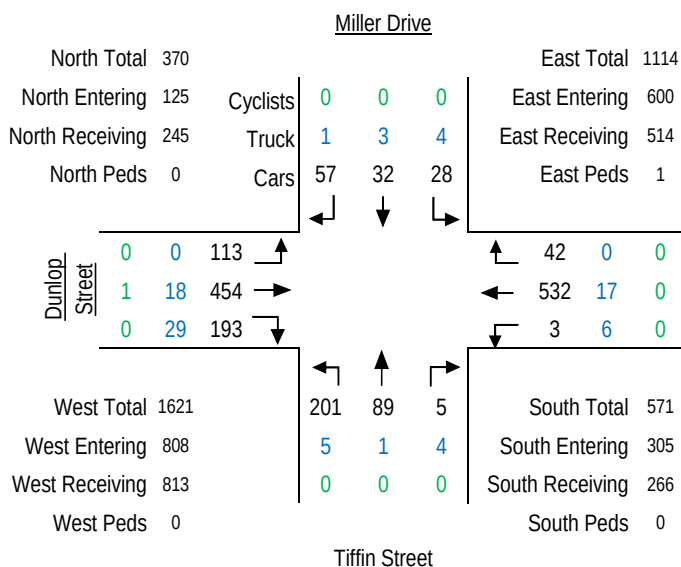
AM Peak Hour: 7:30 to 8:30

MD Peak Hour: 13:00 to 14:00



PM Peak Hour: 16:00 to 17:00

Total 8-Hour Count



Trans-Plan Transportation Inc.

Site ID Code:

Intersection Location:

Municipality:

Count Date:

Weather and Temperature:

Surveyor:

Dunlop Street & Ferndale Drive

Barrie, Ontario

Thursday April 11, 2019

Cloudy, 0 Degrees

TP

AM	NORTH APPROACH											Total	EAST APPROACH											Total	SOUTH APPROACH											Total	WEST APPROACH											Total	Grand Total
	CAR			TRUCKS			CYCLISTS			Peds	CAR			TRUCKS			CYCLISTS			Peds	CAR				TRUCKS			CYCLISTS			Peds																		
	L	T	R	L	T	R	L	T	R		L		T	R	L	T	R	L	T		R	L	T		R	L	T	R	L	T		R																	
7:00	97	49	12	3	5	0	0	0	0	0	166	14	55	42	1	8	0	0	1	0	1	122	3	33	24	1	4	2	0	0	0	0	67	15	82	6	1	4	2	0	0	0	0	110	465				
7:15	106	67	14	1	3	2	0	0	0	0	193	24	96	47	1	7	1	0	0	0	0	176	1	42	11	0	7	3	0	0	0	0	64	7	111	1	0	4	1	0	0	0	0	124	557				
7:30	108	81	20	0	3	2	0	0	0	0	214	26	97	42	3	4	1	0	0	0	0	173	2	49	24	0	2	2	0	0	0	0	79	15	156	10	1	4	2	0	0	0	1	189	655				
7:45	113	118	22	1	5	1	0	0	0	0	260	37	83	43	0	14	1	0	0	0	0	178	2	67	38	1	3	4	0	0	0	1	116	18	129	4	1	10	2	0	0	0	1	165	719				
8:00	78	87	15	5	1	1	0	0	0	0	187	29	87	50	3	13	0	0	0	0	0	182	5	68	35	0	1	2	0	0	0	0	111	12	136	4	0	7	0	0	0	0	0	159	639				
8:15	84	92	5	1	3	0	0	0	0	0	185	37	62	59	2	9	3	0	0	0	0	172	9	56	38	1	5	5	0	0	0	0	114	12	120	8	0	5	2	0	0	0	0	147	618				
8:30	84	78	9	5	3	1	0	0	0	0	180	29	53	35	3	12	2	0	0	0	0	134	8	55	41	0	5	7	0	0	0	1	117	15	140	3	1	7	1	0	0	0	0	167	598				
8:45	102	72	12	3	8	0	0	0	0	0	197	27	46	34	1	7	2	0	0	0	1	118	7	76	29	1	0	3	0	0	0	1	117	20	135	3	2	8	0	0	0	0	2	170	602				
MD																																																	
11:00	60	67	12	1	3	0	0	0	0	0	143	17	75	43	3	8	2	0	0	0	0	148	6	59	27	0	7	4	0	0	0	0	103	13	77	8	1	7	0	0	0	0	0	106	500				
11:15	61	60	11	4	1	0	0	0	0	0	137	25	86	38	4	12	2	0	0	0	0	167	7	57	38	0	4	7	0	0	0	0	113	7	90	6	1	8	0	0	0	0	0	112	529				
11:30	58	47	4	4	3	1	0	0	0	0	117	29	84	49	3	8	4	0	0	0	0	177	2	68	28	0	3	4	0	0	0	1	106	8	88	7	1	8	1	0	0	0	0	113	513				
11:45	75	68	13	5	2	0	0	0	0	0	163	25	75	39	3	14	2	0	0	0	2	160	7	70	37	2	3	2	0	0	0	3	124	12	107	3	0	9	1	0	0	0	0	132	579				
12:00	65	57	11	6	2	0	0	0	0	0	141	37	82	38	3	10	4	0	0	0	0	174	7	77	37	0	3	2	0	0	0	2	128	17	76	7	0	10	0	0	0	0	0	110	553				
12:15	50	56	10	7	5	0	0	0	0	0	128	32	71	32	4	9	0	0	0	0	0	148	4	68	25	1	3	6	0	0	0	0	107	18	110	6	1	9	1	0	0	0	1	146	529				
12:30	58	50	12	1	7	0	0	0	0	0	128	31	97	49	4	6	1	0	0	0	0	188	5	60	30	0	3	6	0	0	0	2	106	7	91	6	0	7	1	0	0	0	0	112	534				
12:45	69	58	4	3	2	2	0	0	0	0	138	25	93	37	2	6	1	0	0	0	0	164	4	76	36	0	3	3	0	0	0	0	122	9	91	2	0	12	0	0	0	0	0	114	538				
13:00	51	72	13	4	6	0	0	0	0	0	146	38	97	33	4	7	2	0	0	0	0	181	8	72	32	0	2	4	0	0	0	0	118	15	74	2	1	9	0	0	0	0	1	102	547				
13:15	54	65	9	3	8	0	0	0	0	0	139	29	91	53	3	6	1	0	0	0	0	183	7	74	31	0	1	3	0	0	0	0	116	9	79	3	0	5	0	0	0	0	2	98	536				
13:30	62	72	11	8	5	0	0	0	0	0	158	22	77	41	3	12	6	0	0	0	1	162	8	66	23	1	4	4	0	0	0	0	106	15	80	4	0	7	0	0	0	0	2	108	534				
13:45	58	62	12	5	6	1	0	0	0	0	144	24	98	26	3	15	4	0	0	0	0	170	10	79	30	1	4	2	0	0	0	1	127	13	95	7	0	7	0	0	0	0	1	123	564				
PM																																																	
15:00	49	61	22	3	0	0	0	0	0	0	135	31	109	45	3	6	4	0	0	0	1	199	7	108	30	0	3	6	0	0	0	1	155	21	93	8	1	9	1	0	0	0	0	133	622				
15:15	64	68	13	4	1	1	0	0	0	0	151	27	109	48	0	11	3	0	0	0	1	199	2	92	34	0	3	2	0	0	0	1	134	16	74	6	3	9	1	0	0	0	0	109	593				
15:30	62	90	24	2	5	0	0	0	0	0	183	27	111	44	4	6	0	0	0	0	0	192	4	96	41	1	0	1	0	0	0	0	143	17	93	3	1	4	1	0	0	0	0	119	637				
15:45	51	89	13	4	3	0	0	0	0	0	160	40	113	60	1	7	6	0	0	0	0	227	2	116	35	0	7	5	0	0	0	0	165	28	98	1	1	5	0	0	0	0	0	133	685				
16:00	60	92	22	2	3	0	0	0	0	1	180	26	127	47	4	3	1	0	0	0	0	208	3	134	36	0	1	4	0	0	0	1	179	25	102	8	0	6	0	0	0	0	0	141	708				
16:15	58	73	17	4	8	2	0	0	0	0	162	35	123	53	1	7	5	0	0	0	3	227	4	102	23	0	1	2	0	0	0	0	132	23	95	4	0	3	2	0	0	0	0	127	648				
16:30	61	69	14	5	1	0	0	0	0	0	150	33	128	30	2	4	0	0	0	0	0	197	9	149	35	1	0	1	0	0	0	2	197	20	114	2	0	6	1	0	0	0	0	143	687				
16:45	66	93	22	3	3	0	0	0	0	0	187	33	121	38	1	8	0	0	0	0	3	204	2	108	25	1	1	1	0	0	0	0	138	32	113	5	1	5	0	0	1	0	0	157	686				
17:00	78	82	16	4	1	0	0	0	0	0	181	39	118	45	1	4	3	0	0	0	1	211	3	157	34	0	2	0	0	0	0	0	196	19	97	6	1	1	0	0	0	1	0	125	713				
17:15	67	86	13	0	2	0	0	0	0	0	168	27	133	39	2	3	1	0	0	0	1	206	5	147	25	0	0	2	0	0	0	1	180	33	97	2	0	1	0	0	0	0	1	134	688				
17:30	64	68	19	1	1	0	0	0	0	0	153	19	123	50	1	5	0	0	0	0	2	200	3	123	24	0	1	1	0	0	0	0	152	22	101	6	0	4	0	0	0	0	1	134	639				
17:45	48	56	9	1	2	0	0	0	0	0	116	24	89	52	1	1	1	0	0	0	0	168	6	98	19	0	0	3	0	0	0	0	126	22	91	3	0	2	0	0	0	0	0	118	528				



Turning Movement Count Diagram

Intersection: Dunlop Street & Ferndale Drive

Municipality: Barrie, Ontario

Intersection ID:

Date: Thursday April 11, 2019

AM Peak Hour: 7:30 to 8:30

MD Peak Hour: 11:45 to 12:45

Ferndale Drive													
North Total 1355							East Total 1810						
North Entering 846		Cyclists	0	0	0	East Entering 705							
North Receiving 509		Truck	4	12	7	East Receiving 1105							
North Peds 0		Cars	62	378	383	East Peds 0							
			⬅	⬇	➡								
Dunlop Street	0	2	57	⬆						⬆	194	5	0
	0	26	541	➡						⬅	329	40	0
	0	6	26	⬇						⬇	129	8	0
			⬅	⬆	➡								
West Total 1113				18	240	135	South Total 978						
West Entering 658			2	11	13	South Entering 419							
West Receiving 455			0	0	0	South Receiving 559							
West Peds 2						South Peds 1							

Ferndale Drive													
North Total 1067						East Total 1499							
North Entering 560		Cyclists	0	0	0	East Entering 668							
North Receiving 507		Truck	0	16	19	East Receiving 831							
North Peds 0		Cars	46	231	248	East Peds 2							
			←	↓	→								
Dunlop Street	0	1	54	↑						↑	158	7	0
	0	35	384	→						←	325	39	0
	0	3	22	↓						↓	125	14	0
			←	↑	→								
West Total 935				23	275	129	South Total 869						
West Entering 499				3	12	16	South Entering 458						
West Receiving 436				0	0	0	South Receiving 411						
West Peds 1							South Peds 7						

PM Peak Hour: 16:30 to 17:30

Total 8-Hour Count

Ferndale Drive													
North Total 1512				East Total 1655									
North Entering 686		Cyclists	0	0	0	East Entering 813							
North Receiving 826		Truck	0	7	12	East Receiving 842							
North Peds 0		Cars	65	330	272	East Peds 5							
			⬅	⬇	➡								
Dunlop Street	0	2	104	⬆						⬆	152	4	0
	1	13	421	➡						➡	500	19	0
	1	1	15	⬇						⬇	132	6	0
			⬅	⬆	➡								
West Total 1163				19	561	119	South Total 1200						
West Entering 558				2	3	4	South Entering 708						
West Receiving 605				0	0	0	South Receiving 492						
West Peds 1							South Peds 3						

Ferndale Drive									
North Total 9975				East Total 12538					
North Entering 5189		Cyclists	0	0	0	East Entering 5698			
North Receiving 4786		Truck	14	111	103	East Receiving 6840			
North Peds 1		Cars	435	2305	2221	East Peds 17			
			⬅	⬇	➡				
<u>Dunlop Street</u>	0	19	535	⬆	⬆ 1381 63 0				
	1	202	3235	➡	⬅ 3009 252 1				
	1	20	154	⬇	⬇ 918 74 0				
			⬅	⬆	➡				
West Total 8052				162	2702	975	South Total 7623		
West Entering 4167				12	86	103	South Entering 4040		
West Receiving 3885				0	0	0	South Receiving 3583		
West Peds 13							South Peds 18		

Appendix C

Background Traffic Growth Data

		Volumes - EMME model														Total Volume
		Dunlop West of Miller		Dunlop betw. Miller / Ferndale		Dunlop East of Ferndale		Miller North of Dunlop		Tiffin South of Dunlop		Ferndale North of Dunlop		Ferndale South of Dunlop		
		WB	EB	WB	EB	WB	EB	SB	NB	SB	NB	SB	NB	SB	NB	
AM	2016 Scenario 10167	659	780	399	554	582	1025	305	78	413	221	908	609	522	511	7566
	2031 Scenario 44317	1185	1395	632	960	864	1434	274	18	561	422	987	690	433	500	10355
	2041 Scenario 33417	1286	1563	767	1129	1136	1762	294	17	566	373	1124	861	525	632	12035
PM	2016 Scenario 10168	893	796	436	488	969	975	269	185	246	310	617	904	574	815	8477
	2031 Scenario 44318	1802	1474	1051	969	1333	1212	353	216	344	454	691	1155	675	1011	12740
	2041 Scenario 33418	1977	1559	1203	1096	1704	1645	364	211	311	469	815	1237	552	986	14129

		Growth Rates														Average
	AM 2016 to 2031	4%	4%	3%	4%	3%	2%	-1%	-9%	2%	4%	1%	1%	-1%	0%	1.86%
	AM 2016 to 2041	3%	3%	3%	3%	3%	2%	0%	-6%	1%	2%	1%	1%	0%	1%	1.72%
	AM 2031 to 2041	1%	1%	2%	2%	3%	2%	1%	-1%	0%	-1%	1%	2%	2%	2%	1.48%
	PM 2016 to 2031	5%	4%	6%	5%	2%	1%	2%	1%	2%	3%	1%	2%	1%	1%	2.58%
	PM 2016 to 2041	3%	3%	4%	3%	2%	2%	1%	1%	1%	2%	1%	1%	0%	1%	1.92%
	PM 2031 to 2041	1%	1%	1%	1%	2%	3%	0%	0%	-1%	0%	2%	1%	-2%	0%	0.97%

Appendix D

Traffic Signal Timings

October 17, 2022

File: T07-SI

Mike Walters, P.Eng.- Dillon Consulting Limited
Delivered Electronically

Dear Mike,

RE: Traffic Signal Timings

With respect to your inquiry on October 06, 2022, attached are the Signal Timings for the intersections of Dunlop Street & Tiffin Street/Miller Drive and Dunlop Street & Ferndale Drive.

