Appendix "C" to Report PED19115 Page 1 of 314





Waterfront Trails Transportation Impact, Parking Justification & TDM Options Study

Paradigm Transportation Solutions Limited

December 2018

Appendix "C" to Report PED19115 Page 2 of 314

Project Number

180010

December 2018

Client

New Horizon Development Group (Sapphire) Inc.

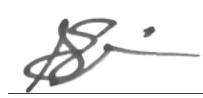
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Engineer's Seal

Signature

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Appendix "C" to Report PED19115 Page 4 of 314

Executive Summary

Content

Paradigm Transportation Solutions Limited (Paradigm) was retained by New Horizon Development Group (Sapphire) Inc. to conduct this Transportation Impact, Parking Justification and TDM Options Study for the proposed residential and commercial development to be located at 310 Frances Avenue in the City of Hamilton, Ontario.

This study includes an analysis of existing traffic conditions, a description of the proposed development, traffic forecasts for each phase of development, a parking assessment, transportation demand management assessment and recommendations for any required roadway improvements to accommodate future traffic conditions.

Development Concept

The proposed commercial development is located on the south side of Frances Avenue east of Green Road. The property is currently vacant land bordered by residential dwellings to the north and a small commercial development to the west.

The subject site is proposed to include a total of 1,836 residential units in three high-rise buildings with a total of 400 square metres (4,306 square feet) of ground-floor commercial retail space. An on-site parking supply of 2,438 spaces is proposed to service the residential component of the site, including 20 barrier free spaces. Seven (7) parking spaces are proposed for the commercial component. All parking spaces are provided in an above-grade parking structure.

The development will be constructed in three phases with one building completed every two years from 2021 (Phase 1) to 2025 (full build-out). Vehicular access to the site is proposed via four (4) all-turns driveway connections to Frances Avenue. These driveways (herein referred to as "Site Access") are planned to be stop-controlled on the minor road (driveway) approach.

Conclusions

Based on the investigations carried out, it is concluded that:

Existing Traffic Operations

Under existing traffic conditions, all intersections within the study area are operating at acceptable levels of service (LOS) during the AM and PM peak hours. The following critical movement is noted:

North Service Road and Green Road:

 Southbound left-turn movement – LOS D during the PM peak hour with a v/c ratio of 0.28. The low v/c ratio on this movement indicates the delay is due to the high volume of through traffic on North Service Road which limits available gaps for side street traffic.

Development Generated Traffic

At full build-out, the development is forecast to generate 556 and 666 trips during the AM and PM peak hours, respectively.

2021 Background Traffic Operations

Under 2021 background traffic conditions all intersections within the study area are forecast to operate at overall acceptable levels of service. The following critical movement is noted:

- North Service Road and Green Road:
 - Southbound left-turn movement LOS D with a v/c of 0.32 during the AM peak hour and LOS F with a v/c of 0.57 during the PM peak hour. The low to moderate v/c ratios indicate the delay is due to the high volume of through traffic on North Service Road which limits available gaps for side street traffic.

2021 Total Traffic Operations (Phase 1)

Under 2021 total traffic conditions all intersections within the study area are forecast to operate at overall acceptable levels of service. The following critical movements are noted:

- North Service Road and Green Road:
 - Southbound left-turn movement LOS E with a v/c ratio of 0.58 during the AM peak hour and LOS F with a v/c ratio of 1.25 during the PM peak hour. The 95th percentile queue is forecast to exceed the available storage by 11 metres during the PM peak hour;
 - Southbound right-turn movement LOS D with a v/c ratio of 0.59 during the AM peak hour; and
 - The moderate v/c ratios during the AM peak hour indicate the delay is due to the high volume of through traffic on North Service Road which limits available gaps for side street traffic.

2023 Background Traffic Operations

Under 2023 background traffic conditions all intersections within the study area are forecast to operate at overall acceptable levels of service. The following critical movements are noted:

- North Service Road and Green Road:
 - Southbound left-turn movement LOS F with a v/c ratio of 0.62 during the AM peak hour and LOS F with a v/c ratio of 1.40 during the PM peak hour. The95th percentile queue is forecast to exceed the available storage by 16 metres during the PM peak hour;
 - Southbound right-turn movement LOS D with a v/c ratio of 0.62 during the AM peak hour; and
 - The moderate v/c ratios during the AM peak hour indicate the delay is due to the high volume of through traffic on North Service Road which limits available gaps for side street traffic.

2023 Total Traffic Operations (Phase 2)

Under 2023 total traffic conditions all intersections within the study area are forecast to operate at overall acceptable levels of service. The following critical movements are noted:

- North Service Road and Green Road:
 - Southbound left-turn movement LOS E with a v/c ratio of 0.93 during the AM peak hour and LOS F with a v/c ratio of 2.66 during the PM peak hour. The 95th percentile queue is forecast to exceed the available storage by 15 metres during the AM peak hour and 51 metres during the PM peak hour;
 - Southbound right-turn movement LOS D with a v/c ratio of 0.95 during the AM peak hour; and
 - Overall intersection LOS E during the PM peak hour.

2025 Background Traffic Operations

Under 2025 background traffic conditions all intersections within the study area are forecast to operate at overall acceptable levels of service. The following critical movements are noted:

- ▶ North Service Road and Green Road:
 - Southbound left-turn movement LOS F with a v/c ratio of 1.0 during the AM peak hour and LOS F with a v/c ratio of 2.97 during the PM peak hour. The 95th percentile queue is forecast to exceed the available storage by 21 metres during the AM peak hour and 55 metres during the PM peak hour;
 - Southbound right-turn movement LOS F with a v/c ratio of 1.01 during the AM peak hour; and
 - Overall intersection LOS D during the AM peak hour and LOS F during the PM peak hour.

2025 Total Traffic Operations (Full Build-Out)

Under 2025 total traffic conditions all intersections within the study area are forecast to operate at overall acceptable levels of service. The following critical movements are noted:

- ► Green Road and Frances Avenue:
 - Westbound left-turn/through/right-turn movement LOS D with a v/c ratio of 0.79 during the AM and 0.74 during the PM peak hour.
- North Service Road and Green Road:
 - Southbound left-turn movement LOS F with a v/c ratio of 1.40 during the AM peak hour and a v/c ratio of 5.47 during the PM peak hour. The 95th percentile queue is forecast to exceed the available storage by 59 metres during the AM peak hour and 55+ metres during the PM peak hour;
 - Southbound right-turn movement LOS F with a v/c ratio of 1.33 during the AM peak hour; and
 - Overall intersection LOS F during the AM and PM peak hours.

Remedial Measures

The following remedial measures are required to provide acceptable levels of service at the study area intersections:

- Traffic signals at the intersection of North Service Road and Green Road. Although not warranted until 2025, the signals should be installed as part of Phase 1 of the development (2021) to provide acceptable levels of service on all approaches;
- A separate westbound right-turn lane should be provided at the intersection of North Service Road and Green Road at the 2025 horizon. This lane warrants 7.5 metres of storage and 120 metres of taper and parallel lane; however, due to environmental constraints, only 10 metres of storage and 15.8 metres of taper can be provided within the right-of-way without significant reconstruction;
- A separate westbound left-turn lane should be provided at the intersection of Green Road and Frances Avenue at the 2025; and
- The southbound left-turn lane at North Service Road and Green Road should be increased by 15 metres by the 2025 horizon.

These improvements are directly related to the increase in traffic due to development of the subject site.

Parking Assessment

City of Stoney Creek By-law Parking Requirements

Based on the City of Stoney Creek Zoning By-law 3692-92, a total of 3,090 parking spaces will be required to service the residential component of the site. A total of 2,438 spaces are proposed. This is a deficiency of 652 spaces or 21% of the By-law parking requirement.

Proxy Site Survey Data

Parking utilization surveys were undertaken at a proxy site in Burlington, Ontario (3060/3070 Rotary Way). Based on the maximum observed demand at the proxy sites, a total of 2,295 spaces would be required to service the site during the peak weekday period. A total of 2,438 spaces are proposed. This is a surplus of 143 spaces or 106% of the proxy site parking requirement.

Overall Findings

The Zoning By-law results in a deficiency in parking of 652 spaces and the proxy site data results in a surplus of 143 spaces. The proxy site data provides an accurate representation of the parking demands for the site as they are based on area-specific data and not a general Zoning By-law. Additionally, it further supports a reduction in parking requirements for the site. Therefore, the proposed parking supply should adequately accommodate the parking demands of the site.

TDM Options

The proposed site with nearby connections to bicycle facilities and transit routes has the potential to be an accessible development. Further enhancing these elements inside and outside the boundaries of the development will ensure these opportunities do not go unused.

By incorporating the TDM options contained in this report, such as improving walking and cycling facilities, reducing the parking supply and developing individualized travel plans for residents (alternative mode trip planning, carpool arrangements, etc.), the site will set the tone for the surrounding area in helping to achieve the City's long-term transportation goals.

Recommendations

Based on the findings of this study, it is recommended that:

- ▶ The City of Hamilton recognize the conclusions drawn above;
- The site be allowed to be developed as planned;
- > The site driveway connections operate under stop sign control;
- The City install traffic signals at the intersection of North Service Road and Green Road by buildout of Phase 1 in 2021. The signal timing and phasing should be optimized as required;

- A separate westbound right-turn lane with 10 metres of storage and 15.8 metres of taper should be provided at the intersection of North Service Road and Green Road at the 2025 horizon;
- A separate westbound left-turn lane with 45 metres storage should be provided at the intersection of Green Road and Frances Avenue at the 2025 horizon. This can be accomplished through pavement markings;
- The southbound left-turn lane at North Service Road and Green Road should be extended by 15 metres by the 2025 horizon. This can be accomplished through pavement markings; and
- The applicant should ensure proper pedestrian and cyclist connections from the surrounding roads to the buildings' main entrances;
- Current bus schedules are provided within the lobby of each building to further promote the use of transit; and
- ► The buildings' management should work with the buildings' residents to form a travel planning committee/team that will help develop individualized travel plans (alternative mode trip planning, carpool arrangements, etc.) for interested residents. To assist the committee/team, the applicant should consider providing a kiosk within the lobby of each building for use by the committee/team.

Contents

1	Introduction	1
1.1 1.2 1.3	Overview Purpose and Scope Study Area Intersections	1
2	Existing Conditions	4
2.1 2.2 2.3 2.3.1	Road Network Existing Transit Service Active Transportation Walkability	5 8 8
2.3.2 2.4	Cycling Existing Traffic Volumes	
2.5	Traffic Operations	
3	Development Concept	16
3.1	Development Description	
3.2 3.3	Development Trip Generation Development Trip Distribution and Assignment	18
4	Evaluation of Future Traffic Conditions	27
4 4.1	2021 Horizon	27
4.1 4.1.1	2021 Horizon 2021 General Background Traffic Growth	27 27
4.1 4.1.1 4.1.2	2021 Horizon 2021 General Background Traffic Growth Other Planned Developments	27 27 27
4.1 4.1.1 4.1.2 4.1.3	2021 Horizon 2021 General Background Traffic Growth Other Planned Developments 2021 Total Background Traffic Volumes	27 27 27 27
4.1 4.1.1 4.1.2 4.1.3 4.1.3	2021 Horizon 2021 General Background Traffic Growth Other Planned Developments 2021 Total Background Traffic Volumes 2021 Background Traffic Operations	27 27 32 37
4.1 4.1.1 4.1.2 4.1.3 4.1.3 4.1.3	2021 Horizon 2021 General Background Traffic Growth Other Planned Developments 2021 Total Background Traffic Volumes 2021 Background Traffic Operations 2021 Future Total Traffic Volumes	27 27 32 37 39
4.1 4.1.1 4.1.2 4.1.3 4.1.3 4.1.3 4.1.4 4.1.5	 2021 Horizon	27 27 27 32 37 39 39 39
4.1 4.1.1 4.1.2 4.1.3 4.1.3 4.1.4 4.1.5 4.2	 2021 Horizon	27 27 32 37 39 39 39
4.1 4.1.1 4.1.2 4.1.3 4.1.3 4.1.3 4.1.4 4.1.5	 2021 Horizon	27 27 32 32 39 39 39 39 39 39 39
4.1 4.1.1 4.1.2 4.1.3 4.1.3 4.1.4 4.1.5 4.2 4.2.1	 2021 Horizon	27 27 32 32 37 39 39 39 43 43 43
4.1 4.1.1 4.1.2 4.1.3 4.1.3 4.1.3 4.1.4 4.1.5 4.2 4.2.1 4.2.2	 2021 Horizon	27 27 27 32 39 39 39 43 43 43 43
4.1 4.1.1 4.1.2 4.1.3 4.1.3 4.1.4 4.1.5 4.2 4.2.1 4.2.2 4.2.3	 2021 Horizon	27 27 32 39 43 43 43 43 43 43 43 43 43 47 47 43 43 43 43
4.1 4.1.1 4.1.2 4.1.3 4.1.3 4.1.4 4.1.5 4.2 4.2.1 4.2.2 4.2.3 4.2.4 4.3 4.3.1	 2021 Horizon	27 27 32 37 39 43 43 43 43 47 47
4.1 4.1.1 4.1.2 4.1.3 4.1.3 4.1.4 4.1.5 4.2 4.2.1 4.2.2 4.2.3 4.2.4 4.3 4.3.1 4.3.2	 2021 Horizon	27 27 32 37 39 39 43 43 43 43 43 43 47 52 52
4.1 4.1.1 4.1.2 4.1.3 4.1.3 4.1.4 4.1.5 4.2 4.2.1 4.2.2 4.2.3 4.2.4 4.3 4.3.1	 2021 Horizon	27 27 27 32 37 39 39 43 43 43 43 43 43 43 52 52 52 57

5	Remedial Measures	62
5.1	Traffic Control Signal	62
5.2	Right-Turn Lane Warrant	
5.3	Left-Turn Lanes	
5.4	Traffic Operations	64
6	Parking Assessment	66
6.1	By-law Parking Requirements	66
6.2	Proxy Site Parking Demand Surveys	
6.3	Overall Parking Assessment	67
7	Transportation Demand Management	69
7.1	Potential TDM Measures	70
7.1 7.1.1	Potential TDM Measures	
		70
7.1.1 7.1.2 7.1.3	Walking Cycling Transit	70 70 71
7.1.1 7.1.2 7.1.3 7.1.4	Walking Cycling Transit Parking	70 70 71 72
7.1.1 7.1.2 7.1.3 7.1.4 7.1.5	Walking Cycling Transit Parking Carpooling	70 70 71 72 72
7.1.1 7.1.2 7.1.3 7.1.4 7.1.5 7.1.6	Walking Cycling Transit Parking Carpooling Car-Share	70 70 71 72 72 72 73
7.1.1 7.1.2 7.1.3 7.1.4 7.1.5 7.1.6 7.1.7	Walking Cycling Transit Parking Carpooling Car-Share Individualized Travel Planning	70 70 71 72 72 73 73
7.1.1 7.1.2 7.1.3 7.1.4 7.1.5 7.1.6	Walking Cycling Transit Parking Carpooling Car-Share	70 70 71 72 72 73 73
7.1.1 7.1.2 7.1.3 7.1.4 7.1.5 7.1.6 7.1.7	Walking Cycling Transit Parking Carpooling Car-Share Individualized Travel Planning	
7.1.1 7.1.2 7.1.3 7.1.4 7.1.5 7.1.6 7.1.7 7.2	Walking Cycling Transit Parking Carpooling Car-Share Individualized Travel Planning TDM Summary	

Appendices

Appendix A	Pre-Study Consultation Documentation
Appendix B	Detailed Turning Movement Count Data
Appendix C	Base Year Traffic Operations Reports
Appendix D	2021 Background Traffic Operations Reports
Appendix E	2021 Future Total Traffic Operations Reports
Appendix F	2023 Background Traffic Operations Reports
Appendix G	2023 Future Total Traffic Operations Reports
Appendix H	2025 Background Traffic Operations Reports
Appendix I	2025 Future Total Traffic Operations Reports
Appendix J	Signal Warrant Justification Worksheet
Appendix K	Westbound Right-Turn Lane Preliminary Design
Appendix L	2025 Remedial Measures Traffic Operations Reports
Appendix M	Proxy Site Survey Parking Data

Figures

Figure 1.1:	Study Area and Subject Development Location	2
Figure 2.1:	Existing Lane Configurations and Traffic Control	6
Figure 2.2:	Existing Transit Routes	7
Figure 2.3:	Existing Cycling and Trail Network	9
Figure 2.4:	Base Year (2018) AM Traffic Volumes	11
Figure 2.5:	Base Year (2018) PM Traffic Volumes	12
Figure 3.1:	Development Site Plan	
Figure 3.2:	Phase 1 AM Development Traffic Assignment	21
Figure 3.3:	Phase 1 PM Development Traffic Assignment	22
Figure 3.4:	Phase 2 AM Development Traffic Assignment	23
Figure 3.5:	Phase 2 PM Development Traffic Assignment	24
Figure 3.6:	Phase 3 (Full Build-Out) AM Development Traffic	
Assig	nment	25
Figure 3.7:	Phase 3 (Full Build-Out) PM Development Traffic	
Assig	nment	26
Figure 4.1:	2021 AM Generalized Growth Background Traffic	
Forec	asts	28
Figure 4.2:	2021 PM Generalized Growth Background Traffic	
	asts	-
Figure 4.3:	Location of Other Area Developments	
		~~
Figure 4.4:	2021 AM Other Area Development Trip Assignment	
Figure 4.5:	2021 AM Other Area Development Trip Assignment 2021 PM Other Area Development Trip Assignment	
Figure 4.5: Figure 4.6:	2021 PM Other Area Development Trip Assignment 2021 AM Total Background Traffic Forecasts	34 35
Figure 4.5: Figure 4.6: Figure 4.7:	2021 PM Other Area Development Trip Assignment 2021 AM Total Background Traffic Forecasts 2021 PM Total Background Traffic Forecasts	34 35 36
Figure 4.5: Figure 4.6: Figure 4.7: Figure 4.8:	2021 PM Other Area Development Trip Assignment 2021 AM Total Background Traffic Forecasts 2021 PM Total Background Traffic Forecasts 2021 AM Total Traffic Forecasts	34 35 36 40
Figure 4.5: Figure 4.6: Figure 4.7: Figure 4.8: Figure 4.9:	2021 PM Other Area Development Trip Assignment 2021 AM Total Background Traffic Forecasts 2021 PM Total Background Traffic Forecasts 2021 AM Total Traffic Forecasts	34 35 36 40 41
Figure 4.5: Figure 4.6: Figure 4.7: Figure 4.8: Figure 4.9: Figure 4.10:	2021 PM Other Area Development Trip Assignment 2021 AM Total Background Traffic Forecasts 2021 PM Total Background Traffic Forecasts 2021 AM Total Traffic Forecasts 2021 PM Total Traffic Forecasts 2023 AM Background Traffic Forecasts	34 35 36 40 41 44
Figure 4.5: Figure 4.6: Figure 4.7: Figure 4.8: Figure 4.9: Figure 4.10: Figure 4.11:	2021 PM Other Area Development Trip Assignment 2021 AM Total Background Traffic Forecasts 2021 PM Total Background Traffic Forecasts 2021 AM Total Traffic Forecasts 2021 PM Total Traffic Forecasts 2023 AM Background Traffic Forecasts 2023 PM Background Traffic Forecasts	34 35 40 41 44 45
Figure 4.5: Figure 4.6: Figure 4.7: Figure 4.8: Figure 4.9: Figure 4.10:	2021 PM Other Area Development Trip Assignment 2021 AM Total Background Traffic Forecasts 2021 PM Total Background Traffic Forecasts 2021 AM Total Traffic Forecasts 2021 PM Total Traffic Forecasts 2023 AM Background Traffic Forecasts	34 35 40 41 44 45
Figure 4.5: Figure 4.6: Figure 4.7: Figure 4.8: Figure 4.9: Figure 4.10: Figure 4.11: Figure 4.12: Figure 4.13:	2021 PM Other Area Development Trip Assignment 2021 AM Total Background Traffic Forecasts	34 35 40 41 44 45 48 49
Figure 4.5: Figure 4.6: Figure 4.7: Figure 4.8: Figure 4.9: Figure 4.10: Figure 4.11: Figure 4.12: Figure 4.13: Figure 4.14:	2021 PM Other Area Development Trip Assignment 2021 AM Total Background Traffic Forecasts	34 35 40 41 44 45 48 49 53
Figure 4.5: Figure 4.6: Figure 4.7: Figure 4.8: Figure 4.9: Figure 4.10: Figure 4.11: Figure 4.12: Figure 4.13: Figure 4.14: Figure 4.15:	2021 PM Other Area Development Trip Assignment 2021 AM Total Background Traffic Forecasts	34 35 36 40 41 44 45 48 49 53 54
Figure 4.5: Figure 4.6: Figure 4.7: Figure 4.8: Figure 4.9: Figure 4.10: Figure 4.10: Figure 4.11: Figure 4.12: Figure 4.13: Figure 4.14: Figure 4.15: Figure 4.16:	2021 PM Other Area Development Trip Assignment 2021 AM Total Background Traffic Forecasts	34 35 40 41 44 45 48 49 53 54 58
Figure 4.5: Figure 4.6: Figure 4.7: Figure 4.8: Figure 4.9: Figure 4.10: Figure 4.11: Figure 4.12: Figure 4.13: Figure 4.14: Figure 4.15:	2021 PM Other Area Development Trip Assignment 2021 AM Total Background Traffic Forecasts	34 35 40 41 44 45 48 49 53 54 58

Tables

Table 2.1:	Vehicle Level of Service Definitions	13
Table 2.2:	Base Year (2018) AM Peak Hour Traffic Operations	
Summ	nary	15
Table 2.3:	Base Year (2018) PM Peak Hour Traffic Operations	
Summ	nary	15
Table 3.1:	Trip Generation	19
Table 3.2:	Trip Distribution	20
Table 4.1:	2021 AM Background Traffic Operations Summary	38
Table 4.2:	2021 PM Background Traffic Operations Summary	38
Table 4.3:	2021 AM Total Traffic Operations Summary	42
Table 4.4:	2021 PM Total Traffic Operations Summary	42
Table 4.5:	2023 AM Background Traffic Operations Summary	46
Table 4.6:	2023 PM Background Traffic Operations Summary	46
Table 4.7:	2023 AM Total Traffic Operations Summary	50
Table 4.8:	2023 PM Total Traffic Operations Summary	51
Table 4.9:	2025 AM Background Traffic Operations Summary	55
Table 4.10:	2025 PM Background Traffic Operations Summary	56
Table 4.11:	2025 AM Total Traffic Operations Summary	60
Table 4.12:	2025 PM Total Traffic Operations Summary	61
Table 5.1:	2025 AM Remedial Measures Total Traffic Operations	65
Table 5.2:	2025 PM Remedial Measures Total Traffic Operations	65
Table 6.1:	Zoning By-law Parking Requirements	66
Table 6.2:	Parking Requirements Based on Proxy Site Data	67
Table 7.1:	Bicycle Parking Guidelines	71
	-	

1 Introduction

1.1 Overview

Paradigm Transportation Solutions Limited (Paradigm) was retained by New Horizon Development Group (Sapphire) Inc. to conduct this Transportation Impact, Parking Justification and TDM Options Study for the proposed mixed-use development located at 310 Frances Avenue in Hamilton, Ontario. **Figure 1.1** details the study area and location of the subject site.

The development is proposed to be constructed in three (3) phases to include three (3) high-rise apartment buildings with a total of 1,836 units and 400 square metres (4,306 square feet) of commercial space. A total of 2,438 parking stalls are proposed to service the residential component of the site, including 20 barrier free spaces. Seven (7) parking spaces are proposed for the commercial component. Vehicular access to the site is proposed via four (4) all-turns driveway connections to Frances Avenue. The site is expected to be fully built and occupied by 2025.

1.2 Purpose and Scope

The purpose of this study is to assess the impacts of the subject site on the adjacent roadway network, to determine the improvements necessary (if any) to mitigate impacts and to assess the adequacy of the proposed parking supply.

The scope of the study includes the following:

- Determination and assessment of the current traffic conditions in the vicinity of the site;
- Determination and assessment of the additional traffic that will be generated by the proposed development;
- Analyses of the impacts of the additional traffic;
- Assessment of the adequacy of the proposed parking supply;
- Assessment of the transportation demand management measures integrated into the site plan; and
- Recommendations on the measures required to accommodate the traffic in a satisfactory manner.

This report has been prepared to meet the City of Hamilton Traffic Impact Study (TIS) Guidelines¹. This report assesses traffic conditions corresponding to the 2021 (Phase 1 opening year), 2023 horizon (Phase 2 opening year) and 2025 horizon (Phase 3 Full Build-Out), as required under the City of Hamilton Guidelines.

¹ City of Hamilton, *Traffic Impact Study Guidelines*, July 2009

Appendix "C" to Report PED19115 Page 16 of 314



Denotes Study Area Intersection

Study Area and Subject Development Location Figure 1.1

Waterfront Trails Transportation Impact, Parking Justification and TDM Options Study 180010

Appendix A contains the pre-study consultation correspondence with the City of Hamilton staff.

1.3 Study Area Intersections

The following intersections were investigated in this study:

- Green Road and Frances Avenue (two-way stop control);
- North Service Road and Green Road (two-way stop control);
- North Service Road and Millen Road (two-way stop control); and
- The four (4) proposed site driveway connections to Frances Avenue (two-way stop control).

2 Existing Conditions

This section documents current traffic conditions, operational deficiencies and constraints experienced by the public travelling at the intersections within the study area. The operational deficiencies and constraints identified at this stage will be fundamental to the process of defining the required remedial measures.

2.1 Road Network

The characteristics of the roadways in the study area are described below. Reference was made to the City of Hamilton's Official Plan². All intersections within the study area are stop-controlled.

- North Service Road is an east-west minor arterial roadway between Centennial Parkway and Fruitland Road. North Service Road has an urban cross-section on the north side and rural cross-section on the south side in the westerly portion of the study area. North Service Road is designated as a full-time truck route by the City of Hamilton. Within the study area, the posted speed limit is 80 kilometres per hour. Parking restrictions are not posted; therefore, parking is subject to City of Hamilton Parking By-law regulations. The surrounding land uses are mainly public park lands and residential development.
- Green Road is north-south local roadway running from Lake Ontario in the north to North Service Road/Queen Elizabeth Way (QEW). Green Road continues south of the QEW; however, a direct connection is not provided across the highway. Within the study area, Green Road has a four-lane urban cross-section consisting of one travel lane and one parking "lane" in each direction. The speed limit is not posted; therefore, it is assumed to be 50 kilometres per hour. North of Frances Avenue, parking is permitted on the east side of the roadway and on the west side of the roadway in the vicinity of Church Street. South of Frances Avenue, parking restrictions are not posted; therefore, parking is subject to City of Hamilton Parking Bylaw regulations. The surrounding land use is mainly residential in nature.
- Millen Road is a two-lane minor arterial roadway with an urban cross-section that provides a continuous and direct connection from North Service Road to South Service Road and points further south across the QEW. Millen Road is designated as a full-time truck route by the City of Hamilton. The speed limit is not posted; therefore, it is assumed to be 50 kilometres per hour. Parking is prohibited on the south side of the roadway on the section parallel to Lake Ontario and stopping is prohibited on the west side of the roadway over the QEW.

² City of Hamilton. *Urban Hamilton Official Plan Schedule C – Functional Road Classification.* January 2017.

The surrounding land use is residential in nature north of the QEW and light industrial in nature south of the QEW.

Frances Avenue is an east-west two-lane local roadway running from Grays Road in the west ending in a cul-de-sac east of Green Road. Within the study area, Frances Avenue has a two-lane urban cross-section. The speed limit is not posted; therefore, it is assumed to be 50 kilometres per hour. Parking restrictions are not posted; therefore, parking is subject to City of Hamilton Parking By-law regulations. The surrounding land use is mainly residential in nature.

On-street parking on the study area roads is regulated by the City of Hamilton On-Street Parking By-law No. 01-218³. The By-law prohibits vehicles from parking for longer than 12 hours at any given time.

Figure 2.1 illustrates the existing lane configurations and traffic control at the study area intersections.

2.2 Existing Transit Service

The City of Hamilton and GO Transit do not currently provide fixed route transit service within 400 metres of the subject site. The nearest fixed transit route in the study area is Route 56 – Centennial, which travels north - south from Eastgate Terminal Platform #3 to Lakeland Community Centre. Service runs daily from 10:00 AM to 6:10 PM on 45- minute headways. The nearest transit stop for Route 56 is located 1.9 kilometres west of the subject site.

However, the site is located within an area where Trans-Cab service is provided. Trans-Cab is a shared ride taxi service between Hamilton Street Railway (HSR) and Hamilton Cab. It is available to all passengers in Stoney Creek where buses do not currently provide service. The subject site is located within the Bell Manor and Levi-Loop Trans-Cab service area. This service picks up passengers and transports to the nearest bus stop transfer point:

- Confederation Parkway and North Service Road (2.7 kilometres from the subject site); or
- Grays Road and Barton Street (2.0 kilometres from the subject site).

Trans-Cab service is provided Monday through Saturday from 6:00 AM to 7:00 PM. This service costs \$0.50 in addition to the standard bus fare (\$3.00 or less depending on method of payment).

Figure 2.2 shows the location of the fixed transit routes and Trans-Cab area.

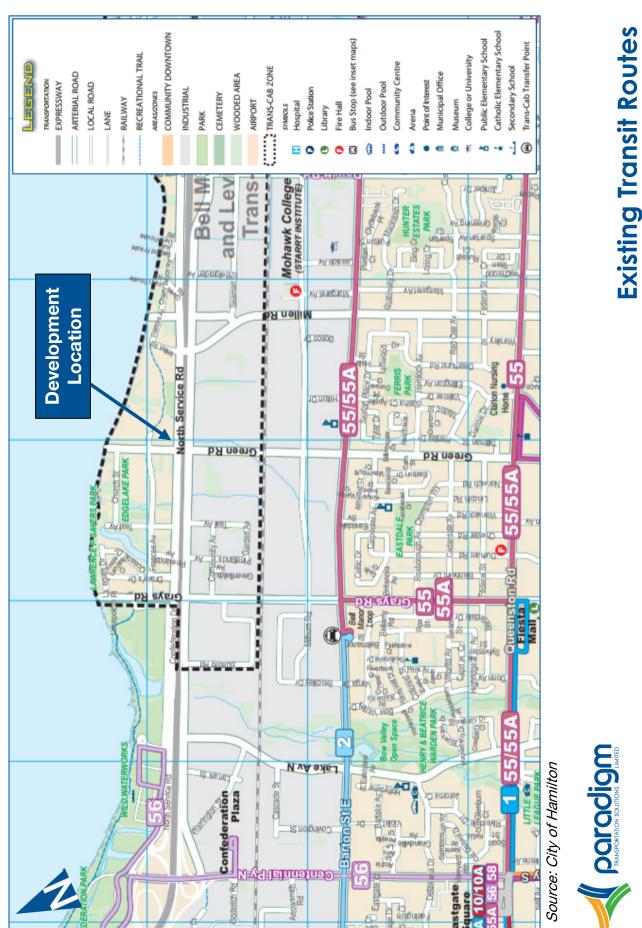
³ City of Hamilton. On-Street Parking By-law No. 01-218.

Appendix "C" to Report PED19115 Page 20 of 314



Figure 2.1

Waterfront Trails Transportation Impact, Parking Justification and TDM Options Study 180010



Appendix "C" to Report PED19115 Page 21 of 314

Waterfront Trails Transportation Impact, Parking Justification and TDM Options Study 180010

Figure 2.2

2.3 Active Transportation

2.3.1 Walkability

Pedestrian sidewalks are provided throughout the study area as follows:

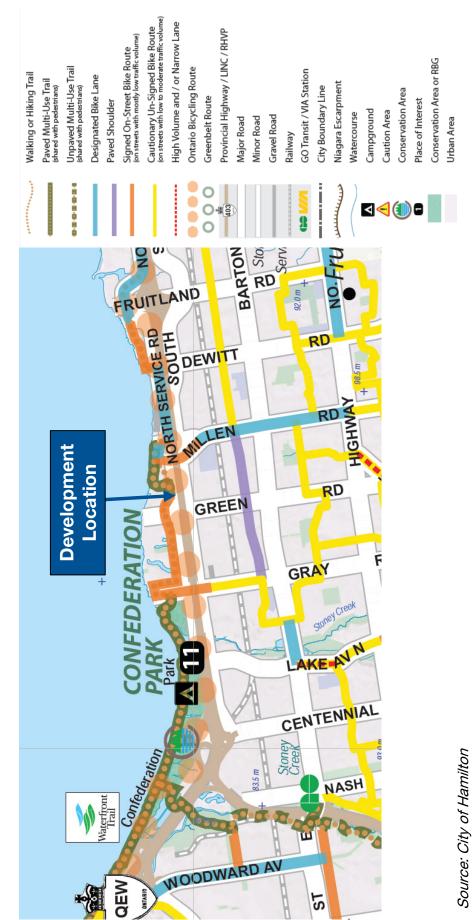
- Green Road
 - Sidewalks are provided on both sides of the roadway.
- Millen Road
 - A sidewalk is provided on the north side of the roadway on the section that runs parallel to Lake Ontario.
- Frances Avenue:
 - Sidewalks are provided along both sides of the roadway.

2.3.2 Cycling

Several roadways within the study area are designated cycling/trail routes. The details of each are as follows:

- Frances Avenue from Grays Road to east of Green Road is identified on the City of Hamilton's Rural Cycling Map as an on-street bike route and a walking or hiking trail. East of Green Road, the trail continues eastward through the undeveloped lands as the extension of Frances Avenue and is designated as a paved multi-use trail (shared with pedestrians). This trail is also part of the Waterfront Trail system;
- North Service Road is designated as part of the Ontario Bicycle Route. The route is an "inter-regional cycling network of provincially and regionally important links that fill an existing gap needed for cycling routes between regions and extends to all provincial and international boundaries"; and
- Millen Road/Frances Avenue/Shoreview Place is designated as a signed on-street bike route throughout the study area. The portion of Millen Road that runs parallel to Lake Ontario (Shoreview Place) is designated as a paved multi-use trail that is part of the Waterfront Trail system. Parking is available on the north side of Shoreview Place.

Figure 2.3 shows the City of Hamilton's cycling and trail map, including the location of the subject site.



Waterfront Trails Transportation Impact, Parking Justification and TDM Options Study

180010

Existing Cycling and Trail Network

Vetwork Figure 2.3



Appendix "C" to Report PED19115 Page 23 of 314

2.4 Existing Traffic Volumes

The weekday AM and PM peak hour traffic counts for the study area intersections were provided as follows:

- Green Road and Frances Avenue: collected by Paradigm staff on June 24, 2015;
- Green Road and North Service Road: collected by Paradigm staff on May 2, 2017; and
- Millen Road and North Service Road: collected by the City of Hamilton on May 6, 2016.

A growth rate of 2% per annum compounded was applied to all intersection volumes for the respective number of years to reflect 2018 conditions. This growth rate is also reflective of the yearly growth in average annual daily traffic (AADT) on the QEW between Fruitland Road and Centennial Parkway from 2005 to 2010⁴.

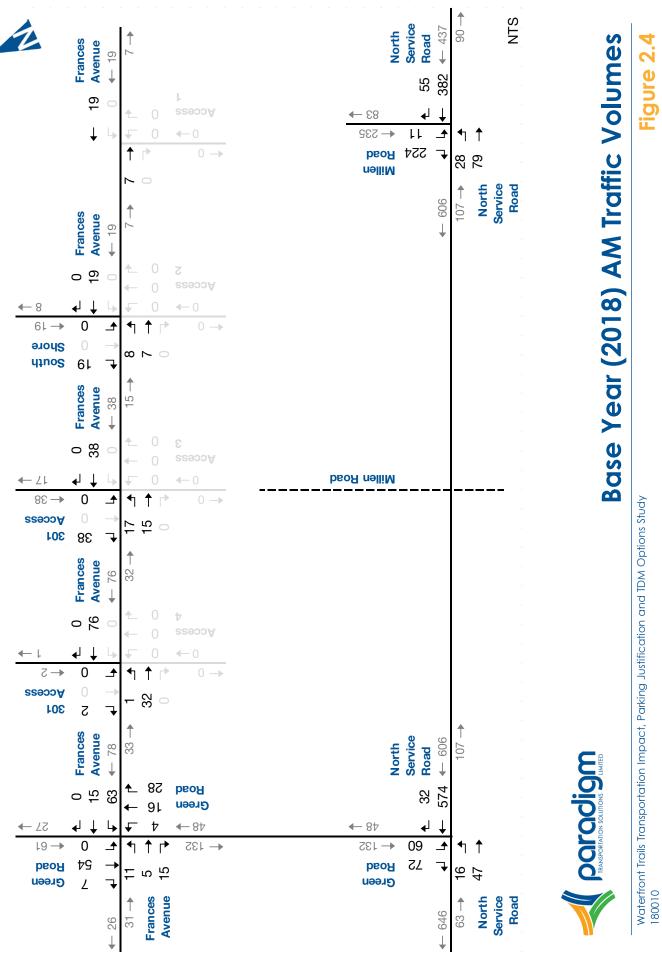
To ensure consistency, network traffic volumes on Green Road and North Service Road were balanced using the higher volume intersection. Any further resultant traffic volume discrepancies were equalized based on percent distribution.

Waterfront Trails is located in the Green Millen Shores Estates (GMSE) development area. Over the past couple of years, Paradigm has completed extensive analysis for a number of development applications within this area. The most recent study was completed in June 2017⁵ and included traffic forecasts for the AM and PM peak hours for the 2021 and 2026 horizon years. These forecasts include general traffic growth, the traffic generated by full development of the GMSE lands (not including the subject site) and the planned improvements to Confederation Park. It is noted that Paradigm assumed the developments at 311 and 321 Frances Avenue and 98 Shoreview were completed and fully occupied at the time of that study.

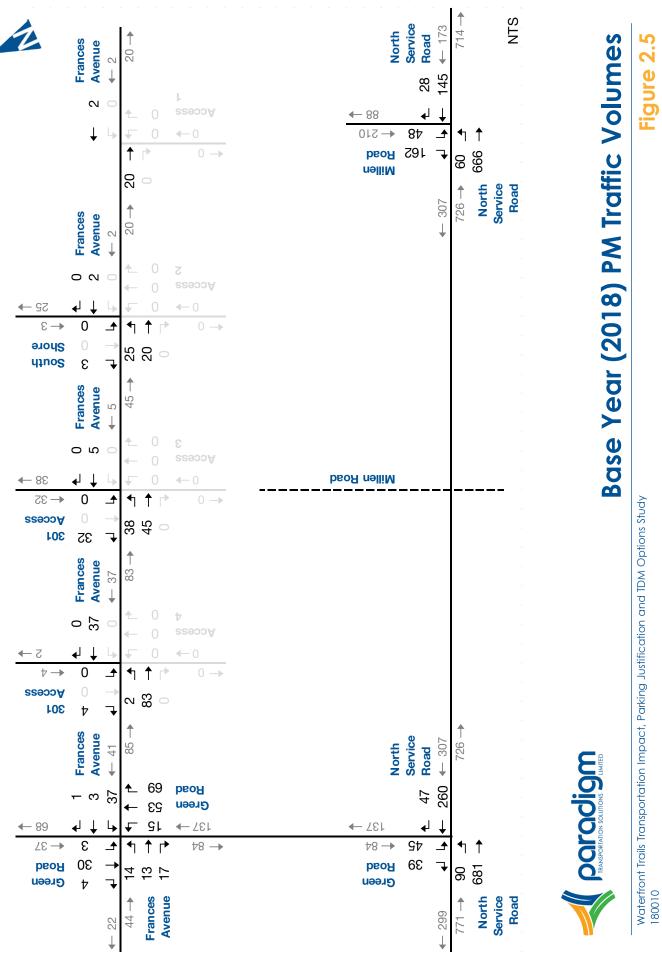
Figure 2.4 and **Figure 2.5** summarize the base year (2018) AM and PM peak hour traffic volumes, respectively. **Appendix B** contains the detailed count data.

⁴ Provincial Highways Traffic Volumes 1988-2010, Ministry of Transportation

⁵ Paradigm Transportation Solutions Limited. *101 Shoreview Place, City of Hamilton Transportation Impact Study*. June 2017.



Appendix "C" to Report PED19115 Page 25 of 314



Appendix "C" to Report PED19115 Page 26 of 314

2.5 Traffic Operations

Intersection level of service (LOS) is a recognized method of quantifying the delay experienced by drivers at intersections. The term "Level of Service" denotes how well a traffic movement operates under given traffic demands, lane arrangements, and traffic controls. Each level is determined by the average amount of control delay per vehicle. Control delay is the total delay associated with stopping for a signal or stop sign, and includes four components: deceleration delay, stopped delay, queue move up time and final acceleration delay.

Table 2.1 contains the level of service criteria for signalized and stopcontrolled intersections. As shown, LOS A indicates small average control delays (less than 10 second per vehicle) whereas LOS F indicates intersection failure, which results in extensive vehicular queues and long delays (over 50 seconds per vehicle at an unsignalized intersection, and over 80 seconds per vehicle at a signalized intersection). LOS D is typically considered acceptable peak-hour performance in an urban setting, and lower LOS values are tolerable for short-term time periods during peak hours when heavier traffic volumes are expected.

Level of Service	Signalized Intersections Average Total Delay (sec/veh)	Unsignalized Intersections Average Total Delay (sec/veh)
A	< = 10	< = 10
В	> 10 & < = 20	> 10 & < = 15
С	> 20 & < = 35	> 15 & < = 25
D	> 35 & < = 55	> 25 & < = 35
E	> 55 & < = 80	> 35 & < = 50
F	> 80	> 50

TABLE 2.1: VEHICLE LEVEL OF SERVICE DEFINITIONS

As per the City of Hamilton TIS Guidelines, the following defines critical movements for intersections:

- Volume to capacity ratios for through movements or shared through/turning movements that operate at 0.85 or greater for signalized intersections;
- Volume to capacity ratios for exclusive turning movements that operate at 0.90 or greater for signalized intersections;
- Level of service based on average delay per vehicle or individual movement is LOS D or greater for unsignalized intersections; and
- Estimated 95th percentile queue lengths exceed available turning lane storage.

The operations of the study intersections under existing, or base year (2018), traffic conditions were evaluated using Synchro 9 with HCM 2000 procedures. The intersection analysis considered three separate measures of performance:

- ► The LOS for each turning movement;
- ▶ The volume to capacity (v/c) ratio for each turning movement; and
- ▶ The 95th percentile queue lengths.

Table 2.2 summarizes the existing intersection operations, indicating the existing levels of service (LOS), volume to capacity ratios (V/C) and 95^{th} percentile queues experienced within the study area for the AM and PM peak hours, respectively.

The analyses indicate that all intersections and movements within the study area currently operate at overall acceptable levels of service, with the following exception:

- North Service Road and Green Road:
 - Southbound left-turn movement LOS D during the PM peak hour with a v/c ratio of 0.28. The low v/c ratio on this movement indicates the delay is due to the high volume of through traffic on North Service Road which limits available gaps for side street traffic.

Appendix C provides the detailed Synchro 9 reports.

TABLE 2.2: BASE YEAR (2018) AM PEAK HOUR TRAFFIC OPERATIONS SUMMARY

ō										Directi	on / M	oveme	nt / Ap	oroach						
erio				Eastbound					Westbound Northbound											
Analysis Period	Intersection	Control Type	MOE	Left	Through	Right	Approach	tleft	Through	Right	Approach	lfeft	Through	Right	Approach	tleft	Through	Right	Approach	Overall
	1 - Green Road & Frances Avenue	TWSC	LOS Delay V/C Q	~ ~ ~ ~	A 9 0.04 1	~ ~ ~ ~	A 9	~ ~ ~ ~	A 10 0.10 3	~ ~ ~ ~	A 10	~ ~ ~ ~	A 1 0.00 0	~ ~ ~ ~	A 1	~ ~ ~ ~	A 0 0.00 0	~ ~ ~ ~	A 0	A 5
AM Peak Hour	2 - North Service Road & Green Road	TWSC	LOS Delay V/C Q Ex Avail.	A 9 0.02 1 125 125	A 0 0.03 0 -		A 2		A 0 0.39 0 -	> > > > >	A 0	, 				C 16 0.17 5 40 35		B 14 0.16 5 -	C 15	A 3
A	3 - North Service Road & Millen Road	TWSC	LOS Delay V/C Q Ex Avail.	A 9 0.03 1 90 89	A 0 0.05 0 -		A 2		A 0 0.28 0 -	> > > > > >	A 0					B 15 0.40 15 -		B 15 0.40 15 25 10	B 15	A 5

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length Ex. - Existing Available Storage Avail. - Available Storage TCS - Traffic Control Signal TWSC - Two-Way Stop Control AWSC - All-Way Stop Control RBT - Roundabout < - Shared Left-Turn Lane

> - Shared Right-Turn Lane

TABLE 2.3: BASE YEAR (2018) PM PEAK HOUR TRAFFIC OPERATIONS SUMMARY

g										Directi	on / M	oveme	nt / Apj	oroach						
erio	erio		Eastbound					West	Westbound Northbound											
Analysis Period	Intersection	Control Type	MOE	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
			LOS	<	A	>	Α	<	B	V	В	<	Α	>	Α	<	A	~	Α	Α
	1 - Green Road & Frances Avenue	TWSC	Delay V/C	<	10 0.06	>	10	<	10 0.06	>	10	<	1 0.01	>	1	<	1 0.00	>	1	4
	Frances Avenue		Q	< <	2	> >		< <	2	>		< <	0.01	>		< <	0.00	> >		
PM Peak Hour	2 - North Service Road & Green Road	TWSC	LOS Delay V/C Q Ex Avail.	A 8 0.08 2 125 123	A 0 0.44 0 -		A 1		A 0 0.20 0 - -	~ ~ ~ ~ ~ ~ ~	A 0					D 33 0.28 9 40 31		B 10 0.06 1 -	C 22	A 2
ā	3 - North Service Road & Millen Road	TWSC	LOS Delay V/C Q Ex Avail.	A 8 0.05 1 90 89	A 0.43 0 -		A 1		A 0 0.11 0 -	~ ~ ~ ~ ~ ~	A 0					B 13 0.21 6 -		B 13 0.21 6 25 19	B 13	A 3

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length Ex. - Existing Available Storage Avail. - Available Storage TCS - Traffic Control Signal TWSC - Two-Way Stop Control AWSC - All-Way Stop Control

< - Shared Left-Turn Lane> - Shared Right-Turn Lane

RBT - Roundabout

3 Development Concept

3.1 **Development Description**

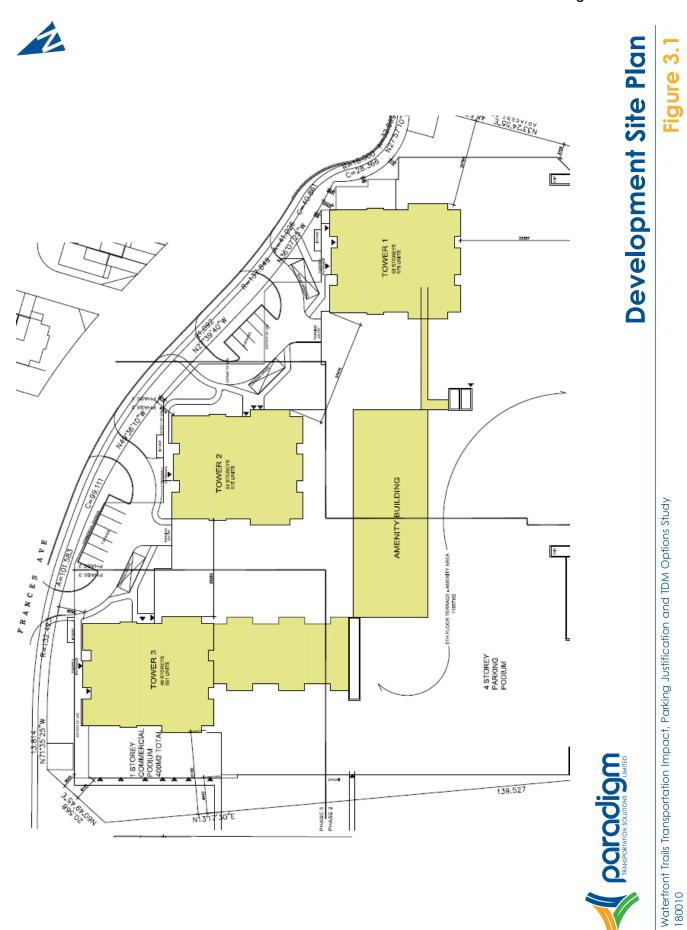
The proposed development is located at 310 Frances Avenue and is bordered by Frances Avenue to the north, Green Road to the east and North Service Road to the south.

The subject site is proposed to be developed in three (3) phases:

- Phase 1 (Tower 1) Completed and occupied in 2021:
 - 59 storey residential apartment building with 670 units, comprising 448 one-bedroom units and 222 two-bedroom units;
 - A total of 889 parking spaces; and
 - Vehicular access via one (1) all-turns driveway connection to Frances Avenue (Site Access 1).
- ▶ Phase 2 (Tower 2) Completed and occupied in 2023:
 - 54 storey residential apartment building with 615 units, comprising 410 one-bedroom units and 205 two-bedroom units;
 - A total of 817 parking spaces; and
 - Vehicular access via two (2) all-turns driveway connections to Frances Avenue (Site Access 2 and Site Access 3).
- ▶ Phase 3 (Tower 3) Completed and occupied in 2025:
 - 48 storey residential apartment building with 551 units, comprising 369 one-bedroom units and 182 two-bedroom units;
 - 400 square metres (4,306 square feet) of commercial retail space;
 - A total of 739 parking spaces; and
 - Vehicular access via one (1) all-turns driveway connection to Frances Avenue (Site Access 4).

The development will also include an amenity building that will be available for all residents of the site by the conclusion of construction. The four (4) allturns driveway connections to Frances Avenue (herein referred to as "Access") are planned to be stop-controlled on the minor road (driveway) leg.

Figure 3.1 shows the proposed site plan.



Appendix "C" to Report PED19115 Page 31 of 314

3.2 Development Trip Generation

Trip generation information is used to forecast the anticipated level of traffic activity to occur as a result of the development of the site.

The Institute of Transportation Engineers (ITE) Trip Generation Manual 10th Edition⁶ provide rates and equations to estimate the constituent component development peak hour traffic volumes. The following Land Use Codes (LUC) were utilized in this study:

- LUC 222 Multifamily Housing (High-Rise): Includes apartments, townhouses, and condominiums that have more that 10 levels; and
- LUC 820 Shopping Centre: Integrated group of commercial establishments that is planned, developed, owned and managed as a unit. The composition is related to its market area in terms of size, location and type of store. Provides on-site parking facilities sufficient to serve its parking demands.

The regression equations were utilized for the residential component of the development as all criteria for their use were met. Average rates were used for the commercial component estimates as all criteria for use of the equation rates were not met.

Note that in order to remain conservative in the trip generation estimates, reductions were not applied to account for the synergy between the residential and commercial components of the development. This decision was largely based on the small size of commercial retail space planned for the site and that it will not be constructed until the final phase of development.

Table 3.1 summarizes the resulting base trip generation and indicates that the site will generate a total of 556 AM peak hour trips and 666 PM peak hour trips upon full build-out.

	Land Use	Unit of	Units/		AM Pea	ak Hour	·		PM Pea	ak Hour	
	Land Use	Measure	GFA	Rate	In	Out	Total	Rate	In	Out	Total
PHASE 1	LUC 222 - Multifamily Housing (High-Rise)	Units	670	FCE ¹	48	152	200	FCE ²	144	92	236
		Total I	Phase 1		48	152	200		144	92	236
PHASE 2	LUC 222 - Multifamily Housing (High-Rise)	Units	615	FCE ¹	44	141	185	FCE ²	133	85	218
		Total I	Phase 2		44	141	185		133	85	218
SE 3	LUC 222 - Multifamily Housing (High-Rise)	Units	551	FCE ¹	40	127	167	FCE ²	120	76	196
PHASE	LUC 820- Shopping Centre	GFA	4,305	0.94	2	2	4	3.81	8	8	16
		Total I	Phase 3		42	129	171		128	84	212
		Total Ne	w Trips		134	422	556		405	261	666
	_			1 T = 0.2	8(x) + 12	2.86	-	2 T = 0.3	34(x) + 8.	56	

TABLE 3.1: TRIP GENERATION

3.3 Development Trip Distribution and Assignment

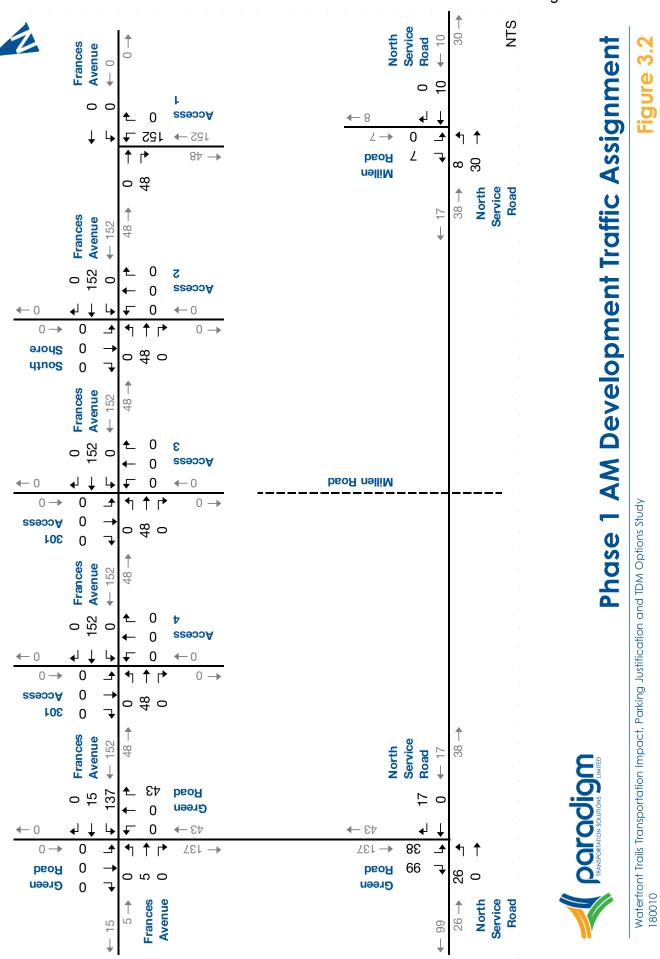
The estimated site generated trips were assigned to the roadway network based on the existing distribution of traffic within the study area as calculated in the June 2017 Paradigm study. The 2016 Transportation Tomorrow Survey (TTS) was not utilized to determine trip distribution data as much of the study area had not yet been fully developed when the TTS data was collected. **Table 3.2** details the estimated trip distribution for the development.

Origin/Destination	IN	OUT			
West via Frances Avenue	10%	10%			
East via North Service Road	20%	20%			
West via North Service Road	55%	65%			
South via Millen Road	15%	5%			
Total	100%	100%			

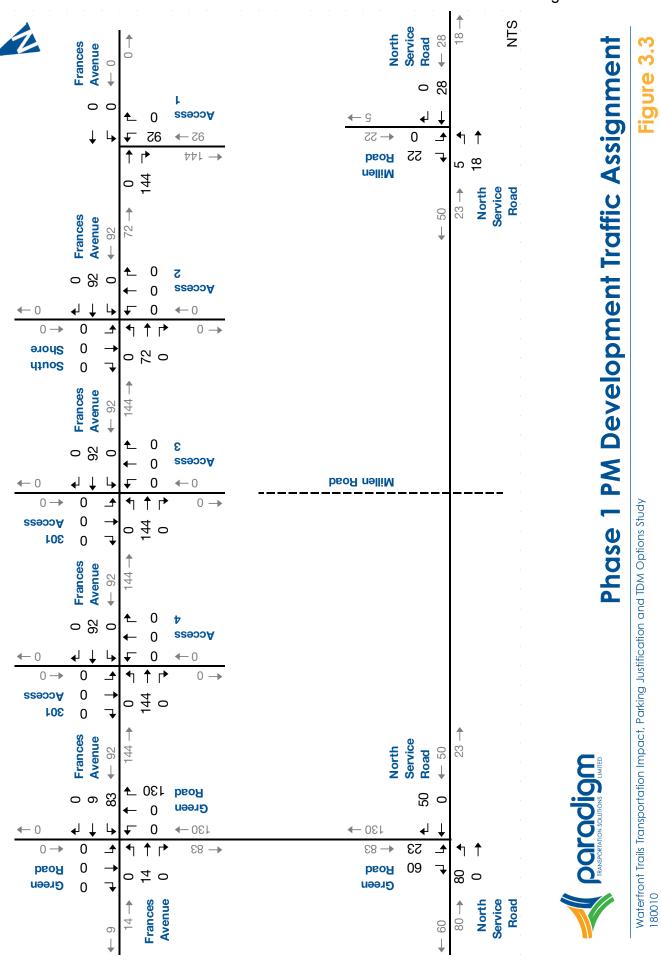
TABLE 3.2: TRIP DISTRIBUTION

Using the trip generation and trip distribution estimates, the site traffic was assigned to the road network. The site traffic is illustrated as follows:

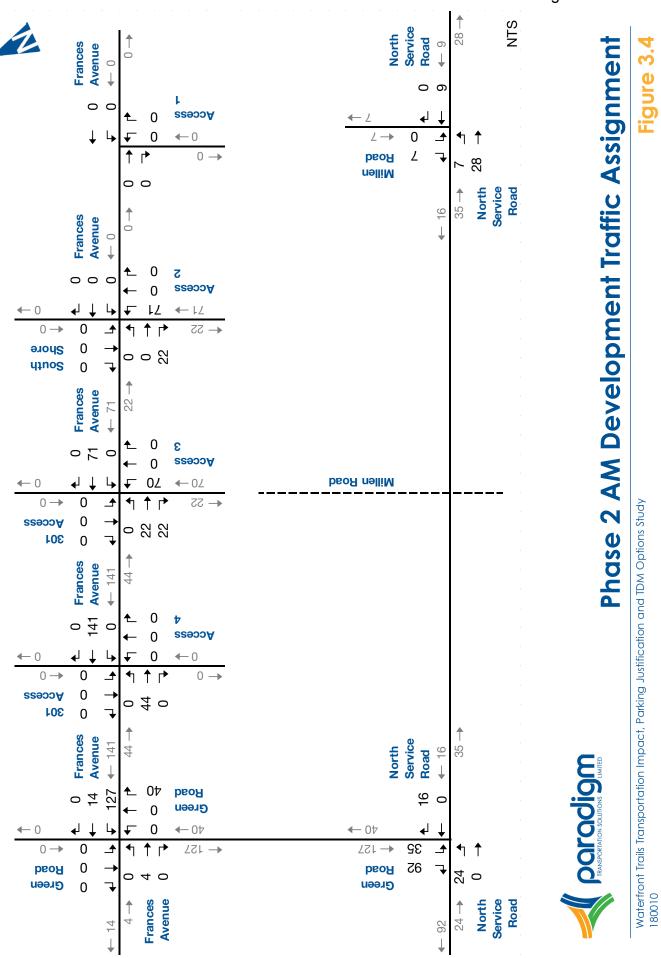
- Figure 3.2 and Figure 3.3 Phase 1;
- Figure 3.4 and Figure 3.5 Phase 2; and
- Figure 3.6 and Figure 3.7 Phase 3 (Full Build-Out)



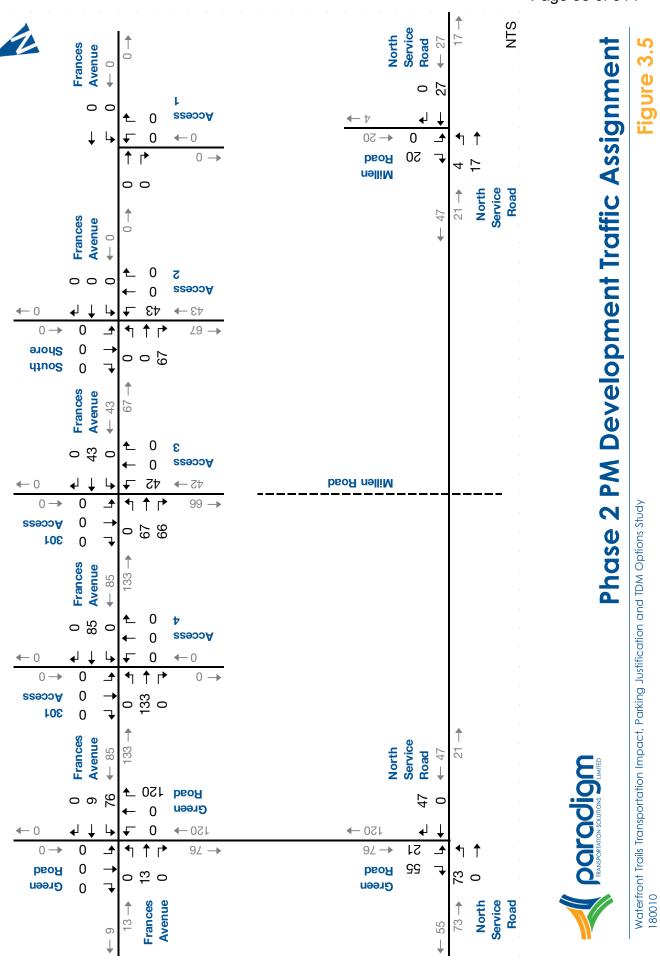
Appendix "C" to Report PED19115 Page 35 of 314



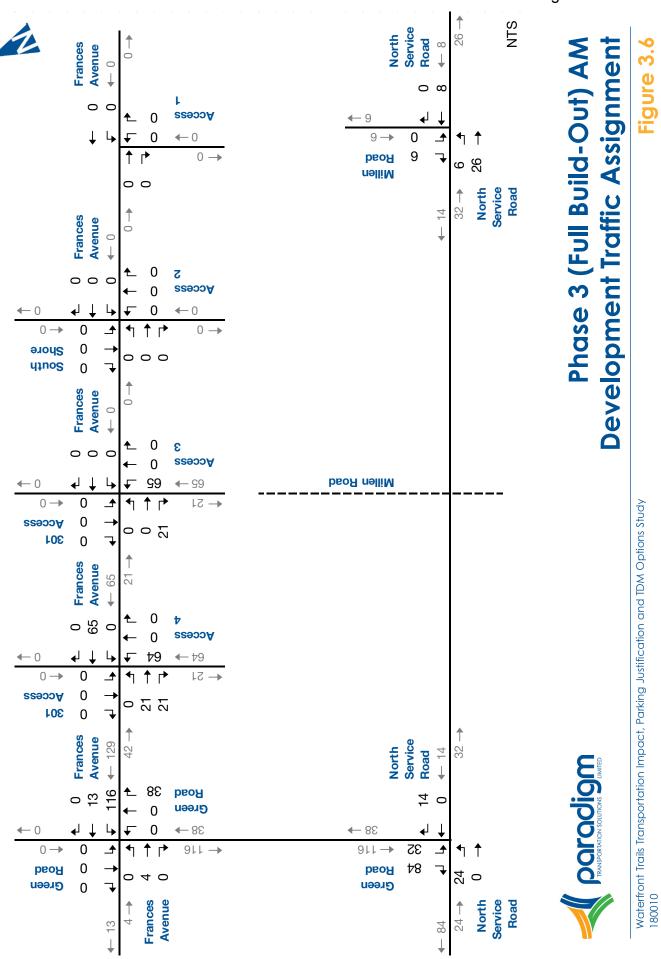
Appendix "C" to Report PED19115 Page 36 of 314



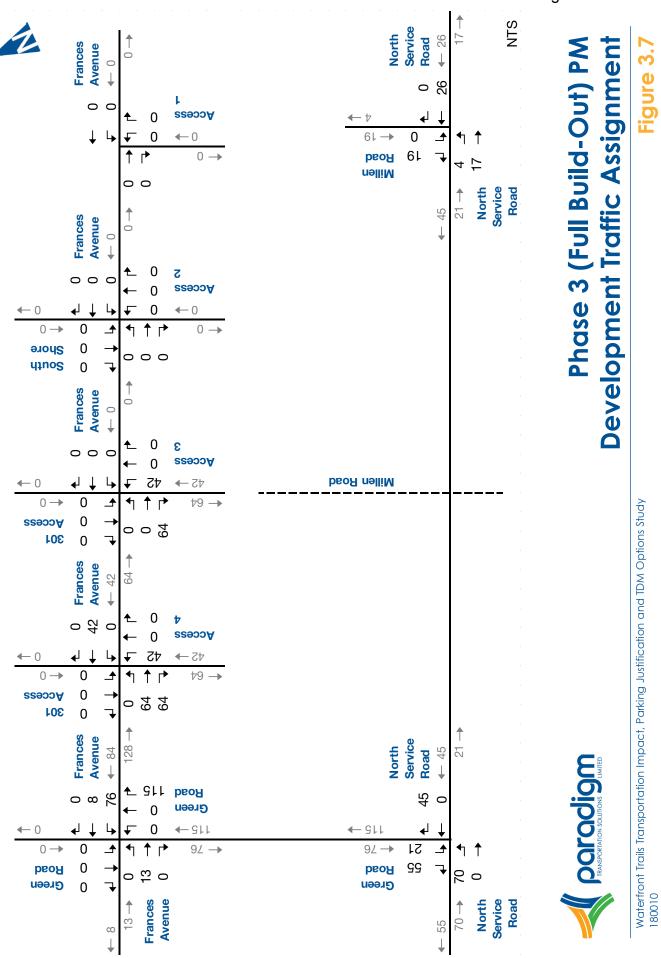
Appendix "C" to Report PED19115 Page 37 of 314



Appendix "C" to Report PED19115 Page 38 of 314



Appendix "C" to Report PED19115 Page 39 of 314



Appendix "C" to Report PED19115 Page 40 of 314

4 Evaluation of Future Traffic Conditions

The assessment of future traffic conditions contained in this section includes estimates of future background and total traffic volumes and analysis for the 2021, 2023 and 2025 horizons. The future traffic volumes in the vicinity of the development will likely consist of increased non-site traffic volumes (generalized background traffic), traffic generated by other developments in the area and the traffic generated by the proposed development.

4.1 2021 Horizon

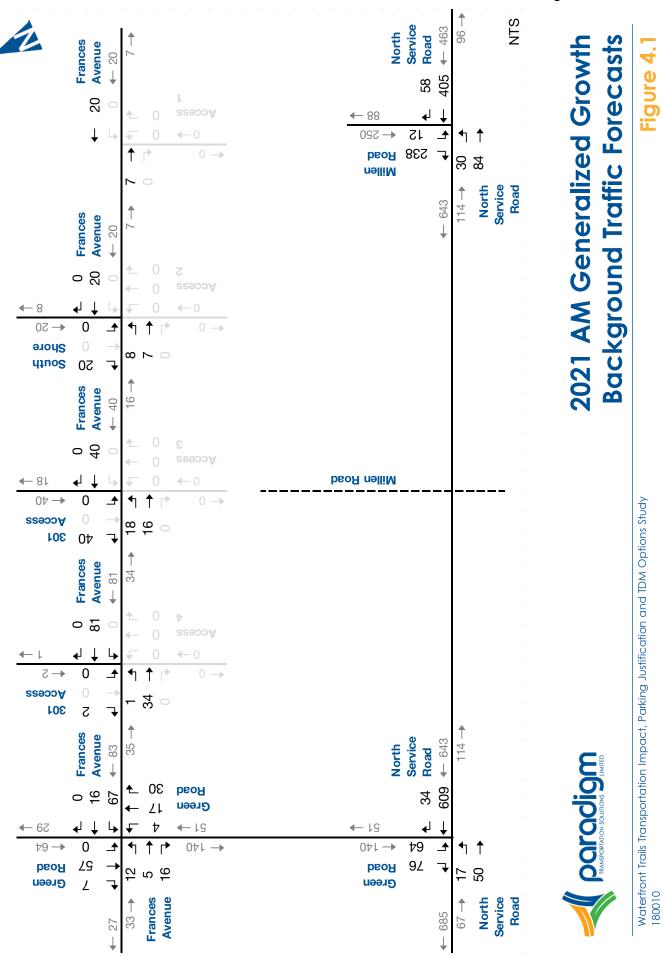
4.1.1 2021 General Background Traffic Growth

To derive the 2021 general background traffic volumes, the non-site traffic (generalized traffic growth) was increased by applying a compound growth rate of 2 percent per annum to the existing traffic volumes (6.1 percent total). Note that this growth rate is consistent with the growth rate used in the previous reports completed by IBI and Paradigm for the GMSE development area. This growth rate is also reflective of the yearly growth in AADT on the QEW between Fruitland Road and Centennial Parkway from 2005 to 2010.

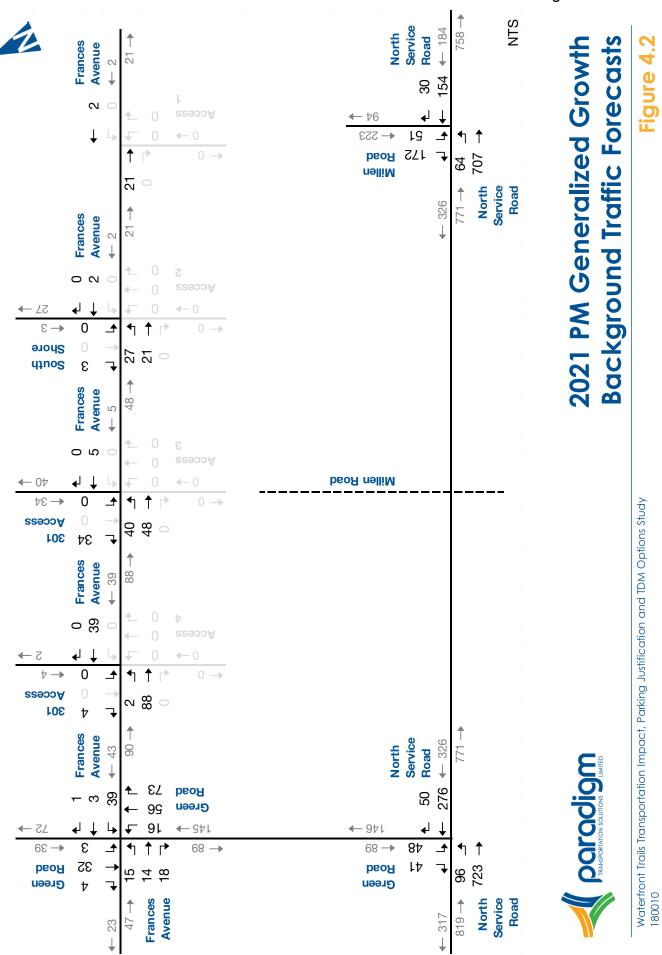
Figure 4.1 and **Figure 4.2** show the 2021 general background traffic forecasts for the AM and PM peak hours.

4.1.2 Other Planned Developments

There are three other developments with traffic expected to impact the study area (Confederation Park, 8 Shoreview Drive, and 101 Shoreview Drive). The traffic generated by these developments were assumed to be completed by the 2021 and are included in the background traffic over and above the general background traffic growth. The development locations are shown in **Figure 4.3** and development information is as follows:



Appendix "C" to Report PED19115 Page 42 of 314



Appendix "C" to Report PED19115 Page 43 of 314



101 Shoreview Place



Appendix "C" to Report PED19115 Page 44 of 314

Waterfront Trails Transportation Impact, Parking Justification and TDM Options Study 180010

Location of Other Area Developments (2021

Figure 4.3

Confederation Park

This development is expected to be completed by 2021 and includes:

- 1,400 square metres (15,000 square feet) of sit-down restaurant space;
- ▶ 5,100 square metres (55,000 square feet) of general retail space; and
- ▶ 4 sport fields.

This development is forecast to generate 114 trips (64 in, 50 out) during the AM peak hour and 329 trips (235 in, 94 out) during the PM peak hour as taken from the Transportation Assessment⁷ prepared by Dillon Consulting.

8 Shoreview Place

This development is expected to be completed by 2021 and includes:

- ▶ 130 congregate care facility units; and
- 50 square metres (538 square feet) of retail use (assumed to be coffee shop).

This development is forecast to generate 61 trips (32 in, 29 out) during the AM peak hour, and 42 trips (22 in, 20 out) during the PM peak hour. These forecasts were taken from the TIS⁸ previously prepared by Paradigm for this development.

101 Shoreview Place

This development is expected to be completed by 2021 and includes:

▶ 479 low-rise condominium/townhouse units.

This development is forecast to generate 321 trips (80 in, 241 out) during the AM peak hour, and 374 trips (216 in, 157 out) during the PM peak hour. These forecasts were taken from the TIS⁹ previously prepared by Paradigm for this development.

Figure 4.4 and **Figure 4.5** show the traffic volumes from the other developments in the study area. Note that not all trips generated by the other planned developments will enter the study area. The trips were assigned to the network based on the assignment detailed in their respective TIS reports.

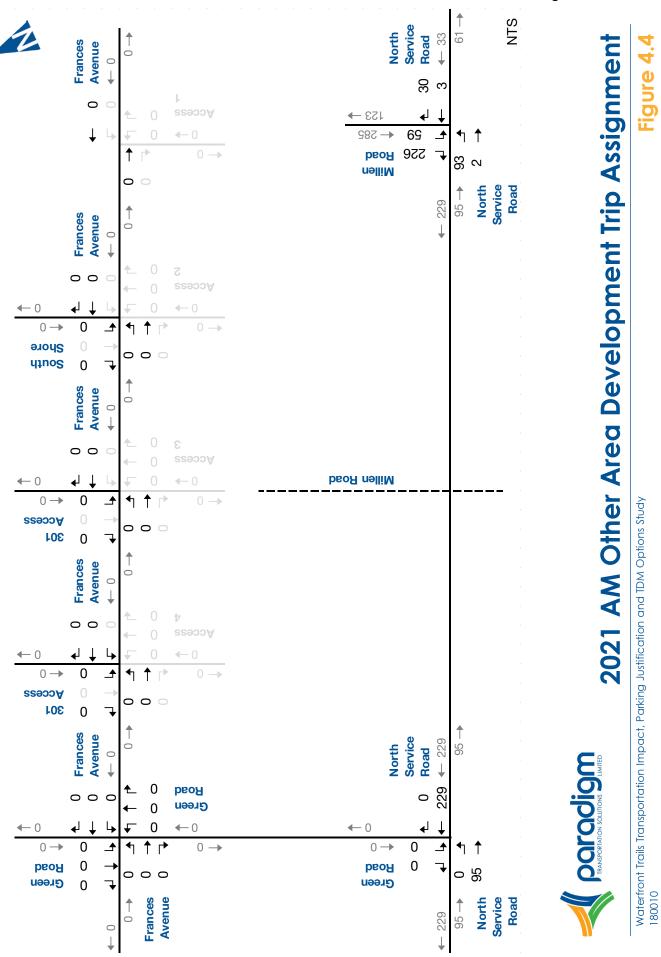
⁸ Paradigm Transportation Solutions Limited. *98 Shoreview Place Transportation Impact Study.* November 2015

⁹ Paradigm Transportation Solutions Limited. *101 Shoreview Place Transportation Impact Study.* July 2017.

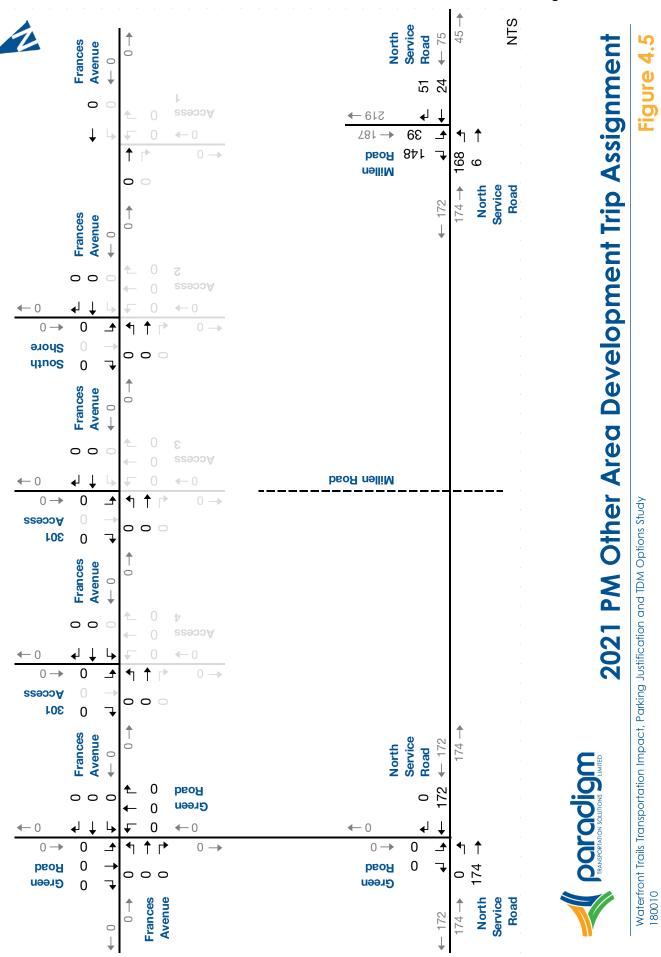
⁷ Dillion Consulting Limited. *Confederation Park Transportation Assessment.* June 2013.

4.1.3 2021 Total Background Traffic Volumes

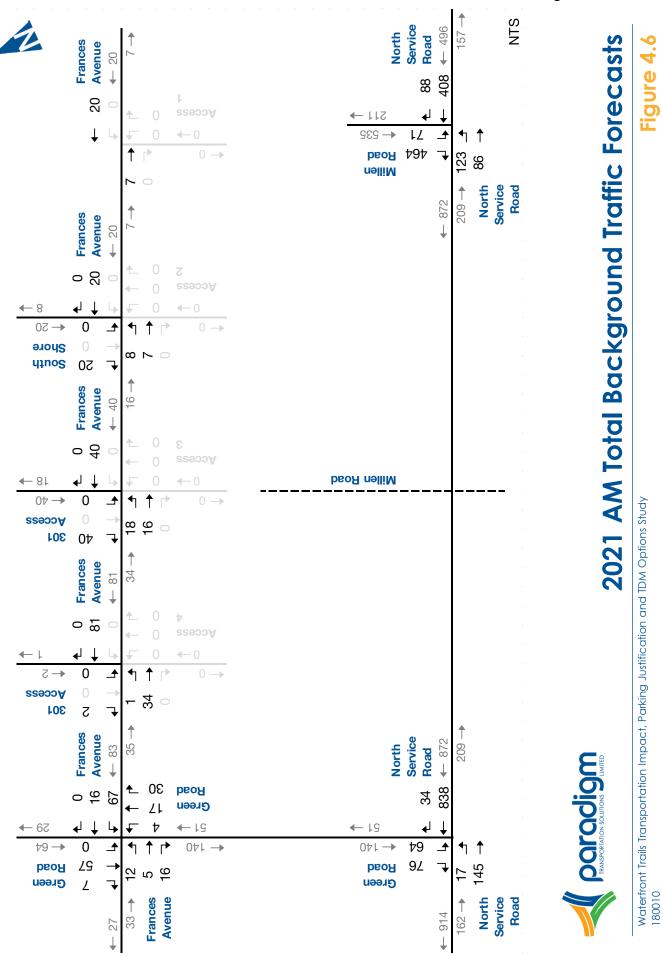
Figure 4.6 and **Figure 4.7** illustrate the 2021 total background traffic including the generalized background traffic and site traffic from the abovenoted area developments for the AM and PM peak hours, respectively.



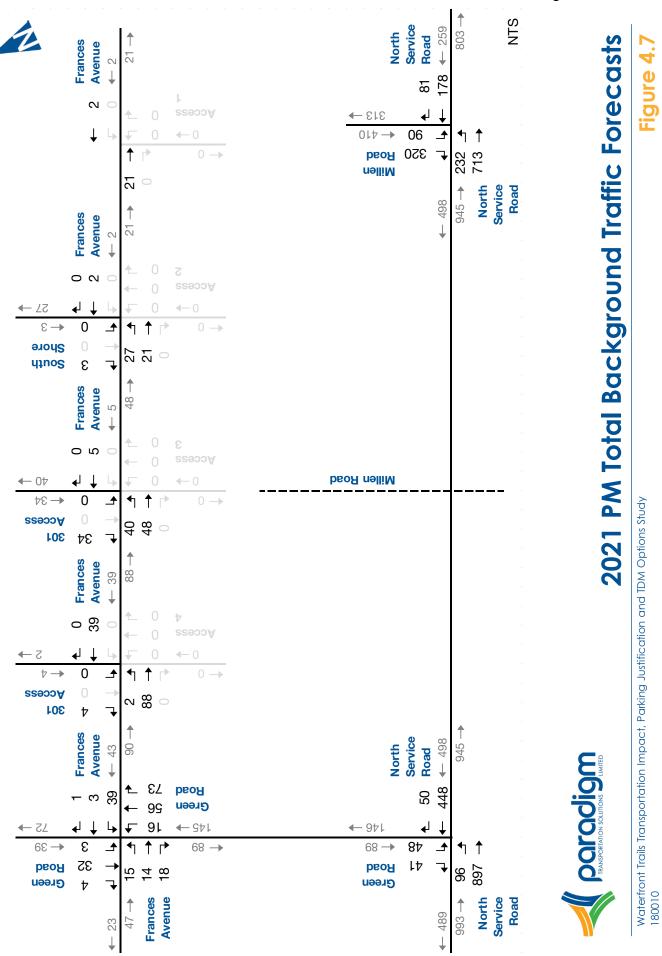
Appendix "C" to Report PED19115 Page 47 of 314



Appendix "C" to Report PED19115 Page 48 of 314



Appendix "C" to Report PED19115 Page 49 of 314



Appendix "C" to Report PED19115 Page 50 of 314

4.1.3 2021 Background Traffic Operations

The operations of the study area intersections under 2021 background traffic volumes were analyzed using Synchro 9 with HCM 2000 procedures.

The 101 Shoreview Place TIS identified remedial measures required in the study area to accommodate background traffic at 2021 and 2026 including:

- Traffic signals at the intersection of North Service Road and Millen Road; and
- Reconfiguring the southbound lanes at North Service Road and Millen Road to have the southbound right-turn as the main approach and the southbound left-turn as the added approach with 50 metres of storage.

These recommended improvements were assumed to be in place at the 2021 horizon and are reflected in all successive analyses.

Table 4.1 and **Table 4.2** summarize the 2021 background traffic operations for the AM and PM peak hours, respectively. The analyses indicate all intersections and movements within the study area are forecast to operate at overall acceptable levels of service. The following exception is noted:

- North Service Road and Green Road:
 - Southbound left-turn movement LOS D with a v/c of 0.32 during the AM peak hour and LOS F with a v/c of 0.57 during the PM peak hour. The low to moderate v/c ratios indicate the delay is due to the high volume of through traffic on North Service which limits available gaps for side street traffic.

Appendix D contains the detailed supporting Synchro 9 reports.

TABLE 4.1: 2021 AM BACKGROUND TRAFFIC OPERATIONS SUMMARY

ā										Directi	on / M	oveme	nt / Ap	oroach						
erio					Eastb	ound			West	oound			North	bound			South	bound		
Analysis Period	Intersection	Control Type	MOE	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
	1 - Green Road & Frances Avenue	TWSC	LOS Delay V/C	v v v	A 9 0.04	~ ~ ~	A 9	v v v	A 10 0.11	~ ~ ~	A 10	V V V	A 1 0.00	~ ~ ~	A 1	~ ~ ~	A 0 0.00	v v v	A 0	A 5
			Q	<	1	>		<	3	>		<	0	>		<	0	>		
lour	2 - North Service Road &		LOS Delay V/C	B 10 0.03	A 0 0.09		A 1		A 0 0.56	> > >	A 0					D 29 0.32		C 20 0.25	C 24	A 3
AM Peak Hour	Green Road	TWSC	Q Ex	1 125	0 -				0 -	> >						10 40		8 -		
W			Avail.	124	-				-	>	-					30		-		_
			LOS Delay	В 11	A 7		А 9		В 11	>	В 11					В 18		C 26	C 25	В 17
	3 - North Service Road & Millen Road		V/C Q	0.36 25	0.09 14				0.54 78	>						0.20 14		0.71 48		0.60
			Ex	90	-				-	>						50		-		
			Avail.	65	-				-	>	700		<u> </u>			36	DOT	-		

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length Ex. - Existing Available Storage Avail. - Available Storage TCS - Traffic Control Signal TWSC - Two-Way Stop Control AWSC - All-Way Stop Control

RBT - Roundabout < - Shared Left-Turn Lane > - Shared Right-Turn Lane

TABLE 4.2: 2021 PM BACKGROUND TRAFFIC OPERATIONS SUMMARY

q										Directi	on / M	oveme	nt / Ap	oroach						
erio					Eastb	ound			West	ound			North	bound			South	bound		
Analysis Period	Intersection	Control Type	MOE	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
	1 - Green Road & Frances Avenue	TWSC	LOS Delay V/C Q	~ ~ ~ ~	A 10 0.06 2	~ ~ ~ ~	A 10	~ ~ ~ ~	B 10 0.06 2	~ ~ ~ ~	B 10	~ ~ ~ ~	A 1 0.01 0	~ ~ ~ ~	A 1	~ ~ ~ ~	A 1 0.00 0	v v v v	A 1	A 4
PM Peak Hour	2 - North Service Road & Green Road	TWSC	LOS Delay V/C Q Ex Avail.	A 9 0.10 3 125 122	A 0 0.57 0 -		A 1		A 0 0.32 0 -	> > > > > >	A 0					F 87 0.57 21 40 19		B 12 0.08 2 -	F 52	A 4
A	3 - North Service Road & Millen Road TCS		LOS Delay V/C Q Ex Avail.	B 10 0.40 33 90 57	B 15 0.73 114 -		B 14		A 8 0.25 26 -	> > > > > > >	A 8					C 22 0.21 22 50 28		C 22 0.22 19 -	C 22	B 15 0.57

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length Ex. - Existing Available Storage Avail. - Available Storage TCS - Traffic Control Signal TWSC - Two-Way Stop Control AWSC - All-Way Stop Control

RBT - Roundabout

< - Shared Left-Turn Lane

> - Shared Right-Turn Lane

4.1.4 2021 Future Total Traffic Volumes

Figure 4.8 and **Figure 4.9** illustrates the forecast 2021 total traffic (background + Phase 1) volumes, for the AM and PM peak hours, respectively.

4.1.5 2021 Future Total Traffic Operations

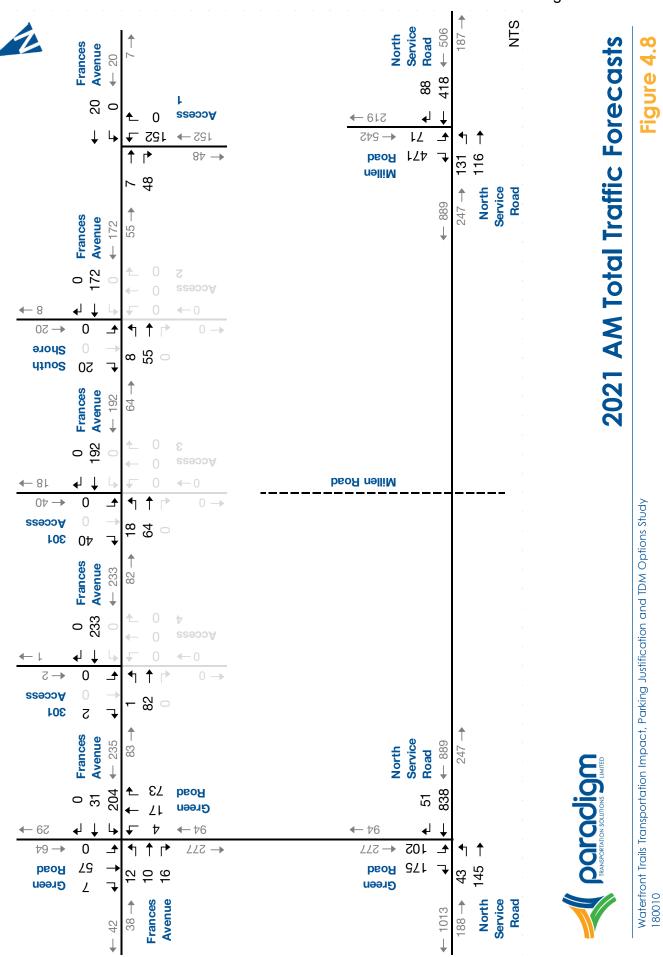
The operations of the study area intersection under 2021 total traffic volumes were analyzed using Synchro 9 with HCM 2000 procedures. Access 1 to the site will be constructed at this horizon.

Table 4.3 and **Table 4.4** summarize the 2021 future total traffic operations for the AM and PM peak hours, respectively. Based on the analyses, it is concluded that the intersections are forecast to operate similar to the background conditions. The following critical movements are noted:

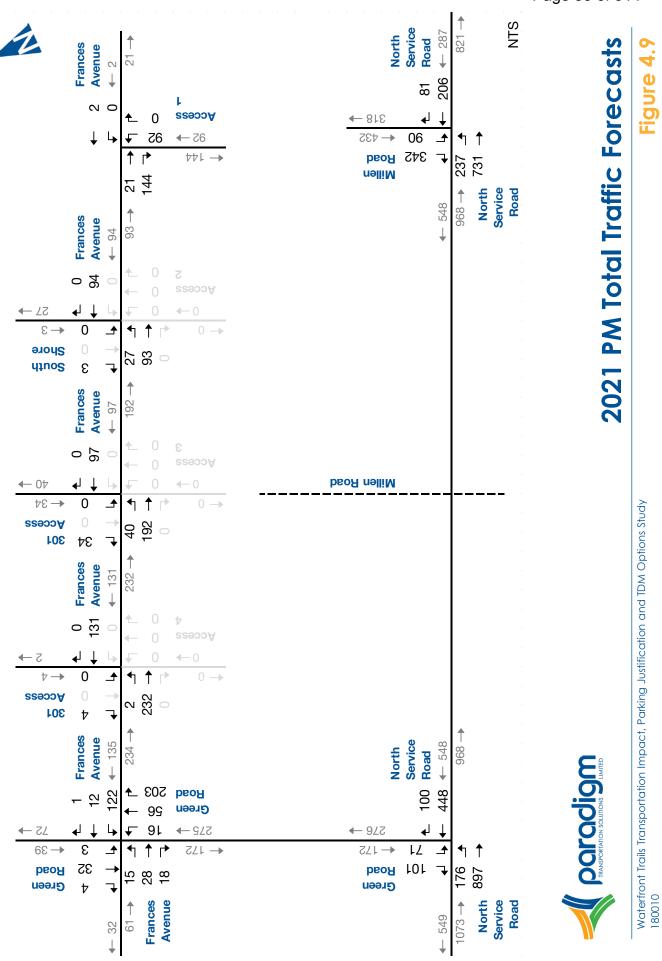
- North Service Road and Green Road:
 - Southbound left-turn movement LOS E with a v/c ratio of 0.58 during the AM peak hour and LOS F with a v/c ratio of 1.25 during the PM peak hour. The 95th percentile queue is forecast to exceed the available storage by 11 metres during the PM peak hour;
 - Southbound right-turn movement LOS D with a v/c ratio of 0.59 during the AM peak hour; and
 - The moderate v/c ratios during the AM peak hour indicate the delay to the above-noted movements is due to the high volume of through traffic on North Service Road which limits available gaps for side street traffic.

The addition of the site generated traffic will increase the delay at the study area intersections by 10 seconds or less during the AM and PM peak hours, in comparison to the background traffic operations. Of note, Site Access 1 on Frances Avenue is assumed to operate under stop sign control and is forecast to operate with acceptable levels of service during both peak hours.

Appendix E provides the detailed supporting Synchro reports.



Appendix "C" to Report PED19115 Page 54 of 314



Appendix "C" to Report PED19115 Page 55 of 314

ō										Directi	on / M	oveme	nt / Apj	proach						
erio					Eastb	ound			West	ound			North	bound			South	bound		
Analysis Period	Intersection	Control Type	MOE	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
	1 - Green Road & Frances Avenue	TWSC	LOS Delay V/C Q	~ ~ ~ ~	A 10 0.05 1	~ ~ ~ ~	A 10	~ ~ ~ ~	B 12 0.33 12	> > > >	B 12	< < < <	A 0 0.00 0	^ ^ ^ ^	A 0	< < < <	A 0 0.00 0	~ ~ ~ ~	A 0	A 7
AM Peak Hour	2 - North Service Road & Green Road	TWSC	LOS Delay V/C Q Ex Avail.	B 11 0.07 2 125 123	A 0.09 0 -		A 2		A 0.57 0 -	~ ~ ~ ~ ~ ~	A 0					E 46 0.58 25 40 15		E 37	A 8	
AM Pea	3 - North Service Road & Millen Road	TCS	LOS Delay V/C Q Ex Avail.	C 24 0.60 37 90 53	B 11 0.16 17 -		B 18		B 19 0.69 80 - -	> > > > > >	B 19					B 13 0.14 14 50 36		B 19 0.58 51 -	B 19	B 19 0.64
	4 - Frances Avenue & Access 1 /easure of Effectiveness	TWSC	LOS Delay V/C Q		A 0.04 0 Q - 951	> > > >	A 0	~ ~ ~ ~	A 0 0.00 0		A 0	A 10 0.17 5	Contro	> > >	A 10		DDT	Rounda		A 6

TABLE 4.3: 2021 AM TOTAL TRAFFIC OPERATIONS SUMMARY

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Ex. - Existing Available Storage Avail. - Available Storage

TWSC - Two-Way Stop Control AWSC - All-Way Stop Control

< - Shared Left-Turn Lane

> - Shared Right-Turn Lane

TABLE 4.4: 2021 PM TOTAL TRAFFIC OPERATIONS SUMMARY

σ										Directi	ion / M	oveme	nt / Ap	proach	ı					
erio					Eastb	ound			Westk	oound			North	bound			South	bound		
Analysis Period	Intersection	Control Type	MOE	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
	1 - Green Road & Frances Avenue	TWSC	LOS Delay V/C Q	v v v v	B 11 0.10 3	^ ^ ^ ^	B 11	v v v v	B 13 0.24 7	^ ^ ^ ^	B 13	~ ~ ~ ~	A 1 0.01 0	^ ^ ^ ^	A 1	v v v v	A 1 0.00 0	~ ~ ~ ~	A 1	A 5
ık Hour	2 - North Service Road & Green Road	TWSC	LOS Delay V/C Q Ex Avail.	A 10 0.19 6 125 119	A 0 0.57 0 -		A 2		A 0 0.35 0 -	~ ~ ~ ~ ~ ~	A 0					F 311 1.25 51 40 -11		B 13 0.20 6 -	F 136	B 14
PM Peak Hour	3 - North Service Road & Millen Road	TCS	LOS Delay V/C Q Ex Avail.	B 11 0.42 34 90 56	B 16 0.75 119 - -		B 15		A 8 0.29 30 - -	~ ~ ~ ~ ~ ~	A 8					C 22 0.21 22 50 28		C 22 0.24 19 -	C 22	B 15 0.59
	4 - Frances Avenue & Access 1	TWSC	LOS Delay V/C Q		A 0 0.11 0	^ ^ ^ ^	A 0	v v v v	A 0 0.00 0		A 0	A 10 0.11 3		> > > >	A 10					A 3
	leasure of Effectiveness				Q - 95	th Perc	entile (Queue	Length				Contro				RBT - I	Rounda	about	

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Ex. - Existing Available Storage Avail. - Available Storage

TWSC - Two-Way Stop Control AWSC - All-Way Stop Control

< - Shared Left-Turn Lane

> - Shared Right-Turn Lane

4.2 2023 Horizon

4.2.1 General Background Traffic Growth

To derive the 2023 general background traffic volumes, a compound growth rate of 2 percent per annum was applied to the existing traffic volumes (10.4 percent total growth).

Figure 4.10 and **Figure 4.11** illustrate the 2023 background traffic forecasts for the AM and PM peak hours, respectively and include:

- General background traffic growth;
- > Traffic from the area developments, as already noted; and
- the Phase 1 site traffic.

4.2.2 2023 Background Traffic Operations

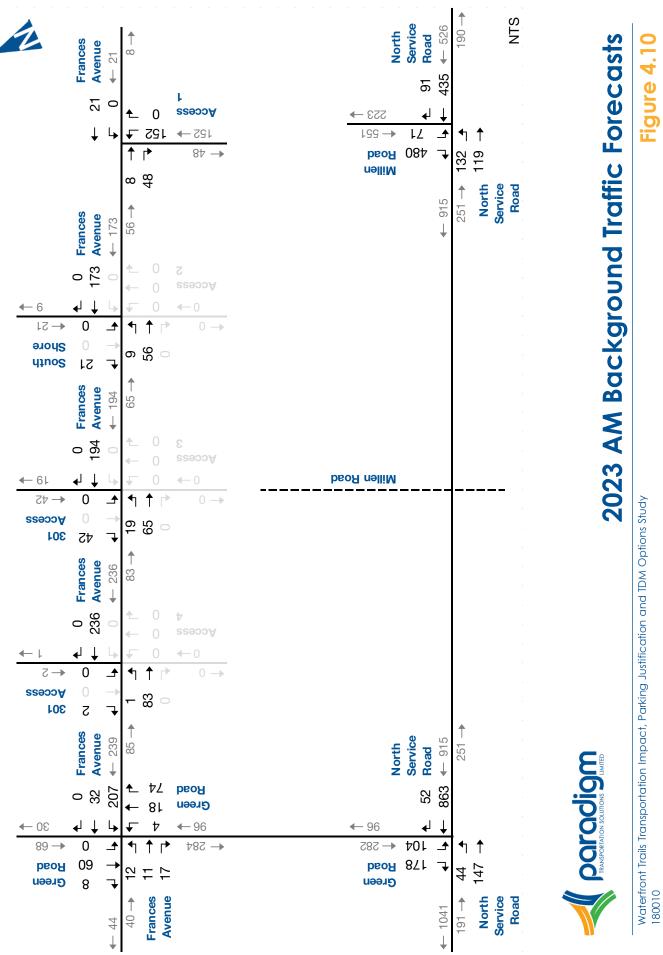
The operations of the study area intersections under 2023 background traffic volumes were analyzed using Synchro 9 with HCM 2000 procedures.

Table 4.5 and **Table 4.6** summarize the 2023 background traffic operationsfor the AM and PM peak hours, respectively.

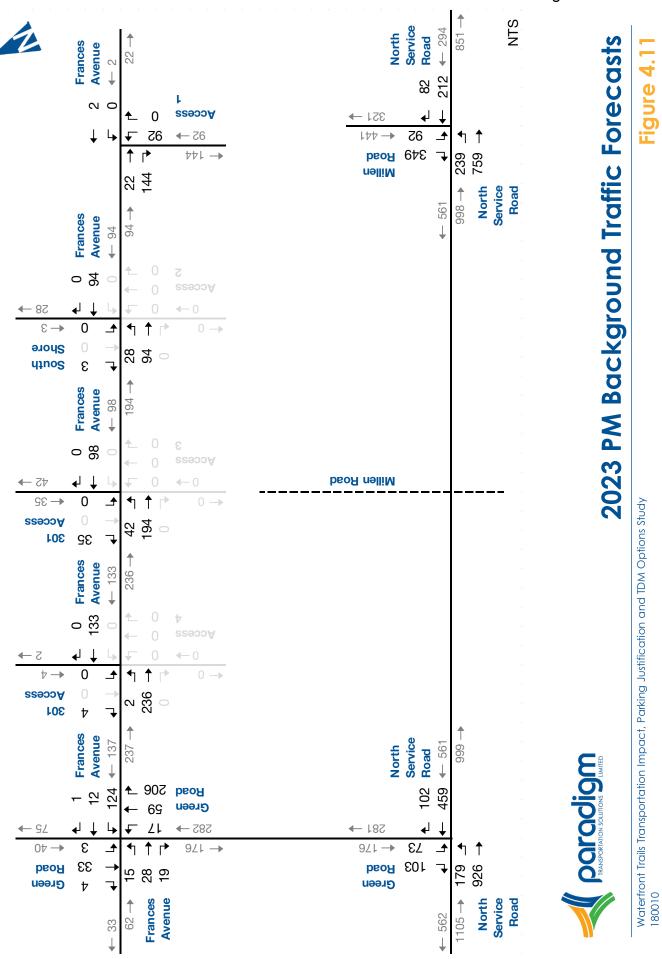
The analyses indicate that all intersections and movements within the study area are forecast to operate at acceptable levels of service under 2023 background traffic volumes. The following critical movements are noted:

- North Service Road and Green Road:
 - Southbound left-turn movement LOS F with a v/c ratio of 0.62 during the AM peak hour and LOS F with a v/c ratio of 1.40 during the PM peak hour. The 95th percentile queue is forecast to exceed the available storage by 16 metres during the PM peak hour;
 - Southbound right-turn movement LOS D with a v/c ratio of 0.62 during the AM peak hour; and
 - The moderate v/c ratios during the AM peak hour indicate the delay to the above-noted movements is due to the high volume of through traffic on North Service Road which limits available gaps for side street traffic.

Appendix **F** contains the detailed supporting Synchro 9 reports.



Appendix "C" to Report PED19115 Page 58 of 314



Appendix "C" to Report PED19115 Page 59 of 314

σ										Directi	on / M	oveme	nt / Ap	proach						
erio					Eastb	ound			West	ound			North	bound			South	bound		
Analysis Period	Intersection	Control Type	MOE	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	tleft	Through	Right	Approach	Overall
	1 - Green Road & Frances Avenue	TWSC	LOS Delay V/C Q	~ ~ ~ ~	A 10 0.05 1	\land \land \land	A 10	~ ~ ~ ~	B 12 0.34 12	> > > >	B 12	< < < <	A 0 0.00 0	\land \land \land	A 0	< < < <	A 0 0.00 0	> > > >	A 0	A 7
ik Hour	2 - North Service Road & Green Road	TWSC	LOS Delay V/C Q Ex Avail.	B 11 0.07 2 125 123	A 0.09 0 -		A 3		A 0 0.59 0 -	~ ~ ~ ~ ~ ~	A 0					F 52 0.62 28 40 12		D 34 0.62 31 -	E 40	A 9
AM Peak Hour	3 - North Service Road & Millen Road	TCS	LOS Delay V/C Q Ex Avail.	C 28 0.66 39 90 51	B 11 0.16 18 -		B 20		B 20 0.72 84 -	> > > > > >	B 20					B 13 0.14 14 50 36		C 20 0.61 56 -	B 19	B 20 0.67
MOE	4 - Frances Avenue & Access 1 Veasure of Effectiveness	TWSC	LOS Delay V/C Q		A 0 0.04 0 Q - 951	> > > >	A 0	< < <	A 0.00 0		A 0	A 10 0.17 5	Contro	> > > >	A 10		DDT	Rounda	hout	A 6

TABLE 4.5: 2023 AM BACKGROUND TRAFFIC OPERATIONS SUMMARY

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Ex. - Existing Available Storage Avail. - Available Storage

TWSC - Two-Way Stop Control AWSC - All-Way Stop Control

< - Shared Left-Turn Lane > - Shared Right-Turn Lane

TABLE 4.6: 2023 PM BACKGROUND TRAFFIC OPERATIONS SUMMARY

q										Directi	on / M	oveme	nt / Ap	proach						
erio					Eastb	ound			West	ound			North	bound			South	bound		
Analysis Period	Intersection	Control Type	MOE	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
	1 - Green Road & Frances Avenue	TWSC	LOS Delay V/C Q	v v v v	B 11 0.10 3	~ ~ ~ ~	B 11	v v v v	B 13 0.24 8	~ ~ ~ ~	B 13	v v v v	A 1 0.01 0	^ ^ ^ ^	A 1	v v v v	A 1 0.00 0	v v v v	A 1	A 5
ik Hour	2 - North Service Road & Green Road	TWSC	LOS Delay V/C Q Ex Avail.	A 10 0.20 6 125 119	A 0.59 0 -		A 2		A 0.36 0 -	> > > > > >	A 0					F 377 1.40 56 40 -16		B 14 0.21 6 -	F 164	C 17
PM Peak Hour	3 - North Service Road & Millen Road	TCS	LOS Delay V/C Q Ex Avail.	B 11 0.43 35 90 55	B 17 0.78 128 - -		B 16		A 9 0.29 31 -	> > > > > > >	A 9					C 22 0.22 23 50 28		C 22 0.24 19 -	C 22	B 16 0.61
	4 - Frances Avenue & Access 1	TWSC	LOS Delay V/C Q		A 0 0.11 0	> > > >	A 0	< < < <	A 0 0.00 0		A 0	A 10 0.11 3		~ ~ ~ ~	A 10					A 3
	leasure of Effectiveness				Q - 95t	h Perc	entile (Queue	ength				Contro				RBT - I	Rounda	about	. —

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Ex. - Existing Available Storage Avail. - Available Storage

TWSC - Two-Way Stop Control AWSC - All-Way Stop Control

< - Shared Left-Turn Lane

> - Shared Right-Turn Lane

4.2.3 2023 Future Total Traffic Volumes

Figure 4.12 and **Figure 4.13** illustrate the forecast 2023 total traffic (2023 background + Phase 2) volumes, for the AM and PM peak hours, respectively.

4.2.4 2023 Future Total Traffic Operations

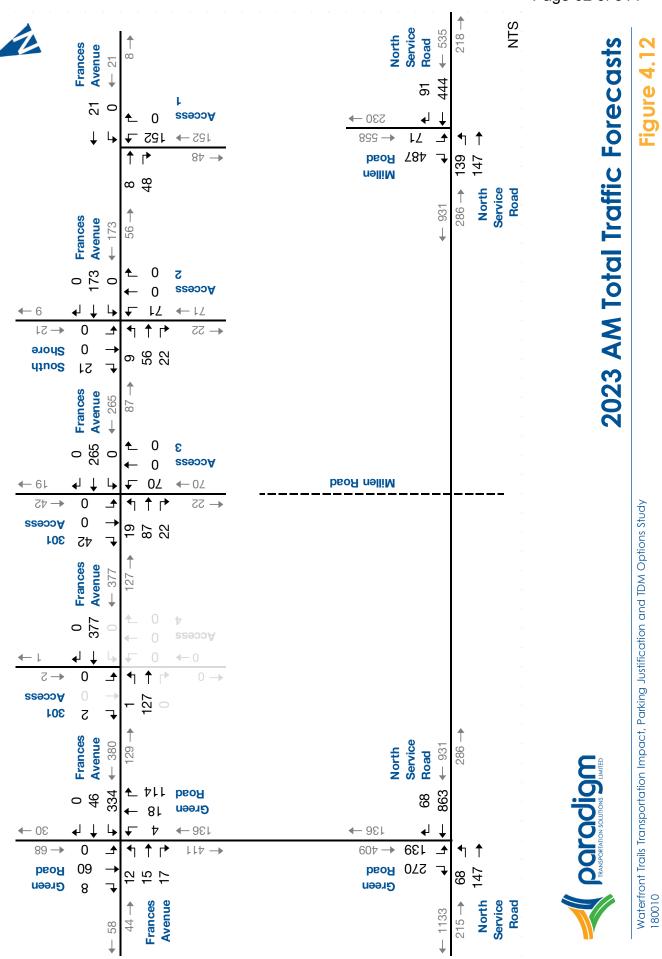
The operations of the study area intersections under 2023 total traffic volumes were analyzed using Synchro 9 with HCM 2000 procedures. In addition to Access 1, Accesses 2 and 3 to the site will be constructed at this horizon.

Table 4.7 and **Table 4.8** summarize the 2023 total traffic operations for the AM and PM peak hours, respectively. Based on the analyses, it is concluded that the intersections are forecast to operate similar to the 2023 background conditions. The following critical movements are noted:

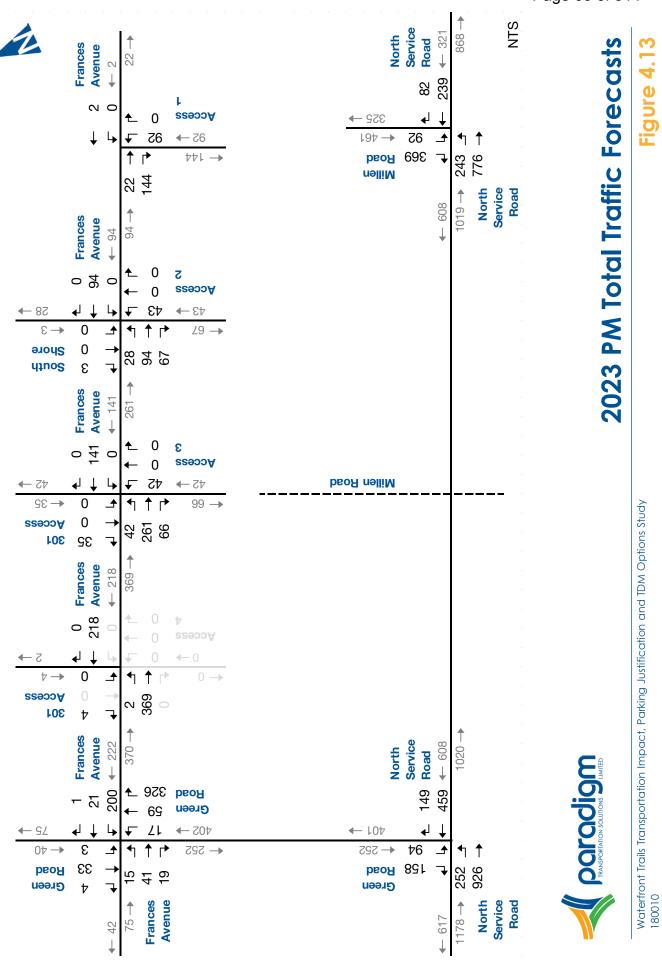
- North Service Road and Green Road:
 - Southbound left-turn movement LOS F with a v/c ratio of 0.93 during the AM peak hour and LOS F with a v/c ratio of 2.66 during the PM peak hour. The 95th percentile queue is forecast to exceed the available storage by 15 metres during the AM peak hour and 51 metres during the PM peak hour;
 - Southbound right-turn movement LOS F with a v/c ratio of 0.95 during the AM peak hour; and
 - Overall intersection LOS E during the PM peak hour.

With the exception of the North Service Road and Green Road intersection, the addition of the site generated traffic will increase the delay at the study area intersections by 3 seconds or less during the AM and PM peak hours, in comparison to the background traffic operations. Of note, Site Access 1, 2 and 3 on Frances Avenue are assumed to operate under stop sign control and are forecast to operate with acceptable levels of service during both peak hours.

Appendix G provides the detailed supporting Synchro reports.



Appendix "C" to Report PED19115 Page 62 of 314



Appendix "C" to Report PED19115 Page 63 of 314

7										Directi	on / M	oveme	nt / Ap	oroach	1					
erio					Eastb	ound			West				North				South	bound		
Analysis Period	Intersection	Control Type	MOE	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
	1 - Green Road & Frances Avenue	TWSC	LOS Delay V/C Q	v v v v	A 10 0.06 2	\land \land \land	A 10	v v v v	C 16 0.56 28	\land \land \land	C 16	v v v v	A 0 0.00 0	\land \land \land	A 0	v v v v	A 0 0.00 0	v v v v	A 0	A 10
	2 - North Service Road & Green Road	TWSC	LOS Delay V/C Q Ex Avail.	B 11 0.11 3 125 122	A 0 0.09 0 -		A 4		A 0.60 0 -	~ ~ ~ ~ ~ ~	A 0					F 111 0.93 55 40 -15		F 78 0.95 77 - -	F 89	C 24
AM Peak Hour	3 - North Service Road & Millen Road	TCS	LOS Delay V/C Q Ex Avail.	C 33 0.72 43 90 47	B 11 0.20 21 -		C 22		C 20 0.73 88 - -	~ ~ ~ ~ ~ ~	C 20					B 13 0.14 14 50 36		C 21 0.63 59 -	B 20	C 20 0.68
An	4 - Frances Avenue & Access 1	TWSC	LOS Delay V/C Q		A 0 0.04 0	~ ~ ~ ~	A 0	< < < <	A 0 0.00 0		A 0	A 10 0.17 5		> > > >	A 10					A 6
	5 - Frances Avenue & Access 2	TWSC	LOS Delay V/C Q	v v v v	A 1 0.01 0	^ ^ ^ ^	A 1	< < < <	A 0 0.00 0	^ ^ ^ ^	A 0	< < < <	B 12 0.12 3	^ ^ ^ ^	B 12	<pre> < <</pre>	A 9 0.03 1	~ ~ ~ ~	A 9	A 3
	6 - Frances Avenue & Access 3	TWSC	LOS Delay V/C Q	v v v v	A 1 0.02 0	^ ^ ^ ^	A 1	< < < <	A 0 0.00 0	~ ^ ^ ^	A 0	< < < <	B 14 0.17 5	\land \land \land	B 14	<pre></pre>	B 10 0.06 2	~ ~ ~ ~	В 10	A 3

TABLE 4.7: 2023 AM TOTAL TRAFFIC OPERATIONS SUMMARY

MOE - Measure of Effectiveness

LOS - Level of Service Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length Ex. - Existing Available Storage Avail. - Available Storage

TCS - Traffic Control Signal TWSC - Two-Way Stop Control AWSC - All-Way Stop Control

RBT - Roundabout

Shared Left-Turn Lane
 Shared Right-Turn Lane

σ										Directi	on / M	oveme	nt / Ap	proach	1					
erio					Eastb	ound			West				North				South	bound		
Analysis Period	Intersection	Control Type	MOE	Left	Through	Right	Approach	tfeft	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
	1 - Green Road & Frances Avenue	TWSC	LOS Delay V/C Q	v v v v	B 12 0.14 4	\land \land \land	B 12	v v v v	C 17 0.45 19	~ ~ ~ ~	C 17	v v v v	A 0 0.01 0	^ ^ ^ ^	A 0	v v v v	A 1 0.00 0	~ ~ ~ ~	A 1	A 7
	2 - North Service Road & Green Road	TWSC	LOS Delay V/C Q Ex Avail.	B 10 0.29 10 125 115	A 0.59 0 -		A 2		A 0 0.39 0 -	> > > > > >	A 0					F 976 2.66 91 40 -51		C 15 0.33 12 - -	F 373	E 47
PM Peak Hour	3 - North Service Road & Millen Road	TCS	LOS Delay V/C Q Ex Avail.	B 11 0.46 37 90 53	B 18 0.79 134 - -		B 16		A 9 0.33 35 - -	> > > > > >	A 9					C 22 0.22 23 50 28		C 22 0.25 20 -	C 22	B 16 0.62
ď	4 - Frances Avenue & Access 1	TWSC	LOS Delay V/C Q		A 0 0.11 0	^ ^ ^ ^	A 0	v v v v	A 0 0.00 0		A 0	A 10 0.11 3		~ ~ ~ ~	A 10					A 3
	5 - Frances Avenue & Access 2	TWSC	LOS Delay V/C Q	v v v v	A 1 0.02 1	^ ^ ^ ^	A 1	v v v v	A 0 0.00 0	> > > >	A 0	< < < <	B 11 0.07 2	~ ^ ^ ^	B 11	~ ~ ~ ~	A 9 0.00 0	~ ~ ~ ~	A 9	A 2
	6 - Frances Avenue & Access 3	TWSC	LOS Delay V/C Q	~ ~ ~ ~	A 1 0.03 1	\land \land \land	A 1	v v v v	A 0 0.00 0	> > > > >	A 0	~ ~ ~ ~	C 16 0.12 3	~ ~ ~ ~	C 16	~ ~ ~ ~	A 9 0.04 1	~ ~ ~ ~	A 9	A 2

TABLE 4.8: 2023 PM TOTAL TRAFFIC OPERATIONS SUMMARY

MOE - Measure of Effectiveness

LOS - Level of Service Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length Ex. - Existing Available Storage Avail. - Available Storage

TCS - Traffic Control Signal TWSC - Two-Way Stop Control AWSC - All-Way Stop Control

RBT - Roundabout

Shared Left-Turn Lane
 Shared Right-Turn Lane

4.3 2025 Horizon

4.3.1 General Background Traffic Growth

To derive the 2025 general background traffic volumes, a compound growth rate of 2 percent per annum was applied to the existing traffic volumes (14.9 percent total growth).

Figure 4.14 and **Figure 4.15** show the 2025 total background traffic forecasts for the AM and PM peak hours, respectively and include:

- General background traffic growth;
- ▶ Traffic from area developments, as already noted; and
- ▶ The Phase 1 and Phase 2 site traffic.

4.3.2 2025 Background Traffic Operations

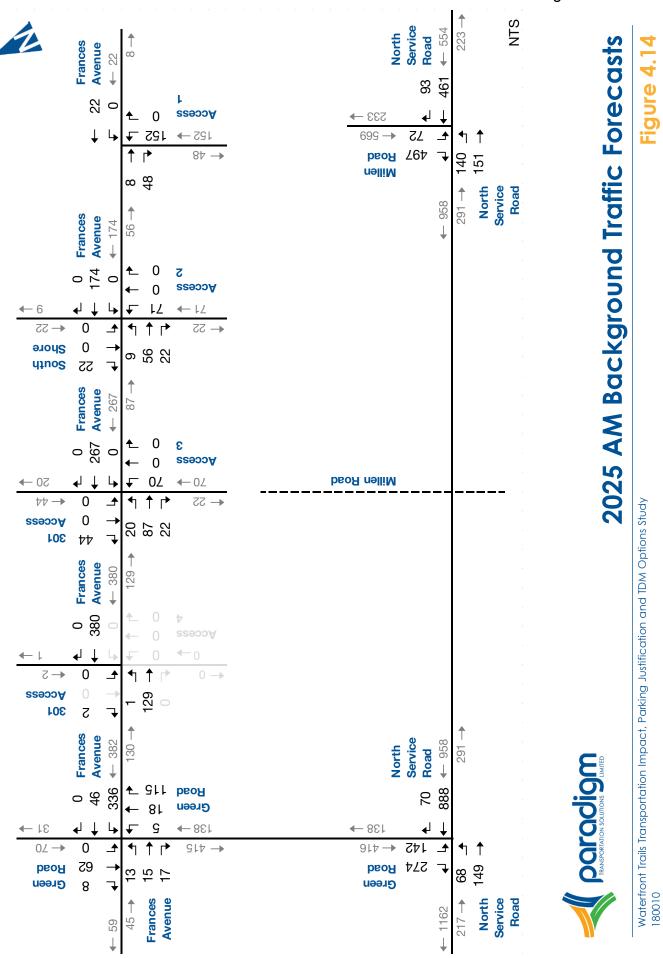
The operations of the study area intersections under 2025 background traffic volumes were analyzed using Synchro 9 with HCM 2000 procedures.

Table 4.9 and **Table 4.10** summarize the 2025 background traffic operations for the AM and PM peak hours, respectively.

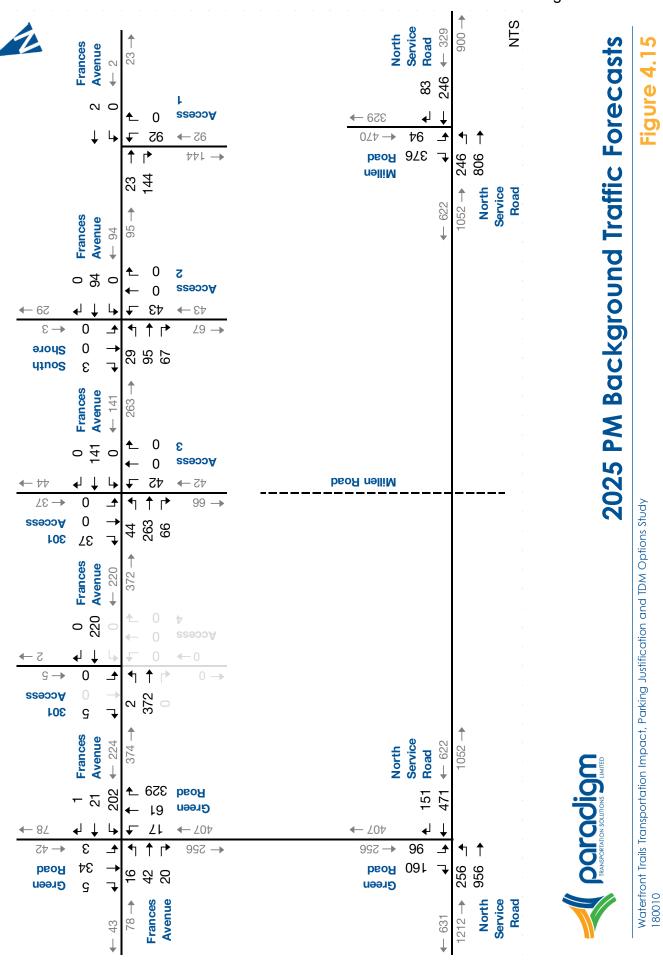
The analyses indicate that all intersections and movements within the study area are forecast to operate at acceptable levels of service under 2025 background traffic volumes. The following critical movements are noted:

- North Service Road and Green Road:
 - Southbound left-turn movement LOS F with a v/c ratio of 1.0 during the AM peak hour and LOS F with a v/c ratio of 2.97 during the PM peak hour. The 95th percentile queue is forecast to exceed the available storage by 21 metres during the AM peak hour and 55 metres during the PM peak hour;
 - Southbound right-turn movement LOS F with a v/c ratio of 1.01 during the AM peak hour; and
 - Overall intersection LOS D during the AM peak hour and LOS F during the PM peak hour.

Appendix H contains the detailed supporting Synchro 9 reports.



Appendix "C" to Report PED19115 Page 67 of 314



Appendix "C" to Report PED19115 Page 68 of 314

7										Directi	on / M	oveme	nt / Ap	proach						
erio					Eastb	ound			West				North				South	bound		
Analysis Period	Intersection	Control Type	MOE	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
	1 - Green Road & Frances Avenue	TWSC	LOS Delay V/C Q	~ ~ ~ ~	A 10 0.06 2	~ ~ ~ ~	A 10	~ ~ ~ ~	C 16 0.56 29	> > > >	C 16	<pre> < <</pre>	A 0 0.00 0	> > > >	A 0	~ ~ ~ ~	A 0 0.00 0	~ ~ ~ ~	A 0	A 10
	2 - North Service Road & Green Road	TWSC	LOS Delay V/C Q Ex Avail.	B 11 0.11 3 125 122	A 0.10 0 -		A 4		A 0 0.61 0 -	> > > > > >	A 0					F 130 1.00 61 40 -21		F 93 1.01 86 - -	F 106	D 28
AM Peak Hour	3 - North Service Road & Millen Road	TCS	LOS Delay V/C Q Ex Avail.	D 40 0.78 45 90 45	B 11 0.21 22 - -		C 25		C 21 0.75 105 -	~ ~ ~ ~ ~ ~	C 21					B 13 0.14 14 50 36		C 22 0.67 68 -	C 21	C 22 0.72
AN	4 - Frances Avenue & Access 1	TWSC	LOS Delay V/C Q		A 0 0.04 0	^ ^ ^ ^	A 0	v v v v	A 0 0.00 0		A 0	A 10 0.17 5		~ ~ ~ ~	A 10					A 6
	5 - Frances Avenue & Access 2	TWSC	LOS Delay V/C Q	v v v v	A 1 0.01 0	~ ~ ~ ~	A 1	v v v v	A 0 0.00 0	> > > >	A 0	~ ~ ~ ~	B 12 0.12 3	~ ^ ^ ^	B 12	v v v v	A 9 0.03 1	~ ~ ~ ~	A 9	A 3
	6 - Frances Avenue & Access 3	TWSC	LOS Delay V/C Q	~ ~ ~ ~	A 1 0.02 0	> > >	A 1	< < < <	A 0 0.00 0	> > > > >	A 0	~ ~ ~ ~	B 15 0.17 5	> > > >	B 15	~ ~ ~ ~	B 10 0.06 2	> > > >	B 10	A 3

TABLE 4.9: 2025 AM BACKGROUND TRAFFIC OPERATIONS SUMMARY

MOE - Measure of Effectiveness

LOS - Level of Service Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length Ex. - Existing Available Storage Avail. - Available Storage

TCS - Traffic Control Signal TWSC - Two-Way Stop Control AWSC - All-Way Stop Control

RBT - Roundabout

Shared Left-Turn Lane
 Shared Right-Turn Lane

TABLE 4.10: 2025 PM BACKGROUND TRAFFIC OPERATIONS SUMMARY

σ										Directi	on / M	oveme	nt / Ap	proach	1					
erio					Eastb	ound			West	oound			North	bound			South	bound		
Analysis Period	Intersection	Control Type	MOE	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
	1 - Green Road & Frances Avenue	TWSC	LOS Delay V/C Q	~ ~ ~ ~	B 13 0.15 4	\land \land \land	B 13	~ ~ ~ ~	C 18 0.47 20	^ ^ ^ ^	C 18	< < < <	A 0 0.01 0	\land \land \land	A 0	~ ~ ~ ~	A 1 0.00 0	> > > >	A 1	A 7
	2 - North Service Road & Green Road	TWSC	LOS Delay V/C Q Ex Avail.	B 11 0.30 10 125 115	A 0.61 0 -		A 2		A 0 0.40 0 -	~ ~ ~ ~ ~ ~	A 0					F 1130 2.97 95 40 -55		C 16 0.34 12 -	F 432	F 54
PM Peak Hour	3 - North Service Road & Millen Road	TCS	LOS Delay V/C Q Ex Avail.	B 12 0.47 38 90 52	B 19 0.82 168 - -		B 18		A 9 0.33 36 - -	~ ~ ~ ~ ~ ~	A 9					C 22 0.22 23 50 27		C 22 0.26 20 -	C 22	B 17 0.65
đ	4 - Frances Avenue & Access 1	TWSC	LOS Delay V/C Q		A 0 0.11 0	~ ~ ~ ~	A 0	~ ~ ~ ~	A 0 0.00 0		A 0	A 10 0.11 3		~ ~ ~ ~	A 10					A 3
	5 - Frances Avenue & Access 2	TWSC	LOS Delay V/C Q	~ ~ ~ ~	A 1 0.02 1	~ ~ ~ ~	A 1	~ ~ ~ ~	A 0 0.00 0	~ ~ ~ ~	A 0	< < < <	B 11 0.07 2	~ ^ ^ ^	B 11	~ ~ ~ ~	A 9 0.00 0	~ ~ ~ ~	A 9	A 2
	6 - Frances Avenue & Access 3	TWSC	LOS Delay V/C Q	~ ~ ~ ~	A 1 0.03 1	~ ^ ^ ^	A 1	v v v v	A 0 0.00 0	~ ^ ^ ^	A 0	~ ~ ~ ~	C 16 0.12 3	\land \land \land	C 16	~ ~ ~ ~	A 9 0.04 1	~ ~ ~ ~	A 9	A 2

MOE - Measure of Effectiveness

LOS - Level of Service Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length Ex. - Existing Available Storage Avail. - Available Storage

TCS - Traffic Control Signal TWSC - Two-Way Stop Control AWSC - All-Way Stop Control

RBT - Roundabout

Shared Left-Turn Lane
 Shared Right-Turn Lane

4.3.3 2025 Future Total Traffic Volumes

Figure 4.16 and **Figure 4.17** illustrate the forecast 2025 total traffic (background + Phase 3) volumes, for the AM and PM peak hours, respectively.

4.3.4 2025 Future Total Traffic Operations

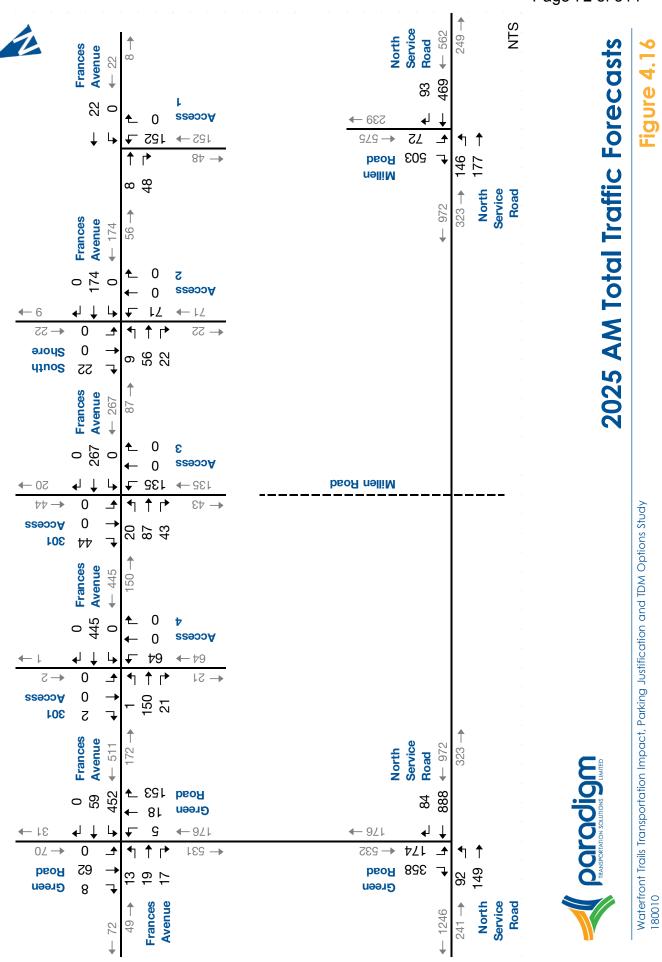
The operations of the study area intersections under 2025 total traffic volumes were analyzed using Synchro 9 with HCM 2000 procedures. All Accesses to the site will be constructed at this horizon.

Table 4.11 and **Table 4.12** summarize the forecast operational results for the AM and PM peak hours, respectively. Based on the analyses, it is concluded that the intersections are forecast to operate similar to the background conditions. The following critical movements are noted:

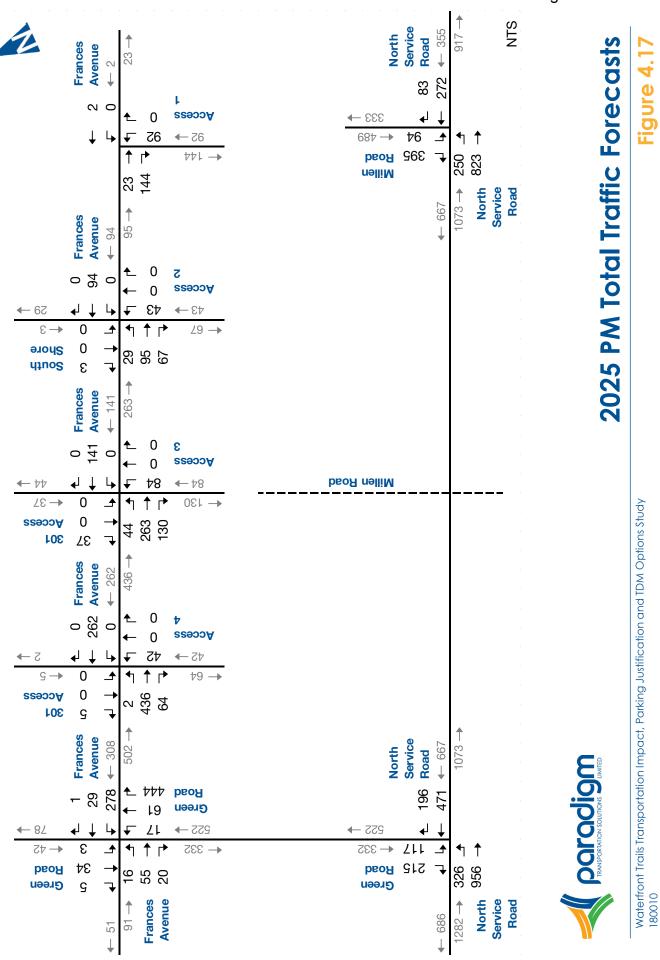
- ▶ Green Road and Frances Avenue:
 - Westbound left-turn/through/right-turn movement LOS D with a v/c ratio of 0.79 during the AM and 0.74 during the PM peak hour.
- North Service Road and Green Road:
 - Southbound left-turn movement LOS F with a v/c ratio of 1.40 during the AM peak hour and a v/c ratio of 5.47 during the PM peak hour. The95th percentile queue is forecast to exceed the available storage by 59 metres during the AM peak hour and 55+ metres during the PM peak hour;
 - Southbound right-turn movement LOS F with a v/c ratio of 1.33 during the AM peak hour; and
 - Overall intersection LOS F during the AM and PM peak hours.

With the exception of the North Service Road and Green Road intersection, the addition of the site generated traffic will increase the delay at the study area intersections by 7 seconds or less during the AM and PM peak hours, in comparison to the background traffic operations. Of note, Site Access 1, 2, 3 and 4 on Frances Avenue are assumed to operate under stop sign control and are forecast to operate with acceptable levels of service during both peak hours.

Appendix I provides the detailed supporting Synchro reports.



Appendix "C" to Report PED19115 Page 72 of 314



Appendix "C" to Report PED19115 Page 73 of 314

TABLE 4.11: 2025 AM TOTAL TRAFFIC OPERATIONS SUMMARY

70										Directi	on / M	oveme	nt / Ap	oroach						
erio					Eastb	ound			West				North				South	bound		
Analysis Period	Intersection	Control Type	MOE	tleft	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
	1 - Green Road & Frances Avenue	TWSC	LOS Delay V/C Q	v v v v	B 10 0.07 2	^ ^ ^ ^	B 10	v v v v	D 26 0.79 62	~ ~ ~ ~	D 26	v v v v	A 0 0.00 0	^ ^ ^ ^	A 0	v v v v	A 0 0.00 0	~ ~ ~ ~	A 0	C 17
	2 - North Service Road & Green Road	TWSC	LOS Delay V/C Q Ex Avail.	B 12 0.16 4 125 121	A 0.10 0 -		A 5		A 0 0.62 0 -	~ ~ ~ ~ ~ ~	A 0					F 278 1.40 99 40 -59		F 204 1.33 156 - -	F 228	F 70
k Hour	3 - North Service Road & Millen Road	TCS	LOS Delay V/C Q Ex Avail.	D 49 0.84 48 90 42	B 12 0.24 25 -		C 29		C 21 0.77 107 -	~ ~ ~ ~ ~ ~	C 21					B 13 0.14 14 50 36		C 23 0.69 79 -	C 21	C 23 0.77
AM Peak Hour	4 - Frances Avenue & Access 1	TWSC	LOS Delay V/C Q		A 0 0.04 0	~ ~ ~ ~	A 0	~ ~ ~ ~	A 0 0.00 0		A 0	A 10 0.17 5		> > > >	A 10					A 6
	5 - Frances Avenue & Access 2	TWSC	LOS Delay V/C Q	v v v v	A 1 0.01 0	~ ~ ~ ~	A 1	v v v v	A 0 0.00 0	> > > >	A 0	v v v v	B 12 0.12 3	~ ~ ~ ~	B 12	~ ~ ~ ~	A 9 0.03 1	~ ~ ~ ~	A 9	A 3
	6 - Frances Avenue & Access 3	TWSC	LOS Delay V/C Q	v v v v	A 1 0.02 0	~ ~ ~ ~	A 1	v v v v	A 0 0.00 0	> > > > >	A 0	v v v v	C 17 0.33 11	~ ~ ~ ~	C 17	~ ~ ~ ~	B 10 0.06 2	~ ~ ~ ~	B 10	A 5
	7 - Frances Avenue & Access 4	TWSC	LOS Delay V/C Q	~ ~ ~ ~	A 0 0.00 0	~ ~ ~ ~	A 0	~ ~ ~ ~	A 0 0.00 0	> > > >	A 0	~ ~ ~ ~	C 17 0.19 5	~ ~ ~ ~	C 17	~ ~ ~ ~	B 11 0.00 0	~ ~ ~ ~	B 11	A 2

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length Ex. - Existing Available Storage

Avail. - Available Storage

TCS - Traffic Control Signal TWSC - Two-Way Stop Control AWSC - All-Way Stop Control

RBT - Roundabout

< - Shared Left-Turn Lane

> - Shared Right-Turn Lane

TABLE 4.12: 2025 PM TOTAL TRAFFIC OPERATIONS SUMMARY

73										Directi	on / M	oveme	nt / Ap	oroach	1					
erio					Eastb	ound			West				North				South	bound		
Analysis Period	Intersection	Control Type	MOE	tleft	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	tleft	Through	Right	Approach	Overall
	1 - Green Road & Frances Avenue	TWSC	LOS Delay V/C Q	v v v v	B 15 0.21 6	^ ^ ^ ^	B 15	v v v v	D 32 0.74 48	~ ^ ^ ^	D 32	v v v v	A 0 0.01 0	^ ^ ^ ^	A 0	v v v v	A 1 0.00 0	~ ~ ~ ~	A 1	B 12
	2 - North Service Road & Green Road	TWSC	LOS Delay V/C Q Ex Avail.	B 12 0.40 16 125 110	A 0.61 0 -		A 3		A 0.43 0 -	^ ^ ^ ^ ^ ^	A 0					F Err 5.47 Err 40 ####		C 19 0.48 20 -	F 3530	F 516
k Hour	3 - North Service Road & Millen Road	TCS	LOS Delay V/C Q Ex Avail.	B 12 0.50 40 90 50	C 20 0.84 173 -		B 19		A 9 0.36 40 -	~ ~ ~ ~ ~ ~	A 9					C 22 0.22 23 50 27		C 22 0.27 20 -	C 22	B 18 0.66
PM Peak Hour	4 - Frances Avenue & Access 1	TWSC	LOS Delay V/C Q		A 0 0.11 0	~ ~ ~ ~	A 0	~ ~ ~ ~	A 0 0.00 0		A 0	A 10 0.11 3		~ ~ ~ ~	A 10					A 3
	5 - Frances Avenue & Access 2	TWSC	LOS Delay V/C Q	v v v v	A 1 0.02 1	\land \land \land	A 1	v v v v	A 0 0.00 0	~ ~ ~ ~	A 0	v v v v	B 11 0.07 2	\land \land \land	B 11	v v v v	A 9 0.00 0	~ ~ ~ ~	A 9	A 2
	6 - Frances Avenue & Access 3	TWSC	LOS Delay V/C Q	v v v v	A 1 0.03 1	$^{\wedge}$ $^{\wedge}$ $^{\wedge}$	A 1	v v v v	A 0 0.00 0	~ ~ ~ ~	A 0	v v v v	C 18 0.25 8	\land \land \land	C 18	v v v v	A 9 0.04 1	~ ~ ~ ~	A 9	A 3
	7 - Frances Avenue & Access 4	TWSC	LOS Delay V/C Q	v v v v	A 0 0.32 0	\land \land \land	A 0	v v v v	A 0 0.00 0	~ ^ ^ ^	A 0	v v v v	C 17 0.13 4	\land \land \land	C 17	v v v v	A 0 0.00 0	~ ~ ~ ~	A 0	A 1

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length Ex. - Existing Available Storage

Avail. - Available Storage

TCS - Traffic Control Signal TWSC - Two-Way Stop Control AWSC - All-Way Stop Control

RBT - Roundabout

< - Shared Left-Turn Lane

> - Shared Right-Turn Lane

5 Remedial Measures

The following section reviews the need for measures that should potentially be implemented to mitigate the impacts of increased in traffic on the study network.

5.1 Traffic Control Signal

The southbound left-turn and right-turn movements at intersection of North Service Road and Green Road are forecast to operate at LOS F and LOS D, respectively by 2021 with the additional development traffic.

Using Justification 7 under Ontario Traffic Manual (OTM) Book 12¹⁰ procedures, the intersection of North Service Road and Green Road satisfies the necessary conditions to implement traffic control signals by 2025 under total traffic conditions. The signal warrant is fulfilled 145%, which exceeds the fulfillment requirement of 120% for existing intersections and accounts for increased uncertainty of volume projections for proposed new developments. Under 2023 total traffic conditions, the warrant is fulfilled 117%, which almost meets the requirement for the installation of traffic signals. Under 2021 total traffic conditions, the warrant is only fulfilled 87%, which does not meet the requirements set out in Book 12.

However, to provide acceptable levels of service for the southbound movements at the intersection of Green Road and North Service Road, it is recommended traffic signals are installed at the 2021 horizon year. Upon full build-out of the site in 2025, traffic signals are forecast to be warranted at the intersection. The provision of signals will not only help to improve delays on the southbound approach but will also improve safety within the area by providing a protected phase for traffic on Green Road. This removes the potential for motorists frustration and unsafe turning movements from Green Road when gaps are not available.

Appendix J includes the signal warrant justification worksheets.

5.2 Right-Turn Lane Warrant

At the intersection of North Service Road and Green Road, the westbound through/right-turn movement is forecast to approach capacity at the 2021 horizon. This is likely caused by the general increase in through traffic coupled with the increase in right-turning traffic due to the proposed development.

The Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roadways¹¹ (GDGCR) details the requirements for auxiliary right-

¹⁰ Ministry of Transportation Ontario. *Ontario Traffic Manual Book 12 – Traffic Signals.* March 2012.

¹¹ Transportation Association of Canada. *Geometric Design Guide for Canadian Roads.* 2017.

turn lanes. The GDGCR recommends a right-turn lane at a signalized intersection without a separate signal indication "when the volume of right-turning traffic is 10% to 20% of the total approaching volume". The right-turning volume accounts for 6% and 18% of the total advancing volume during the AM and PM peak hours respectively. Of the right-turning traffic, 33% and 50% is site-generated during the AM and PM peak hours respectively, at the 2021 horizon. By 2025, the right-turning volume accounts for 9% and 30% of the total advancing volume during the AM and PM peak hours respectively. Of the right-turning the AM and PM peak hours is site-generated during the total advancing volume during the AM and PM peak hours respectively. Of the right-turning the AM and PM peak hours respectively.

Based on the TAC GDGCR, a westbound right-turn lane should be provided on North Service Road at Green Road at the 2025 horizon. Based on an 80 kilometre per hour design speed, a total lane length of 127.5 metres is required as follows:

- A minimum of 60 metres of taper (based on a 3.5 metre lane width);
- A minimum of 60 metres of parallel lane; and
- ▶ 7.5 metres of storage.

There is an open channelized river on the north side of North Service Road, approximately 60 metres east of Green Road. The location of the river limits the available space to construct a westbound right-turn lane without undertaking major road widening. At this location, a short right-turn lane and taper may be a feasible solution to fit within the existing roadway constraints. **Appendix K** provides a preliminary design for the right-turn lane, indicating a 10-metre lane and 15.8 metre taper can be accommodated west of the culvert. The right-turn lane is sub-standard compared to TAC requirements, however it allows for speed reduction outside of the through lane on North Service Road.

5.3 Left-Turn Lanes

The westbound shared left-turn/through/right-turn movement at intersection of Green Road and Frances Avenue is forecast to operate at LOS D during the AM and PM peak hour at the 2025 horizon, with the addition of the development traffic. An all-way Stop is not recommended for the intersection as it may result in northbound traffic backing up into the intersection of Green Road and North Service Road.

The majority (about 90 percent) of westbound traffic at the intersection completes a westbound to southbound left-turn from Frances Avenue onto Green Road. Provision of a separate left-turn lane will help to improve operations on the westbound approach since it will separate left-turns from the through and right-turning traffic. Based on the analyses in the following section, 45 metres of storage should be provided. The cross-section of Frances Avenue is wide enough to accommodate both a left-turn lane and shared through right-turn lane through pavement markings only and without the need for road widening. Therefore, it is recommended that separate lanes are provided on this approach.

5.4 Traffic Operations

Paradigm completed Synchro 9 level of service analyses with HCM 2000 procedures for the intersections with the proposed improvements:

- ▶ Traffic signals at North Service Road and Green Road;
- A separate westbound left-turn lane at Green Road and Frances Road; and
- A separate westbound right-turn lane at North Service Road and Green Road.

The intersections were assessed for the 2025 future total traffic horizon, as this represents the "worst case scenario". If the intersection improvements provide acceptable levels of service for all movements at this horizon, they will provide acceptable levels of service for the 2021 and 2023 horizons.

Table 5.1 and **Table 5.2** summarize the total traffic operations for the AM and PM peak hours, respectively. Based on the analyses, it is concluded that the intersections are forecast to operate at acceptable levels of service. The following exceptions are noted:

- Green Road and Frances Avenue:
 - Westbound left-turn movement LOS D with a v/c ratio of 0.68 during the PM peak hour. The 95th percentile queue indicates 45 metres of storage is required.
- ▶ North Service Road and Green Road:
 - Southbound left-turn movement 95th percentile queue is forecast to exceed the available storage by 15 metres during the AM peak hour; and
 - Southbound right-turn movement 95th percentile queue is forecast to extend back and may block the commercial plaza driveway during the AM peak hour. This will occur for approximately 5% of the peak hour or for about three minutes.

The 50th percentile queue estimate is 47 metres which will not extend beyond the driveway. The 50th percentile queue is a better representation of the actual level of queueing as it will occur for about half of the peak hour.

As well, commercial developments typically have very low AM peak hour traffic volumes; therefore, if the queue does extend back to block this driveway, the overall impacts may be negligible.

Appendix L includes the detailed Synchro reports.

TABLE 5.1: 2025 AM REMEDIAL MEASURES TOTAL TRAFFIC OPERATIONS

ā		[Directi	on / M	oveme	nt / Ap	proach	ı					
Period					Eastb	ound			West	oound			North	bound			South	bound		
Analysis P	Intersection	Control Type	MOE	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
Hour	1 - Green Road & Frances Avenue	LOS Delay V/C Q	~ ~ ~ ~	B 10 0.07 2	~ ~ ~ ~	B 10	C 21 0.69 45	B 11 0.09 2	~ ~ ~ ~	C 20	~ ~ ~ ~	A 0 0.00 0	~ ~ ~ ~	A 0	~ ~ ~ ~	A 0 0.00 0	~ ~ ~ ~	A 0	B 13	
AM Peak Hour	2 - North Service Road & Green Road	LOS Delay V/C Q Ex Avail.	C 30 0.64 43 125 82	A 8 0.15 20 -		B 16		C 20 0.83 205 - -	A 7 0.07 6 60 54	B 19					D 36 0.45 55 40 -15		D 46 0.71 93 - -	D 42	C 26 0.79	
LOS - Le	Measure of Effectiveness evel of Service Average Delay per Vehicle ir			xisting	Availa	Queue I ble Stor prage	0		TWSC	- Two	Contro -Way St Vay Sto	op Cor	ntrol		< - Sha	Rounda ared Le ared Rig	ft-Turn			

TABLE 5.2: 2025 PM REMEDIAL MEASURES TOTAL TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	eft	Eastb - G		ę		West	ound			North	ound			South	oound		
	Intersection		MOE	ft	dþ		'n													
				Le	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Overall
lour	1 - Green Road & Frances Avenue	TWSC	LOS Delay V/C Q	~ ~ ~ ~	B 15 0.21 6	~ ~ ~ ~	B 15	D 28 0.68 40	B 12 0.06 2	< < < <	D 27	~ ~ ~ ~	A 0 0.01 0	~ ~ ~ ~	A 0	~ ~ ~ ~	A 1 0.00 0	~ ~ ~ ~	A 1	A 10
PM Peak Hour	North Service Road & Green Road	TCS	LOS Delay V/C Q Ex Avail.	B 15 0.65 68 125 57	B 18 0.83 193 - -		B 17		A 8 0.43 58 -	A 6 0.13 7 60 53	A 8					C 34 0.36 37 40 3		C 31 0.14 19 - -	C 32	B 16 0.72

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length Ex. - Existing Available Storage Avail. - Available Storage TCS - Traffic Control Signal TWSC - Two-Way Stop Control AWSC - All-Way Stop Control RBT - Roundabout < - Shared Left-Turn Lane

> - Shared Right-Turn Lane

6 Parking Assessment

In any equilibrium system, there are a minimum of two components that are required to reach the equilibrium point. With parking systems, this is the balance of parking supply and demand. Reaching an appropriate supply level is equally important as demand. The ubiquitous oversupply of cheap and easily accessible parking has long been identified as a major contributing factor to the growth in single-occupant vehicle (SOV) travel.

The anticipated parking demand for the proposed development was estimated to determine if a reduction from the generic parking requirements set-out in the City of Stoney Creek's Zoning By-law 3692-92 could be justified. Two (2) approaches were considered, with the findings for each documented below.

6.1 By-law Parking Requirements

The Stoney Creek Zoning By-law requires a total of 1.60 parking spaces per one-bedroom apartment unit (1.25 spaces per unit for residents and 0.35 spaces per unit for visitors) and a total of 1.85 parking spaces per two-bedroom unit (1.50 spaces per unit for residents and 0.35 spaces per unit for visitors). Under this By-law, a total of 3,090 parking spaces will be required to service the residential component of the site. The site is proposing 2,438 spaces which is a deficiency of 652 spaces, or about 21 percent of parking required under the By-law as shown in **Table 6.1**.

Number of	Number of	By-Law P	arking Requ	uirements	Required
Bedrooms	Units	Residents	Visitors	Total	Spaces
1	1227	1.25	0.35	1.60	1,963
2	609	1.50	0.35	1.85	1,127
	Т	otal By-Law	Parking Red	quirements	3,090
		Propos	sed Number	of Spaces	2,438
			Stall D	Deficiency	652
			Percent D	Deficiency	21%

TABLE 6.1: ZONING BY-LAW PARKING REQUIREMENTS

6.2 Proxy Site Parking Demand Surveys

Another approach to estimate the parking demands of the proposed site is the use of local parking surveys. Ultimately, a similar site within the City of Hamilton would be used as the proxy site for collection of parking and trip generation data to determine the area-specific parking demands. However, a similar site where parking could be easily accessed was not found within City limits. In lieu of this, parking and trip generation surveys were undertaken on four consecutive weekdays at a similar 'proxy' site in Burlington, Ontario. The site (3060/3070 Rotary Way) is located at the intersection of Dundas Street and Rotary Way. The site consists of 224 residential condominiums with a total parking supply of 432 spaces available for both residents and visitors. This amounts to a total parking supply of 1.93 spaces per residential unit. Although this proxy site is smaller than the proposed site, it is quite similar to the type of development proposed for the subject site and proximity to a major highway. As well, both the subject site and proxy site are in locations outside the city centre where reliance on automobile transportation tends to be higher.

The four-day parking demand data was summarized in 30-minute increments by day for both the AM and PM survey hours. A utilization rate was then produced for each half hour on each consecutive day, which was then summarized into a parking rate per unit for each 30-minute period.

Analyses of the proxy site data indicate that the <u>peak</u> parking rate was observed to be 1.25 spaces per unit during the AM survey period and 0.96 spaces per unit during the PM survey period inclusive of visitor parking demands. The average rates were 1.16 and 0.83 spaces per unit in the AM and PM peak hours respectively. In order to be conservative, the peak parking demand of 1.25 was chosen as the most representative parking demand rate for the proxy site. Note that this rate is between 0.35 and 0.60 spaces per unit lower than the current Zoning By-law requirements for the proposed site. The proxy site survey data is provided in **Appendix M**.