Signalized Intersections within the City of Barrie function as a semi-actuated; meaning the signals remain green on the major road/ main street until a vehicle is detected on the minor road/ side street or a pedestrian pushes the pushbutton to activate the pedestrian phase.

Vehicles on the minor road/side street are detected by electromagnetic wires, which are embedded in the pavement on the side street near the painted stop bar. Vehicle presence only on the side street would result in a possible green time of between the minimum and maximum times, as noted, depending on vehicle demand detected.

Pedestrians must push the pedestrian push button to be detected. Pedestrian "Walk" and "Flashing Don't Walk" times on the side street, as noted, would be used in the event that the pedestrian push button was activated.

If you require any further information please feel free to contact me at (705) 739-4220 ext. 4937.

Sincerely,

A handwritten signature in blue ink, appearing to read "Stephen Salis".

Stephen Salis, C.E.T.
Senior Transportation Systems Technologist

Dunlop Street & Tiffin Street/Miller Drive – FREE PLAN (NO COORDINATION)

Roadway	Direction	Vehicular Indications				Pedestrian Indications	
		Minimum Green	Maximum Green	Amber	All Red	Walk	Flashing Don't Walk
Dunlop Street (main street)	Advanced Eastbound Left Turn	7	12	3	1	N/A	N/A
Dunlop Street (main street)	Advanced Westbound Left Turn	7	12	3	1	N/A	N/A
Dunlop Street (main street)	Eastbound	60	60	4	2	39	21
Dunlop Street (main street)	Westbound	60	60	4	2	39	21
Tiffin Street (side street)	Advanced Northbound Left Turn	7	12	3	1	N/A	N/A
Miller Drive (side street)	Advanced Southbound Left Turn	7	12	3	1	N/A	N/A
Tiffin Street (side street)	Northbound	10	20	4	2	12	18
Miller Drive (side street)	Southbound	10	20	4	2	12	18

NOTE: All times are recorded in seconds, based on full demand.

Dunlop Street & Ferndale Drive – FREE PLAN (NO COORDINATION)

Roadway	Direction	Vehicular Indications				Pedestrian Indications	
		Minimum Green	Maximum Green	Amber	All Red	Walk	Flashing Don't Walk
Dunlop Street (main street)	Advanced Eastbound Left Turn	7	12	3	1	N/A	N/A
Dunlop Street (main street)	Advanced Westbound Left Turn	7	12	3	1	N/A	N/A
Dunlop Street (main street)	Eastbound	30	30	4	2	7	23
Dunlop Street (main street)	Westbound	30	30	4	2	7	23
Ferndale Drive (side street)	Advanced Northbound Left Turn	7	12	3	1	N/A	N/A
Ferndale Drive (side street)	Advanced Southbound Left Turn	7	20	3	1	N/A	N/A
Ferndale Drive (side street)	Northbound	10	30	4	2	7	23
Ferndale Drive (side street)	Southbound	10	30	4	2	7	23

NOTE: All times are recorded in seconds, based on full demand.

Appendix E

Level of Service Definitions

Highway Capacity Manual 2010

Signalized intersection level of service (LOS) is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated in terms of average control delay per vehicle (in seconds) during a specified time period (e.g., weekday PM peak hour). Control delay is a complex measure based on many variables, including signal phasing and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity and resulting queues. Table 1 summarizes the LOS criteria for signalized intersections, as described in the *Highway Capacity Manual 2010* (Transportation Research Board, 2010).

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)	General Description
A	≤10	Free Flow
B	>10 – 20	Stable Flow (slight delays)
C	>20 – 35	Stable flow (acceptable delays)
D	>35 – 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 – 80	Unstable flow (intolerable delay)
F ¹	>80	Forced flow (congested and queues fail to clear)

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio for a lane group exceeds 1.0 LOS F is assigned to the individual lane group. LOS for overall approach or intersection is determined solely by the control delay.

Unsignalized intersection LOS criteria can be further reduced into three intersection types: all-way stop, two-way stop, and roundabout control. All-way stop and roundabout control intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. This approach is because major-street through vehicles are assumed to experience zero delay, a weighted average of all movements results in very low overall average delay, and this calculated low delay could mask deficiencies of minor movements. Table 2 shows LOS criteria for unsignalized intersections.

Table 2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)
A	0 – 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F ¹	>50

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio exceeds 1.0, LOS F is assigned an individual lane group for all unsignalized intersections, or minor street approach at two-way stop-controlled intersections. Overall intersection LOS is determined solely by control delay.

Appendix F

Synchro Analysis Worksheets

Lanes, Volumes, Timings
110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	627	264	7	392	20	128	18	9	55	77	87
Future Volume (vph)	62	627	264	7	392	20	128	18	9	55	77	87
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	69	697	293	8	458	0	142	30	0	61	183	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8			4		
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	60.0	60.0	7.0	60.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	66.0	66.0	11.5	66.0		11.0	36.0		11.5	36.0	
Total Split (s)	16.0	66.0	66.0	16.0	66.0		16.0	26.0		16.0	26.0	
Total Split (%)	12.9%	53.2%	53.2%	12.9%	53.2%		12.9%	21.0%		12.9%	21.0%	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max	Max	None	Max		None	None		None	None	
Act Effect Green (s)	71.5	67.8	67.8	67.9	60.5		27.7	18.9		27.6	15.2	
Actuated g/C Ratio	0.64	0.60	0.60	0.60	0.54		0.25	0.17		0.25	0.14	
v/c Ratio	0.12	0.33	0.28	0.02	0.26		0.52	0.11		0.16	0.72	
Control Delay	9.0	12.6	2.3	8.9	15.6		41.4	32.3		31.3	53.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.0	12.6	2.3	8.9	15.6		41.4	32.3		31.3	53.3	
LOS	A	B	A	A	B		D	C		C	D	
Approach Delay		9.5			15.5			39.8			47.8	
Approach LOS		A			B			D			D	
Queue Length 50th (m)	5.7	38.2	0.0	0.7	30.1		26.1	4.1		10.6	33.2	
Queue Length 95th (m)	12.4	68.7	13.7	2.7	45.5		44.7	13.3		21.7	59.0	
Internal Link Dist (m)		363.2			184.5			357.0			236.1	
Turn Bay Length (m)	245.0		130.0	165.0			240.0			125.0		
Base Capacity (vph)	621	2094	1044	442	1750		281	311		418	327	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.11	0.33	0.28	0.02	0.26		0.51	0.10		0.15	0.56	
Intersection Summary												

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

Cycle Length: 124

Actuated Cycle Length: 112.3

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 18.4

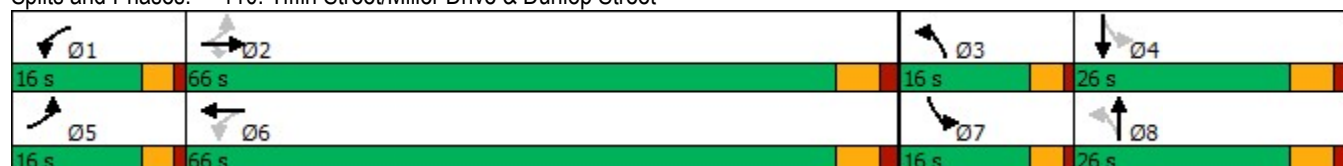
Intersection LOS: B

Intersection Capacity Utilization 81.3%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 110: Tiffin Street/Miller Drive & Dunlop Street



Lanes, Volumes, Timings
120: Ferndale Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	584	33	141	380	205	21	259	152	402	402	68
Future Volume (vph)	61	584	33	141	380	205	21	259	152	402	402	68
Confl. Peds. (#/hr)			1	1			2					2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	67	678	0	155	643	0	23	452	0	442	517	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	16.0	36.0		16.0	36.0		16.0	36.0		24.0	36.0	
Total Split (%)	14.3%	32.1%		14.3%	32.1%		14.3%	32.1%		21.4%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	40.0	30.1		45.2	34.7		25.1	15.9		42.0	35.8	
Actuated g/C Ratio	0.42	0.31		0.47	0.36		0.26	0.17		0.44	0.37	
v/c Ratio	0.19	0.64		0.47	0.54		0.09	0.73		0.92	0.40	
Control Delay	16.2	32.3		20.1	24.3		17.8	36.6		48.2	23.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	16.2	32.3		20.1	24.3		17.8	36.6		48.2	23.8	
LOS	B	C		C	C		B	D		D	C	
Approach Delay		30.9			23.5			35.7			35.1	
Approach LOS		C			C			D			D	
Queue Length 50th (m)	6.8	59.5		16.7	46.2		2.5	34.5		63.5	34.5	
Queue Length 95th (m)	15.7	87.5		32.1	72.3		7.2	52.4		#123.4	59.3	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	425	1062		356	1195		353	1079		481	1375	
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	0.16	0.64		0.44	0.54		0.07	0.42		0.92	0.38	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

Cycle Length: 112

Actuated Cycle Length: 96.2

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 31.0

Intersection LOS: C

Intersection Capacity Utilization 83.8%

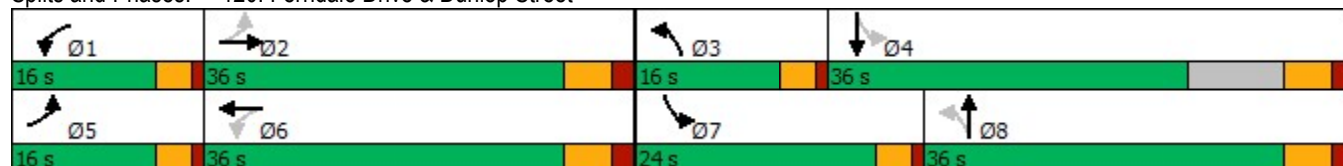
ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	486	229	9	566	43	212	93	9	33	36	60
Future Volume (vph)	116	486	229	9	566	43	212	93	9	33	36	60
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	122	512	241	9	641	0	223	107	0	35	101	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8			4		
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	60.0	60.0	7.0	60.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	66.0	66.0	11.5	66.0		11.0	36.0		11.5	36.0	
Total Split (s)	16.0	66.0	66.0	16.0	66.0		16.0	26.0		16.0	26.0	
Total Split (%)	12.9%	53.2%	53.2%	12.9%	53.2%		12.9%	21.0%		12.9%	21.0%	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max	Max	None	Max		None	None		None	None	
Act Effect Green (s)	75.2	71.1	71.1	69.0	60.0		28.7	19.8		20.6	10.9	
Actuated g/C Ratio	0.67	0.63	0.63	0.62	0.54		0.26	0.18		0.18	0.10	
v/c Ratio	0.24	0.23	0.23	0.02	0.37		0.74	0.35		0.13	0.48	
Control Delay	7.9	9.8	2.0	6.9	16.0		52.5	45.7		33.4	31.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	7.9	9.8	2.0	6.9	16.0		52.5	45.7		33.4	31.6	
LOS	A	A	A	A	B		D	D		C	C	
Approach Delay		7.4			15.8			50.3			32.0	
Approach LOS		A			B			D			C	
Queue Length 50th (m)	8.8	22.4	0.0	0.6	41.5		44.4	22.2		6.1	9.6	
Queue Length 95th (m)	17.3	43.9	11.6	2.5	61.7		#76.2	41.7		14.7	27.5	
Internal Link Dist (m)		363.2			184.5			357.0			236.1	
Turn Bay Length (m)	245.0		130.0	165.0			240.0			125.0		
Base Capacity (vph)	545	2200	1063	525	1730		302	352		337	337	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.22	0.23	0.23	0.02	0.37		0.74	0.30		0.10	0.30	
Intersection Summary												

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

Cycle Length: 124

Actuated Cycle Length: 112.1

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 18.9

Intersection LOS: B

Intersection Capacity Utilization 88.4%

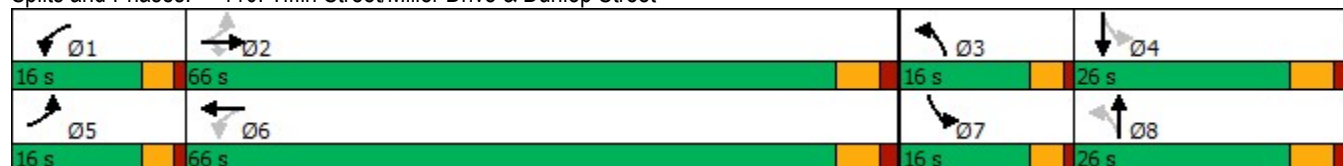
ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 110: Tiffin Street/Miller Drive & Dunlop Street



Lanes, Volumes, Timings
120: Ferndale Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	109	447	16	142	535	161	22	581	127	293	347	67
Future Volume (vph)	109	447	16	142	535	161	22	581	127	293	347	67
Confl. Peds. (#/hr)			3	3			1		5	5		1
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	112	477	0	146	718	0	23	730	0	302	427	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	16.0	36.0		16.0	36.0		16.0	36.0		24.0	36.0	
Total Split (%)	14.3%	32.1%		14.3%	32.1%		14.3%	32.1%		21.4%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	41.7	30.2		43.1	30.9		35.2	26.0		50.9	44.7	
Actuated g/C Ratio	0.40	0.29		0.41	0.29		0.33	0.25		0.48	0.42	
v/c Ratio	0.41	0.49		0.40	0.75		0.07	0.87		0.76	0.29	
Control Delay	23.8	34.3		22.7	39.1		16.0	49.0		34.6	20.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	23.8	34.3		22.7	39.1		16.0	49.0		34.6	20.5	
LOS	C	C		C	D		B	D		C	C	
Approach Delay		32.3			36.3			48.0			26.3	
Approach LOS		C			D			D			C	
Queue Length 50th (m)	15.1	47.6		20.1	74.5		2.6	79.4		42.2	27.5	
Queue Length 95th (m)	27.5	66.1		34.8	102.0		7.1	103.8		#81.4	47.4	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	316	977		398	959		418	972		419	1458	
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	0.35	0.49		0.37	0.75		0.06	0.75		0.72	0.29	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

Cycle Length: 112

Actuated Cycle Length: 105.4

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 36.0

Intersection LOS: D

Intersection Capacity Utilization 86.7%

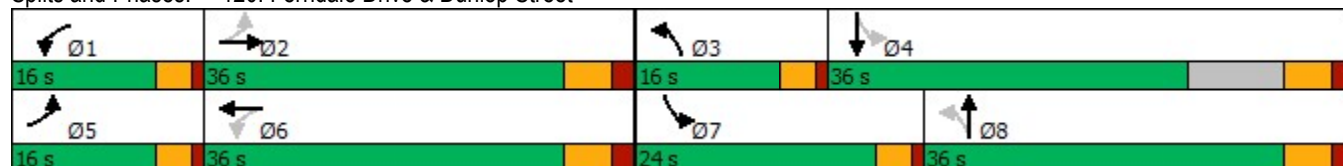
ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	683	269	10	427	20	130	20	10	74	80	89
Future Volume (vph)	68	683	269	10	427	20	130	20	10	74	80	89
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	76	759	299	11	496	0	144	33	0	82	188	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8			4		
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	60.0	60.0	7.0	60.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	66.0	66.0	11.5	66.0		11.0	36.0		11.5	36.0	
Total Split (s)	16.0	66.0	66.0	16.0	66.0		16.0	26.0		16.0	26.0	
Total Split (%)	12.9%	53.2%	53.2%	12.9%	53.2%		12.9%	21.0%		12.9%	21.0%	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max	Max	None	Max		None	None		None	None	
Act Effect Green (s)	71.7	67.9	67.9	67.9	60.5		27.3	18.4		28.4	15.4	
Actuated g/C Ratio	0.64	0.60	0.60	0.60	0.54		0.24	0.16		0.25	0.14	
v/c Ratio	0.14	0.36	0.29	0.03	0.28		0.53	0.12		0.21	0.73	
Control Delay	9.1	13.0	2.3	8.9	16.1		42.1	33.1		32.0	54.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.1	13.0	2.3	8.9	16.1		42.1	33.1		32.0	54.4	
LOS	A	B	A	A	B		D	C		C	D	
Approach Delay		9.9			15.9			40.4			47.6	
Approach LOS		A			B			D			D	
Queue Length 50th (m)	6.3	43.0	0.0	0.9	33.6		26.7	4.5		14.5	34.5	
Queue Length 95th (m)	13.4	75.9	14.0	3.4	49.8		45.3	14.4		27.6	61.1	
Internal Link Dist (m)		363.2			184.5			357.0			236.1	
Turn Bay Length (m)	245.0		130.0	165.0			240.0			125.0		
Base Capacity (vph)	599	2092	1046	418	1744		278	307		413	326	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.13	0.36	0.29	0.03	0.28		0.52	0.11		0.20	0.58	
Intersection Summary												

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

Cycle Length: 124

Actuated Cycle Length: 112.7

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 18.8

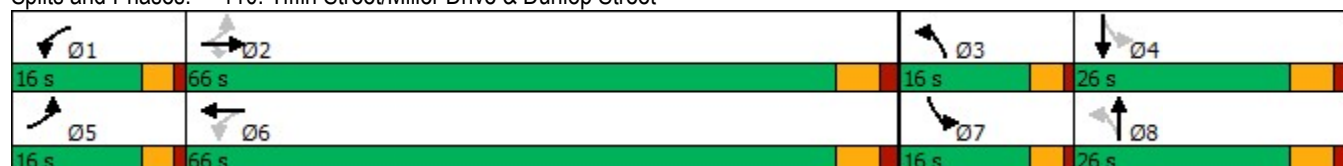
Intersection LOS: B

Intersection Capacity Utilization 86.7%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 110: Tiffin Street/Miller Drive & Dunlop Street



Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	653	36	145	418	209	22	264	157	410	410	70
Future Volume (vph)	65	653	36	145	418	209	22	264	157	410	410	70
Confl. Peds. (#/hr)			1	1			2					2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	758	0	159	689	0	24	463	0	451	528	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	16.0	36.0		16.0	36.0		16.0	36.0		24.0	36.0	
Total Split (%)	14.3%	32.1%		14.3%	32.1%		14.3%	32.1%		21.4%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	40.1	30.1		45.2	34.6		25.4	16.2		42.3	36.1	
Actuated g/C Ratio	0.42	0.31		0.47	0.36		0.26	0.17		0.44	0.37	
v/c Ratio	0.22	0.72		0.54	0.58		0.09	0.73		0.94	0.41	
Control Delay	16.6	34.7		22.2	26.0		17.8	36.6		52.8	23.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	16.6	34.7		22.2	26.0		17.8	36.6		52.8	23.9	
LOS	B	C		C	C		B	D		D	C	
Approach Delay		33.2			25.3			35.7			37.2	
Approach LOS		C			C			D			D	
Queue Length 50th (m)	7.3	69.2		17.3	52.4		2.6	35.4		65.4	35.5	
Queue Length 95th (m)	16.7	100.3		33.1	80.9		7.4	53.4		#129.3	60.7	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	403	1058		326	1184		353	1076		478	1372	
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	0.18	0.72		0.49	0.58		0.07	0.43		0.94	0.38	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

Cycle Length: 112

Actuated Cycle Length: 96.6

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 32.7

Intersection LOS: C

Intersection Capacity Utilization 84.7%

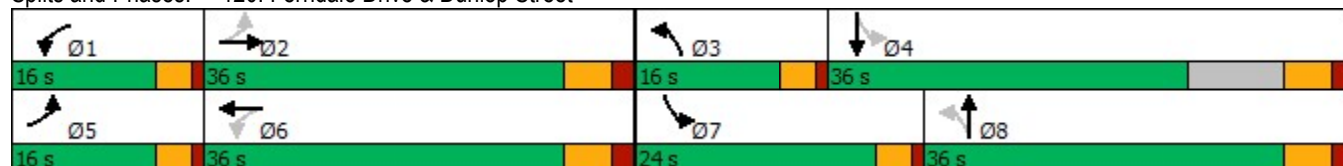
ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	129	526	233	12	619	44	217	100	10	47	39	64
Future Volume (vph)	129	526	233	12	619	44	217	100	10	47	39	64
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	136	554	245	13	698	0	228	116	0	49	108	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8			4		
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	60.0	60.0	7.0	60.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	66.0	66.0	11.5	66.0		11.0	36.0		11.5	36.0	
Total Split (s)	16.0	66.0	66.0	16.0	66.0		16.0	26.0		16.0	26.0	
Total Split (%)	12.9%	53.2%	53.2%	12.9%	53.2%		12.9%	21.0%		12.9%	21.0%	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max	Max	None	Max		None	None		None	None	
Act Effect Green (s)	75.6	71.6	71.6	69.1	60.1		28.9	17.6		21.8	11.5	
Actuated g/C Ratio	0.67	0.63	0.63	0.61	0.53		0.26	0.16		0.19	0.10	
v/c Ratio	0.28	0.25	0.23	0.03	0.41		0.77	0.42		0.17	0.50	
Control Delay	8.5	10.2	2.0	7.3	17.1		56.0	49.2		34.0	33.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	8.5	10.2	2.0	7.3	17.1		56.0	49.2		34.0	33.0	
LOS	A	B	A	A	B		E	D		C	C	
Approach Delay		7.8			16.9			53.7			33.3	
Approach LOS		A			B			D			C	
Queue Length 50th (m)	9.9	24.7	0.0	0.9	46.8		45.8	24.3		8.7	11.2	
Queue Length 95th (m)	20.2	49.8	12.1	3.4	71.9		#82.5	45.3		19.0	29.6	
Internal Link Dist (m)		363.2			184.5			357.0			236.1	
Turn Bay Length (m)	245.0		130.0	165.0			240.0			125.0		
Base Capacity (vph)	515	2194	1062	506	1716		295	330		339	334	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.26	0.25	0.23	0.03	0.41		0.77	0.35		0.14	0.32	
Intersection Summary												

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

Cycle Length: 124

Actuated Cycle Length: 113.2

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 20.1

Intersection LOS: C

Intersection Capacity Utilization 89.4%

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: 110: Tiffin Street/Miller Drive & Dunlop Street

 Ø1	 Ø2	 Ø3	 Ø4
16 s	66 s	16 s	26 s
 Ø5	 Ø6	 Ø7	 Ø8
16 s	66 s	16 s	26 s

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	113	495	19	146	596	164	25	593	131	298	354	71
Future Volume (vph)	113	495	19	146	596	164	25	593	131	298	354	71
Confl. Peds. (#/hr)			3	3			1		5	5		1
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	116	530	0	151	783	0	26	746	0	307	438	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	16.0	36.0		16.0	36.0		16.0	36.0		24.0	36.0	
Total Split (%)	14.3%	32.1%		14.3%	32.1%		14.3%	32.1%		21.4%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	41.8	30.2		43.2	30.9		35.8	26.6		51.6	43.2	
Actuated g/C Ratio	0.39	0.28		0.41	0.29		0.34	0.25		0.49	0.41	
v/c Ratio	0.46	0.55		0.44	0.82		0.08	0.87		0.78	0.31	
Control Delay	25.5	35.8		23.8	43.3		16.1	49.6		37.7	22.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	25.5	35.8		23.8	43.3		16.1	49.6		37.7	22.0	
LOS	C	D		C	D		B	D		D	C	
Approach Delay		33.9			40.1			48.5			28.5	
Approach LOS		C			D			D			C	
Queue Length 50th (m)	16.0	55.1		21.4	85.7		2.9	82.1		45.8	34.7	
Queue Length 95th (m)	28.1	73.9		35.8	#123.7		7.8	106.6		#87.1	48.8	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	291	967		371	952		418	964		411	1392	
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	0.40	0.55		0.41	0.82		0.06	0.77		0.75	0.31	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

Cycle Length: 112

Actuated Cycle Length: 106.2

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 38.1

Intersection LOS: D

Intersection Capacity Utilization 87.6%

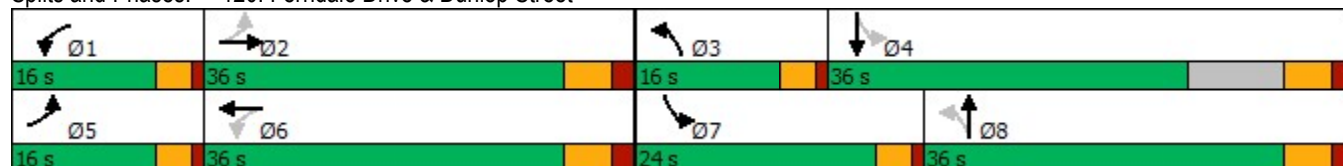
ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
110: Tiffin Street/Miller Drive & Dunlop Street

01-27-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	695	269	11	431	21	130	20	14	76	80	89
Future Volume (vph)	68	695	269	11	431	21	130	20	14	76	80	89
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	76	772	299	12	502	0	144	38	0	84	188	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8			4		
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	60.0	60.0	7.0	60.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	66.0	66.0	11.5	66.0		11.0	36.0		11.5	36.0	
Total Split (s)	16.0	66.0	66.0	16.0	66.0		16.0	26.0		16.0	26.0	
Total Split (%)	12.9%	53.2%	53.2%	12.9%	53.2%		12.9%	21.0%		12.9%	21.0%	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max	Max	None	Max		None	None		None	None	
Act Effct Green (s)	71.1	65.8	65.8	67.9	60.5		27.3	18.4		28.4	15.4	
Actuated g/C Ratio	0.63	0.58	0.58	0.60	0.54		0.24	0.16		0.25	0.14	
v/c Ratio	0.14	0.38	0.29	0.03	0.29		0.53	0.14		0.22	0.73	
Control Delay	9.1	14.6	2.5	8.9	16.0		41.9	30.1		32.0	54.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.1	14.6	2.5	8.9	16.0		41.9	30.1		32.0	54.3	
LOS	A	B	A	A	B		D	C		C	D	
Approach Delay		11.1			15.9			39.4			47.4	
Approach LOS		B			B			D			D	
Queue Length 50th (m)	6.3	44.0	0.0	1.0	34.2		26.7	4.5		14.9	34.5	
Queue Length 95th (m)	13.4	77.5	14.0	3.6	50.6		45.3	15.1		28.0	61.1	
Internal Link Dist (m)		363.2			184.5			357.0			236.1	
Turn Bay Length (m)	245.0		130.0	165.0			240.0			125.0		
Base Capacity (vph)	596	2027	1022	406	1746		279	303		413	326	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.13	0.38	0.29	0.03	0.29		0.52	0.13		0.20	0.58	
Intersection Summary												

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

01-27-2023

Cycle Length: 124

Actuated Cycle Length: 112.6

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 19.4

Intersection LOS: B

Intersection Capacity Utilization 86.7%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 110: Tiffin Street/Miller Drive & Dunlop Street