The peak proxy site rate of 1.25 spaces per unit (residents and visitors combined) was applied to the 1,836 proposed units at 310 Frances Avenue This results in a parking requirement of 2,295 spaces, or an oversupply of 143 spaces (6 percent) as shown in **Table 6.2**.

Units	Proxy Site Parking Requirement	Required Spaces
1,836	1.25 spaces per dwelling unit	2,295
Prop	oosed Number of Spaces	2,438
	Stall Surplus	143
	Percent Surplus	6%

TABLE 6.2: PARKING REQUIREMENTS BASED ON PROXY SITE DATA

6.3 Overall Parking Assessment

Based on the information contained within this section, it is anticipated that the site will have a deficiency in parking of 652 spaces based on the By-law parking requirements and a surplus of 143 spaces based on the proxy site data. The proxy site data provides an accurate representation of the parking

demands for the site as they are based on area-specific data and not a general Zoning By-law. Additionally, it further supports a reduction in parking requirements for the site. Therefore, the proposed parking supply should adequately accommodate the parking demands of the site.

In the event that the parking demands of the site exceed the available capacity during the higher demand evening and weekend periods, on-street parking is available on Frances Avenue adjacent to the site and on Green Road west of the site (**Figure 1.1**). While it is not intended that residents would utilize the on-street parking, it is not unreasonable to assume that visitors to the building may park on Frances Avenue or Green Road for a short duration.

At present, the City's On-street parking By-law permits parking for up to 12 hours at any give time on these roadways. Since adequate parking should be provided on-site and on-street parking will likely only be used by visitors, posting of parking restrictions on both roadways is not recommended as this will negatively impact the number of parking spaces available for the existing residential properties.

7 Transportation Demand Management

This section of the report has been prepared to meet the City of Hamilton's Transportation Demand Management for Development Guidelines¹². More specifically, section *3.A Residential* of the guidelines. Although a small commercial component is proposed for the development, given the proposed size of 400 square metres and minor estimated trip generation, section 3.A provides a better representation of the requirements of the development.

Transportation Demand Management (TDM) refers to ways of making the capacity of our roads more efficient by reducing vehicle demand. TDM approaches consider how people's choices of travel mode are affected by factors such as land use patterns, development design, parking availability, parking cost, and the relative cost, convenience and availability of alternative modes of travel. TDM is one of the tools that municipalities are using to create more vibrant and sustainable communities. Using policies and programs to make active and sustainable transportation more convenient, a TDM approach to transportation can deliver long-term environmental sustainability, improve public health, create stronger communities, and build more prosperous and livable cities. Various TDM strategies are used to influence these factors so that the alternatives are more competitive with driving alone, thus reducing reliance on motor vehicles.

TDM strategies can be divided into two basic categories:

- Pre-occupancy: actions that can be done while a development is being designed and built, and
- Post-occupancy: actions that can be done once people are using the development.

The pre-occupancy actions are critical because they are most likely to determine how attractive, convenient and safe alternative travel will be once the site is occupied. Actions such as modifying the site plan to improve pedestrian safety and convenience or reducing the number of provided parking stalls can encourage a reduction in vehicle trips to the site. After the development is built, further strategies include transit or rideshare subsidies and providing convenient information about where and how to use these alternatives. It should be noted that the actions taken after development will not be as effective if TDM strategies are not initially implemented in the site planning stages. For example, transit subsidies will not be taken advantage of if the closest transit stops are not easy to get to or do not connect with the greater transit network. Thus, it is important to take advantage of both pre-occupancy and post-occupancy TDM strategies.

¹² City of Hamilton, Transportation Demand Management Development Guidelines, June 2015.

The City of Hamilton has developed Transportation Demand Management Land Development Guidelines¹³ that are *"a tool for developers and City staff to include TDM initiatives into new development, redevelopment and existing buildings through the development approval process"*. The guidelines outline the report requirements and provide strategies to support TDM within developments and were referenced in the preparation of this report.

7.1 Potential TDM Measures

There are several reasons why incorporating a TDM plan into a residential site is important:

- It reduces auto ownership levels, thereby reducing private vehicle trips and congestion;
- It creates safe and attractive environments that encourage travel by walking, cycling and transit over auto travel; and
- It supports the development of healthy communities.

The following section outlines potential TDM options available to the site. These measures will enhance the site's overall convenience, safety and traffic flow by reducing vehicles trips.

7.1.1 Walking

The accessibility of a development is essential in helping to ensure that those that can walk, do. Proper pedestrian connections from the community to the site should be available to ensure safety and to increase the experience of those that choose to walk.

The site plan indicates direct sidewalk connections will be provided from entrances of the buildings to the existing sidewalks along the south side of Frances Avenue and east side of Green Road. Other measures that can be taken that help to improve safety and the attractiveness of the site include providing adequate lighting throughout the site and overhead weather protection near the building's main entrance and adjacent sidewalks.

7.1.2 Cycling

As outlined in **Section 2.3.2**, the site will be served by bicycle infrastructure. With signed bike routes on Frances Avenue, Shoreview Place and Millen Road the site can facilitate the daily use of bicycles.

To further encourage this use, the development should include visible, welllit short-term bicycle parking for visitors and secure, indoor bicycle parking storage spaces for tenants/residents. The City's TDM guidelines specify the recommended number of bicycle parking spaces for residential and retail buildings. These guidelines include the following:

¹³ TDM for Development, Prepared for City of Hamilton by IBI Group, June 2015

- Long term bicycle parking: 0.50 to 1.25 spaces per dwelling unit or 918 to 2,295 spaces total; and
- Short term bicycle parking: 0.05 to 0.20 spaces per dwelling unit or 92 to 367 spaces total.

The development will provide both short-term and long-term bicycle parking spaces. **Table 7.1** details the City's bicycle parking guidelines for the site.

Land Use	Units	Bicycle Pa	arking Requirement	Required Spaces
2 A Decidential	1996	Long-term	0.5 to 1.25 spaces per dwelling unit	918 to 2295
3.A Residential	1836	Short-term	0.05 to 0.2 spaces per dwelling unit	92 to 367
			Total Spaces	1010 to 2662

TABLE 7.1: BICYCLE PARKING GUIDELINES

The development is providing a total of 444 long-term bicycle parking spaces within bike rooms on each level of the parking garage. This is a deficiency of 474 bicycle parking spaces compared to the TDM Guidelines. However, each unit will also have a storage locker large enough to accommodate a bicycle. Therefore, the potential bicycle parking of the development is 2,280 spaces, well within the City's guidelines.

A total of 92 short-term bicycle parking spaces will be provided via bike racks paced near the building entrances, which meets the City's guidelines.

Bicycle parking requirements were not considered for the commercial component, given the small size in comparison to the development. The Stoney Creek Zoning By-law does not detail bicycle parking requirements for commercial sites. If long-term bicycle parking is required by employees of the commercial component, the development may be able to allocate spaces, given the surplus. The short-term bicycle parking required for the residential component will also be available for patrons of the commercial component.

By providing the recommended number of short and long-term bicycle parking stalls, residents, employees and visitors will be more likely to choose to travel to/from the development by cycling. This increase in sustainable transportation results in a reduction of automobile trips and thus a reduction in parking demand should result.

7.1.3 Transit

The use of transit places less reliance on the use of personal automobiles for trips that can be completed by convenient and desirable transit options. As previously discussed, there is no fixed route transit service within the area of

the subject development. Trans-Cab service is available to pick up and transport passengers between the nearest bus stop transfer points approximately 2.0 kilometres from the site. See **Section 2.2** for details on this route as well as connections available to the wider HSR network.

It is recommended that bus route maps and schedules are provided at visible and convenient locations at the site, such as in the building's lobby. It is also recommended that the applicant advocate to the City of Hamilton and HSR to bring fixed route transit service to the area. If fixed route service is provided, it is recommended that weather protected waiting areas such as bus shelters or overhangs be provided at all stop locations. These additions will help to increase transit usage (especially during inclement weather).

7.1.4 Parking

The City's TDM Policy provides guidelines indicating that reducing parking spaces with the intent of encouraging other uses of transportation is possible. However, one should be cautious and not reduce the number of parking spaces to a point in which significant issues are created. As detailed in **Section 6**, the required number of parking spaces varies from a surplus of 134 to a deficiency of 652 depending on the method used for calculation. In order to mitigate any potential parking shortfall, TDM measures detailed in the following sections, consistent with the City's TDM policy should be considered by the applicant to help manage parking. Managing parking supply helps to reduce the undesirable impacts of parking demand on local and regional traffic levels and can result in positive impacts on community livability and design.

To further encourage residents to use sustainable travel modes, the development could consider selling parking spaces separately from the cost of a unit. This is more equitable and efficient since occupants are not forced to pay for parking they do not need and allows consumers to adjust their parking supply to reflect their needs. This is an important factor that supports reducing the parking supply as residents are notified at the onset of the project that parking will be provided on a limited basis as an additional cost in lieu of the price to purchase a unit. If residents are unwilling to change their travel behaviour, they will not purchase a unit.

If the number of parking spaces is reduced, caution should be given to providing adequate accessibility to other transportation modes. Additional provisions should be made, such as providing suitable bike parking, providing suitable access to transit service, and enhancing pedestrian and bike connections to ensure that other modes of transportation are readily accessible.

7.1.5 Carpooling

Ride-share involves two or more people sharing a vehicle for a trip. The cost of the journey (fuel, tolls, parking, etc.) can be split between the driver and passengers, resulting in savings for all concerned. This also reduces the number of vehicle trips and parking demands.

There are several tools available such as Car Pool World, which set up online ride sharing databases. These databases enable people to enter their daily journey so that the database can automatically search out coworkers whose journeys match. A less formal option would be installing notice boards in the lobby of the buildings for residents who may organize informal carpools.

7.1.6 Car-Share

Car sharing is recognized in the City's TDM policy as a means of reducing automobile dependence by providing access to a car on an as-need basis and reducing the need to own a vehicle. The provision of secured car-share spaces in private lots can result in a reduction in residential parking requirements. The TDM policy states that a 2% reduction in the parking will result for providing car-share spaces for 2% of the building occupants. This means that if 37 car-share spaces are provided for the redevelopment, a reduction of 37 spaces to the required building parking spaces will be permitted.

Car-share appeals to a broad range of households from young urban professionals to families who want a lifestyle that is not tied to owning and maintaining a private vehicle. It also attracts those that want to retain the option to drive for primarily non-work trip purposes.

Another option could be providing additional car-share vehicles within walking distance of the site if the current supply of vehicles is insufficient to meet demands.

7.1.7 Individualized Travel Planning

Research has indicated that educating the occupants by going directly to residents increases the likelihood that a shift to more sustainable modes of transportation will occur. The Organisation for Economic Co-operation and Development (OECD) and the Global Environmental Change Program of the UK Economic and Social Research council hosted a workshop¹⁴ that recognized the importance of understanding the forces that motivate and shape individuals' travel behaviour. It identified several key messages of benefit to TDM policy development:

Hierarchy of Choice: An employer can make decisions that influence how all his or her employees travel to work. Similarly, an individual's decision to buy his or her house may affect how all the members of the household travel. A greater understanding of this hierarchy can assist in identifying those high-order organizations and individual choices. TDM strategies and policies should target those key decision makers.

¹⁴ Organisation for Economic Co-operation and Development (OECD). 1997. Second OECD Workshop on Individual Travel Behaviour: "Culture, Choice and Technology" Final Report. University of Sussex, Brighton, UK 17-19 July 1996. Paris: OECD.

- Perception: Individuals' perceptions of time, environment, and alternative modes of travel and travel behaviour, determine whether they feel they have a choice in how they travel. For example, people who have rarely taken public transport or cycled may not perceive these modes as suited to their lifestyle because of perceived disadvantages which they associate with these modes. In many cases, individuals over-estimate the benefits of their current choice and under-estimate the capacity of alternative modes to satisfy their needs. Altering these perceptions can open the range of options available to travelers.
- Culture: Culture plays an important role in determining the status, image and acceptability of different types of travel behaviour. For example, the car has social and cultural attributes that go well beyond its role as a mode of transportation. TDM strategies must consider these cultural factors.
- Education (Information and Learning): Individuals need targeted, relevant, effective and positive information to better understand the consequences of different travel choices on their own, and their community's quality of life. This information would be most effective if available before individuals engage prior to car and home purchases.

Individual travel planning has demonstrated that working directly with residents/employees as well as providing appropriate infrastructure increases the use of sustainable modes and reduces the site's dependency on vehicles. Therefore, it is an important component to the encouragement of the use of sustainable modes of transportation at the subject site.

The applicant should work with the buildings' residents to form a travel planning committee/team that will help develop individualized travel plans for interested residents. This team could be responsible for:

- Ensuring up-to-date bus routes and maps are available within the lobbies of the buildings and providing information on next available bus, cost of trip and where to purchase passes;
- Providing assistance to residents in signing up for and arranging carpool and bike sharing services; and
- Developing specific travel plans using alternative modes of transportation (HSR travel planning, etc.), including total trip time.

Additionally, the applicant should consider provision of a kiosk or message/bulletin board within the building entrance for use by the committee/team.

7.2 TDM Summary

The proposed site with nearby connections to bicycle facilities and transit routes has the potential to be an accessible development. Further enhancing

these elements inside and outside the boundaries of the development will ensure these opportunities do not go unused. The City's outcomes for incorporating TDM with new development include the following:

- Promoting more attractive streetscapes that are inclusive and inviting for everyone;
- Developing neighbourhoods and districts with a variety of uses that allow people to live and work in closer proximity;
- Preserving streets and public space for a more balanced transportation system; and
- Promoting public health and active lifestyles.

By incorporating the TDM options previously discussed, such as improving walking and cycling facilities, reducing the parking supply and developing individualized travel plans for residents (alternative mode trip planning, car share arrangements, etc.), the site will set the tone for the surrounding area in helping to achieve these City goals.

8 **Conclusions and Recommendations**

8.1 Conclusions

Based on the investigations carried out, it is concluded that:

Existing Traffic Operations

Under existing traffic conditions, all intersections within the study area are operating at acceptable levels of service during the AM and PM peak hours. The following critical movement is noted:

- North Service Road and Green Road:
 - Southbound left-turn movement LOS D during the PM peak hour with a v/c ratio of 0.28. The low v/c ratio on this movement indicates the delay is due to the high volume of through traffic on North Service Road which limits available gaps for side street traffic.

Development Generated Traffic

At full build-out, the development is forecast to generate 556 and 666 trips during the AM and PM peak hours, respectively.

2021 Background Traffic Operations

Under 2021 background traffic conditions all intersections within the study area are forecast to operate at overall acceptable levels of service. The following critical movement is noted:

- North Service Road and Green Road:
 - Southbound left-turn movement LOS D with a v/c of 0.32 during the AM peak hour and LOS F with a v/c of 0.57 during the PM peak hour. The low to moderate v/c ratios indicate the delay is due to the high volume of through traffic on North Service Road which limits available gaps for side street traffic.

2021 Total Traffic Operations (Phase 1)

Under 2021 total traffic conditions all intersections within the study area are forecast to operate at overall acceptable levels of service. The following critical movements are noted:

- North Service Road and Green Road:
 - Southbound left-turn movement LOS E with a v/c ratio of 0.58 during the AM peak hour and LOS F with a v/c ratio of 1.25 during the PM peak hour. The 95th percentile queue is forecast to

exceed the available storage by 11 metres during the PM peak hour;

- Southbound right-turn movement LOS D with a v/c ratio of 0.59 during the AM peak hour; and
- The moderate v/c ratios during the AM peak hour indicate the delay is due to the high volume of through traffic on North Service Road which limits available gaps for side street traffic.

2023 Background Traffic Operations

Under 2023 background traffic conditions all intersections within the study area are forecast to operate at overall acceptable levels of service. The following critical movements are noted:

- North Service Road and Green Road:
 - Southbound left-turn movement LOS F with a v/c ratio of 0.62 during the AM peak hour and LOS F with a v/c ratio of 1.40 during the PM peak hour. The95th percentile queue is forecast to exceed the available storage by 16 metres during the PM peak hour;
 - Southbound right-turn movement LOS D with a v/c ratio of 0.62 during the AM peak hour; and
 - The moderate v/c ratios during the AM peak hour indicate the delay is due to the high volume of through traffic on North Service Road which limits available gaps for side street traffic.

2023 Total Traffic Operations (Phase 2)

Under 2023 total traffic conditions all intersections within the study area are forecast to operate at overall acceptable levels of service. The following critical movements are noted:

- North Service Road and Green Road:
 - Southbound left-turn movement LOS E with a v/c ratio of 0.93 during the AM peak hour and LOS F with a v/c ratio of 2.66 during the PM peak hour. The 95th percentile queue is forecast to exceed the available storage by 15 metres during the AM peak hour and 51 metres during the PM peak hour;
 - Southbound right-turn movement LOS D with a v/c ratio of 0.95 during the AM peak hour; and
 - Overall intersection LOS E during the PM peak hour.

2025 Background Traffic Operations

Under 2025 background traffic conditions all intersections within the study area are forecast to operate at overall acceptable levels of service. The following critical movements are noted:

- ▶ North Service Road and Green Road:
 - Southbound left-turn movement LOS F with a v/c ratio of 1.0 during the AM peak hour and LOS F with a v/c ratio of 2.97 during the PM peak hour. The 95th percentile queue is forecast to exceed the available storage by 21 metres during the AM peak hour and 55 metres during the PM peak hour;
 - Southbound right-turn movement LOS F with a v/c ratio of 1.01 during the AM peak hour; and
 - Overall intersection LOS D during the AM peak hour and LOS F during the PM peak hour.

2025 Total Traffic Operations (Full Build-Out)

Under 2025 total traffic conditions all intersections within the study area are forecast to operate at overall acceptable levels of service. The following critical movements are noted:

- Green Road and Frances Avenue:
 - Westbound left-turn/through/right-turn movement LOS D with a v/c ratio of 0.79 during the AM and 0.74 during the PM peak hour.
- North Service Road and Green Road:
 - Southbound left-turn movement LOS F with a v/c ratio of 1.40 during the AM peak hour and a v/c ratio of 5.47 during the PM peak hour. The 95th percentile queue is forecast to exceed the available storage by 59 metres during the AM peak hour and 55+ metres during the PM peak hour;
 - Southbound right-turn movement LOS F with a v/c ratio of 1.33 during the AM peak hour; and
 - Overall intersection LOS F during the AM and PM peak hours.

Remedial Measures

The following remedial measures are required in order to provide acceptable levels of service at the study area intersections:

Traffic signals at the intersection of North Service Road and Green Road. Although not warranted until 2025, the signals should be installed as part of Phase 1 of the development (2021) to provide acceptable levels of service on all approaches;

- A separate westbound right-turn lane should be provided at the intersection of North Service Road and Green Road at the 2025 horizon. This lane warrants 7.5 metres of storage and 120 metres of taper and parallel lane; however, due to environmental constraints, only 10 metres of storage and 15.8 metres of taper can be provided within the right-of-way without significant reconstruction;
- A separate westbound left-turn lane should be provided at the intersection of Green Road and Frances Avenue at the 2025; and
- The southbound left-turn lane at North Service Road and Green Road should be increased by 15 metres by the 2025 horizon.

These improvements are directly related to the increase in traffic due to development of the subject site.

Parking Assessment

City of Stoney Creek By-law Parking Requirements

Based on the City of Stoney Creek Zoning By-law 3692-92, a total of 3,090 parking spaces will be required to service the residential component of the site. A total of 2,438 spaces are proposed. This is a deficiency of 652 spaces or 21% of the By-law parking requirement.

Proxy Site Survey Data

Parking utilization surveys were undertaken at a proxy site in Burlington, Ontario (3060/3070 Rotary Way). Based on the maximum observed demand at the proxy sites, a total of 2,295 spaces would be required to service the site during the peak weekday period. A total of 2,438 spaces are proposed. This is a surplus of 143 spaces or 106% of the proxy site parking requirement.

Overall Findings

The Zoning By-law results in a deficiency in parking of 652 spaces and the proxy site data results in a surplus of 143 spaces. The proxy site data provides an accurate representation of the parking demands for the site as they are based on area-specific data and not a general Zoning By-law. Additionally, it further supports a reduction in parking requirements for the site. Therefore, the proposed parking supply should adequately accommodate the parking demands of the site.

TDM Options

The proposed site with nearby connections to bicycle facilities and transit routes has the potential to be an accessible development. Further enhancing these elements inside and outside the boundaries of the development will ensure these opportunities do not go unused. By incorporating the TDM options contained in this report, such as improving walking and cycling facilities, reducing the parking supply and developing individualized travel plans for residents (alternative mode trip planning, carpool arrangements, etc.), the site will set the tone for the surrounding area in helping to achieve the City's long-term transportation goals.

8.2 **Recommendations**

Based on the findings of this study, it is recommended that:

- ▶ The City of Hamilton recognize the conclusions drawn above;
- The site be allowed to be developed as planned;
- The site driveway connections operate under stop sign control;
- The City install traffic signals at the intersection of North Service Road and Green Road by buildout of Phase 1 in 2021. The signal timing and phasing should be optimized as required;
- A separate westbound right-turn lane with 10 metres of storage and 15.8 metres of taper should be provided at the intersection of North Service Road and Green Road at the 2025 horizon;
- A separate westbound left-turn lane with 45 metres storage should be provided at the intersection of Green Road and Frances Avenue at the 2025 horizon. This can be accomplished through pavement markings;
- The southbound left-turn lane at North Service Road and Green Road should be extended by 15 metres by the 2025 horizon. This can be accomplished through pavement markings; and
- The applicant should ensure proper pedestrian and cyclist connections from the surrounding roads to the buildings' main entrances;
- Current bus schedules are provided within the lobby of each building to further promote the use of transit; and
- The buildings' management should work with the buildings' residents to form a travel planning committee/team that will help develop individualized travel plans (alternative mode trip planning, carpool arrangements, etc.) for interested residents. To assist the committee/team, the applicant should consider providing a kiosk within the lobby of each building for use by the committee/team.

Appendix A

Pre-Study Consultation Documentation

Appendix "C" to Report PED19115 Page 96 of 314

Heather Goodman

From: Sent: To: Subject: Heather Goodman April 11, 2018 8:58 AM 'Transportation Planning' RE: 180010 (Waterfront Trails TIS & PS) - Scope of Work

Hi Tiffany,

Do you know if there are any updates on the review of our scope? Specifically, we would like to confirm the correct by-law.

Thanks,

Heather Goodman, B.Eng., EIT, MITE

Transportation Consultant



Paradigm Transportation Solutions Limited p: 416.479.9684 x502 m: 905.506.0454

From: Wolsey, Tiffany [mailto:Tiffany.Wolsey@hamilton.ca] On Behalf Of Transportation Planning
Sent: March 5, 2018 2:09 PM
To: Heather Goodman <hgoodman@ptsl.com>
Subject: RE: 180010 (Waterfront Trails TIS & PS) - Scope of Work

Hello,

The planner on file will be able to advise you on the appropriate bylaw to use for the parking study.

Thank you,

Tiffany Wolsey

Transportation Management Coordinator Transportation Planning Planning & Economic Development Department

From: Heather Goodman [mailto:hgoodman@ptsl.com]
Sent: January-26-18 5:59 PM
To: Transportation Planning
Cc: Jill Juhlke
Subject: RE: 180010 (Waterfront Trails TIS & PS) - Scope of Work

Hello,

Appendix "C" to Report PED19115 Page 98 of 314 In addition to the information requested below, could you please confirm the By-law to use for the parking study.

I look forward to your comments.

Regards,

Heather Goodman, B.Eng., EIT, MITE

Transportation Consultant



Paradigm Transportation Solutions Limited p: 416.479.9684 x502 m: 905.506.0454

From: Heather Goodman
Sent: January 26, 2018 10:25 AM
To: 'Ng, Jeffrey' <<u>Jeffrey.Ng@hamilton.ca</u>>
Cc: Jill Juhlke <<u>jjuhlke@ptsl.com</u>>; Transportation Planning <<u>Transportation.Planning@hamilton.ca</u>>
Subject: RE: 180010 (Waterfront Trails TIS & PS) - Scope of Work

Thanks Jeff, I appreciate you sending the scope forward.

Regards,

Heather Goodman, B.Eng., EIT, MITE

Transportation Consultant



Paradigm Transportation Solutions Limited

p: 416.479.9684 x502 m: 905.506.0454

From: Ng, Jeffrey [mailto:Jeffrey.Ng@hamilton.ca]
Sent: January 26, 2018 10:24 AM
To: Heather Goodman <<u>hgoodman@ptsl.com</u>>
Cc: Jill Juhlke <<u>jjuhlke@ptsl.com</u>>; Transportation Planning <<u>Transportation.Planning@hamilton.ca</u>>
Subject: RE: 180010 (Waterfront Trails TIS & PS) - Scope of Work

Hi Heather,

Unfortunately our section is no longer reviewing development applications. I've copied Transportation Planning who will be able to assist moving forward.

Thanks,

Jeff Ng

Traffic Technologist Geomatics & Corridor Management City of Hamilton Engineering Services, Public Works Dept. Tel: 905-546-2424 ext 4577 Fax: 905-540-5926

Permit Applications: <u>http://hamilton.ca/cm</u> Road Closure Notices: <u>http://hamilton.ca/roadclosures</u>

From: Heather Goodman [mailto:hgoodman@ptsl.com]
Sent: January 26, 2018 10:12 AM
To: Ng, Jeffrey <<u>Jeffrey.Ng@hamilton.ca</u>>
Cc: Jill Juhlke <<u>jjuhlke@ptsl.com</u>>
Subject: 180010 (Waterfront Trails TIS & PS) - Scope of Work

Hi Jeff,

Paradigm would like to inform the City that we will be undertaking a Transportation Impact Study (TIS) and Parking Justification Study for lands located the northeast corner of North Service Road and Green Road, detailed in the enclosed project overview and work plan. We ask that you please review the work plan to ensure the scope of the study is acceptable and provide comments if necessary.

In addition, we will use the following details for the study:

- The traffic impact study will be prepared to conform to the City's Traffic Impact Study Guidelines will assess the 2021, 2023 and 2025 horizon years, consistent with the completion of each phase of development.
- To remain consistent with other TIS reports for the area, a growth rate of 2% per year, and all development data from the 101 Shoreview TIS Report & 560 Grays Road TIS Report completed by Paradigm in July 2017 and November 2017, respectively will be utilized.

Due to the time sensitive nature of the project, we ask that you please provide comments at your earliest convenience. Please do not hesitate to contact me if you have questions relating to this project.

Regards,

Heather Goodman, B.Eng., EIT, MITE

Transportation Consultant



Paradigm Transportation Solutions Limited

5000 Yonge Street, Suite 1901, Toronto ON M2N 7E9 p: 416.479.9684 x502 m: 905.506.0454 e: hgoodman@ptsl.com w: www.ptsl.com

Appendix "C" to Report PED19115 Page 100 of 314



22 King Street South, Suite 300 Waterloo, ON N2J 1N8 p: 519.896.3163 905.381.2229 f: 1.855.764.7349

www.ptsl.com

26 January 2018 Project: 170247

Jeff Ng Traffic Technologist City of Hamilton 77 James Street North, Suite 400 Hamilton, ON L8R 2K3

Dear Mr. Ng:

RE: 560 GRAYS ROAD, CITY OF HAMILTON TRAFFIC IMPACT STUDY UPDATE SCOPE OF WORK

Paradigm Transportation Solutions Limited (Paradigm) was retained on behalf of **New Horizon Development Group** (the Client) to carry out a Transportation Impact Study (TIS) and Parking Justification Study update for the Waterfront Trails Development lands in Hamilton, Ontario.

The Waterfront Trails Development is located in the northeast quadrant of the intersection of North Service Road and Green Road in the Stoney Creek area of the City of Hamilton. The development proposal includes a total of 1,500 residential apartment units contained within three to four high-rise buildings.

This development is located in the Green Millen Shore Estates (GMSE) development area. Over the past couple of years, Paradigm has completed extensive analyses of multiple developments within this area. We will rely on this experience and our knowledge of the area in preparing this study.

Work Plan

Based on our understanding of the development proposal and the City requirements, we proposed to carry out the following scope of work:

- Task 1 Pre-Study Consultation: We will submit a scope of work to the City of Hamilton to obtain their comments and approval on the approach and methodology proposed in this work plan prior to making significant progress on the studies.
- Task 2 Data Collection: We will request from the City the most recent signal timing plans (where applicable) and Paradigm will collect turning movement counts at the following study area intersections:
 - North Service Road and Green Road (stop controlled); and
 - North Service Road and Millen Road (stop controlled).

- Task 3 Site Visit: Paradigm staff will conduct a site visit to inventory the traffic and roadway conditions in the immediate area of the proposed development, traffic control, adjacent driveway locations, adjacent land use and operational conditions within the study area. The site visit will also include confirming traffic regulations and parking restrictions along the study area roadways.
- Task 4 Traffic Forecasting: We will prepare trip generation estimates for three horizons reflecting the anticipated completion of each building as follows:
 - Tower 1 2021 horizon: 44 storeys containing 487 units;
 - Tower 2 2023 horizon: 50 storeys containing 570 units; and
 - Tower 3 2025 horizon: 39 storeys containing 435 units.
- Task 5 Operational Analyses: Using the traffic forecasts developed in Task 1, we will analyze the operations of the intersection of North Service Road and Green Road and North Service Road and Millen Road during the weekday AM and PM peak hours for each phase of development (2021, 2023 and 2025) both without and with full development of the site. These analyses will be conducted to meet City of Hamilton traffic impact study guidelines.
- Task 6 Remedial Measures Responsibility: We will provide specific information outlining what remedial measures are required (under background or future total conditions) at each horizon and highlight those needed to support the proposed development.
- Task 7 Report and Recommendations: Paradigm will prepare a detailed final report documenting our investigations, findings and recommendations, including the Synchro 9 capacity analysis. This report will also include the Parking Justification. The final report will include appendices containing relevant traffic data as well as the detailed output generated by the operational analysis software.

Parking Justification Study

Based on the information provided, the Client will be seeking a variance to supply less than the parking required under the current in-force City of Hamilton Zoning By-law (05-200). Based on our extensive traffic and parking study experience in Hamilton, we have local data that confirms that a variance can be sought.

- Task 8 Area Parking Inventory: Paradigm staff will undertake an inventory of the current available on-street parking within convenient walking distance of the site. The inventory will be summarized by block and sub-area including the number of spaces, type of parking and time restrictions. This will be used to demonstrate the additional potential supply of parking available if there are times when spillover parking may be required.
- Task 9 Parking Generation: Paradigm will review the ITE Parking Generation 4th Edition to assess the parking generation for the site based on the proposed land uses. Furthermore, we will look at the TTS data for the area and consider automobile ownership and the percentage of trips made by alternative modes of travel. We will use Paradigm's in-house parking generation data collected for apartment units to develop a site-specific parking generation rate for the proposed development.



Task 10 – Parking Assessment: Based on the planned on-site parking supply, we will assess the extent to which parking demand can be accommodated on the site and the potential for spill-over parking that may need to be accommodated within the surrounding area.

We trust the foregoing work plan is acceptable. If you have any questions related to this project, please contact me at (905) 381-2229 x103 or (519) 896-3163 x103 or by email at selkins@ptsl.com.

Yours very truly,

PARADIGM TRANSPORTATION SOLUTIONS LIMITED

Stew Elkins B.E.S., MITE Vice-President



Appendix B

Detailed Turning Movement Count Data

Appendix "C" to Report PED19115 Page 104 of 314

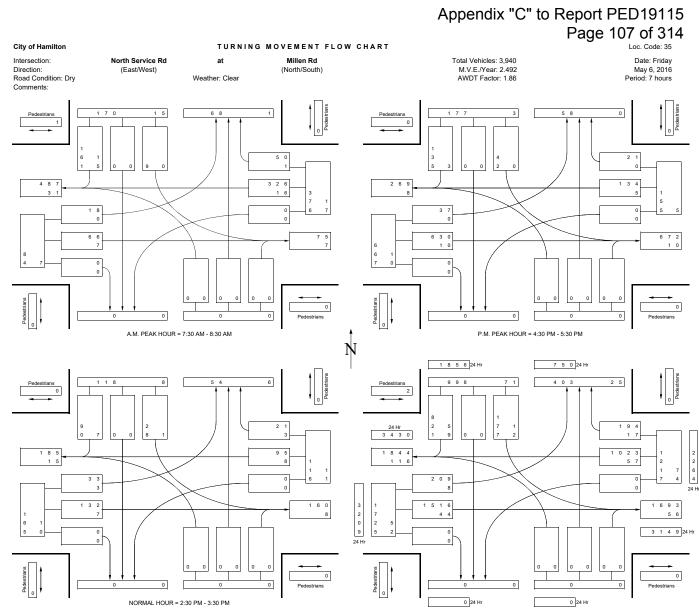
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Mvmt Tot	1	3	1	2	1	6	2	8	3	30	:	3	1		1	2	1	4	5	50	2	3	1	0		3	2	8	4	1	1	1
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Appendix "C" to Report PED19115 Page 106 of 314

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7:15-7:30	4			2				74	5		6	1			12			22			
7:30-7:45	4	1		6	3			147	4		7	1			8	1		21			
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8:00-8:15	6			11				114	4		8	1			15			20			
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8:30-8:45	1			8				115	6		8				13			13			
8:45-9:00	8	1		18				81	4		11				8			11			
4:00-4:15	21			68				47	4		14				11			15			
4:15-4:30	15			68	1			50	7		7				7	2		12			
4:30-4:45	15			82				74	6		9				16			10			
4:45-5:00	20			123				38	1		13				15	1		10			
5:00-5:15	23			118	1			57	5		11	1			17			10			
5:15-5:30	24			135	2			50	4		12				3			12			
5:30-5:45	21			129	2			38	3		9				8			6			
5:45-6:00	17			83	1			26	1		8				7			7			



7 Hr & 24 Hr TOTAL VOLUMES

Appendix "C" to Report PED19115 Page 108 of 314

Appendix C

Base Year Traffic Operations Reports

Appendix "C" to Report PED19115 Page 110 of 314

Appendix "C" to Report PED19115 Page 111 of 314

1: Green Road & Fra		/										
	۶	-	\mathbf{r}	1	+	•	1	1	1	1	Ŧ	~
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4			4	
Traffic Volume (vph)	11	5	15	63	15	0	4	16	28	0	54	7
Future Volume (vph)	11	5	15	63	15	0	4	16	28	0	54	7
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.935						0.921			0.984	
Flt Protected		0.982			0.961			0.996				
Satd. Flow (prot)	0	1683	0	0	1826	0	0	1637	0	0	1870	0
FIt Permitted		0.982			0.961			0.996				
Satd. Flow (perm)	0	1683	0	0	1826	0	0	1637	0	0	1870	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.1			52.2			184.8			166.7	
Travel Time (s)		11.9			3.8			13.3			12.0	
Confl. Peds. (#/hr)	1					1	2		3	3		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	0%	0%	0%	0%	0%	0%	7%	7%	0%	0%	0%
Adj. Flow (vph)	12	5	16	68	16	0	4	17	30	0	59	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	33	0	0	84	0	0	51	0	0	67	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Riaht	Left	Left	Right
Vedian Width(m)		0.0	J -		0.0	5		3.6	5		3.6	J .
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
•												
Intersection Summary	thor											
	ther											
Control Type: Unsignalized Intersection Capacity Utilization	00 (0)			10		of Service						

Movement	≯											
Movomont	-	→	\mathbf{r}	4	-	•	1	1	1	1	Ŧ	-
WUVEIHEIN	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SE
Lane Configurations		\$			\$			\$			4	
Traffic Volume (veh/h)	11	5	15	63	15	0	4	16	28	0	54	
Future Volume (Veh/h)	11	5	15	63	15	0	4	16	28	0	54	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	12	5	16	68	16	0	4	17	30	0	59	
Pedestrians		2			3						1	
Lane Width (m)		3.6			3.6						3.6	
Walking Speed (m/s)		1.2			1.2						1.2	
Percent Blockage		0			0						0	
Right turn flare (veh)					-							
Median type								None			None	
Median storage veh)											110110	
Upstream signal (m)								185				
pX, platoon unblocked								100				
vC, conflicting volume	114	123	65	124	112	36	69			50		
vC1, stage 1 conf vol		120	00	121	112	50	07			50		
vC2, stage 2 conf vol												
vCu, unblocked vol	114	123	65	124	112	36	69			50		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	7.2	0.0	0.2		0.0	0.2						
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	99	98	92	98	100	100			100		
cM capacity (veh/h)	825	766	1003	830	777	1039	1542			1566		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1		1007	1012			1000		
Volume Total	33	84	51	67								
Volume Left	12	68	4	0/								
Volume Right	12	00	30	8								
cSH	891	819	1542	1566								
Volume to Capacity	0.04	0.10	0.00	0.00								
Queue Length 95th (m)	0.04	2.7	0.00	0.00								
Control Delay (s)	9.2	2.7	0.1	0.0								
Lane LOS	9.2 A	9.9 A	0.6 A	0.0								
	9.2	A 9.9	A 0.6	0.0								
Approach Delay (s) Approach LOS	9.2 A	9.9 A	0.0	0.0								
	A	А										
Intersection Summary												
Average Delay			5.0									
Intersection Capacity Utilizat Analysis Period (min)	ion		22.6% 15	IC	U Level o	of Service			A			

Waterfront Trails TIS 5:00 pm 06-13-2018 AM Base Year (2018)

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 AM Base Year (2018)

	٠	_	-	•	1	1	
		EDT	WDT	WBR	CDI		
ane Group	EBL	EBT	WBT	WBR	SBL	SBR	
ane Configurations	`	↑ 47	4	32	<mark>ች</mark> 60	7 2	
Fraffic Volume (vph)	16		574				
uture Volume (vph)	16	47	574	32	60	72	
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	120.0			0.0	40.0	0.0	
Storage Lanes	1			0	1	1	
Taper Length (m)	7.5				7.5		
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor							
Frt			0.993			0.850	
It Protected	0.950				0.950		
Satd. Flow (prot)	1687	1696	1800	0	1770	1615	
It Permitted	0.950				0.950		
Satd. Flow (perm)	1687	1696	1800	0	1770	1615	
ink Speed (k/h)		80	80		50		
ink Distance (m)		123.4	826.3		184.8		
Fravel Time (s)		5.6	37.2		13.3		
Confl. Peds. (#/hr)	1			1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	7%	12%	4%	19%	2%	0%	
Adj. Flow (vph)	17	51	624	35	65	78	
Shared Lane Traffic (%)		01	021	00	00		
ane Group Flow (vph)	17	51	659	0	65	78	
Enter Blocked Intersection	No	No	No	No	No	No	
ane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(m)	LUI	3.6	3.6	rugin	3.6	rught	
Link Offset(m)		0.0	0.0		0.0		
Crosswalk Width(m)		4.8	4.8		4.8		
Two way Left Turn Lane		4.0	4.0		4.0		
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
	25	1.00	1.00	1.00	25	1.00	
Furning Speed (k/h)	20	Free	Free	10		10	
Sign Control		Free	Free		Stop		
ntersection Summary Area Type: 0	Other						

Intersection Capacity Utilization 43.3% Analysis Period (min) 15

	≯		t	*	٢	1	
	-			-	-	•	
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	<u></u>	↑	4		٦.	1	
Traffic Volume (veh/h)	16	47	574	32	60	72	
Future Volume (Veh/h)	16	47	574	32	60	72	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	17	51	624	35	65	78	
Pedestrians					1		
Lane Width (m)					3.6		
Walking Speed (m/s)					1.2		
Percent Blockage					0		
Right turn flare (veh)							
Vedian type		None	None				
Vedian storage veh)							
Jpstream signal (m)							
X, platoon unblocked							
/C, conflicting volume	660				728	642	
VC1, stage 1 conf vol							
VC2, stage 2 conf vol							
/Cu, unblocked vol	660				728	642	
C, single (s)	4.2				6.4	6.2	
C, 2 stage (s)							
F (s)	2.3				3.5	3.3	
00 queue free %	98				83	84	
cM capacity (veh/h)	904				383	477	
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2		
/olume Total	17	51	659	65	78		
/olume Left	17	0	0	65	0		
/olume Right	0	0	35	0	78		
SH	904	1700	1700	383	477		
/olume to Capacity	0.02	0.03	0.39	0.17	0.16		
Queue Length 95th (m)	0.5	0.0	0.0	4.8	4.6		
Control Delay (s)	9.1	0.0	0.0	16.3	14.0		
ane LOS	A			С	В		
Approach Delay (s)	2.3		0.0	15.1			
Approach LOS				С			
ntersection Summary							
Average Delay			2.7				
ntersection Capacity Utiliza	ation		43.3%	IC	U Level o	of Service	A
Analysis Period (min)			15				

Waterfront Trails TIS 5:00 pm 06-13-2018 AM Base Year (2018)

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 AM Base Year (2018)

	≯		-	•	5	1	
				`			
ane Group	EBL	EBT	WBT	WBR	SBL	SBR	
ane Configurations	<u>٦</u>	↑	f >		٦	1	
Fraffic Volume (vph)	28	79	382	55	11	224	
Future Volume (vph)	28	79	382	55	11	224	
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	85.0			0.0	0.0	25.0	
Storage Lanes	1			0	1	1	
Faper Length (m)	7.5				7.5		
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
-rt			0.983			0.850	
It Protected	0.950				0.950		
Satd. Flow (prot)	1719	1810	1820	0	1504	1583	
It Permitted	0.950				0.950		
Satd. Flow (perm)	1719	1810	1820	0	1504	1583	
ink Speed (k/h)		80	80		50		
ink Distance (m)		826.3	260.0		127.1		
Fravel Time (s)		37.2	11.7		9.2		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
leavy Vehicles (%)	5%	5%	2%	7%	20%	2%	
Adj. Flow (vph)	30	86	415	60	12	243	
Shared Lane Traffic (%)							
ane Group Flow (vph)	30	86	475	0	12	243	
Enter Blocked Intersection	No	No	No	No	No	No	
ane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(m)		3.6	3.6	5.	3.6	J .	
_ink Offset(m)		0.0	0.0		0.0		
Crosswalk Width(m)		4.8	4.8		4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Furning Speed (k/h)	25			15	25	15	
Sign Control		Free	Free		Stop		
ntersection Summary							
)ther						
Control Type: Unsignalized							

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	≯	→	-		>	*	
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	ľ	•	ĥ		1	1	
Traffic Volume (veh/h)	28	79	382	55	11	224	
Future Volume (Veh/h)	28	79	382	55	11	224	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	30	86	415	60	12	243	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)						3	
Median type		None	None				
Median storage veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	475				591	445	
vC1, stage 1 conf vol					071	110	
vC2, stage 2 conf vol							
vCu, unblocked vol	475				591	445	
tC, single (s)	4.1				6.6	6.2	
tC, 2 stage (s)							
tF (s)	2.2				3.7	3.3	
p0 queue free %	97				97	60	
cM capacity (veh/h)	1072				429	613	
Direction. Lane #	EB 1	EB 2	WB 1	SB 1			
Volume Total	30	86	475	255			
Volume Left	30	00	475	200			
	30	0	60	243			
Volume Right cSH	1072			643			
Volume to Capacity	0.03	1700 0.05	1700 0.28	043			
Queue Length 95th (m)	0.03	0.05	0.28	0.40			
Control Delay (s)	8.5	0.0	0.0	15.2			
Lane LOS	6.5 A	0.0	0.0	14.0 B			
Approach Delay (s)	A 2.2		0.0	в 14.6			
Approach LOS	2.2		0.0	14.0 B			
Intersection Summary							
Average Delay			4.7				
Intersection Capacity Utiliza	tion		44.0%	IC	Ulevelo	f Service	А
Analysis Period (min)			11.070	10	2 201010	. 20.1100	**

Waterfront Trails TIS 5:00 pm 06-13-2018 AM Base Year (2018)

Synchro 9 Report Page 5 Waterfront Trails TIS 5:00 pm 06-13-2018 AM Base Year (2018)

Appendix "C" to Report PED19115 Page 114 of 314

1: Green Road & Fr	ances	Avenu	e															
	٦	-	\mathbf{r}	4	-	•	٩	1	1	1	Ŧ	~						
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations		4			4			4			\$							
Traffic Volume (vph)	14	13	17	37	3	1	15	53	69	3	30	4						
Future Volume (vph)	14	13	17	37	3	1	15	53	69	3	30	4						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900						
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Ped Bike Factor																		
Frt		0.948			0.997			0.932			0.986							
FIt Protected		0.984			0.957			0.995			0.996							
Satd. Flow (prot)	0	1772	0	0	1765	0	0	1762	0	0	1866	0						
FIt Permitted		0.984			0.957			0.995			0.996							
Satd. Flow (perm)	0	1772	0	0	1765	0	0	1762	0	0	1866	0						
Link Speed (k/h)		50			50			50			50							
Link Distance (m)		165.1			52.2			184.8			166.7							
Travel Time (s)		11.9			3.8			13.3			12.0							
Confl. Peds. (#/hr)	1		1	1		1	2		1	1		2						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92						
Heavy Vehicles (%)	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%						
Adj. Flow (vph)	15	14	18	40	3	1	16	58	75	3	33	4						
Shared Lane Traffic (%)																		
ane Group Flow (vph)	0	47	0	0	44	0	0	149	0	0	40	0						
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No						
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right						
Vedian Width(m)		0.0	-		0.0	-		3.6	-		3.6	-						
Link Offset(m)		0.0			0.0			0.0			0.0							
Crosswalk Width(m)		4.8			4.8			4.8			4.8							
Two way Left Turn Lane																		
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Turning Speed (k/h)	25		15	25		15	25		15	25		15						
Sign Control		Stop			Stop			Free			Free							
Intersection Summary																		
Area Type: C	Other																	
Control Type: Unsignalized																		
Control Type: Unsignalized Intersection Capacity Utilizati Analysis Period (min) 15	ion 23.7%			Ю	CU Level (of Service	A											

	≯	-	\mathbf{r}	1	+	*	1	1	1	1	Ŧ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations		\$			\$			\$			4	
Traffic Volume (veh/h)	14	13	17	37	3	1	15	53	69	3	30	
Future Volume (Veh/h)	14	13	17	37	3	1	15	53	69	3	30	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	15	14	18	40	3	1	16	58	75	3	33	
Pedestrians		2			1			1			1	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	174	209	38	196	174	98	39			134		
vC1, stage 1 conf vol	.,,,	207	00	170		70	0,			101		
vC2, stage 2 conf vol												
vCu, unblocked vol	174	209	38	196	174	98	39			134		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)		0.0	0.2		0.0	0.2						
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	98	98	94	100	100	99			100		
cM capacity (veh/h)	779	681	1037	727	713	963	1581			1462		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	47	44	149	40								
Volume Left	15	40	16	3								
Volume Right	18	1	75	4								
cSH	822	730	1581	1462								
Volume to Capacity	0.06	0.06	0.01	0.00								
Queue Length 95th (m)	1.5	1.5	0.2	0.0								
Control Delay (s)	9.6	10.2	0.9	0.6								
Lane LOS	А	В	А	А								
Approach Delay (s)	9.6	10.2	0.9	0.6								
Approach LOS	А	В										
Intersection Summary												
Average Delay			3.8									
Intersection Capacity Utiliza	tion		23.7%	IC	U Level o	of Service			А			
Analysis Period (min)			15									

Waterfront Trails TIS 5:00 pm 06-13-2018 PM Base Year (2018)

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 PM Base Year (2018)

Lane Group EBL EBT WBT WBR SBL SBR Lane Configurations 1	1	1	•	-	-+	≯	
Lane Configurations Image: Configuration of the second of th	SBR	SBL	WBR	WBT	EBT	EBL	Lane Group
Traffic Volume (vph) 90 681 260 47 45 39 Future Volume (vph) 90 681 260 47 45 39 Ideal Flow (vphp) 1900 1900 1900 1900 1900 1900 Storage Length (m) 120.0 0.0 40.0 0.0 Storage Length (m) 7.5 7.5 Lane Util. Factor 1.00 1.00 1.00 1.00 Fit 0.979 0.850 Fit Protected 0.950 0.950 Satd. Flow (pern) 1805 1881 1751 0 1770 1615 Link Speed (k/h) 80 80 50 50 50 50 Link Speed (k/h) 80 80 50 50 51 51 41.8 51 51 51 51 51 51 51 56 51.2 13.3 51 42 53 51 49 42 53 51 49 42 53 51 49 42 53 51 49 42		5		1.	•	5	
Future Volume (vph) 90 681 260 47 45 39 Ideal Flow (vphp) 1900 1900 1900 1900 1900 1900 Storage Length (m) 120. 0.0 40.0 0.0 Storage Length (m) 7.5 7.5 1 Taper Length (m) 7.5 7.5 1.00 Fit Fractor 1.00 1.00 1.00 1.00 Fit Protected 0.950 0.950 0.950 Stadt. Flow (port) 1805 1881 1751 0 1770 Stadt. Flow (perm) 1805 1881 1751 0 1770 1615 Link Speed (kh) 80 80 50 50 50 50 Link Speed (kh) 80 80 50 50 50 50 Link Distance (m) 123.4 826.3 184.8 50 50 Link Distance (m) 5.6 37.2 13.3 50 50 Heavy Veichelse (%			47				
Ideal Flow (vphpl) 1900 1900 1900 1900 1900 1900 Storage Length (m) 120.0 0.0 40.0 0.0 Storage Length (m) 120.0 0.0 40.0 0.0 Storage Lanes 1 0 1 1 Taper Length (m) 7.5 7.5 Lane Util. Factor 1.00 1.00 1.00 1.00 Fit 0.979 0.850 Statd. Flow (prot) 1805 1881 1751 0 1770 Fit Protected 0.950 0.950 0.950 0.950 Satd. Flow (perm) 1805 1881 1751 0 1770 1615 Link Speed (kh) 80 80 50 0.950 50 111 Link Speed (kh) 80 80 50 111 113.3 111 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 142 Heavy Vehicles (%) 9% 740 28	39	45	47	260	681	90	
Storage Length (m) 120.0 0.0 40.0 0.0 Storage Lanes 1 0 1 1 Taper Length (m) 7.5 7.5 - - Lane Util, Factor 1.00 1.00 1.00 1.00 1.00 Fit 0.979 0.850 - - Storage Kork (prot) 1805 1881 1751 0 1770 Statk Flow (perm) 1805 1881 1751 0 1770 1615 Statk Speed (k/h) 80 80 50 - - - Link Speed (k/h) 80 80 50 -	1900	1900	1900	1900	1900	1900	
Storage Lanes 1 0 1 1 Taper Length (m) 7.5 7.5 7.5 7.5 Lane Util, Factor 1.00 1.00 1.00 1.00 1.00 Fit 0.979 0.850 0.950 0.950 Satd. Flow (port) 1805 1881 1751 0 1770 1615 Satd. Flow (perm) 1805 1881 1751 0 1770 1615 Link Speed (k/h) 80 80 50 50 50 50 Peak Hour Factor 0.92	0.0	40.0	0.0			120.0	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1	1	0			1	
Frit 0.979 0.850 Fil Protected 0.950 0.950 Satd. Flow (prot) 1805 1881 1751 0 1770 1615 Fil Permitted 0.950 0.950 0.950 0.950 0.950 Satd. Flow (perm) 1805 1881 1751 0 1770 1615 Link Speed (k/h) 80 80 50 50 50 50 Parkel four Factor 0.92		7.5				7.5	
Fit Protected 0.950 0.950 Satd. Flow (prot) 1805 1881 1751 0 1770 1615 Fit Permitted 0.950 0.950 0.950 0.950 Satd. Flow (perm) 1805 1881 1751 0 1770 1615 Link Speed (k/h) 80 80 50 50 512 13.3 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 0.92 Peak Hour Factor 0.98 740 283 51 49 42 Shared Lane Traffic (%) Lane Group Flow (vph) 98 740 334 0 49 42 Enter Blocked Intersection No No No No No No Link Offset(m) 3.6 3.6 3.6 3.6 3.6 3.6	1.00	1.00	1.00	1.00	1.00	1.00	
Satd. Flow (prot) 1805 1881 1751 0 1770 1615 FI Permitted 0.950	0.850			0.979			Frt
Fit Permitted 0.950 0.950 Satd. Flow (perm) 1805 1881 1751 0 1770 1615 Link Speed (k/h) 80 80 50 1116		0.950				0.950	FIt Protected
Fit Permitted 0.950 0.950 Satd. Flow (perm) 1805 1881 1751 0 1770 1615 Link Speed (k/h) 80 80 50 1116	1615	1770	0	1751	1881	1805	Satd. Flow (prot)
Link Speed (k/h) 80 80 50 Link Distance (m) 123.4 826.3 184.8 Travel Time (s) 5.6 37.2 13.3 Peak Hour Factor 0.92 0.92 0.92 0.92 Peak Hour Factor 0.92 0.92 0.92 0.92 Link Diffic (%) 0% 1% 7% 2% 2% 0% Adj. Flow (vph) 98 740 283 51 49 42 Shared Lane Traffic (%) Lane Group Flow (vph) 98 740 334 0 49 42 Enter Blocked Intersection No No No No No No Lane Alignment Left Left Right Left Right Link Offset(m) 3.6 3.6 3.6 3.6 3.6 Crosswalk Width(rm) 4.8 4.8 4.8 4.8		0.950				0.950	Flt Permitted
Link Distance (m) 123.4 826.3 184.8 Travel Time (s) 5.6 37.2 13.3 Peak Hour Factor 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 0% 1% 7% 2% 0% Adj. Flow (vph) 98 740 283 51 49 42 Shared Lane Traffic (%) Eather Blocked Intersection No No No No No Lane Group Flow (vph) 98 740 334 0 49 42 Enter Blocked Intersection No No No No No No Lane Alignment Left Left Left Right Left Right Median Width(m) 3.6 3.6 3.6 3.6 3.6 3.6 Crosswalk Width(m) 4.8 4.8 4.8 4.8 4.8	1615	1770	0	1751	1881	1805	Satd. Flow (perm)
Travel Time (s) 5.6 37.2 13.3 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 0% 1% 7% 2% 2% 0% Adj. Flow (vph) 98 740 283 51 49 42 Shared Lane Traffic (%) 98 740 334 0 49 42 Lane Group Flow (vph) 98 740 334 0 49 42 Enter Blocked Intersection No No No No No No Lane Alignment Left Left Left Right Left Right Icink Offset(m) 0.0 0.0 0.0 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 4.8 4.8		50		80	80		Link Speed (k/h)
Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 0% 1% 7% 2% 2% 0% Adj. Flow (vph) 98 740 283 51 49 42 Shared Lane Traffic (%) Jane Group Flow (vph) 98 740 334 0 49 42 Enter Blocked Intersection No No No No No No Lane Alignment Left Left Right Left Right Kight Median Width(m) 3.6 3.6 3.6 3.6 1.6 Crosswalk Width(m) 4.8 4.8		184.8		826.3	123.4		Link Distance (m)
Heavy Vehicles (%) 0% 1% 7% 2% 2% 0% Adj. Flow (vph) 98 740 283 51 49 42 Shared Lane Traffic (%) 28 51 49 42 Lane Group Flow (vph) 98 740 334 0 49 42 Enter Blocked Intersection No No No No No No No Lane Alignment Left Left Left Right Left Right Median Width(m) 3.6 3.6 3.6 3.6 3.6 Crosswalk Width(m) 4.8 4.8 4.8		13.3		37.2	5.6		Travel Time (s)
Adj. Flow (vph) 98 740 283 51 49 42 Shared Lane Traffic (%)	0.92	0.92	0.92	0.92	0.92	0.92	Peak Hour Factor
Shared Lane Traffic (%) Visit Constraints Visit Constand to not	0%	2%	2%	7%	1%	0%	Heavy Vehicles (%)
Lane Group Flow (vph) 98 740 334 0 49 42 Enter Blocked Intersection No No No No No No No Lane Alignment Left Left Right Left Right Bight Median Width(m) 3.6 3.6 3.6 3.6 Inthe Offset(m) O.0 O.0 O.0 Crosswalk Width(m) 4.8 4.8 4.8 A.8 A.8 A.8	42	49	51	283	740	98	Adj. Flow (vph)
Enter Blocked Intersection No No No No No Lane Alignment Left Left Left Right Left Right Median Width(m) 3.6 3.6 3.6 Intersection No No No Link Offset(m) 0.0 0.0 0.0 Octoor Crosswalk Width(m) 4.8 4.8 4.8 4.8							Shared Lane Traffic (%)
Lane Alignment Left Left Right Left Right Median Width(m) 3.6 3.6 3.6 3.6 1.000000000000000000000000000000000000	42	49	0	334	740	98	Lane Group Flow (vph)
Median Width(m) 3.6 3.6 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8	No	No	No	No	No	No	Enter Blocked Intersection
Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8	Right		Right			Left	
Crosswalk Width(m) 4.8 4.8 4.8		3.6		3.6			
Two way Left Turn Lane		4.8		4.8	4.8		
							Two way Left Turn Lane
Headway Factor 1.00 1.00 1.00 1.00 1.00 1.00				1.00	1.00		
Turning Speed (k/h) 25 15 25 15	15		15			25	
Sign Control Free Free Stop		Stop		Free	Free		Sign Control
Intersection Summary							
Area Type: Other						Other	
Control Type: Unsignalized Intersection Capacity Utilization 45.8% ICU Level of Service A							

2: North Service Ro	٨		+	۰.	5	1	
1			WDT	-	C DI		
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	<u></u>	†	4	47	<u> </u>	1	
Traffic Volume (veh/h)	90	681	260	47	45	39	
Future Volume (Veh/h)	90	681	260	47	45	39	
Sign Control		Free	Free		Stop		
Grade	0.00	0%	0%	0.00	0%	0.00	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph) Pedestrians	98	740	283	51	49	42	
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None	None				
Median storage veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	334				1244	308	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	334				1244	308	
tC, single (s)	4.1				6.4	6.2	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	92				72	94	
cM capacity (veh/h)	1237				177	736	
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2		
Volume Total	98	740	334	49	42		
Volume Left	98	0	0	49	0		
Volume Right	0	0	51	0	42		
cSH	1237	1700	1700	177	736		
Volume to Capacity	0.08	0.44	0.20	0.28	0.06		
Queue Length 95th (m)	2.1	0.0	0.0	8.6	1.4		
Control Delay (s)	8.2	0.0	0.0	33.0	10.2		
Lane LOS	A			D	В		
Approach Delay (s) Approach LOS	1.0		0.0	22.4 C			
Intersection Summary							
Average Delay			2.3				
Intersection Capacity Utiliza	tion		45.8%	IC	U Level o	f Service	А

Waterfront Trails TIS 5:00 pm 06-13-2018 PM Base Year (2018)

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 PM Base Year (2018)

ane Group	≯		-	•	· 🖌	1	
	EBL	EBT	WBT	WBR	SBL	SBR	
ane Configurations	5	•	1	WBIT	500	7	
Traffic Volume (vph)	60	666	145	28	48	162	
Future Volume (vph)	60	666	145	28	48	162	
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	85.0			0.0	0.0	25.0	
Storage Lanes	1			0	1	1	
Taper Length (m)	7.5				7.5		
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt			0.978			0.850	
It Protected	0.950				0.950		
Satd. Flow (prot)	1805	1863	1798	0	1805	1583	
It Permitted	0.950				0.950		
Satd. Flow (perm)	1805	1863	1798	0	1805	1583	
_ink Speed (k/h)		80	80		50		
ink Distance (m)		826.3	260.0		127.1		
Travel Time (s)		37.2	11.7		9.2		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	0%	2%	4%	0%	0%	2%	
Adj. Flow (vph)	65	724	158	30	52	176	
Shared Lane Traffic (%)							
ane Group Flow (vph)	65	724	188	0	52	176	
Enter Blocked Intersection	No	No	No	No	No	No	
ane Alignment	Left	Left	Left	Right	Left	Right	
Vedian Width(m)		3.6	3.6	Ŭ	3.6	Ŭ	
_ink Offset(m)		0.0	0.0		0.0		
Crosswalk Width(m)		4.8	4.8		4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Furning Speed (k/h)	25			15	25	15	
Sign Control		Free	Free		Stop		
ntersection Summary							
	Ither						
Control Type: Unsignalized							

3: North Service R	٦		+	•	1	1	
		-	-	`	*		
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	<u></u>	↑	A		្តិ	1	
Traffic Volume (veh/h)	60	666	145	28	48	162	
Future Volume (Veh/h)	60	666	145	28	48	162	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	65	724	158	30	52	176	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)						3	
Median type		None	None				
Median storage veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	188				1027	173	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	188				1027	173	
tC, single (s)	4.1				6.4	6.2	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	95				79	80	
cM capacity (veh/h)	1398				250	871	
1 31 1		ED 0	WD 1	CD 1	200	0/1	
Direction, Lane #	EB 1	EB 2	WB 1	SB 1			
Volume Total	65	724	188	228			
Volume Left	65	0	0	52			
Volume Right	0	0	30	176			
cSH	1398	1700	1700	1095			
Volume to Capacity	0.05	0.43	0.11	0.21			
Queue Length 95th (m)	1.2	0.0	0.0	6.3			
Control Delay (s)	7.7	0.0	0.0	13.1			
Lane LOS	А			В			
Approach Delay (s)	0.6		0.0	13.1			
Approach LOS				В			
Intersection Summary							
Average Delay			2.9				
Intersection Capacity Utiliza	ation		45.1%	IC	U Level o	of Service	A
Analysis Period (min)			15				

Waterfront Trails TIS 5:00 pm 06-13-2018 PM Base Year (2018)

Synchro 9 Report Page 5 Waterfront Trails TIS 5:00 pm 06-13-2018 PM Base Year (2018)

Appendix D

2021 Background Traffic Operations Reports

Appendix "C" to Report PED19115 Page 118 of 314

Appendix "C" to Report PED19115 Page 119 of 314

	ances		-									
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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4			4	
Traffic Volume (vph)	12	5	16	67	16	0	4	17	30	0	57	7
Future Volume (vph)	12	5	16	67	16	0	4	17	30	0	57	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.934						0.919			0.985	
Flt Protected		0.982			0.961			0.996				
Satd. Flow (prot)	0	1680	0	0	1826	0	0	1633	0	0	1872	0
FIt Permitted		0.982			0.961			0.996				
Satd. Flow (perm)	0	1680	0	0	1826	0	0	1633	0	0	1872	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.1			52.2			184.8			166.7	
Travel Time (s)		11.9			3.8			13.3			12.0	
Confl. Peds. (#/hr)	1					1	2		3	3		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	0%	0%	0%	0%	0%	0%	7%	7%	0%	0%	0%
Adj. Flow (vph)	13	5	17	73	17	0	4	18	33	0	62	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	35	0	0	90	0	0	55	0	0	70	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0	5		0.0	5		3.6	5		3.6	5
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
)ther											
Control Type: Unsignalized												
Intersection Capacity Utilizati	on 23.1%			IC	U Level o	of Service	A					
Analysis Period (min) 15												

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	٦	→	\mathbf{r}	1	-		1	1		-	ŧ	*
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (veh/h)	12	5	16	67	16	0	4	17	30	0	57	
Future Volume (Veh/h)	12	5	16	67	16	0	4	17	30	0	57	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	13	5	17	73	17	0	4	18	33	0	62	
Pedestrians		2			3						1	
Lane Width (m)		3.6			3.6						3.6	
Walking Speed (m/s)		1.2			1.2						1.2	
Percent Blockage		0			0						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	120	130	68	131	118	38	72			54		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	120	130	68	131	118	38	72			54		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	99	98	91	98	100	100			100		
cM capacity (veh/h)	817	759	999	821	771	1036	1538			1560		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	35	90	55	70								
Volume Left	13	73	4	0								
Volume Right	17	0	33	8								
cSH	886	811	1538	1560								
Volume to Capacity	0.04	0.11	0.00	0.00								
Queue Length 95th (m)	1.0	3.0	0.1	0.0								
Control Delay (s)	9.2	10.0	0.6	0.0								
Lane LOS	A	A	A									
Approach Delay (s)	9.2	10.0	0.6	0.0								
Approach LOS	А	А										
Intersection Summary												
Average Delay			5.0									
Intersection Capacity Utilizat Analysis Period (min)	lion		23.1%	IC	U Level o	of Service			A			

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2021 Background

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2021 Background

	≯	-	-	•	1	1	
ane Group	EBL	EBT	WBT	WBR	SBL	SBR	
ane Configurations	5	^	î,		٦	1	
Fraffic Volume (vph)	17	145	838	34	64	76	
uture Volume (vph)	17	145	838	34	64	76	
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	120.0			0.0	40.0	0.0	
Storage Lanes	1_0.0			0	10.0	1	
Taper Length (m)	7.5			Ū	7.5		
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt			0.995			0.850	
Flt Protected	0.950		0.770		0.950	0.000	
Satd. Flow (prot)	1687	1696	1808	0	1770	1615	
Flt Permitted	0.950	1070	1000	0	0.950	1015	
Satd. Flow (perm)	1687	1696	1808	0	1770	1615	
_ink Speed (k/h)	1007	80	80	0	50	1015	
Link Distance (m)		123.4	826.3		184.8		
Fravel Time (s)			37.2		104.0		
	1	5.6	37.2	1	13.3		
Confl. Peds. (#/hr)	-	0.00	0.00		0.00	0.92	
Peak Hour Factor	0.92 7%	0.92	0.92 4%	0.92	0.92 2%	0.92	
Heavy Vehicles (%)		12%		19%			
Adj. Flow (vph)	18	158	911	37	70	83	
Shared Lane Traffic (%)		450			70		
ane Group Flow (vph)	18	158	948	0	70	83	
Enter Blocked Intersection	No	No	No	No	No	No	
ane Alignment	Left	Left	Left	Right	Left	Right	
Vedian Width(m)		3.6	3.6		3.6		
_ink Offset(m)		0.0	0.0		0.0		
Crosswalk Width(m)		4.8	4.8		4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Furning Speed (k/h)	25			15	25	15	
Sign Control		Free	Free		Stop		
ntersection Summary							
	Other						
Control Type: Unsignalized							
ntersection Capacity Utilizati	ion 57.5%			IC	U Level	of Service B	

2: North Service Ro							
	≯	-	+	•	1	-	
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	ľ	•	4Î		ľ	1	
Traffic Volume (veh/h)	17	145	838	34	64	76	
Future Volume (Veh/h)	17	145	838	34	64	76	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	18	158	911	37	70	83	
Pedestrians					1		
Lane Width (m)					3.6		
Walking Speed (m/s)					1.2		
Percent Blockage					0		
Right turn flare (veh)							
Median type		None	None				
Median storage veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	949				1124	930	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	949				1124	930	
tC, single (s)	4.2				6.4	6.2	
tC, 2 stage (s)							
tF (s)	2.3				3.5	3.3	
p0 queue free %	97				68	75	
cM capacity (veh/h)	703				221	326	
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2		
Volume Total	18	158	948	70	83		
Volume Left	18	0	0	70	0		
Volume Right	0	0	37	0	83		
cSH	703	1700	1700	221	326		
Volume to Capacity	0.03	0.09	0.56	0.32	0.25		
Queue Length 95th (m)	0.6	0.0	0.0	10.4	7.9		
Control Delay (s)	10.3	0.0	0.0	28.7	19.8		
Lane LOS	В			D	С		
Approach Delay (s)	1.0		0.0	23.8			
Approach LOS				С			
Intersection Summary							
Average Delay			3.0				
Intersection Capacity Utiliza	ition		57.5%	IC	U Level o	of Service	В
Analysis Period (min)			15				

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2021 Background

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2021 Background

HCM Unsignalized Intersection Capacity Analysis

North Service Ro			\uau				06-14-2018	3: North Service R		mich r	loau			
	٦	-	+	•	1	1			≯	-	-	•	1	
ne Group	EBL	EBT	WBT	WBR	SBL	SBR		Lane Group	EBL	EBT	WBT	WBR	SBL	S
ne Configurations	5	*	ĥ		5	1		Permitted Phases	2					
fic Volume (vph)	123	86	408	88	71	464		Detector Phase	2	2	6		4	
ure Volume (vph)	123	86	408	88	71	464		Switch Phase	2	-	0			
al Flow (vphpl)	1900	1900	1900	1900	1900	1900		Minimum Initial (s)	20.0	20.0	20.0		10.0	10
prage Length (m)	85.0	1700	1700	0.0	50.0	0.0		Minimum Split (s)	26.0	26.0	26.0		24.0	24
prage Lanes	05.0			0.0	30.0	0.0		Total Split (s)	32.0	32.0	32.0		24.0	24
per Length (m)	7.5			0	7.5	1		Total Split (%)		53.3%	53.3%		46.7%	46.7
ne Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00							40.7%	
	1.00	1.00	1.00	1.00	1.00			Maximum Green (s)	26.0	26.0	26.0			22
Destanted	0.050		0.976		0.050	0.850		Yellow Time (s)	4.0	4.0	4.0		4.0	4
Protected	0.950	1010	1000		0.950	4500		All-Red Time (s)	2.0	2.0	2.0		2.0	2
td. Flow (prot)	1719	1810	1802	0		1583		Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0
Permitted	0.381			_	0.950			Total Lost Time (s)	6.0	6.0	6.0		6.0	6
td. Flow (perm)	689	1810	1802	0	1504	1583		Lead/Lag						
ght Turn on Red				Yes		Yes		Lead-Lag Optimize?						_
td. Flow (RTOR)			23			289		Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.
k Speed (k/h)		80	80		50			Recall Mode		C-Max	C-Max		Min	Mi
ik Distance (m)		826.3	260.0		127.1			Walk Time (s)	7.0	7.0	7.0		7.0	7.
avel Time (s)		37.2	11.7		9.2			Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.
ak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		Pedestrian Calls (#/hr)	0	0	0		0	
avy Vehicles (%)	5%	5%	2%	7%	20%	2%		Act Effct Green (s)	32.5	32.5	32.5		15.5	15.
j. Flow (vph)	134	93	443	96	77	504		Actuated g/C Ratio	0.54	0.54	0.54		0.26	0.2
ared Lane Traffic (%)								v/c Ratio	0.36	0.09	0.55		0.20	0.8
ne Group Flow (vph)	134	93	539	0	77	504		Control Delay	13.6	8.8	12.6		16.6	19.
ter Blocked Intersection	No	No	No	No	No	No		Queue Delay	0.0	0.0	0.0		0.0	0.
ne Alignment	Left	Left	Left	Right	Left	Right		Total Delay	13.6	8.8	12.6		16.6	19.
edian Width(m)		3.6	3.6	Ŭ	3.6	Ů		LOS	В	А	В		В	
ik Offset(m)		0.0	0.0		0.0			Approach Delay		11.6	12.6		18.8	
osswalk Width(m)		4.8	4.8		4.8			Approach LOS		В	В		В	
o way Left Turn Lane											-			
adway Factor	1.00	1.00	1.00	1.00	1.00	1.00		Intersection Summary						
ming Speed (k/h)	25			15	25	15		Area Type:	Other					
mber of Detectors	1	2	2		1	1		Cycle Length: 60						
tector Template	Left	Thru	Thru		Left	Right		Actuated Cycle Length: 60						
ading Detector (m)	2.0	10.0	10.0		2.0	2.0		Offset: 0 (0%), Referenced	to phase 2:	EBTL an	d 6:WBT,	Start of G	Green	
illing Detector (m)	0.0	0.0	0.0		0.0	0.0		Natural Cycle: 60						
tector 1 Position(m)	0.0	0.0	0.0		0.0	0.0		Control Type: Actuated-Co	ordinated					
tector 1 Size(m)	2.0	0.6	0.6		2.0	2.0		Maximum v/c Ratio: 0.81						
tector 1 Type		CI+Ex			CI+Ex			Intersection Signal Delay: 1					tersectior	
tector 1 Channel	01. 24	511.24	0 24		011.24	5		Intersection Capacity Utiliza	ation 66.8%			IC	U Level o	of Serv
ector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0		Analysis Period (min) 15						
ector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0								
ector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0		Splits and Phases: 3: No	orth Service	Road & M	Aillen Roa	ıd		
tector 2 Position(m)	0.0	9.4	9.4		0.0	0.0		A						\sim
tector 2 Size(m)		9.4	9.4					🗝 Ø2 (R)						ſ∕•ø
tector 2 Size(m)		U.6 CI+Ex	U.6 CI+Ex					32 s					28	Bs
tector 2 Type		UI+EX	UI+EX					Ø6 (R)					1	
		0.0	0.0					(X) OU						
ector 2 Extend (s)	P	0.0	0.0			D		028						
rn Type	Perm	NA	NA		Prot	Perm								
tected Phases		2	6		4									

Synchro 9 Report Page 5

Synchro 9 Report Page 6

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Lane Group	EBL	EBT	WBT	SBL	SBR	
Lane Group Flow (vph)	134	93	539	77	504	
v/c Ratio	0.36	0.09	0.55	0.20	0.81	
Control Delay	13.6	8.8	12.6	16.6	19.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	13.6	8.8	12.6	16.6	19.1	
Queue Length 50th (m)	7.9	4.6	34.3	7.0	21.6	
Queue Length 95th (m)	25.0	13.5	77.6	13.6	47.6	
Internal Link Dist (m)		802.3	236.0	103.1		
Turn Bay Length (m)	85.0			50.0		
Base Capacity (vph)	373	981	987	551	763	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.36	0.09	0.55	0.14	0.66	

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Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	۲.	•	ĥ		۲.	1		
Traffic Volume (vph)	123	86	408	88	71	464		
Future Volume (vph)	123	86	408	88	71	464		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0		
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00		
Frt	1.00	1.00	0.98		1.00	0.85		
Flt Protected	0.95	1.00	1.00		0.95	1.00		
Satd. Flow (prot)	1719	1810	1802		1504	1583		
Flt Permitted	0.38	1.00	1.00		0.95	1.00		
Satd. Flow (perm)	690	1810	1802		1504	1583		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	 	
Adj. Flow (vph)	134	93	443	96	77	504		
RTOR Reduction (vph)	0	0	11	0	0	214		
Lane Group Flow (vph)	134	93	528	0	77	290		
Heavy Vehicles (%)	5%	5%	2%	7%	20%	2%		
Turn Type	Perm	NA	NA		Prot	Perm		
Protected Phases		2	6		4			
Permitted Phases	2					4		
Actuated Green, G (s)	32.5	32.5	32.5		15.5	15.5		
Effective Green, g (s)	32.5	32.5	32.5		15.5	15.5		
Actuated g/C Ratio	0.54	0.54	0.54		0.26	0.26		
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0		
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)	373	980	976		388	408		
v/s Ratio Prot		0.05	c0.29		0.05			
v/s Ratio Perm	0.19					c0.18		
v/c Ratio	0.36	0.09	0.54		0.20	0.71		
Uniform Delay, d1	7.8	6.6	8.9		17.4	20.2		
Progression Factor	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2	2.7	0.2	2.2		0.3	5.6		
Delay (s)	10.5	6.8	11.1		17.6	25.8		
Level of Service	В	А	В		В	С		
Approach Delay (s)		9.0	11.1		24.7			
Approach LOS		A	В		С			
Intersection Summary							 	
HCM 2000 Control Delay			16.6		CM 2000	Level of Service	 В	
HCM 2000 Volume to Capa	acity ratio		0.60	11	5101 2000		D	
Actuated Cycle Length (s)	iony ratio		60.0	S	um of losi	time (s)	12.0	
Intersection Capacity Utiliza	ation		66.8%			of Service	12.0 C	
Analysis Period (min)	1001		15	IC.	O LEVEL	JI JEI VILE	C	
c Critical Lane Group			13					
e onacar carle ordup								