 Ø1	 Ø2	 Ø3	 Ø4
16 s	66 s	16 s	26 s
 Ø5	 Ø6	 Ø7	 Ø8
16 s	66 s	16 s	26 s

Lanes, Volumes, Timings
120: Ferndale Drive & Dunlop Street

01-27-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	661	37	145	439	209	25	264	157	410	410	75
Future Volume (vph)	67	661	37	145	439	209	25	264	157	410	410	75
Confl. Peds. (#/hr)			1	1			2					2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	74	767	0	159	712	0	27	463	0	451	533	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	16.0	36.0		16.0	36.0		16.0	36.0		24.0	36.0	
Total Split (%)	14.3%	32.1%		14.3%	32.1%		14.3%	32.1%		21.4%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	40.2	30.1		45.1	34.6		25.4	16.2		42.3	36.0	
Actuated g/C Ratio	0.42	0.31		0.47	0.36		0.26	0.17		0.44	0.37	
v/c Ratio	0.23	0.72		0.54	0.60		0.10	0.73		0.94	0.42	
Control Delay	16.7	35.0		22.5	26.9		17.9	36.6		52.8	24.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	16.7	35.0		22.5	26.9		17.9	36.6		52.8	24.0	
LOS	B	C		C	C		B	D		D	C	
Approach Delay		33.4			26.1			35.6			37.2	
Approach LOS		C			C			D			D	
Queue Length 50th (m)	7.6	70.3		17.3	55.6		3.0	35.4		65.4	35.8	
Queue Length 95th (m)	17.1	102.0		33.1	85.2		8.0	53.4		#129.3	61.4	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	393	1058		323	1179		352	1076		478	1371	
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	0.19	0.72		0.49	0.60		0.08	0.43		0.94	0.39	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

01-27-2023

Cycle Length: 112

Actuated Cycle Length: 96.6

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 32.9

Intersection LOS: C

Intersection Capacity Utilization 84.7%

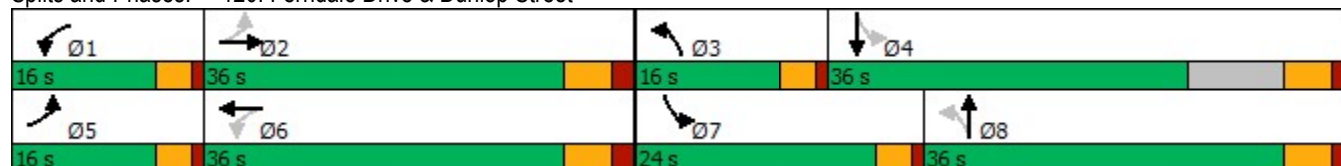
ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
210: West Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	785	1	1	465	1	2
Future Volume (vph)	785	1	1	465	1	2
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	873	0	0	518	3	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 51.4%				ICU Level of Service A		
Analysis Period (min) 15						

Lanes, Volumes, Timings
220: East Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	769	17	26	461	4	7
Future Volume (vph)	769	17	26	461	4	7
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	873	0	0	541	12	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 55.5%				ICU Level of Service B		
Analysis Period (min) 15						

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

01-27-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	129	532	233	14	631	47	217	100	12	48	39	64
Future Volume (vph)	129	532	233	14	631	47	217	100	12	48	39	64
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	136	560	245	15	713	0	228	118	0	51	108	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8			4		
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	60.0	60.0	7.0	60.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	66.0	66.0	11.5	66.0		11.0	36.0		11.5	36.0	
Total Split (s)	16.0	66.0	66.0	16.0	66.0		16.0	26.0		16.0	26.0	
Total Split (%)	12.9%	53.2%	53.2%	12.9%	53.2%		12.9%	21.0%		12.9%	21.0%	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max	Max	None	Max		None	None		None	None	
Act Effct Green (s)	75.2	69.2	69.2	69.1	60.1		29.0	17.7		22.0	11.7	
Actuated g/C Ratio	0.66	0.61	0.61	0.61	0.53		0.26	0.16		0.19	0.10	
v/c Ratio	0.28	0.26	0.24	0.03	0.42		0.77	0.43		0.18	0.49	
Control Delay	8.7	11.6	2.3	7.4	17.2		55.3	49.3		33.8	32.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	8.7	11.6	2.3	7.4	17.2		55.3	49.3		33.8	32.6	
LOS	A	B	A	A	B		E	D		C	C	
Approach Delay		8.8			17.0			53.2			33.0	
Approach LOS		A			B			D			C	
Queue Length 50th (m)	9.9	25.0	0.0	1.0	48.1		45.8	24.8		9.1	11.2	
Queue Length 95th (m)	20.5	51.0	12.2	3.9	74.6		#81.2	46.0		19.6	29.6	
Internal Link Dist (m)		363.2			184.5			357.0			236.1	
Turn Bay Length (m)	245.0		130.0	165.0			240.0			125.0		
Base Capacity (vph)	507	2121	1035	504	1716		296	328		341	335	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.27	0.26	0.24	0.03	0.42		0.77	0.36		0.15	0.32	
Intersection Summary												

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

01-27-2023

Cycle Length: 124

Actuated Cycle Length: 113.2

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 20.4

Intersection LOS: C

Intersection Capacity Utilization 89.4%

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: 110: Tiffin Street/Miller Drive & Dunlop Street

 Ø1	 Ø2	 Ø3	 Ø4
16 s	66 s	16 s	26 s
 Ø5	 Ø6	 Ø7	 Ø8
16 s	66 s	16 s	26 s

Lanes, Volumes, Timings
120: Ferndale Drive & Dunlop Street

01-27-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	118	519	21	146	606	164	26	593	131	298	354	73
Future Volume (vph)	118	519	21	146	606	164	26	593	131	298	354	73
Confl. Peds. (#/hr)			3	3			1		5	5		1
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	122	557	0	151	794	0	27	746	0	307	440	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	16.0	36.0		16.0	36.0		16.0	36.0		24.0	36.0	
Total Split (%)	14.3%	32.1%		14.3%	32.1%		14.3%	32.1%		21.4%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	42.0	30.2		43.1	30.8		35.8	26.6		51.6	43.2	
Actuated g/C Ratio	0.40	0.28		0.41	0.29		0.34	0.25		0.49	0.41	
v/c Ratio	0.49	0.58		0.45	0.84		0.08	0.87		0.78	0.32	
Control Delay	26.4	36.3		24.2	44.5		16.1	49.6		37.7	22.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	26.4	36.3		24.2	44.5		16.1	49.6		37.7	22.0	
LOS	C	D		C	D		B	D		D	C	
Approach Delay		34.5			41.3			48.4			28.5	
Approach LOS		C			D			D			C	
Queue Length 50th (m)	16.9	58.4		21.4	87.9		3.0	82.1		45.8	34.9	
Queue Length 95th (m)	29.6	77.8		35.8	#126.8		7.9	106.6		#87.1	49.1	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	286	968		359	947		417	964		411	1391	
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	0.43	0.58		0.42	0.84		0.06	0.77		0.75	0.32	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

01-27-2023

Cycle Length: 112

Actuated Cycle Length: 106.2

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 38.5

Intersection LOS: D

Intersection Capacity Utilization 87.6%

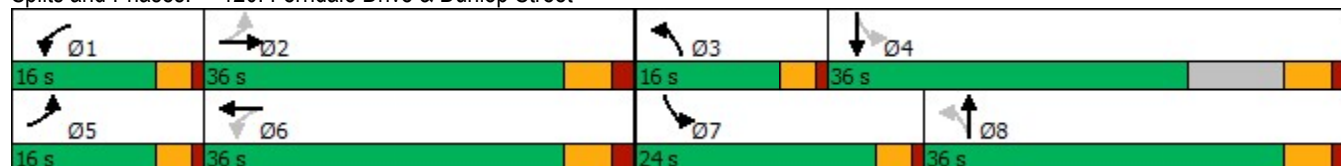
ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
210: West Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	591	2	3	702	1	1
Future Volume (vph)	591	2	3	702	1	1
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	624	0	0	742	2	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 49.3%				ICU Level of Service A		
Analysis Period (min) 15						

Lanes, Volumes, Timings
220: East Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	585	5	8	689	15	28
Future Volume (vph)	585	5	8	689	15	28
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	621	0	0	733	45	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 52.6%				ICU Level of Service A		
Analysis Period (min) 15						

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	842	283	11	523	21	137	21	10	77	84	94
Future Volume (vph)	71	842	283	11	523	21	137	21	10	77	84	94
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	79	936	314	12	604	0	152	34	0	86	197	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8			4		
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	60.0	60.0	7.0	60.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	66.0	66.0	11.5	66.0		11.0	36.0		11.5	36.0	
Total Split (s)	16.0	66.0	66.0	16.0	66.0		16.0	26.0		16.0	26.0	
Total Split (%)	12.9%	53.2%	53.2%	12.9%	53.2%		12.9%	21.0%		12.9%	21.0%	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max	Max	None	Max		None	None		None	None	
Act Effect Green (s)	71.2	65.8	65.8	67.9	60.5		27.6	18.7		28.9	15.8	
Actuated g/C Ratio	0.63	0.58	0.58	0.60	0.53		0.24	0.17		0.26	0.14	
v/c Ratio	0.16	0.46	0.31	0.04	0.35		0.57	0.12		0.22	0.75	
Control Delay	9.4	15.9	2.5	9.1	17.0		43.5	33.4		31.9	56.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.4	15.9	2.5	9.1	17.0		43.5	33.4		31.9	56.2	
LOS	A	B	A	A	B		D	C		C	E	
Approach Delay		12.4			16.9			41.6			48.8	
Approach LOS		B			B			D			D	
Queue Length 50th (m)	6.7	57.8	0.0	1.0	43.5		28.4	4.8		15.3	36.9	
Queue Length 95th (m)	13.8	98.4	14.2	3.6	62.3		47.7	14.7		28.7	64.5	
Internal Link Dist (m)		363.2			184.5			357.0			236.1	
Turn Bay Length (m)	245.0		130.0	165.0			240.0			125.0		
Base Capacity (vph)	539	2019	1026	349	1739		274	309		416	325	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.15	0.46	0.31	0.03	0.35		0.55	0.11		0.21	0.61	
Intersection Summary												

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

Cycle Length: 124

Actuated Cycle Length: 113.1

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 20.0

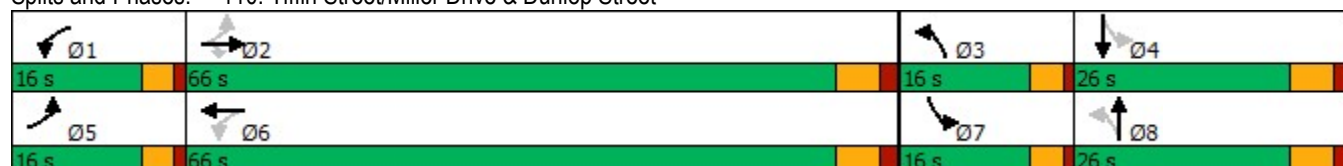
Intersection LOS: C

Intersection Capacity Utilization 90.1%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 110: Tiffin Street/Miller Drive & Dunlop Street



Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	810	38	153	511	220	23	277	164	431	431	74
Future Volume (vph)	68	810	38	153	511	220	23	277	164	431	431	74
Confl. Peds. (#/hr)			1	1			2					2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	75	932	0	168	804	0	25	484	0	474	555	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	16.0	36.0		16.0	36.0		16.0	36.0		24.0	36.0	
Total Split (%)	14.3%	32.1%		14.3%	32.1%		14.3%	32.1%		21.4%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	40.2	30.1		45.7	34.9		26.2	17.1		43.2	36.9	
Actuated g/C Ratio	0.41	0.31		0.47	0.36		0.27	0.17		0.44	0.38	
v/c Ratio	0.26	0.89		0.66	0.69		0.09	0.75		1.01	0.43	
Control Delay	17.7	45.0		31.3	30.1		17.8	37.4		68.0	24.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	17.7	45.0		31.3	30.1		17.8	37.4		68.0	24.1	
LOS	B	D		C	C		B	D		E	C	
Approach Delay		43.0			30.3			36.5			44.4	
Approach LOS		D			C			D			D	
Queue Length 50th (m)	7.9	93.5		18.7	68.3		2.8	38.3		~74.4	38.2	
Queue Length 95th (m)	17.6	#146.3		#43.2	102.6		7.7	56.5		#144.7	64.1	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	354	1046		281	1170		351	1063		470	1367	
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	0.21	0.89		0.60	0.69		0.07	0.46		1.01	0.41	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

Cycle Length: 112

Actuated Cycle Length: 97.8

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 38.9

Intersection LOS: D

Intersection Capacity Utilization 86.9%

ICU Level of Service E

Analysis Period (min) 15

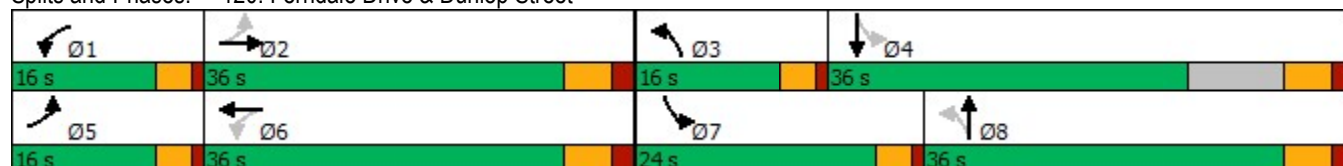
~ Volume exceeds capacity, queue is theoretically infinite.