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2021 Background

Synchro 9 Report Page 7 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2021 Background

HCM Signalized Intersection Capacity Analysis 3: North Service Road & Millen Road

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Synchro 9 Report Page 8

Appendix "C" to Report PED19115 Page 123 of 314

1: Green Road & Fra		Avenu	e								00-1	4-2018
	۶	-	\mathbf{r}	1	-	*	1	1	1	1	Ŧ	~
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			¢			\$	
Traffic Volume (vph)	15	14	18	39	3	1	16	56	73	3	32	4
Future Volume (vph)	15	14	18	39	3	1	16	56	73	3	32	4
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.947			0.997			0.932			0.987	
FIt Protected		0.985			0.956			0.995			0.996	
Satd. Flow (prot)	0	1772	0	0	1763	0	0	1762	0	0	1868	0
FIt Permitted		0.985			0.956			0.995			0.996	
Satd. Flow (perm)	0	1772	0	0	1763	0	0	1762	0	0	1868	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.1			52.2			184.8			166.7	
Travel Time (s)		11.9			3.8			13.3			12.0	
Confl. Peds. (#/hr)	1		1	1		1	2		1	1		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	16	15	20	42	3	1	17	61	79	3	35	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	51	0	0	46	0	0	157	0	0	42	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Vedian Width(m)		0.0	J .		0.0	5		3.6	J .		3.6	5
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
	ther											
Control Type: Unsignalized												

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SE
Lane Configurations		¢			\$			\$			¢	
Traffic Volume (veh/h)	15	14	18	39	3	1	16	56	73	3	32	
Future Volume (Veh/h)	15	14	18	39	3	1	16	56	73	3	32	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.
Hourly flow rate (vph)	16	15	20	42	3	1	17	61	79	3	35	
Pedestrians		2			1			1			1	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	183	220	40	207	182	102	41			141		
vC1, stage 1 conf vol	100	220	10	207	102	102						
vC2, stage 2 conf vol												
vCu, unblocked vol	183	220	40	207	182	102	41			141		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)		0.0	0.2		0.0	0.2						
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	98	98	94	100	100	99			100		
cM capacity (veh/h)	768	671	1034	712	704	956	1579			1453		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	51	46	157	42								
Volume Left	16	42	17	3								
Volume Right	20	1	79	4								
cSH	816	715	1579	1453								
Volume to Capacity	0.06	0.06	0.01	0.00								
Queue Length 95th (m)	1.6	1.6	0.3	0.0								
Control Delay (s)	9.7	10.4	0.9	0.5								
Lane LOS	A	В	A	A								
Approach Delay (s)	9.7	10.4	0.9	0.5								
Approach LOS	A	В										
Intersection Summary												
Average Delay			3.8									
Intersection Capacity Utiliza	ition		24.8%	IC	U Level o	of Service			А			
Analysis Period (min)			15									

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Background

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Background

	٠	_	-	•	\	1	
		EDT	WDT	-			
ane Group	EBL	EBT	WBT	WBR	SBL	SBR	
ane Configurations	<u></u>	1	1	50	`	1	
Traffic Volume (vph)	96	897	448	50	48	41	
uture Volume (vph)	96	897	448	50	48	41	
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	120.0			0.0	40.0	0.0	
Storage Lanes	1			0	1	1	
Taper Length (m)	7.5				7.5		
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt			0.987			0.850	
It Protected	0.950				0.950		
Satd. Flow (prot)	1805	1881	1761	0	1770	1615	
Fit Permitted	0.950				0.950		
Satd. Flow (perm)	1805	1881	1761	0	1770	1615	
_ink Speed (k/h)		80	80		50		
ink Distance (m)		123.4	826.3		184.8		
Fravel Time (s)		5.6	37.2		13.3		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	0%	1%	7%	2%	2%	0%	
Adj. Flow (vph)	104	975	487	54	52	45	
Shared Lane Traffic (%)							
ane Group Flow (vph)	104	975	541	0	52	45	
Enter Blocked Intersection	No	No	No	No	No	No	
ane Alignment	Left	Left	Left	Right	Left	Right	
Vedian Width(m)		3.6	3.6	5.	3.6	3	
_ink Offset(m)		0.0	0.0		0.0		
Crosswalk Width(m)		4.8	4.8		4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Furning Speed (k/h)	25			15	25	15	
Sign Control		Free	Free		Stop		
ntersection Summary							
	Other						
Control Type: Unsignalized							

	≯	1	t	*	6	1		
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	<u> </u>		1	WDI	<u>30L</u>	<u> </u>		
Traffic Volume (veh/h)	96	T 897	448	50	48	41		
Future Volume (Veh/h)	90 96	897	440	50	40	41		
Sign Control	90	Free	Free	50	48 Stop	41		
Grade		0%	0%		0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly flow rate (vph)	104	975	487	54	52	45		
Pedestrians	104	975	407	54	52	40		
Lane Width (m)								
Walking Speed (m/s)								
Percent Blockage								
Right turn flare (veh)		NI						
Median type		None	None					
Median storage veh)								
Upstream signal (m)								
pX, platoon unblocked								
vC, conflicting volume	541				1697	514		
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol	541				1697	514		
tC, single (s)	4.1				6.4	6.2		
tC, 2 stage (s)								
tF (s)	2.2				3.5	3.3		
p0 queue free %	90				43	92		
cM capacity (veh/h)	1038				91	564		
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2			
Volume Total	104	975	541	52	45			
Volume Left	104	0	0	52	0			
Volume Right	0	0	54	0	45			
cSH	1038	1700	1700	91	564			
Volume to Capacity	0.10	0.57	0.32	0.57	0.08			
Queue Length 95th (m)	2.7	0.0	0.0	20.7	2.1			
Control Delay (s)	8.9	0.0	0.0	86.9	11.9			
Lane LOS	А			F	В			
Approach Delay (s)	0.9		0.0	52.1				
Approach LOS				F				
Intersection Summary								
Average Delay			3.5					
Intersection Capacity Utiliza	ition		57.2%	IC	U Level o	of Service	В	

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Background

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Background

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ane Group	EBL	EBT	WBT	WBR	SBL	SBR	Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
ane Configurations	5	•	4Î		٦	1	Permitted Phases	2					4	
raffic Volume (vph)	232	713	178	81	90	320	Detector Phase	2	2	6		4	4	
uture Volume (vph)	232	713	178	81	90	320	Switch Phase							
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	Minimum Initial (s)	20.0	20.0	20.0		10.0	10.0	
Storage Length (m)	85.0			0.0	50.0	0.0	Minimum Split (s)	26.0	26.0	26.0		24.0	24.0	
Storage Lanes	1			0	1	1	Total Split (s)	46.0	46.0	46.0		24.0	24.0	
aper Length (m)	7.5				7.5		Total Split (%)	65.7%	65.7%	65.7%		34.3%	34.3%	
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	Maximum Green (s)	40.0	40.0			18.0	18.0	
rt			0.958			0.850	Yellow Time (s)	4.0	4.0			4.0	4.0	
It Protected	0.950				0.950		All-Red Time (s)	2.0	2.0			2.0	2.0	
Satd. Flow (prot)	1805	1863	1772	0		1583	Lost Time Adjust (s)	0.0	0.0			0.0	0.0	
It Permitted	0.587				0.950		Total Lost Time (s)	6.0	6.0			6.0	6.0	
Satd. Flow (perm)	1115	1863	1772	0		1583	Lead/Lag	2.0	2.0	2.2		2.0		
Right Turn on Red				Yes		Yes	Lead-Lag Optimize?							
Satd. Flow (RTOR)			55			348	Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	
ink Speed (k/h)		80	80		50		Recall Mode	C-Max	C-Max			Max	Max	
ink Distance (m)		826.3	260.0		127.1		Walk Time (s)	7.0	7.0			7.0	7.0	
ravel Time (s)		37.2	11.7		9.2		Flash Dont Walk (s)	11.0	11.0			11.0	11.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	Pedestrian Calls (#/hr)	0	0	0		0	0	
leavy Vehicles (%)	0%	2%	4%	0%	0%	2%	Act Effct Green (s)	40.0				18.0	18.0	
dj. Flow (vph)	252	775	193	88	98	348	Actuated g/C Ratio	0.57	0.57			0.26	0.26	
Shared Lane Traffic (%)	202		170	00	70	010	v/c Ratio	0.40	0.73			0.21	0.52	
ane Group Flow (vph)	252	775	281	0	98	348	Control Delay	10.6	16.1	6.8		21.9	6.0	
Inter Blocked Intersection	No	No	No	No	No	No	Queue Delay	0.0	0.0			0.0	0.0	
ane Alignment	Left	Left	Left	Right	Left	Right	Total Delay	10.6	16.1			21.9	6.0	
Aledian Width(m)	LOIT	3.6	3.6	Ngn	3.6	Night	LOS	10.0 B	B			C	A	
ink Offset(m)		0.0	0.0		0.0		Approach Delay	D	14.8			9.5	Л	
Crosswalk Width(m)		4.8	4.8		4.8		Approach LOS		B			7.5 A		
wo way Left Turn Lane		4.0	4.0		4.0		Appilacii LOS		D	A		A		
leadway Factor	1.00	1.00	1.00	1.00	1.00	1.00	Intersection Summary							
urning Speed (k/h)	25	1.00	1.00	1.00	25	15	Area Type:	Other						
lumber of Detectors	25	2	2	10	25	15	Cycle Length: 70							
Detector Template	Left	∠ Thru	∠ Thru		Left	Right	Actuated Cycle Length: 7							
eading Detector (m)	2.0	10.0	10.0		2.0	2.0	Offset: 0 (0%), Reference	d to phase 2	EBTL a	nd 6:WBT,	Start of C	Green		
railing Detector (m)	2.0	0.0	0.0		2.0	0.0	Natural Cycle: 60							
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0	Control Type: Actuated-C	oordinated						
Detector 1 Size(m)	2.0	0.0	0.0		2.0	2.0	Maximum v/c Ratio: 0.73							
Detector 1 Size(m)			CI+Ex		Z.U CI+Ex	CI+Ex	Intersection Signal Delay	: 12.1			In	itersectio	n LOS: B	
Detector 1 Type Detector 1 Channel	UI+EX	CI+EX	UI+EX		UI+EX	UITEX	Intersection Capacity Util		6		IC	CU Level	of Service B	
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0	Analysis Period (min) 15							
							, , , , , , , , , , , , , , , , , , ,							
etector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0	Splits and Phases: 3: 1	Jorth Service	Road &	Millen Roa	ad			
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0	A							- A.
Detector 2 Position(m)		9.4	9.4				₽ 🚄 Ø2 (R)							≪ ► Ø4
Detector 2 Size(m)		0.6	0.6				46 s							24 s
Detector 2 Type		CI+Ex	CI+EX				← (n)							
Detector 2 Channel							Ø6 (R)							
Detector 2 Extend (s)	_	0.0	0.0		_	_	 40 S							
urn Type	Perm	NA	NA		Prot	Perm								

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Background

Synchro 9 Report Page 5 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Background

Synchro 9 Report Page 6

3: North Service Ro		ment	loau			06-14-201
	٠	-	-	1	<	
Lane Group	EBL	EBT	WBT	SBL	SBR	
Lane Group Flow (vph)	252	775	281	98	348	
v/c Ratio	0.40	0.73	0.27	0.21	0.52	
Control Delay	10.6	16.1	6.8	21.9	6.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	10.6	16.1	6.8	21.9	6.0	
Queue Length 50th (m)	17.4	70.9	13.9	10.6	0.0	
Queue Length 95th (m)	32.6	113.5	25.6	22.2	18.6	
Internal Link Dist (m)		802.3	236.0	103.1		
Turn Bay Length (m)	85.0			50.0		
Base Capacity (vph)	637	1064	1036	464	665	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.40	0.73	0.27	0.21	0.52	

	⊁	-	-	•	1	1			
Movement	EBL	EBT	WBT	WBR	SBL	SBR			
Lane Configurations	1	•	¢Î		ľ	1			
Traffic Volume (vph)	232	713	178	81	90	320			
Future Volume (vph)	232	713	178	81	90	320			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0			
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00			
Frt	1.00	1.00	0.96		1.00	0.85			
Flt Protected	0.95	1.00	1.00		0.95	1.00			
Satd. Flow (prot)	1805	1863	1771		1805	1583			
Flt Permitted	0.59	1.00	1.00		0.95	1.00			
Satd. Flow (perm)	1116	1863	1771		1805	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92			
Adj. Flow (vph)	252	775	193	88	98	348			
RTOR Reduction (vph)	0	0	24	0	0	259			
Lane Group Flow (vph)	252	775	257	0	98	89			
Heavy Vehicles (%)	0%	2%	4%	0%	0%	2%			
Turn Type	Perm	NA	NA		Prot	Perm			
Protected Phases	1 01111	2	6		4	1 0111			
Permitted Phases	2	-	Ū			4			
Actuated Green, G (s)	40.0	40.0	40.0		18.0	18.0			
Effective Green, g (s)	40.0	40.0	40.0		18.0	18.0			
Actuated g/C Ratio	0.57	0.57	0.57		0.26	0.26			
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)	637	1064	1012		464	407			
v/s Ratio Prot	037	c0.42	0.15		0.05	407			
v/s Ratio Perm	0.23	00.12	0.10		0.00	c0.06			
v/c Ratio	0.40	0.73	0.25		0.21	0.22			
Uniform Delay, d1	8.3	11.0	7.5		20.4	20.5			
Progression Factor	1.00	1.00	1.00		1.00	1.00			
Incremental Delay, d2	1.8	4.4	0.6		1.00	1.2			
Delay (s)	10.1	15.4	8.1		21.5	21.7			
Level of Service	B	13.4 B	A		21.3 C	C			
Approach Delay (s)	J	14.1	8.1		21.7	0			
Approach LOS		14.1 B	0.1 A		21.7 C				
		J	А		U				
Intersection Summary									
HCM 2000 Control Delay			15.1	Н	CM 2000	Level of Service	•	В	
HCM 2000 Volume to Capacity	ratio		0.57						
Actuated Cycle Length (s)			70.0		um of lost			12.0	
Intersection Capacity Utilization	1		56.7%	IC	U Level	of Service		В	
Analysis Period (min)			15						
c Critical Lane Group									

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Background

Synchro 9 Report Page 7

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Background

HCM Signalized Intersection Capacity Analysis 3: North Service Road & Millen Road

Synchro 9 Report Page 8

Appendix E

2021 Future Total Traffic Operations Reports

Appendix "C" to Report PED19115 Page 128 of 314

Appendix "C" to Report PED19115 Page 129 of 314

1: Green Road & Fra	ances	Avenu	с 									4-2018
	۶	-	\mathbf{i}	4	-	•	1	1	1	1	Ŧ	~
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			\$			4			4	
Traffic Volume (vph)	12	10	16	204	31	0	4	17	73	0	57	7
Future Volume (vph)	12	10	16	204	31	0	4	17	73	0	57	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.944						0.894			0.985	
Flt Protected		0.984			0.958			0.998				
Satd. Flow (prot)	0	1711	0	0	1820	0	0	1588	0	0	1872	0
Flt Permitted		0.984			0.958			0.998				
Satd. Flow (perm)	0	1711	0	0	1820	0	0	1588	0	0	1872	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.1			52.2			184.8			166.7	
Travel Time (s)		11.9			3.8			13.3			12.0	
Confl. Peds. (#/hr)	1					1	2		3	3		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	0%	0%	0%	0%	0%	0%	7%	7%	0%	0%	0%
Adj. Flow (vph)	13	11	17	222	34	0	4	18	79	0	62	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	41	0	0	256	0	0	101	0	0	70	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0	5		0.0	5		3.6	5		3.6	5
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
	ther											
Control Type: Unsignalized												
Intersection Capacity Utilization	nn 35 0%			10	CULEvelo	of Sorvico	Δ					

	≯	-	\mathbf{i}	1	+	•	•	Ť	1	1	Ļ	4
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBI
Lane Configurations	LDL	4	LDIN	WDL	4	WDR	NDL	4	NDN	JDL	4	30
Traffic Volume (veh/h)	12	10	16	204	31	0	4	17	73	0	57	
Future Volume (Veh/h)	12	10	16	204	31	0	4	17	73	0	57	
Sign Control	12	Stop	10	204	Stop	0	4	Free	75	0	Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	13	11	17	222	34	0.72	4	18	79	0.72	62	0.7
Pedestrians	10	2	.,		3	0		10		Ū	1	
Lane Width (m)		3.6			3.6						3.6	
Walking Speed (m/s)		1.2			1.2						1.2	
Percent Blockage		0			0						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	152	176	68	157	140	62	72			100		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	152	176	68	157	140	62	72			100		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	98	98	72	95	100	100			100		
cM capacity (veh/h)	764	716	999	784	749	1006	1538			1502		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	41	256	101	70								
Volume Left	13	222	4	0								
Volume Right	17	0	79	8								
cSH	830	780	1538	1502								
Volume to Capacity	0.05	0.33	0.00	0.00								
Queue Length 95th (m)	1.2	11.5	0.1	0.0								
Control Delay (s)	9.6	11.9	0.3	0.0								
Lane LOS	A	В	A									
Approach Delay (s)	9.6	11.9	0.3	0.0								
Approach LOS	A	В										
Intersection Summary												
Average Delay			7.4									
Intersection Capacity Utilization	n		35.9%	IC.	U Level of	of Sorvico			Α			

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2021 Total

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2021 Total

	٦	-	+	•	1	1	
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	٦	1	ţ,		٦	1	
Traffic Volume (vph)	43	145	838	51	102	175	
Future Volume (vph)	43	145	838	51	102	175	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	120.0			0.0	40.0	0.0	
Storage Lanes	1			0	1	1	
Taper Length (m)	7.5				7.5		
Lane Util, Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor							
Frt			0.992			0.850	
Flt Protected	0.950		5.772		0.950	5.000	
Satd. Flow (prot)	1687	1696	1798	0	1770	1615	
Elt Permitted	0.950	1070			0.950	1010	
Satd. Flow (perm)	1687	1696	1798	0	1770	1615	
Link Speed (k/h)	1007	80	80		50	1010	
Link Distance (m)		123.4	826.3		184.8		
Travel Time (s)		5.6	37.2		13.3		
Confl. Peds. (#/hr)	1	0.0	07.2	1	10.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	7%	12%	4%	19%	2%	0%	
Adj. Flow (vph)	47	158	911	55	111	190	
Shared Lane Traffic (%)	.,	100	,	00		170	
Lane Group Flow (vph)	47	158	966	0	111	190	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(m)	Loit	3.6	3.6	rught	3.6	. vigin	
Link Offset(m)		0.0	0.0		0.0		
Crosswalk Width(m)		4.8	4.8		4.8		
Two way Left Turn Lane		1.0	1.0		1.0		
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25	1.00	1.00	1.00	25	15	
Sign Control	20	Free	Free	10	Stop	10	
5		1100	1100		Jup		
Intersection Summary							
	Other						
Control Type: Unsignalized Intersection Capacity Utilizati						of Service (

2: North Service Ro	Jau & G	Teell	Vau				
	٦	-	-	•	1	∢	
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	۲	1	¢Î,		٦	1	
Traffic Volume (veh/h)	43	145	838	51	102	175	
Future Volume (Veh/h)	43	145	838	51	102	175	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	47	158	911	55	111	190	
Pedestrians					1		
Lane Width (m)					3.6		
Walking Speed (m/s)					1.2		
Percent Blockage					0		
Right turn flare (veh)							
Median type		None	None				
Median storage veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	967				1192	940	
vC1, stage 1 conf vol	707					, 10	
vC2, stage 2 conf vol							
vCu, unblocked vol	967				1192	940	
tC, single (s)	4.2				6.4	6.2	
tC, 2 stage (s)							
tF (s)	2.3				3.5	3.3	
p0 queue free %	93				42	41	
cM capacity (veh/h)	692				193	322	
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2		
Volume Total	47	158	966	111	190		
Volume Left	47	0	0	111	0		
Volume Right	0	0	55	0	190		
cSH	692	1700	1700	193	322		
Volume to Capacity	0.07	0.09	0.57	0.58	0.59		
Queue Length 95th (m)	1.7	0.09	0.0	25.0	28.4		
Control Delay (s)	10.6	0.0	0.0	46.4	31.0		
Lane LOS	10.0 B	0.0	0.0	40.4 E	51.0 D		
Approach Delay (s)	2.4		0.0	36.7	D		
Approach LOS	2.4		0.0	30.7 E			
Intersection Summary							
Average Delay			7.8				
Intersection Capacity Utiliza	tion		64.7%	IC	U Level o	of Service	С
Analysis Period (min)			15	10			-

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2021 Total

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2021 Total

HCM Unsignalized Intersection Capacity Analysis

		1illen F	louu								3: North Service Road & Millen Road		
	٦	-	+	×	1	1			لر	بر الا ا	← الا	× → ← ⊀	$\mathcal{F} \rightarrow \leftarrow \mathcal{K} \rightarrow \leftarrow$
ane Group	EBL	EBT	WBT	WBR	SBL	SBR		Lane Group	Lane Group EBL	Lane Group EBL EBT	Lane Group EBL EBT WBT	Lane Group EBL EBT WBT WBR	Lane Group EBL EBT WBT WBR SBL
ane Configurations	1	•	el el		1	1		Permitted Phases	Permitted Phases 2	Permitted Phases 2	Permitted Phases 2	Permitted Phases 2	Permitted Phases 2
iffic Volume (vph)	131	116	418	88	71	471	Detector P	hase	hase 2	hase 2 2	hase 2 2 6	hase 2 2 6	hase 2 2 6 4
iture Volume (vph)	131	116	418	88	71	471	Switch Phase						
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	Minimum Initial (s)		20.0	20.0 20.0	20.0 20.0 20.0	20.0 20.0 20.0	20.0 20.0 20.0 10.0
torage Length (m)	85.0			0.0	50.0	0.0	Minimum Split (s)		26.0	26.0 26.0	26.0 26.0 26.0	26.0 26.0 26.0	26.0 26.0 26.0 24.0
itorage Lanes	1			0	1	1	Total Split (s)		32.0	32.0 32.0	32.0 32.0 32.0	32.0 32.0 32.0	32.0 32.0 32.0 28.0
aper Length (m)	7.5				7.5		Total Split (%)		53.3%	53.3% 53.3%	53.3% 53.3% 53.3%	53.3% 53.3% 53.3%	53.3% 53.3% 53.3% 46.7%
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	Maximum Green (s)		26.0	26.0 26.0	26.0 26.0 26.0	26.0 26.0 26.0	26.0 26.0 26.0 22.0
rt			0.976			0.850	Yellow Time (s)						
It Protected	0.950				0.950		All-Red Time (s)						
atd. Flow (prot)	1719	1810	1803	0		1583	Lost Time Adjust (s)						
It Permitted	0.300				0.950		Total Lost Time (s)						
atd. Flow (perm)	543	1810	1803	0	1504	1583	Lead/Lag						
Right Turn on Red				Yes		Yes	Lead-Lag Optimize?						
atd. Flow (RTOR)			22			279	Vehicle Extension (s)		3.0	3.0 3.0	3.0 3.0 3.0	3.0 3.0 3.0	3.0 3.0 3.0 3.0
ink Speed (k/h)		80	80		50		Recall Mode						
ink Distance (m)		826.3	260.0		127.1		Walk Time (s)	Ű		7.0 7.0			
ravel Time (s)		37.2	11.7		9.2		Flash Dont Walk (s)						
eak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	Pedestrian Calls (#/hr)						
leavy Vehicles (%)	5%	5%	2%	7%	20%	2%	Act Effct Green (s)	26					
dj. Flow (vph)	142	126	454	96	77	512	Actuated g/C Ratio	0.43					
hared Lane Traffic (%)	112	120	101	70		512	v/c Ratio	0.60					
ane Group Flow (vph)	142	126	550	0	77	512	Control Delay	27.2		11.1			
inter Blocked Intersection	No	No	No	No	No	No	Queue Delay	0.0			0.0 0.0		
ane Alignment	Left	Left	Left	Right	Left	Right	Total Delay	27.2					
fedian Width(m)	Lon	3.6	3.6	rtigitt	3.6	rtigitt	LOS	27.2 C					
ink Offset(m)		0.0	0.0		0.0		Approach Delay	0		-	19.6 18.8		
Crosswalk Width(m)		4.8	4.8		4.8		Approach LOS						
wo way Left Turn Lane		1.0	1.0		1.0						B B	<u>в</u> в	5 5 5
leadway Factor	1.00	1.00	1.00	1.00	1.00	1.00	Intersection Summary						
urning Speed (k/h)	25	1.00	1.00	1.00	25	1.00	Area Type:	Other					
umber of Detectors	1	2	2	15	1	1	Cycle Length: 60						
etector Template	Left	Thru	Thru		Left	Right	Actuated Cycle Length						
eading Detector (m)	2.0	10.0	10.0		2.0	2.0		erenced to ph		ase 2:EB	ase 2:EBTL and 6:	ase 2:EBTL and 6:WBT, Star	ase 2:EBTL and 6:WBT, Start of Gree
railing Detector (m)	0.0	0.0	0.0		0.0	0.0	Natural Cycle: 60						
etector 1 Position(m)	0.0	0.0	0.0		0.0	0.0	Control Type: Actuated						
etector 1 Size(m)	2.0	0.6	0.6		2.0	2.0	Maximum v/c Ratio: 0.						
Detector 1 Type	CI+Ex		CI+Ex		CI+Ex	CI+Ex	Intersection Signal Del						Intersectio
etector 1 Channel	ONEX	OTTEX	OHEA		ONEX	OHEA	Intersection Capacity L			%	%	% 10	% ICU Level
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0	Analysis Period (min)	5					
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0							
etector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0	Splits and Phases: 3	: North Servio		e Road &	e Road & Millen Ro	e Road & Millen Road	ce Road & Millen Road
Detector 2 Position(m)	0.0	9.4	9.4		0.0	0.0							
etector 2 Size(m)		0.6	0.6				● ▲ Ø2 (R)						
Detector 2 Type		CI+Ex	CI+Ex				32 s						
etector 2 Channel		SHEA	SHEA				Ø6 (R)						I
Detector 2 Extend (s)		0.0	0.0				32 s						
urn Type	Perm	NA	NA		Prot	Perm							
Protected Phases	i cini	2	6		4	1 01111							

Synchro 9 Report Page 5

Synchro 9 Report Page 6

3: North Service Ro	Jau & IV		luau			06-14-201
	٦	-	+	1	∢	
Lane Group	EBL	EBT	WBT	SBL	SBR	
Lane Group Flow (vph)	142	126	550	77	512	
v/c Ratio	0.60	0.16	0.69	0.14	0.68	
Control Delay	27.2	11.1	18.8	13.6	12.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	27.2	11.1	18.8	13.6	12.3	
Queue Length 50th (m)	12.0	8.4	46.9	5.8	19.4	
Queue Length 95th (m)	#36.7	17.4	79.7	13.6	50.8	
Internal Link Dist (m)		802.3	236.0	103.1		
Turn Bay Length (m)	85.0			50.0		
Base Capacity (vph)	235	784	793	551	757	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.60	0.16	0.69	0.14	0.68	

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

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2021 Total

Synchro 9 Report Page 7

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2021 Total

	≯	-+	+	•	1	1		
Vovement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	٦	•	ĥ		٦	1		
Traffic Volume (vph)	131	116	418	88	71	471		
Future Volume (vph)	131	116	418	88	71	471		
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Fotal Lost time (s)	6.0	6.0	6.0		6.0	6.0		
ane Util, Factor	1.00	1.00	1.00		1.00	1.00		
Frt	1.00	1.00	0.98		1.00	0.85		
It Protected	0.95	1.00	1.00		0.95	1.00		
Satd. Flow (prot)	1719	1810	1803		1504	1583		
It Permitted	0.30	1.00	1.00		0.95	1.00		
Satd. Flow (perm)	544	1810	1803		1504	1583		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Adj. Flow (vph)	142	126	454	96	77	512		
RTOR Reduction (vph)	0	0	12	0	0	177		
Lane Group Flow (vph)	142	126	538	0	77	335		
Heavy Vehicles (%)	5%	5%	2%	7%	20%	2%		
Furn Type	Perm	NA	NA	170	Prot	Perm		
Protected Phases	T CHI	2	6		4	1 GHH		
Permitted Phases	2	2	U		т	4		
Actuated Green, G (s)	26.0	26.0	26.0		22.0	22.0		
Effective Green, g (s)	26.0	26.0	26.0		22.0	22.0		
Actuated g/C Ratio	0.43	0.43	0.43		0.37	0.37		
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0		
/ehicle Extension (s)	3.0	3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)	235	784	781		551	580		
/s Ratio Prot	233	0.07	c0.30		0.05	300		
//s Ratio Perm	0.26	0.07	0.50		0.05	c0.21		
//c Ratio	0.20	0.16	0.69		0.14	0.58		
Jniform Delay, d1	13.1	10.4	13.7		12.7	15.3		
Progression Factor	1.00	1.00	1.00		1.00	1.00		
ncremental Delay, d2	11.00	0.4	4.9		0.5	4.2		
Delay (s)	24.1	10.8	18.6		13.2	19.4		
_evel of Service	24.1 C	10.0 B	10.0 B		13.2 B	B		
Approach Delay (s)	C	17.8	18.6		18.6	D		
Approach LOS		B	B		B			
Intersection Summary								
HCM 2000 Control Delay			18.5	H	CM 2000	Level of Service	В	
ICM 2000 Volume to Capacit	v ratio		0.64	11	5.01 2000	2010101001000	5	
Actuated Cycle Length (s)			60.0	Si	um of lost	time (s)	12.0	
ntersection Capacity Utilization	n		67.3%			of Service	C	
Analysis Period (min)	///		15		O LOVEI (0	
Critical Lane Group			13					

				-		•	
	-	•	*	•		1	
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	4			ન	- Y		
Traffic Volume (vph)	7	48	0	20	152	0	
Future Volume (vph)	7	48	0	20	152	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.883						
Flt Protected					0.950		
Satd. Flow (prot)	1645	0	0	1863	1770	0	
FIt Permitted					0.950		
Satd. Flow (perm)	1645	0	0	1863	1770	0	
Link Speed (k/h)	50			50	50		
Link Distance (m)	44.7			49.4	43.7		
Travel Time (s)	3.2			3.6	3.1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	8	52	0	22	165	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	60	0	0	22	165	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(m)	0.0	-		0.0	3.6		
Link Offset(m)	0.0			0.0	0.0		
Crosswalk Width(m)	4.8			4.8	4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)		15	25		25	15	
Sign Control	Free			Free	Stop		
Intersection Summary							
Area Type: (Other						
Control Type: Unsignalized							
Intersection Capacity Utilizat	tion 18.4%			10	CU Level o	of Service /	A Contraction of the second seco
Analysis Dariad (min) 15	1011 10.470			I.	O LEVEL		1

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis 4: Access 1 & Frances Avenue

	-	*	4	+	•	*
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	4Î			ę	Y	
Traffic Volume (veh/h)	7	48	0	20	152	0
Future Volume (Veh/h)	7	48	0	20	152	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	52	0	22	165	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			60		56	34
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			60		56	34
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		83	100
cM capacity (veh/h)			1544		952	1039
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	60	22	165			
Volume Left	00	0	165			
Volume Right	52	0	0			
cSH	1700	1544	952			
Volume to Capacity	0.04	0.00	0.17			
Queue Length 95th (m)	0.04	0.0	5.0			
Control Delay (s)	0.0	0.0	9.6			
Lane LOS	0.0	0.0	7.0 A			
Approach Delay (s)	0.0	0.0	9.6			
Approach LOS	0.0	0.0	9.0 A			
			A			
Intersection Summary						
Average Delay			6.4			
Intersection Capacity Utiliza	ation		18.4%	IC	U Level (of Service
Analysis Period (min)			15			

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2021 Total

Synchro 9 Report Page 9 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2021 Total

Appendix "C" to Report PED19115 Page 134 of 314

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	-	-	•	¥	-		7	I	1		*	*
ane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
ane Configurations		4			4			4			4 >	
Fraffic Volume (vph)	15	28	18	122	12	1	16	56	203	3	32	4
Future Volume (vph)	15	28	18	122	12	1	16	56	203	3	32	4
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
rt		0.959			0.999			0.900			0.987	
It Protected		0.988			0.957			0.997			0.996	
Satd. Flow (prot)	0	1800	0	0	1768	0	0	1705	0	0	1868	0
It Permitted		0.988			0.957			0.997			0.996	
Satd. Flow (perm)	0	1800	0	0	1768	0	0	1705	0	0	1868	0
_ink Speed (k/h)		50			50			50			50	
ink Distance (m)		165.1			52.2			184.8			166.7	
Fravel Time (s)		11.9			3.8			13.3			12.0	
Confl. Peds. (#/hr)	1		1	1		1	2		1	1		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	16	30	20	133	13	1	17	61	221	3	35	4
Shared Lane Traffic (%)												
ane Group Flow (vph)	0	66	0	0	147	0	0	299	0	0	42	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
ane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Vedian Width(m)		0.0	5		0.0	5		3.6	5		3.6	5
_ink Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
ntersection Summary												
	ther											
Control Type: Unsignalized												
ntersection Capacity Utilization	on 40.9%			IC	Ulevel	of Service	Α					

	≯	→	\mathbf{r}	1	-	•	1	1	1	1	Ŧ	*
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SE
Lane Configurations		4			\$			\$			4	
Traffic Volume (veh/h)	15	28	18	122	12	1	16	56	203	3	32	
Future Volume (Veh/h)	15	28	18	122	12	1	16	56	203	3	32	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.0
Hourly flow rate (vph)	16	30	20	133	13	1	17	61	221	3	35	
Pedestrians		2			1			1			1	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked	050				05.4							
vC, conflicting volume	259	362	40	286	254	174	41			283		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol vCu, unblocked vol	259	362	40	286	254	174	41			283		
tC, single (s)	259	362 6.5	40	286	254 6.5	6.2	41			283 4.1		
tC, 2 stage (s)	7.1	0.0	0.2	7.1	0.0	0.2	4.1			4.1		
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	3.5 98	4.0	3.3 98	3.5 78	4.0	3.3 100	2.2			100		
cM capacity (veh/h)	677	560	1034	617	643	874	1579			1290		
1 , , , ,	-				045	074	1377			1270		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	66	147	299	42								
Volume Left	16 20	133	17	3								
Volume Right cSH	683	1 620	221 1579	4 1290								
CSH Volume to Capacity	083	0.24	0.01	0.00								
Queue Length 95th (m)	2.6	7.3	0.01	0.00								
Control Delay (s)	2.6	12.6	0.5	0.1								
Lane LOS	10.8 B	12.0 B	0.5 A	0.0 A								
Approach Delay (s)	В 10.8	В 12.6	0.5	A 0.6								
Approach LOS	10.0 B	12.0 B	0.5	0.0								
Intersection Summary												
Average Delay			4.9									_
Intersection Capacity Utiliza	tion		40.9%	IC	U Level o	of Service			А			
Analysis Period (min)			15									

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Total

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Total

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Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	٦	1	ĥ		٦	1	
Traffic Volume (vph)	176	897	448	100	71	101	
Future Volume (vph)	176	897	448	100	71	101	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	120.0			0.0	40.0	0.0	
Storage Lanes	1			0	1	1	
Taper Length (m)	7.5				7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt			0.975			0.850	
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1805	1881	1746	0	1770	1615	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1805	1881	1746	0	1770	1615	
Link Speed (k/h)		80	80		50		
Link Distance (m)		123.4	826.3		184.8		
Travel Time (s)		5.6	37.2		13.3		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	0%	1%	7%	2%	2%	0%	
Adj. Flow (vph)	191	975	487	109	77	110	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	191	975	596	0	77	110	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Vedian Width(m)		3.6	3.6		3.6		
Link Offset(m)		0.0	0.0		0.0		
Crosswalk Width(m)		4.8	4.8		4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25			15	25	15	
Sign Control		Free	Free		Stop		
Intersection Summary							
	Other						
Control Type: Unsignalized Intersection Capacity Utilizati						of Service	

2: North Service Ro	٦		+		L.	1	
		-			*		
Vovement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	<u></u>	↑	- î÷		<u>۲</u>	1	
Traffic Volume (veh/h)	176	897	448	100	71	101	
Future Volume (Veh/h)	176	897	448	100	71	101	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	191	975	487	109	77	110	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Vedian type		None	None				
Vedian storage veh)							
Upstream signal (m)							
X, platoon unblocked							
/C, conflicting volume	596				1898	542	
/C1, stage 1 conf vol							
/C2, stage 2 conf vol							
/Cu, unblocked vol	596				1898	542	
C, single (s)	4.1				6.4	6.2	
C, 2 stage (s)							
F (s)	2.2				3.5	3.3	
00 queue free %	81				0	80	
cM capacity (veh/h)	990				61	545	
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2		
/olume Total	191	975	596	77	110		
Volume Left	191	975	0	77	0		
Volume Right	141	0	109	0	110		
SH	990	1700	1700	61	545		
	0.19	0.57	0.35	1.25	0.20		
Volume to Capacity Queue Length 95th (m)	0.19	0.57	0.35	51.4	6.0		
Control Delay (s)	5.7 9.5	0.0	0.0	51.4 310.5	6.0 13.3		
Lane LOS	9.5 A	0.0	0.0	310.5 F	13.3 B		
	A 1.6		0.0	135.7	В		
Approach Delay (s) Approach LOS	1.0		0.0	135.7 F			
ntersection Summary							
Average Delay			13.9				
ntersection Capacity Utiliza	tion		57.8%	IC	U Level a	f Service	В

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Total

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Total

3: North Service Ro	au a iv	Illien F	loau				06-14-2018	3: North Service F	koau & N	lillen	Road					
	۶	-	+	*	1	1			٦	-	-	•	1	-		
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR		Lane Group	EBL	EBT	WBT	WBR	SBL	SBR		
ane Configurations	5	•	ţ,		5	1		Permitted Phases	2					4		
Fraffic Volume (vph)	237	731	206	81	90	342		Detector Phase	2	2	6		4	4		
uture Volume (vph)	237	731	206	81	90	342		Switch Phase								
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900		Minimum Initial (s)	20.0	20.0	20.0		10.0	10.0		
Storage Length (m)	85.0	1700	1700	0.0	50.0	0.0		Minimum Split (s)	26.0	26.0			24.0	24.0		
Storage Lanes	1			0.0	30.0	1		Total Split (s)	46.0	46.0			24.0	24.0		
	7.5			0	7.5	I		Total Split (%)	65.7%				34.3%	34.3%		
aper Length (m)	1.00	1.00	1.00	1.00	1.00	1.00										
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		Maximum Green (s)	40.0	40.0			18.0	18.0		
rt	0.050		0.962		0.050	0.850		Yellow Time (s)	4.0	4.0			4.0	4.0		
It Protected	0.950	10/6			0.950	1500		All-Red Time (s)	2.0	2.0			2.0	2.0		
Satd. Flow (prot)	1805	1863	1777	0		1583		Lost Time Adjust (s)	0.0	0.0			0.0	0.0		
It Permitted	0.567				0.950			Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0		
Satd. Flow (perm)	1077	1863	1777	0	1805	1583		Lead/Lag								
Right Turn on Red				Yes		Yes		Lead-Lag Optimize?								
Satd. Flow (RTOR)			47			372		Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0		
ink Speed (k/h)		80	80		50			Recall Mode	C-Max	C-Max	C-Max		Max	Max		
ink Distance (m)		826.3	260.0		127.1			Walk Time (s)	7.0	7.0	7.0		7.0	7.0		
ravel Time (s)		37.2	11.7		9.2			Flash Dont Walk (s)	11.0	11.0			11.0	11.0		
eak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		Pedestrian Calls (#/hr)	0	0			0	0		
leavy Vehicles (%)	0%	2%	4%	0%	0%	2%		Act Effct Green (s)	40.0	40.0	-		18.0	18.0		
Adj. Flow (vph)	258	795	224	88	98	372		Actuated g/C Ratio	0.57	0.57			0.26	0.26		
Shared Lane Traffic (%)	250	175	224	00	70	572		v/c Ratio	0.42	0.75			0.20	0.54		
	258	795	312	0	98	372		Control Delay	11.1	16.8			21.9	6.1		
ane Group Flow (vph)						No										
Inter Blocked Intersection	No	No	No	No	No			Queue Delay	0.0	0.0			0.0	0.0		
ane Alignment	Left	Left	Left	Right	Left	Right		Total Delay	11.1	16.8			21.9	6.1		
/ledian Width(m)		3.6	3.6		3.6			LOS	В	B			С	A		
ink Offset(m)		0.0	0.0		0.0			Approach Delay		15.4	7.4		9.4			
Crosswalk Width(m)		4.8	4.8		4.8			Approach LOS		В	A		A			
wo way Left Turn Lane								Intersection Summary								
leadway Factor	1.00	1.00	1.00	1.00	1.00	1.00		Area Type:	Other							
urning Speed (k/h)	25			15	25	15		Cycle Length: 70	Other							
lumber of Detectors	1	2	2		1	1		Actuated Cycle Length: 70								
etector Template	Left	Thru	Thru		Left	Right		Offset: 0 (0%), Referenced		EDTI -	nd 6.MDT	Start of C	roop			
eading Detector (m)	2.0	10.0	10.0		2.0	2.0			1 to phase 2	EBIL	IIU O:WBI,	SIGUID	Jieen			
railing Detector (m)	0.0	0.0	0.0		0.0	0.0		Natural Cycle: 60								
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0		Control Type: Actuated-Co	ordinated							
Detector 1 Size(m)	2.0	0.6	0.6		2.0	2.0		Maximum v/c Ratio: 0.75								
Detector 1 Type		CI+Ex			CI+Ex			Intersection Signal Delay:						n LOS: B		
Detector 1 Channel	.		L n					Intersection Capacity Utiliz	ation 56.8%			IC	CU Level	of Service B		
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0		Analysis Period (min) 15								
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0										
	0.0	0.0	0.0		0.0	0.0		Splits and Phases: 3: N	orth Service	Road &	Millen Roa	ad				
Detector 1 Delay (s)	0.0		0.0 9.4		0.0	0.0		· .							1	
Detector 2 Position(m)		9.4						🖉 🖉 🖉 🖉								
Detector 2 Size(m)		0.6	0.6					46 s							24 s	
Detector 2 Type		CI+Ex	CI+Ex					←								
Detector 2 Channel								Ø6 (R)			_	_				
etector 2 Extend (s)		0.0	0.0					46 S								
Turn Type	Perm	NA	NA		Prot	Perm										
Protected Phases		2	6		4											

Synchro 9 Report Page 5 Synchro 9 Report Page 6

3: North Service Ro		illien F	load			06-14-201
	≯	-	+	1	∢	
Lane Group	EBL	EBT	WBT	SBL	SBR	
Lane Group Flow (vph)	258	795	312	98	372	
v/c Ratio	0.42	0.75	0.30	0.21	0.54	
Control Delay	11.1	16.8	7.4	21.9	6.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	11.1	16.8	7.4	21.9	6.1	
Queue Length 50th (m)	18.2	74.1	16.7	10.6	0.0	
Queue Length 95th (m)	34.3	119.2	29.7	22.2	19.2	
Internal Link Dist (m)		802.3	236.0	103.1		
Turn Bay Length (m)	85.0			50.0		
Base Capacity (vph)	615	1064	1035	464	683	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.42	0.75	0.30	0.21	0.54	

Vovement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	٦	1	¢Î		۲	1		
Traffic Volume (vph)	237	731	206	81	90	342		
Future Volume (vph)	237	731	206	81	90	342		
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0		
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00		
Frt	1.00	1.00	0.96		1.00	0.85		
FIt Protected	0.95	1.00	1.00		0.95	1.00		
Satd. Flow (prot)	1805	1863	1777		1805	1583		
FIt Permitted	0.57	1.00	1.00		0.95	1.00		
Satd. Flow (perm)	1077	1863	1777		1805	1583		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Adj. Flow (vph)	258	795	224	88	98	372		
RTOR Reduction (vph)	0	0	20	0	0	276		
Lane Group Flow (vph)	258	795	292	0	98	96		
Heavy Vehicles (%)	0%	2%	4%	0%	0%	2%		
Turn Type	Perm	NA	NA		Prot	Perm		
Protected Phases		2	6		4			
Permitted Phases	2					4		
Actuated Green, G (s)	40.0	40.0	40.0		18.0	18.0		
Effective Green, g (s)	40.0	40.0	40.0		18.0	18.0		
Actuated g/C Ratio	0.57	0.57	0.57		0.26	0.26		
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0		
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)	615	1064	1015		464	407		
//s Ratio Prot		c0.43	0.16		0.05			
//s Ratio Perm	0.24					c0.06		
//c Ratio	0.42	0.75	0.29		0.21	0.24		
Uniform Delay, d1	8.5	11.2	7.7		20.4	20.6		
Progression Factor	1.00	1.00	1.00		1.00	1.00		
ncremental Delay, d2	2.1	4.8	0.7		1.0	1.4		
Delay (s)	10.6	16.0	8.4		21.5	21.9		
Level of Service	В	В	A		С	С		
Approach Delay (s)		14.7	8.4		21.8			
Approach LOS		В	A		C			
Intersection Summary			15.4	1.1	214 2000	Level of Servi		
HCM 2000 Control Delay	ity ratio		0.59	H	UVI 2000	Level of Servi	.e	
HCM 2000 Volume to Capac	ity fallo			5	um of loci	time (c)		
Actuated Cycle Length (s)			70.0		um of lost	.,		
Intersection Capacity Utilizati	10[1		56.8%	IC	U Level (of Service		
Analysis Period (min) c Critical Lane Group			15					
c Critical Lane Group								

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Total

Synchro 9 Report Page 7 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Total

HCM Signalized Intersection Capacity Analysis 3: North Service Road & Millen Road

 $\mathcal{F} \rightarrow \leftarrow \mathcal{F} \checkmark$

Synchro 9 Report Page 8

Lane Group Lane Configurations Traffic Volume (vph) Future Volume (vph)	EBT 21 21	EBR 144	WBL	WBT	•	1	
Lane Configurations Traffic Volume (vph)	₽ 21		WBL	WBT		-	
Traffic Volume (vph)	21	1//			NBL	NBR	
		144		ę	Y		
Future Volume (vph)	21	144	0	2	92	0	
	21	144	0	2	92	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.882						
Flt Protected					0.950		
Satd. Flow (prot)	1643	0	0	1863	1770	0	
Flt Permitted					0.950		
Satd. Flow (perm)	1643	0	0	1863	1770	0	
Link Speed (k/h)	50			50	50		
Link Distance (m)	44.7			49.4	43.7		
Travel Time (s)	3.2			3.6	3.1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	23	157	0	2	100	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	180	0	0	2	100	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(m)	0.0			0.0	3.6		
Link Offset(m)	0.0			0.0	0.0		
Crosswalk Width(m)	4.8			4.8	4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)		15	25		25	15	
Sign Control	Free			Free	Stop		
Intersection Summary							
	Ither						
Control Type: Unsignalized Intersection Capacity Utilization						of Service A	

	Anal	ysis	Period	(min') 15
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HCM Unsignalized Intersection Capacity Analysis 4: Access 1 & Frances Avenue

	-	\mathbf{r}	4	+	٩	1	
Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	ĥ			ŧ	Y		
Traffic Volume (veh/h)	21	144	0	2	92	0	
Future Volume (Veh/h)	21	144	0	2	92	0	
Sign Control	Free			Free	Stop		
Grade	0%			0%	0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	23	157	0	2	100	0	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None			None			
Median storage veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume			180		104	102	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			180		104	102	
tC, single (s)			4.1		6.4	6.2	
tC, 2 stage (s)							
tF (s)			2.2		3.5	3.3	
p0 queue free %			100		89	100	
cM capacity (veh/h)			1396		895	954	
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	180	2	100				
Volume Left	0	0	100				
Volume Right	157	0	001				
cSH	1700	1396	895				
	0.11	0.00					
Volume to Capacity	0.11	0.00	0.11				
Queue Length 95th (m)							
Control Delay (s)	0.0	0.0	9.5				
Lane LOS	0.0	0.0	A				
Approach Delay (s)	0.0	0.0	9.5				
Approach LOS			A				
Intersection Summary							
Average Delay			3.4				
Intersection Capacity Utilizat	tion		21.8%	IC	U Level o	of Service	
Analysis Period (min)			15				

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Total

Synchro 9 Report Page 9 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2021 Total

Appendix F

2023 Background Traffic Operations Reports

Appendix "C" to Report PED19115 Page 140 of 314

Appendix "C" to Report PED19115 Page 141 of 314

	۶	-	\mathbf{r}	4	-	•	1	1	۲	1	Ŧ	~
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			¢,	
Traffic Volume (vph)	12	11	17	207	32	0	4	18	74	0	60	8
Future Volume (vph)	12	11	17	207	32	0	4	18	74	0	60	8
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.943						0.896			0.984	
FIt Protected		0.985			0.959			0.998				
Satd. Flow (prot)	0	1713	0	0	1822	0	0	1592	0	0	1870	0
FIt Permitted		0.985			0.959			0.998				
Satd. Flow (perm)	0	1713	0	0	1822	0	0	1592	0	0	1870	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.1			52.2			184.8			166.7	
Travel Time (s)		11.9			3.8			13.3			12.0	
Confl. Peds. (#/hr)	1					1	2		3	3		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	0%	0%	0%	0%	0%	0%	7%	7%	0%	0%	0%
Adj. Flow (vph)	13	12	18	225	35	0	4	20	80	0	65	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	43	0	0	260	0	0	104	0	0	74	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Vedian Width(m)		0.0	Ū		0.0	Ū		3.6	Ū		3.6	Ū
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
	ther											
Control Type: Unsignalized	04.004			10								
Intersection Capacity Utilization	n 36 3%			10	CULEvelo	of Service	A					

	≯	+	>	~	Ļ	*	•	Ť	*	1	T	4
Movement	EBL	EBT	EBR	▼ WBL	WBT	WBR	NBL	NBT	NBR	SBL	▼ SBT	SBF
	EDL		EDK	WDL		WDR	INDL		NDK	SDL		SDF
Lane Configurations Traffic Volume (veh/h)	12	↔ 11	17	207	↔ 32	0	4	4) 18	74	0	↔ 60	8
Future Volume (Veh/h)	12	11	17	207	32	0	4	18	74	0	60	6
Sign Control	12	Stop	17	207	Stop	0	4	Free	74	0	Free	C
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	12	18	225	35	0.72	4	20	80	0.72	65	0.72
Pedestrians	15	2	10	225	3	0	7	20	00	0	1	
Lane Width (m)		3.6			3.6						3.6	
Walking Speed (m/s)		1.2			1.2						1.2	
Percent Blockage		0			0						0	
Right turn flare (veh)		0			0						0	
Median type								None			None	
Median storage veh)								110110			110110	
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	158	182	72	164	147	64	76			103		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	158	182	72	164	147	64	76			103		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	98	98	71	95	100	100			100		
cM capacity (veh/h)	756	710	995	774	743	1003	1533			1498		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	43	260	104	74								
Volume Left	13	225	4	0								
Volume Right	18	0	80	9								
cSH	824	770	1533	1498								
Volume to Capacity	0.05	0.34	0.00	0.00								
Queue Length 95th (m)	1.3	12.0	0.1	0.0								
Control Delay (s)	9.6	12.0	0.3	0.0								
Lane LOS	A	В	А									
Approach Delay (s)	9.6	12.0	0.3	0.0								
Approach LOS	А	В										
Intersection Summary												
Average Delay			7.4									
Intersection Capacity Utilization	on		36.3%	IC	U Level o	of Service			A			

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Background

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Background

	٠		-	*	6	1	
		EDT	WDT	-	CDI		
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	1	147	þ	F.0	104	170	
Traffic Volume (vph)	44	147	863	52	104	178	
Future Volume (vph)	44	147	863	52	104	178	
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	120.0			0.0	40.0	0.0	
Storage Lanes	1			0	1	1	
Taper Length (m)	7.5				7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor							
Frt			0.992			0.850	
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1687	1696	1797	0	1770	1615	
FIt Permitted	0.950				0.950		
Satd. Flow (perm)	1687	1696	1797	0	1770	1615	
Link Speed (k/h)		80	80		50		
Link Distance (m)		123.4	826.3		184.8		
Travel Time (s)		5.6	37.2		13.3		
Confl. Peds. (#/hr)	1	0.0	07.2	1	10.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	7%	12%	4%	19%	2%	0%	
Adj. Flow (vph)	48	160	938	57	113	193	
Shared Lane Traffic (%)	40	100	730	57	115	175	
Lane Group Flow (vph)	48	160	995	0	113	193	
	48 No		995 No	No	No	193 No	
Enter Blocked Intersection		No					
Lane Alignment	Left	Left	Left	Right	Left	Right	
Vedian Width(m)		3.6	3.6		3.6		
Link Offset(m)		0.0	0.0		0.0		
Crosswalk Width(m)		4.8	4.8		4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25			15	25	15	
Sign Control		Free	Free		Stop		
Intersection Summary							

← � 1 1 ٠ -Movement EBL EBT WBT WBR SBL SBR Lane Configurations ٦ ÷ Þ 7 Traffic Volume (veh/h) 44 147 863 52 104 178 Future Volume (Veh/h) 44 147 863 52 104 178 Sign Control Free Free Stop Grade 0% 0% 0% Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Hourly flow rate (vph) 48 160 938 57 113 193 Pedestrians Lane Width (m) 3.6 Walking Speed (m/s) 1.2 Percent Blockage 0 Right turn flare (veh) Median type None None Median storage veh) Upstream signal (m) pX, platoon unblocked vC, conflicting volume 996 1224 968 vC1, stage 1 conf vol vC2, stage 2 conf vol 996 1224 968 vCu, unblocked vol tC, single (s) 4.2 6.2 6.4 tC, 2 stage (s) tF (s) 2.3 3.5 3.3 p0 queue free % 93 38 38 cM capacity (veh/h) 675 184 311 EB 1 SB 2 Direction, Lane # EB2 WB1 SB 1 Volume Total 48 160 995 113 193 Volume Left 48 0 0 113 0 Volume Right 57 193 0 0 0

311

0.62

31.1

33.9

D

ICU Level of Service

184

0.62

F

Е

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Background

Analysis Period (min) 15

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Background

675 1700 1700

0.09

0.0

1.8 0.0

0.59

0.0 27.6

0.0 51.7

0.0 40.4

8.5

15

66.3%

0.07

10.7

В

2.5

cSH

Volume to Capacity

Control Delay (s)

Approach Delay (s)

Intersection Summary Average Delay

Analysis Period (min)

Intersection Capacity Utilization

Approach LOS

Lane LOS

Queue Length 95th (m)

HCM Unsignalized Intersection Capacity Analysis

2: North Service Road & Green Road

Synchro 9 Report Page 4

С

3: North Service Ro			loau				06-14-2018 3: North Servie		Road & Millen Road					
	٦	-	←	*	1	1			۶	-	+	•	1	1
ane Group	EBL	EBT	WBT	WBR	SBL	SBR	Lane Group	E	EBL	EBT	WBT	WBR	SBL	SBR
ane Configurations	<u> </u>	•	¢Î,		۲.	1	Permitted Phases		2					4
raffic Volume (vph)	132	119	435	91	71	480	Detector Phase		2	2	6		4	4
uture Volume (vph)	132	119	435	91	71	480	Switch Phase							
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	Minimum Initial (s)	2	20.0	20.0	20.0		10.0	10.0
Storage Length (m)	85.0	1700	1700	0.0	50.0	0.0	Minimum Split (s)		26.0	26.0	26.0		24.0	24.0
Storage Lanes	1			0.0	1	1	Total Split (s)		32.0	32.0	32.0		28.0	28.0
aper Length (m)	7.5			0	7.5		Total Split (%)		.3%	53.3%			46.7%	
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	Maximum Green (s)		26.0	26.0	26.0		22.0	22.0
rt	1.00	1.00	0.977	1.00	1.00	0.850	Yellow Time (s)		4.0	4.0	4.0		4.0	4.0
It Protected	0.950		0.977		0.050	0.000	All-Red Time (s)		2.0	2.0	2.0		2.0	2.0
		1810	1805	0	0.950	1583			2.0		2.0			2.0
Satd. Flow (prot)	1719 0.279	1010	1005	U	1504 0.950	1003	Lost Time Adjust (s)			0.0			0.0	
It Permitted		1010	1005	^		1500	Total Lost Time (s)		6.0	6.0	6.0		6.0	6.0
Satd. Flow (perm)	505	1810	1805	0	1504	1583	Lead/Lag							
Right Turn on Red				Yes		Yes	Lead-Lag Optimize?		~ ~					
atd. Flow (RTOR)			22			263	Vehicle Extension (s)		3.0	3.0	3.0		3.0	3.0
ink Speed (k/h)		80	80		50		Recall Mode			C-Max			Max	Max
ink Distance (m)		826.3	260.0		127.1		Walk Time (s)		7.0	7.0	7.0		7.0	7.0
ravel Time (s)		37.2	11.7		9.2		Flash Dont Walk (s)		11.0	11.0	11.0		11.0	11.0
eak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	Pedestrian Calls (#/h		0	0	0		0	0
leavy Vehicles (%)	5%	5%	2%	7%	20%	2%	Act Effct Green (s)		26.0	26.0	26.0		22.0	22.0
ldj. Flow (vph)	143	129	473	99	77	522	Actuated g/C Ratio	0).43	0.43	0.43		0.37	0.37
Shared Lane Traffic (%)							v/c Ratio	0	0.66	0.16	0.72		0.14	0.70
ane Group Flow (vph)	143	129	572	0	77	522	Control Delay	3	32.0	11.1	19.9		13.6	13.7
nter Blocked Intersection	No	No	No	No	No	No	Queue Delay		0.0	0.0	0.0		0.0	0.0
ane Alignment	Left	Left	Left	Right	Left	Right	Total Delay	3	32.0	11.1	19.9		13.6	13.7
/ledian Width(m)		3.6	3.6	, in the second s	3.6	Ŭ	LOS		С	В	В		В	В
ink Offset(m)		0.0	0.0		0.0		Approach Delay			22.1	19.9		13.7	
Crosswalk Width(m)		4.8	4.8		4.8		Approach LOS			С	В		В	
wo way Left Turn Lane										-				
leadway Factor	1.00	1.00	1.00	1.00	1.00	1.00	Intersection Summar							
urning Speed (k/h)	25			15	25	15	Area Type:	Other						
lumber of Detectors	1	2	2	10	1	1	Cycle Length: 60							
Detector Template	Left	Thru	Thru		Left	Right	Actuated Cycle Leng							
eading Detector (m)	2.0	10.0	10.0		2.0	2.0	Offset: 0 (0%), Refer	enced to pha	ase 2:	EBTL an	d 6:WBT,	Start of C	Green	
railing Detector (m)	0.0	0.0	0.0		0.0	0.0	Natural Cycle: 60							
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0	Control Type: Actuat	ed-Coordinat	ted					
Detector 1 Size(m)	2.0	0.6	0.6		2.0	2.0	Maximum v/c Ratio:).72						
Detector 1 Type	CI+Ex		CI+Ex		CI+Ex		Intersection Signal D	elay: 17.7				In	tersectio	n LOS: B
Detector 1 Channel	CI+EX	UI+EX	UI+EX		CI+EX	CI+EX	Intersection Capacity	Utilization 6	8.4%			IC	U Level	of Service (
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0	Analysis Period (min							
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0	Splits and Phases:	3: North Sei	rvice	Road & M	Villen Roa	d		
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0								А.
Detector 2 Position(m)		9.4	9.4				/ →Ø2 (R)							≪ ∕Ø4
Detector 2 Size(m)		0.6	0.6				<u>32 s</u>						2	8 s
Detector 2 Type		CI+Ex	CI+Ex				←					_		
Detector 2 Channel							Ø6 (R)							
Detector 2 Extend (s)		0.0	0.0				32 s							
urn Type	Perm	NA	NA		Prot	Perm								
Protected Phases		2	6		4									

Synchro 9 Report Page 5

Synchro 9 Report Page 6

3: North Service Reservice Reservice	bad & N	lillen F	06-14-201			
	٦	-	+	1	∢	
Lane Group	EBL	EBT	WBT	SBL	SBR	
Lane Group Flow (vph)	143	129	572	77	522	
v/c Ratio	0.66	0.16	0.72	0.14	0.70	
Control Delay	32.0	11.1	19.9	13.6	13.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	32.0	11.1	19.9	13.6	13.7	
Queue Length 50th (m)	12.5	8.6	49.6	5.8	22.3	
Queue Length 95th (m)	#39.0	17.8	84.3	13.6	55.6	
Internal Link Dist (m)		802.3	236.0	103.1		
Turn Bay Length (m)	85.0			50.0		
Base Capacity (vph)	218	784	794	551	747	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.66	0.16	0.72	0.14	0.70	

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

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Background

Synchro 9 Report Page 7

HCM Signalized Ir 3: North Service R			,	Analys	is	
	۶	-	-	•	1	~
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	ľ	1	4Î		ľ	1
Traffic Volume (vph)	132	119	435	91	71	480
Future Volume (vph)	132	119	435	91	71	480
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0

Lane Util. Factor	1.00	1.00	1.00		1.00	1.00			
Frt	1.00	1.00	0.98		1.00	0.85			
Flt Protected	0.95	1.00	1.00		0.95	1.00			
Satd. Flow (prot)	1719	1810	1804		1504	1583			
Flt Permitted	0.28	1.00	1.00		0.95	1.00			
Satd. Flow (perm)	505	1810	1804		1504	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92			
Adj. Flow (vph)	143	129	473	99	77	522			
RTOR Reduction (vph)	0	0	12	0	0	167			
Lane Group Flow (vph)	143	129	560	0	77	355			
Heavy Vehicles (%)	5%	5%	2%	7%	20%	2%			
Turn Type	Perm	NA	NA		Prot	Perm			
Protected Phases		2	6		4				
Permitted Phases	2					4			
Actuated Green, G (s)	26.0	26.0	26.0		22.0	22.0			
Effective Green, g (s)	26.0	26.0	26.0		22.0	22.0			
Actuated g/C Ratio	0.43	0.43	0.43		0.37	0.37			
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)	218	784	781		551	580			
v/s Ratio Prot		0.07	c0.31		0.05				
v/s Ratio Perm	0.28					c0.22			
v/c Ratio	0.66	0.16	0.72		0.14	0.61			
Uniform Delay, d1	13.5	10.4	14.0		12.7	15.5			
Progression Factor	1.00	1.00	1.00		1.00	1.00			
Incremental Delay, d2	14.4	0.5	5.6		0.5	4.8			
Delay (s)	27.9	10.8	19.5		13.2	20.3			
Level of Service	С	В	В		В	С			
Approach Delay (s)		19.8	19.5		19.4				
Approach LOS		В	В		В				
Intersection Summary									
HCM 2000 Control Delay		19.5	HC	CM 2000	Level of Serv	ice	В		
HCM 2000 Volume to Capac		0.67							
Actuated Cycle Length (s)		60.0	Su	im of lost	time (s)		12.0		
Intersection Capacity Utilizat		68.4%	IC	U Level o	of Service		С		
Analysis Period (min)			15						
c Critical Lane Group									

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Background

Synchro 9 Report Page 8

Lane Group	-	\rightarrow \rightarrow \checkmark \leftarrow \checkmark \land												
Lana Craun		¥ .	1	+	1	1								
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR								
Lane Configurations	ę.			ę	Y									
Traffic Volume (vph)	8	48	0	21	152	0								
Future Volume (vph)	8	48	0	21	152	0								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900								
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00								
Frt	0.885													
Flt Protected					0.950									
Satd. Flow (prot)	1649	0	0	1863	1770	0								
FIt Permitted					0.950									
Satd. Flow (perm)	1649	0	0	1863	1770	0								
Link Speed (k/h)	50			50	50									
Link Distance (m)	44.7			49.4	43.7									
Travel Time (s)	3.2			3.6	3.1									
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92								
Adj. Flow (vph)	9	52	0	23	165	0								
Shared Lane Traffic (%)														
Lane Group Flow (vph)	61	0	0	23	165	0								
Enter Blocked Intersection	No	No	No	No	No	No								
Lane Alignment	Left	Right	Left	Left	Left	Right								
Median Width(m)	0.0			0.0	3.6									
Link Offset(m)	0.0			0.0	0.0									
Crosswalk Width(m)	4.8			4.8	4.8									
Two way Left Turn Lane														
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00								
Turning Speed (k/h)		15	25		25	15								
Sign Control	Free			Free	Stop									
Intersection Summary														
	Other													
Control Type: Unsignalized														
Intersection Capacity Utilizat	ion 18.5%			10	CU Level (of Service	A							

	Anal	ysis	Period	(min') 15
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HCM Unsignalized Intersection Capacity Analysis 4: Access 1 & Frances Avenue

	-	*	4	+	•	*
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	f,			र्भ	Y	
Traffic Volume (veh/h)	8	48	0	21	152	0
Future Volume (Veh/h)	8	48	0	21	152	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	52	0	23	165	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			61		58	35
vC1, stage 1 conf vol			01		00	00
vC2, stage 2 conf vol						
vCu, unblocked vol			61		58	35
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)			1.1		5.1	5.2
tF (s)			2.2		3.5	3.3
p0 queue free %			100		83	100
cM capacity (veh/h)			1542		949	1038
	FB 1		NB 1		, , , ,	1050
Direction, Lane #	EB 1 61	WB 1 23	165			
	• ·					
Volume Left	0	0	165			
Volume Right	52	0	0			
cSH	1700	1542	949			
Volume to Capacity	0.04	0.00	0.17			
Queue Length 95th (m)	0.0	0.0	5.0			
Control Delay (s)	0.0	0.0	9.6			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			6.4			
ntersection Capacity Utilization 18.5%				IC	U Level (of Service
Analysis Period (min)			15			
,						

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Background

Synchro 9 Report Page 9 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Background

Appendix "C" to Report PED19115 Page 146 of 314

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			\$			4			4	
Traffic Volume (vph)	15	28	19	124	12	1	17	59	206	3	33	4
Future Volume (vph)	15	28	19	124	12	1	17	59	206	3	33	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.958			0.999			0.901			0.987	
FIt Protected		0.988			0.957			0.997			0.997	
Satd. Flow (prot)	0	1798	0	0	1768	0	0	1707	0	0	1870	0
FIt Permitted		0.988			0.957			0.997			0.997	
Satd. Flow (perm)	0	1798	0	0	1768	0	0	1707	0	0	1870	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.1			52.2			184.8			166.7	
Travel Time (s)		11.9			3.8			13.3			12.0	
Confl. Peds. (#/hr)	1		1	1		1	2		1	1		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	16	30	21	135	13	1	18	64	224	3	36	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	67	0	0	149	0	0	306	0	0	43	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Vedian Width(m)		0.0	Ū		0.0	0		3.6	Ū		3.6	Ŭ
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
	ther											
Control Type: Unsignalized												
Intersection Capacity Utilization	on 41.7%			10	CU Level o	of Sorvico	Δ					

	≯	-+	>	~	+	•	•	Ť	-	1	Ţ	~
ovement	EBL	EBT	EBR	• WBL	WBT	WBR	NBL	NBT	NBR	SBL	▼ SBT	SBI
ane Configurations	EDL		EDK	VVDL		VVDR	INDL		INDIK	JDL	3D1	30
raffic Volume (veh/h)	15	28	19	124	12	1	17	↔ 59	206	3	33	
uture Volume (Veh/h)	15	20	19	124	12	1	17	59	200	3	33	
ign Control	15	Stop	17	124	Stop	1	17	Free	200	J	Free	
rade		0%			0%			0%			0%	
eak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
ourly flow rate (vph)	16	30	21	135	13	1	18	64	224	3	36	0.7
edestrians	10	2	2.	100	1			1		0	1	
ane Width (m)		3.6			3.6			3.6			3.6	
/alking Speed (m/s)		1.2			1.2			1.2			1.2	
ercent Blockage		0			0			0			0	
ight turn flare (veh)												
edian type								None			None	
edian storage veh)												
pstream signal (m)												
K, platoon unblocked												
C, conflicting volume	266	371	41	294	261	178	42			289		
C1, stage 1 conf vol												
C2, stage 2 conf vol												
Cu, unblocked vol	266	371	41	294	261	178	42			289		
C, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
C, 2 stage (s)												
(s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
) queue free %	98	95	98	78	98	100	99			100		
V capacity (veh/h)	669	553	1033	608	637	869	1577			1283		
irection, Lane #	EB 1	WB 1	NB 1	SB 1								
olume Total	67	149	306	43								
olume Left	16	135	18	3								
olume Right	21	1	224	4								
SH	680	611	1577	1283								
olume to Capacity	0.10	0.24	0.01	0.00								
ueue Length 95th (m)	2.6	7.6	0.3	0.1								
ontrol Delay (s)	10.9	12.8	0.5	0.6								
ane LOS	B	B	A	A 0.6								
pproach Delay (s) pproach LOS	10.9 B	12.8 B	0.5	0.6								
tersection Summary												
verage Delay			5.0									
tersection Capacity Utilizati	IC	U Level c	f Service			А						
	on		5.0 41.7% 15	IC	U Level c	f Service			А			

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Background

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Background

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Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	٦	1	ĥ		۲	1	
Traffic Volume (vph)	179	926	459	102	73	103	
Future Volume (vph)	179	926	459	102	73	103	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	120.0			0.0	40.0	0.0	
Storage Lanes	1			0	1	1	
Taper Length (m)	7.5				7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt			0.975			0.850	
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1805	1881	1746	0	1770	1615	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1805	1881	1746	0	1770	1615	
ink Speed (k/h)		80	80		50		
Link Distance (m)		123.4	826.3		184.8		
Travel Time (s)		5.6	37.2		13.3		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	0%	1%	7%	2%	2%	0%	
Adj. Flow (vph)	195	1007	499	111	79	112	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	195	1007	610	0	79	112	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Median Width(m)		3.6	3.6	5	3.6		
Link Offset(m)		0.0	0.0		0.0		
Crosswalk Width(m)		4.8	4.8		4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25			15	25	15	
Sign Control		Free	Free		Stop		
Intersection Summary							
	Other						
Control Type: Unsignalized							
Intersection Capacity Utilizat	ion 59.4%			10	:III evel (of Service	B

	≯		+	*	L.	1		
		-			*	*		
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	<u>۳</u>	↑	4		٦	1		
Traffic Volume (veh/h)	179	926	459	102	73	103		
Future Volume (Veh/h)	179	926	459	102	73	103		
Sign Control		Free	Free		Stop			
Grade		0%	0%		0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly flow rate (vph)	195	1007	499	111	79	112		
Pedestrians								
Lane Width (m)								
Walking Speed (m/s)								
Percent Blockage								
Right turn flare (veh)								
Median type		None	None					
Median storage veh)								
Upstream signal (m)								
pX, platoon unblocked								
vC, conflicting volume	610				1952	554		
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol	610				1952	554		
tC, single (s)	4.1				6.4	6.2		
tC, 2 stage (s)								
tF (s)	2.2				3.5	3.3		
p0 queue free %	80				0	79		
cM capacity (veh/h)	979				57	535		
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2			
Volume Total	195	1007	610	79	112			
Volume Left	195	0	0	79	0			
Volume Right	0	0	111	0	112			
cSH	979	1700	1700	57	535			
Volume to Capacity	0.20	0.59	0.36	1.40	0.21			
Queue Length 95th (m)	5.9	0.0	0.0	56.2	6.3			
Control Delay (s)	9.6	0.0	0.0	377.3	13.5			
Lane LOS	А			F	В			
Approach Delay (s)	1.6		0.0	164.0				
Approach LOS				F				
Intersection Summary								
Average Delay			16.6					
Intersection Capacity Utiliza	ition		59.4%	IC	U Level o	f Service	В	

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Background

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Background

3: North Service Ro	oad & M	lillen F	load				06-14-2018	3: North Service F	Road & IV	/lillen l	Road					0
	٦	-	-	•	1	1			٦	-	-	•	×	1		
ane Group	EBL	EBT	WBT	WBR	SBL	SBR		Lane Group	EBL	EBT	WBT	WBR	SBL	SBR		
ane Configurations	5	•	ţ,		5	1		Permitted Phases	2					4		
raffic Volume (vph)	239	759	212	82	92	349		Detector Phase	2	2	6		4	4		
uture Volume (vph)	239	759	212	82	92	349		Switch Phase								
leal Flow (vphpl)	1900	1900	1900	1900	1900	1900		Minimum Initial (s)	20.0	20.0	20.0		10.0	10.0		
torage Length (m)	85.0	1700	.,	0.0	50.0	0.0		Minimum Split (s)	26.0	26.0			24.0	24.0		
torage Lanes	1			0.0	1	1		Total Split (s)	46.0	46.0			24.0	24.0		
aper Length (m)	7.5			0	7.5			Total Split (%)	65.7%	65.7%			34.3%	34.3%		
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		Maximum Green (s)	40.0	40.0			18.0	18.0		
	1.00	1.00	0.962	1.00	1.00								4.0	4.0		
rt It Deata at a d	0.050		0.962		0.050	0.850		Yellow Time (s)	4.0	4.0						
It Protected	0.950	1040	1777	0	0.950	1502		All-Red Time (s)	2.0	2.0			2.0	2.0		
atd. Flow (prot)	1805	1863	1777	0		1583		Lost Time Adjust (s)	0.0	0.0			0.0	0.0		
It Permitted	0.561	10/0	4777	C	0.950	4500		Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0		
atd. Flow (perm)	1066	1863	1777	0	1805	1583		Lead/Lag								
ight Turn on Red				Yes		Yes		Lead-Lag Optimize?								
atd. Flow (RTOR)			46			379		Vehicle Extension (s)	3.0	3.0			3.0	3.0		
ink Speed (k/h)		80	80		50			Recall Mode		C-Max			Max	Max		
ink Distance (m)		826.3	260.0		127.1			Walk Time (s)	7.0	7.0			7.0	7.0		
ravel Time (s)		37.2	11.7		9.2			Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0		
eak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		Pedestrian Calls (#/hr)	0	0	0		0	0		
eavy Vehicles (%)	0%	2%	4%	0%	0%	2%		Act Effct Green (s)	40.0	40.0	40.0		18.0	18.0		
dj. Flow (vph)	260	825	230	89	100	379		Actuated g/C Ratio	0.57	0.57	0.57		0.26	0.26		
hared Lane Traffic (%)								v/c Ratio	0.43	0.78	0.31		0.22	0.55		
ane Group Flow (vph)	260	825	319	0	100	379		Control Delay	11.2	18.0	7.5		22.0	6.1		
nter Blocked Intersection	No	No	No	No	No	No		Queue Delay	0.0	0.0	0.0		0.0	0.0		
ane Alignment	Left	Left	Left	Right	Left	Right		Total Delay	11.2	18.0	7.5		22.0	6.1		
ledian Width(m)		3.6	3.6	J .	3.6	5		LOS	В	В			С	А		
ink Offset(m)		0.0	0.0		0.0			Approach Delay		16.4			9.4			
rosswalk Width(m)		4.8	4.8		4.8			Approach LOS		В	A		А			
wo way Left Turn Lane		1.0	1.0							5						
leadway Factor	1.00	1.00	1.00	1.00	1.00	1.00		Intersection Summary								
urning Speed (k/h)	25	1.00	1.00	15	25	15		Area Type:	Other							
umber of Detectors	1	2	2	10	1	1		Cycle Length: 70								
etector Template	Left	Thru	Thru		Left	Right		Actuated Cycle Length: 70								
eading Detector (m)	2.0	10.0	10.0		2.0	2.0		Offset: 0 (0%), Reference	d to phase 2:	:EBTL a	nd 6:WBT	, Start of C	Green			
railing Detector (m)	0.0	0.0	0.0		0.0	0.0		Natural Cycle: 60								
etector 1 Position(m)	0.0	0.0	0.0		0.0	0.0		Control Type: Actuated-Co	pordinated							
		0.0			2.0	2.0		Maximum v/c Ratio: 0.78								
etector 1 Size(m)	2.0		0.6					Intersection Signal Delay:	13.1			In	ntersectio	n LOS: B		
etector 1 Type	CI+EX	CI+Ex	CI+EX		CI+Ex	CI+Ex		Intersection Capacity Utiliz		5				of Service E	3	
etector 1 Channel	0.0	0.0	0.0		0.0	0.0		Analysis Period (min) 15								
etector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0										
etector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0		Splits and Phases: 3: N	orth Service	Road &	Millen Ro	ad				
etector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0			STAT SCI VICE		CITIXU				A	
etector 2 Position(m)		9.4	9.4					Ø2 (R)							Ø4	
etector 2 Size(m)		0.6	0.6					46 s							24 s	
etector 2 Type		CI+Ex	CI+Ex					←								
etector 2 Channel								Ø6 (R)								
etector 2 Extend (s)		0.0	0.0					46 s								
urn Type	Perm	NA	NA		Prot	Perm										
rotected Phases		2	6		4											

Synchro 9 Report Page 5 Synchro 9 Report Page 6

3: North Service Ro			louu			
	٦	-	-	1	-	
Lane Group	EBL	EBT	WBT	SBL	SBR	
Lane Group Flow (vph)	260	825	319	100	379	
v/c Ratio	0.43	0.78	0.31	0.22	0.55	
Control Delay	11.2	18.0	7.5	22.0	6.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	11.2	18.0	7.5	22.0	6.1	
Queue Length 50th (m)	18.3	79.1	17.3	10.8	0.0	
Queue Length 95th (m)	34.9	128.0	30.6	22.5	19.4	
Internal Link Dist (m)		802.3	236.0	103.1		
Turn Bay Length (m)	85.0			50.0		
Base Capacity (vph)	609	1064	1035	464	688	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.43	0.78	0.31	0.22	0.55	

	≯	-+	-	•	1	∢			
Movement	EBL	EBT	WBT	WBR	SBL	SBR			
Lane Configurations	5	•	ĥ		ň	1			
Traffic Volume (vph)	239	759	212	82	92	349			
Future Volume (vph)	239	759	212	82	92	349			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900			
Total Lost time (s)	6.0	6.0	6.0	.,	6.0	6.0			
Lane Util, Factor	1.00	1.00	1.00		1.00	1.00			
Frt	1.00	1.00	0.96		1.00	0.85			
Flt Protected	0.95	1.00	1.00		0.95	1.00			
Satd. Flow (prot)	1805	1863	1777		1805	1583			
Flt Permitted	0.56	1.00	1.00		0.95	1.00			
Satd. Flow (perm)	1065	1863	1777		1805	1583			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92			
Adj. Flow (vph)	260	825	230	89	100	379			
RTOR Reduction (vph)	200	023	230	09	0	282			
Lane Group Flow (vph)	260	825	20	0	100	282 97			
Lane Group Flow (vpn) Heavy Vehicles (%)	260	825	299 4%	0%	0%	2%			
		2% NA		0%					
Turn Type	Perm		NA		Prot	Perm			
Protected Phases	0	2	6		4				
Permitted Phases	2	10.0	10.0		10.0	4			
Actuated Green, G (s)	40.0	40.0	40.0		18.0	18.0			
Effective Green, g (s)	40.0	40.0	40.0		18.0	18.0			
Actuated g/C Ratio	0.57	0.57	0.57		0.26	0.26			
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0			
Lane Grp Cap (vph)	608	1064	1015		464	407			
v/s Ratio Prot		c0.44	0.17		0.06				
v/s Ratio Perm	0.24					c0.06			
v/c Ratio	0.43	0.78	0.29		0.22	0.24			
Uniform Delay, d1	8.5	11.5	7.7		20.4	20.6			
Progression Factor	1.00	1.00	1.00		1.00	1.00			
Incremental Delay, d2	2.2	5.5	0.7		1.1	1.4			
Delay (s)	10.7	17.1	8.5		21.5	22.0			
Level of Service	В	В	А		С	C			
Approach Delay (s)		15.6	8.5		21.9				
Approach LOS		В	A		С				
Intersection Summary									
HCM 2000 Control Delay			16.0	U	CM 2000	Level of Servio	<u>`0</u>	В	
HCM 2000 Volume to Capac	situ ratio		0.61	п	JIVI 2000	Level OF Servic	.e	D	
	JILY TALLO		70.0	c.	im of loci	time (c)		12.0	
	Actuated Cycle Length (s)				um of lost	. ,			
Intersection Capacity Utilizat	แบก		58.3%	IC	U Level (of Service		В	
Analysis Period (min)			15						
c Critical Lane Group									

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Background

Synchro 9 Report Page 7 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Background

HCM Signalized Intersection Capacity Analysis 3: North Service Road & Millen Road

> Synchro 9 Report Page 8

06-14-2018

4: Access 1 & Fran	ces Ave	enue					06-14-20
	-	\mathbf{i}	1	+	1	1	
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	el el			ę	Y		
Traffic Volume (vph)	22	144	0	2	92	0	
Future Volume (vph)	22	144	0	2	92	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.883						
Flt Protected					0.950		
Satd. Flow (prot)	1645	0	0	1863	1770	0	
FIt Permitted					0.950		
Satd. Flow (perm)	1645	0	0	1863	1770	0	
Link Speed (k/h)	50			50	50		
Link Distance (m)	44.7			49.4	43.7		
Travel Time (s)	3.2			3.6	3.1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	24	157	0	2	100	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	181	0	0	2	100	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(m)	0.0			0.0	3.6		
Link Offset(m)	0.0			0.0	0.0		
Crosswalk Width(m)	4.8			4.8	4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)		15	25		25	15	
Sign Control	Free			Free	Stop		
Intersection Summary							
	Other						
Control Type: Unsignalized							
Intersection Capacity Utilizat	tion 21.8%			10	CU Level	of Service A	A
Analycic Doriod (min) 15							

Analysis Period	(min)	15
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HCM Unsignalized Intersection Capacity Analysis 4: Access 1 & Frances Avenue

06-14-2018

	-	\mathbf{r}	4	+	1	1	
Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	4Î			र्स	Y		
Traffic Volume (veh/h)	22	144	0	2	92	0	
Future Volume (Veh/h)	22	144	0	2	92	0	
Sign Control	Free			Free	Stop		
Grade	0%			0%	0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	24	157	0	2	100	0	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	None			None			
Median storage veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume			181		104	102	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			181		104	102	
tC, single (s)			4.1		6.4	6.2	
tC, 2 stage (s)							
tF (s)			2.2		3.5	3.3	
p0 queue free %			100		89	100	
cM capacity (veh/h)			1394		893	953	
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	181	2	100				
Volume Left	0	0	100				
Volume Right	157	0	0				
cSH	1700	1394	893				
Volume to Capacity	0.11	0.00	0.11				
Queue Length 95th (m)	0.0	0.0	3.0				
Control Delay (s)	0.0	0.0	9.5				
Lane LOS			А				
Approach Delay (s)	0.0	0.0	9.5				
Approach LOS			А				
Intersection Summary							
Average Delay			3.4				
Intersection Capacity Utilizat	tion		21.8%	IC	U Level o	of Service	
Analysis Period (min)			15				
			.5				

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Background

Synchro 9 Report Page 9 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Background

Appendix G

2023 Future Total Traffic Operations Reports

Appendix "C" to Report PED19115 Page 152 of 314

Appendix "C" to Report PED19115 Page 153 of 314

1: Green Road & Fra										、	ı	,
	۶	-	\mathbf{r}	1	-		^	Т		- >	÷	*
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4			4	
Traffic Volume (vph)	12	15	17	334	46	0	4	18	114	0	60	8
Future Volume (vph)	12	15	17	334	46	0	4	18	114	0	60	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.948						0.887			0.984	
Flt Protected		0.986			0.958			0.999				
Satd. Flow (prot)	0	1728	0	0	1820	0	0	1576	0	0	1870	0
Flt Permitted		0.986			0.958			0.999				
Satd. Flow (perm)	0	1728	0	0	1820	0	0	1576	0	0	1870	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.1			52.2			184.8			166.7	
Travel Time (s)		11.9			3.8			13.3			12.0	
Confl. Peds. (#/hr)	1					1	2		3	3		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	0%	0%	0%	0%	0%	0%	7%	7%	0%	0%	0%
Adj. Flow (vph)	13	16	18	363	50	0	4	20	124	0	65	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	47	0	0	413	0	0	148	0	0	74	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0	5		0.0	5		3.6	5		3.6	5
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
	Ither											
Control Type: Unsignalized												

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations		4			\$			\$			4	
Traffic Volume (veh/h)	12	15	17	334	46	0	4	18	114	0	60	
Future Volume (Veh/h)	12	15	17	334	46	0	4	18	114	0	60	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	13	16	18	363	50	0	4	20	124	0	65	
Pedestrians		2			3						1	
Lane Width (m)		3.6			3.6						3.6	
Walking Speed (m/s)		1.2			1.2						1.2	
Percent Blockage		0			0						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	188	226	72	188	169	86	76			147		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	188	226	72	188	169	86	76			147		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	98	98	51	93	100	100			100		
cM capacity (veh/h)	710	672	995	743	723	975	1533			1444		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	47	413	148	74								
Volume Left	13	363	4	0								
Volume Right	18	0	124	9								
cSH	781	740	1533	1444								
Volume to Capacity	0.06	0.56	0.00	0.00								
Queue Length 95th (m)	1.5	27.9	0.1	0.0								
Control Delay (s)	9.9	15.8	0.2	0.0								
Lane LOS	А	С	A									
Approach Delay (s)	9.9	15.8	0.2	0.0								
Approach LOS	А	С										
Intersection Summary												
Average Delay			10.3									
Intersection Capacity Utiliza Analysis Period (min)	tion		46.3%	IC	U Level o	of Service			A			

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Total

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Total

Lane Group EBL EBL WBT WBR SBL SBL Iane Configurations 1 1 863 68 139 27 Traffic Volume (vph) 68 147 863 68 139 27 Iduar Flow (vph) 1900 100 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 <th></th> <th>× →</th> <th>t</th> <th>*</th> <th>ſ</th> <th>1</th> <th></th>		× →	t	*	ſ	1	
Lane Configurations Total Total <th>_</th> <th>-</th> <th></th> <th></th> <th>-</th> <th></th> <th></th>	_	-			-		
Traffic Volume (vph) 68 147 863 68 139 27 Future Volume (vph) 68 147 863 68 139 27 Ideal Flow (vph) 68 147 863 68 139 27 Ideal Flow (vph) 1900 190 100 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.05				WBR		SBR	
Future Volume (vph) 68 147 863 68 139 27 Ideal Flow (vphp) 1900 100 100 1.00 <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td></td>						1	
Ideal Flow (vphpl) 1900 100 110						270	
Storage Length (m) 120.0 0.0 40.0 0. Storage Lanes 1 0 1 Taper Length (m) 7.5 7.5 Lane Util, Factor 1.00 1.00 1.00 1.00 1.00 Ped Bike Factor 0.990 0.85 0.950 0.950 Fit 0.990 0.85 0.950 0.950 Satd. Flow (port) 1687 1696 1790 0 1770 161 Fit Permitted 0.950 161 111 1 1 1 1 1 140 13.3 200						270	
Storage Lanes 1 0 1 Taper Length (m) 7.5 7.5 Lane Util. Factor 1.00 1.00 1.00 1.00 1.00 Ped Bike Factor 0.990 0.85 0.950 0.950 Fit 0.990 0.85 0.950 0.950 Satd. Flow (prot) 1687 1696 1790 0 1770 161 Fit Portilited 0.950			1900			1900	
Taper Length (m) 7.5 7.5 Lane Ulii, Factor 1.00 1.00 1.00 1.00 1.00 Ped Bike Factor 1.00 1.00 1.00 1.00 1.00 1.00 Ped Bike Factor 0.990 0.85 0.950 0.950 0.950 Satd. Flow (prot) 1687 1696 1790 0 1770 161 Fit Permitted 0.950		120.0			40.0	0.0	
Lane Util, Factor 1.00 1.01 1	Storage Lanes			0		1	
Ped Bike Factor 0.990 0.85 Frt 0.950 0.950 Ell Protected 0.950 0.950 Satd. Flow (port) 1687 1696 1790 0 1770 161 Flt Permitted 0.950 0.950 0.950 0.950 Satd. Flow (port) 1687 1696 1790 0 1770 161 Link Speed (k/h) 80 80 50 111 161 111 11 11 123.4 826.3 184.8 133 133 133 133 133 141 144 142.4 142.4 142.4 142.4 142.4 142.4 142.4 142.4 142.4 142.4 142.4 142.4 142.4 143.3 143.3 143.3 143.3 143.3 150 143.3 144.4 144.4 144.4 144.4 144.4 144.4 144.4 144.4 144.4 144.4 144.4 144.4 150 29 151 29 151	aper Length (m)	7.5			7.5		
Frit 0.990 0.85 FIP Protected 0.950 0.950 Satd. Flow (prot) 1687 1696 1790 0 1770 161 FIP Permitted 0.950 0.950 0.950 0.950 0.950 Satd. Flow (perm) 1687 1696 1790 0 1770 161 Link Speed (k/h) 80 80 50 123.4 826.3 184.8 Travel Time (s) 5.6 37.2 13.3 170 161 1 Peak Hour Factor 0.92	ane Util. Factor	1.00 1.00	1.00	1.00	1.00	1.00	
Fit Protected 0.950 0.950 Satd. Flow (prot) 1687 1696 1790 0 1770 161 Fit Permitted 0.950 0.950 0.950 0.950 Satd. Flow (perm) 1687 1696 1790 0 1770 161 Link Speed (k/h) 80 80 50	^v ed Bike Factor						
Satd. Flow (prot) 1687 1696 1790 0 1770 161 FI Permitted 0.950 0.950 0.950 0.950 0.950 0.950 0.950 0.950 0.950 0.950 0.950 0.950 0.950 0.950 0.950 161 11 0.950 161 11.11 181 80 80 50 50 15.6 37.2 13.3 1691 170 161 11 1 1 123.4 826.3 184.8 184.8 1696 1790 0.92	rt		0.990			0.850	
Filt Permitted 0.950 0.950 Satd. Flow (perm) 1687 1696 1790 0 1770 161 Link Speed (k/h) 80 80 50 111 1637 1637 1638 1790 0 1770 161 Link Speed (k/h) 80 80 50 50 111 1	It Protected	0.950			0.950		
Satd. Flow (perm) 1687 1696 1790 0 1770 161 Link Speed (k/h) 80 80 50 37.2 13.3 50 50 50 37.2 13.3 50 50 50 50 37.2 0.92	Satd. Flow (prot)	1687 1696	1790	0	1770	1615	
Link Speed (k/h) 80 80 50 Link Distance (m) 123.4 826.3 184.8 Travel Time (s) 5.6 37.2 13.3 Confl. Peds. (#/hr) 1 1 1 Peak Hour Factor 0.92 0.93 151 </td <td>It Permitted</td> <td>0.950</td> <td></td> <td></td> <td>0.950</td> <td></td> <td></td>	It Permitted	0.950			0.950		
Link Distance (m) 123.4 826.3 184.8 Travel Time (s) 5.6 37.2 13.3 Confl. Peds. (#/hr) 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 7% 12% 4% 19% 2% 0% Adj. Flow (vph) 74 160 938 74 151 29 Shared Lane Traffic (%) Eane Group Flow (vph) 74 160 1012 0 151 29 Inter Blocked Intersection No Crosswalk Width(m) 3.6 3.6 3.6 1.6 Link Offset(m) 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8	Satd. Flow (perm)	1687 1696	1790	0	1770	1615	
Link Distance (m) 123.4 826.3 184.8 Travel Time (s) 5.6 37.2 13.3 Confl. Peds. (#/hr) 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 74 160 938 74 151 29 Shared Lane Traffic (%) Eare Group Flow (vph) 74 160 1012 0 151 29 Enter Blocked Intersection No Crosswalk Width(m) 3.6 3.6 3.6 3.6 Torswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Torswalk Width Turn Lane	ink Speed (k/h)	80	80		50		
Confl. Peds. (#/hr) 1 1 Peak Hour Factor 0.92 0.93 Mathematical statistics 1.04 Intermatical statistics 0.92 0.92 Distributical statistics 0.92 Distributical statistics 0.92 Distributical statistics 0.01 Correction statistics Distributical statististististics	ink Distance (m)	123.4	826.3		184.8		
Peak Hour Factor 0.92		5.6	37.2		13.3		
Peak Hour Factor 0.92	Confl. Peds. (#/hr)	1		1			
Adj. Flow (vph) 74 160 938 74 151 29 Shared Lane Traffic (%) 29 Lane Group Flow (vph) 74 160 1012 0 151 29 Enter Blocked Intersection No No No No No No No Lane Alignment Left Left Left Right Left Right Median Width(m) 3.6 </td <td></td> <td>0.92 0.92</td> <td>0.92</td> <td>0.92</td> <td>0.92</td> <td>0.92</td> <td></td>		0.92 0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph) 74 160 938 74 151 29 Shared Lane Traffic (%)	leavy Vehicles (%)	7% 12%	4%	19%	2%	0%	
Shared Lane Traffic (%) 74 160 1012 0 151 29 Enter Blocked Intersection No No No No No Lane Alignment Left Left Left Right Left Right Median Width(m) 3.6		74 160	938	74	151	293	
Lane Group Flow (vph) 74 160 1012 0 151 29 Enter Blocked Intersection No No No No No No No Lane Alignment Left Left Left Right Left Right Median Width(m) 3.6 3.6 3.6 .00 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Unit Set Set Set Set Set Set Set Set Set Se							
Enter Blocked Intersection No No <th< td=""><td></td><td>74 160</td><td>1012</td><td>0</td><td>151</td><td>293</td><td></td></th<>		74 160	1012	0	151	293	
Lane Alignment Left Left Left Right Left Right Median Width(m) 3.6 <td< td=""><td></td><td></td><td></td><td></td><td></td><td>No</td><td></td></td<>						No	
Median Ŵidth(m) 3.6 3.6 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane						Right	
Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane				grit		gin	
Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane							
Two way Left Turn Lane							
		1.0	1.0		1.0		
Headway Factor 100 100 100 100 100 10	Headway Factor	1.00 1.00	1.00	1.00	1.00	1.00	
			1.00			1.00	
Sign Control Free Free Stop			Free	15		15	
•	5						
Intersection Summary Area Type: Other		10					

Intersection Capacity Utilization 72.9% Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis 2: North Service Road & Green Road ٠

	۶	-	+	×	1	~
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	5	1	ĥ		٦	1
Traffic Volume (veh/h)	68	147	863	68	139	270
Future Volume (Veh/h)	68	147	863	68	139	270
Sign Control	00	Free	Free	00	Stop	270
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	160	938	74	151	293
Pedestrians		100	,00		1	270
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)					U	
Median type		None	None			
Median storage veh)		None	None			
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1013				1284	976
vC1, stage 1 conf vol	1013				1204	770
vC2, stage 2 conf vol						
vCu, unblocked vol	1013				1284	976
tC, single (s)	4.2				6.4	6.2
tC, 2 stage (s)	4.Z				0.4	0.2
tF (s)	2.3				3.5	3.3
p0 queue free %	2.3				3.5	3.3 5
cM capacity (veh/h)	665				162	307
1 3						307
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2	
Volume Total	74	160	1012	151	293	
Volume Left	74	0	0	151	0	
Volume Right	0	0	74	0	293	
cSH	665	1700	1700	162	307	
Volume to Capacity	0.11	0.09	0.60	0.93	0.95	
Queue Length 95th (m)	3.0	0.0	0.0	55.2	77.1	
Control Delay (s)	11.1	0.0	0.0	110.5	78.1	
Lane LOS	В			F	F	
Approach Delay (s)	3.5		0.0	89.1		
Approach LOS				F		
Intersection Summary						
Average Delay			23.9			
Intersection Capacity Utilization	ation		72.9%	IC	U Level o	of Service
Analysis Period (min)			15			

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Total

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Total

3: North Service Ro	au & iv	illien F	loau				06-14-2018	3: North Service F	toau & Iv	illien i	Road				
	٦	-	-	•	1	∢			٦	-	+	•	1	4	
ane Group	EBL	EBT	WBT	WBR	SBL	SBR		Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
ane Configurations	<u>5</u>	*	ţ,		N	1		Permitted Phases	2					4	
Fraffic Volume (vph)	139	147	444	91	71	487		Detector Phase	2	2	6		4	4	
uture Volume (vph)	139	147	444	91	71	487		Switch Phase							
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900		Minimum Initial (s)	20.0	20.0	20.0		10.0	10.0	
Storage Length (m)	85.0	1700	1700	0.0	50.0	0.0		Minimum Split (s)	26.0	26.0	26.0		24.0	24.0	
Storage Lanes	1			0.0	1	1		Total Split (s)	32.0	32.0	32.0		28.0	28.0	
Taper Length (m)	7.5			U	7.5	1		Total Split (%)	53.3%	53.3%			46.7%	46.7%	
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		Maximum Green (s)	26.0	26.0	26.0		22.0	22.0	
	1.00	1.00	0.977	1.00	1.00					4.0			4.0	4.0	
rt N Dente at a d	0.050		0.977		0.050	0.850		Yellow Time (s)	4.0		4.0				
It Protected	0.950	1010	1005	0	0.950	1500		All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	
Satd. Flow (prot)	1719	1810	1805	0		1583		Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0	
Fit Permitted	0.270	1010	1005	^	0.950	1500		Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0	
Satd. Flow (perm)	489	1810	1805	0	1504	1583		Lead/Lag							
Right Turn on Red				Yes		Yes		Lead-Lag Optimize?							
Satd. Flow (RTOR)			22			255		Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	
ink Speed (k/h)		80	80		50			Recall Mode	C-Max				Max	Max	
_ink Distance (m)		826.3	260.0		127.1			Walk Time (s)	7.0	7.0	7.0		7.0	7.0	
Fravel Time (s)		37.2	11.7		9.2			Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		Pedestrian Calls (#/hr)	0	0	0		0	0	
Heavy Vehicles (%)	5%	5%	2%	7%	20%	2%		Act Effct Green (s)	26.0	26.0	26.0		22.0	22.0	
Adj. Flow (vph)	151	160	483	99	77	529		Actuated g/C Ratio	0.43	0.43	0.43		0.37	0.37	
Shared Lane Traffic (%)								v/c Ratio	0.72	0.20	0.73		0.14	0.71	
ane Group Flow (vph)	151	160	582	0	77	529		Control Delay	37.5	11.5	20.5		13.6	14.7	
Inter Blocked Intersection	No	No	No	No	No	No		Queue Delay	0.0	0.0	0.0		0.0	0.0	
ane Alignment	Left	Left	Left	Right	Left	Right		Total Delay	37.5	11.5	20.5		13.6	14.7	
/ledian Width(m)		3.6	3.6	J .	3.6	J .		LOS	D	В	С		В	В	
ink Offset(m)		0.0	0.0		0.0			Approach Delay		24.1	20.5		14.6		
Crosswalk Width(m)		4.8	4.8		4.8			Approach LOS		C			В		
Two way Left Turn Lane		1.0	1.0		110					-			5		
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00		Intersection Summary							
furning Speed (k/h)	25	1.00	1.00	1.00	25	15		Area Type:	Other						
Sumber of Detectors	1	2	2	15	1	1		Cycle Length: 60							
Detector Template	Left	Thru	Thru		Left	Right		Actuated Cycle Length: 60)						
eading Detector (m)	2.0	10.0	10.0		2.0	2.0		Offset: 0 (0%), Referenced	d to phase 2	EBTL ar	nd 6:WBT,	Start of C	Green		
railing Detector (m)	0.0	0.0	0.0		0.0	0.0		Natural Cycle: 60							
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0		Control Type: Actuated-Co	ordinated						
	2.0	0.0	0.0		2.0	2.0		Maximum v/c Ratio: 0.73							
Detector 1 Size(m)								Intersection Signal Delay:	18.8			In	tersection	n LOS: B	
Detector 1 Type	CI+EX	CI+Ex	CI+EX		CI+Ex	CI+EX		Intersection Capacity Utiliz		,				of Service C	
Detector 1 Channel	0.0	0.0	0.0		0.0	0.0		Analysis Period (min) 15							
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0									
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0		Splits and Phases: 3: N	orth Service	Road &	Millen Ro:	ad			
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0			0.01 001100				1	А.	
Detector 2 Position(m)		9.4	9.4					Ø2 (R)						< ₩ Ø4	
Detector 2 Size(m)		0.6	0.6					32 s					2	8 s	
Detector 2 Type		CI+Ex	CI+Ex					←							
Detector 2 Channel								Ø6 (R)							
Detector 2 Extend (s)		0.0	0.0					32 s							
Turn Type	Perm	NA	NA		Prot	Perm									
Protected Phases		2	6		4										

Synchro 9 Report Page 5 Synchro 9 Report Page 6

3: North Service Reservice Reservice	oad & N	lillen F	Road			06-14-201
	٦	-	+	1	1	
Lane Group	EBL	EBT	WBT	SBL	SBR	
Lane Group Flow (vph)	151	160	582	77	529	
v/c Ratio	0.72	0.20	0.73	0.14	0.71	
Control Delay	37.5	11.5	20.5	13.6	14.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	37.5	11.5	20.5	13.6	14.7	
Queue Length 50th (m)	13.6	10.9	51.0	5.8	24.1	
Queue Length 95th (m)	#42.6	21.4	#87.9	13.6	58.5	
Internal Link Dist (m)		802.3	236.0	103.1		
Turn Bay Length (m)	85.0			50.0		
Base Capacity (vph)	211	784	794	551	741	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.72	0.20	0.73	0.14	0.71	

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

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Total

Synchro 9 Report Page 7 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Total

	≯		-		1	1		
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	٢	1	1>		1	1		
Traffic Volume (vph)	139	147	444	91	71	487		
Future Volume (vph)	139	147	444	91	71	487		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Total Lost time (s)	6.0	6.0	6.0	.,	6.0	6.0		
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00		
Frt	1.00	1.00	0.98		1.00	0.85		
Flt Protected	0.95	1.00	1.00		0.95	1.00		
Satd. Flow (prot)	1719	1810	1805		1504	1583		
Flt Permitted	0.27	1.00	1.00		0.95	1.00		
Satd. Flow (perm)	488	1810	1805		1504	1583		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Adj. Flow (vph)	151	160	483	99	77	529		
RTOR Reduction (vph)	0	0	12	0	0	162		
Lane Group Flow (vph)	151	160	570	0	77	368		
Heavy Vehicles (%)	5%	5%	2%	7%	20%	2%		
Turn Type	Perm	NA	NA	170	Prot	Perm		
Protected Phases	T CITIT	2	6		4	T CHIT		
Permitted Phases	2	2	0		т	4		
Actuated Green, G (s)	26.0	26.0	26.0		22.0	22.0		
Effective Green, g (s)	26.0	26.0	26.0		22.0	22.0		
Actuated g/C Ratio	0.43	0.43	0.43		0.37	0.37		
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0		
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)	211	784	782		551	580		
v/s Ratio Prot	211	0.09	c0.32		0.05	500		
v/s Ratio Perm	0.31	0.07	C0.32		0.05	c0.23		
v/c Ratio	0.72	0.20	0.73		0.14	0.63		
Uniform Delay, d1	14.0	10.6	14.1		12.7	15.7		
Progression Factor	14.0	1.00	1.00		1.00	1.00		
Incremental Delay, d2	18.7	0.6	5.9		0.5	5.2		
Delay (s)	32.7	11.2	20.0		13.2	20.9		
Level of Service	52.7 C	B	20.0 B		13.2 B	C		
Approach Delay (s)	0	21.6	20.0		19.9	0		
Approach LOS		21.0 C	20.0 B		B			
Intersection Summary								
HCM 2000 Control Delay			20.3	H	CM 2000	Level of Service	С	
HCM 2000 Volume to Capa	icity ratio		0.68					
Actuated Cycle Length (s)	,		60.0	Si	um of lost	time (s)	12.0	
Intersection Capacity Utiliza	ation		69.0%			of Service	С	
Analysis Period (min)			15					
c Critical Lane Group								

$\begin{array}{c c c c c c c c c c c c c c c c c c c $	06-14-20
Lane Configurations Image: Configuration in the image: Configuratin the image: Configuration in the image: Configuration in the im	
Traffic Volume (vph) 8 48 0 21 152 0 Future Volume (vph) 8 48 0 21 152 0 Ideal Flow (vphpl) 1900 1900 1900 1900 1900 1900 Lane Util, Factor 1.00 1.00 1.00 1.00 1.00 1.00 Frt 0.885 0.950 50 50 50 50 Satd. Flow (prot) 1649 0 1863 1770 0 FIN Protected 0.950 50 50 50 50 Satd. Flow (perm) 1649 0 1863 1770 0 Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 9 52 0 23 165 0 Shared Lane Traffic (%) Lane Group Flow (vph) 61 0 0.23 165 0 Lane Group Flow (vph) 61	
Traffic Volume (vph) 8 48 0 21 152 0 Future Volume (vph) 8 48 0 21 152 0 Ideal Flow (vph) 1900 1900 1900 1900 1900 1900 Lane Util. Factor 1.00 1.00 1.00 1.00 1.00 1.00 Frt 0.885 0.950 Satd. Flow (prot) 1649 0 1863 1770 0 Ell Permitted 0.950 Satd. Flow (perm) 1649 0 1863 1770 0 Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Lane Group Flow (vph) 9 52 0 23 165 0 Shared Lane Traffic (%) Lane Group Flow (vph) 61 0 0.23 165 0 Lane Group Flow (vph) 61 0 0.23 165 0 164 0 164	
Ideal Flow (vphpt) 1900 1900 1900 1900 1900 Lane Ulii, Factor 1.00 1.00 1.00 1.00 1.00 Fit 0.885 0.950 0.950 0.950 Satd. Flow (port) 1649 0 1863 1770 0 FII Protected 0.950 0.950 0.950 0.950 Satd. Flow (perm) 1649 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 50 Link Speed (k/h) 50 3.2 3.6 3.1 Peak Hour Factor 0.92	
Lane Util. Factor 1.00 1.00 1.00 1.00 1.00 Frt 0.885 0.950 5 Statk. Flow (port) 1649 0 0 1863 1770 0 Statk. Flow (perm) 1649 0 0 1863 1770 0 Statk. Flow (perm) 1649 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 10 <td></td>	
Fit 0.885 Fit Protected 0.950 Satd. Flow (prot) 1649 0 1863 1770 0 Fit Permitted 0.950 0 1863 1770 0 Satd. Flow (perm) 1649 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 Adj. Flow (vph) 9 52 0 23 165 0 Shared Lane Traffic (%) Lane Group Flow (vph) 61 0 0.23 165 0 Lane Group Flow (vph) 61 0 0.23 165 0 Enter Blocked Intersection No No No No No Lane Group Flow (vph) 0.0 0.00 3.6 0 0.0 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 <td></td>	
Fit Protected 0.950 Sald. Flow (prot) 1649 0 0 1863 1770 0 Fit Permitted 0.950 Sald. Flow (perm) 1649 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 50 Link Distance (m) 44.7 49.4 43.7 - Peak Hour Factor 0.92 0.92 0.92 0.92 Peak Hour Factor 0.92 0.92 0.92 0.92 Adj. Flow (vph) 9 52 0 23 165 0 Shared Lane Traffic (%) Lane Group Flow (vph) 61 0 0.23 165 0 Enter Blocked Intersection No No No No No No Link Offseit(m) 0.0 0.0 3.6 - - Median Width(m) 0.0 0.00 0.0 3.6 - Lane Alignment Left Right Keft Right - Median Width(m) 0.0 0.00 0.0 </td <td></td>	
Satd. Flow (prot) 1649 0 0 1863 1770 0 FII Permitted 0.950 <t< td=""><td></td></t<>	
Flt Permitted 0.950 Satd. Flow (perm) 1649 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 1 Link Distance (m) 44.7 49.4 43.7 1 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 Adj. Flow (vph) 9 52 0 23 165 0 Shared Lane Traffic (%) 0.00 No No No Lane Group Flow (vph) 61 0 0 23 165 0 5 Lane Group Flow (vph) 61 0 0 23 165 0 Lane Alignment Left Right Left Left Right Median Width(m) 0.0 0.0 3.6 1 1 Unik Offset(m) 0.0 0.00 0.0 1 0 Crosswalk Width(m) 4.8 4.8 4.8 1 1 Headway Factor	
Satd. Flow (perm) 1649 0 0 1863 1770 0 Link Speed (k/h) 50	
Link Speed (k/h) 50 50 50 Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 Peak Hour Factor 0.92 0.92 0.92 0.92 Lane Group Flow (vph) 9 52 0 23 165 0 Shared Lane Traffic (%) Lane Group Flow (vph) 61 0 23 165 0 Lane Group Flow (vph) 61 0 0.23 165 0 Enter Blocked Intersection No No No No No Lane Alignment Left Right Left Left Right Median Width(m) 0.0 0.0 3.6 Link Offseit(m) 0.0 0.00 3.6 Link Offseit(m) 0.0 1.00 1.00 1.00 Link Offseit(m) 1.00 1.00 1.00 1.	
Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 9 52 0 23 165 0 Shared Lane Traffic (%)	
Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 9 52 0 23 165 0 Shared Lane Traffic (%)	
Peak Hour Factor 0.92	
Adj. Flow (vph) 9 52 0 23 165 0 Shared Lane Traffic (%) Lane Group Flow (vph) 61 0 0 23 165 0 Enter Blocked Intersection No No No No No Lane Alignment Left Right Left Right Median Width(m) 0.0 0.0 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 Turning Speed (k/h) 15 25 25 15 Sign Control Free Free Stop	
Shared Lane Traffic (%) Lane Group Flow (vph) 61 0 0 23 165 0 Enter Blocked Intersection No No No No No No Lane Alignment Left Right Left Left Left Right Median Width(m) 0.0 0.0 3.6 0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 Turning Speed (k/h) 15 25 25 15 5 Sign Control Free Free Stop 10	
Lane Group Flow (vph) 61 0 0 23 165 0 Enter Blocked Intersection No No No No No No Lane Alignment Left Right Left Left Left Left Right Median Width(m) 0.0 0.0 3.6	
Enter Blocked Intersection No Lane Alignment Left Right Left Left Right Right Left Left Right Right Left Left Right Right Left Left Right Right Left Right Left Right Left Right Left Left Right Left Right Left Left Right Left Left Right Left Right Right<	
Lane Alignment Left Right Left Left Left Right Median Width(m) 0.0 0.0 3.6 <t< td=""><td></td></t<>	
Median Width(m) 0.0 0.0 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane	
Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 Headway Factor 1.00 1.00 1.00 1.00 1.00 Turning Speed (k/h) 15 25 25 15 Sign Control Free Free Stop	
Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane	
Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 1.00 Turning Speed (k/h) 15 25 25 15 Sign Control Free Free Stop Intersection Summary	
Headway Factor 1.00 1.00 1.00 1.00 Turning Speed (k/h) 15 25 25 15 Sign Control Free Free Stop Intersection Summary Intersection Summary Intersection Summary Intersection Summary	
Turning Špeed (k/h) 15 25 25 15 Sign Control Free Free Stop Intersection Summary	
Sign Control Free Free Stop Intersection Summary	
Intersection Summary	
Area Type: Other	
Control Type: Unsignalized Intersection Capacity Utilization 18.5% ICU Level of Service A	

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis 4: Access 1 & Frances Avenue

06-14-2018

	-	\mathbf{r}	•	←	1	1
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	4Î			र्भ	Y	
Traffic Volume (veh/h)	8	48	0	21	152	0
Future Volume (Veh/h)	8	48	0	21	152	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	52	0	23	165	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			61		58	35
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			61		58	35
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		83	100
cM capacity (veh/h)			1542		949	1038
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	61	23	165			
Volume Left	0	0	165			
Volume Right	52	0	0			
cSH	1700	1542	949			
Volume to Capacity	0.04	0.00	0.17			
Queue Length 95th (m)	0.04	0.0	5.0			
Control Delay (s)	0.0	0.0	9.6			
Lane LOS	0.0	0.0	9.0 A			
	0.0	0.0	9.6			
Approach Delay (s)	0.0	0.0	9.6 A			
Approach LOS			A			
Intersection Summary						
Average Delay			6.4			
Intersection Capacity Utiliza	ation		18.5%	IC	U Level of	of Service
Analysis Period (min)			15			

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Total

Synchro 9 Report Page 9 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Total

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (vph)	9	56	22	0	173	0	71	0	0	0	0	21
Future Volume (vph)	9	56	22	0	173	0	71	0	0	0	0	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.966									0.865	
Flt Protected		0.995						0.950				
Satd. Flow (prot)	0	1790	0	0	1863	0	0	1770	0	0	1611	0
Flt Permitted		0.995						0.950				
Satd. Flow (perm)	0	1790	0	0	1863	0	0	1770	0	0	1611	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		53.8			44.7			33.3			43.2	
Travel Time (s)		3.9			3.2			2.4			3.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	61	24	0	188	0	77	0	0	0	0	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	95	0	0	188	0	0	77	0	0	23	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
)ther											
Control Type: Unsignalized												
Intersection Capacity Utilizati	on 29.4%			IC	U Level	of Service	A					

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations		÷.			4			\$			4	
Traffic Volume (veh/h)	9	56	22	0	173	0	71	0	0	0	0	2
Future Volume (Veh/h)	9	56	22	0	173	0	71	0	0	0	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	10	61	24	0.72	188	0	77	0	0	0	0.72	
Pedestrians		01	2.	Ū	100			Ū	Ū	Ū	Ū	
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)		NONC			None							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	188			85			304	281	73	281	293	1
vC1, stage 1 conf vol	100			60			304	201	73	201	293	- D
vC1, stage 1 confi vol												
vC2, stage 2 coni voi	188			85			304	281	73	281	293	1
tC, single (s)	4.1			60 4.1			7.1	6.5	6.2	7.1	293 6.5	6
	4.1			4.1			7.1	0.0	0.2	7.1	0.0	C
tC, 2 stage (s) tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3
	2.2							4.0			4.0	
p0 queue free %				100			88	100	100	100	100	0
cM capacity (veh/h)	1386			1512			627	623	989	668	613	8
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	95	188	77	23								
Volume Left	10	0	77	0								
Volume Right	24	0	0	23								
cSH	1386	1512	627	854								
Volume to Capacity	0.01	0.00	0.12	0.03								
Queue Length 95th (m)	0.2	0.0	3.3	0.7								
Control Delay (s)	0.9	0.0	11.5	9.3								
Lane LOS	А		В	A								
Approach Delay (s)	0.9	0.0	11.5	9.3								
Approach LOS			В	А								
Intersection Summary												
Average Delay			3.1									
Intersection Capacity Utiliza	tion		29.4%	IC	U Level o	f Service			А			
Analysis Period (min)			15									

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Total

Synchro 9 Report Page 11 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Total

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (vph)	19	87	22	0	265	0	70	0	0	0	0	42
Future Volume (vph)	19	87	22	0	265	0	70	0	0	0	0	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977									0.865	
Flt Protected		0.993						0.950				
Satd. Flow (prot)	0	1807	0	0	1863	0	0	1770	0	0	1611	0
Flt Permitted		0.993						0.950				
Satd. Flow (perm)	0	1807	0	0	1863	0	0	1770	0	0	1611	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		38.9			53.8			33.6			37.9	
Travel Time (s)		2.8			3.9			2.4			2.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	95	24	0	288	0	76	0	0	0	0	46
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	140	0	0	288	0	0	76	0	0	46	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
)ther											
Control Type: Unsignalized												
Intersection Capacity Utilizati	on 39.7%			IC	U Level	of Service	A					

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBF
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (veh/h)	19	87	22	0	265	0	70	0	0	0	0	4
Future Volume (Veh/h)	19	87	22	0	265	0	70	0	0	0	0	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph) Pedestrians	21	95	24	0	288	0	76	0	0	0	0	4
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	288			119			483	437	107	437	449	28
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	288			119			483	437	107	437	449	28
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.
p0 queue free %	98			100			83	100	100	100	100	9
cM capacity (veh/h)	1274			1469			458	505	947	523	497	75
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	140	288	76	46								
Volume Left	21	0	76	0								
Volume Right	24	0	0	46								
cSH	1274	1469	458	751								
Volume to Capacity	0.02	0.00	0.17	0.06								
Queue Length 95th (m)	0.4	0.0	4.7	1.6								
Control Delay (s)	1.3	0.0	14.4	10.1								
Lane LOS	A		В	В								
Approach Delay (s)	1.3	0.0	14.4	10.1								
Approach LOS			В	В								
Intersection Summary												
Average Delay			3.2									
Intersection Capacity Utilization	on		39.7%	IC	U Level o	I Service			A			

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Total

Synchro 9 Report Page 13 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2023 Total

Appendix "C" to Report PED19115 Page 160 of 314

Lane Group EBL EBT EBR WBL WBT WBR NBL NBT NBR SBL SBT Lane Configurations + <t< th=""><th>: Green Road & Fr</th><th></th><th>Avenu</th><th>e</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>00-</th><th>4-2018</th></t<>	: Green Road & Fr		Avenu	e								00-	4-2018
Lane Configurations 4 4 4 4 4 4 4 5 Traffic Volume (vph) 15 41 19 200 21 1 17 59 326 3 33 Future Volume (vph) 15 41 19 200 21 1 17 59 326 3 33 Future Volume (vph) 15 41 19 200 21 1 17 59 326 3 33 Ideal Flow (vphp) 1900 100 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 </th <th></th> <th>≯</th> <th>-</th> <th>\mathbf{r}</th> <th>1</th> <th>-</th> <th>*</th> <th>1</th> <th>†</th> <th>1</th> <th>1</th> <th>Ŧ</th> <th>-</th>		≯	-	\mathbf{r}	1	-	*	1	†	1	1	Ŧ	-
Traffic Volume (vph) 15 41 19 200 21 1 17 59 326 3 33 Future Volume (vph) 15 41 19 200 21 1 17 59 326 3 33 Ideal Flow (vph) 1900 100 1.00 1.00 1.00 <td< th=""><th>ane Group</th><th>EBL</th><th>EBT</th><th>EBR</th><th>WBL</th><th>WBT</th><th>WBR</th><th>NBL</th><th>NBT</th><th>NBR</th><th>SBL</th><th>SBT</th><th>SBR</th></td<>	ane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Future Volume (vph) 15 41 19 200 21 1 17 59 326 3 33 Ideal Flow (vphp) 1900	ane Configurations		\$			\$			¢			\$	
Ideal Flow (vphpl) 1900 <td>raffic Volume (vph)</td> <td>15</td> <td>41</td> <td>19</td> <td>200</td> <td>21</td> <td>1</td> <td>17</td> <td>59</td> <td>326</td> <td>3</td> <td>33</td> <td>4</td>	raffic Volume (vph)	15	41	19	200	21	1	17	59	326	3	33	4
Lane Util, Factor 1.00 <td>uture Volume (vph)</td> <td>15</td> <td>41</td> <td>19</td> <td>200</td> <td>21</td> <td>1</td> <td>17</td> <td>59</td> <td>326</td> <td>3</td> <td>33</td> <td>4</td>	uture Volume (vph)	15	41	19	200	21	1	17	59	326	3	33	4
Ped Bike Factor 0.965 0.999 0.890 0.987 Fit Protected 0.990 0.957 0.998 0.997 Satd. Flow (prot) 0 1815 0 0 1769 0 0 1688 0 0 1870 Satd. Flow (perm) 0 1815 0 0 1769 0 0 1688 0 0 1870 Link Speed (k/h) 50 50 50 50 50 50 50 50 12.0 Confl. Peds. (#/hr) 1 1 1 1 2 1 0 0	leal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Frt 0.965 0.999 0.890 0.987 Fil Protected 0.990 0.957 0.998 0.997 Satd. Flow (prot) 0 1815 0 0 1769 0 0 1688 0 0 187 Fil Permitted 0.990 0.957 0.998 0.997 0.997 0.998 0.997 Satd. Flow (perm) 0 1815 0 0 1769 0 0 1688 0 0 1870 Link Speed (k/h) 50	ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fit Protected 0.990 0.957 0.998 0.997 Satd. Flow (prot) 0 1815 0 0 1769 0 0 1688 0 0 1870 Fit Permitted 0.990 0.957 0.998 0.997 0.998 0.997 Satd. Flow (perm) 0 1815 0 0 1769 0 0 1688 0 0 1870 0.997 Satd. Flow (perm) 0 1815 0 0 1769 0 0 1688 0 0 1870 0.997 Satd. Flow (perm) 0 165.1 52.2 184.8 166.7 12.0 1 1 1 2 1	ed Bike Factor												
Satd. Flow (prot) 0 1815 0 0 1769 0 0 1688 0 0 1870 0.997 0.998 0.997 0.997 0.998 0.997 0.997 0.998 0.997 0.997 0.997 0.997 0.997 0.998 0.997 0.997 0.997 0.997 0.997 0.977 50 64.3 73 73 73 73 73 73 73 73 73 73 73 73 <td>rt</td> <td></td> <td>0.965</td> <td></td> <td></td> <td>0.999</td> <td></td> <td></td> <td>0.890</td> <td></td> <td></td> <td>0.987</td> <td></td>	rt		0.965			0.999			0.890			0.987	
Fit Permitted 0.990 0.957 0.998 0.997 Satd. Flow (perm) 0 1815 0 0 1769 0 0 1688 0 0 1870 Link Speed (k/h) 50 50 50 50 50 50 50 Link Distance (m) 165.1 52.2 184.8 166.7 12.0 Confl. Peds. (#/hr) 1 1 1 1 2 1 1 Peak Hour Factor 0.92	It Protected		0.990			0.957			0.998			0.997	
Satd. Flow (perm) 0 1815 0 0 1769 0 0 1688 0 0 1870 Link Speed (k/h) 50	atd. Flow (prot)	0	1815	0	0	1769	0	0	1688	0	0	1870	0
Link Speed (k/h) 50 50 50 50 50 50 Link Distance (m) 165.1 52.2 184.8 166.7 Travel Time (s) 11.9 3.8 13.3 12.0 Confl. Peds (#/hr) 1 1 1 2 1 1 Peak Hour Factor 0.92 <td< td=""><td>It Permitted</td><td></td><td>0.990</td><td></td><td></td><td>0.957</td><td></td><td></td><td>0.998</td><td></td><td></td><td>0.997</td><td></td></td<>	It Permitted		0.990			0.957			0.998			0.997	
Link Distance (m) 165.1 52.2 184.8 166.7 Travel Time (s) 11.9 3.8 13.3 12.0 Confl. Peds. (#/hr) 1 1 1 2 1 1 Peak Hour Factor 0.92	atd. Flow (perm)	0	1815	0	0	1769	0	0	1688	0	0	1870	0
Travel Time (s) 11.9 3.8 13.3 12.0 Confl. Peds. (#/hr) 1 1 1 1 2 1 1 Peak Hour Factor 0.92 0	ink Speed (k/h)								50			50	
Confl. Peds. (#/hr) 1 1 1 1 2 1 1 Peak Hour Factor 0.92	ink Distance (m)		165.1			52.2			184.8			166.7	
Peak Hour Factor 0.92	ravel Time (s)		11.9			3.8			13.3			12.0	
Heavy Vehicles (%) 0% 0	onfl. Peds. (#/hr)	1		1	1		1	2		1	1		2
Adj. Flow (vph) 16 45 21 217 23 1 18 64 354 3 36 Shared Lane Trafic (%) Lane Group Flow (vph) 0 82 0 0 241 0 0 436 0 0 43 Inter Blocked Intersection No No <t< td=""><td>eak Hour Factor</td><td>0.92</td><td>0.92</td><td>0.92</td><td>0.92</td><td>0.92</td><td>0.92</td><td>0.92</td><td>0.92</td><td>0.92</td><td>0.92</td><td>0.92</td><td>0.92</td></t<>	eak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%) 0 13 Enter Blocked Intersection No	leavy Vehicles (%)	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Lane Group Flow (vph) 0 82 0 0 241 0 0 436 0 0 433 Enter Blocked Intersection No No <td>.dj. Flow (vph)</td> <td>16</td> <td>45</td> <td>21</td> <td>217</td> <td>23</td> <td>1</td> <td>18</td> <td>64</td> <td>354</td> <td>3</td> <td>36</td> <td>4</td>	.dj. Flow (vph)	16	45	21	217	23	1	18	64	354	3	36	4
Enter Blocked Intersection No No <th< td=""><td>hared Lane Traffic (%)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>	hared Lane Traffic (%)												
Lane Alignment Left Left Right Left Right Left Right Left Left <td></td> <td></td> <td>82</td> <td></td> <td></td> <td>241</td> <td></td> <td></td> <td>436</td> <td></td> <td>0</td> <td>43</td> <td>0</td>			82			241			436		0	43	0
Median Width(m) 0.0 0.0 3.6 3.6 Link Offset(m) 0.0 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1	nter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Link Offset(m) 0.0 0.0 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 4.8 4.8 Two way Left Turn Lane	ane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Crosswalk Width(m) 4.8 4.8 4.8 4.8 4.8 Two way Left Turn Lane	ledian Width(m)		0.0			0.0			3.6			3.6	
Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.0	ink Offset(m)		0.0			0.0			0.0			0.0	
Headway Factor 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.0	rosswalk Width(m)		4.8			4.8			4.8			4.8	
Turning Speed (k/h) 25 15 25 15 25 15 25 Sign Control Stop Stop Free Free Intersection Summary Area Type: Other	wo way Left Turn Lane												
Sign Control Stop Stop Free Free Intersection Summary Area Type: Other	leadway Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Area Type: Other	urning Speed (k/h)	25		15	25		15	25		15	25		15
Area Type: Other	ign Control		Stop			Stop			Free			Free	
Control Type: Unsignalized		Other											
Intersection Capacity Utilization 53.7% ICU Level of Service A	ntersection Capacity Utilizati	ion 53.7%			IC	CU Level (of Service	e A					

	≯	→	\mathbf{r}	1	-	•	٩.	1	1	1	Ŧ	-
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (veh/h)	15	41	19	200	21	1	17	59	326	3	33	
Future Volume (Veh/h)	15	41	19	200	21	1	17	59	326	3	33	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	16	45	21	217	23	1	18	64	354	3	36	
Pedestrians		2			1			1			1	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	336	501	41	366	326	243	42			419		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	336	501	41	366	326	243	42			419		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	90	98	59	96	100	99			100		
cM capacity (veh/h)	593	467	1033	526	586	799	1577			1150		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	82	241	436	43								
Volume Left	16	217	18	3								
Volume Right	21	1	354	4								
cSH	571	532	1577	1150								
Volume to Capacity	0.14	0.45	0.01	0.00								
Queue Length 95th (m)	4.0	18.7	0.3	0.1								
Control Delay (s)	12.4	17.3	0.4	0.6								
Lane LOS	В	С	A	А								
Approach Delay (s)	12.4	17.3	0.4	0.6								
Approach LOS	В	С										
Intersection Summary												
Average Delay			6.7									
Intersection Capacity Utiliza Analysis Period (min)	tion		53.7% 15	IC	U Level o	of Service			A			

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Total

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Total

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Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	٦	1	ĥ		۲	1	
Traffic Volume (vph)	252	926	459	149	94	158	
Future Volume (vph)	252	926	459	149	94	158	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	120.0			0.0	40.0	0.0	
Storage Lanes	1			0	1	1	
Taper Length (m)	7.5				7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt			0.967			0.850	
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1805	1881	1737	0	1770	1615	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1805	1881	1737	0	1770	1615	
Link Speed (k/h)		80	80		50		
Link Distance (m)		123.4	826.3		184.8		
Travel Time (s)		5.6	37.2		13.3		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	0%	1%	7%	2%	2%	0%	
Adj. Flow (vph)	274	1007	499	162	102	172	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	274	1007	661	0	102	172	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Vedian Width(m)		3.6	3.6	Ŭ	3.6	Ŭ	
Link Offset(m)		0.0	0.0		0.0		
Crosswalk Width(m)		4.8	4.8		4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25			15	25	15	
Sign Control		Free	Free		Stop		
Intersection Summary							
	Other						
Control Type: Unsignalized							
Intersection Capacity Utilizati	ion 62.4%			IC	U Level	of Service	B

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		-		<u>`</u>		-	
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	٦	↑	4Î		<u>۲</u>	1	
Traffic Volume (veh/h)	252	926	459	149	94	158	
Future Volume (Veh/h)	252	926	459	149	94	158	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	274	1007	499	162	102	172	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None	None				
Median storage veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	661				2135	580	
vC1, stage 1 conf vol	001				2100	500	
vC2, stage 2 conf vol							
vCu, unblocked vol	661				2135	580	
tC, single (s)	4.1				6.4	6.2	
tC, 2 stage (s)	1.1				0.1	0.2	
tF (s)	2.2				3.5	3.3	
p0 queue free %	71				0	67	
cM capacity (veh/h)	937				38	518	
		50.0		CD 1		510	
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2		
Volume Total	274	1007	661	102	172		
Volume Left	274	0	0	102	0		
Volume Right	0	0	162	0	172		
cSH	937	1700	1700	38	518		
Volume to Capacity	0.29	0.59	0.39	2.66	0.33		
Queue Length 95th (m)	9.8	0.0	0.0	90.7	11.5		
Control Delay (s)	10.4	0.0	0.0	975.9	15.4		
Lane LOS	В			F	С		
Approach Delay (s)	2.2		0.0	373.0			
Approach LOS				F			
Intersection Summary							
Average Delay			47.4				
Intersection Capacity Utiliza	ition		62.4%	IC	U Level o	of Service	В
Analysis Period (min)			15				

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Total

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Total

HCM Unsignalized Intersection Capacity Analysis

3: North Service Ro	ad & IV	Illien F	koad				06-14-2018	3: North Service F	toau & i	Villien	Road					(
	≯	+	Ļ	•	1	∢			≯	+	Ļ	•	1	1		
ane Group	EBL	EBT	WBT	WBR	SBL	SBR		Lane Group	EBL	EBT	WBT	WBR	SBL	SBR		
ane Configurations	5	*	ĥ		N	1		Permitted Phases	2					4		
raffic Volume (vph)	243	776	239	82	92	369		Detector Phase	2	2	6		4	4		
uture Volume (vph)	243	776	239	82	92	369		Switch Phase	-	-	0					
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900		Minimum Initial (s)	20.0	20.0	20.0		10.0	10.0		
Storage Length (m)	85.0	1700	1700	0.0	50.0	0.0		Minimum Split (s)	26.0	26.0			24.0	24.0		
Storage Lanes	1			0.0	1	1		Total Split (s)	46.0				24.0	24.0		
	7.5			0	7.5	I		Total Split (%)	65.7%				34.3%	34.3%		
Taper Length (m)	1.00	1.00	1.00	1 00	1.00	1.00										
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		Maximum Green (s)	40.0	40.0			18.0	18.0		
Frt	0.050		0.966		0.050	0.850		Yellow Time (s)	4.0	4.0			4.0	4.0		
Fit Protected	0.950	1010	4700		0.950	1500		All-Red Time (s)	2.0				2.0	2.0		
Satd. Flow (prot)	1805	1863	1782	0	1805	1583		Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		
It Permitted	0.535				0.950			Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0		
Satd. Flow (perm)	1016	1863	1782	0	1805	1583		Lead/Lag								
Right Turn on Red				Yes		Yes		Lead-Lag Optimize?								
Satd. Flow (RTOR)			41			401		Vehicle Extension (s)	3.0		3.0		3.0	3.0		
_ink Speed (k/h)		80	80		50			Recall Mode	C-Max	C-Max	C-Max		Max	Max		
ink Distance (m)		826.3	260.0		127.1			Walk Time (s)	7.0	7.0	7.0		7.0	7.0		
Fravel Time (s)		37.2	11.7		9.2			Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		Pedestrian Calls (#/hr)	0	0	0		0	0		
Heavy Vehicles (%)	0%	2%	4%	0%	0%	2%		Act Effct Green (s)	40.0	40.0	40.0		18.0	18.0		
Adj. Flow (vph)	264	843	260	89	100	401		Actuated g/C Ratio	0.57	0.57	0.57		0.26	0.26		
Shared Lane Traffic (%)	201	0.10	200	07	100	101		v/c Ratio	0.46	0.79			0.22	0.57		
ane Group Flow (vph)	264	843	349	0	100	401		Control Delay	11.9	18.9	8.0		22.0	6.2		
Enter Blocked Intersection	No	No	No	No	No	No		Queue Delay	0.0	0.0			0.0	0.0		
ane Alignment	Left	Left	Left	Right	Left	Right		Total Delay	11.9	18.9	8.0		22.0	6.2		
Median Width(m)	Leit	3.6	3.6	Right	3.6	Nghi		LOS	B				22.0 C	A		
_ink Offset(m)		0.0	0.0		0.0			Approach Delay	D	17.2	8.0		9.3	A		
Crosswalk Width(m)		4.8	4.8		4.8			Approach LOS		В	A		А			
Two way Left Turn Lane	4.00	1.00	1 0 0	1 00	1 00	4.00		Intersection Summary								
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00		Area Type:	Other							
urning Speed (k/h)	25			15	25	15		Cycle Length: 70	Other							
lumber of Detectors	1	2	2		1	1		Actuated Cycle Length: 7	n							
Detector Template	Left	Thru	Thru		Left	Right		Offset: 0 (0%), Reference		FRTLa	nd 6·W/RT	Start of G	roon			
eading Detector (m)	2.0	10.0	10.0		2.0	2.0		Natural Cycle: 60	a to pridate z		a 0.001,	Junior	JIGGIT			
railing Detector (m)	0.0	0.0	0.0		0.0	0.0		Control Type: Actuated-C	oordinatod							
etector 1 Position(m)	0.0	0.0	0.0		0.0	0.0		Maximum v/c Ratio: 0.79	oorumateu							
etector 1 Size(m)	2.0	0.6	0.6		2.0	2.0			12.4			1-1	torcotic	1 LOS: B		
etector 1 Type	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex		Intersection Signal Delay:		,						
etector 1 Channel								Intersection Capacity Utili	zation 59.2%	0		IC	U Level	of Service B		
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0		Analysis Period (min) 15								
etector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0				. .						
etector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0		Splits and Phases: 3: N	Iorth Service	e Road &	Millen Roa	ad				
etector 2 Position(m)		9.4	9.4					Ø2 (R)							<^ ₩ Ø4	
etector 2 Size(m)		0.6	0.6										_		- 104	
Detector 2 Type		CI+Ex	CI+Ex					46 s							215	
etector 2 Channel		SHEA	SILLA					Ø6 (R)								
Detector 2 Extend (s)		0.0	0.0					46 s								
	Perm	NA	NA		Prot	Perm										
urn Type	Penn				Prot 4	reilli										
rotected Phases		2	6		4											

Synchro 9 Report Page 5 Synchro 9 Report Page 6

	٠	-	+	1	-	
Lane Group	EBL	EBT	WBT	SBL	SBR	
Lane Group Flow (vph)	264	843	349	100	401	
v/c Ratio	0.46	0.79	0.34	0.22	0.57	
Control Delay	11.9	18.9	8.0	22.0	6.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	11.9	18.9	8.0	22.0	6.2	
Queue Length 50th (m)	19.0	82.2	19.9	10.8	0.0	
Queue Length 95th (m)	36.7	#134.4	34.5	22.5	19.7	
Internal Link Dist (m)		802.3	236.0	103.1		
Turn Bay Length (m)	85.0			50.0		
Base Capacity (vph)	580	1064	1035	464	704	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.46	0.79	0.34	0.22	0.57	

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

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Total

Synchro 9 Report Page 7

HCM Signalized Inte	ersectio	on Cap	acity A	Analysi	s		
3: North Service Roa	ad & M	illen R	oad				
	۶	+	+	*	1	∢	
	501	COT	LUD T	1100	0.01	000	

Traffic Volume (vph) 243 776 239 82 92 369 Future Volume (vph) 243 776 239 82 92 369 Ideal Flow (vph) 1900 1900 1900 1900 1900 1900 Total Lost time (s) 6.0 6.0 6.0 6.0 6.0 Lane Util Factor 1.00 1.00 1.00 1.00 0.85 Fit Fit Protected 0.95 1.00 1.00 0.95 1.00 Stat Flow (prot) 1805 1863 1782 1805 1583 Fit Permitted 0.53 1.00 1.00 0.95 1.00 Stat Flow (perm) 1016 1863 1782 1805 1583 Peak-hour factor, PHF 0.92<	Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Future Volume (vph) 243 776 239 82 92 369 Ideal Flow (vphpl) 1900 1900 1900 1900 1900 1900 Total Lost time (s) 6.0 6.0 6.0 6.0 6.0 a.0 Lane Util. Factor 1.00 1.00 1.00 0.97 1.00 0.85 Fil Protected 0.95 1.00 1.00 0.95 1.00 Satd. Flow (port) 1805 1883 TR82 1805 1583 Fil Permitted 0.53 1.00 1.00 0.92 </td <td>Lane Configurations</td> <td>ľ</td> <td>•</td> <td>ĥ</td> <td></td> <td>ľ</td> <td>1</td> <td></td> <td></td>	Lane Configurations	ľ	•	ĥ		ľ	1		
Ideal Flow (vphpl) 1900 1900 1900 1900 1900 Total Lost time (s) 6.0 6.0 6.0 6.0 1.00 Lane Util. Factor 1.00 1.00 1.00 1.00 1.00 1.00 Frt 1.00 1.00 0.97 1.00 0.85 1.00 Stat. Flow (prol) 1805 1863 1782 1805 1583 Flow (prol) 1805 1863 1782 1805 1583 Flow (prol) 1016 1863 1782 1805 1583 Flow (prol) 1016 1863 1782 1805 1583 Flow (prol) 264 843 260 89 100 401 RTCOR Reduction (vph) 0 18 0 0 298 Lane Group Flow (vph) 264 843 331 0 100 103 Heavy Vehicles (%) 0% 2% 4% 0% 0% 2% Tum Type Perm NA Prot Perm Permited Phases 2 6 4 4 C C C C C C C C	Traffic Volume (vph)	243	776	239	82	92	369		
Total Lost time (s) 6.0 6.0 6.0 6.0 6.0 Lane Util, Factor 1.00 1.00 1.00 1.00 1.00 Fit Protected 0.95 1.00 0.097 1.00 0.855 Fit Protected 0.95 1.00 1.00 0.955 1.00 Satd. Flow (prot) 1805 1863 1782 1805 1583 Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 264 843 260 89 100 401 RTOR Reduction (vph) 0 18 0 298 103 Lane Group Flow (vph) 264 843 331 0 100 103 Heavy Vehicles (%) 0% 2% 4 Actuated Green, G (s) 4.0.0 4.0.0 4.0.0 Actuated Green, G (s) 40.0 40.0 4.0.0 4.0.0 4.0.0 4.0.0 Actuated Green, G (s) 4.0.0 4.0.0 4.0.0 4.0.0 4.0.0 4.0.0 4.0.0 4.0.0 4.0.0 <td< td=""><td>Future Volume (vph)</td><td>243</td><td>776</td><td>239</td><td>82</td><td>92</td><td>369</td><td></td><td></td></td<>	Future Volume (vph)	243	776	239	82	92	369		
Lane Util. Factor 1.00 1.00 1.00 1.00 1.00 0.85 Fit Protected 0.95 1.00 1.00 0.97 1.00 0.85 Fit Protected 0.95 1.00 1.00 0.95 1.00 Satd. Flow (port) 1805 1863 1782 1805 1583 Fit Permitted 0.53 1.00 1.00 0.95 1.00 Satd. Flow (perm) 1016 1863 1782 1805 1583 Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 AdJ. Flow (yph) 264 843 260 89 100 401 RTOR Reduction (yph) 0 0 18 0 298 Lane Group Flow (yph) 264 843 331 0 100 103 Heavy Vehicles (%) 0% 2% 4% 0% 0% 2% Turn Type Perm NA NA Prot Perm Protected Phases 2 6 4 Permitted Phases 2 6 4 Permitted Phases 2 4 4 Actuated Green, G (s) 40.0 40.0 40.0 18.0 18.0 Effective Green, g (s) 40.0 40.0 40.0 18.0 18.0 Lane Grp Cap (yph) 580 1064 1018 464 407 v/s Ratio Prot c0.45 0.19 0.06 v/s Ratio Prot c0.45 0.19 0.06 Incremental Delay, d1 8.7 11.7 7.9 20.4 20.7 Progression Factor 1.00 1.00 1.00 1.00 Incremental Delay, d2 2.6 6.1 0.9 1.1 1.5 Delay (s) 11.3 17.8 8.7 22.2 Level of Service B A C C Approach Leay (s) 16.2 8.7 22.0 Approach Leay (s) 16.4 HCM 2000 Level of Service B HCM 2000 Control Delay 16.4 HCM 2000 Level of Service B HCM 2000 Control Delay 16.4 HCM 2000 Level of Service B Analysis Period (min) 15	Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Frt 1.00 1.00 0.97 1.00 0.85 Fil Protected 0.95 1.00 1.00 0.95 1.00 Satd. Flow (prot) 1805 1863 1782 1805 1583 Fil Permitted 0.53 1.00 1.00 0.95 1.00 Satd. Flow (perm) 1016 1863 1782 1805 1583 Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 264 843 260 89 100 401 RTOR Reduction (vph) 0 0 18 0 298 28 Lane Group Flow (vph) 264 843 331 0 100 103 Heavy Vehicles (%) 0% 2% 4% 0% 0% 2% Protected Phases 2 6 4 4 4 Actuated Green, G (s) 40.0 40.0 18.0 18.0 18.0 Effective Green, g (s) 40.0 40.0 18.0 18.0 18.0 <td< td=""><td>Total Lost time (s)</td><td>6.0</td><td>6.0</td><td>6.0</td><td></td><td>6.0</td><td>6.0</td><td></td><td></td></td<>	Total Lost time (s)	6.0	6.0	6.0		6.0	6.0		
Fit Protected 0.95 1.00 1.00 0.95 1.00 Satd. Flow (prot) 1805 1782 1805 1583 Fit Permitted 0.53 1.00 1.00 0.95 1.00 Satd. Flow (perm) 1016 1863 1782 1805 1583 Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 264 843 260 89 100 401 RTOR Reduction (vph) 0 0 18 0 0 298 Lane Group Flow (vph) 264 843 331 0 100 103 Heavy Vehicles (%) 0% 2% 4% 0% 0% 2% Tum Type Perm NA NA Prot Perm Perm Protected Phases 2 6 4	Lane Util. Factor	1.00	1.00	1.00		1.00	1.00		
Satd. Flow (prot) 1805 1863 1782 1805 1583 FIP Permitted 0.53 1.00 1.00 0.95 1.00 Satd. Flow (perm) 1016 1863 1782 1805 1583 Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 264 843 260 89 100 401 RTOR Reduction (vph) 0 18 0 292 0.92 Lane Group Flow (vph) 264 843 331 0 100 103 Heavy Vehicles (%) 0% 2% 4 4 4 Actuated Green, G (s) 40.0 40.0 40.0 40.0 40.0 Actuated green, g (s) 40.0 40.0 40.0 18.0 18.0 Effective Green, g (s) 40.0 40.0 18.0 18.0 18.0 Larea Grop Cap (vph) 580 1064 1018 464 407 v/s Ratio Port c0.45 0.19 0.06 v/s Ratio Port c0.45 0.19 0.1 <td>Frt</td> <td>1.00</td> <td>1.00</td> <td>0.97</td> <td></td> <td>1.00</td> <td>0.85</td> <td></td> <td></td>	Frt	1.00	1.00	0.97		1.00	0.85		
Fit Permitted 0.53 1.00 1.00 0.95 1.00 Satd. Flow (perm) 1016 1863 1782 1805 1583 Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 Adj. Flow (ych) 264 843 260 89 100 401 RTOR Reduction (yph) 0 0 18 0 298 298 Lane Group Flow (yph) 264 843 331 0 100 103 Heavy Vehicles (%) 0% 2% 4% 0% 0% 2% Urm Type Perm NA NA Prot Perm Protected Phases 2 6 4 4 Actutated Green, G (s) 40.0 40.0 18.0 18.0 Actutated g/C Ratio 0.57 0.57 0.26 0.26 Clearance Time (s) 6.0 6.0 6.0 6.0 Vehicle Extension (s) 3.0 3.0 3.0 3.0 3.0 Lane Grop Cap (vph) 580 1064 1018 46	Flt Protected	0.95	1.00	1.00		0.95	1.00		
Satd. Flow (perm) 1016 1863 1782 1805 1583 Peak-hour factor, PHF 0.92	Satd. Flow (prot)	1805	1863	1782		1805	1583		
Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 264 843 260 89 100 401 RTOR Reduction (vph) 0 18 0 0 298 Lane Group Flow (vph) 264 843 331 0 100 103 Heavy Vehicles (%) 0% 2% 4% 0% 0% 2% Tum Type Perm NA NA Prot Perm Protected Phases 2 6 4 4 Protected Phases 2 4 4 4 Actuated Green, G (s) 40.0 40.0 18.0 18.0 18.0 Clearance Time (s) 6.0 6.0 6.0 6.0 Coloc Coloc Vehicle Extension (s) 3.0 3.0 3.0 3.0 3.0 3.0 Lane Grp Cap (vph) 580 1064 1018 464 407 V/s Ratio Prot Colo Kotao <	Flt Permitted	0.53	1.00	1.00		0.95	1.00		
Adj. Flow (vph) 264 843 260 89 100 401 RTOR Reduction (vph) 0 0 18 0 0 298 Lane Group Flow (vph) 264 843 331 0 100 103 Heary Vehicles (%) 0% 2% 4% 0% 0% 2% Turn Type Perm NA NA Prot Perm Protected Phases 2 6 4 Permitted Phases 2 6 4 Actuated Green, G (S) 40.0 40.0 18.0 18.0 Effective Green, g (S) 40.0 40.0 18.0 18.0 Actuated g/C Ratio 0.57 0.57 0.26 0.26 Clearance Time (S) 6.0 6.0 6.0 6.0 Vehicle Extension (S) 3.0 3.0 3.0 3.0 3.0 Lane Grp Cap (vph) 580 1064 1018 464 407 v/s Ratio Perm 0.26 c0.07 v/c Ratio 0.46 0.79 0.33 0.22 0.25 <td>Satd. Flow (perm)</td> <td>1016</td> <td>1863</td> <td>1782</td> <td></td> <td>1805</td> <td>1583</td> <td></td> <td></td>	Satd. Flow (perm)	1016	1863	1782		1805	1583		
RTOR Reduction (vph) 0 0 18 0 0 298 Lane Group Flow (vph) 264 843 331 0 100 103 Heavy Vehicles (%) 0% 2% 4% 0% 0% 2% Tum Type Perm NA NA Prot Perm Protected Phases 2 6 4 4 Actuated Green, G (s) 40.0 40.0 18.0 18.0 Effective Green, g (s) 40.0 40.0 18.0 18.0 Clearance Time (s) 6.0 6.0 6.0 6.0 Clearance Time (s) 6.0 6.0 6.0 6.0 Lane Gro Cap (vph) 580 1064 1018 464 407 v/s Ratio Prot c0.45 0.19 0.06 .0 0.07 v/c Ratio 0.46 0.79 0.33 0.22 0.25 Uniform Delay, d1 8.7 11.7 7.9 20.4 20.7 Progression Factor 1.00	Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Lane Group Flow (vph) 264 843 331 0 100 103 Heavy Vehicles (%) 0% 2% 4% 0% 0% 2% Tum Type Perm NA NA Prot Perm Protected Phases 2 6 4 Permilted Phases 2 6 4 Permilted Phases 2 6 4 Actuated Green, G (s) 40.0 40.0 18.0 18.0 Actuated Green, G (s) 40.0 40.0 18.0 18.0 Actuated Green, G (s) 6.0 6.0 6.0 6.0 Clearance Time (s) 6.0 6.0 6.0 6.0 Vehicle Extension (s) 3.0 3.0 3.0 3.0 3.0 Verial Ratio Prot c.0.45 0.19 0.06	Adj. Flow (vph)	264	843	260	89	100	401		
Heavy Vehicles (%) 0% 2% 4% 0% 0% 2% Tum Type Perm NA NA NA Prot Perm Protected Phases 2 6 4 Perm Perm Permitted Phases 2 4 Actuated Green, G (s) 40.0 40.0 18.0 18.0 Effective Green, g (s) 40.0 40.0 18.0 18.0 Actuated Green, G (s) 40.0 40.0 40.0 18.0 18.0 Catuated g/C Ratio 0.57 0.57 0.26 0.26 Cctearance Time (s) 6.0 6.0 6.0 6.0 Co.07 V/s Ratio Prot c.0.45 0.19 0.06 V/s Ratio Prot v/s Ratio Prot c.0.07 V/s Ratio Prot 0.26 c.007 V/s Ratio Prot c.0.45 0.19 0.06 V/s Ratio Prot v/s Ratio Prot c.0.07 V/s Ratio Prot v/s Ratio Prot c.0.07 V/s Ratio Prot v/s Ratio Prot 0.06 V/s Ratio Prot v/s Ratio Prot 0.026 C.07 V/s Ratio Prot	RTOR Reduction (vph)	0	0	18	0	0	298		
Heavy Vehicles (%) 0% 2% 4% 0% 0% 2% Turn Type Perm NA NA Prot Perm Perm Probected Phases 2 6 4 Perm Perm <td< td=""><td>Lane Group Flow (vph)</td><td>264</td><td>843</td><td>331</td><td>0</td><td>100</td><td>103</td><td></td><td></td></td<>	Lane Group Flow (vph)	264	843	331	0	100	103		
Protected Phases 2 6 4 Permitted Phases 2 4 Actuated Green, G (s) 40.0 40.0 18.0 Effective Green, g (s) 40.0 40.0 18.0 Actuated g/C Ratio 0.57 0.57 0.26 0.26 Clearance Time (s) 6.0 6.0 6.0 6.0 6.0 Vehicle Extension (s) 3.0 3.0 3.0 3.0 3.0 3.0 Lane Grp Cap (vph) 580 1064 1018 464 407 v/s Ratio Prot c0.45 0.19 0.06 v/c/c/c/c/c/c/c/c/c/c/c/c/c/c/c/c/c/c/c	Heavy Vehicles (%)	0%	2%	4%	0%	0%	2%		
Protected Phases 2 6 4 Permitted Phases 2 4 Actuated Green, G (s) 40.0 40.0 18.0 Effective Green, g (s) 40.0 40.0 18.0 Actuated g/C Ratio 0.57 0.57 0.26 0.26 Clearance Time (s) 6.0 6.0 6.0 6.0 6.0 Vehicle Extension (s) 3.0 3.0 3.0 3.0 3.0 3.0 Lane Grp Cap (vph) 580 1064 1018 464 407 v/s Ratio Prot c0.45 0.19 0.06 v/c/c/c/c/c/c/c/c/c/c/c/c/c/c/c/c/c/c/c	Turn Type	Perm	NA	NA		Prot	Perm		
Permitted Phases 2 4 Actuated Green, G (s) 40.0 40.0 18.0 18.0 Actuated Green, G (s) 40.0 40.0 40.0 18.0 18.0 Actuated GV Ratio 0.57 0.57 0.26 26 Clearance Time (s) 6.0 6.0 6.0 6.0 40.0 Vehicle Extension (s) 3.0 3.0 3.0 3.0 3.0 3.0 Lane Grp Cap (vph) 580 1064 1018 464 407 v/s Ratio Perm 0.26 0.45 0.19 0.06 v/s Ratio Perm 0.26 0.07 v/s Ratio Perm 0.26 0.19 0.06 v/s Ratio Perm 0.26 0.07 v/s Ratio Perm 0.26 0.19 0.06 v/s Ratio Perm 0.26 0.07 v/s Ratio Perm 0.26 0.100 1.00 1.00 1.00 1.00 Incremental Delay, d1 8.7 1.1.7 7.9 20.4 20.7 Progression Factor<	Protected Phases		2	6		4			
Effective Green, g (s) 40.0 40.0 40.0 18.0 18.0 Actuated g/C Ratio 0.57 0.57 0.57 0.26 0.26 Clearance Time (s) 6.0 6.0 6.0 6.0 6.0 Vehicle Extension (s) 3.0 3.0 3.0 3.0 3.0 Lane Grp Cap (vph) 580 1064 1018 464 407 v/s Ratio Prot c0.45 0.19 0.06 v/v/v/v/v/v/v/v/v/v/v/v/v/v/v/v/v/v/v/	Permitted Phases	2					4		
Actuated g/C Ratio 0.57 0.57 0.26 0.26 Clearance Time (s) 6.0 6.0 6.0 6.0 6.0 Vehicle Extension (s) 3.0 3.0 3.0 3.0 3.0 3.0 Lane Grp Cap (vph) 580 1064 1018 464 407 v/s Ratio Perm 0.26 c0.07	Actuated Green, G (s)	40.0							
Clearance Time (s) 6.0 6.0 6.0 6.0 6.0 6.0 Vehicle Extension (s) 3.0 3.0 3.0 3.0 3.0 3.0 Lane Grp Cap (vph) 580 1064 1018 464 407 v/s Ratio Perm 0.26 c0.07 c0.07 v/c Ratio 0.46 0.79 0.33 0.22 0.25 Uniform Delay, d1 8.7 11.7 7.9 20.4 20.7 Progression Factor 1.00 1.00 1.00 1.00 1.00 Incremental Delay, d2 2.6 6.1 0.9 1.1 1.5 Delay (s) 11.3 17.8 8.7 21.5 22.2 Level of Service B B A C C Approach LOS B A C C Approach LOS B A C Intersection Summary 16.4 HCM 2000 Level of Service B A C Actuated Cycle Length (s) 70.0	Effective Green, g (s)	40.0	40.0	40.0		18.0	18.0		
Vehicle Extension (s) 3.0 3.0 3.0 3.0 3.0 3.0 3.0 Lane Grp Cap (vph) 580 1064 1018 464 407 v/s Ratio Prot c0.45 0.19 0.06	Actuated g/C Ratio	0.57	0.57	0.57		0.26	0.26		
Lane Grp Cap (vph) 580 1064 1018 464 407 v/s Ratio Prot c0.45 0.19 0.06 c0.07 v/s Ratio Perm 0.26 c0.07 v/s Ratio 0.04 0.07 v/s Ratio 0.25 v/s Ratio 0.10 1.07 v/s Ratio 0.25 v/s Ratio 0.25 v/s Ratio 0.10 1.00	Clearance Time (s)	6.0							
w/s Ratio Prot c0.45 0.19 0.06 w/s Ratio Perm 0.26 c0.07 w/s Ratio Perm 0.26 c0.07 w/c Ratio 0.46 0.79 0.33 0.22 0.25 Uniform Delay, d1 8.7 11.7 7.9 20.4 20.7 Progression Factor 1.00 1.00 1.00 1.00 1.00 Incremental Delay, d2 2.6 6.1 0.9 1.1 1.5 Delay (s) 11.3 17.8 8.7 21.5 22.2 Level of Service B B A C C Approach Delay (s) 16.2 8.7 22.0 Approach Delay (s) 16.4 HCM 2000 Level of Service B HCM 2000 Control Delay 16.4 HCM 2000 Level of Service B HCM 2000 Level of Service B HCM 2000 Volume to Capacity ratio 0.62 - - - Actuated Cycle Length (s) 70.0 Sum of lost time (s) 12.0 Intersection Capacity Utilization 59.2% ICU Level of Service B	Vehicle Extension (s)	3.0	3.0	3.0		3.0			
v/s Ratio Perm 0.26 c0.07 v/c Ratio 0.46 0.79 0.33 0.22 0.25 Uniform Delay, d1 8.7 11.7 7.9 20.4 20.7 Progression Factor 1.00 1.00 1.00 1.00 1.00 Incremental Delay, d2 2.6 6.1 0.9 1.1 1.5 Delay (s) 11.3 17.8 8.7 21.5 22.2 Level of Service B B A C C Approach Delay (s) 16.2 8.7 22.0 Approach Delay Approach Delay E HCM 2000 Control Delay 16.4 HCM 2000 Level of Service B B HCM 2000 Volume to Capacity ratio 0.62 - - - Intersection Capacity (si) 70.0 Sum of lost time (s) 12.0 12.0 Intersection Capacity (tilization 59.2% ICU Level of Service B B	Lane Grp Cap (vph)	580		1018			407		
v/c Ratio 0.46 0.79 0.33 0.22 0.25 Uniform Delay, d1 8.7 11.7 7.9 20.4 20.7 Progression Factor 1.00 1.00 1.00 1.00 1.00 Incremental Delay, d2 2.6 6.1 0.9 1.1 1.5 Delay (s) 11.3 17.8 8.7 21.5 22.2 Level of Service B B A C C Approach Delay (s) 16.2 8.7 22.0 Approach LOS B A C Intersection Summary 16.4 HCM 2000 Level of Service B B C Intersection Summary 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 13.5 12.0 12.0 12.0 12.0 15.5 12.0 12.0 12.0 12.0 12.0 12.0	v/s Ratio Prot		c0.45	0.19		0.06			
Uniform Delay, d1 8.7 11.7 7.9 20.4 20.7 Progression Factor 1.00 1.00 1.00 1.00 1.00 Incremental Delay, d2 2.6 6.1 0.9 1.1 1.5 Delay (s) 11.3 17.8 8.7 21.5 22.2 Level of Service B B A C C Approach Delay (s) 16.2 8.7 22.0 Intersection Summary HCM 2000 Control Delay 16.4 HCM 2000 Level of Service B HCM 2000 Control Delay 0.62 C C Actuated Cycle Length (s) 70.0 Sum of lost time (s) 12.0 Intersection Capacity Utilization 59.2% ICU Level of Service B	v/s Ratio Perm	0.26							
Progression Factor 1.00 1.00 1.00 1.00 1.00 Incremental Delay, d2 2.6 6.1 0.9 1.1 1.5 Delay (s) 11.3 17.8 8.7 21.5 22.2 Level of Service B B A C C Approach Delay (s) 16.2 8.7 22.0 C Approach Delay (s) 16.2 8.7 22.0 C Intersection Summary B A C C HCM 2000 Control Delay 16.4 HCM 2000 Level of Service B HCM 2000 Volume to Capacity ratio 0.62 C C Actuated Cycle Length (s) 70.0 Sum of lost time (s) 12.0 Intersection Spacity Utilization 59.2% ICU Level of Service B	v/c Ratio								
Incremental Delay, d2 2.6 6.1 0.9 1.1 1.5 Delay (s) 11.3 17.8 8.7 21.5 22.2 Level of Service B B A C C Approach Delay (s) 16.2 8.7 22.0 Approach Delay (s) Approach Delay B A C Intersection Summary HCM 2000 Control Delay 16.4 HCM 2000 Level of Service B HCM 2000 Volume to Capacity ratio 0.62 - - - - Intersection Capacity (s) 70.0 Sum of lost time (s) 12.0 12.0 Intersection Capacity Utilization 59.2% ICU Level of Service B Analysis Period (min) 15 - -	Uniform Delay, d1			7.9					
Delay (s) 11.3 17.8 8.7 21.5 22.2 Level of Service B B A C C Approach Delay (s) 16.2 8.7 22.0 Approach LOS B A C Intersection Summary B A C C Intersection Summary Intersection Summary Intersection Capacity ratio 0.62 C Intersection Capacity (Litization 59.2% ICU Level of Service B Analysis Period (min) 15	Progression Factor								
Level of Service B B A C C Approach Delay (s) 16.2 8.7 22.0 Approach Delay (s) Approach Delay Approach D	Incremental Delay, d2								
Approach Delay (s) 16.2 8.7 22.0 Approach LOS B A C Intersection Summary 16.4 HCM 2000 Level of Service B HCM 2000 Volume to Capacity ratio 0.62 B A C Actuated Cycle Length (s) 70.0 Sum of lost time (s) 12.0 Intersection Capacity Utilization 59.2% ICU Level of Service B Analysis Period (min) 15 15 B	Delay (s)								
Approach LOS B A C Intersection Summary Intersection Summary Intersection Summary Intersection Capacity ratio 0.62 HCM 2000 Volume to Capacity ratio 0.62 Actuated Cycle Length (s) 70.0 Sum of lost time (s) 12.0 Intersection Capacity Utilization 59.2% ICU Level of Service B Analysis Period (min) 15 IS IS	Level of Service	В					С		
Intersection Summary InterSection Summary InterSection Capacity ratio InterSection Capacity (S) InterSection Capacity Utilization InterSection	Approach Delay (s)								
HCM 2000 Control Delay 16.4 HCM 2000 Level of Service B HCM 2000 Volume to Capacity ratio 0.62	Approach LOS		В	А		С			
HCM 2000 Control Delay 16.4 HCM 2000 Level of Service B HCM 2000 Volume to Capacity ratio 0.62	Intersection Summary								
HCM 2000 Volume to Capacity ratio 0.62 Actuated Cycle Length (s) 70.0 Sum of lost time (s) 12.0 Intersection Capacity Utilization 59.2% ICU Level of Service B Analysis Period (min) 15	HCM 2000 Control Delay			16.4	H	CM 2000	Level of Servi	e	В
Actuated Cycle Length (s) 70.0 Sum of lost time (s) 12.0 Intersection Capacity Utilization 59.2% ICU Level of Service B Analysis Period (min) 15		icity ratio		0.62					
Intersection Capacity Utilization 59.2% ICU Level of Service B Analysis Period (min) 15 15 15 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 16 15 16	Actuated Cycle Length (s)	,		70.0	S	um of lost	time (s)		12.0
Analysis Period (min) 15		ation		59.2%	IC	U Level o	of Service		В
c Critical Lane Group	Analysis Period (min)			15					
	c Critical Lane Group								