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: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	135	648	245	12	761	47	228	104	10	48	41	67
Future Volume (vph)	135	648	245	12	761	47	228	104	10	48	41	67
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	142	682	258	13	850	0	240	120	0	51	114	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8			4		
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	60.0	60.0	7.0	60.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	66.0	66.0	11.5	66.0		11.0	36.0		11.5	36.0	
Total Split (s)	16.0	66.0	66.0	16.0	66.0		16.0	26.0		16.0	26.0	
Total Split (%)	12.9%	53.2%	53.2%	12.9%	53.2%		12.9%	21.0%		12.9%	21.0%	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max	Max	None	Max		None	None		None	None	
Act Effct Green (s)	75.4	69.3	69.3	69.1	60.1		29.1	17.8		22.1	11.8	
Actuated g/C Ratio	0.66	0.61	0.61	0.61	0.53		0.26	0.16		0.19	0.10	
v/c Ratio	0.34	0.32	0.25	0.03	0.50		0.82	0.44		0.18	0.52	
Control Delay	9.5	12.2	2.3	7.5	18.6		60.9	49.8		33.8	34.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.5	12.2	2.3	7.5	18.6		60.9	49.8		33.8	34.3	
LOS	A	B	A	A	B		E	D		C	C	
Approach Delay		9.5			18.4			57.2			34.1	
Approach LOS		A			B			E			C	
Queue Length 50th (m)	10.3	31.7	0.0	0.9	61.2		48.8	25.6		9.1	12.6	
Queue Length 95th (m)	21.3	63.6	12.5	3.5	92.8		#91.0	46.7		19.6	31.7	
Internal Link Dist (m)		363.2			184.5			357.0			236.1	
Turn Bay Length (m)	245.0		130.0	165.0			240.0			125.0		
Base Capacity (vph)	447	2122	1040	463	1716		292	329		341	334	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.32	0.32	0.25	0.03	0.50		0.82	0.36		0.15	0.34	
Intersection Summary												

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

Cycle Length: 124

Actuated Cycle Length: 113.4

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 21.2

Intersection LOS: C

Intersection Capacity Utilization 90.3%

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: 110: Tiffin Street/Miller Drive & Dunlop Street

 Ø1	 Ø2	 Ø3	 Ø4
16 s	66 s	16 s	26 s
 Ø5	 Ø6	 Ø7	 Ø8
16 s	66 s	16 s	26 s

Lanes, Volumes, Timings
120: Ferndale Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	119	613	20	154	736	172	26	623	138	314	373	74
Future Volume (vph)	119	613	20	154	736	172	26	623	138	314	373	74
Confl. Peds. (#/hr)			3	3			1		5	5		1
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	123	653	0	159	936	0	27	784	0	324	461	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	16.0	36.0		16.0	36.0		16.0	36.0		24.0	36.0	
Total Split (%)	14.3%	32.1%		14.3%	32.1%		14.3%	32.1%		21.4%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	42.0	30.1		43.5	30.9		36.9	27.7		53.1	44.6	
Actuated g/C Ratio	0.39	0.28		0.40	0.29		0.34	0.26		0.49	0.41	
v/c Ratio	0.53	0.69		0.54	1.00		0.08	0.90		0.84	0.33	
Control Delay	28.3	39.7		27.3	68.6		16.2	52.0		45.5	22.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	28.3	39.7		27.3	68.6		16.2	52.0		45.5	22.2	
LOS	C	D		C	E		B	D		D	C	
Approach Delay		37.9			62.6			50.8			31.8	
Approach LOS		D			E			D			C	
Queue Length 50th (m)	17.1	71.4		22.6	~113.6		3.1	88.2		53.4	37.3	
Queue Length 95th (m)	29.6	92.8		37.6	#165.5		7.9	#120.6		#101.3	51.6	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	267	952		313	934		415	947		399	1414	
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	0.46	0.69		0.51	1.00		0.07	0.83		0.81	0.33	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

Cycle Length: 112

Actuated Cycle Length: 107.9

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 47.3

Intersection LOS: D

Intersection Capacity Utilization 89.8%

ICU Level of Service E

Analysis Period (min) 15

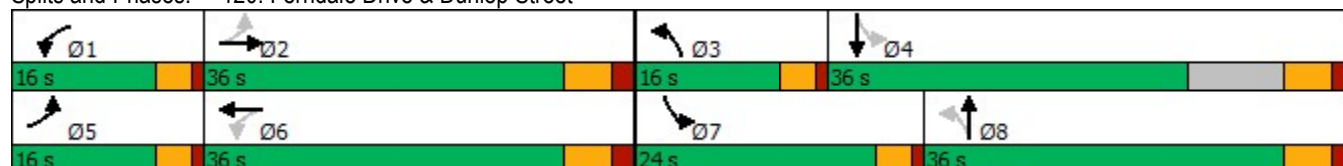
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

Splits and Phases: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
110: Tiffin Street/Miller Drive & Dunlop Street

01-27-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	854	283	12	528	22	137	21	15	79	84	94
Future Volume (vph)	71	854	283	12	528	22	137	21	15	79	84	94
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	79	949	314	13	611	0	152	40	0	88	197	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8			4		
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	60.0	60.0	7.0	60.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	66.0	66.0	11.5	66.0		11.0	36.0		11.5	36.0	
Total Split (s)	16.0	66.0	66.0	16.0	66.0		16.0	26.0		16.0	26.0	
Total Split (%)	12.9%	53.2%	53.2%	12.9%	53.2%		12.9%	21.0%		12.9%	21.0%	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max	Max	None	Max		None	None		None	None	
Act Effect Green (s)	71.2	65.8	65.8	67.9	60.5		27.7	18.8		28.9	15.8	
Actuated g/C Ratio	0.63	0.58	0.58	0.60	0.53		0.24	0.17		0.26	0.14	
v/c Ratio	0.16	0.47	0.31	0.05	0.35		0.57	0.14		0.23	0.75	
Control Delay	9.5	16.1	2.5	9.2	17.1		43.3	29.9		32.0	56.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.5	16.1	2.5	9.2	17.1		43.3	29.9		32.0	56.2	
LOS	A	B	A	A	B		D	C		C	E	
Approach Delay		12.5			16.9			40.5			48.8	
Approach LOS		B			B			D			D	
Queue Length 50th (m)	6.7	59.0	0.0	1.1	44.1		28.4	4.8		15.7	36.9	
Queue Length 95th (m)	13.8	100.1	14.2	3.8	62.9		47.7	15.6		29.3	64.5	
Internal Link Dist (m)		363.2			184.5			357.0			236.1	
Turn Bay Length (m)	245.0		130.0	165.0			240.0			125.0		
Base Capacity (vph)	535	2016	1024	343	1736		274	307		416	324	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.15	0.47	0.31	0.04	0.35		0.55	0.13		0.21	0.61	
Intersection Summary												

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

01-27-2023

Cycle Length: 124

Actuated Cycle Length: 113.3

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 20.1

Intersection LOS: C

Intersection Capacity Utilization 90.1%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 110: Tiffin Street/Miller Drive & Dunlop Street

 Ø1	 Ø2	 Ø3	 Ø4
16 s	66 s	16 s	26 s
 Ø5	 Ø6	 Ø7	 Ø8
16 s	66 s	16 s	26 s

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

01-27-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	818	39	153	532	220	26	277	164	431	431	79
Future Volume (vph)	70	818	39	153	532	220	26	277	164	431	431	79
Confl. Peds. (#/hr)			1	1			2					2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	77	942	0	168	827	0	29	484	0	474	561	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	16.0	36.0		16.0	36.0		16.0	36.0		24.0	36.0	
Total Split (%)	14.3%	32.1%		14.3%	32.1%		14.3%	32.1%		21.4%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	40.3	30.1		45.6	34.8		26.3	17.1		43.2	34.6	
Actuated g/C Ratio	0.41	0.31		0.47	0.36		0.27	0.17		0.44	0.35	
v/c Ratio	0.28	0.90		0.66	0.71		0.11	0.75		1.01	0.46	
Control Delay	17.9	46.1		31.3	31.0		17.9	37.4		70.5	26.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	17.9	46.1		31.3	31.0		17.9	37.4		70.5	26.1	
LOS	B	D		C	C		B	D		E	C	
Approach Delay		43.9			31.1			36.3			46.4	
Approach LOS		D			C			D			D	
Queue Length 50th (m)	8.1	94.9		18.7	71.5		3.2	38.3		~79.3	47.0	
Queue Length 95th (m)	18.0	#148.7		#43.4	#107.5		8.5	56.5		#146.8	65.0	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	348	1046		281	1166		350	1063		467	1343	
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	0.90		0.60	0.71		0.08	0.46		1.01	0.42	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

01-27-2023

Cycle Length: 112

Actuated Cycle Length: 97.8

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 40.0

Intersection LOS: D

Intersection Capacity Utilization 86.9%

ICU Level of Service E

Analysis Period (min) 15

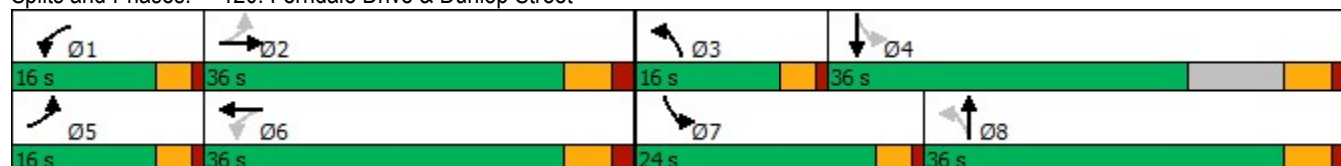
~ Volume exceeds capacity, queue is theoretically infinite.

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: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
210: West Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	947	1	1	563	1	2
Future Volume (vph)	947	1	1	563	1	2
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1053	0	0	627	3	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 59.9%				ICU Level of Service B		
Analysis Period (min) 15						

Lanes, Volumes, Timings
220: East Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	931	17	26	559	4	7
Future Volume (vph)	931	17	26	559	4	7
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1053	0	0	650	12	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 60.6%				ICU Level of Service B		
Analysis Period (min) 15						

Lanes, Volumes, Timings
110: Tiffin Street/Miller Drive & Dunlop Street

01-27-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	135	654	245	15	773	49	228	104	12	50	41	67
Future Volume (vph)	135	654	245	15	773	49	228	104	12	50	41	67
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	142	688	258	16	866	0	240	122	0	53	114	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8			4		
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	60.0	60.0	7.0	60.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	66.0	66.0	11.5	66.0		11.0	36.0		11.5	36.0	
Total Split (s)	16.0	66.0	66.0	16.0	66.0		16.0	26.0		16.0	26.0	
Total Split (%)	12.9%	53.2%	53.2%	12.9%	53.2%		12.9%	21.0%		12.9%	21.0%	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max	Max	None	Max		None	None		None	None	
Act Effect Green (s)	75.4	69.3	69.3	69.1	60.1		29.1	17.8		22.3	11.9	
Actuated g/C Ratio	0.66	0.61	0.61	0.61	0.53		0.26	0.16		0.20	0.10	
v/c Ratio	0.35	0.32	0.25	0.04	0.51		0.82	0.44		0.19	0.52	
Control Delay	9.6	12.3	2.3	7.6	18.8		60.8	49.6		33.8	34.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.6	12.3	2.3	7.6	18.8		60.8	49.6		33.8	34.0	
LOS	A	B	A	A	B		E	D		C	C	
Approach Delay		9.6			18.6			57.1			34.0	
Approach LOS		A			B			E			C	
Queue Length 50th (m)	10.3	32.0	0.0	1.1	62.7		48.8	25.9		9.5	12.6	
Queue Length 95th (m)	21.5	64.7	12.6	4.1	95.8		#90.9	47.4		20.0	31.7	
Internal Link Dist (m)		363.2			184.5			357.0			236.1	
Turn Bay Length (m)	245.0		130.0	165.0			240.0			125.0		
Base Capacity (vph)	441	2120	1039	461	1714		292	328		342	334	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.32	0.32	0.25	0.03	0.51		0.82	0.37		0.15	0.34	
Intersection Summary												

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

01-27-2023

Cycle Length: 124

Actuated Cycle Length: 113.5

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 21.3

Intersection LOS: C

Intersection Capacity Utilization 90.3%

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: 110: Tiffin Street/Miller Drive & Dunlop Street

 Ø1	 Ø2	 Ø3	 Ø4
16 s	66 s	16 s	26 s
 Ø5	 Ø6	 Ø7	 Ø8
16 s	66 s	16 s	26 s

Lanes, Volumes, Timings
120: Ferndale Drive & Dunlop Street

01-27-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	123	637	22	154	746	172	27	623	138	314	373	77
Future Volume (vph)	123	637	22	154	746	172	27	623	138	314	373	77
Confl. Peds. (#/hr)			3	3			1		5	5		1
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	127	680	0	159	946	0	28	784	0	324	464	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	16.0	36.0		16.0	36.0		16.0	36.0		24.0	36.0	
Total Split (%)	14.3%	32.1%		14.3%	32.1%		14.3%	32.1%		21.4%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	42.1	30.1		43.4	30.8		36.9	27.7		53.1	44.6	
Actuated g/C Ratio	0.39	0.28		0.40	0.29		0.34	0.26		0.49	0.41	
v/c Ratio	0.54	0.72		0.56	1.02		0.08	0.90		0.84	0.33	
Control Delay	28.8	40.7		28.1	72.3		16.1	52.0		45.5	22.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	28.8	40.7		28.1	72.3		16.1	52.0		45.5	22.2	
LOS	C	D		C	E		B	D		D	C	
Approach Delay		38.8			65.9			50.7			31.8	
Approach LOS		D			E			D			C	
Queue Length 50th (m)	17.7	75.1		22.6	~120.8		3.2	88.2		53.4	37.5	
Queue Length 95th (m)	30.6	97.3		37.6	#168.6		8.0	#120.6		#101.3	52.0	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	267	951		304	930		413	947		399	1413	
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	0.48	0.72		0.52	1.02		0.07	0.83		0.81	0.33	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

01-27-2023

Cycle Length: 112

Actuated Cycle Length: 107.9

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 48.5

Intersection LOS: D

Intersection Capacity Utilization 89.8%

ICU Level of Service E

Analysis Period (min) 15

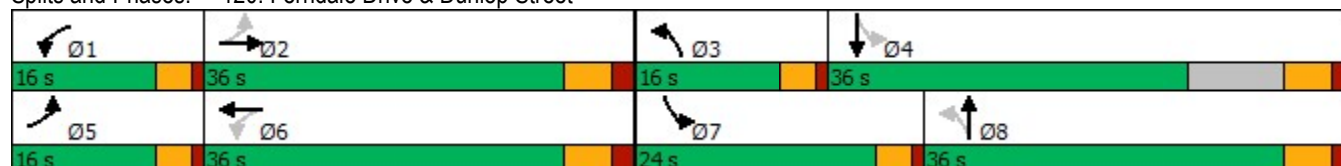
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