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Total

Synchro 9 Report Page 8

06-14-2018

Lane Group Lane Configurations Traffic Volume (vph) Future Volume (vph) Ideal Flow (vphp) Lane Util. Factor Frt FIt Protected Sata. Flow (pot) Fit Permitted Sata. Flow (perm)	EBT 22 22 1900 1.00 0.883 1645	EBR 144 144 1900 1.00	WBL 0 0 1900 1.00	WBT 4 2 2 1900 100	NBL 92 92 1900	NBR 0 0	
Lane Configurations Traffic Volume (vph) Future Volume (vph) Ideal Flow (vphpl) Lane Util. Factor Frt Fit Protected Satd. Flow (prot) Fit Permitted	22 22 1900 1.00 0.883	144 144 1900	0 0 1900	2 2 1900	92 92	0	
Traffic Volume (vph) Future Volume (vph) Ideal Flow (vphpi) Lane Util. Factor Frt Fit Protected Satd. Flow (prot) Fit Permitted	22 22 1900 1.00 0.883	144 1900	0 1900	2 2 1900	92 92		
Future Volume (vph) Ideal Flow (vphpl) Lane Util. Factor Frt FIt Protected Satd. Flow (prot) Fit Permitted	22 1900 1.00 0.883	144 1900	0 1900	2 1900	92		
Ideal Flow (vphpl) Lane Util. Factor Frt Flt Protected Satd. Flow (prot) Flt Permitted	1900 1.00 0.883	1900	1900	1900		0	
Lane Util. Factor Frt Flt Protected Satd. Flow (prot) Flt Permitted	1.00 0.883				1000	0	
Frt Flt Protected Satd. Flow (prot) Flt Permitted	0.883	1.00	1.00	1.00	1900	1900	
Flt Protected Satd. Flow (prot) Flt Permitted				1.00	1.00	1.00	
Satd. Flow (prot) Flt Permitted	1645						
Flt Permitted	1645				0.950		
		0	0	1863	1770	0	
Satd Flow (perm)					0.950		
	1645	0	0	1863	1770	0	
Link Speed (k/h)	50			50	50		
Link Distance (m)	44.7			49.4	43.7		
Travel Time (s)	3.2			3.6	3.1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	24	157	0	2	100	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	181	0	0	2	100	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(m)	0.0			0.0	3.6		
Link Offset(m)	0.0			0.0	0.0		
Crosswalk Width(m)	4.8			4.8	4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)		15	25		25	15	
Sign Control	Free			Free	Stop		
Intersection Summary							
	ther						
Control Type: Unsignalized Intersection Capacity Utilizatio						of Service A	

	Anal	ysis	Period	(min') 15
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HCM Unsignalized Intersection Capacity Analysis 4: Access 1 & Frances Avenue

	-	*	4	+	•	*
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	ĥ			ę	Y	
Traffic Volume (veh/h)	22	144	0	2	92	0
Future Volume (Veh/h)	22	144	0	2	92	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	24	157	0	2	100	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			181		104	102
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			181		104	102
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		89	100
cM capacity (veh/h)			1394		893	953
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	181	2	100			
Volume Left	0	0	100			
Volume Right	157	0	0			
cSH	1700	1394	893			
Volume to Capacity	0.11	0.00	0,11			
Queue Length 95th (m)	0.0	0.00	3.0			
Control Delay (s)	0.0	0.0	9.5			
Lane LOS	0.0	0.0	7.J			
Approach Delay (s)	0.0	0.0	9.5			
Approach LOS	0.0	0.0	9.5 A			
			A			
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utiliz	ation		21.8%	IC	U Level o	of Service
Analysis Period (min)			15			

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Total

Synchro 9 Report Page 9 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Total

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (vph)	28	94	67	0	94	0	43	0	0	0	0	3
Future Volume (vph)	28	94	67	0	94	0	43	0	0	0	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.952									0.865	
Flt Protected		0.993						0.950				
Satd. Flow (prot)	0	1761	0	0	1863	0	0	1770	0	0	1611	0
FIt Permitted		0.993						0.950				
Satd. Flow (perm)	0	1761	0	0	1863	0	0	1770	0	0	1611	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		53.8			44.7			33.3			48.0	
Travel Time (s)		3.9			3.2			2.4			3.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	102	73	0	102	0	47	0	0	0	0	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	205	0	0	102	0	0	47	0	0	3	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
	ther											
Control Type: Unsignalized Intersection Capacity Utilization						of Service						

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SE
Lane Configurations		\$			\$			4			\$	
Traffic Volume (veh/h)	28	94	67	0	94	0	43	0	0	0	0	
Future Volume (Veh/h)	28	94	67	0	94	0	43	0	0	0	0	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.
Hourly flow rate (vph)	30	102	73	0	102	0	47	0	0	0	0	
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	102			175			304	300	138	300	337	1
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	102			175			304	300	138	300	337	1
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3
p0 queue free %	98			100			93	100	100	100	100	1
cM capacity (veh/h)	1490			1401			637	600	910	642	572	9
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	205	102	47	3								
Volume Left	30	0	47	0								
Volume Right	73	0	0	3								
cSH	1490	1401	637	953								
Volume to Capacity	0.02	0.00	0.07	0.00								
Queue Length 95th (m)	0.5	0.0	1.9	0.1								
Control Delay (s)	1.2	0.0	11.1	8.8								
Lane LOS	A		В	A								
Approach Delay (s)	1.2	0.0	11.1	8.8								
Approach LOS			В	А								
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization	on		33.0%	IC	U Level d	t Service			A			

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Total

Synchro 9 Report Page 11 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Total

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (vph)	42	261	66	0	141	0	42	0	0	0	0	35
Future Volume (vph)	42	261	66	0	141	0	42	0	0	0	0	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976									0.865	
Flt Protected		0.994						0.950				
Satd. Flow (prot)	0	1807	0	0	1863	0	0	1770	0	0	1611	0
Flt Permitted		0.994						0.950				
Satd. Flow (perm)	0	1807	0	0	1863	0	0	1770	0	0	1611	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		38.9			53.8			33.6			40.8	
Travel Time (s)		2.8			3.9			2.4			2.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	46	284	72	0	153	0	46	0	0	0	0	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	402	0	0	153	0	0	46	0	0	38	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
)ther											
Control Type: Unsignalized												
Intersection Capacity Utilizati	on 46.5%			IC	U Level	of Service	A					

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations		\$			\$			\$			4	
Traffic Volume (veh/h)	42	261	66	0	141	0	42	0	0	0	0	1
Future Volume (Veh/h)	42	261	66	0	141	0	42	0	0	0	0	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	46	284	72	0	153	0	46	0	0	0	0	
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)		NOTIC			None							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	153			356			603	565	320	565	601	1
vC1, stage 1 conf vol	100			300			003	505	320	505	001	
vC1, stage 2 conf vol												
vC2, stage 2 com vol	153			356			603	565	320	565	601	1
tC, single (s)	4.1			300 4.1			7.1	6.5	6.2	7.1	6.5	é
	4.1			4.1			7.1	0.0	0.2	7.1	0.0	C
tC, 2 stage (s)	2.2			2.2			2.5	4.0	2.2	2.5	4.0	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3
p0 queue free %	97			100			88	100	100	100	100	0
cM capacity (veh/h)	1428			1203			384	420	721	425	401	8
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	402	153	46	38								
Volume Left	46	0	46	0								
Volume Right	72	0	0	38								
cSH	1428	1203	384	893								
Volume to Capacity	0.03	0.00	0.12	0.04								
Queue Length 95th (m)	0.8	0.0	3.2	1.1								
Control Delay (s)	1.1	0.0	15.7	9.2								
Lane LOS	A		С	A								
Approach Delay (s)	1.1	0.0	15.7	9.2								
Approach LOS			С	А								
Intersection Summary												
Average Delay			2.4									
Intersection Capacity Utiliza	ation		46.5%	IC	U Level o	f Service			А			
Analysis Period (min)			15									

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Total

Synchro 9 Report Page 13 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2023 Total

Appendix H

2025 Background Traffic Operations Reports

Appendix "C" to Report PED19115 Page 168 of 314

Appendix "C" to Report PED19115 Page 169 of 314

Lane Configurations Traffic Volume (vph) Future Volume (vph) Ideal Flow (vphp) 19 Lane Util. Factor Ped Bike Factor Fit Protected Satd. Flow (prot) FI Protected Satd. Flow (prot) Fit Protected Satd. Flow (perm) Link Speed (k/h) Link Distance (m) Travel Time (s) Confl. Peds. (#/hr) Peak Hour Factor 0. Heavy Vehicles (%) 10 Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph) Shared Lane Traffic (%)	BL 13 13 000 00 0 0 0	EBT 4 15 15 1900 1.00 0.949 0.986 1727 0.986 1727 50 165.1 11.9	EBR 17 17 1900 1.00	WBL 336 336 1900 1.00 0 0	← WBT 46 46 1900 1.00 0.958 1820 0.958 1820 0.958 1820 50 52.2 3.8	WBR 0 1900 1.00	NBL 5 5 1900 1.00	↑ NBT 18 18 1900 1.00 0.887 0.998 1575 0.998 1575 0.998 1575 50 184.8	NBR 115 115 1900 1.00 0 0	SBL 0 1900 1.00 0 0	SBT 4 62 62 1900 1.00 0.984 1870 1870 1870 50 166.7	SBR 8 1900 1.00
Lane Configurations Traffic Volume (vph) Future Volume (vph) Ideal Flow (vphpl) 19 Lane Util. Factor 1. Ped Bike Factor 1. Fit Protected Statd. Flow (prot) Fit Protected Statd. Flow (perm) Link Speed (k/h) Link Distance (m) Travel Time (s) Confl. Peds. (#/hr) Peak Hour Factor 0. Heavy Vehicles (%) 10 Adj. Flow (uph) Shared Lane Traffic (%)	13 13 000 00 0 0 0	4 15 15 1900 1.00 0.949 0.986 1727 0.986 1727 50 165.1	17 17 1900 1.00	336 336 1900 1.00	 ♣ 46 46 1900 1.00 0.958 1820 0.958 1820 50 52.2 	0 0 1900 1.00	5 5 1900 1.00	Image: Constraint of the second sec	115 115 1900 1.00	0 0 1900 1.00	 4 62 62 1900 1.00 0.984 1870 1870 50 	8 8 1900 1.00
Traffic Volume (vph) Future Volume (vph) Ideal Flow (vphpl) 19 Ideal Flow (vphpl) 19 Lane Util. Factor 1. Ped Bike Factor 1. Fit Protected Satd. Flow (prot) FIL Premitted Satd. Flow (perm) Link Speed (k/h) Link Distance (m) Travel Time (s) Confl. Peds. (#/hr) Peak Hour Factor 0. Heavy Vehicles (%) 10 Adj. Flow (pph) Shared Lane Traffic (%) Lane Group Flow (vph) Shared Lane Traffic (%)	13 200 00 0 0	15 15 1900 1.00 0.949 0.986 1727 0.986 1727 50 165.1	17 1900 1.00	336 1900 1.00	46 46 1900 1.00 0.958 1820 0.958 1820 50 52.2	0 1900 1.00	5 1900 1.00	18 18 1900 1.00 0.887 0.998 1575 0.998 1575 50	115 1900 1.00	0 1900 1.00	62 62 1900 1.00 0.984 1870 1870 50	8 1900 1.00
Future Volume (vph) Ideal Flow (vphp) 19 Lane Util. Factor 1. Ped Bike Factor 1. Frt FIT FIL Protected Sata. Flow (port) Sata. Flow (port) Sata. Flow (perm) Link Speed (k/h) Link Speed (k/h) Confl. Peds. (#/hr) Peak Hour Factor Peak Hour Factor 0. Heavy Vehicles (%) 10 Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph) State Gup Flow (vph)	13 200 00 0 0	15 1900 1.00 0.949 0.986 1727 0.986 1727 50 165.1	17 1900 1.00	336 1900 1.00	46 1900 1.00 0.958 1820 0.958 1820 50 52.2	0 1900 1.00	5 1900 1.00	18 1900 1.00 0.887 0.998 1575 0.998 1575 50	115 1900 1.00	0 1900 1.00	62 1900 1.00 0.984 1870 1870 50	8 1900 1.00
Ideal Flow (vphp) 19 Lane Util. Factor 1. Ped Bike Factor 1. Frt Flt Flt Protected Satd. Flow (port) Flt Permitted Satd. Flow (perm) Link Distance (m) Travel Time (s) Confl. Peds. (#/hr) Peak Hour Factor 0. Heavy Vehicles (%) 10 Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph) Stared Lane Traffic (%)	000000000000000000000000000000000000000	1900 1.00 0.949 0.986 1727 0.986 1727 50 165.1	1900 1.00	1900 1.00	1900 1.00 0.958 1820 0.958 1820 50 52.2	1900 1.00	1900 1.00	1900 1.00 0.887 0.998 1575 0.998 1575 50	1900 1.00	1900 1.00	1900 1.00 0.984 1870 1870 50	1900 1.00
Lane Util. Factor 1. Ped Bike Factor Fit Fit Protected Satd. Flow (prot) Fit Premitted Satd. Flow (perm) Link Speed (k/h) Link Distance (m) Travel Time (s) Confl. Peds. (#/hr) Peak Hour Factor 0. Heavy Vehicles (%) 10 Adj. Flow (vph) Shared Lane Traffic (%)	0 0 1	1.00 0.949 0.986 1727 0.986 1727 50 165.1	1.00	1.00	1.00 0.958 1820 0.958 1820 50 52.2	1.00	1.00	1.00 0.887 0.998 1575 0.998 1575 50	1.00	1.00	1.00 0.984 1870 1870 50	1.00
Ped Bike Factor Frt Fit Protected Satd. Flow (prot) Fit Permitted Satd. Flow (perm) Link Speed (k/h) Link Distance (m) Travel Time (s) Confl. Peds. (#/hr) Peak Hour Factor 0. Heavy Vehicles (%) 10 Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph) 10	0 0 1	0.949 0.986 1727 0.986 1727 50 165.1	0	0	0.958 1820 0.958 1820 50 52.2	0	0	0.887 0.998 1575 0.998 1575 50	0	0	0.984 1870 1870 50	0
Frt Fit Protected Fit Permitted Satd. Flow (perm) Link Speed (k/h) Link Distance (m) Travel Time (s) Confl. Peds. (#/hr) Peak Hour Factor 0. Heavy Vehicles (%) 10 Abared Lane Traffic (%) Lane Group Flow (vph)	0	0.986 1727 0.986 1727 50 165.1			1820 0.958 1820 50 52.2			0.998 1575 0.998 1575 50			1870 1870 50	
Fli Protected Satd. Flow (port) Fli Permitted Satd. Flow (perm) Link Speed (k/h) Link Distance (m) Travel Time (s) Confl. Peds. (#/hr) Peak Hour Factor 0. Heavy Vehicles (%) 10 Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph) 10	0	0.986 1727 0.986 1727 50 165.1			1820 0.958 1820 50 52.2			0.998 1575 0.998 1575 50			1870 1870 50	
Satd. Flow (prot) FI Permitted Satd. Flow (perm) Link Speed (k/h) Link Distance (m) Travel Time (s) Confl. Peds. (#/hr) Peak Hour Factor 0. Heavy Vehicles (%) 10 Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph) 10	0	1727 0.986 1727 50 165.1			1820 0.958 1820 50 52.2			1575 0.998 1575 50			1870 50	
Fit Permitted Satd. Flow (perm) Link Speed (k/h) Link Distance (m) Travel Time (s) Confl. Peds. (#/hr) Peak Hour Factor 0, Heavy Vehicles (%) 10 Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph) Lane Group Flow (vph)	0	0.986 1727 50 165.1			0.958 1820 50 52.2			0.998 1575 50			1870 50	
Satd. Flow (perm) Link Speed (k/h) Link Distance (m) Travel Time (s) Confl. Peds. (#/hr) Peak Hour Factor 0. Heavy Vehicles (%) 10 Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph) Shared Lane Share (%)	1	1727 50 165.1	0	0	1820 50 52.2	0	0	1575 50	0	0	50	0
Link Speed (k/h) Link Distance (m) Travel Time (s) Confl. Peds. (#/hr) Peak Hour Factor 0. Heavy Vehicles (%) 10 Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph)	1	50 165.1	0	0	50 52.2	0	0	50	0	0	50	0
Link Distance (m) Travel Time (s) Confl. Peds. (#/hr) Peak Hour Factor 0. Heavy Vehicles (%) 10 Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph)		165.1			52.2							
Travel Time (s) Confl. Peds. (#/hr) Peak Hour Factor 0. Heavy Vehicles (%) 10 Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph)								184.8			1667	
Confl. Peds. (#/hr) Peak Hour Factor 0, Heavy Vehicles (%) 1(Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph)		11.9			3.8						100.7	
Peak Hour Factor 0. Heavy Vehicles (%) 10 Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph)					0.0			13.3			12.0	
Heavy Vehicles (%) 10 Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph)						1	2		3	3		2
Adj. Flow (vph) Shared Lane Traffic (%) Lane Group Flow (vph)	.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%) Lane Group Flow (vph)	0%	0%	0%	0%	0%	0%	0%	7%	7%	0%	0%	0%
Lane Group Flow (vph)	14	16	18	365	50	0	5	20	125	0	67	9
Enter Blocked Intersection	0	48	0	0	415	0	0	150	0	0	76	0
	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment L	.eft	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0	5		0.0	5		3.6	5		3.6	5
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
	.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type: Other												
Control Type: Unsignalized												
Intersection Capacity Utilization 47	7.3%			10	U Level	of Service	A					

	≯		1	1	t	•	•	Ť	*		1	7
		EDT	T		WDT	-	1	•		CD1	▼ CDT	-
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations	10	4	47	224	4	0		4	445	0	.	
Traffic Volume (veh/h)	13	15	17	336	46	0	5	18	115	0	62	1
Future Volume (Veh/h)	13	15	17	336	46	0	5	18	115	0	62 Free	
Sign Control Grade		Stop 0%			Stop 0%			Free 0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	0.92	16	18	365	50	0.92	0.92	20	125	0.92	67	0.9
Pedestrians	14	2	10	303	3	0	5	20	125	U	1	
Lane Width (m)		3.6			3.6						3.6	
Walking Speed (m/s)		1.2			1.2						1.2	
Percent Blockage		0			0						0	
Right turn flare (veh)		0			0						0	
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	192	232	74	193	174	86	78			148		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	192	232	74	193	174	86	78			148		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	98	98	50	93	100	100			100		
cM capacity (veh/h)	705	667	992	737	718	974	1531			1442		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	48	415	150	76								
Volume Left	14	365	5	0								
Volume Right	18	0	125	9								
cSH	774	735	1531	1442								
Volume to Capacity	0.06	0.56	0.00	0.00								
Queue Length 95th (m)	1.6	28.6	0.1	0.0								
Control Delay (s)	10.0	16.1	0.3	0.0								
Lane LOS	A	С	A	0.0								
Approach Delay (s) Approach LOS	10.0 A	16.1 C	0.3	0.0								
Intersection Summary												
Average Delay			10.4									
Intersection Capacity Utiliza	ation		47.3%	IC	U Level o	f Service			А			
Analysis Period (min)			15									

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Background

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Background

Lane Croup EBI EBT WBT WBR SBL SBR Lane Configurations 1		۶	-	-	×.	1	1	
Traffic Volume (vph) 68 149 888 70 142 274 Future Volume (vph) 68 149 888 70 142 274 Ideal Flow (vph) 1900 1900 1900 1900 1900 1900 Storage Length (m) 120.0 0.0 40.0 0.0 Storage Lanes 1 1 Taper Length (m) 7.5 7.5 7.5	Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
Traffic Volume (vph) 68 149 888 70 142 274 Future Volume (vph) 68 149 888 70 142 274 Ideal Flow (vph) 1900 1900 1900 1900 1900 Storage Length (m) 120.0 0.0 40.0 0.0 Storage Lanes 1 0 1 1 Taper Length (m) 7.5 7.5 7.5 Lane Util. Factor 1.00 1.00 1.00 1.00 Ped Bike Factor 775 0.50 0.850 Fit retected 0.950 0.950 0.950 Satid. Flow (port) 1.687 1696 1790 0 1770 1615 Fit Permitted 0.950 0.950 0.950 0.950 0.9170 1615 Satid. Flow (perm) 1687 1696 1790 0 1770 1615 Link Speed (k/h) 80 80 50 0.92 0.92 0.92 0.92 0.92 0.92 0.92 0.92 0.92 0.92 0.92 0.	Lane Configurations	5	•	î,		٦	1	
Future Volume (vph) 68 149 888 70 142 274 Ideal Flow (vphp) 1900 1900 1900 1900 1900 Storage Length (m) 120.0 0.0 40.0 0.0 Storage Length (m) 7.5 7.5 Lane Ulii, Factor 1.00 1.00 1.00 1.00 Ped Bike Factor					70			
Ideal Flow (vphp) 1900 1900 1900 1900 1900 Storage Length (m) 120.0 0.0 40.0 0.0 Storage Lanes 1 0 1 1 Taper Length (m) 7.5 7.5 Lane Util. Factor 1.00 1.00 1.00 1.00 1.00 Ped Bike Factor 0.990 0.850 0.850 0.950 State Flow (prot) 1687 1696 1790 0 1770 1615 FIL Protected 0.950 0.950 0.950 0.950 0.950 0.950 Satd. Flow (prot) 1687 1696 1790 0 1770 1615 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.01 1.02 <td>Future Volume (vph)</td> <td>68</td> <td>149</td> <td>888</td> <td>70</td> <td>142</td> <td>274</td> <td></td>	Future Volume (vph)	68	149	888	70	142	274	
Storage Length (m) 120.0 0.0 40.0 0.0 Storage Lanes 1 0 1 1 Taper Length (m) 7.5 7.5 Lane Util, Factor 1.00 1.00 1.00 1.00 Ped Bike Factor 990 0.850 Fit 0.990 0.950 Satd. Flow (port) 1687 1696 1790 0 1770 1615 Fit Permitted 0.950 0.950 0.950 0.950 0.950 0.950 Satd. Flow (port) 1687 1696 1790 0 1770 1615 Link Speed (k/h) 80 80 50 50 50 50 Link Distance (m) 123.4 826.3 184.8 1734 186.3 184.8 Travel Time (s) 5.6 37.2 13.3 100 100 100 100 102 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 104 0 154 298 Shared Lane Traffic (%) Lane Group Flow (p/h) 74<		1900	1900	1900	1900	1900	1900	
Storage Lanes 1 0 1 1 Taper Length (m) 7.5 7.5 Lane Util. Factor 1.00 1.00 1.00 1.00 Ped Bike Factor 0.990 0.850 Fit 0.990 0.950 Satd. Flow (port) 1.887 1696 1790 0 1770 Satd. Flow (perm) 1687 1696 1790 0 1770 1615 Link Speed (k/h) 80 80 50 0 11 1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 7% 123.4 826.3 184.8 13.3 1 Confl. Peds. (#/hr) 1 1 1 1 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Shared Lane Traffic (%) 1 1 1 1 1 1 Lane Group Flow (vph) 74 162 965 76 154 298 Enter Blocked Intersection		120.0			0.0	40.0	0.0	
Taper Length (m) 7.5 7.5 Lane Ulti, Factor 1.00 1.00 1.00 1.00 Ped Bike Factor 0.990 0.850 Fit 0.990 0.950 Satu, Flow (port) 1.687 1696 1770 1615 Fit Permitted 0.950 0.950 Satu, Flow (perm) 1687 1696 1790 1770 1615 Link Speed (k/h) 80 80 50 50 50 Link Distance (m) 123.4 826.3 184.8 77.5 76 Confl. Peds, (#hr) 1 1 1 1 1 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 7% 12% 4% 19% 2% 0% Adi, Flow (vph) 74 162 1041 0 154 298 Shared Lane Traffic (%) 1 1 1 1 1 1 Lane Group Flow (vph) 74 162 1041 0					0	1		
Lane Util, Factor 1.00 1.00 1.00 1.00 1.00 Ped Bike Factor 0.990 0.850 Fit Protected 0.950 0.950 Satd. Flow (prot) 1687 1696 1790 0 1770 1615 Fit Protected 0.950 0.950 0.950 0.950 Satd. Flow (prot) 1687 1696 1790 0 1770 1615 Link Speed (kh) 80 80 50 50 50 50 Link Distance (m) 123.4 826.3 184.8 1733 50 50 Link Distance (m) 123.4 826.3 184.8 50 50 50 Lane Group Factor 0.92 0.92 0.92 0.92 0.92 1092 56 Peak Hour Factor 0.92 0.92 0.92 0.92 1092 56 Shared Lane Traffic (%) Lane Group Flow (vph) 74 162 965 76 154 298 Enter						7.5		
Ped Bike Factor 0.990 0.850 Fit 0.950 0.950 Satd. Flow (port) 1687 1696 1790 0 1770 1615 Fit Permitted 0.950 0.950 0.950 0.950 0.950 Satd. Flow (port) 1687 1696 1790 0 1770 1615 Link Speed (k/h) 80 80 50 0.111 100			1 00	1 00	1 00		1.00	
Prit 0.990 0.850 FIP Protected 0.950 0.950 Satd. Flow (prot) 1687 1696 1770 1615 FIP Permitted 0.950 0.950 0.950 Satd. Flow (perm) 1687 1696 1790 0 1770 1615 Link Speed (k/h) 80 80 50 0.950 0.950 Link Speed (k/h) 80 80 50 0.920 0.92 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>								
Fit Protected 0.950 0.950 Satd. Flow (prot) 1687 1696 1790 0 1770 1615 Fit Permitted 0.950 0.950 0.950 50 Satd. Flow (perm) 1687 1696 1790 0 1770 1615 Link Speed (k/h) 80 80 50 50 50 50 Confl. Peds, (#/hr) 123.4 826.3 184.8 8 60 50 Confl. Peds, (#/hr) 1				0 990			0.850	
Satd. Flow (prot) 1687 1696 1790 0 1770 1615 FI Permitted 0.950 0.950 0.950 0.950 Satd. Flow (perm) 1687 1696 1790 0 1770 1615 Link Speed (k/h) 80 80 50 50 50 50 Link Distance (m) 123.4 826.3 184.8 50 56 56 Confl. Peds. (#/hr) 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Lane Group Flow (vph) 74 162 965 76 154 298 Enter Blocked Intersection No No No No No No Lane Group Flow (vph) 74 162 1041 0 154 298 Enter Blocked Intersection No No No No No No Lane Al		0.950		5.775		0.950	0.000	
Fit Permitted 0.950 0.950 Satd. Flow (perm) 1687 1696 1790 0 1770 1615 Link Speed (k/h) 80 80 50 50 50 50 50 Link Distance (m) 123.4 826.3 184.8 50 50 56 37.2 13.3 Confl. Peds. (#/hr) 1			1696	1790	0		1615	
Satd. Flow (perm) 1687 1696 1790 0 1770 1615 Link Speed (k/h) 80 80 50 <td></td> <td></td> <td>1070</td> <td>1770</td> <td>U</td> <td></td> <td>1015</td> <td></td>			1070	1770	U		1015	
Link Speed (k/h) 80 80 50 Link Distance (m) 123.4 826.3 184.8 Travel Time (s) 5.6 37.2 13.3 Confl. Peds. (#hr) 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 7% 12% 4% 19% 2% Shared Lane Traffic (%) 74 162 965 76 154 298 Shared Lane Traffic (%) 74 162 1041 0 154 298 Enter Blocked Intersection No No No No No Median Width(m) 3.6 3.6 3.6 3.6 Link Offset(m) 0.0 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 Headway Factor 1.00 1.00 1.00 1.00 1.00 Turning Speed (k/h) 25 </td <td></td> <td></td> <td>1606</td> <td>1700</td> <td>0</td> <td></td> <td>1615</td> <td></td>			1606	1700	0		1615	
Link Distance (m) 123.4 826.3 184.8 Travel Time (s) 5.6 37.2 13.3 Confl. Peds. (#hr) 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 Peak Hour Factor 0.92 0.92 0.92 0.92 Lane Srup Flow (vph) 74 162 965 76 154 298 Shared Lane Traffic (%) Enter Blocked Intersection No No No No Lane Group Flow (vph) 74 162 1041 0 154 298 Enter Blocked Intersection No No No No No Link Offsel(rm) 0.0 0.0 0.0 0.0 Cosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 1.00 Sign Control Free Free Stop 15 25 15		1007			0		1015	
Travel Time (s) 5.6 37.2 13.3 Confl. Peds. (#/hr) 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 7% 12% 4% 19% 2% 0% Adj. Flow (vph) 74 162 965 76 154 298 Shared Lane Traffic (%) 1 0 154 298 Lane Group Flow (vph) 74 162 1041 0 154 298 Enter Blocked Intersection No No No No No No Lane Group Flow (vph) 74 162 1641 0 154 298 Enter Blocked Intersection No No No No No No Lane Alignment Left Left Right Left Right Lift Right Link Offset(m) 0.0 0.0 0.0 0.0 0.0 Cosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00								
Confl. Peds. (#/hr) 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 7% 12% 4% 19% 2% 0% Adj. Flow (vph) 74 162 965 76 154 298 Shared Lane Traffic (%) Lane Group Flow (vph) 74 162 1041 0 154 298 Enter Blocked Intersection No No No No No No Median Width(m) 3.6 3.6 3.6 3.6 Link Offset(m) 0.0 0.0 Crosswalk Width(m) 4.8 4.8 Two way Left Turn Lane 5 15 25 15 Sign Control Free Free Stop Intersection Summary <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>								
Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 7% 12% 4% 19% 2% 0% Adj. Flow (vph) 74 162 965 76 154 298 Shared Lane Traffic (%) 74 162 1041 0 154 298 Enter Blocked Intersection No No No No No No Median Width(m) 3.6 3.6 3.6 1.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 4.8 1.00 1		1	5.0	J1.Z	1	13.3		
Heavy Vehicles (%) 7% 12% 4% 19% 2% 0% Adj. Flow (vph) 74 162 965 76 154 298 Shared Lane Traffic (%) Image: Stress of the stress			0.02	0.02		0.02	0.02	
Adj. Flow (vph) 74 162 965 76 154 298 Shared Lane Traffic (%) Lane Group Flow (vph) 74 162 1041 0 154 298 Enter Blocked Intersection No No No No No No Lane Alignment Left Left Right Left Right Link Offset(m) 0.0 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 Headway Factor 1.00 1.00 1.00 1.00 1.00 Turning Speed (k/h) 25 15 25 15 Sign Control Free Free Stop								
Shared Lane Traffic (%) 162 1041 0 154 298 Lane Group Flow (vph) 74 162 1041 0 154 298 Enter Blocked Intersection No No No No No No Median Width(m) 3.6 3.6 3.6 3.6 1.6 Unik Offset(m) 0.0 0.0 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 1.00 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
Lane Group Flow (vph) 74 162 1041 0 154 298 Enter Blocked Intersection No No No No No No Lane Alignment Left Left Right Left Right Median Width(m) 3.6 3.6 3.6 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 1.00 Turning Speed (k/h) 25 15 25 15 Sign Control Free Free Stop		74	102	905	70	104	290	
Enter Blocked Intersection No No No No No No Lane Alignment Left Left Left Right Left Right Median Width(m) 3.6 3.6 3.6 3.6 S.6 S.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane		74	140	1041	0	154	200	
Lane Alignment Left Left Right Left Right Median Width(m) 3.6					-			
Median Width(m) 3.6 3.6 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane								
Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane		Left			Right		Right	
Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane								
Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 Turning Speed (k/h) 25 15 25 15 Sign Control Free Free Stop								
Headway Factor 1.00 1.00 1.00 1.00 1.00 Turning Speed (k/h) 25 15 25 15 Sign Control Free Free Stop Intersection Summary			4.8	4.8		4.8		
Turning Špeed (k/h) 25 15 25 15 Sign Control Free Free Stop Intersection Summary		1.00	1.00	1.00	1.00	1.00	1.00	
Sign Control Free Free Stop			1.00	1.00				
Intersection Summary		25	Free	Free	15		15	
	Sign Control		Free	Free		Stop		
	Intersection Summary							
		Other						
Control Type: Unsignalized Intersection Capacity Utilization 74.6% ICU Level of Service D								

2: North Service Re	oad & G	reen F	Road				06-14-2018
	≯	-	+	•	1	∢	
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	5	•	1.		٦	1	
Traffic Volume (veh/h)	68	149	888	70	142	274	
Future Volume (Veh/h)	68	149	888	70	142	274	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	74	162	965	76	154	298	
Pedestrians					1		
Lane Width (m)					3.6		
Walking Speed (m/s)					1.2		
Percent Blockage					0		
Right turn flare (veh)							
Median type		None	None				
Median storage veh)							
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	1042				1314	1004	
vC1, stage 1 conf vol	1012					1001	
vC2, stage 2 conf vol							
vCu, unblocked vol	1042				1314	1004	
tC, single (s)	4.2				6.4	6.2	
tC, 2 stage (s)					0.11	0.2	
tF (s)	2.3				3.5	3.3	
p0 queue free %	89				0	0	
cM capacity (veh/h)	648				154	296	
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2	270	
Volume Total	74	162	1041	154	298		
Volume Left	74	0	0	154	270		
Volume Right	0	0	76	0	298		
cSH	648	1700	1700	154	296		
Volume to Capacity	0.11	0.10	0.61	1.00	1.01		
Queue Length 95th (m)	3.1	0.10	0.01	60.6	85.6		
Control Delay (s)	11.3	0.0	0.0	130.0	93.1		
Lane LOS	11.3 B	0.0	0.0	130.0 F	93.1 F		
	в 3.5		0.0	F 105.6	F		
Approach Delay (s) Approach LOS	3.5		0.0	105.6 F			
Intersection Summary							
			28.1		_		
Average Delay	ation		28.1 74.6%	10		of Service	D
Intersection Capacity Utiliza	10011			IC	U Level (n Service	U
Analysis Period (min)			15				

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Background

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Background

HCM Unsignalized Intersection Capacity Analysis

3: North Service Ro			Nuau				5. NOTUT	3: North Service	5. NOTITI Service Road &	5. NOTITI SELVICE ROAD & MILLET	3: North Service Road & Millen Road	J. NOTH Service Road & Millen Road
	٦	→	+	×	1	1			الر	بر خ م	> → ←	ナ → ← ヽ
e Group	EBL	EBT	WBT	WBR	SBL	SBR			EBL	EBL EBT	EBL EBT WBT	EBL EBT WBT WBF
ne Configurations	5	•	ĥ		۲	1	nases		2	2	2	2
raffic Volume (vph)	140	151	461	93	72	497	ise		2	2 2	2 2 6	2 2 6
uture Volume (vph)	140	151	461	93	72	497	е					
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	tial (s)		20.0	20.0 20.0	20.0 20.0 20.0	20.0 20.0 20.0
torage Length (m)	85.0			0.0	50.0	0.0	lit (s)					
torage Lanes	1			0	1	1)					
aper Length (m)	7.5				7.5		, 6)					
ne Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	reen (s)					
t			0.977			0.850	(s)					
Protected	0.950		0.777		0.950	0.000	e (s)					
td. Flow (prot)	1719	1810	1805	0		1583	djust (s)					
Permitted	0.251	1010	1000	Ū	0.950	1000	me (s)					
td. Flow (perm)	454	1810	1805	0	1504	1583				0.0		
iaht Turn on Red	101	1010	1000	Yes	1001	Yes	otimize?					
atd. Flow (RTOR)			21	100		242	nsion (s)	3	0	.0 3.0	.0 3.0 3.0	0 3.0 3.0
ink Speed (k/h)		80	80		50	2.12	101011 (0)	C-Ma				
ink Distance (m)		826.3	260.0		127.1		5)	7.0				
ravel Time (s)		37.2	11.7		9.2		valk (s)	11.0				
eak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	alls (#/hr)	0				
eavy Vehicles (%)	5%	5%	2%	7%	20%	2%	en (s)	26.0		-		
dj. Flow (vph)	152	164	501	101	78	540	C Ratio	0.43				
hared Lane Traffic (%)	152	104	501	101	70	540	/ Natio	0.78				
ane Group Flow (vph)	152	164	602	0	78	540	v	45.7				
Inter Blocked Intersection	No	No	No	No	No	No	y 	43.7				
ane Alignment	Left	Left	Left	Right	Left	Right	,	45.7				
ledian Width(m)	Lon	3.6	3.6	rtigitt	3.6	rtigitt		D				
ink Offset(m)		0.0	0.0		0.0		elay	D				
Crosswalk Width(m)		4.8	4.8		4.8)S		-			
wo way Left Turn Lane		4.0	4.0		4.0					C	0 0	0 0
leadway Factor	1.00	1.00	1.00	1.00	1.00	1.00	Summary					
urning Speed (k/h)	25	1.00	1.00	1.00	25	15		Other				
lumber of Detectors	1	2	2	10	1	1	n: 60					
etector Template	Left	Thru	Thru		Left	Right	cle Length:					
eading Detector (m)	2.0	10.0	10.0		2.0	2.0		ced to phase	2:EBTL a	1	nd 6:WB	nd 6:WBT, Start o
railing Detector (m)	0.0	0.0	0.0		0.0	0.0	e: 60					
etector 1 Position(m)	0.0	0.0	0.0		0.0	0.0		Coordinated				
Detector 1 Size(m)	2.0	0.6	0.6		2.0	2.0	c Ratio: 0.78					
etector 1 Type	CI+Ex		CI+Ex		CI+Ex		Signal Dela					
etector 1 Channel	22.				A			tilization 70.7	%			
etector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0	iod (min) 15	5				
etector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0						
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0	nases: 3:	North Servic	e Road 8	Mi	llen Ro	llen Road
Detector 2 Position(m)	2.0	9.4	9.4		2.5							
etector 2 Size(m)		0.6	0.6									
etector 2 Type		CI+Ex	CI+Ex									
etector 2 Channel												
etector 2 Extend (s)		0.0	0.0									
urn Type	Perm	NA	NA		Prot	Perm						
rotected Phases		2	6		4							

Synchro 9 Report Page 5

Synchro 9 Report Page 6

06-14-2018

3: North Service Ro	bad & N	lillen F	Road			06-14-201
	٦	-	-	1	1	
Lane Group	EBL	EBT	WBT	SBL	SBR	
Lane Group Flow (vph)	152	164	602	78	540	
v/c Ratio	0.78	0.21	0.76	0.14	0.74	
Control Delay	45.7	11.5	21.8	13.6	16.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	45.7	11.5	21.8	13.6	16.4	
Queue Length 50th (m)	14.2	11.2	53.9	5.9	27.3	
Queue Length 95th (m)	#44.8	21.9	#105.0	13.8	#67.6	
Internal Link Dist (m)		802.3	236.0	103.1		
Turn Bay Length (m)	85.0			50.0		
Base Capacity (vph)	196	784	794	551	733	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.78	0.21	0.76	0.14	0.74	

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

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Background

Synchro 9 Report Page 7

HCM Signalized Int 3: North Service Ro		•		Analysi	S		
	۶	-	←	•	1	∢	
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	٦	↑	f,		٦	1	
Traffic Volume (vph)	140	151	461	93	72	497	

Future Volume (vph)1401514619372497Ideal Flow (vphp)190019001900190019001900Total Lost time (s)6.06.06.06.06.0Lane Util. Factor1.001.001.001.001.00Frt1.001.001.000.951.00Satd. Flow (prot)17191810180615041583Fit Protected0.251.001.000.951.00Satd. Flow (pern)4541810180615041583Peak-hour factor, PHF0.920.920.920.920.92Adj. Flow (vph)15216450110178540RTOR Reduction (vph)01200153Lane Group Flow (vph)152164590078387Heavy Vehicles (%)5%5%2%7%20%2%Turn TypePermNANAProtPermProtected Phases2644Permitted Phases2644	
Total Lost time (s) 6.0 6.0 6.0 6.0 6.0 Lane Util. Factor 1.00 1.00 1.00 1.00 1.00 Frt 1.00 1.00 0.98 1.00 0.85 Fit Protected 0.95 1.00 0.95 1.00 Satat. Flow (prot) 1719 1810 1806 1504 1583 Fit Permitted 0.25 1.00 1.00 0.95 1.00 Satat. Flow (perm) 454 1810 1806 1504 1583 Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 152 164 501 101 78 540 RTOR Reduction (vph) 0 0 12 0 153 Lane Group Flow (vph) 152 164 590 78 387 Heavy Vehicles (%) 5% 5% 2% 7% 20% 2% Tum Type Perm NA NA	
Lane Util. Factor 1.00 1.00 1.00 1.00 1.00 Frt 1.00 1.00 0.98 1.00 0.85 Filt Protected 0.95 1.00 0.95 1.00 Satd. Flow (prot) 1719 1810 1806 1504 1583 Filt Permitted 0.25 1.00 1.00 0.95 1.00 Satd. Flow (perm) 454 1810 1806 1504 1583 Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 152 164 501 101 78 540 RTOR Reduction (vph) 0 0 12 0 0 153 Lane Group Flow (vph) 152 164 590 0 78 387 Heavy Vehicles (%) 5% 5% 2% 7% 20% 2% Turn Type Perm NA NA Prot Perm Perm Protiteded Phases <	
Frt 1.00 1.00 0.98 1.00 0.85 FIP Protected 0.95 1.00 0.95 1.00 Satd. Flow (prot) 1719 1810 1806 1504 1583 FIP Permitted 0.25 1.00 1.00 0.95 1.00 Satd. Flow (perm) 454 1810 1806 1504 1583 Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 152 164 501 101 78 540 RTOR Reduction (vph) 0 0 12 0 0 153 Lane Group Flow (vph) 152 164 590 0 78 387 Heavy Vehicles (%) 5% 5% 2% 7% 20% 2% Turn Type Perm NA NA Prot Perm Protieted Phases 2 6 4 4	
Fit Protected 0.95 1.00 1.00 0.95 1.00 Satd. Flow (prot) 1719 1810 1806 1504 1583 Fit Permitted 0.25 1.00 0.95 1.00 Satd. Flow (perm) 454 1810 1806 1504 1583 Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 152 164 501 101 78 540 RTOR Reduction (vph) 0 12 0 0 153 Lane Group Flow (vph) 152 164 590 0 78 387 Heavy Vehicles (%) 5% 5% 2% 7% 20% 2% Turn Type Perm NA NA Prot Perm Protected Phases 2 6 4	
Satd. Flow (prot) 1719 1810 1806 1504 1583 Flt Permitted 0.25 1.00 1.00 0.95 1.00 Satd. Flow (perm) 454 1810 1806 1504 1583 Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 152 164 501 101 78 540 RTOR Reduction (vph) 0 0 12 0 153 Lane Group Flow (vph) 152 164 590 78 387 Heavy Vehicles (%) 5% 5% 2% 7% 20% 2% Tum Type Perm NA NA Prot Perm Perm 4 Protected Phases 2 6 4 4 4 4	
Fit Permitted 0.25 1.00 1.00 0.95 1.00 Satd. Flow (perm) 454 1810 1806 1504 1583 Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 152 164 501 101 78 540 RTOR Reduction (vph) 0 0 12 0 0 153 Lane Group Flow (vph) 152 164 590 0 78 387 Heavy Vehicles (%) 5% 5% 2% 7% 20% 2% Tum Type Perm NA NA Prot Perm Protected Phases 2 6 4 4	
Satd. Flow (perm) 454 1810 1806 1504 1583 Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 152 164 501 101 78 540 RTOR Reduction (vph) 0 0 12 0 0 153 Lane Group Flow (vph) 152 164 590 0 78 387 Heavy Vehicles (%) 5% 5% 2% 7% 20% 2% Tum Type Perm NA NA Prot Perm Protected Phases 2 6 4 4	
Peak-hour factor, PHF 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 152 164 501 101 78 540 RTOR Reduction (vph) 0 0 12 0 0 153 Lane Group Flow (vph) 152 164 590 0 78 387 Heavy Vehicles (%) 5% 5% 2% 7% 20% 2% Turn Type Perm NA NA Prot Perm Protected Phases 2 6 4 4	
Adj. Flow (vph) 152 164 501 101 78 540 RTOR Reduction (vph) 0 0 12 0 0 153 Lane Group Flow (vph) 152 164 590 0 78 387 Heavy Vehicles (%) 5% 5% 2% 7% 20% 2% Turn Type Perm NA NA Prot Perm Protected Phases 2 6 4 4	
RTOR Reduction (vph) 0 0 12 0 0 153 Lane Group Flow (vph) 152 164 590 0 78 387 Heavy Vehicles (%) 5% 5% 2% 7% 20% 2% Tum Type Perm NA NA Prot Perm Protected Phases 2 6 4 4 Permitted Phases 2 4 4	
Lane Group Flow (vph) 152 164 590 0 78 387 Heavy Vehicles (%) 5% 5% 2% 7% 20% 2% Tum Type Perm NA NA Prot Perm Protected Phases 2 6 4 4 Permitted Phases 2 4 4	
Heavy Vehicles (%) 5% 5% 2% 7% 20% 2% Turn Type Perm NA NA Prot Perm Protected Phases 2 6 4 Permitted Phases 2 4	
Turn Type Perm NA NA Prot Perm Protected Phases 2 6 4 4 Permitted Phases 2 4 4	
Protected Phases 2 6 4 Permitted Phases 2 4	
Permitted Phases 2 4	
Actuated Green, G (s) 26.0 26.0 22.0 22.0	
Effective Green, g (s) 26.0 26.0 26.0 22.0 22.0	
Actuated g/C Ratio 0.43 0.43 0.43 0.37 0.37	
Clearance Time (s) 6.0 6.0 6.0 6.0 6.0	
Vehicle Extension (s) 3.0 3.0 3.0 3.0 3.0 3.0	
Lane Grp Cap (vph) 196 784 782 551 580	
v/s Ratio Prot 0.09 0.33 0.05	
v/s Ratio Perm c0.34 c0.24	
v/c Ratio 0.78 0.21 0.75 0.14 0.67	
Uniform Delay, d1 14.5 10.6 14.3 12.7 15.9	
Progression Factor 1.00 1.00 1.00 1.00 1.00	
Incremental Delay, d2 25.4 0.6 6.7 0.5 6.0	
Delay (s) 39.9 11.2 21.0 13.2 21.9	
Level of Service D B C B C	
Approach Delay (s) 25.0 21.0 20.8	
Approach LOS C C C	
Intersection Summary	
HCM 2000 Control Delay 21.7 HCM 2000 Level of Service C	
HCM 2000 Volume to Capacity ratio 0.72	
Actuated Cycle Length (s) 60.0 Sum of lost time (s) 12.0	
Intersection Capacity Utilization 70.7% ICU Level of Service C	
Analysis Period (min) 15	
c Critical Lane Group	

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Background

Synchro 9 Report Page 8

06-14-2018

	-	\mathbf{r}	1	+	1	1	
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	ę.			ę	¥		
Traffic Volume (vph)	8	48	0	22	152	0	
Future Volume (vph)	8	48	0	22	152	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.885						
Flt Protected					0.950		
Satd. Flow (prot)	1649	0	0	1863	1770	0	
Flt Permitted					0.950		
Satd. Flow (perm)	1649	0	0	1863	1770	0	
Link Speed (k/h)	50			50	50		
Link Distance (m)	44.7			49.4	43.7		
Travel Time (s)	3.2			3.6	3.1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	9	52	0	24	165	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	61	0	0	24	165	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(m)	0.0			0.0	3.6		
Link Offset(m)	0.0			0.0	0.0		
Crosswalk Width(m)	4.8			4.8	4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)		15	25		25	15	
Sign Control	Free			Free	Stop		
Intersection Summary							
	Other						
Control Type: Unsignalized							
Intersection Capacity Utilizati	ion 18.5%			10	CU Level (of Service	A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis 4: Access 1 & Frances Avenue

06-14-2018

	→	\mathbf{r}	4	+	1	~
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	4			ų	Y	
Traffic Volume (veh/h)	8	48	0	22	152	0
Future Volume (Veh/h)	8	48	0	22	152	0
Sign Control	Free			Free	Stop	-
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	52	0	24	165	0
Pedestrians						-
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			61		59	35
vC1, stage 1 conf vol			01		07	55
vC2, stage 2 conf vol						
vCu, unblocked vol			61		59	35
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					0.1	0.2
tF (s)			2.2		3.5	3.3
p0 queue free %			100		83	100
cM capacity (veh/h)			1542		948	1038
	FB 1	WB 1	NB 1		740	1050
Direction, Lane #						
Volume Total	61	24	165			
Volume Left	0	0	165			
Volume Right	52	0	0			
cSH	1700	1542	948			
Volume to Capacity	0.04	0.00	0.17			
Queue Length 95th (m)	0.0	0.0	5.0			
Control Delay (s)	0.0	0.0	9.6			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.6			
Approach LOS			А			
Intersection Summary						
Average Delay			6.3			
Intersection Capacity Utiliza	ation		18.5%	IC	U Level	of Service
Analysis Period (min)			15			
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Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Background

Synchro 9 Report Page 9 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Background

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (vph)	9	56	22	0	174	0	71	0	0	0	0	22
Future Volume (vph)	9	56	22	0	174	0	71	0	0	0	0	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.966									0.865	
Flt Protected		0.995						0.950				
Satd. Flow (prot)	0	1790	0	0	1863	0	0	1770	0	0	1611	0
FIt Permitted		0.995						0.950				
Satd. Flow (perm)	0	1790	0	0	1863	0	0	1770	0	0	1611	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		53.8			44.7			33.3			43.2	
Travel Time (s)		3.9			3.2			2.4			3.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	61	24	0	189	0	77	0	0	0	0	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	95	0	0	189	0	0	77	0	0	24	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
)ther											
Control Type: Unsignalized												
Intersection Capacity Utilizati	on 29.4%			IC	U Level	of Service	A					

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations		\$			\$			4			4	
Traffic Volume (veh/h)	9	56	22	0	174	0	71	0	0	0	0	2
Future Volume (Veh/h)	9	56	22	0	174	0	71	0	0	0	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	10	61	24	0	189	0	77	0	0	0	0	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)		None			None							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	189			85			306	282	73	282	294	18
vC1, stage 1 conf vol	107			05			300	202	75	202	274	TC
vC2, stage 2 conf vol												
vCu, unblocked vol	189			85			306	282	73	282	294	18
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6
tC, 2 stage (s)	4.1			4.1			7.1	0.5	0.2	7.1	0.5	0
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3
p0 queue free %	2.2			100			88	4.0	100	100	100	s ç
cM capacity (veh/h)	1385			1512			625	622	989	667	613	85
1 3 3 3							020	022	909	007	015	00
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	95	189	77	24								
Volume Left	10	0	77	0								
Volume Right	24	0	0	24								
cSH	1385	1512	625	853								
Volume to Capacity	0.01	0.00	0.12	0.03								
Queue Length 95th (m)	0.2	0.0	3.4	0.7								
Control Delay (s)	0.9	0.0	11.6	9.3								
Lane LOS	А		В	А								
Approach Delay (s)	0.9	0.0	11.6	9.3								
Approach LOS			В	А								
Intersection Summary												
Average Delay			3.1									
Intersection Capacity Utilizat	tion		29.4%	IC	U Level of	f Service			A			
Analysis Period (min)			15									

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Background

Synchro 9 Report Page 11 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Background

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (vph)	20	87	22	0	267	0	70	0	0	0	0	44
Future Volume (vph)	20	87	22	0	267	0	70	0	0	0	0	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.977									0.865	
Flt Protected		0.992						0.950				
Satd. Flow (prot)	0	1805	0	0	1863	0	0	1770	0	0	1611	0
Flt Permitted		0.992						0.950				
Satd. Flow (perm)	0	1805	0	0	1863	0	0	1770	0	0	1611	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		38.9			53.8			33.6			37.9	
Travel Time (s)		2.8			3.9			2.4			2.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	95	24	0	290	0	76	0	0	0	0	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	141	0	0	290	0	0	76	0	0	48	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
)ther											
Control Type: Unsignalized												

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SE
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (veh/h)	20	87	22	0	267	0	70	0	0	0	0	
Future Volume (Veh/h)	20	87	22	0	267	0	70	0	0	0	0	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.
Hourly flow rate (vph)	22	95	24	0	290	0	76	0	0	0	0	
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	290			119			489	441	107	441	453	2
vC1, stage 1 conf vol	270			117			107		107		100	~
vC2, stage 2 conf vol												
vCu, unblocked vol	290			119			489	441	107	441	453	2
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	(
tC, 2 stage (s)	1.1			1.1			7.1	0.0	0.2	7.1	0.0	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	
p0 queue free %	98			100			83	100	100	100	100	
cM capacity (veh/h)	1272			1469			452	502	947	520	494	7
		WD 1	ND 1				432	502	777	520	7/7	,
Direction, Lane # Volume Total	EB 1 141	WB 1 290	NB 1 76	SB 1 48								
Volume Left	22	270	76	40								
Volume Right	22	0	0	48								
cSH	1272	1469	452	749								
Volume to Capacity	0.02	0.00	432	0.06								
Queue Length 95th (m)	0.02	0.00	4.8	1.6								
Control Delay (s)	1.4	0.0	4.0 14.6	10.1								
Lane LOS	1.4 A	0.0	14.0 B	B								
Approach Delay (s)	A 1.4	0.0	В 14.6	в 10.1								
Approach LOS	1.4	0.0	14.0 B	B								
Intersection Summary												
Average Delay			3.2									
Intersection Capacity Utiliza	ation		40.6%	IC	Ulevelo	of Service			А			
Analysis Period (min)			10.070		2 201010							

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Background

Synchro 9 Report Page 13 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Background

Appendix "C" to Report PED19115 Page 176 of 314

ane Group ane Configurations Traffic Volume (vph)	EBL	→	\mathbf{i}	-								,
ane Configurations	EBL		•	-	-	•	1	T.	1	1	Ŧ	-
Traffic Volume (vph)		EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
		\$			\$			¢			\$	
·	16	42	20	202	21	1	17	61	329	3	34	5
Future Volume (vph)	16	42	20	202	21	1	17	61	329	3	34	5
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.965			0.999			0.891			0.985	
It Protected		0.990			0.957			0.998			0.997	
Satd. Flow (prot)	0	1815	0	0	1769	0	0	1690	0	0	1866	0
It Permitted		0.990			0.957			0.998			0.997	
Satd. Flow (perm)	0	1815	0	0	1769	0	0	1690	0	0	1866	0
ink Speed (k/h)		50			50			50			50	
ink Distance (m)		165.1			52.2			184.8			166.7	
Fravel Time (s)		11.9			3.8			13.3			12.0	
Confl. Peds. (#/hr)	1		1	1		1	2		1	1		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	17	46	22	220	23	1	18	66	358	3	37	5
Shared Lane Traffic (%)												
ane Group Flow (vph)	0	85	0	0	244	0	0	442	0	0	45	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
ane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Vedian Width(m)		0.0	5		0.0	5		3.6	5		3.6	5
_ink Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Furning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
ntersection Summary												
	ther											
Control Type: Unsignalized						of Service						

-												
	٦	-	\mathbf{r}	4	•	*	1	1	1	1	Ŧ	*
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SE
Lane Configurations		\$			\$			\$			4	
Traffic Volume (veh/h)	16	42	20	202	21	1	17	61	329	3	34	
Future Volume (Veh/h)	16	42	20	202	21	1	17	61	329	3	34	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.
Hourly flow rate (vph)	17	46	22	220	23	1	18	66	358	3	37	
Pedestrians		2			1			1			1	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)					Ū						Ū	
Median type								None			None	
Median storage veh)								None			TUDIIC	
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	342	508	42	374	332	247	44			425		
vC1, stage 1 conf vol	342	308	42	374	332	247	44			420		
vC1, stage 2 conf vol												
vC2, stage 2 control vCu, unblocked vol	342	508	42	374	332	247	44			425		
tC, single (s)	7.1	6.5	42	7.1	6.5	6.2	44			425		
	7.1	0.5	0.2	7.1	0.5	0.2	4.1			4.1		
tC, 2 stage (s) tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
	3.5 97	4.0	3.3 98	3.5 58	4.0	3.3 100	2.2			100		
p0 queue free %	588	463	98	58 519	96 581	795	1575			1144		
cM capacity (veh/h)				-	581	795	1575			1144		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	85	244	442	45								
Volume Left	17	220	18	3								
Volume Right	22	1	358	5								
cSH	568	525	1575	1144								
Volume to Capacity	0.15	0.47	0.01	0.00								
Queue Length 95th (m)	4.2	19.5	0.3	0.1								
Control Delay (s)	12.5	17.7	0.4	0.6								
Lane LOS	В	С	A	А								
Approach Delay (s)	12.5	17.7	0.4	0.6								
Approach LOS	В	С										
Intersection Summary												
Average Delay			6.8									
Intersection Capacity Utilizat	ion		54.3%	IC	U Level o	of Service			А			

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Background

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Background

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Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	٦	•	î,		٦	1	
Traffic Volume (vph)	256	956	471	151	96	160	
Future Volume (vph)	256	956	471	151	96	160	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	120.0			0.0	40.0	0.0	
Storage Lanes	1			0	1	1	
Taper Length (m)	7.5				7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt			0.967			0.850	
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1805	1881	1737	0	1770	1615	
FIt Permitted	0.950				0.950		
Satd. Flow (perm)	1805	1881	1737	0	1770	1615	
Link Speed (k/h)		80	80		50		
Link Distance (m)		123.4	826.3		184.8		
Travel Time (s)		5.6	37.2		13.3		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	0%	1%	7%	2%	2%	0%	
Adj. Flow (vph)	278	1039	512	164	104	174	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	278	1039	676	0	104	174	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Vedian Width(m)		3.6	3.6		3.6		
Link Offset(m)		0.0	0.0		0.0		
Crosswalk Width(m)		4.8	4.8		4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25			15	25	15	
Sign Control		Free	Free		Stop		
Intersection Summary							
	Other						
Control Type: Unsignalized Intersection Capacity Utilizati					CU Level		

2: North Service Ro	٨		+	4	Υ.	1	
		-	•		*		
Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations	- ሽ	↑	f,		ሻ	1	
Traffic Volume (veh/h)	256	956	471	151	96	160	
Future Volume (Veh/h)	256	956	471	151	96	160	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	278	1039	512	164	104	174	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None	None				
Median storage veh)			110110				
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	676				2189	594	
vC1, stage 1 conf vol	070				2107	374	
vC2, stage 2 conf vol							
vCu, unblocked vol	676				2189	594	
tC, single (s)	4.1				6.4	6.2	
tC, 2 stage (s)	4.1				0.4	0.2	
ic, z siage (s) iF (s)	2.2				3.5	3.3	
pO queue free %	2.2				3.5	3.3 66	
					35		
cM capacity (veh/h)	925					509	
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2		
Volume Total	278	1039	676	104	174		
Volume Left	278	0	0	104	0		
Volume Right	0	0	164	0	174		
cSH	925	1700	1700	35	509		
Volume to Capacity	0.30	0.61	0.40	2.97	0.34		
Queue Length 95th (m)	10.2	0.0	0.0	95.2	12.0		
Control Delay (s)	10.6	0.0	0.0	1129.6	15.7		
Lane LOS	В			F	С		
Approach Delay (s)	2.2		0.0	432.4			
Approach LOS				F			
Intersection Summary							
Average Delay			54.2				
Intersection Capacity Utiliza	tion		63.5%	IC	U Level o	f Service	В

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Background

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Background

: North Service Ro	auaiv	illien i	Road				06-14-2018	3: North Service F		ппен г	Nuau			
	≯	+	Ļ	•	*	1			≯	+	t	•	1	4
ane Group	EBL	EBT	WBT	WBR	SBL	SBR		Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
ane Configurations	5	•	ĥ		5	1		Permitted Phases	2					4
raffic Volume (vph)	246	806	246	83	94	376		Detector Phase	2	2	6		4	4
uture Volume (vph)	246	806	246	83	94	376		Switch Phase						
leal Flow (vphpl)	1900	1900	1900	1900	1900	1900		Minimum Initial (s)	20.0	20.0	20.0		10.0	10.0
torage Length (m)	85.0	1700	1700	0.0	50.0	0.0		Minimum Split (s)	26.0	26.0	26.0		24.0	24.0
torage Lanes	1			0.0	1	1		Total Split (s)	46.0	46.0	46.0		24.0	24.0
aper Length (m)	7.5			U	7.5			Total Split (%)	65.7%	65.7%	65.7%		34.3%	34.3%
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		Maximum Green (s)	40.0	40.0	40.0		18.0	18.0
t	1.00	1.00	0.966	1.00	1.00	0.850		Yellow Time (s)	40.0	40.0	40.0		4.0	4.0
t Protected	0.950		0.900		0.950	0.000		All-Red Time (s)	4.0	4.0	4.0		4.0 2.0	4.0 2.0
	1805	1863	1782	0	1805	1583		Lost Time Adjust (s)	2.0	2.0	2.0		2.0	2.0
atd. Flow (prot) It Permitted	0.528	1803	1/82	U	0.950	1003			0.0	0.0 6.0	0.0 6.0			0.0 6.0
		1040	1700	0		1500		Total Lost Time (s)	0.0	0.0	0.0		6.0	0.0
atd. Flow (perm)	1003	1863	1782	0	1805	1583		Lead/Lag						
ight Turn on Red			40	Yes		Yes		Lead-Lag Optimize?	2.0	2.0	2.0		2.0	3.0
atd. Flow (RTOR)		0.0	40		50	409		Vehicle Extension (s)	3.0	3.0	3.0		3.0	
nk Speed (k/h)		80	80		50			Recall Mode	C-Max	C-Max	C-Max		Max	Max
nk Distance (m)		826.3	260.0		127.1			Walk Time (s)	7.0	7.0	7.0		7.0	7.0
ravel Time (s)		37.2	11.7		9.2			Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0
eak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		Pedestrian Calls (#/hr)	0	0	0		0	0
eavy Vehicles (%)	0%	2%	4%	0%	0%	2%		Act Effct Green (s)	40.0	40.0	40.0		18.0	18.0
dj. Flow (vph)	267	876	267	90	102	409		Actuated g/C Ratio	0.57	0.57	0.57		0.26	0.26
hared Lane Traffic (%)								v/c Ratio	0.47	0.82	0.34		0.22	0.58
ane Group Flow (vph)	267	876	357	0	102	409		Control Delay	12.1	20.7	8.1		22.0	6.2
nter Blocked Intersection	No	No	No	No	No	No		Queue Delay	0.0	0.0	0.0		0.0	0.0
ane Alignment	Left	Left	Left	Right	Left	Right		Total Delay	12.1	20.7	8.1		22.0	6.2
ledian Width(m)		3.6	3.6		3.6			LOS	В	С	A		С	A
nk Offset(m)		0.0	0.0		0.0			Approach Delay		18.7	8.1		9.4	
rosswalk Width(m)		4.8	4.8		4.8			Approach LOS		В	А		А	
wo way Left Turn Lane														
eadway Factor	1.00	1.00	1.00	1.00	1.00	1.00		Intersection Summary	0.11					
urning Speed (k/h)	25			15	25	15		Area Type:	Other					
umber of Detectors	1	2	2		1	1		Cycle Length: 70						
etector Template	Left	Thru	Thru		Left	Right		Actuated Cycle Length: 70					_	
eading Detector (m)	2.0	10.0	10.0		2.0	2.0		Offset: 0 (0%), Referenced	d to phase 2	:EBTL an	d 6:WBT,	Start of G	Green	
railing Detector (m)	0.0	0.0	0.0		0.0	0.0		Natural Cycle: 60						
etector 1 Position(m)	0.0	0.0	0.0		0.0	0.0		Control Type: Actuated-Co	pordinated					
etector 1 Size(m)	2.0	0.6	0.6		2.0	2.0		Maximum v/c Ratio: 0.82						
etector 1 Type	CI+Ex	CI+Ex			CI+Ex	CI+Ex		Intersection Signal Delay:					ntersectior	
etector 1 Channel	0 24	51.24	011 24		011.24	5		Intersection Capacity Utiliz	zation 60.8%)		IC	CU Level o	of Service E
etector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0		Analysis Period (min) 15						
etector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0								
etector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0		Splits and Phases: 3: N	orth Service	Road & M	Aillen Roa	ad		
etector 2 Position(m)	0.0	9.4	9.4		0.0	0.0								
etector 2 Size(m)		9.4	9.4					🗕 🔶 Ø2 (R)						
								46 s						
etector 2 Type		CI+Ex	CI+Ex					Ø6 (R)						
etector 2 Channel		0.0						46 c						
etector 2 Extend (s) urn Type	D	0.0	0.0			D		10.5						
	Perm	NA	NA		Prot	Perm								

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Background

Synchro 9 Report Page 5 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Background

Synchro 9 Report Page 6

06-14-2018

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Lane Group	EBL	EBT	WBT	SBL	SBR	
Lane Group Flow (vph)	267	876	357	102	409	
v/c Ratio	0.47	0.82	0.34	0.22	0.58	
Control Delay	12.1	20.7	8.1	22.0	6.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	12.1	20.7	8.1	22.0	6.2	
Queue Length 50th (m)	19.5	88.3	20.6	11.1	0.0	
Queue Length 95th (m)	37.6	#167.6	35.6	22.9	20.0	
Internal Link Dist (m)		802.3	236.0	103.1		
Turn Bay Length (m)	85.0			50.0		
Base Capacity (vph)	573	1064	1035	464	710	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.47	0.82	0.34	0.22	0.58	