Splits and Phases: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
210: West Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	715	2	3	846	1	1
Future Volume (vph)	715	2	3	846	1	1
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	755	0	0	894	2	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 56.9%				ICU Level of Service B		
Analysis Period (min) 15						

Lanes, Volumes, Timings
220: East Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	709	5	8	833	15	28
Future Volume (vph)	709	5	8	833	15	28
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	751	0	0	885	45	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 60.2%				ICU Level of Service B		
Analysis Period (min) 15						

Lanes, Volumes, Timings
110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	1035	297	11	641	22	144	22	11	80	88	99
Future Volume (vph)	75	1035	297	11	641	22	144	22	11	80	88	99
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	83	1150	330	12	736	0	160	36	0	89	208	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8			4		
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	60.0	60.0	7.0	60.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	66.0	66.0	11.5	66.0		11.0	36.0		11.5	36.0	
Total Split (s)	16.0	66.0	66.0	16.0	66.0		16.0	26.0		16.0	26.0	
Total Split (%)	12.9%	53.2%	53.2%	12.9%	53.2%		12.9%	21.0%		12.9%	21.0%	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max	Max	None	Max		None	None		None	None	
Act Effect Green (s)	71.4	65.9	65.9	67.9	60.5		28.0	19.2		29.4	16.2	
Actuated g/C Ratio	0.63	0.58	0.58	0.60	0.53		0.25	0.17		0.26	0.14	
v/c Ratio	0.19	0.57	0.32	0.05	0.43		0.60	0.13		0.23	0.78	
Control Delay	9.9	18.0	2.5	9.4	18.4		45.2	33.1		32.0	58.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.9	18.0	2.5	9.4	18.4		45.2	33.1		32.0	58.8	
LOS	A	B	A	A	B		D	C		C	E	
Approach Delay		14.3			18.3			43.0			50.8	
Approach LOS		B			B			D			D	
Queue Length 50th (m)	7.3	79.9	0.0	1.0	57.4		30.1	5.0		15.9	39.9	
Queue Length 95th (m)	14.4	130.1	14.4	3.6	78.5		50.3	15.4		29.6	#68.6	
Internal Link Dist (m)		363.2			184.5			357.0			236.1	
Turn Bay Length (m)	245.0		130.0	165.0			240.0			125.0		
Base Capacity (vph)	473	2007	1028	286	1729		270	311		418	323	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.18	0.57	0.32	0.04	0.43		0.59	0.12		0.21	0.64	
Intersection Summary												

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

Cycle Length: 124

Actuated Cycle Length: 114

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 21.2

Intersection LOS: C

Intersection Capacity Utilization 91.2%

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: 110: Tiffin Street/Miller Drive & Dunlop Street

 Ø1	 Ø2	 Ø3	 Ø4
16 s	66 s	16 s	26 s
 Ø5	 Ø6	 Ø7	 Ø8
16 s	66 s	16 s	26 s

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	1001	40	160	626	231	24	292	173	453	453	78
Future Volume (vph)	71	1001	40	160	626	231	24	292	173	453	453	78
Confl. Peds. (#/hr)			1	1			2					2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	78	1144	0	176	942	0	26	511	0	498	584	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	16.0	36.0		16.0	36.0		16.0	36.0		24.0	36.0	
Total Split (%)	14.3%	32.1%		14.3%	32.1%		14.3%	32.1%		21.4%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	40.3	30.1		46.1	35.0		27.4	18.2		44.3	38.0	
Actuated g/C Ratio	0.41	0.30		0.46	0.35		0.28	0.18		0.45	0.38	
v/c Ratio	0.33	1.11		0.68	0.82		0.10	0.75		1.08	0.44	
Control Delay	19.8	96.5		34.2	36.5		17.6	37.8		88.8	24.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	19.8	96.5		34.2	36.5		17.6	37.8		88.8	24.3	
LOS	B	F		C	D		B	D		F	C	
Approach Delay		91.6			36.2			36.8			54.0	
Approach LOS		F			D			D			D	
Queue Length 50th (m)	8.4	~142.6		20.1	88.8		2.9	41.8		~92.3	41.2	
Queue Length 95th (m)	18.9	#205.2		#51.7	#149.0		7.9	60.0		#161.1	67.6	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	302	1032		276	1154		350	1050		462	1360	
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	1.11		0.64	0.82		0.07	0.49		1.08	0.43	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

Cycle Length: 112

Actuated Cycle Length: 99.2

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 58.2

Intersection LOS: E

Intersection Capacity Utilization 93.2%

ICU Level of Service F

Analysis Period (min) 15

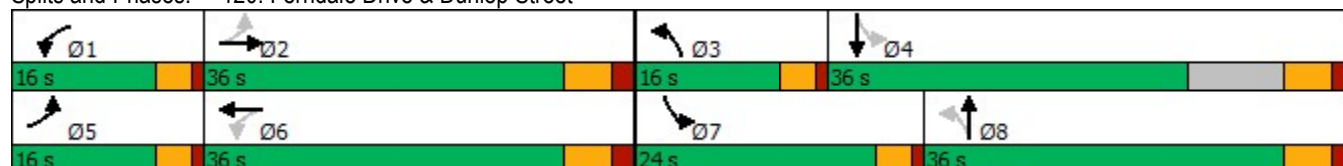
~ Volume exceeds capacity, queue is theoretically infinite.

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: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	141	797	258	13	934	49	239	109	11	50	43	70
Future Volume (vph)	141	797	258	13	934	49	239	109	11	50	43	70
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	148	839	272	14	1035	0	252	127	0	53	119	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8			4		
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	60.0	60.0	7.0	60.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	66.0	66.0	11.5	66.0		11.0	36.0		11.5	36.0	
Total Split (s)	16.0	66.0	66.0	16.0	66.0		16.0	26.0		16.0	26.0	
Total Split (%)	12.9%	53.2%	53.2%	12.9%	53.2%		12.9%	21.0%		12.9%	21.0%	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max	Max	None	Max		None	None		None	None	
Act Effect Green (s)	75.6	69.5	69.5	69.1	60.1		29.3	18.0		22.4	12.1	
Actuated g/C Ratio	0.66	0.61	0.61	0.61	0.53		0.26	0.16		0.20	0.11	
v/c Ratio	0.43	0.40	0.26	0.04	0.60		0.87	0.46		0.19	0.53	
Control Delay	11.2	13.2	2.3	7.8	21.0		67.4	50.0		33.8	35.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.2	13.2	2.3	7.8	21.0		67.4	50.0		33.8	35.3	
LOS	B	B	A	A	C		E	D		C	D	
Approach Delay		10.6			20.8			61.6			34.9	
Approach LOS		B			C			E			C	
Queue Length 50th (m)	10.8	41.4	0.0	1.0	81.3		51.8	27.1		9.5	13.8	
Queue Length 95th (m)	22.5	82.5	12.8	3.7	122.6		#100.4	49.0		20.0	33.0	
Internal Link Dist (m)		363.2			184.5			357.0			236.1	
Turn Bay Length (m)	245.0		130.0	165.0			240.0			125.0		
Base Capacity (vph)	377	2119	1044	405	1712		289	328		342	333	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.39	0.40	0.26	0.03	0.60		0.87	0.39		0.15	0.36	
Intersection Summary												

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

11-21-2022

Cycle Length: 124

Actuated Cycle Length: 113.8

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 22.6

Intersection LOS: C

Intersection Capacity Utilization 91.2%

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: 110: Tiffin Street/Miller Drive & Dunlop Street

 Ø1	 Ø2	 Ø3	 Ø4
16 s	66 s	16 s	26 s
 Ø5	 Ø6	 Ø7	 Ø8
16 s	66 s	16 s	26 s

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	757	21	162	907	181	27	655	145	330	392	78
Future Volume (vph)	125	757	21	162	907	181	27	655	145	330	392	78
Confl. Peds. (#/hr)			3	3			1		5	5		1
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	129	802	0	167	1122	0	28	824	0	340	484	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	16.0	36.0		16.0	36.0		16.0	36.0		24.0	36.0	
Total Split (%)	14.3%	32.1%		14.3%	32.1%		14.3%	32.1%		21.4%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	42.1	30.0		43.9	30.9		37.8	28.7		54.5	45.9	
Actuated g/C Ratio	0.38	0.27		0.40	0.28		0.35	0.26		0.50	0.42	
v/c Ratio	0.56	0.86		0.70	1.22		0.08	0.93		0.88	0.34	
Control Delay	29.5	48.5		38.5	143.3		16.2	55.6		51.9	22.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	29.5	48.5		38.5	143.3		16.2	55.6		51.9	22.4	
LOS	C	D		D	F		B	E		D	C	
Approach Delay		45.9			129.7			54.4			34.5	
Approach LOS		D			F			D			C	
Queue Length 50th (m)	17.9	93.0		23.9	~166.7		3.2	94.4		59.1	39.5	
Queue Length 95th (m)	31.1	#126.7		#48.4	#215.8		8.0	#131.4		#112.2	54.4	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	263	936		255	920		410	932		391	1434	
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	0.49	0.86		0.65	1.22		0.07	0.88		0.87	0.34	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

Cycle Length: 112

Actuated Cycle Length: 109.5

Natural Cycle: 115

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.22

Intersection Signal Delay: 73.1

Intersection LOS: E

Intersection Capacity Utilization 95.9%

ICU Level of Service F

Analysis Period (min) 15

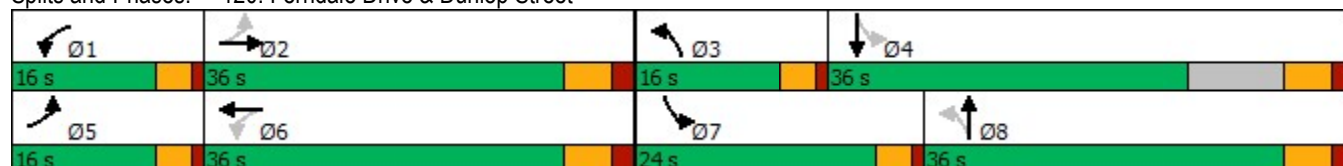
~ Volume exceeds capacity, queue is theoretically infinite.

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: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

01-27-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	1047	297	12	645	23	144	22	15	82	88	99
Future Volume (vph)	75	1047	297	12	645	23	144	22	15	82	88	99
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	83	1163	330	13	743	0	160	41	0	91	208	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8			4		
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	60.0	60.0	7.0	60.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	66.0	66.0	11.5	66.0		11.0	36.0		11.5	36.0	
Total Split (s)	16.0	66.0	66.0	16.0	66.0		16.0	26.0		16.0	26.0	
Total Split (%)	12.9%	53.2%	53.2%	12.9%	53.2%		12.9%	21.0%		12.9%	21.0%	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max	Max	None	Max		None	None		None	None	
Act Effect Green (s)	71.4	65.9	65.9	67.9	60.5		28.0	19.1		29.4	16.2	
Actuated g/C Ratio	0.63	0.58	0.58	0.60	0.53		0.25	0.17		0.26	0.14	
v/c Ratio	0.19	0.58	0.32	0.06	0.43		0.60	0.15		0.23	0.78	
Control Delay	9.9	18.1	2.5	9.4	18.5		45.3	30.4		32.0	58.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.9	18.1	2.5	9.4	18.5		45.3	30.4		32.0	58.8	
LOS	A	B	A	A	B		D	C		C	E	
Approach Delay		14.4			18.3			42.2			50.7	
Approach LOS		B			B			D			D	
Queue Length 50th (m)	7.3	81.2	0.0	1.1	58.1		30.1	5.0		16.3	39.9	
Queue Length 95th (m)	14.4	132.3	14.4	3.8	79.5		50.3	15.9		30.0	#68.6	
Internal Link Dist (m)		363.2			184.5			357.0			236.1	
Turn Bay Length (m)	245.0		130.0	165.0			240.0			125.0		
Base Capacity (vph)	471	2007	1028	283	1728		269	307		417	323	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.18	0.58	0.32	0.05	0.43		0.59	0.13		0.22	0.64	
Intersection Summary												

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

01-27-2023

Cycle Length: 124

Actuated Cycle Length: 114

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 21.3

Intersection LOS: C

Intersection Capacity Utilization 91.2%

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: 110: Tiffin Street/Miller Drive & Dunlop Street

 Ø1	 Ø2	 Ø3	 Ø4
16 s	66 s	16 s	26 s
 Ø5	 Ø6	 Ø7	 Ø8
16 s	66 s	16 s	26 s

Lanes, Volumes, Timings
120: Ferndale Drive & Dunlop Street

01-27-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	1010	41	160	647	231	27	292	173	453	453	82
Future Volume (vph)	73	1010	41	160	647	231	27	292	173	453	453	82
Confl. Peds. (#/hr)			1	1			2					2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	1155	0	176	965	0	30	511	0	498	588	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	16.0	36.0		16.0	36.0		16.0	36.0		24.0	36.0	
Total Split (%)	14.3%	32.1%		14.3%	32.1%		14.3%	32.1%		21.4%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	40.4	30.1		46.0	35.0		27.4	18.2		44.3	35.7	
Actuated g/C Ratio	0.41	0.30		0.46	0.35		0.28	0.18		0.45	0.36	
v/c Ratio	0.35	1.12		0.68	0.84		0.11	0.75		1.08	0.47	
Control Delay	20.2	100.1		34.2	37.9		17.8	37.8		92.1	26.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	20.2	100.1		34.2	37.9		17.8	37.8		92.1	26.2	
LOS	C	F		C	D		B	D		F	C	
Approach Delay		95.0			37.3			36.7			56.4	
Approach LOS		F			D			D			E	
Queue Length 50th (m)	8.6	~144.9		20.1	92.2		3.4	41.8		~93.9	50.4	
Queue Length 95th (m)	19.3	#208.0		#51.8	#155.5		8.6	60.0		#163.2	68.3	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	296	1033		276	1152		350	1050		459	1331	
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	0.27	1.12		0.64	0.84		0.09	0.49		1.08	0.44	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

01-27-2023

Cycle Length: 112

Actuated Cycle Length: 99.2

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.12

Intersection Signal Delay: 60.2

Intersection LOS: E

Intersection Capacity Utilization 93.5%

ICU Level of Service F

Analysis Period (min) 15

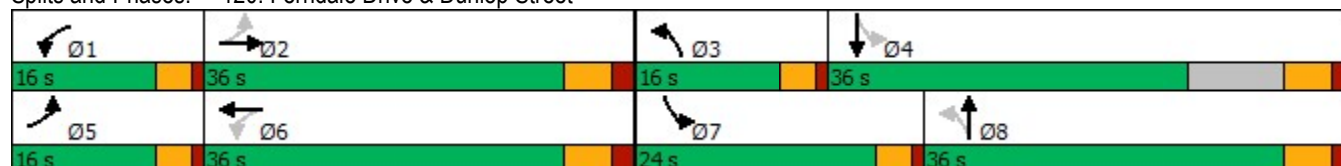
~ Volume exceeds capacity, queue is theoretically infinite.