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

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Background

Synchro 9 Report Page 7

	≯	-+	-	•	1	1		
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	ň	•	¢Î		ň	1		
Traffic Volume (vph)	246	806	246	83	94	376		
Future Volume (vph)	246	806	246	83	94	376		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Total Lost time (s)	6.0	6.0	6.0	1700	6.0	6.0		
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00		
Frt	1.00	1.00	0.97		1.00	0.85		
Flt Protected	0.95	1.00	1.00		0.95	1.00		
Satd. Flow (prot)	1805	1863	1782		1805	1583		
Flt Permitted	0.53	1.00	1.00		0.95	1.00		
Satd. Flow (perm)	1004	1863	1782		1805	1583		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Adj. Flow (vph)	267	876	267	90	102	409		
RTOR Reduction (vph)	0	0/0	17	0	0	304		
Lane Group Flow (vph)	267	876	340	0	102	105		
Heavy Vehicles (%)	0%	2%	4%	0%	0%	2%		
Turn Type	Perm	NA	NA	070	Prot	Perm		
Protected Phases	T CHII	2	6		4	1 CHII		
Permitted Phases	2	2	0		т	4		
Actuated Green, G (s)	40.0	40.0	40.0		18.0	18.0		
Effective Green, g (s)	40.0	40.0	40.0		18.0	18.0		
Actuated g/C Ratio	0.57	0.57	0.57		0.26	0.26		
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0		
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)	573	1064	1018		464	407		
v/s Ratio Prot	575	c0.47	0.19		0.06	407		
v/s Ratio Perm	0.27	CU.47	0.17		0.00	c0.07		
v/c Ratio	0.27	0.82	0.33		0.22	0.26		
Uniform Delay, d1	8.8	12.1	7.9		20.5	20.7		
Progression Factor	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2	2.7	7.2	0.9		1.1	1.5		
Delay (s)	11.5	19.4	8.8		21.6	22.2		
Level of Service	B	17.4 B	0.0 A		21.0 C	22.2 C		
Approach Delay (s)	D	17.5	8.8		22.1	0		
Approach LOS		17.5 B	0.0 A		22.1 C			
		U	А		U			
Intersection Summary								
HCM 2000 Control Delay			17.1	H	CM 2000	Level of Serv	ice B	
HCM 2000 Volume to Capa	acity ratio		0.65					
Actuated Cycle Length (s)			70.0		um of lost		12.0	
Intersection Capacity Utiliza	ation		60.8%	IC	U Level (of Service	В	
Analycic Doriod (min)			15					

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Background

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Analysis Period (min) c Critical Lane Group

Lane Croup EBT EBR WBL WBT NBL NBR Lane Configurations 1	4: Access 1 & Fran	0007110	Jildo					
Lane Configurations Image: Configuration of the second of th		-	\rightarrow	1	+	1	1	
Traffic Volume (vph) 23 144 0 2 92 0 Future Volume (vph) 23 144 0 2 92 0 Ideal Flow (vphpl) 1900 1900 1900 1900 1900 1900 Lane Util. Factor 1.00 1.00 1.00 1.00 1.00 1.00 Frt 0.884 0 2 92 0 1.00 1.00 Frt 0.884 0 1.00 1.00 1.00 1.00 1.00 Satd. Flow (prot) 1647 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 50 Satd. Flow (perm) 1647 0 0 1863 1770 0 Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Enter Bioc	Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	
Traffic Volume (vph) 23 144 0 2 92 0 Future Volume (vph) 23 144 0 2 92 0 Ideal Flow (vphp) 1900 1900 1900 1900 1900 1900 Lane Util. Factor 1.00 1.00 1.00 1.00 1.00 1.00 Fr 0.884 0 2 92 0 Fit Particle 0.950 0 1.00 1.00 1.00 Satid. Flow (perm) 1647 0 0 1863 1770 0 Satid. Flow (perm) 1647 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 50 Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 182 0 0 2 100 0 Shared Lane Traffic (%) 1.00 0.0 0.0<	Lane Configurations	eî Î			ę	¥		
Ideal Flow (vphpl) 1900 1900 1900 1900 1900 Lane Ulii, Factor 1.00 1.00 1.00 1.00 1.00 Frt 0.884	Traffic Volume (vph)		144	0		92	0	
Lane Util. Factor 1.00 1.00 1.00 1.00 1.00 1.00 Frt 0.884 Fil Protected 0.950 Satd. Flow (prot) 1647 0 0 1863 1770 0 Fil Permitted 0.950 Satd. Flow (perm) 1647 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) Lane Group Flow (vph) 182 0 0 2 100 0 Shared Lane Traffic (%) Lane Group Flow (vph) 182 0 0 2 100 0 Enter Blocked Intersection No No No No No No Lane Alignment Left Right Left Left Right Median Width(m) 0.0 0.0 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 1.00 Turning Speed (k/h) 15 25 25 15 Sign Control Free Free Stop Intersection Summary Area Type: Other	Future Volume (vph)	23	144	0	2	92	0	
Fit 0.884 FIt Protected 0.950 Satd. Flow (prot) 1647 0 0 RIP Permitted 0.950 Satd. Flow (perm) 1647 0 0 Ink Distance (m) 44.7 49.4 3.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) Lane Group Flow (vph) 182 0 0 2 100 0 Eane Alignment Left Right Left Left Right Kather Median Width(m) 0.0 0.0 3.6 100 100 1.00 1.00 Crosswalk Width(m) 4.8 4.8 4.8 4.8 15 25 25 15 Sign Control Free Free Stop 15 25 15 15	deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Fil Protected 0.950 Satd. Flow (prot) 1647 0 0 1863 1770 0 Fil Permitted 0.950 0 1863 1770 0 Satd. Flow (perm) 1647 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 50 50 50 Link Speed (k/h) 50 3.2 3.6 3.1 Peek Hour Factor 0.92 0.92 0.92 0.92 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) 182 0 2 100 0 Enter Blocked Intersection No No No No Lane Alignment Left Right Left Left Right Right Median Width(m) 0.0 0.0 0.0 Crosswalk Width(m) 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 4.8 4.8 4.8 4.8 4.8 4.8	Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Satd. Flow (prot) 1647 0 1863 1770 0 FIP Permitted 0.950 0.950 Satd. Flow (perm) 1647 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 Link Distance (m) 44.7 49.4 43.7 1 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) 152 0 2 100 0 Lane Group Flow (vph) 182 0 2 100 0 Lane Alignment Left Right Left Right Keit Median Width(m) 0.0 0.0 3.6 100 100 100 Link Offset(m) 0.0 0.0 0.0 100 100 100 100 100 Troswalk Width(m) 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00<	Frt	0.884						
Fil Permitted 0.950 Satd. Flow (perm) 1647 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 10 11 Link Distance (m) 44.7 49.4 43.7 17 17 14 14 17 14 14 17 14 14 17 14 14 17 14 14 17 14 14 17 14 14 17 14 14 17 14 14 17 14 14 17 14 14 17 14 14 17 14 14 17 14 14 17 14 14 17 14 18 17 16 1	Flt Protected					0.950		
Satd. Flow (perm) 1647 0 0 1863 1770 0 Link Speed (k/h) 50	Satd. Flow (prot)	1647	0	0	1863	1770	0	
Link Speed (k/h) 50 50 50 Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) Lane Group Flow (vph) 182 0 0 2 100 0 Shared Lane Traffic (%) Lane Alignment Left Right Left Left Left Right Median Width(m) 0.0 0.0 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 1.00 Turning Speed (k/h) 15 25 25 15 Sign Control Free Free Stop Intersection Summary Area Type: Other	FIt Permitted					0.950		
Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%)	Satd. Flow (perm)	1647	0	0	1863	1770	0	
Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) Itale Group Flow (vph) 182 0 2 100 0 Enter Blocked Intersection No No No No No No Median Width(m) 0.0 0.0 3.6 Itale Kright Left Left Right Median Width(m) 0.0 0.0 3.6 Itale Kright Itale Kright Itale Kright Itale Kright Inter Section 0.0 1.00 0.0 0.0 Itale Kright Itale Kright Inter Section 0.0 0.0 0.0 Itale Kright Itale Kright Itale Kright Headway Factor 1.00 1.00 1.00 1.00 1.00 1.00 Itale Kright Itale Kright Intersection Summary Itale Kright Free Stop Stop Itale Kright Itale Kright Area Type: Other	Link Speed (k/h)	50			50	50		
Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) 1 2 0 0 2 100 0 Enter Blocked Intersection No No No No No No Lane Alignment Left Right Left Left Left Right Median Width(m) 0.0 0.0 3.6 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 4.8 1.00	Link Distance (m)	44.7			49.4	43.7		
Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%)	Travel Time (s)	3.2			3.6	3.1		
Shared Lane Traffic (%) 0 2 100 0 Lane Group Flow (vph) 182 0 0 2 100 0 Enter Blocked Intersection No No No No No No Lane Alignment Left Right Left Left Right No No No Median Width(m) 0.0 0.0 3.6 No No No No Crosswalk Width(m) 0.0 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane	Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Lane Group Flow (vph) 182 0 0 2 100 0 Enter Blocked Intersection No No No No No No Lane Alignment Left Right Left Left Left Right Median Width(m) 0.0 0.0 3.6	Adj. Flow (vph)	25	157	0	2	100	0	
Enter Blocked Intersection No No No No No No No No No Lane Alignment Left Right Left Left Right Right Left Left Right Right Right Left Left Right Right No No No No No Lane Alignment Left Right Left Left Right Left Right Left Left Right Left Left <thleft< th=""> Left <thleft< t<="" td=""><td>Shared Lane Traffic (%)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></thleft<></thleft<>	Shared Lane Traffic (%)							
Lane Alignment Left Right Left Left Left Right Median Width(m) 0.0 0.0 3.6	Lane Group Flow (vph)	182	0	0	2	100	0	
Median Width(m) 0.0 0.0 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 Turning Speed (k/h) 15 25 25 15 Sign Control Free Free Stop	Enter Blocked Intersection	No	No	No	No	No	No	
Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane	Lane Alignment	Left	Right	Left	Left	Left	Right	
Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane	Vedian Width(m)	0.0	-		0.0	3.6	-	
Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 Turning Speed (k/h) 15 25 25 15 Sign Control Free Stop Intersection Summary Area Type: Other Other	Link Offset(m)	0.0			0.0	0.0		
Headway Factor 1.00 1.00 1.00 1.00 Turning Speed (k/h) 15 25 25 15 Sign Control Free Free Stop Intersection Summary Area Type: Other	Crosswalk Width(m)	4.8			4.8	4.8		
Turning Speed (k/h) 15 25 25 15 Sign Control Free Free Stop Intersection Summary Area Type: Other	Two way Left Turn Lane							
Sign Control Free Free Stop Intersection Summary Area Type: Other	Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Intersection Summary Area Type: Other	Turning Speed (k/h)		15	25		25	15	
Area Type: Other	Sign Control	Free			Free	Stop		
	Intersection Summary							
Control Type: Unsignalized		Other						
Intersection Capacity Utilization 21.9% ICU Level of Service A	Control Type: Unsignalized							

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis 4: Access 1 & Frances Avenue

	-	\mathbf{r}	4	-	1	1
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	¢Î			र्स	Y	
Traffic Volume (veh/h)	23	144	0	2	92	0
Future Volume (Veh/h)	23	144	0	2	92	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	157	0	2	100	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			182		106	104
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			182		106	104
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		89	100
cM capacity (veh/h)			1393		892	951
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	182	2	100			
Volume Left	0	0	100			
Volume Right	157	0	001			
cSH	1700	1393	892			
Volume to Capacity	0.11	0.00	0.11			
Queue Length 95th (m)	0.0	0.0	3.0			
Control Delay (s)	0.0	0.0	9.5			
Lane LOS	0.0	0.0	7.J			
Approach Delay (s)	0.0	0.0	9.5			
Approach LOS	0.0	0.0	9.5 A			
11			A			
Intersection Summary						
Average Delay			3.4			(C) 1
Intersection Capacity Utilizat	tion		21.9%	IC	U Level o	of Service
Analysis Period (min)			15			

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Background

Synchro 9 Report Page 9 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Background

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (vph)	29	95	67	0	94	0	43	0	0	0	0	3
Future Volume (vph)	29	95	67	0	94	0	43	0	0	0	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.953									0.865	
Flt Protected		0.992						0.950				
Satd. Flow (prot)	0	1761	0	0	1863	0	0	1770	0	0	1611	0
FIt Permitted		0.992						0.950				
Satd. Flow (perm)	0	1761	0	0	1863	0	0	1770	0	0	1611	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		53.8			44.7			33.3			48.0	
Travel Time (s)		3.9			3.2			2.4			3.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	103	73	0	102	0	47	0	0	0	0	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	208	0	0	102	0	0	47	0	0	3	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
)ther											
Control Type: Unsignalized												
Intersection Capacity Utilizati	on 33.1%			IC	U Level	of Service	A					

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations		\$			\$			4			\$	
Traffic Volume (veh/h)	29	95	67	0	94	0	43	0	0	0	0	
Future Volume (Veh/h)	29	95	67	0	94	0	43	0	0	0	0	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	32	103	73	0	102	0	47	0	0	0	0	
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	102			176			308	306	140	306	342	1
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	102			176			308	306	140	306	342	1
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3
p0 queue free %	98			100			93	100	100	100	100	1
cM capacity (veh/h)	1490			1400			631	595	909	636	568	9
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	208	102	47	3								
Volume Left	32	0	47	0								
Volume Right	73	0	0	3								
cSH	1490	1400	631	953								
Volume to Capacity	0.02	0.00	0.07	0.00								
Queue Length 95th (m)	0.5	0.0	1.9	0.1								
Control Delay (s)	1.3	0.0	11.2	8.8								
Lane LOS	A	0.0	B	A								
Approach Delay (s)	1.3	0.0	11.2	8.8								
Approach LOS			В	A								
Intersection Summary			<u> </u>									
Average Delay			2.3									
Intersection Capacity Utilization	on		33.1%	IC	U Level c	of Service			A			

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Background

Synchro 9 Report Page 11 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Background

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			÷			\$			\$	
Traffic Volume (vph)	44	263	66	0	141	0	42	0	0	0	0	37
Future Volume (vph)	44	263	66	0	141	0	42	0	0	0	0	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976									0.865	
Flt Protected		0.994						0.950				
Satd. Flow (prot)	0	1807	0	0	1863	0	0	1770	0	0	1611	0
FIt Permitted		0.994						0.950				
Satd. Flow (perm)	0	1807	0	0	1863	0	0	1770	0	0	1611	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		38.9			53.8			33.6			40.8	
Travel Time (s)		2.8			3.9			2.4			2.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	48	286	72	0	153	0	46	0	0	0	0	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	406	0	0	153	0	0	46	0	0	40	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
)ther											
Control Type: Unsignalized												
Intersection Capacity Utilizati	on 46.7%			IC	U Level	of Service	A					

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SE
Lane Configurations		\$			\$			4			4	
Traffic Volume (veh/h)	44	263	66	0	141	0	42	0	0	0	0	1
Future Volume (Veh/h)	44	263	66	0	141	0	42	0	0	0	0	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	48	286	72	0	153	0	46	0	0	0	0	
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)		110110			110110							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	153			358			611	571	322	571	607	1
vC1, stage 1 conf vol	155			550			UTT	571	522	571	007	
vC2, stage 2 conf vol												
vCu, unblocked vol	153			358			611	571	322	571	607	1
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6
tC, 2 stage (s)	7.1			7.1			7.1	0.5	0.2	7.1	0.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3
p0 queue free %	97			100			88	100	100	100	100	
cM capacity (veh/h)	1428			1201			378	416	719	421	397	8
1 31 1							370	410	/19	4Z I	397	0
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	406	153	46	40								
Volume Left	48	0	46	0								
Volume Right	72	0	0	40								
cSH Values to Conneitu	1428	1201	378	893								
Volume to Capacity	0.03	0.00	0.12	0.04								
Queue Length 95th (m)	0.8	0.0	3.3	1.1								
Control Delay (s)	1.2	0.0	15.8	9.2								
Lane LOS	A	0.0	C	A								
Approach Delay (s)	1.2	0.0	15.8	9.2								
Approach LOS			С	А								
Intersection Summary												
Average Delay			2.4									
Intersection Capacity Utiliza	ation		46.7%	IC	U Level o	t Service			А			
Analysis Period (min)			15									

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Background

Synchro 9 Report Page 13 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Background

Appendix I

2025 Future Total Traffic Operations Reports

Appendix "C" to Report PED19115 Page 184 of 314

Appendix "C" to Report PED19115 Page 185 of 314

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (vph)	13	19	17	452	59	0	5	18	153	0	62	8
Future Volume (vph)	13	19	17	452	59	0	5	18	153	0	62	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.954						0.883			0.984	
Flt Protected		0.987			0.958			0.999				
Satd. Flow (prot)	0	1743	0	0	1820	0	0	1569	0	0	1870	0
Flt Permitted		0.987			0.958			0.999				
Satd. Flow (perm)	0	1743	0	0	1820	0	0	1569	0	0	1870	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.1			52.2			184.8			166.7	
Travel Time (s)		11.9			3.8			13.3			12.0	
Confl. Peds. (#/hr)	1					1	2		3	3		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	0%	0%	0%	0%	0%	0%	7%	7%	0%	0%	0%
Adj. Flow (vph)	14	21	18	491	64	0	5	20	166	0	67	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	53	0	0	555	0	0	191	0	0	76	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0	Ū		0.0	Ū		3.6	Ū		3.6	Ū
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
	ther											
Control Type: Unsignalized												

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Movement	EBL	EBT	EBR	▼ WBL	WBT	WBR	NBL	NBT	NBR	SBL	▼ SBT	SBI
Lane Configurations	EDL		EDK	VVDL		WDR	INDL		INDIK	JDL	3D1	30
Traffic Volume (veh/h)	13	19	17	452	59	0	5	18	153	0	62	
Future Volume (Veh/h)	13	19	17	452	59	0	5	18	153	0	62	
Sign Control	15	Stop	17	4JZ	Stop	0	5	Free	155	U	Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	14	21	18	491	64	0.72	5	20	166	0.72	67	0.7
Pedestrians		2	10		3	Ū		20	100	0	1	
Lane Width (m)		3.6			3.6						3.6	
Walking Speed (m/s)		1.2			1.2						1.2	
Percent Blockage		0			0						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	220	272	74	216	194	107	78			189		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	220	272	74	216	194	107	78			189		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	97	98	31	91	100	100			100		
cM capacity (veh/h)	664	633	992	707	700	949	1531			1394		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	53	555	191	76								
Volume Left	14	491	5	0								
Volume Right	18	0	166	9								
cSH	732	706	1531	1394								
Volume to Capacity	0.07	0.79	0.00	0.00								
Queue Length 95th (m)	1.9	62.4	0.1	0.0								
Control Delay (s)	10.3	26.1	0.2	0.0								
Lane LOS	В	D	A									
Approach Delay (s) Approach LOS	10.3 B	26.1 D	0.2	0.0								
••	D	U										
Intersection Summary Average Delay			17.3									
Average Delay Intersection Capacity Utilizati			56.7%	10	Ulevelo	4 C			В			

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

Lane Configurations FBL EBT WBR SBL SBR Lane Configurations 1 1 1 1 1 1 Traffic Volume (vph) 92 149 888 84 174 358 Future Volume (vph) 92 149 888 84 174 358 Edeal Flow (vphp) 120.0 0.0 40.0 0.0 Storage Length (m) 120.0 0.0 40.0 0.0 Storage Length (m) 7.5 7.5 7.5 100 1.00 1		٨		Ļ	۰.	1	1	
Lane Configurations Image: Configurations Image: Configurations Image: Configurations Traffic Volume (vph) 92 149 888 84 174 358 Future Volume (vph) 92 149 888 84 174 358 Future Volume (vph) 92 149 888 84 174 358 Future Volume (vph) 92 149 888 84 174 358 Future Volume (vph) 92 149 888 84 174 358 Storage Length (m) 120.0 0.0 40.0 0.0 100 1900 1900 1900 Storage Length (m) 7.5 7.5 Lane Util. Factor 1.00 1.00 1.00 1.00 Ped Bike Factor 6 0.950 0.950 0.950 Storage Storage Storage Storage 0.850 1770 1615 1615 1616 1616 1615 1616 1615 1616 1615 1616 1617 10 10 142 826.3 184.8 174 389 1770			-	-			•	
Traffic Volume (vph) 92 149 888 84 174 358 Future Volume (vph) 92 149 888 84 174 358 Ideal Flow (vph) 1900 1900 1900 1900 1900 Storage Length (m) 120.0 0.0 40.0 0.0 Storage Lanes 1 0 1 1 Taper Length (m) 7.5 7.5	Lane Group				WBR			
Future Volume (vph) 92 149 888 84 174 358 Ideal Flow (vphp) 1900 1900 1900 1900 1900 Storage Length (m) 120.0 0.0 40.0 0.0 Storage Length (m) 7.5 7.5 Lane Util. Factor 1.00 1.00 1.00 1.00 Ped Bike Factor 7.5 0.950 0.950 Fit 0.950 0.950 0.950 Satd. Flow (pern) 1687 1696 1783 0 1770 1615 Link Distance (m) 123.4 826.3 184.8 174 389 Confl. Peds. (#hr) 1 1 1 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 7% 12% 4% 19% 389 Shared Lane Traffic (%) 100 162 1056 189 389 Ink Distance (Intersection No No No No No Link Distance (wph) 100 162	Lane Configurations	<u>٦</u>	↑	4		<u>۲</u>	1	
ideal Flow (vphp) 1900 1900 1900 1900 1900 Storage Length (m) 120.0 0.0 40.0 0.0 Storage Lanes 1 0 1 1 Taper Length (m) 7.5 7.5 Lane Util. Factor 1.00 1.00 1.00 1.00 Ped Bike Factor - - 0.850 Fit 0.988 0.850 Fit Protected 0.950 0.950 Satd. Flow (port) 1687 1696 1783 0 1770 1615 Fit Permitted 0.950 0.950 0.950 0.950 0.950 0.950 Satd. Flow (port) 1687 1696 1783 0 1770 1615 1.11 1 Fravel Time (s) 5.6 37.2 13.3 1.3 1<	Traffic Volume (vph)	92	149	888	84	174	358	
Storage Length (m) 120.0 0.0 40.0 0.0 Storage Lanes 1 0 1 1 Taper Length (m) 7.5 7.5 1.00 1.00 Lane Util, Factor 1.00 1.00 1.00 1.00 1.00 Ped Bike Factor 0.988 0.850 Fit 0.988 0.850 Storage Length (m) 1687 1696 1783 0 1770 Stot Flow (prot) 1687 1696 1783 0 1770 1615 Fit Protected 0.950 0.950 0.950 0.950 0.950 Statk Flow (prot) 1687 1696 1783 0 1770 1615 Link Speed (k/h) 80 80 50 50 50 50 Link Distance (m) 123.4 826.3 184.8 1730 170 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 192 Heavy Vehicles (%) 7% 12% 4% 19% 2% 0% Shared Lane Traffic (%)	Future Volume (vph)	92	149	888	84	174	358	
Storage Lanes 1 0 1 1 Taper Length (m) 7.5 7.5 Lane Util. Factor 1.00 1.00 1.00 1.00 Ped Bike Factor 0.968 0.850 Fit 0.988 0.850 Fit Protected 0.950 0.950 Satd. Flow (port) 1.687 1696 1783 0 1770 1615 Fit Permitted 0.950 0.950 0.950 0.950 0.950 0.950 Satd. Flow (port) 1.687 1696 1783 0 1770 1615 Link Speed (k/h) 80 80 50 0 1 1 Link Speed (k/h) 80 80 50 0 1 1 Peak Hour Factor 0.92 <t< td=""><td>Ideal Flow (vphpl)</td><td>1900</td><td>1900</td><td>1900</td><td>1900</td><td>1900</td><td>1900</td><td></td></t<>	Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Taper Length (m)7.57.5Lane Ulil. Factor1.001.001.001.001.00Ped Bike Factor0.9500.950Fit0.9500.950Satd. Flow (pern)1.6871696178301/F Permitted0.9500.950Satd. Flow (pern)1.6871696178301/F Permitted0.9500.950Satd. Flow (pern)1.6871696178301/F Permitted0.9500.950Link Speed (k/h)808050Link Distance (m)123.4826.3184.8Travel Time (s)5.637.213.3Confl. Peds. (#hr)11Peak Hour Factor0.920.920.920.92Heavy Vehicles (%)7%12%4%19%2%Adj. Flow (vph)10016210560189389Shared Lane Traffic (%)Lane Group Flow (vph)10016210560189389Enter Blocked IntersectionNoNoNoNoNoLane AlignmentLeftLeftRightRightMedian Width(m)3.63.63.63.6Link Diffset(m)0.00.00.00.0Turning Speed (k/h)25152515Sign ControlFreeFreeSlop	Storage Length (m)	120.0			0.0	40.0	0.0	
Lane Util, Factor 1.00 1.00 1.00 1.00 1.00 1.00 Ped Bike Factor 0.988 0.850 Fit Protected 0.950 0.950 Satd. Flow (prot) 1687 1696 1783 0 1770 1615 Fit Protected 0.950 0.950 0.950 0.950 0.950 Satd. Flow (prot) 1687 1696 1783 0 1770 1615 Link Speed (k/h) 80 80 50 50 50 50 Link Distance (m) 123.4 826.3 184.8 1770 1615 Link Distance (m) 123.4 826.3 184.8 1770 1615 Peak Hour Factor 0.92 0.92 0.92 0.92 1092 1092 Peak Hour Factor 0.92 0.92 0.92 0.92 164 100 Lane Group Flow (vph) 100 162 965 91 189 389 Shared Lane Traffic (%) Lane Alignmen	Storage Lanes	1			0	1	1	
Ped Bike Factor 0.988 0.850 Fit 0.950 0.950 Sati. Flow (prot) 1687 1696 1783 0 1770 1615 Fit Permitted 0.950 0.950 0.950 0.950 0.950 Sati. Flow (prot) 1687 1696 1783 0 1770 1615 Link Speed (k/h) 80 80 50 0.111 100 1615 Link Distance (m) 123.4 826.3 184.8 184.8 1720 1615 Travel Time (s) 5.6 37.2 13.3 1720 1615 100 100 162 965 91 139 389 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 170 1615 Lane Group Flow (vph) 100 162 965 91 189 389 389 Shared Lane Traffic (%) Lane Group Flow (vph) 100 162 1056 0 189 389 Enter Blocked Intersection No No No No No	Taper Length (m)	7.5				7.5		
Frit 0.988 0.850 FIP Ordeted 0.950 0.950 Satd. Flow (prot) 1687 1696 1783 0 1770 1615 FIP Permitted 0.950 0.950 0.950 0.950 Satd. Flow (perm) 1687 1696 1783 0 1770 1615 Link Speed (k/h) 80 80 50 0.950 0.950 Confl. Peds. (#/hr) 123.4 826.3 184.8 0.01770 1615 Link Distance (m) 123.4 826.3 184.8 0.01770 1615 Confl. Peds. (#/hr) 1 1 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 7% 12% 4% 19% 2% 0% Adj. Flow (vph) 100 162 965 91 189 389 Shared Lane Traffic (%) 100 162 1056 0 189 389 Lane Alignment Left Left Right Right Right Median Width(m) 3.6 3.6 3.6 3.6 1.00 Crosswalk Width(m) 4.8 4.8 4.8 4.8	Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frit 0.988 0.850 FIP Ordeted 0.950 0.950 Satd. Flow (prot) 1687 1696 1783 0 1770 1615 FIP Permitted 0.950 0.950 0.950 0.950 Satd. Flow (perm) 1687 1696 1783 0 1770 1615 Link Speed (k/h) 80 80 50 0.950 0.950 Confl. Peds. (#/hr) 123.4 826.3 184.8 0.01770 1615 Link Distance (m) 123.4 826.3 184.8 0.01770 1615 Confl. Peds. (#/hr) 1 1 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 7% 12% 4% 19% 2% 0% Adj. Flow (vph) 100 162 965 91 189 389 Shared Lane Traffic (%) 100 162 1056 0 189 389 Lane Alignment Left Left Right Right Right Median Width(m) 3.6 3.6 3.6 3.6 1.00 Crosswalk Width(m) 4.8 4.8 4.8 4.8	Ped Bike Factor							
Fit Protected 0.950 0.950 Satd. Flow (prot) 1687 1696 1783 0 1770 1615 Fit Permitted 0.950 0.950 0.950 0.950 Satd. Flow (perm) 1687 1696 1783 0 1770 1615 Link Speed (k/h) 80 80 50 50 50 50 Confl. Peds, (#/h) 123.4 826.3 184.8 50 50 Confl. Peds, (#/h) 1 1 1 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 7% 12% 4% 19% 2% 0% Adj. Flow (vph) 100 162 1056 0 189 389 Shared Lane Traffic (%) 7% 12% 4% 19% 389 Enter Blocked Intersection No No No No No Lane Alignment Left Left Right Right Right Median Width(m) 3.6 3.6 </td <td></td> <td></td> <td></td> <td>0.988</td> <td></td> <td></td> <td>0.850</td> <td></td>				0.988			0.850	
Satd. Flow (prot) 1687 1696 1783 0 1770 1615 FI Permitted 0.950 0.950 0.950 0.950 0.950 Satd. Flow (perm) 1687 1696 1783 0 1770 1615 Link Speed (k/h) 80 80 50 50 50 50 Link Distance (m) 123.4 826.3 184.8 50 56 56 Confl. Peds. (#/hr) 1 <t< td=""><td></td><td>0.950</td><td></td><td></td><td></td><td>0.950</td><td></td><td></td></t<>		0.950				0.950		
Fit Permitted 0.950 0.950 Satat. Flow (perm) 1687 1696 1783 0 1770 1615 Link Speed (k/h) 80 80 50 50 50 Link Distance (m) 123.4 826.3 184.8 50 Travel Time (s) 5.6 37.2 13.3 Confl. Peds. (#/hr) 1 1 1 Peak Hour Factor 0.92 0.92 0.92 Heavy Vehicles (%) 7% 12% 4% Jamed Lane Traffic (%) 1 1 1 Lane Group Flow (vph) 100 162 965 91 Shared Lane Traffic (%) 1 1 1 Lane Group Flow (vph) 100 162 1056 0 Lane Group Flow (vph) 100 162 1056 0 Lane Group Flow (vph) 0.0 0.0 No No Lane Group Flow (vph) 0.0 100 162 165 Link Offset(m) 0.0 0.0 0.0 100 Lane Group Flow (vph) 100 162 165 3.6 Link Offset(m) 3.6 3.6 3.6 Link Offset(m) 0.0 0.0 0.0 </td <td>Satd, Flow (prot)</td> <td>1687</td> <td>1696</td> <td>1783</td> <td>0</td> <td>1770</td> <td>1615</td> <td></td>	Satd, Flow (prot)	1687	1696	1783	0	1770	1615	
Satd. Flow (perm) 1687 1696 1783 0 1770 1615 Link Speed (k/h) 80 80 50 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
Link Speed (k/h)808050Link Distance (m)123.4826.3184.8Travel Time (s)5.637.213.3Confl. Peds. (#hr)11Peak Hour Factor0.920.920.920.92Heavy Vehicles (%)7%12%4%19%2%0.920.920.920.92Heavy Vehicles (%)7%12%4%10016296591189Shared Lane Traffic (%)10016210560Lane Group Flow (vph)10016210560Lane AlignmentLeftLeftRightRightMedian Width(m)3.63.63.6Link Offset(m)0.00.00.0Crosswalk Width(m)4.84.84.8Two way Left Turn LaneHeadway Factor1.001.00Headway Factor10.01.001.00Turning Speed (k/h)25152515Sign ControlFreeFreeStop	Satd, Flow (perm)	1687	1696	1783	0	1770	1615	
Link Distance (m) 123.4 826.3 184.8 Travel Time (s) 5.6 37.2 13.3 Confl. Peds. (#/hr) 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 Peak Hour Factor 0.92 0.92 0.92 0.92 Lane Stop Flow (vph) 100 162 965 91 189 389 Shared Lane Traffic (%) Lane Group Flow (vph) 100 162 1056 0 189 389 Enter Blocked Intersection No No No No No No Median Width(m) 3.6 3.6 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 4.8 4.8 Headway Factor 1.00			80					
Travel Time (s) 5.6 37.2 13.3 Confl. Peds. (#/hr) 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 7% 12% 4% 19% 2% 0% Adj. Flow (vph) 100 162 965 91 189 389 Shared Lane Traffic (%) Lane Group Flow (vph) 100 162 1056 0 189 389 Enter Blocked Intersection No No No No No No Lane Group Flow (vph) 100 162 1056 0 189 389 Enter Blocked Intersection No No No No No No Lane Alignment Left Left Right Left Right Itild Right Median Width(m) 3.6 3.6 3.6 Itild Itild<								
Confl. Peds. (#/hr) 1 1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 7% 12% 4% 19% 2% 0% Adj. Flow (vph) 100 162 965 91 189 389 Shared Lane Traffic (%) Lane Group Flow (vph) 100 162 1056 0 189 389 Enter Blocked Intersection No No No No No No Median Width(m) 3.6 3.6 3.6 3.6 1.6 Link Offset(m) 0.0 0.0 Crosswalk Width(m) 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00								
Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Heavy Vehicles (%) 7% 12% 4% 19% 2% 0% Adj. Flow (vph) 100 162 965 91 189 389 Shared Lane Traffic (%) 100 162 1056 0 189 389 Enter Blocked Intersection No No No No No No Median Width(m) 3.6 3.6 3.6 1.6 1.6 1.0 1.0 1.0 1.0 1.0 1.0 1.00		1			1			
Heavy Vehicles (%) 7% 12% 4% 19% 2% 0% Adj. Flow (vph) 100 162 965 91 189 389 Shared Lane Traffic (%) Lane Group Flow (vph) 100 162 1056 0 189 389 Enter Blocked Intersection No No No No No No Lane Atignment Left Left Right Left Right Median Width(m) 3.6 3.6 3.6 Link Offset(m) 0.0 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 4.8 Headway Factor 1.00 1.00 1.00 1.00 1.00 Turming Speed (k/h) 25 15 25 15 Sign Control			0.92	0.92		0.92	0.92	
Adj. Flow (vph) 100 162 965 91 189 389 Shared Lane Traffic (%) Lane Group Flow (vph) 100 162 1056 0 189 389 Enter Blocked Intersection No No No No No Lane Alignment Left Left Right Lane Alignment Left Left Right Left Right Median Width(m) 3.6 3.6 3.6 3.6 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 Turning Speed (k/h) 25 15 25 15 Sign Control Free Free Stop								
Shared Lane Traffic (%) Lane Group Flow (vph) 100 162 1056 0 189 389 Enter Blocked Intersection No No No No No Lane Alignment Left Left Right Left Right Median Width(m) 3.6 3.6 3.6 3.6 Link Offset(m) 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00								
Lane Group Flow (vph) 100 162 1056 0 189 389 Enter Blocked Intersection No No No No No No Lane Alignment Left Left Right Left Right Median Width(m) 3.6 3.6 3.6 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 Turning Speed (k/h) 25 15 25 15 Sign Control Free Free Stop		100	102	,00		107	007	
Enter Blocked Intersection No No No No No No Lane Alignment Left Left Right Left Right Median Width(m) 3.6 3.6 3.6 Link Offset(m) 0.0 0.0 Link Offset(m) 0.0 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane		100	162	1056	0	189	389	
Lane Alignment Left Left Right Left Right Median Width(m) 3.6								
Median Width(m) 3.6 3.6 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 Headway Factor 1.00 1.00 1.00 1.00 1.00 Turning Speed (k/h) 25 15 25 15 Sign Control Free Free Stop								
Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 Headway Factor 1.00 1.00 1.00 1.00 1.00 Turning Speed (k/h) 25 15 25 15 Sign Control Free Free Stop		Loft			rugrit		rugitt	
Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane								
Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 1.00 Turning Speed (k/h) 25 15 25 15 Sign Control Free Free Stop								
Headway Factor 1.00 1.00 1.00 1.00 1.00 Turning Speed (k/h) 25 15 25 15 Sign Control Free Free Stop			0.7	U		7.0		
Turning Śpeed (k/h) 25 15 25 15 Sign Control Free Free Stop		1.00	1.00	1.00	1.00	1.00	1.00	
Sign Control Free Free Stop			1.00	1.00				
		25	Free	Free	15		15	
Intersection Summary	5	_	1700	1100	_	Stop		
Area Type: Other			_		_	_		
	Control Type: Unsignalized	ion 00 70/			10	NIL ovel	of Condi	D
	Intersection Capacity Utilizat	1011 80.7%			IC	O Level	JI SELVICE	U U

1 ← � 1 ٠ -WBT Movement EBL EBT WBR SBL SBR Lane Configurations ٦ . 🕈 Þ 7 Traffic Volume (veh/h) 92 149 888 84 174 358 Future Volume (Veh/h) 92 149 888 84 174 358 Sign Control Free Free Stop Grade 0% 0% 0% Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Hourly flow rate (vph) 100 162 965 91 189 389 Pedestrians 1 Lane Width (m) 3.6 Walking Speed (m/s) 1.2 Percent Blockage 0 Right turn flare (veh) Median type None None Median storage veh) Upstream signal (m) pX, platoon unblocked vC, conflicting volume 1057 1374 1012 vC1, stage 1 conf vol vC2, stage 2 conf vol 1057 1374 1012 vCu, unblocked vol tC, single (s) 4.2 6.4 6.2 tC, 2 stage (s) tF (s) 2.3 3.5 3.3 p0 queue free % 84 0 0 cM capacity (veh/h) 640 135 293 EB 1 Direction, Lane # EB2 WB1 SB 1 SB 2 Volume Total 100 162 1056 189 389 Volume Left 100 0 0 189 0 Volume Right 91 389 0 0 0 1700 293 cSH 640 1700 135 Volume to Capacity 0.16 0.10 0.62 1.40 1.33 Queue Length 95th (m) 99.3 4.4 0.0 0.0 155.9 Control Delay (s) 11.7 0.0 0.0 278.0 204.2 Lane LOS В F Approach Delay (s) 4.5 0.0 228.3 Approach LOS E

Intersection Summary			
Average Delay	70.2		
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

Analysis Period (min) 15

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

HCM Unsignalized Intersection Capacity Analysis

2: North Service Road & Green Road

Synchro 9 Report Page 4

	uu u n	1illen F	louu			
	≯	-	-	•	1	1
ne Group	EBL	EBT	WBT	WBR	SBL	SBR
e Configurations	1	•	લૈ		1	1
raffic Volume (vph)	146	177	469	93	72	503
uture Volume (vph)	146	177	469	93	72	503
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900
itorage Length (m)	85.0			0.0	50.0	0.0
torage Lanes	1			0	1	1
per Length (m)	7.5			Ū	7.5	
ne Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
	1.00	1.00	0.978	1.00	1.00	0.850
rotected	0.950		0.770		0.950	0.000
Flow (prot)	1719	1810	1807	0		1583
rmitted	0.242	1010	1007	U	0.950	1303
Flow (perm)	438	1810	1807	0	1504	1583
nt Turn on Red	430	1010	1007	Yes	1504	Yes
td. Flow (RTOR)			21	res		235
		00			50	230
k Speed (k/h)		80	80		50	
k Distance (m)		826.3	260.0		127.1	
rel Time (s)		37.2	11.7		9.2	
ak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
avy Vehicles (%)	5%	5%	2%	7%	20%	2%
j. Flow (vph)	159	192	510	101	78	547
hared Lane Traffic (%)						
ane Group Flow (vph)	159	192	611	0	78	547
nter Blocked Intersection	No	No	No	No	No	No
ane Alignment	Left	Left	Left	Right	Left	Right
ledian Width(m)		3.6	3.6		3.6	
nk Offset(m)		0.0	0.0		0.0	
osswalk Width(m)		4.8	4.8		4.8	
vo way Left Turn Lane						
idway Factor	1.00	1.00	1.00	1.00	1.00	1.00
ning Speed (k/h)	25			15	25	15
ber of Detectors	1	2	2		1	1
or Template	Left	Thru	Thru		Left	Right
ding Detector (m)	2.0	10.0	10.0		2.0	2.0
ailing Detector (m)	0.0	0.0	0.0		0.0	0.0
etector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
tector 1 Size(m)	2.0	0.6	0.6		2.0	2.0
etector 1 Type	CI+Ex		CI+Ex		CI+Ex	CI+Ex
etector 1 Channel	CITEA	GITEA	CITEA		CITEA	CITEX
etector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
etector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
tector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
tector 2 Position(m)		9.4	9.4			
ector 2 Size(m)		0.6	0.6			
etector 2 Type		CI+Ex	CI+Ex			
ector 2 Channel						
tor 2 Extend (s)		0.0	0.0			
Гуре	Perm	NA	NA		Prot	Perm
d Phases		2	6		4	

Synchro 9 Report Page 5

Synchro 9 Report Page 6

3: North Service Reservice Reservice	oad & N	1illen F	Road			06-14-201
	٦	-	+	1	-	
Lane Group	EBL	EBT	WBT	SBL	SBR	
Lane Group Flow (vph)	159	192	611	78	547	
v/c Ratio	0.84	0.24	0.77	0.14	0.75	
Control Delay	56.2	11.8	22.4	13.6	17.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	56.2	11.8	22.4	13.6	17.4	
Queue Length 50th (m)	15.5	13.4	55.1	5.9	29.1	
Queue Length 95th (m)	#48.1	25.4	#107.2	13.8	#79.2	
Internal Link Dist (m)		802.3	236.0	103.1		
Turn Bay Length (m)	85.0			50.0		
Base Capacity (vph)	189	784	794	551	729	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.84	0.24	0.77	0.14	0.75	

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

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

Synchro 9 Report Page 7

HCM Signalized Int			nalys	is		
3: North Service Ro	ad & Mille	n Road				
					,	

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Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	1	1	4		ň	1		
Traffic Volume (vph)	146	177	469	93	72	503		
Future Volume (vph)	146	177	469	93	72	503		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Total Lost time (s)	6.0	6.0	6.0		6.0	6.0		
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00		
Frt	1.00	1.00	0.98		1.00	0.85		
Flt Protected	0.95	1.00	1.00		0.95	1.00		
Satd. Flow (prot)	1719	1810	1807		1504	1583		
Flt Permitted	0.24	1.00	1.00		0.95	1.00		
Satd. Flow (perm)	438	1810	1807		1504	1583		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Adj. Flow (vph)	159	192	510	101	78	547		
RTOR Reduction (vph)	0	0	12	0	0	149		
Lane Group Flow (vph)	159	192	599	0	78	398		
Heavy Vehicles (%)	5%	5%	2%	7%	20%	2%		
Turn Type	Perm	NA	NA		Prot	Perm		
Protected Phases	1 0/111	2	6		4	1 0111		
Permitted Phases	2	_	-			4		
Actuated Green, G (s)	26.0	26.0	26.0		22.0	22.0		
Effective Green, g (s)	26.0	26.0	26.0		22.0	22.0		
Actuated g/C Ratio	0.43	0.43	0.43		0.37	0.37		
Clearance Time (s)	6.0	6.0	6.0		6.0	6.0		
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)	189	784	783		551	580		
/s Ratio Prot	,	0.11	0.33		0.05	500		
v/s Ratio Perm	c0.36	0	0.00		0.00	c0.25		
v/c Ratio	0.84	0.24	0.77		0.14	0.69		
Uniform Delay, d1	15.2	10.8	14.4		12.7	16.1		
Progression Factor	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2	34.1	0.7	7.0		0.5	6.5		
Delay (s)	49.3	11.5	21.4		13.2	22.6		
Level of Service	47.5 D	B	21.4 C		13.2 B	C		
Approach Delay (s)	5	28.6	21.4		21.4	5		
Approach LOS		20.0 C	21.4 C		21.4 C			
		U	Ŭ		0		 	
Intersection Summary								
HCM 2000 Control Delay			23.0	Н	CM 2000	Level of Service	С	
HCM 2000 Volume to Capa	acity ratio		0.77					
Actuated Cycle Length (s)			60.0		um of lost		12.0	
Intersection Capacity Utiliza	ation		71.5%	IC	CU Level	of Service	С	
Analysis Period (min)			15					
c Critical Lane Group								

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

Synchro 9 Report Page 8

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	-	•	×.	•		1	
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	Þ			ب ا	Y		
Traffic Volume (vph)	8	48	0	22	152	0	
Future Volume (vph)	8	48	0	22	152	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	0.885						
Flt Protected					0.950		
Satd. Flow (prot)	1649	0	0	1863	1770	0	
Flt Permitted					0.950		
Satd. Flow (perm)	1649	0	0	1863	1770	0	
Link Speed (k/h)	50			50	50		
Link Distance (m)	44.7			49.4	43.7		
Travel Time (s)	3.2			3.6	3.1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	9	52	0	24	165	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	61	0	0	24	165	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(m)	0.0			0.0	3.6		
Link Offset(m)	0.0			0.0	0.0		
Crosswalk Width(m)	4.8			4.8	4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)		15	25		25	15	
Sign Control	Free			Free	Stop		
Intersection Summary							
	Other						
Control Type: Unsignalized							
Intersection Capacity Utilizati	ion 18 5%			10		of Service /	Λ.

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis 4: Access 1 & Frances Avenue

06-14-2018

	-	\mathbf{r}	4	+	•	*
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	ĥ			ę	Y	
Traffic Volume (veh/h)	8	48	0	22	152	0
Future Volume (Veh/h)	8	48	0	22	152	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	52	0	24	165	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			61		59	35
vC1, stage 1 conf vol			01		0,	00
vC2, stage 2 conf vol						
vCu, unblocked vol			61		59	35
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		83	100
cM capacity (veh/h)			1542		948	1038
Direction, Lane #	EB 1	WB 1	NB 1		710	1030
Volume Total	61	24	165			
Volume Left	01	24	165			
Volume Right	52	0	0			
cSH	1700	1542	948			
Volume to Capacity	0.04	0.00	948			
Queue Length 95th (m)						
	0.0	0.0	5.0			
Control Delay (s)	0.0	0.0	9.6			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.6			
Approach LOS			А			
Intersection Summary						
Average Delay			6.3			
Intersection Capacity Utiliz	ation		18.5%	IC	U Level of	of Service
Analysis Period (min)			15			

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

Synchro 9 Report Page 9 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			÷			\$			\$	
Traffic Volume (vph)	9	56	22	0	174	0	71	0	0	0	0	22
Future Volume (vph)	9	56	22	0	174	0	71	0	0	0	0	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.966									0.865	
Flt Protected		0.995						0.950				
Satd. Flow (prot)	0	1790	0	0	1863	0	0	1770	0	0	1611	0
Flt Permitted		0.995						0.950				
Satd. Flow (perm)	0	1790	0	0	1863	0	0	1770	0	0	1611	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		53.8			44.7			33.3			43.2	
Travel Time (s)		3.9			3.2			2.4			3.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	61	24	0	189	0	77	0	0	0	0	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	95	0	0	189	0	0	77	0	0	24	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
)ther											
Control Type: Unsignalized												
Intersection Capacity Utilizati	on 29.4%			IC	U Level	of Service	A					

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	▼ SBT	SBF
Lane Configurations	LDL	4	LDIX	WDL	4	WDI	NDL	4	NDI	JDL	4	501
Traffic Volume (veh/h)	9	56	22	0	174	0	71	47	0	0	0	2
Future Volume (Veh/h)	9	56	22	0	174	0	71	0	0	0	0	2
Sign Control	,	Free	22	0	Free	0	/1	Stop	0	0	Stop	2.
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	10	61	24	0.72	189	0	77	0.72	0	0	0	2
Pedestrians						-		-		-	-	
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	189			85			306	282	73	282	294	18
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	189			85			306	282	73	282	294	18
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.
p0 queue free %	99			100			88	100	100	100	100	9
cM capacity (veh/h)	1385			1512			625	622	989	667	613	85
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	95	189	77	24								
Volume Left	10	0	77	0								
Volume Right	24	0	0	24								
cSH	1385	1512	625	853								
Volume to Capacity	0.01	0.00	0.12	0.03								
Queue Length 95th (m)	0.2	0.0	3.4	0.7								
Control Delay (s)	0.9	0.0	11.6	9.3								
Lane LOS	A 0.9	0.0	B 11.6	A 9.3								
Approach Delay (s) Approach LOS	0.9	0.0	11.6 B	9.3 A								
Intersection Summary												
Average Delay			3.1									
Intersection Capacity Utilizat	ion		29.4%	IC	U Level o	f Service			А			
Analysis Period (min)			15									

Synchro 9 Report Page 11 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (vph)	20	87	43	0	267	0	135	0	0	0	0	44
Future Volume (vph)	20	87	43	0	267	0	135	0	0	0	0	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.961									0.865	
Flt Protected		0.993						0.950				
Satd. Flow (prot)	0	1778	0	0	1863	0	0	1770	0	0	1611	0
FIt Permitted		0.993						0.950				
Satd. Flow (perm)	0	1778	0	0	1863	0	0	1770	0	0	1611	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		38.9			53.8			33.6			37.9	
Travel Time (s)		2.8			3.9			2.4			2.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	95	47	0	290	0	147	0	0	0	0	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	164	0	0	290	0	0	147	0	0	48	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
)ther											
Control Type: Unsignalized												
Intersection Capacity Utilizati	on 45.6%			IC	U Level (of Service	A					

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations		\$			4			4			4	
Traffic Volume (veh/h)	20	87	43	0	267	0	135	0	0	0	0	4
Future Volume (Veh/h)	20	87	43	0	267	0	135	0	0	0	0	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	22	95	47	0	290	0	147	0	0	0	0	4
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)		NOTIC			NUTIC							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	290			142			500	452	118	452	476	2
vC1, stage 1 conf vol	290			142			200	452	110	452	470	2
vC1, stage 1 confi vol												
vC2, stage 2 coni voi	290			142			500	452	118	452	476	20
	290			4.1								
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3
p0 queue free %	98			100			67	100	100	100	100	9
cM capacity (veh/h)	1272			1441			444	494	933	511	479	74
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	164	290	147	48								
Volume Left	22	0	147	0								
Volume Right	47	0	0	48								
cSH	1272	1441	444	749								
Volume to Capacity	0.02	0.00	0.33	0.06								
Queue Length 95th (m)	0.4	0.0	11.4	1.6								
Control Delay (s)	1.2	0.0	17.1	10.1								
Lane LOS	А		С	В								
Approach Delay (s)	1.2	0.0	17.1	10.1								
Approach LOS			С	В								
Intersection Summary												
Average Delay			4.9									
Intersection Capacity Utiliza	tion		45.6%	IC	U Level of	Service			А			
Analysis Period (min)			15									

Synchro 9 Report Page 13 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			4			4	
Traffic Volume (vph)	1	150	21	0	445	0	64	0	0	0	0	2
Future Volume (vph)	1	150	21	0	445	0	64	0	0	0	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.983									0.865	
Flt Protected								0.950				
Satd. Flow (prot)	0	1831	0	0	1863	0	0	1770	0	0	1611	0
FIt Permitted								0.950				
Satd. Flow (perm)	0	1831	0	0	1863	0	0	1770	0	0	1611	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		52.2			38.9			35.0			36.9	
Travel Time (s)		3.8			2.8			2.5			2.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	163	23	0	484	0	70	0	0	0	0	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	187	0	0	484	0	0	70	0	0	2	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
	ther											
Control Type: Unsignalized Intersection Capacity Utilization						of Service						

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations		4			\$			\$			4	
Traffic Volume (veh/h)	1	150	21	0	445	0	64	0	0	0	0	
Future Volume (Veh/h)	1	150	21	0	445	0	64	0	0	0	0	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	1	163	23	0	484	0	70	0	0	0	0	
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	484			186			662	660	174	660	672	4
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	484			186			662	660	174	660	672	48
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3
p0 queue free %	100			100			81	100	100	100	100	10
cM capacity (veh/h)	1079			1388			373	383	869	376	377	58
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	187	484	70	2								
Volume Left	1	0	70	0								
Volume Right	23	0	0	2								
cSH	1079	1388	373	583								
Volume to Capacity	0.00	0.00	0.19	0.00								
Queue Length 95th (m)	0.0	0.0	5.4	0.1								
Control Delay (s)	0.1	0.0	16.9	11.2								
Lane LOS	А		С	В								
Approach Delay (s)	0.1	0.0	16.9	11.2								
Approach LOS			С	В								
Intersection Summary												
Average Delay			1.6									
Intersection Capacity Utiliza	ition		40.3%	IC	U Level o	f Service			А			
Analysis Period (min)			15									

Synchro 9 Report Page 15 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

Appendix "C" to Report PED19115 Page 193 of 314

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (vph)	16	55	20	278	29	1	17	61	444	3	34	5
Future Volume (vph)	16	55	20	278	29	1	17	61	444	3	34	5
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.970						0.885			0.985	
FIt Protected		0.991			0.957			0.998			0.997	
Satd. Flow (prot)	0	1826	0	0	1770	0	0	1678	0	0	1866	0
FIt Permitted		0.991			0.957			0.998			0.997	
Satd. Flow (perm)	0	1826	0	0	1770	0	0	1678	0	0	1866	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.1			52.2			184.8			166.7	
Travel Time (s)		11.9			3.8			13.3			12.0	
Confl. Peds. (#/hr)	1		1	1		1	2		1	1		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	17	60	22	302	32	1	18	66	483	3	37	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	99	0	0	335	0	0	567	0	0	45	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Vedian Width(m)		0.0	5		0.0	5		3.6	5		3.6	5
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
	ther											
Control Type: Unsignalized Intersection Capacity Utilization					CU Level o							

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBI
Lane Configurations		4			\$			\$			4	
Traffic Volume (veh/h)	16	55	20	278	29	1	17	61	444	3	34	
Future Volume (Veh/h)	16	55	20	278	29	1	17	61	444	3	34	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	17	60	22	302	32	1	18	66	483	3	37	
Pedestrians		2			1			1			1	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	409	634	42	443	394	310	44			550		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	409	634	42	443	394	310	44			550		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	85	98	32	94	100	99			100		
cM capacity (veh/h)	522	393	1031	446	536	734	1575			1029		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	99	335	567	45								
Volume Left	17	302	18	3								
Volume Right	22	1	483	5								
cSH	479	453	1575	1029								
Volume to Capacity	0.21	0.74	0.01	0.00								
Queue Length 95th (m)	6.2	48.2	0.3	0.1								
Control Delay (s)	14.5	32.2	0.4	0.6								
Lane LOS	В	D	A	A								
Approach Delay (s)	14.5	32.2	0.4	0.6								
Approach LOS	В	D										
Intersection Summary												
Average Delay			11.9									
Intersection Capacity Utiliza	tion		66.0%	IC	U Level o	of Service			С			
Analysis Period (min)			15									

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

	٠	-+	+	×	1	1	
Lane Group	EBL	FBT	WBT	WBR	SBL	SBR	
Lane Configurations	5	•	1	WBIT	500	1	
Traffic Volume (vph)	326	956	471	196	117	215	
Future Volume (vph)	326	956	471	196	117	215	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (m)	120.0	1700	1700	0.0	40.0	0.0	
Storage Lanes	120.0			0.0	10.0	1	
Taper Length (m)	7.5			0	7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00		0.960			0.850	
Fit Protected	0.950		5.700		0.950	5.000	
Satd. Flow (prot)	1805	1881	1728	0	1770	1615	
Flt Permitted	0.950	1001	1720	0	0.950	1015	
Satd. Flow (perm)	1805	1881	1728	0	1770	1615	
Link Speed (k/h)	1000	80	80	0	50	1010	
Link Distance (m)		123.4	826.3		184.8		
Travel Time (s)		5.6	37.2		13.3		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Heavy Vehicles (%)	0%	1%	7%	2%	2%	0%	
Adj. Flow (vph)	354	1039	512	213	127	234	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	354	1039	725	0	127	234	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Left	Left	Right	Left	Right	
Vedian Width(m)		3.6	3.6		3.6		
Link Offset(m)		0.0	0.0		0.0		
Crosswalk Width(m)		4.8	4.8		4.8		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (k/h)	25			15	25	15	
Sign Control		Free	Free		Stop		
Intersection Summary							
	Other						
Control Type: Unsignalized							
Intersection Capacity Utilizati	ion 71.3%			IC	U Level	of Service (

	≯	+	Ļ	*	¢	1		
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	<u> </u>	•	1	WDI	<u>, 300</u>	7		
Traffic Volume (veh/h)	326	956	471	196	117	215		
Future Volume (Veh/h)	326	956	471	196	117	215		
Sign Control	520	Free	Free	170	Stop	215		
Grade		0%	0%		0%			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly flow rate (vph)	354	1039	512	213	127	234		
Pedestrians	001	1007	012	210		201		
Lane Width (m)								
Walking Speed (m/s)								
Percent Blockage								
Right turn flare (veh)								
Median type		None	None					
Median storage veh)								
Upstream signal (m)								
pX, platoon unblocked								
vC, conflicting volume	725				2366	618		
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol	725				2366	618		
tC, single (s)	4.1				6.4	6.2		
tC, 2 stage (s)								
tF (s)	2.2				3.5	3.3		
p0 queue free %	60				0	52		
cM capacity (veh/h)	887				23	493		
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2			
Volume Total	354	1039	725	127	234			
Volume Left	354	0	0	127	0			
Volume Right	0	0	213	0	234			
cSH	887	1700	1700	23	493			
Volume to Capacity	0.40	0.61	0.43	5.47	0.48			
Queue Length 95th (m)	15.5	0.0	0.0	Err	20.1			
Control Delay (s)	11.7	0.0	0.0	Err	18.7			
Lane LOS	В			F	С			
Approach Delay (s)	3.0		0.0	3529.8				
Approach LOS				F				
Intersection Summary								
Average Delay			515.7					
Intersection Capacity Utiliza	tion		71.3%	IC	U Level o	of Service	C	

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

3: North Service Ro	au a iv	illien F	loau				06-14-2018	3: North Service F		men	Roau					
	٦	-	←	*	1	1			٦	-	-	•	1	1		
ane Group	EBL	EBT	WBT	WBR	SBL	SBR		Lane Group	EBL	EBT	WBT	WBR	SBL	SBR		
ane Configurations	N	*	î,		×.	1		Permitted Phases	2					4		
raffic Volume (vph)	250	823	272	83	94	395		Detector Phase	2	2	6		4	4		
Future Volume (vph)	250	823	272	83	94	395		Switch Phase								
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900		Minimum Initial (s)	20.0	20.0	20.0		10.0	10.0		
Storage Length (m)	85.0	1700	1700	0.0	50.0	0.0		Minimum Split (s)	26.0	26.0			24.0	24.0		
Storage Lanes	1			0.0	1	1		Total Split (s)	46.0	46.0			24.0	24.0		
aper Length (m)	7.5			0	7.5			Total Split (%)	65.7%				34.3%	34.3%		
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		Maximum Green (s)	40.0	40.0			18.0	18.0		
rt	1.00	1.00	0.969	1.00	1.00	0.850		Yellow Time (s)	4.0	4.0			4.0	4.0		
It Protected	0.950		0.909		0.050	0.000								2.0		
		1040	1704	0	0.950	1502		All-Red Time (s)	2.0	2.0			2.0 0.0	2.0		
Satd. Flow (prot)	1805 0.504	1863	1786	0		1583		Lost Time Adjust (s)	0.0	0.0						
Fit Permitted		1040	1704	0	0.950	1502		Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0		
Satd. Flow (perm)	958	1863	1786	0	1805	1583		Lead/Lag								
Right Turn on Red			27	Yes		Yes		Lead-Lag Optimize?	2.0	2.0	2.0		2.0	3.0		
atd. Flow (RTOR)			36		50	429		Vehicle Extension (s)	3.0	3.0			3.0			
ink Speed (k/h)		80	80		50			Recall Mode	C-Max	C-Max			Max	Max		
ink Distance (m)		826.3	260.0		127.1			Walk Time (s)	7.0	7.0			7.0	7.0		
ravel Time (s)		37.2	11.7		9.2			Flash Dont Walk (s)	11.0	11.0			11.0	11.0		
eak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		Pedestrian Calls (#/hr)	0	0	U U		0	0		
leavy Vehicles (%)	0%	2%	4%	0%	0%	2%		Act Effct Green (s)	40.0	40.0			18.0	18.0		
Adj. Flow (vph)	272	895	296	90	102	429		Actuated g/C Ratio	0.57	0.57	0.57		0.26	0.26		
Shared Lane Traffic (%)								v/c Ratio	0.50	0.84	0.37		0.22	0.59		
ane Group Flow (vph)	272	895	386	0	102	429		Control Delay	12.9	21.9	8.6		22.0	6.3		
Inter Blocked Intersection	No	No	No	No	No	No		Queue Delay	0.0	0.0	0.0		0.0	0.0		
ane Alignment	Left	Left	Left	Right	Left	Right		Total Delay	12.9	21.9	8.6		22.0	6.3		
ledian Width(m)		3.6	3.6		3.6			LOS	В	С	А		С	А		
ink Offset(m)		0.0	0.0		0.0			Approach Delay		19.8	8.6		9.3			
Crosswalk Width(m)		4.8	4.8		4.8			Approach LOS		В	А		А			
wo way Left Turn Lane																
leadway Factor	1.00	1.00	1.00	1.00	1.00	1.00		Intersection Summary								
urning Speed (k/h)	25			15	25	15		Area Type:	Other							
lumber of Detectors	1	2	2		1	1		Cycle Length: 70								
Detector Template	Left	Thru	Thru		Left	Right		Actuated Cycle Length: 70								
eading Detector (m)	2.0	10.0	10.0		2.0	2.0		Offset: 0 (0%), Referenced	to phase 2	:EBTL a	nd 6:WBT,	, Start of C	Green			
railing Detector (m)	0.0	0.0	0.0		0.0	0.0		Natural Cycle: 65								
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0		Control Type: Actuated-Co	ordinated							
Detector 1 Size(m)	2.0	0.6	0.6		2.0	2.0		Maximum v/c Ratio: 0.84								
Detector 1 Type		CI+Ex			CI+Ex			Intersection Signal Delay:						n LOS: B		
Detector 1 Channel	OITEN	OIL LA	ONEA		OIL LA	SHEA		Intersection Capacity Utiliz	ation 61.6%	5		IC	CU Level	of Service B		
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0		Analysis Period (min) 15								
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0										
	0.0	0.0	0.0		0.0	0.0		Splits and Phases: 3: N	orth Service	Road &	Millen Roa	ad				
Detector 1 Delay (s) Detector 2 Position(m)	0.0	0.0 9.4	0.0 9.4		0.0	0.0		· .							1	
								/ →Ø2 (R)							Ø4	
Detector 2 Size(m)		0.6	0.6					46 s							24 s	
Detector 2 Type		CI+Ex	CI+Ex					←								
Detector 2 Channel								Ø6 (R)								
Detector 2 Extend (s)	_	0.0	0.0		_	_		40 S								
Furn Type	Perm	NA	NA		Prot	Perm										
Protected Phases		2	6		4											

Synchro 9 Report Page 5 Synchro 9 Report Page 6

3: North Service Ro			loau			06-14-201
	٦	-	+	1	1	
Lane Group	EBL	EBT	WBT	SBL	SBR	
Lane Group Flow (vph)	272	895	386	102	429	
v/c Ratio	0.50	0.84	0.37	0.22	0.59	
Control Delay	12.9	21.9	8.6	22.0	6.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	12.9	21.9	8.6	22.0	6.3	
Queue Length 50th (m)	20.3	92.0	23.3	11.1	0.0	
Queue Length 95th (m)	40.0	#173.4	39.6	22.9	20.4	
Internal Link Dist (m)		802.3	236.0	103.1		
Turn Bay Length (m)	85.0			50.0		
Base Capacity (vph)	547	1064	1036	464	725	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.50	0.84	0.37	0.22	0.59	

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

Queue shown is maximum after two cycles.

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

Synchro 9 Report Page 7

HCM Signalized In	tersection Capacity Ar	nalysis
3: North Service R	oad & Millen Road	

Movement

Lane Configurations

Traffic Volume (vph)

Future Volume (vph)

Ideal Flow (vphpl)

Total Lost time (s)

Lane Util. Factor

Satd. Flow (prot)

Satd. Flow (perm)

Adj. Flow (vph)

Turn Type

Peak-hour factor, PHF

Heavy Vehicles (%)

Protected Phases

Permitted Phases

Actuated Green, G (s)

Effective Green, g (s)

Actuated g/C Ratio

Clearance Time (s)

Vehicle Extension (s)

Lane Grp Cap (vph)

v/s Ratio Prot

v/s Ratio Perm

Uniform Delay, d1

Progression Factor

Level of Service

Approach LOS

Approach Delay (s)

Incremental Delay, d2

v/c Ratio

Delay (s)

Flt Protected

Flt Permitted

Frt

 $\rightarrow \leftarrow \checkmark \checkmark \checkmark$ ٦ EBL EBT WBT WBR SBL SBR ٦ . 🕈 Þ 7 250 823 272 83 94 395 250 823 272 83 94 395 1900 1900 1900 1900 1900 1900 6.0 6.0 6.0 6.0 6.0 1.00 1.00 1.00 1.00 1.00 1.00 1.00 0.97 1.00 0.85 1.00 1.00 0.95 1.00 0.95 1805 1863 1785 1805 1583 0.50 1.00 1.00 0.95 1.00 958 1863 1785 1805 1583 0.92 0.92 0.92 0.92 0.92 0.92 272 895 296 90 102 429 RTOR Reduction (vph) 0 0 15 0 0 319 Lane Group Flow (vph) 272 895 371 0 102 110 4% 0% 0% 2% 0% 2% Prot Perm NA NA Perm 2 6 4 2 4 40.0 40.0 18.0 18.0 40.0 40.0 40.0 40.0 18.0 18.0 0.57 0.57 0.57 0.26 0.26 6.0 6.0 6.0 6.0 6.0 3.0 3.0 3.0 3.0 3.0 547 1020 464 407 1064 c0.48 0.21 0.06 0.28 c0.07 0.50 0.84 0.36 0.22 0.27 9.0 12.4 8.1 20.5 20.8 1.00 1.00 1.00 1.00 1.00 3.2 8.1 1.0 1.1 1.6 12.2 20.4 9.1 21.6 22.4 В С А С С 18.5 9.1 22.2 В А С

HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	В
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	61.6%	ICU Level of Service	В
Analysis Period (min)	15		
c Critical Lane Group			

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

Synchro 9 Report Page 8

Image: constraint of the second sec	4: Access 1 & Fran	ces Ave	enue					06-14-20
Lane Configurations Image: Configuration of the second		-	\mathbf{r}	1	+	1	1	
Traffic Volume (vph) 23 144 0 2 92 0 Future Volume (vph) 23 144 0 2 92 0 Ideal Flow (vph) 1900 1900 1900 1900 1900 1900 Lane Util. Factor 1.00 1.00 1.00 1.00 1.00 1.00 Frit 0.884 O Stati. Flow (prot) 1647 0 1863 1770 0 Stati. Flow (perm) 1647 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 50 Link Distance (m) 44.7 49.4 43.7 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) 162 0 0 2 100 0 Lane Group Flow (vph) 182 0 0 2 100	Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	
Traffic Volume (vph) 23 144 0 2 92 0 Future Volume (vph) 23 144 0 2 92 0 Ideal Flow (vphp) 1900 1900 1900 1900 1900 1900 Lane Util. Factor 1.00 1.00 1.00 1.00 1.00 1.00 Frit 0.884 0 2 92 0 Stat. Flow (port) 1647 0 0 1863 1770 0 Stat. Flow (perm) 1647 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 50 Link Speed (k/h) 50 50 50 50 50 Link Speed (k/h) 50 50 50 50 50 Stat. Flow (port) 44.7 43.7 173 0 2 100 0 Shared Lane Cm) 44.7 9.2 0.92 0.92 0.92 0.92 0.92 0.92 0.92 0.92 0.92 0.92 0.92 0	Lane Configurations	el A			ę	Y		
Ideal Flow (vphp) 1900 1900 1900 1900 1900 Lane Ulii, Factor 1.00 1.00 1.00 1.00 1.00 1.00 Frit 0.884 0.950 0 1863 1770 0 Satd. Flow (prot) 1647 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 50 50 Link Distance (m) 44.7 49.4 43.7 1 <td< td=""><td>Traffic Volume (vph)</td><td></td><td>144</td><td>0</td><td></td><td>92</td><td>0</td><td></td></td<>	Traffic Volume (vph)		144	0		92	0	
Lane Util Factor 1.00 1.00 1.00 1.00 1.00 1.00 1.00 Frt 0.884 Fil Protected 0.950 Satd. Flow (port) 1647 0 0 1863 1770 0 Fil Permitted 0.950 Satd. Flow (perm) 1647 0 0 1863 1770 0 Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 AdJ, Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) Lane Group Flow (vph) 182 0 0 2 100 0 Shared Lane Traffic (%) Lane Group Flow (vph) 182 0 0 2 100 0 Shared Lane Traffic (%) Lane Alignment Left Right Left Left Left Right Median Width(m) 0.0 0.0 3.6 Trosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 1.00 1.00 Turning Speed (kh) 15 25 25 15 Sign Control Free Free Stop Intersection Summary Area Type: Other	Future Volume (vph)	23	144	0	2	92	0	
Fit 0.884 FI Protected 0.950 Satd. Flow (prot) 1647 0 0 1863 1770 0 Elt Permitted 0.950 0 0.950 0 0 1863 1770 0 Satd. Flow (perm) 1647 0 0 1863 1770 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 50 10 10 10.0	Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Fit Protected 0.950 Satd. Flow (prot) 1647 0 0 1863 1770 0 Fit Permitted 0.950 0.950 0 1863 1770 0 Satd. Flow (perm) 1647 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 50 Link Distance (m) 44.7 49.4 43.7 Peak Hour Factor 0.92 0.92 0.92 0.92 Peak Hour Factor 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) 182 0 0 2 100 0 Lane Group Flow (vph) 182 0 0 2 100 0 Enter Blocked Intersection No No No No No Lane Alignment Left Right Left Left Right Median Width(m) 0.0 0.0 0.0 0 0 Crosswalk Width(m) 0.100 1.00 1.00 1.00 1.00 Turning Speed (k/h) 15 25 15 15 15 <td>Lane Util. Factor</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td>1.00</td> <td></td>	Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Satd. Flow (prot) 1647 0 0 1863 1770 0 FI Permitted 0.950 0.950 Satd. Flow (perm) 1647 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 50 50 Link Distance (m) 44.7 49.4 43.7 7 <td>Frt</td> <td>0.884</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Frt	0.884						
Fit Permitted 0.950 Satd. Flow (perm) 1647 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 Shared Lane Traffic (%) 157 0 2 100 0 Shared Lane Traffic (%) 182 0 0 2 100 0 Eane Alignment Left Right Left Left Right Lane Alignment Left Right Left Left Right Median Width(m) 0.0 0.0 3.6 Two way Left Turn Lane 1.00 1.00 1.00 1.00 Tuming Speed (k/h) 15 25 25 15 Sign Control Free Free Stop Intersection Summary	Flt Protected					0.950		
Satd. Flow (perm) 1647 0 0 1863 1770 0 Link Speed (k/h) 50 50 50 50 Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) Lane Group Flow (vph) 182 0 0 2 100 0 Enter Blocked Intersection No No No No No No No Link Offset(m) 0.0 0.0 3.6 Link Offset(m) 0.0 0.0 0.0 Vidith(rm) 4.8 4.8 4.8 4.8 Link Offset(m) 1.00 1.00 1.00 1.00 1.00 1.00 1.00 Crosswalk Width(m) 4.8 4.8 4.8 4.8	Satd. Flow (prot)	1647	0	0	1863	1770	0	
Link Speed (k/h) 50 50 50 Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%)	Flt Permitted					0.950		
Link Distance (m) 44.7 49.4 43.7 Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) Lane Group Flow (vph) 182 0 0 2 100 0 Enter Blocked Intersection No No No No No Lane Alignment Left Right Left Left Right Median Width(m) 0.0 0.0 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 1.00 1.00 Turning Speed (kh) 15 25 25 15 Sign Control Free Free Stop Intersection Summary Area Type: Other	Satd. Flow (perm)	1647	0	0	1863	1770	0	
Travel Time (s) 3.2 3.6 3.1 Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) Lane Group Flow (vph) 182 0 2 100 0 Enter Blocked Intersection No No No No No Median Width(m) 0.0 0.0 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 Turning Speed (k/h) 15 25 25 15 Sign Control Free Free Stop Intersection Summary	Link Speed (k/h)	50			50	50		
Peak Hour Factor 0.92 0.92 0.92 0.92 0.92 0.92 Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) Lane Group Flow (vph) 182 0 0 2 100 0 Enter Blocked Intersection No No No No No No Lane Alignment Left Right Left Left Left Right Median Width(m) 0.0 0.0 3.6 0 <t< td=""><td>Link Distance (m)</td><td>44.7</td><td></td><td></td><td>49.4</td><td>43.7</td><td></td><td></td></t<>	Link Distance (m)	44.7			49.4	43.7		
Adj. Flow (vph) 25 157 0 2 100 0 Shared Lane Traffic (%) 182 0 0 2 100 0 Enter Blocked Intersection No No No No No No Enter Blocked Intersection No No No No No No Lane Alignment Left Right Left Left Right Left Right Median Width(m) 0.0 0.0 3.6 0.0	Travel Time (s)	3.2			3.6	3.1		
Shared Lane Traffic (%) Lane Group Flow (vph) 182 0 0 2 100 0 Enter Blocked Intersection No No No No No Lane Alignment Left Right Left Left Right Median Width(m) 0.0 0.0 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane	Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Lane Group Flow (vph) 182 0 0 2 100 0 Enter Blocked Intersection No No No No No No Lane Alignment Left Right Left Left Left Right Median Width(m) 0.0 0.0 3.6 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 4.8 1.00	Adj. Flow (vph)	25	157	0	2	100	0	
Enter Blocked Intersection No No No No No Lane Alignment Left Right Left Left Right Median Width(m) 0.0 0.0 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane	Shared Lane Traffic (%)							
Lane Alignment Left Right Left Left Right Median Width(m) 0.0 0.0 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 Turning Speed (k/h) 15 25 25 15 Sign Control Free Free Stop Intersection Summary 4 4 4	Lane Group Flow (vph)	182	0	0	2	100	0	
Median Ŵidth(m) 0.0 0.0 3.6 Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane Headway Factor 1.00 1.00 1.00 Headway Factor 10.0 1.00 1.00 1.00 1.00 Turning Speed (k/h) 15 25 25 15 Sign Control Free Free Stop Intersection Summary Area Type: Other	Enter Blocked Intersection	No	No	No	No	No	No	
Link Offset(m) 0.0 0.0 0.0 Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane	Lane Alignment	Left	Right	Left	Left	Left	Right	
Crosswalk Width(m) 4.8 4.8 4.8 Two way Left Turn Lane	Median Width(m)	0.0			0.0	3.6		
Two way Left Tum Lane Headway Factor 1.00 1.00 1.00 1.00 Turning Speed (k/h) 15 25 15 Sign Control Free Stop Intersection Summary Intersection Summary Area Type: Other Other	Link Offset(m)	0.0			0.0	0.0		
Headway Factor 1.00 1.00 1.00 1.00 Turning Speed (k/h) 15 25 25 15 Sign Control Free Free Stop Intersection Summary Area Type: Other	Crosswalk Width(m)	4.8			4.8	4.8		
Turning Śpeed (k/h) 15 25 25 15 Sign Control Free Free Stop Intersection Summary Area Type: Other	Two way Left Turn Lane							
Sign Control Free Free Stop Intersection Summary Area Type: Other	Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Intersection Summary Area Type: Other	Turning Speed (k/h)		15	25		25	15	
Area Type: Other	Sign Control	Free			Free	Stop		
	Intersection Summary							
Control Type: Unsignalized		Other						
Intersection Capacity Utilization 21.9% ICU Level of Service A								

Analysis Period	(min) 15
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HCM Unsignalized Intersection Capacity Analysis 4: Access 1 & Frances Avenue

	-	\mathbf{r}	4	+	•	*
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	el A			ŧ	¥	
Traffic Volume (veh/h)	23	144	0	2	92	0
Future Volume (Veh/h)	23	144	0	2	92	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	157	0	2	100	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			182		106	104
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			182		106	104
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					0.1	0.2
tF (s)			2.2		3.5	3.3
p0 queue free %			100		89	100
cM capacity (veh/h)			1393		892	951
Direction, Lane #	EB 1	WB 1	NB 1		072	701
Volume Total	182	2	100			
Volume Left	0	0	100			
	157	0	001			
Volume Right cSH	1700	1393	892			
	0.11	0.00	892 0.11			
Volume to Capacity						
Queue Length 95th (m)	0.0	0.0	3.0			
Control Delay (s)	0.0	0.0	9.5			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.5			
Approach LOS			A			
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utiliz	ation		21.9%	IC	U Level o	of Service
Analysis Period (min)			15			
, , ,						

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

Synchro 9 Report Page 9 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (vph)	29	95	67	0	94	0	43	0	0	0	0	3
Future Volume (vph)	29	95	67	0	94	0	43	0	0	0	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.953									0.865	
Flt Protected		0.992						0.950				
Satd. Flow (prot)	0	1761	0	0	1863	0	0	1770	0	0	1611	0
FIt Permitted		0.992						0.950				
Satd. Flow (perm)	0	1761	0	0	1863	0	0	1770	0	0	1611	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		53.8			44.7			33.3			48.0	
Travel Time (s)		3.9			3.2			2.4			3.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	103	73	0	102	0	47	0	0	0	0	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	208	0	0	102	0	0	47	0	0	3	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
	ther											
Control Type: Unsignalized Intersection Capacity Utilization						of Service						

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SE
Lane Configurations		\$			4			\$			4	
Traffic Volume (veh/h)	29	95	67	0	94	0	43	0	0	0	0	
Future Volume (Veh/h)	29	95	67	0	94	0	43	0	0	0	0	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.
Hourly flow rate (vph)	32	103	73	0	102	0	47	0	0	0	0	
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)		110110			Homo							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	102			176			308	306	140	306	342	1
vC1, stage 1 conf vol	102			170			300	300	140	300	J4Z	
vC2, stage 2 conf vol												
vCu, unblocked vol	102			176			308	306	140	306	342	1
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	
tC, 2 stage (s)	4.1			4.1			7.1	0.5	0.2	7.1	0.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	
p0 queue free %	2.2			100			3.5 93	4.0	3.3 100	3.5 100	4.0	1
cM capacity (veh/h)	98 1490			1400			631	595	909	636	568	9
1 31 1							031	090	909	030	200	,
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	208	102	47	3								
Volume Left	32	0	47	0								
Volume Right	73	0	0	3								
cSH	1490	1400	631	953								
Volume to Capacity	0.02	0.00	0.07	0.00								
Queue Length 95th (m)	0.5	0.0	1.9	0.1								
Control Delay (s)	1.3	0.0	11.2	8.8								
Lane LOS	A		В	A								
Approach Delay (s)	1.3	0.0	11.2	8.8								
Approach LOS			В	А								
Intersection Summary												
Average Delay			2.3									
Intersection Capacity Utiliza	ition		33.1%	IC	U Level o	f Service			A			
Analysis Period (min)			15									

Synchro 9 Report Page 11 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (vph)	44	263	130	0	141	0	84	0	0	0	0	37
Future Volume (vph)	44	263	130	0	141	0	84	0	0	0	0	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.960									0.865	
Flt Protected		0.995						0.950				
Satd. Flow (prot)	0	1779	0	0	1863	0	0	1770	0	0	1611	0
Flt Permitted		0.995						0.950				
Satd. Flow (perm)	0	1779	0	0	1863	0	0	1770	0	0	1611	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		38.9			53.8			33.6			40.8	
Travel Time (s)		2.8			3.9			2.4			2.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	48	286	141	0	153	0	91	0	0	0	0	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	475	0	0	153	0	0	91	0	0	40	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
	ther											
Control Type: Unsignalized												
Intersection Capacity Utilizati	on 52.9%			IC	U Level	of Service	A					

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations		\$			\$			\$			\$	
Traffic Volume (veh/h)	44	263	130	0	141	0	84	0	0	0	0	3
Future Volume (Veh/h)	44	263	130	0	141	0	84	0	0	0	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	48	286	141	0	153	0	91	0	0	0	0	4
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	153			427			646	606	356	606	676	1!
vC1, stage 1 conf vol	100			127			010	000	550	000	070	1.
vC2, stage 2 conf vol												
vCu, unblocked vol	153			427			646	606	356	606	676	15
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6
tC, 2 stage (s)	1.1			1.1			7.1	0.0	0.2	7.1	0.0	0
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3
p0 queue free %	97			100			75	100	100	100	100	ç
cM capacity (veh/h)	1428			1132			358	398	688	399	363	89
			ND 4	-			550	370	000	577	505	0.
Direction, Lane # Volume Total	EB 1 475	WB 1 153	NB 1 91	SB 1 40								
Volume Left	473	0	91	40								
	46	0	91	40								
Volume Right	141	1132	358	893								
cSH Valuma ta Canasitu		0.00	0.25	0.04								
Volume to Capacity	0.03 0.8	0.0	0.25	0.04								
Queue Length 95th (m)	0.8	0.0	18.4	9.2								
Control Delay (s)		0.0										
Lane LOS	A	0.0	C	A								
Approach Delay (s)	1.1	0.0	18.4	9.2								
Approach LOS			С	А								
Intersection Summary												
Average Delay			3.4									
Intersection Capacity Utiliza	ition		52.9%	IC	U Level a	t Service			А			
Analysis Period (min)			15									

Synchro 9 Report Page 13 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

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ane Group	EBT	EBR	WBL	WBT	NBL	NBR				
ane Configurations	¢Î			ŧ	Y					
Fraffic Volume (vph)	436	64	0	262	42	0				
uture Volume (vph)	436	64	0	262	42	0				
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900				
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00				
Frt	0.983									
It Protected					0.950					
Satd. Flow (prot)	1831	0	0	1863	1770	0				
It Permitted					0.950					
Satd. Flow (perm)	1831	0	0	1863	1770	0				
ink Speed (k/h)	50			50	50					
ink Distance (m)	52.2			38.9	35.0					
Fravel Time (s)	3.8			2.8	2.5					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				
Adj. Flow (vph)	474	70	0	285	46	0				
Shared Lane Traffic (%)										
ane Group Flow (vph)	544	0	0	285	46	0				
Enter Blocked Intersection	No	No	No	No	No	No				
ane Alignment	Left	Right	Left	Left	Left	Right				
/ledian Width(m)	0.0			0.0	3.6					
ink Offset(m)	0.0			0.0	0.0					
Crosswalk Width(m)	4.8			4.8	4.8					
Fwo way Left Turn Lane										
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00				
Furning Speed (k/h)		15	25		25	15				
Sign Control	Free			Free	Stop					
ntersection Summary										
	Other									
Control Type: Unsignalized										
ntersection Capacity Utilizat	ion 36.8%			IC	CU Level (of Service /	Δ.			