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: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
210: West Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1144	1	1	682	1	2
Future Volume (vph)	1144	1	1	682	1	2
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1272	0	0	759	3	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 70.3%				ICU Level of Service C		
Analysis Period (min) 15						

Lanes, Volumes, Timings
220: East Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1128	17	26	678	4	7
Future Volume (vph)	1128	17	26	678	4	7
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1272	0	0	782	12	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 70.4%				ICU Level of Service C		
Analysis Period (min) 15						

Lanes, Volumes, Timings
110: Tiffin Street/Miller Drive & Dunlop Street

01-27-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	141	802	258	15	946	51	239	109	13	51	43	70
Future Volume (vph)	141	802	258	15	946	51	239	109	13	51	43	70
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	4%	5%	29%	10%	21%	12%	6%	22%	2%	9%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	148	844	272	16	1050	0	252	129	0	54	119	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6			8			4		
Detector Phase	5	2	2	1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	60.0	60.0	7.0	60.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.0	66.0	66.0	11.5	66.0		11.0	36.0		11.5	36.0	
Total Split (s)	16.0	66.0	66.0	16.0	66.0		16.0	26.0		16.0	26.0	
Total Split (%)	12.9%	53.2%	53.2%	12.9%	53.2%		12.9%	21.0%		12.9%	21.0%	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0		1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max	Max	None	Max		None	None		None	None	
Act Effct Green (s)	75.6	69.5	69.5	69.1	60.1		29.4	18.1		22.7	12.2	
Actuated g/C Ratio	0.66	0.61	0.61	0.61	0.53		0.26	0.16		0.20	0.11	
v/c Ratio	0.43	0.40	0.26	0.05	0.61		0.87	0.46		0.19	0.53	
Control Delay	11.5	13.3	2.3	7.9	21.3		67.0	50.3		33.8	35.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.5	13.3	2.3	7.9	21.3		67.0	50.3		33.8	35.1	
LOS	B	B	A	A	C		E	D		C	D	
Approach Delay		10.7			21.1			61.3			34.7	
Approach LOS		B			C			E			C	
Queue Length 50th (m)	10.8	41.7	0.0	1.1	83.2		51.8	27.6		9.7	13.8	
Queue Length 95th (m)	22.7	83.8	13.0	4.2	126.4		#99.9	49.7		20.4	33.0	
Internal Link Dist (m)		363.2			184.5			357.0			236.1	
Turn Bay Length (m)	245.0		130.0	165.0			240.0			125.0		
Base Capacity (vph)	372	2116	1044	403	1710		290	326		343	333	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.40	0.40	0.26	0.04	0.61		0.87	0.40		0.16	0.36	
Intersection Summary												

Lanes, Volumes, Timings

110: Tiffin Street/Miller Drive & Dunlop Street

01-27-2023

Cycle Length: 124

Actuated Cycle Length: 114

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 22.7

Intersection LOS: C

Intersection Capacity Utilization 96.1%

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: 110: Tiffin Street/Miller Drive & Dunlop Street

 Ø1	 Ø2	 Ø3	 Ø4
16 s	66 s	16 s	26 s
 Ø5	 Ø6	 Ø7	 Ø8
16 s	66 s	16 s	26 s

Lanes, Volumes, Timings
120: Ferndale Drive & Dunlop Street

01-27-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	129	780	23	162	917	181	28	655	145	330	392	80
Future Volume (vph)	129	780	23	162	917	181	28	655	145	330	392	80
Confl. Peds. (#/hr)			3	3			1		5	5		1
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	133	828	0	167	1132	0	29	824	0	340	486	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	16.0	36.0		16.0	36.0		16.0	36.0		24.0	36.0	
Total Split (%)	14.3%	32.1%		14.3%	32.1%		14.3%	32.1%		21.4%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	42.2	30.0		43.8	30.9		37.8	28.7		54.5	45.8	
Actuated g/C Ratio	0.39	0.27		0.40	0.28		0.35	0.26		0.50	0.42	
v/c Ratio	0.57	0.88		0.70	1.23		0.09	0.93		0.88	0.34	
Control Delay	30.1	50.8		38.5	148.9		16.2	55.6		51.9	22.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	30.1	50.8		38.5	148.9		16.2	55.6		51.9	22.4	
LOS	C	D		D	F		B	E		D	C	
Approach Delay		47.9			134.7			54.3			34.5	
Approach LOS		D			F			D			C	
Queue Length 50th (m)	18.6	96.8		23.9	~170.1		3.3	94.4		59.1	39.6	
Queue Length 95th (m)	32.0	#133.5		#48.4	#218.4		8.3	#131.4		#112.2	54.7	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	263	937		255	918		410	932		391	1433	
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	0.51	0.88		0.65	1.23		0.07	0.88		0.87	0.34	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

01-27-2023

Cycle Length: 112

Actuated Cycle Length: 109.5

Natural Cycle: 105

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.23

Intersection Signal Delay: 75.1

Intersection LOS: E

Intersection Capacity Utilization 96.4%

ICU Level of Service F

Analysis Period (min) 15

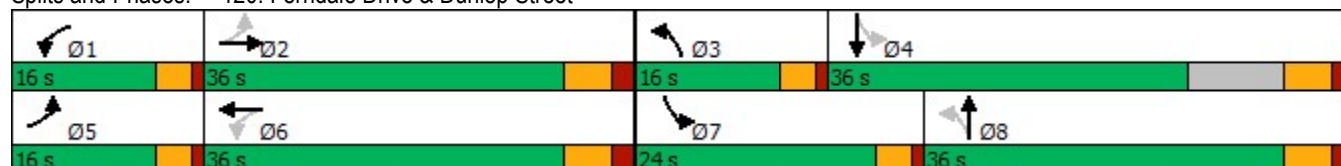
~ Volume exceeds capacity, queue is theoretically infinite.

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: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
210: West Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	865	2	3	1023	1	1
Future Volume (vph)	865	2	3	1023	1	1
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	913	0	0	1080	2	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 66.2%				ICU Level of Service C		
Analysis Period (min) 15						

Lanes, Volumes, Timings
220: East Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	860	5	8	1010	15	28
Future Volume (vph)	860	5	8	1010	15	28
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	910	0	0	1071	45	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 69.5%				ICU Level of Service C		
Analysis Period (min) 15						

Lanes, Volumes, Timings
210: West Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1144	1	1	682	1	2
Future Volume (vph)	1144	1	1	682	1	2
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1272	0	1	758	3	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 41.7%				ICU Level of Service A		
Analysis Period (min) 15						

Lanes, Volumes, Timings
220: East Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1128	17	26	678	4	7
Future Volume (vph)	1128	17	26	678	4	7
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1272	0	29	753	12	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 41.7%				ICU Level of Service A		
Analysis Period (min) 15						

Lanes, Volumes, Timings
210: West Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	865	2	3	1023	1	1
Future Volume (vph)	865	2	3	1023	1	1
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	913	0	3	1077	2	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 38.3%				ICU Level of Service A		
Analysis Period (min) 15						

Lanes, Volumes, Timings
220: East Site Driveway & Dunlop Street

01-27-2023

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	860	5	8	1010	15	28
Future Volume (vph)	860	5	8	1010	15	28
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)						
Lane Group Flow (vph)	910	0	8	1063	45	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Control Type: Unsignalized						
Intersection Capacity Utilization 37.9%				ICU Level of Service A		
Analysis Period (min) 15						

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	1001	40	160	626	231	24	292	173	453	453	78
Future Volume (vph)	71	1001	40	160	626	231	24	292	173	453	453	78
Confl. Peds. (#/hr)			1	1			2					2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	78	1144	0	176	942	0	26	511	0	498	584	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	12.0	39.0		12.0	39.0		17.0	36.0		25.0	36.0	
Total Split (%)	10.7%	34.8%		10.7%	34.8%		15.2%	32.1%		22.3%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	42.6	33.0		44.1	35.8		27.4	18.3		45.3	39.0	
Actuated g/C Ratio	0.42	0.33		0.44	0.36		0.27	0.18		0.45	0.39	
v/c Ratio	0.35	1.02		0.85	0.81		0.10	0.76		1.05	0.44	
Control Delay	20.6	66.8		55.5	35.9		17.3	38.4		80.7	23.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	20.6	66.8		55.5	35.9		17.3	38.4		80.7	23.9	
LOS	C	E		E	D		B	D		F	C	
Approach Delay		63.8			39.0			37.4			50.0	
Approach LOS		E			D			D			D	
Queue Length 50th (m)	8.6	~126.6		20.6	90.1		2.9	41.9		~88.9	40.5	
Queue Length 95th (m)	19.2	#193.1		#65.8	#142.4		7.7	60.0		#157.6	66.5	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	232	1121		208	1166		363	1037		473	1360	
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	0.34	1.02		0.85	0.81		0.07	0.49		1.05	0.43	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

Cycle Length: 112

Actuated Cycle Length: 100.4

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.05

Intersection Signal Delay: 49.5

Intersection LOS: D

Intersection Capacity Utilization 93.2%

ICU Level of Service F

Analysis Period (min) 15

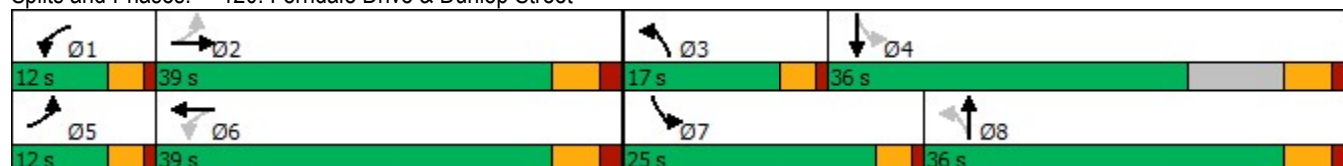
~ Volume exceeds capacity, queue is theoretically infinite.

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: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
120: Ferndale Drive & Dunlop Street

11-21-2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	757	21	162	907	181	27	655	145	330	392	78
Future Volume (vph)	125	757	21	162	907	181	27	655	145	330	392	78
Confl. Peds. (#/hr)			3	3			1		5	5		1
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	129	802	0	167	1122	0	28	824	0	340	484	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	12.0	44.0		12.0	44.0		12.0	36.0		20.0	36.0	
Total Split (%)	10.7%	39.3%		10.7%	39.3%		10.7%	32.1%		17.9%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	47.8	38.0		48.2	38.2		38.3	29.1		51.1	42.3	
Actuated g/C Ratio	0.43	0.34		0.43	0.34		0.34	0.26		0.46	0.38	
v/c Ratio	0.67	0.69		0.67	1.00		0.08	0.93		1.06	0.37	
Control Delay	36.9	35.1		33.6	64.4		17.8	56.0		96.1	25.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	36.9	35.1		33.6	64.4		17.8	56.0		96.1	25.6	
LOS	D	D		C	E		B	E		F	C	
Approach Delay		35.4			60.4			54.8			54.7	
Approach LOS		D			E			D			D	
Queue Length 50th (m)	16.7	83.1		22.3	~137.9		3.4	94.4		~69.1	42.0	
Queue Length 95th (m)	#38.0	105.7		#40.3	#185.6		8.6	#131.4		#128.3	58.0	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	196	1168		248	1117		348	918		322	1305	
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	0.66	0.69		0.67	1.00		0.08	0.90		1.06	0.37	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

11-21-2022

Cycle Length: 112

Actuated Cycle Length: 111.1

Natural Cycle: 115

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 52.0

Intersection LOS: D

Intersection Capacity Utilization 95.9%

ICU Level of Service F

Analysis Period (min) 15

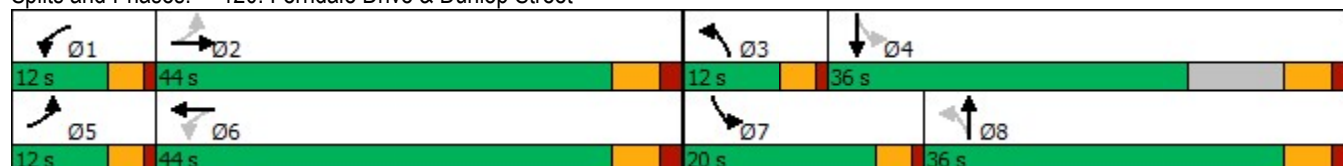
~ Volume exceeds capacity, queue is theoretically infinite.

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: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
120: Ferndale Drive & Dunlop Street

01-19-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	1010	41	160	647	231	27	292	173	453	453	83
Future Volume (vph)	73	1010	41	160	647	231	27	292	173	453	453	83
Confl. Peds. (#/hr)			1	1			2					2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	1155	0	176	965	0	30	511	0	498	589	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	12.0	39.0		12.0	39.0		17.0	36.0		25.0	36.0	
Total Split (%)	10.7%	34.8%		10.7%	34.8%		15.2%	32.1%		22.3%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	42.6	33.0		44.1	35.8		27.5	18.3		45.3	36.7	
Actuated g/C Ratio	0.42	0.33		0.44	0.36		0.27	0.18		0.45	0.37	
v/c Ratio	0.37	1.03		0.85	0.83		0.11	0.76		1.06	0.47	
Control Delay	21.1	69.4		55.5	37.2		17.5	38.4		83.7	25.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	21.1	69.4		55.5	37.2		17.5	38.4		83.7	25.8	
LOS	C	E		E	D		B	D		F	C	
Approach Delay		66.3			40.0			37.2			52.3	
Approach LOS		E			D			D			D	
Queue Length 50th (m)	8.8	~133.3		20.6	93.7		3.3	41.9		~90.5	49.7	
Queue Length 95th (m)	19.7	#196.1		#65.8	#148.6		8.4	60.0		#159.7	67.3	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	226	1121		208	1165		362	1037		470	1322	
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	0.35	1.03		0.85	0.83		0.08	0.49		1.06	0.45	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

01-19-2023

Cycle Length: 112

Actuated Cycle Length: 100.4

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 51.1

Intersection LOS: D

Intersection Capacity Utilization 93.5%

ICU Level of Service F

Analysis Period (min) 15

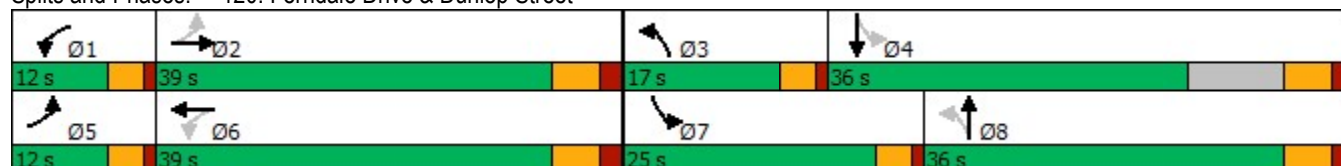
~ Volume exceeds capacity, queue is theoretically infinite.

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: 120: Ferndale Drive & Dunlop Street



Lanes, Volumes, Timings
120: Ferndale Drive & Dunlop Street

01-19-2023

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	129	780	23	162	917	181	28	655	145	330	392	80
Future Volume (vph)	129	780	23	162	917	181	28	655	145	330	392	80
Confl. Peds. (#/hr)			3	3			1		5	5		1
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	5%	19%	6%	11%	3%	10%	4%	9%	2%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	133	828	0	167	1132	0	29	824	0	340	486	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	7.0	30.0		7.0	30.0		7.0	10.0		7.0	10.0	
Minimum Split (s)	11.5	36.0		11.0	36.0		11.5	36.0		11.0	36.0	
Total Split (s)	12.0	44.0		12.0	44.0		12.0	36.0		20.0	36.0	
Total Split (%)	10.7%	39.3%		10.7%	39.3%		10.7%	32.1%		17.9%	32.1%	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	Max		None	Max		None	None		None	None	
Act Effect Green (s)	47.9	38.0		48.1	38.1		38.3	29.1		51.1	42.3	
Actuated g/C Ratio	0.43	0.34		0.43	0.34		0.34	0.26		0.46	0.38	
v/c Ratio	0.69	0.71		0.70	1.01		0.09	0.93		1.06	0.37	
Control Delay	38.3	35.8		35.9	66.9		17.8	56.0		96.1	25.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	38.3	35.8		35.9	66.9		17.8	56.0		96.1	25.5	
LOS	D	D		D	E		B	E		F	C	
Approach Delay		36.2			62.9			54.7			54.6	
Approach LOS		D			E			D			D	
Queue Length 50th (m)	17.3	86.6		22.3	~144.8		3.6	94.4		~69.1	42.1	
Queue Length 95th (m)	#40.5	110.0		#39.0	#188.4		8.9	#131.4		#128.3	58.3	
Internal Link Dist (m)		202.3			198.6			473.7			355.6	
Turn Bay Length (m)	160.0			70.0			65.0			70.0		
Base Capacity (vph)	196	1168		238	1116		347	918		322	1306	
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	0.68	0.71		0.70	1.01		0.08	0.90		1.06	0.37	
Intersection Summary												

Lanes, Volumes, Timings

120: Ferndale Drive & Dunlop Street

01-19-2023

Cycle Length: 112

Actuated Cycle Length: 111.1

Natural Cycle: 105

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 52.9

Intersection LOS: D

Intersection Capacity Utilization 96.4%

ICU Level of Service F

Analysis Period (min) 15

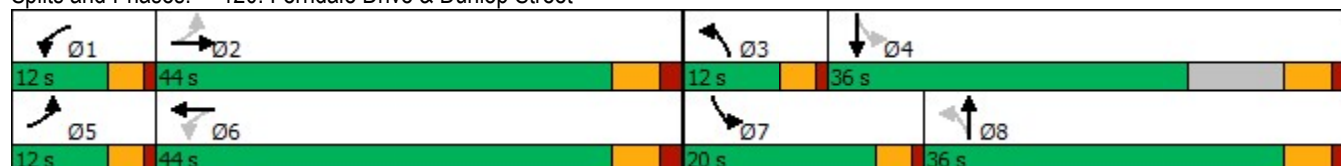
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

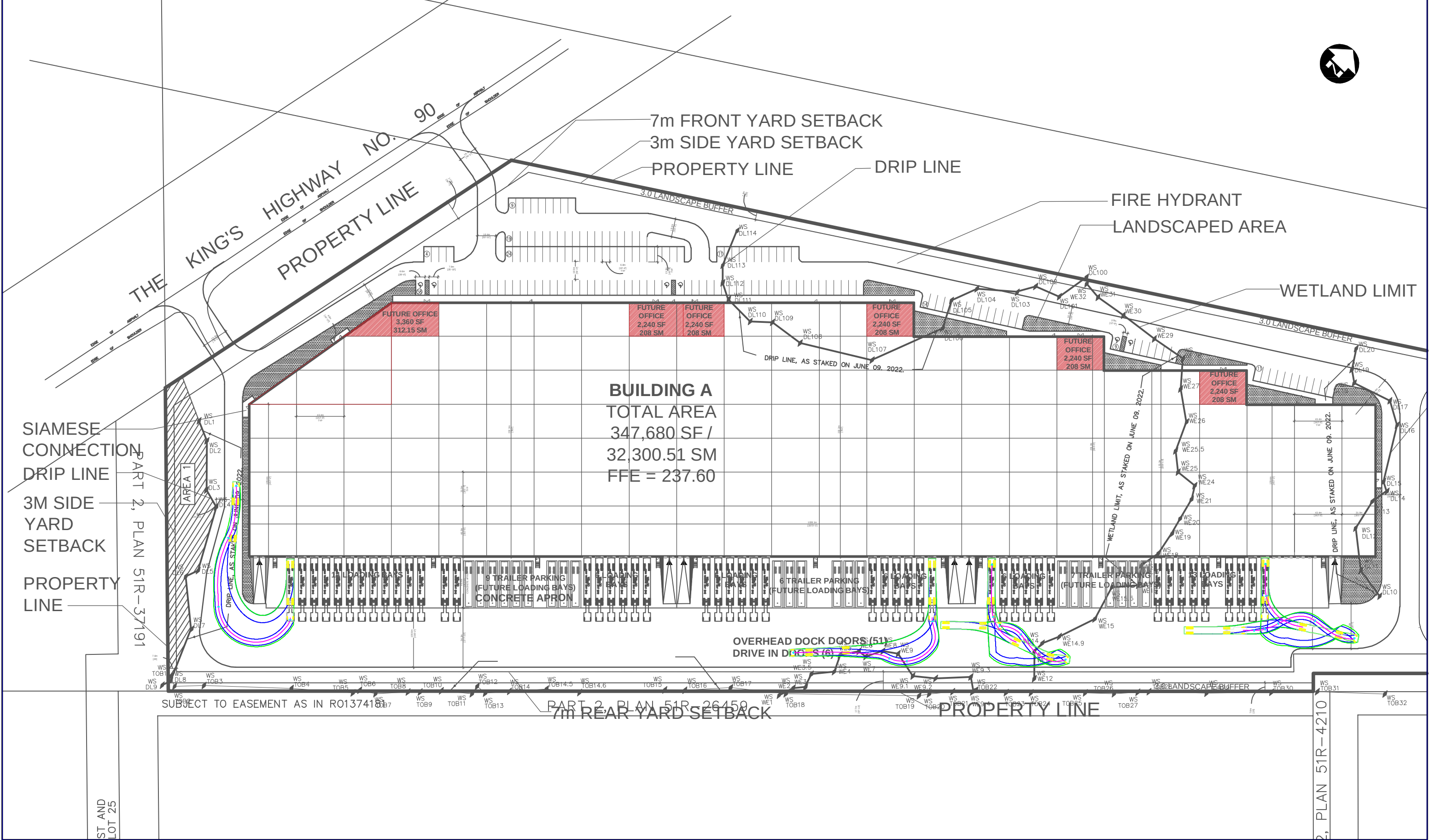
Queue shown is maximum after two cycles.

Splits and Phases: 120: Ferndale Drive & Dunlop Street



Appendix G

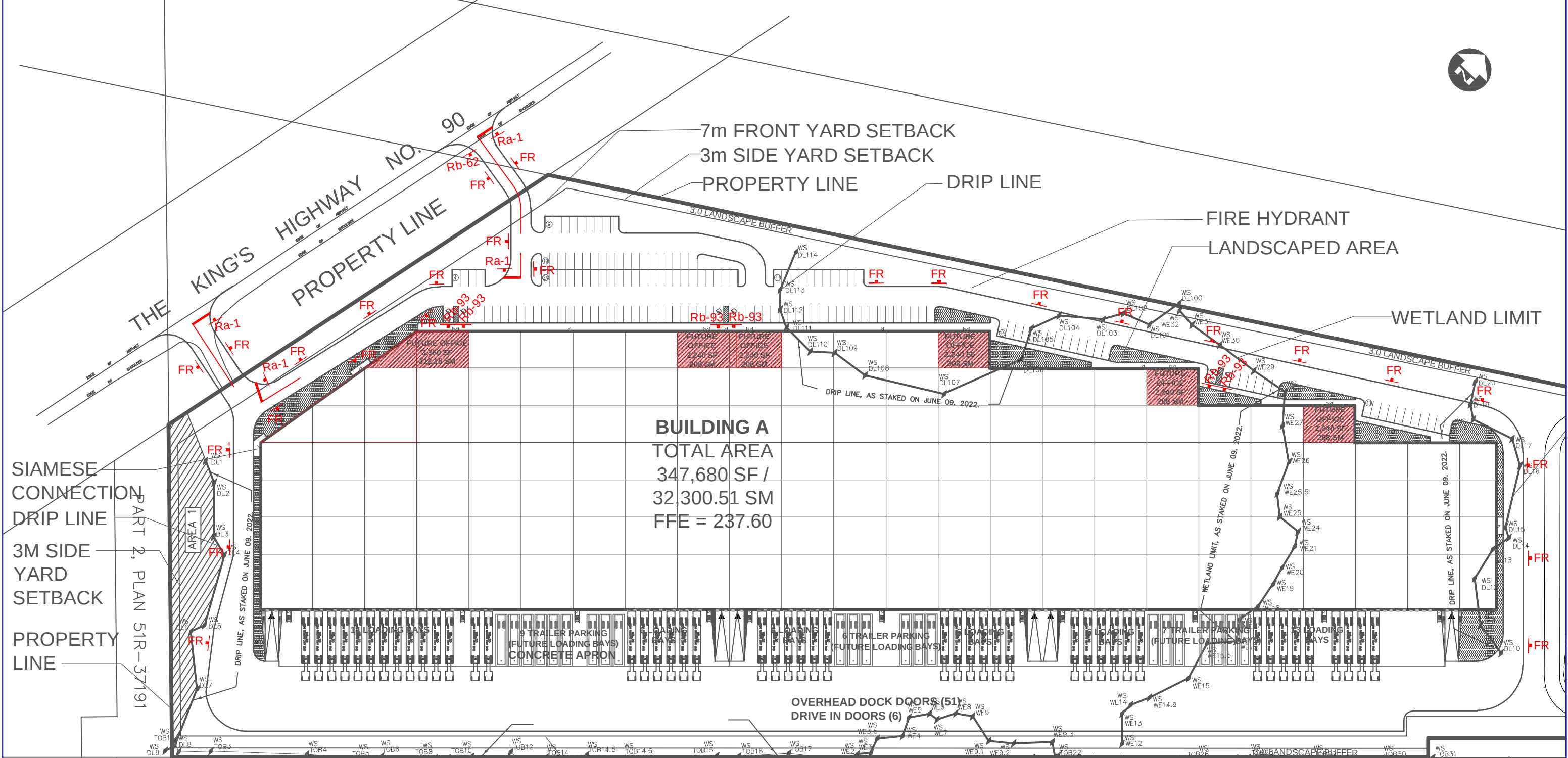
Truck Turning Path Diagrams



Conditions of Use Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited. Do not scale dimensions from drawing. Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.				NOTES: Design info provided by Powers Brown Architecture dated January 19, 2023.					DESIGN BJH REVIEWED BY MDW		PROPOSED WAREHOUSE DEVELOPMENT 545 DUNLOP STREET WEST, CITY OF BARRIE	PROJECT NO. 22-5012
									DRAWN BJH CHECKED BY MDW			
									DATE 2023-01-25			
									SCALE 1:1250			
			1 TRANSPORTATION IMPACT STUDY SUBMISSION 2023-01-25 BJH						TRUCK TURNING PATH ASSESSMENT	T-1		
			No. ISSUE D FOR DATE BY									

Appendix H

On-Site Traffic Signage and Pavement Marking Plan



SIAMESE CONNECTION
DRIP LINE
3M SIDE YARD SETBACK
PROPERTY LINE
PART 2, PLAN 51R-37191

SUBJECT TO EASEMENT AS IN R0137418
PART 2, PLAN 51R-26450
7m REAR YARD SETBACK
PROPERTY LINE
PART 2, PLAN 51R-4210

Ra-1
600x600

Rb-62
600x600

Rb-93
300x450

FR
300x450

Conditions of Use Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited. Do not scale dimensions from drawing. Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.				NOTES: Design info provided by Powers Brown Architecture dated January 19, 2023.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											</
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	----