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis 7: Access 4 & Frances Avenue

06-14-2018

	→	*	4	Ļ	•	*
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	¢,			ب ا	Y	
Traffic Volume (veh/h)	436	64	0	262	42	0
Future Volume (Veh/h)	436	64	0	262	42	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	474	70	0	285	46	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			544		794	509
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			544		794	509
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		87	100
cM capacity (veh/h)			1025		357	564
Direction. Lane #	FB 1	WB 1	NB 1			
Volume Total	544	285	46			
Volume Left	0	0	46			
Volume Right	70	0	0			
cSH	1700	1025	357			
Volume to Capacity	0.32	0.00	0.13			
Queue Length 95th (m)	0.0	0.0	3.5			
Control Delay (s)	0.0	0.0	16.6			
Lane LOS	0.0	0.0	C			
Approach Delay (s)	0.0	0.0	16.6			
Approach LOS	0.0	0.0	10.0 C			
			Ū			
Intersection Summary			0.9			
Average Delay			36.8%	10	:U Level o	f Can day
Intersection Capacity Utiliza	ation			IC	U Level o	of Service
Analysis Period (min)			15			

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

Synchro 9 Report Page 15 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

Appendix J

Signal Warrant Justification Worksheet

Appendix "C" to Report PED19115 Page 202 of 314



Horizon Year: Region/City/Township:	2021 Background Traffic City of Hamilton			
Major Street: Minor Street:	North Service Road Green Road	North/South?:	Ν	_
Number of Approach Lanes:	1			Warrant Results
Tee Intersection?	Y	150% Satisfied	No	Justification for new intersections with forecast traffic
Flow Conditions:	Free	120% Satisfied	No	Justification for existing intersections with forecast traffic

PM Forecast Only? N

	Major Street								Minor Street					
		North Service Road					Green Road							
		Eastbound			Westbound			Northbound			Southbound			
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road	
AM Peak Hour	17	145			838	34				64		76		
PM Peak Hour	96	897			448	50				48		41		
Average Hourly Volume	28	261	0	0	322	21	0	0	0	28	0	29	0	

Warrant	AHV
1A - All	689
1B - Minor	57
2A - Major	631
2B - Cross	28

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes		1	2 or	Average	
1A	Flow Conditions	Free	Restricted	Free	Restricted	Hourly
	Flow Conditions	Х				Volume
	All Approaches	480	720	600	900	689
	All Approaches				% Fulfilled	143.4%

	Approach Lanes	1		2 or	Average	
	Flow Conditions	Free	Restricted	Free	Restricted	Hourly
1B	Flow Conditions	Х				Volume
	Minor Street	180	255	180	255	57
1	Approaches				% Fulfilled	31.8%

	Approach Lanes	1		2 or	Average	
	Flow Conditions	Free	Restricted	Free	Restricted	Hourly
2A	Flow Conditions	Х				Volume
	Major Street	480	720	600	900	631
	Approaches				% Fulfilled	131.5%

	Approach Lanes	1		2 or	Average	
	Flow Conditions	Free	Restricted	Free	Restricted	Hourly
2B	Flow Conditions	х				Volume
	Traffic Crossing Major	50	75	50	75	28
	Street				% Fulfilled	56.0%



Horizon Year: Region/City/Township:	2023 Background Traffic City of Hamilton			
Major Street: Minor Street:	North Service Road Green Road	North/South?:	Ν	_
Number of Approach Lanes:	1			Warrant Results
Tee Intersection?	Y	150% Satisfied	No	Justification for new intersections with forecast traffic
Flow Conditions:	Free	120% Satisfied	No	Justification for existing intersections with forecast traffic

PM Forecast Only? N

	Major Street								Minor Street					
		North Service Road					Green Road							
	Eastbound Westbound				Northbound S				Southbound		Peds Crossing			
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road	
AM Peak Hour	44	147			863	52				104		178		
PM Peak Hour	179	926			459	102				73		103		
Average Hourly Volume	56	268	0	0	331	39	0	0	0	44	0	70	0	

Warrant	AHV
1A - All	808
1B - Minor	115
2A - Major	693
2B - Cross	44

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes		1	2 or	Average	
1A	Flow Conditions	Free	Restricted	Free	Restricted	Hourly
	Flow Conditions	Х				Volume
	All Approaches	480	720	600	900	808
	All Approaches				% Fulfilled	168.2%

	Approach Lanes		1	2 or	Average	
	Flow Conditions	Free	Restricted	Free	Restricted	Hourly
1B	Flow Conditions	Х				Volume
	Minor Street	180	255	180	255	115
	Approaches				% Fulfilled	63.6%

	Approach Lanes		1	2 or	Average	
	Flow Conditions		Restricted	Free	Restricted	Hourly
2A	Flow Conditions	Х				Volume
	Major Street	480	720	600	900	693
	Approaches				% Fulfilled	144.4%

	Approach Lanes		1	2 or	Average	
	Flow Conditions	Free	Restricted	Free	Restricted	Hourly
2B	Flow Conditions	Х				Volume
	Traffic Crossing Major	50	75	50	75	44
Street					% Fulfilled	88.5%



Horizon Year: Region/City/Township:	2023 Background Traffic City of Hamilton			·
Major Street: Minor Street:	North Service Road Green Road	North/South?:	N	_
Number of Approach Lanes:	1			Warrant Results
Tee Intersection?	Y	150% Satisfied	No	Justification for new intersections with forecast traffic
Flow Conditions:	Free	120% Satisfied	No	Justification for existing intersections with forecast traffic

PM Forecast Only? N

	Major Street								Minor	Street			
		North Service Road						Green Road					
		Eastbound			Westbound			Northbound			Southbound		Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	68	149			888	70				142		274	
PM Peak Hour	256	956			471	151				96		160	
Average Hourly Volume	81	276	0	0	340	55	0	0	0	60	0	109	0

Warrant	AHV
1A - All	920
1B - Minor	168
2A - Major	752
2B - Cross	60

Warrant 1 - Minimum Vehicular Volume

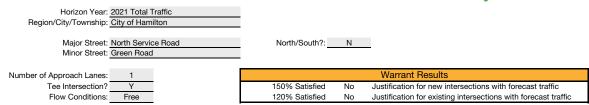
	Approach Lanes		1	2 or	Average		
Elew Cond	Flow Conditions	Free	Restricted	Free	Restricted	Hourly	
1A	Flow Conditions	Х				Volume	
	All Approaches	480	720	600	900	920	
	All Approaches				% Fulfilled	191.7%	

	Approach Lanes		1	2 or	Average	
Eleve Genedition	Flow Conditions	Free	Restricted	Free	Restricted	Hourly
1B	Flow Conditions	Х				Volume
	Minor Street	180	255	180	255	168
	Approaches				% Fulfilled	93.3%

	Approach Lanes		1	2 or	Average	
	Flow Conditions		Restricted	Free	Restricted	Hourly
2A	Flow Conditions	Х				Volume
	Major Street	480	720	600	900	752
	Approaches				% Fulfilled	156.7%

	Approach Lanes		1	2 or	Average	
	Flow Conditions	Free	Restricted	Free	Restricted	Hourly
2B	Flow Conditions	х				Volume
	Traffic Crossing Major	50	75	50	75	60
	Street				% Fulfilled	119.0%





PM Forecast Only? N

			Major	Street					Minor	Street			
		North Service Road						Green Road					
		Eastbound			Westbound			Northbound			Southbound		Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	43	145			838	51				102		175	
PM Peak Hour	176	897			448	100				71		101	
Average Hourly Volume	55	261	0	0	322	38	0	0	0	43	0	69	0

Warrant	AHV
1A - All	787
1B - Minor	112
2A - Major	675
2B - Cross	43

Warrant 1 - Minimum Vehicular Volume

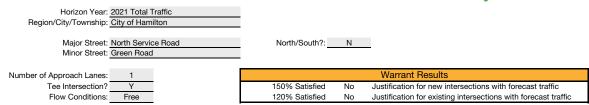
	Approach Lanes		1	2 or	Average	
	TA Flow Conditions	Free	Restricted	Free	Restricted	Hourly
1A		Х				Volume
Г	All Approaches	480	720	600	900	787
	All Approaches				% Fulfilled	163.9%

	Approach Lanes		1		2 or more		
	B Flow Conditions	Free	Restricted	Free	Restricted	Hourly	
1B		Х				Volume	
	Minor Street		255	180	255	112	
1					% Fulfilled	62.4%	

	Approach Lanes		1	2 or	Average			
	Flow Conditions	Free	Restricted	Free	Restricted	Hourly		
2A		Х				Volume		
	Major Street	480	720	600	900	675		
	Approaches				% Fulfilled	140.5%		

	Approach Lanes		1	2 or	Average	
	2B Flow Conditions	Free	Restricted	Free	Restricted	Hourly
2B		х				Volume
	Traffic Crossing Major	50	75	50	75	43
	Street				% Fulfilled	86.5%





PM Forecast Only? N

			Major	Street					Minor	Street			
			North Ser	vice Road			Green Road						
		Eastbound		Westbound			Northbound				Southbound	Peds Crossing	
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	68	147			863	68				139		270	
PM Peak Hour	252	926			459	149				94		158	
Average Hourly Volume	80	268	0	0	331	54	0	0	0	58	0	107	0

Warrant	AHV
1A - All	898
1B - Minor	165
2A - Major	733
2B - Cross	58

Warrant 1 - Minimum Vehicular Volume

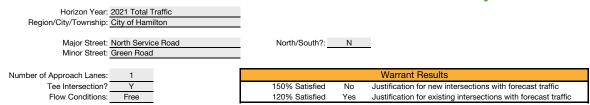
	Approach Lanes		1	2 or	Average	
	1A Flow Conditions	Free	Restricted	Free	Restricted	Hourly
1A		Х				Volume
F	All Approaches	480	720	600	900	898
	All Approaches				% Fulfilled	187.1%

	Approach Lanes		1	2 or	Average	
	1B Flow Conditions	Free	Restricted	Free	Restricted	Hourly
1B		Х				Volume
Ν	Minor Street	180	255	180	255	165
Approaches					% Fulfilled	91.8%

	Approach Lanes		1	2 or	Average			
	A Flow Conditions	Free	Restricted	Free	Restricted	Hourly		
2A		Х				Volume		
	Major Street	480	720	600	900	733		
	Approaches				% Fulfilled	152.7%		

	Approach Lanes		1	2 or	Average	
	2B Flow Conditions	Free	Restricted	Free	Restricted	Hourly
2B		Х				Volume
	Traffic Crossing Major	50	75	50	75	58
	Street				% Fulfilled	116.5%





PM Forecast Only? N

			Major	Street					Minor	Street			
		North Service Road					Green Road						
		Eastbound		Westbound			Northbound				Southbound	Peds Crossing	
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	92	149			888	84				174		358	
PM Peak Hour	326	956			471	196				117		215	
Average Hourly Volume	105	276	0	0	340	70	0	0	0	73	0	143	0

Warrant	AHV
1A - All	1007
1B - Minor	216
2A - Major	791
2B - Cross	73

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes		1	2 or	Average	
	Flow Conditions	Free	Restricted	Free	Restricted	Hourly
1A	Flow Conditions	Х				Volume
	All Approaches	480	720	600	900	1007
	All Approaches				% Fulfilled	209.7%

	Approach Lanes		1	2 or	more	Average
	Flow Conditions	Free	Restricted	Free	Restricted	Hourly
1B	Flow Conditions	Х				Volume
	Minor Street	180	255	180	255	216
	Approaches				% Fulfilled	120.0%

	Approach Lanes		1	2 or	more	Average
	Flow Conditions	Free	Restricted	Free	Restricted	Hourly
2A	Flow Conditions	Х				Volume
	Major Street	480	720	600	900	791
	Approaches				% Fulfilled	164.7%

	Approach Lanes		1	2 or	Average	
	Flow Conditions	Free	Restricted	Free	Restricted	Hourly
2B	Flow Conditions	х				Volume
	Traffic Crossing Major	50	75	50	75	73
	Street				% Fulfilled	145.5%

Appendix K

Westbound Right-Turn Lane Preliminary Design

Appendix "C" to Report PED19115 Page 210 of 314





Preliminary Right-Turn Lane Design North Service Road and Green Road

Waterfront Trails Transportation Impact, Parking Justification and TDM Options Study 180010

Figure K.1

Appendix "C" to Report PED19115 Page 212 of 314

Appendix L

2025 Remedial Measures Traffic Operations Reports

Appendix "C" to Report PED19115 Page 214 of 314

Appendix "C" to Report PED19115 Page 215 of 314

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ane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
ane Configurations		\$		٦	4			4			4	
Fraffic Volume (vph)	13	19	17	452	59	0	5	18	153	0	62	8
Future Volume (vph)	13	19	17	452	59	0	5	18	153	0	62	8
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.954						0.883			0.984	
Fit Protected		0.987		0.950				0.999				
Satd. Flow (prot)	0	1743	0	1805	1900	0	0	1569	0	0	1870	0
It Permitted		0.987		0.950				0.999				
Satd. Flow (perm)	0	1743	0	1805	1900	0	0	1569	0	0	1870	0
_ink Speed (k/h)		50			50			50			50	
ink Distance (m)		165.1			52.2			184.8			166.7	
Fravel Time (s)		11.9			3.8			13.3			12.0	
Confl. Peds. (#/hr)	1					1	2		3	3		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	0%	0%	0%	0%	0%	0%	7%	7%	0%	0%	0%
Adj. Flow (vph)	14	21	18	491	64	0	5	20	166	0	67	9
Shared Lane Traffic (%)												
ane Group Flow (vph)	0	53	0	491	64	0	0	191	0	0	76	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
ane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Vedian Width(m)		3.6	Ū		3.6	Ū		3.6	Ū		3.6	Ū
_ink Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Furning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
ntersection Summary												
	ther											
Control Type: Unsignalized												
ntersection Capacity Utilization	on 53.6%			IC	U Level o	of Service	A					

	٦	-	\mathbf{i}	1	-	•	•	Ť	-	1	Ļ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBI
Lane Configurations	LDL	4	EDIX	5	1	WDIX	NDL	4	NDR	JDL	4	501
Traffic Volume (veh/h)	13	19	17	452	59	0	5	18	153	0	62	
Future Volume (Veh/h)	13	19	17	452	59	0	5	18	153	0	62	
Sign Control	15	Stop	17	102	Stop	0	0	Free	100	0	Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	14	21	18	491	64	0	5	20	166	0	67	
Pedestrians		2			3						1	
Lane Width (m)		3.6			3.6						3.6	
Walking Speed (m/s)		1.2			1.2						1.2	
Percent Blockage		0			0						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								185				
pX, platoon unblocked												
vC, conflicting volume	220	272	74	216	194	107	78			189		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	220	272	74	216	194	107	78			189		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	97	98	31	91	100	100			100		
cM capacity (veh/h)	664	633	992	707	700	949	1531			1394		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	53	491	64	191	76							
Volume Left	14	491	0	5	0							
Volume Right	18	0	0	166	9							
cSH	732	707	700	1531	1394							
Volume to Capacity	0.07	0.69	0.09	0.00	0.00							
Queue Length 95th (m)	1.9	45.1	2.4	0.1	0.0							
Control Delay (s)	10.3	20.8	10.7	0.2	0.0							
Lane LOS	B	C	В	A	0.0							
Approach Delay (s) Approach LOS	10.3 B	19.7 C		0.2	0.0							
	D	0										
Intersection Summary Average Delay			13.1									
Average Delay Intersection Capacity Utiliza	tion		53.6%	10	Ulevelo	f Sonvice			А			
Analysis Period (min)				IC	O LEVELO	JEIVILE			А			

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

2: North Service Ro		Freen F	Road				06-14-20	2: North Service R	oad & G	Green I	Road					
	٦	-	+	•	1	4			٦	-	+	•	1	1		
ane Group	EBL	EBT	WBT	WBR	SBL	SBR		Lane Group	EBL	EBT	WBT	WBR	SBL	SBR		
ane Configurations	5	*	*	1	3	1		Turn Type	Perm	NA	NA	Perm	Prot	Perm		
raffic Volume (vph)	92	149	888	84	174	358		Protected Phases	1 01111	2		1 0.111	4	1 0.111		
uture Volume (vph)	92	149	888	84	174	358		Permitted Phases	2	-	0	6		4		
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900		Detector Phase	2	2	6	6	4	4		
Storage Length (m)	120.0	1700	1700	60.0	40.0	0.0		Switch Phase	2	2	0	0	4	4		
Storage Lanes	120.0			1	40.0	1		Minimum Initial (s)	20.0	20.0	20.0	20.0	10.0	10.0		
	7.5			1	7.5	I		Minimum Split (s)	26.0	26.0		26.0	24.0			
Faper Length (m) _ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		Total Split (s)	26.0	26.0	20.0	26.0	30.0	24.0		
	1.00	1.00	1.00		1.00	1.00										
Ped Bike Factor				0.98		0.050		Total Split (%)	70.0%	70.0%		70.0%	30.0%	30.0%		
irt	0.050			0.850	0.050	0.850		Maximum Green (s)	64.0	64.0	64.0	64.0	24.0	24.0		
Fit Protected	0.950	4/0/	1007	4057	0.950	4/45		Yellow Time (s)	4.0	4.0		4.0	4.0	4.0		
Satd. Flow (prot)	1687	1696	1827	1357	1770	1615		All-Red Time (s)	2.0	2.0		2.0	2.0	2.0		
It Permitted	0.138		46		0.950			Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		
Satd. Flow (perm)	245	1696	1827	1326	1770	1615		Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		
Right Turn on Red				Yes		Yes		Lead/Lag								
atd. Flow (RTOR)				80		149		Lead-Lag Optimize?								
ink Speed (k/h)		80	80		50			Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		
ink Distance (m)		123.4	826.3		184.8			Recall Mode	C-Max	C-Max	C-Max	C-Max	Max	Max		
ravel Time (s)		5.6	37.2		13.3			Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0		
Confl. Peds. (#/hr)	1			1				Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		Pedestrian Calls (#/hr)	0	0	0	0	0	0		
leavy Vehicles (%)	7%	12%	4%	19%	2%	0%		Act Effct Green (s)	64.0	64.0	64.0	64.0	24.0	24.0		
dj. Flow (vph)	100	162	965	91	189	389		Actuated g/C Ratio	0.64	0.64	0.64	0.64	0.24	0.24		
Shared Lane Traffic (%)								v/c Ratio	0.64	0.15		0.10	0.45	0.78		
ane Group Flow (vph)	100	162	965	91	189	389		Control Delay	34.0	7.6		2.3	36.3	33.7		
Enter Blocked Intersection	No	No	No	No	No	No		Queue Delay	0.0	0.0		0.0	0.0	0.0		
ane Alignment	Left	Left	Left	Right	Left	Right		Total Delay	34.0	7.6		2.3	36.3	33.7		
fedian Width(m)	Lon	3.6	3.6	rugru	3.6	rugin		LOS	C	A		A		C		
ink Offset(m)		0.0	0.0		0.0			Approach Delay	U	17.7	19.8	~	34.6	C		
Crosswalk Width(m)		4.8	4.8		4.8			Approach LOS		B			54.0 C			
wo way Left Turn Lane		4.0	4.0		4.0			Appidacii LOS		D	D		C			
leadway Factor	1.00	1.00	1.00	1.00	1.00	1.00		Intersection Summary								
	25	1.00	1.00	1.00	25	15		Area Type:	Other							
urning Speed (k/h) lumber of Detectors	25	2	2	15	25	15		Cycle Length: 100								
								Actuated Cycle Length: 100)							
etector Template	Left	Thru	Thru 10.0	Right 2.0	Left	Right 2.0		Offset: 0 (0%), Referenced		EBTL an	nd 6:WBT	, Start of (Green			
eading Detector (m)	2.0	10.0	10.0		2.0			Natural Cycle: 75								
railing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0		Control Type: Actuated-Co	ordinated							
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0		Maximum v/c Ratio: 0.83								
etector 1 Size(m)	2.0	0.6	0.6	2.0	2.0	2.0		Intersection Signal Delay: 2	4.0			Ir	ntersectio	on LOS: C		
etector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		Intersection Capacity Utiliza						of Service E		
etector 1 Channel								Analysis Period (min) 15	100100.070			IV.		OF DELVICE L		
etector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0		Analysis r chou (mill) 15								
etector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0		Splits and Phases: 2: No	rth Sorvico	Doad 9	Groop De	he				
etector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0			IIII JEIVILE	NUQU &	Green Ru	au			1.8	
etector 2 Position(m)		9.4	9.4					₽ 🚣 Ø2 (R)							**•ø4	
etector 2 Size(m)		0.6	0.6					70 s							30 s	
Detector 2 Type		CI+Ex	CI+Ex					*								
Detector 2 Channel								Ø6 (R)								
Detector 2 Extend (s)		0.0	0.0					70 s								

Synchro 9 Report Page 3 Synchro 9 Report Page 4

						,	
	×	→	-	 	¥	-	
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Group Flow (vph)	100	162	965	91	189	389	
v/c Ratio	0.64	0.15	0.83	0.10	0.45	0.78	
Control Delay	34.0	7.6	21.5	2.3	36.3	33.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	34.0	7.6	21.5	2.3	36.3	33.7	
Queue Length 50th (m)	11.3	12.0	136.5	0.7	32.9	46.5	
Queue Length 95th (m)	#43.0	20.4	204.7	6.2	54.6	#92.7	
Internal Link Dist (m)		99.4	802.3		160.8		
Turn Bay Length (m)	120.0			60.0	40.0		
Base Capacity (vph)	156	1085	1169	877	424	500	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.64	0.15	0.83	0.10	0.45	0.78	

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

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

Synchro 9 Report Page 5

	٦	-+	+		1	1		
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	۲	•	1	1	ň	1		
Traffic Volume (vph)	92	149	888	84	174	358		
Future Volume (vph)	92	149	888	84	174	358		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		
Frt	1.00	1.00	1.00	0.85	1.00	0.85		
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1687	1696	1827	1326	1770	1615		
Flt Permitted	0.14	1.00	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	245	1696	1827	1326	1770	1615		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Adj. Flow (vph)	100	162	965	91	189	389		
RTOR Reduction (vph)	0	0	0	29	0	113		
Lane Group Flow (vph)	100	162	965	62	189	276		
Confl. Peds. (#/hr)	1			1				
Heavy Vehicles (%)	7%	12%	4%	19%	2%	0%		
Turn Type	Perm	NA	NA	Perm	Prot	Perm		
Protected Phases		2	6		4			
Permitted Phases	2			6		4		
Actuated Green, G (s)	64.0	64.0	64.0	64.0	24.0	24.0		
Effective Green, g (s)	64.0	64.0	64.0	64.0	24.0	24.0		
Actuated g/C Ratio	0.64	0.64	0.64	0.64	0.24	0.24		
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	156	1085	1169	848	424	387		
v/s Ratio Prot		0.10	c0.53		0.11			
v/s Ratio Perm	0.41			0.05		c0.17		
v/c Ratio	0.64	0.15	0.83	0.07	0.45	0.71		
Uniform Delay, d1	11.0	7.2	13.7	6.8	32.3	34.8		
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2	18.5	0.3	6.7	0.2	3.4	10.7		
Delay (s)	29.5	7.5	20.4	7.0	35.7	45.5		
Level of Service	С	А	С	A	D	D		
Approach Delay (s)		15.9	19.3		42.3			
Approach LOS		В	В		D			
Intersection Summary								
HCM 2000 Control Delay			25.8	H	CM 2000	Level of Service	С	
HCM 2000 Volume to Capa	icity ratio		0.79					
Actuated Cycle Length (s)	,		100.0	Si	um of lost	time (s)	12.0	
Intersection Capacity Utiliza	ation		88.0%			of Service	E	
Analysis Period (min)			15					

Waterfront Trails TIS 5:00 pm 06-13-2018 AM 2025 Total

HCM Signalized Intersection Capacity Analysis

Synchro 9 Report Page 6

Appendix "C" to Report PED19115 Page 218 of 314

1: Green Road & Fra		Avenu	e								00-1	4-2018
	۶	-	\mathbf{i}	1	-	*	1	1	1	1	↓	~
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4		٦	f,			4			4	
Traffic Volume (vph)	16	55	20	278	29	1	17	61	444	3	34	5
Future Volume (vph)	16	55	20	278	29	1	17	61	444	3	34	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.970			0.995			0.885			0.985	
FIt Protected		0.991		0.950				0.998			0.997	
Satd. Flow (prot)	0	1826	0	1752	1890	0	0	1678	0	0	1866	0
FIt Permitted		0.991		0.950				0.998			0.997	
Satd. Flow (perm)	0	1826	0	1752	1890	0	0	1678	0	0	1866	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		165.1			52.2			184.8			166.7	
Travel Time (s)		11.9			3.8			13.3			12.0	
Confl. Peds. (#/hr)	1		1	1		1	2		1	1		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	17	60	22	302	32	1	18	66	483	3	37	5
Shared Lane Traffic (%)												
ane Group Flow (vph)	0	99	0	302	33	0	0	567	0	0	45	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Vedian Width(m)		3.6	-		3.6	-		3.6	-		3.6	-
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
	ther											
Control Type: Unsignalized												

	≯		~	1	+	•	•	Ť	*	5	1	1
	-	-	•	¥			7		1		*	•
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SB
Lane Configurations		÷		ኘ	4Î			4			4	
Traffic Volume (veh/h)	16	55	20	278	29	1	17	61	444	3	34	
Future Volume (Veh/h)	16	55	20	278	29	1	17	61	444	3	34	
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.9
Hourly flow rate (vph)	17	60	22	302	32	1	18	66	483	3	37	
Pedestrians		2			1			1			1	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								185				
pX, platoon unblocked												
vC, conflicting volume	409	634	42	443	394	310	44			550		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	409	634	42	443	394	310	44			550		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	85	98	32	94	100	99			100		
cM capacity (veh/h)	522	393	1031	446	536	734	1575			1029		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1							
Volume Total	99	302	33	567	45							
Volume Left	17	302	0	18	3							
Volume Right	22	0	1	483	5							
cSH	479	446	541	1575	1029							
Volume to Capacity	0.21	0.68	0.06	0.01	0.00							
Queue Length 95th (m)	6.2	39.6	1.6	0.3	0.1							
Control Delay (s)	14.5	28.4	12.1	0.4	0.6							
Lane LOS	В	D	В	A	A							
Approach Delay (s)	14.5	26.8		0.4	0.6							
Approach LOS	В	D										
Intersection Summary												
Average Delay			10.2									
Intersection Capacity Utiliza Analysis Period (min)	tion		64.4%	IC	U Level o	of Service			С			

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

Synchro 9 Report Page 1 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

Synchro 9 Report Page 2

2: North Service Ro		ICCITI	loau				2: North Servi		0.001	Iteaa				
	٦	-	+	•	1	-		الحر	-	. +-	•	1	-	
ane Group	EBL	EBT	WBT	WBR	SBL	SBR	Lane Group	EBL	. EBT	WBT	WBR	SBL	SBR	
ane Configurations	5	•	•	1	5	1	Permitted Phases	2)		6		4	
raffic Volume (vph)	326	956	471	196	117	215	Detector Phase	2		2 6		4	4	
uture Volume (vph)	326	956	471	196	117	215	Switch Phase							
deal Flow (vphpl)	1900	1900	1900	1900	1900	1900	Minimum Initial (s)	20.0	20.0) 20.0	20.0	10.0	10.0	
Storage Length (m)	120.0	.,	1700	60.0	40.0	0.0	Minimum Split (s)	26.0				24.0	24.0	
Storage Lanes	1			1	1	1	Total Split (s)	66.0				24.0		
aper Length (m)	7.5				7.5		Total Split (%)	73.3%						
ane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	Maximum Green (s)	60.0				18.0	18.0	
Frt	1.00	1.00	1.00	0.850	1.00	0.850	Yellow Time (s)	4.0				4.0	4.0	
It Protected	0.950			0.000	0.950	0.030	All-Red Time (s)	2.0				2.0	2.0	
Satd. Flow (prot)	1805	1881	1776	1583	1770	1615	Lost Time Adjust (s)	0.0				0.0	0.0	
It Permitted	0.428	1001	1//0	1303	0.950	1010	Total Lost Time (s)	6.0				6.0	6.0	
Satd. Flow (perm)	813	1881	1776	1583	1770	1615	Lead/Lag	0.0	, 0.0	, 0.0	0.0	0.0	0.0	
Right Turn on Red	013	1001	1//0	Yes	1770	Yes	Lead-Lag Optimize?							
Satd. Flow (RTOR)				213		234	Vehicle Extension (s) 3.0) 3.0	3.0	3.0	3.0	
		00	00	213	FO	234	· · · · · · · · · · · · · · · · · · ·) 3.u C-Max						
ink Speed (k/h)		80	80		50		Recall Mode					Max	Max	
ink Distance (m)		123.4	826.3		184.8		Walk Time (s)	7.0				7.0	7.0	
ravel Time (s)	0.00	5.6	37.2	0.00	13.3	0.00	Flash Dont Walk (s)	11.0				11.0	11.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	Pedestrian Calls (#/h				-	0	0	
leavy Vehicles (%)	0%	1%	7%	2%	2%	0%	Act Effct Green (s)	60.0				18.0	18.0	
Adj. Flow (vph)	354	1039	512	213	127	234	Actuated g/C Ratio	0.67				0.20	0.20	
Shared Lane Traffic (%)							v/c Ratio	0.65				0.36	0.46	
ane Group Flow (vph)	354	1039	512	213	127	234	Control Delay	16.0				34.4	7.6	
Enter Blocked Intersection	No	No	No	No	No	No	Queue Delay	0.0				0.0	0.0	
ane Alignment	Left	Left	Left	Right	Left	Right	Total Delay	16.0					7.6	
/ledian Width(m)		3.6	3.6		3.6		LOS	E				С	A	
.ink Offset(m)		0.0	0.0		0.0		Approach Delay		18.0) 6.3		17.1		
Crosswalk Width(m)		4.8	4.8		4.8		Approach LOS		E	8 A		В		
wo way Left Turn Lane							Intersection Summa	24						
leadway Factor	1.00	1.00	1.00	1.00	1.00	1.00		1						
urning Speed (k/h)	25			15	25	15	Area Type:	Other						
lumber of Detectors	1	2	2	1	1	1	Cycle Length: 90							
Detector Template	Left	Thru	Thru	Right	Left	Right	Actuated Cycle Leng		0.EDTI			C		
eading Detector (m)	2.0	10.0	10.0	2.0	2.0	2.0	Offset: 0 (0%), Refer	enced to phase	Z:FRIUS	ING 6:WB	, start of	Green		
railing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	Natural Cycle: 75							
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	Control Type: Actual							
Detector 1 Size(m)	2.0	0.6	0.6	2.0	2.0	2.0	Maximum v/c Ratio:							
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	Intersection Signal E						n LOS: B	
Detector 1 Channel							Intersection Capacity		%			CU Level	of Service C	
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	Analysis Period (min) 15						
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0								
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	Splits and Phases:	2: North Servic	e Road 8	Green R	oad			
Detector 2 Position(m)	0.0	9.4	9.4	0.0	0.0	0.0	A							
Detector 2 Size(m)		9.4	9.4				🗕 🗇 Ø2 (R)							
Detector 2 Type		CI+Ex	CI+Ex				66 s							
Detector 2 Channel		UI+EX	UI+EX				Ø6 (R)							
		0.0	0.0				66 g							
Detector 2 Extend (s)	D.	0.0	0.0	D.		Dec	00.5							
Turn Type	Perm	NA	NA	Perm	Prot	Perm								

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

Synchro 9 Report Page 3 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

Synchro 9 Report Page 4

06-14-2018

Appendix "C" to Report PED19115 Page 220 of 314

	٦	-	-	•	1	-	
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Group Flow (vph)	354	1039	512	213	127	234	
v/c Ratio	0.65	0.83	0.43	0.19	0.36	0.46	
Control Delay	16.0	18.7	8.4	1.2	34.4	7.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	16.0	18.7	8.4	1.2	34.4	7.6	
Queue Length 50th (m)	33.6	124.1	38.4	0.0	20.1	0.0	
Queue Length 95th (m)	67.6	193.1	57.7	6.7	36.9	19.0	
Internal Link Dist (m)		99.4	802.3		160.8		
Turn Bay Length (m)	120.0			60.0	40.0		
Base Capacity (vph)	542	1254	1184	1126	354	510	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.65	0.83	0.43	0.19	0.36	0.46	

	≯	-	-	•	1	1		
Movement	EBL	EBT	WBT	WBR	SBL	SBR		
Lane Configurations	ľ	•	1	1	ľ	1		
Traffic Volume (vph)	326	956	471	196	117	215		
Future Volume (vph)	326	956	471	196	117	215		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		
Frt	1.00	1.00	1.00	0.85	1.00	0.85		
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1805	1881	1776	1583	1770	1615		
FIt Permitted	0.43	1.00	1.00	1.00	0.95	1.00		
Satd. Flow (perm)	813	1881	1776	1583	1770	1615		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Adj. Flow (vph)	354	1039	512	213	127	234		
RTOR Reduction (vph)	0	0	0	71	0	187		
Lane Group Flow (vph)	354	1039	512	142	127	47		
Heavy Vehicles (%)	0%	1%	7%	2%	2%	0%		
Turn Type	Perm	NA	NA	Perm	Prot	Perm		
Protected Phases	1 cm	2	6	T CITI	4	1 cm		
Permitted Phases	2	2	0	6		4		
Actuated Green, G (s)	60.0	60.0	60.0	60.0	18.0	18.0		
Effective Green, g (s)	60.0	60.0	60.0	60.0	18.0	18.0		
Actuated g/C Ratio	0.67	0.67	0.67	0.67	0.20	0.20		
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)	542	1254	1184	1055	354	323		
v/s Ratio Prot	J4Z	c0.55	0.29	1055	c0.07	323		
v/s Ratio Perm	0.44	C0.55	0.29	0.09	CU.U7	0.03		
v/c Ratio	0.44	0.83	0.43	0.09	0.36	0.03		
Uniform Delay, d1	0.65	11.2	7.0	5.5	31.0	29.7		
Progression Factor	1.00	1.00	1.00	5.5 1.00	1.00	1.00		
Incremental Delay, d2	6.0	6.4	1.00	0.3	2.8	0.9		
Delay (s)	0.0 14.9	17.6	8.2	5.8	33.8	30.6		
Level of Service	14.9 B	17.0 B	0.2 A	0.0 A	33.0 C	30.0 C		
	D			А		C		
Approach Delay (s)		16.9 B	7.5		31.7 C			
Approach LOS		В	A		C			
Intersection Summary								
HCM 2000 Control Delay			16.3	Н	CM 2000	Level of Service	В	
HCM 2000 Volume to Capac	city ratio		0.72					
Actuated Cycle Length (s)			90.0		um of lost	. ,	12.0	
Intersection Capacity Utilizat	tion		68.6%	IC	U Level	of Service	С	
Analysis Period (min)			15					
c Critical Lane Group								

Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

Synchro 9 Report Page 5 Waterfront Trails TIS 5:00 pm 06-13-2018 PM 2025 Total

HCM Signalized Intersection Capacity Analysis 2: North Service Road & Green Road

> Synchro 9 Report Page 6

06-14-2018

Appendix M

Proxy Site Survey Parking Data

Appendix "C" to Report PED19115 Page 222 of 314

3060-3070 Rotary Way

Appendix "C" to Report PED19115 Page 223 of 314

Period	Time		Pa	rking Dema	nd			U	tilization Ra	te			Pa	rking Rate/L	Jnit	
Period	Time	Day 1	Day 2	Day 3	Day 4	Average	Day 1	Day 2	Day 3	Day 4	Average	Day 1	Day 2	Day 3	Day 4	Average
	6:30	222	255	280	280	259	51%	59%	65%	65%	60%	0.99	1.14	1.25	1.25	1.16
	7:00	205	241	265	261	243	47%	56%	61%	60%	56%	0.92	1.08	1.18	1.17	1.08
	7:30	169	225	253	243	223	39%	52%	59%	56%	52%	0.75	1.00	1.13	1.08	1.00
AM	8:00	146	207	217	226	199	34%	48%	50%	52%	46%	0.65	0.92	0.97	1.01	0.89
A	8:30	121	173	175	224	173	28%	40%	41%	52%	40%	0.54	0.77	0.78	1.00	0.77
	9:00	103	145	152	214	154	24%	34%	35%	50%	36%	0.46	0.65	0.68	0.96	0.69
	9:30	93	131	129	202	139	22%	30%	30%	47%	32%	0.42	0.58	0.58	0.90	0.62
	10:00	84	127	123	197	133	19%	29%	28%	46%	31%	0.38	0.57	0.55	0.88	0.59
	15:00	62	94	118	170	111	14%	22%	27%	39%	26%	0.28	0.42	0.53	0.76	0.50
	15:30	67	89	112	173	110	16%	21%	26%	40%	25%	0.30	0.40	0.50	0.77	0.49
	16:00	74	88	118	164	111	17%	20%	27%	38%	26%	0.33	0.39	0.53	0.73	0.50
	16:30	86	108	125	171	123	20%	25%	29%	40%	28%	0.38	0.48	0.56	0.76	0.55
	17:00	96	118	146	188	137	22%	27%	34%	44%	32%	0.43	0.53	0.65	0.84	0.61
Μd	17:30	109	133	155	191	147	25%	31%	36%	44%	34%	0.49	0.59	0.69	0.85	0.66
	18:00	117	143	155	206	155	27%	33%	36%	48%	36%	0.52	0.64	0.69	0.92	0.69
	18:30	127	159	161	206	163	29%	37%	37%	48%	38%	0.57	0.71	0.72	0.92	0.73
	19:00	146	173	189	214	181	34%	40%	44%	50%	42%	0.65	0.77	0.84	0.96	0.81
	19:30	155	177	192	214	185	36%	41%	44%	50%	43%	0.69	0.79	0.86	0.96	0.83
	20:00	174	153	205	209	185	40%	35%	47%	48%	43%	0.78	0.68	0.92	0.93	0.83
													AM	Peak Dema	and per Unit	1.25
													AM Av	erage Dema	and per Unit	1.16
													PM	Peak Dema	and per Unit	0.96
													PM Av	erage Dema	and per Unit	0.83

REPORT WATERFRONT TRAILS 3 STONEY CREEK, ONTARIO

PEDESTRIAN WIND ASSESSMENT

PROJECT #: 1802941

JUNE 7, 2018

SUBMITTED TO

Michael Foley New Horizons Development Group mike@nhdg.coa

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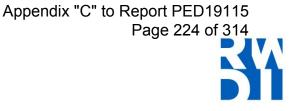
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1. INTRODUCTION

Appendix "C" to Report PED19115 Page 225 of 314

RWDI was retained by New Horizons Development Group (NHDG) to assess the pedestrian wind conditions around the proposed Waterfront Trails 3 development in Stoney Creek, Ontario. This qualitative assessment is based on the following:

- a review of the regional long-term meteorological data from Hamilton International Airport;
- design drawings and documents received from NHDG on May 17, 2018;
- wind-tunnel studies undertaken by RWDI for similar projects in Toronto and Hamilton;
- our engineering judgment, experience and expert knowledge of wind flows around buildings¹⁻³; and,
- use of software developed by RWDI (Windestimator²) for estimating the potential wind conditions around generalized building forms.

This qualitative approach provides a screening-level estimation of potential wind conditions. Conceptual wind control measures to improve wind comfort are recommended, where necessary. In order to quantify these conditions or refine any conceptual mitigation measures, physical scale-model tests in a boundary-layer wind tunnel would be required.

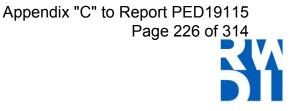
Note that other wind issues, such as those related to cladding and structural wind loads, snow, etc., are not considered in the scope of this assessment.



Image 1 – Rendering of the Proposed Project

- 1. C.J. Williams, H. Wu, W.F. Waechter and H.A. Baker (1999), "Experience with Remedial Solutions to Control Pedestrian Wind Problems", 10th International Conference on Wind Engineering, Copenhagen, Denmark.
- 2. H. Wu, C.J. Williams, H.A. Baker and W.F. Waechter (2004), "Knowledgebased Desk-Top Analysis of Pedestrian Wind Conditions", ASCE Structure Congress 2004, Nashville, Tennessee.
- 3. H. Wu and F. Kriksic (2012). "Designing for Pedestrian Comfort in Response to Local Climate", Journal of Wind Engineering and Industrial Aerodynamics, vol.104-106, pp.397-407.

2. SITE & BUILDING INFORMATION



The site of the proposed development is located north of the Queen Elizabeth Way, east of Green Road and south of Frances Avenue in Stoney Creek, Ontario. The proposed development consists of three towers approximately 185 m in height, with a large four-storey podium at the base (Image 1). Currently the site is undeveloped (Image 2). The surrounding environment can be described as :

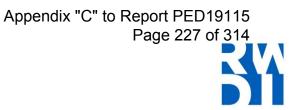
- Suburban low-rise developments to the east-southeast, clockwise through northwest; and,
- 2) Open water (Lake Ontario) to the north-northwest, clockwise through east.

In the immediate surrounding environment, a group of three broad buildings, approximately 15 storeys in height, exists directly to the north, between the proposed development and Lake Ontario.

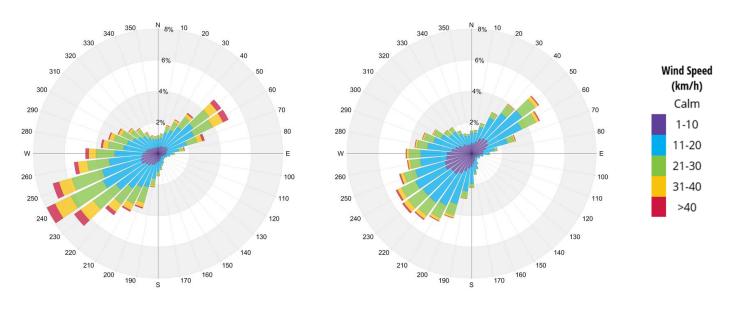


Image 2 – Aerial View of the Site and Surroundings (Credit: Google™ Earth)

3. METEOROLOGICAL DATA



Wind statistics recorded at Hamilton International Airport between 1988 and 2017 were used as a reference for ambient wind conditions for the Summer (May through October) and Winter (November through April) seasons. Image 3 graphically depicts the directional distributions of wind frequencies and speeds for the two seasons. Winds from northeast and southwest quadrants are predominant in both summer and winter. Strong winds of a mean speed greater than 30 km/h measured at the airport (at an anemometer height of 10 m) occur more often in the winter than in the summer.

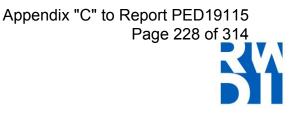


Winter - November through April

Summer – May through October

Image 3 – Directional Distribution of Winds Approaching Hamilton International Airport (1988 – 2017)

4. PEDESTRIAN WIND CRITERIA



The RWDI pedestrian wind criteria are used in the current study. These criteria have been developed by RWDI through research and consulting practice since 1974. They have also been widely accepted by municipal authorities as well as by the building design and city planning community. The criteria are as follows:

Pedestrian Safety

Pedestrian safety is associated with excessive gust wind speeds that can adversely affect a pedestrian's balance and footing. If strong winds that can affect a person's balance (**90 km/h**) occur more than 0.1% of the time, or 9 hours per year, the wind conditions are considered severe.

Pedestrian Comfort

Wind comfort can be categorized by typical pedestrian activities:

Sitting (≤ 10 km/h): Calm or light breezes desired for outdoor seating areas where one can read a paper without having it blown away.
Standing (≤ 14 km/h): Gentle breezes suitable for main building entrances and bus stops.

Strolling (≤ 17 km/h): Moderate winds that would be appropriate for window shopping and strolling along a downtown street, plaza or park.
Walking (≤ 20 km/h): Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering.
Uncomfortable: None of the comfort categories are met

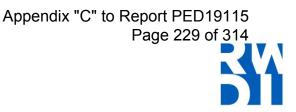
Wind conditions are considered suitable for sitting, standing, strolling or walking if the associate mean wind speeds are expected for at least four out of five days (80% of the time. Wind control measures are typically required at locations where winds are rated as uncomfortable or they exceed the wind safety criterion.

Note that these wind speeds are assessed at the pedestrian height (i.e., 1.5 m above grade or the concerned floor level), typically lower than those recorded in the airport (10 m height and open terrain).

These criteria for wind forces represent average wind tolerance. They are sometimes subjective and regional differences in wind climate and thermal conditions as well as variations in age, health, clothing, etc. can also affect people's perception of the wind climate.

For the current development, wind speeds comfortable for walking or strolling are appropriate for parking lots and the surrounding sidewalks. Lower wind speeds comfortable for sitting or standing are preferred for building entrances where pedestrians may linger. For amenity spaces, wind conditions which are comfortable for sitting are generally desired. However, the use of outdoor amenity spaces is more frequent in the summer in Ontario. Increased wind speeds may be acceptable in the winter.

5. PEDESTRIAN WIND CONDITIONS

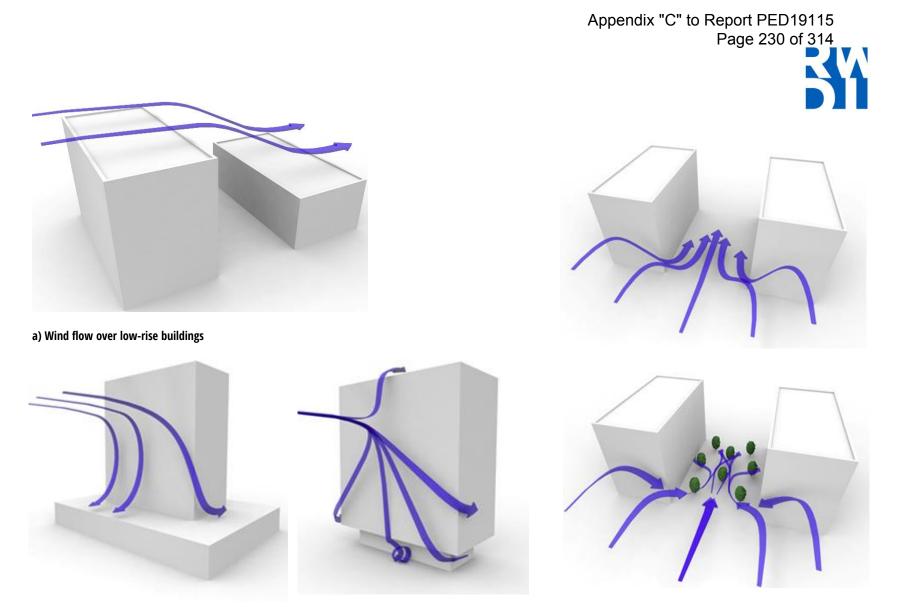


5.1 Background

Predicting wind speeds and frequencies of occurrence is complicated. It involves the assessment of building geometry, orientation, position and height of surrounding buildings, upwind terrain and the local wind climate. Over the years, RWDI has conducted thousands of wind tunnel model studies on pedestrian wind conditions around buildings, yielding a broad knowledge base. This knowledge has been incorporated into RWDI's proprietary software that allows, in many situations, for a screening-level qualitative estimation of pedestrian wind conditions without wind tunnel testing.

Wind generally tends to flow over arrays of buildings of even height and thereby typically do not result in severe impacts at grade level in these scenarios (Image 4a). Tall buildings tend to intercept the stronger winds at higher elevations and redirect them to the ground level (Image 4b). Such a Downwashing Flow is often the main cause for wind accelerations around large buildings at the pedestrian level. When winds approach at an oblique angle to a tall façade and are deflected down, a localized increase in the wind activity or Corner Acceleration can be expected around the exposed building corner at pedestrian level (Image 4b). When two buildings are situated side by side, wind flow tends to accelerate through the space between the buildings due to a channelling effect caused by the narrow gap (Image 4c). If these building/wind combinations occur for prevailing winds, there is a greater potential for increased wind activity and uncomfortable conditions.

Large podiums and tower setbacks capture the downwashed flows and help reduce wind impact at grade (Image 4b). However, increased wind activity would then be created on the lower windward roofs or terraces where low wind speeds are typically desired for amenity use. A typical wind speed reduction strategy is to include landscaping in amenity areas and in the area between buildings (Image 4c). Dense trees and other landscaping helps diffuse strong wind flows and reduces wind impacts in areas under and immediately around them.



b) Downwashing Wind Flow Around Buildings with Podiums (Left) and Undercuts (Right)

c) Channelling Wind Flow Between Buildings without (Top) and with (Bottom) Landscaping

Image 4 – General Wind Flow Phenomena Around Buildings

RWDI Project #1802941 June 7, 2018

Appendix "C" to Report PED19115 Page 231 of 314

5.2 Existing Site

Wind conditions on and around the existing open site (Image 5) are expected to be comfortable for sitting or standing during the summer. During the winter, due to the seasonally stronger winds, wind speeds are expected to be higher and comfortable for strolling.

Wind conditions at all areas are expected to meet the criterion used to assess pedestrian safety.

5.3 Proposed Site

5.3.1 Anticipated Wind Flow Patterns

The proposed project is significantly taller than all existing surrounding buildings, and will therefore be exposed to the prevailing winds. In that respect, the proposed orientation of the towers is positive. The towers are oriented so that tower corners face prevailing winds, and the flat façades are on an oblique angle to prevailing winds. This orientation provides the least resistance to winds for the given tower geometry, and will therefore result in the least impact on winds at the pedestrians level.



Image 5 – Existing Site



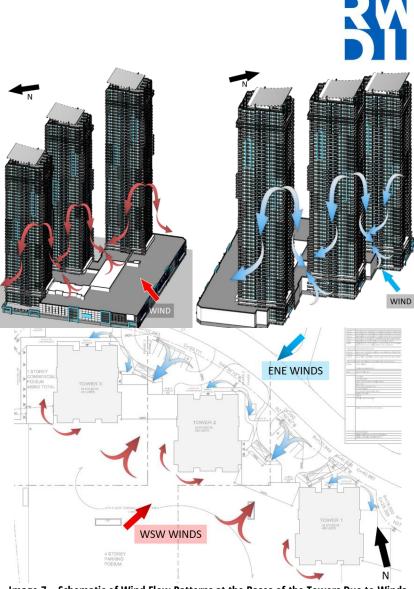
Image 6 – Proposed Site

However, since the proposed development is a set of three towers oriented approximately in a line perpendicular to the prevailing winds, and the three towers are taller than the surroundings (Image 6), it is expected that the towers will intercept stronger winds at higher elevations, resulting in downwashing and channelling flows (Image 4a).

The magnitude of the increase in wind speeds at the base of the towers, relative to the Existing site conditions, depends on multiple factors. The presence of the large four-storey podium at the base of the towers is positive in that it will tend to disperse accelerated wind flows around the base of the towers. Schematics of the predicted wind flow around the tower bases for the most common wind directions are shown in Image 7.

The presence of narrow spaces between buildings will also result in channelling accelerations, as shown in Image 4b and in Image 7. The raised building massing shown in white in Image 7 (top left and top right) are approximately 3.5 m in height and will provide shelter to the areas immediately to the north and east.

Overall, owing to the height of the towers and the gaps between them, downwashing and channelling flows are expected. The large podium is expected to substantially limit the flow of these redirected winds on to Green Road and Queen Elizabeth Way. A schematic of predicted relative wind speeds at the base of the three towers can be seen in Image 8. The following sections discuss these wind conditions in detail.

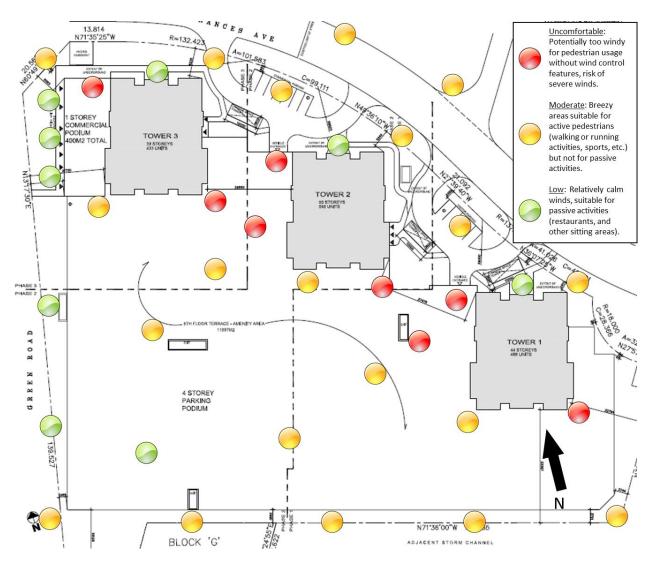


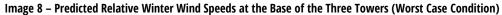
Appendix "C" to Report PED19115

Page 232 of 314

Image 7 – Schematic of Wind Flow Patterns at the Bases of the Towers Due to Winds from the West-Southwest (Top Left), East-Northeast (Right) and Overall (Bottom)

Appendix "C" to Report PED19115 Page 233 of 314





RWDI Project #1802941 June 7, 2018

Pedestrian Wind Assessment

Appendix "C" to Report PED19115 Page 234 of 314

5.3.2 Entrances and Sidewalks

The main entrances to each of the three towers (Image 9, red triangles), located at the center of the north side of each tower. They are both well recessed into the footprint of the towers, and covered by a deep overhead canopy (Image 10). These are positive design features from a wind perspective, in that they shelter the entrances from both direct ambient wind exposure, and downwashing impacts of the prevailing strong winds. It is expected that wind speeds at the tower entrances will

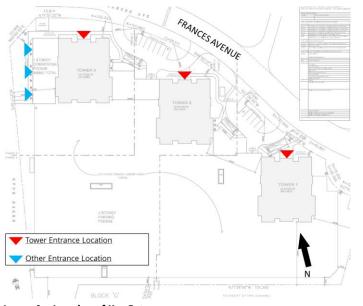


Image 9 – Location of Key Entrances

be comfortable for standing or better throughout the year, which is appropriate for a main entrance. The commercial entrances (Image 9, blue triangles) are also expected to be subject to wind speeds which are comfortable for standing throughout the year. This is because the commercial entrances are not located in an area of accelerated flow, such as between towers or near tower corners. Conversely, the fourstorey podium protects the entrances from downwashing flows and corner accelerations typical of the base of the towers.

The towers are expected to cause minor increases in wind activity in the surrounding areas. The presence of the four storey podium is a significant positive design feature which will disperse winds and avoid strong localized wind accelerations (Image 4b). Wind conditions comfortable for walking or strolling are anticipated at the sidewalks along Frances Avenue and Green Road, which is considered appropriate.

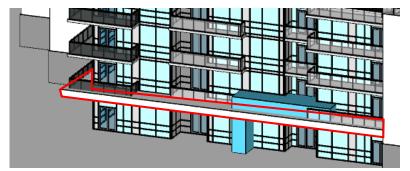


Image 10 – Recessed Entrances and Overhead Canopies

RWDI Project #1802941 June 7, 2018

Appendix "C" to Report PED19115 Page 235 of 314

5.3.3 Podium Amenity

As discussed in Section 5.3.1, large podiums capture downwashing flows and this tends to make podium roofs windy for amenity use. It is expected that the wind safety criterion may be exceeded at the northwest and southeast corners of the proposed towers at the podium level as a result of winds channeling and accelerating around the tower corners. Wind speeds at the southwest podium corner, further away from the towers, are expected to be lower. A wind tunnel assessment would allow quantification of the frequency of strong winds at podium locations.

Pedestrian wind conditions on the podium could be improved through the addition of wind screen features and overhead wind control features around sitting areas of the podium amenity space (See Section 6). Strategic placement of landscaping is also an effective means of reducing wind speeds, particularly in the summer when the area will be used frequently.

5.3.4 Rooftop Amenity Spaces

The curved canopy features above the rooftop amenity spaces are well oriented and are positive from a wind perspective, in that they are expected to provide shelter from west-southwesterly winds (Image 11). A portion of the winds from the west-southwest may be drawn underneath the canopy (Image 11, right), but the net effect of the canopy will be to reduce wind speeds on the rooftop. The more open northeast-facing side of the canopy will trap wind flows and force winds down to the rooftop areas (Image 11, left).

If improved wind comfort conditions are desired on the rooftop amenity spaces, strategic placement of a combination of horizontal and vertical wind control features could be placed around the north and east sides of the amenity space. These features could be in the form of dense landscaping or porous wind screen / parapet features. Screens or landscaping used to reduce direct exposure to ambient winds would need to be at least 2.5 m in height in order to be effective. See Section 6.

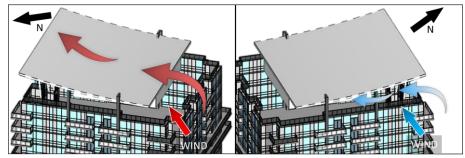
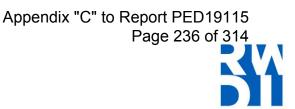


Image 11 – Anticipated Wind Flow Patterns at the Rooftop Amenity Due to Winds from the West-Southwest (Left) and East-Northeast (Right)

6. RECOMMENDATIONS



Wind control features are recommended on the podium amenity space and at the rooftop amenity spaces. Winds are predominantly from the west-southwesterly directions, and secondarily from the eastnortheasterly directions. The canopies at the tower rooftops are positive in that they will protect rooftop amenity spaces from west-southwesterly winds.

The rooftop and podium will be exposed to winds from the eastnortheasterly directions, and the podium will also be exposed to westsouthwesterly winds. Canopies located as low as possible around the tower at the southeast and northwest building corners would be beneficial in terms of wind comfort and safety. Canopies extending from the tower walls should be at least 2.5 m in depth in order to have an appreciable benefit. Additional canopies and/or trellises are recommended over any designated seating or gathering area. Alternatively, trees with large canopies may also be considered for overhead protection.

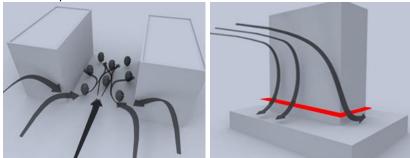


Image 12 – Schematic of Channeling and Downwashing Flows and Conceptual Wind Control Including Landscaping (Left) and Overhead Canopies (Right)

Vertical wind control features would also be beneficial to disrupt the flow of winds on the podium. These could be in the form of porous wind screens or dense landscaping. Vertical features should be at least 2.5 m in height to be effective. Locations where wind control features or increased parapet heights would be beneficial are shown conceptually in Image 13. Examples of these features are shown in Image 14. Wind tunnel testing is required to quantify the impact of these features.

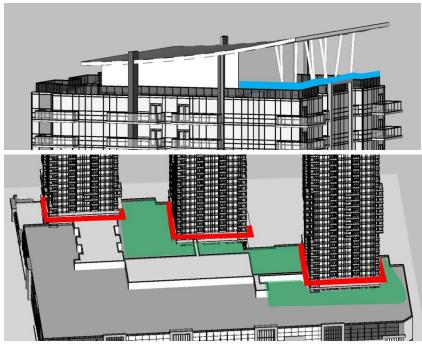


Image 13 – Recommended Wind Control Features Include Overhead Canopies (Red), Wind Screens or Parapets (Blue) and/or Landscaped Areas (Green)

RWDI Project #1802941 June 7, 2018



a) Wraparound Overhead Canopies – The strong winds expected to accelerate around the tower corners could be dispersed by wraparound overhead canopies.



b) Dense Landscaping Canopies – The strong winds expected to accelerate around the tower corners could be dispersed by wraparound overhead canopies.



Page 237 of 314

Appendix "C" to Report PED19115

b) Vertical Wind Screens – Strong horizontal wind flows can be reduced by providing vertical features which provide wind resistance

Image 14 - Recommended Wind Control Features Include Overhead Canopies (Top Left), Dense Landscaping (Bottom Left) and Vertical Wind Screens (Right)

RWDI Project #1802941 June 7, 2018

7. SUMMARY

The proposed development is located on a site that is currently open and undeveloped. The proposed buildings are significantly taller than the existing surroundings. Therefore, the addition of the proposed development would increase wind speeds at grade level around the development relative to existing conditions.

The design of the development includes several features that are positive from a wind perspective. These include the orientation of the towers with their corners facing into the prevailing winds, large podium that will dissipate downwashing flows, recessed main entrances and deeps canopies above them. These features aid in providing critical areas of shelter from strong winds, and are recommended to be retained in the final design.

Wind speeds at the building entrances are expected to be comfortable for standing, and wind speeds at surrounding sidewalk locations are expected to be comfortable for strolling or walking throughout the year. These wind conditions are considered appropriate.

Wind speeds at the podium amenity spaces and rooftop amenity spaces are expected to be stronger than desired. Exceedances of the wind safety criterion may potentially occur at the southeast and northwest corners of each of the towers at the podium level. Conceptual wind control strategies have been discussed and can be refined as the design develops. The wind conditions discussed herein should be quantified through wind tunnel testing. This would provide verification of areas where wind control features are required and would allow wind control features to be developed .

Appendix "C" to Report PED19115

Page 238 of 314

8. APPLICABILITY OF RESULTS

The assessment discussed in this report is based on the drawings of the proposed development received as of May 17, 2018. In the event of any significant changes to the design, construction or operation of the building or addition of surroundings in the future, RWDI could provide an assessment of their impact on the pedestrian wind conditions discussed in this report. It is the responsibility of others to contact RWDI to initiate this process.

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SHADOW IMPACT ANALYSIS

PROPOSED DEVELOPMENT 48,54&59 Storey Condominium Project 311 FRANCES AVENUE Stoney Creek, Ontario

KNYMH FILE # 17305

Prepared by: Marc Begin KNYMH INC.

December 19, 2018

SHADOW IMPACT ANALYSIS

PROPOSED DEVELOPMENT

48,55&59 Storey Condominiums 311 Frances Avenue Stoney Creek, Ontario

TABLE OF CONTENTS:

SECTION	DESCRIPTION	PAGE NO:
1.0	PURPOSE	1
2.0	DESCRIPTION OF NEIGHBOURING PROPERTIES	1
3.0	METHOD OF ANALYSIS	2
4.0	SHADOW IMPACT ANALYSIS OF THE PROPOSED DEVELOPME 4.1 WINTER SHADOWS (Dec. 21) 4.2 SPRING / FALL SHADOWS (Mar. 21) 4.3 SUMMER SHADOWS (June 21)	NT 3 3 4 4
5.0	GENERAL OBSERVATIONS	5
6.0	SUMMARY OBSERVATIONS REGARDING IMPACT OF DEVELOPMENT UPON THE SURROUNDING AREA	6
7.0	APPENDIX "A" – SHADOW DIAGRAMS FOR THE STUDY PERIODS 7.03.21.1000 to 7.03.21.1600 SPRING SHADOWS 7.06.21.1000 to 7.06.21.1600 SUMMER SHADOWS 7.12.21.1000 to 7.12.21.1600 WINTER SHADOWS	7 8-11 12-15 16-19

KNYMH FILE # 17305

Prepared by: KNYMH INĆ. Marc Begin

December 19, 2018

Prepared by: KNYMH INC. Marc Begin

SHADOW IMPACT ANALYSIS

December 19, 2018

PROPOSED DEVELOPMENT

311 Frances Avenue Stoney Creek, Ontario

1.0 PURPOSE:

The purpose of this report is to analyse the impact of a proposed development upon the adjacent properties, streets, and public spaces at the above noted location. We will discuss and comment upon the impact of the massing of the proposed development upon the adjacent properties using a computer generated model for analysis of the proposed 48,54,59 storey buildings with a 4 storey flat roof parking podium and a rooftop mechanical room which includes the rooftop building service equipment and a decorative sloped roof.

We have provided shadow graphics along with Satellite imagery of the surrounding area.

The property is located in Stoney Creek Ontario, on the North side of the North Service Road, East of Green Road.

2.0 DESCRIPTION OF THE SITE AND NEIGHBOURING PROPERTIES:

The Subject Property: (See Diagram in Section 8.0)

The Subject property is zoned MUC-4

Neighbouring properties include:

2.1) TO THE WEST: The property abuts Green Road. Across Green road is a 1 Storey commercial building zoned GC-35 and further West are 2 storey townhouse units zoned RM3-10.

2.2) TO THE NORTH: The property abuts Frances Avenue. To the North is an existing high rise development zoned RM5 and a recently developed 2 Storey Townhouse site zoned RM3-40 and 3 Storey Units zoned R6-5. Further North is a 4 storey mid rise apartment zoned RM3-40. To the North West across the Green Road France Avenue Intersection, are 2 storey townhouse units zoned RM2.

2.3) TO THE SOUTH: The property abuts the North Service Road and the QEW.

2.4) TO THE EAST: The property abuts a storm channel and conservations lands zoned P1 and P5. Further east are two 6 storey mid rise buildings under construction zoned RM3-55 and recently constructed 2 storey townhouse units zoned RM3-52

3.0 METHOD OF ANALYSIS:

The method of analysis will be a discussion of the impact the development of the 48,54,59 storey residential buildings, fronting Green Road and Frances Avenue, has on the adjacent properties and the public realm. The summary is within Section 6.0.

The graphic analysis which we present within this report is developed using a computer generated modelling program in conjunction with satellite imagery and survey information.

Geographic Coordinates: Latitude 43.23 North, Longitude 79.72 West Standard Time: UTC -5:00 Daylight Savings Time: UTC -4:00 Test Dates: March 21, June 21, and December 21 Test Times: 1000am, 1200pm, 200pm and 400pm

The diagrams enclosed illustrate shadow patterns for 4 times of day on 3 specific days of the year, which reflect the solstice through the 4 seasons of the year. Generally speaking the analysis of the shadow diagrams identifies the typical shadows, which are cast in a Spring / Fall, Summer and Winter periods.

The following analysis of the shadow plans will discuss the shadow pattern for each of the dates and times and will identify characteristics of those shadows and the anticipated impact upon the immediate site and neighbouring sites with specific concern for amenity spaces and predominantly pedestrian utilized areas which may be impacted by the proposed development.

4.0 SHADOW IMPACT ANALYSIS OF THE PROPOSED DEVELOPMENT

4.1 <u>WINTER SHADOWS</u>: (DECEMBER 21 • Diagrams 7.12.21.1000 through 7.12.21.1600)

The next section provides a summary of the Winter shadow effect of the subject property upon the surrounding area. This commentary will discuss the impact of the 48,54,59 - storey residential apartment building's shadows upon properties at the north, east and west side of the subject property.

It should be noted that Winter Shadows are the "longest" in terms of the shadow length due to a very low sun angle, but shadows are present for the shortest period of time (hours in the day) due to very short days this time of year. The times for this period are under Eastern Standard Time (UTC -5:00).

4.1A 10:00am (Diagram 7.12.21.1000)

The morning sun in winter rotates approximately 116-degrees from east to west in approximately 9-hours at this time of year. At this time the sun has an altitude angle of 16.26 degrees.

• The shadow falls across the Green Road and the adjacent townhouse properties to the Northwest and extending Northwest to the single family properties across Church St

4.1B 12:00pm (Diagram 7.12.21.1200)

The noontime sun in winter is still relatively low (23.21-degrees) in the sky and is located directly south of the subject property.

• The shadow by this time of day falls across Frances Ave and onto the apartment buildings to the North as well as the front yards of some of the townhouses across Green Road and extending Northwest to the single family properties across Church St.

4.1C 2:00pm (Diagram 7.12.21.1400)

The afternoon sun in winter is starting to descend and is 19.25 degrees above the horizon.

• The shadow by this time of day falls across Frances Ave and onto the apartment buildings to the North as well as the townhouses and Mid Rise across Frances Avenue. The shadow is extending well into Lake Ontario

4.1D 4:00pm (Diagram 7.12.21.1600)

The late afternoon sun in winter is descending and is very low at 5.97 degrees above the horizon.

• The shadow by this time of day falls across Frances Ave onto the apartment buildings to the North as well as the townhouses and Mid Rise across Frances Avenue. The shadow is extending well into Lake Ontario.

4.2 SPRING & FALL EQUINOX SHADOWS: (MARCH 21 • Diagrams 7.03.21.1000 through 7.03.21.1600)

A summary of the Spring and Fall shadow effect on the subject property and surrounding area is following. It should be noted that the Fall and Spring are the "moderate" in terms of the annual shadows. The times for this period are under Eastern Daylight Time.

4.2A 10:00am (Diagram 7.03.21.1000)

The morning sun in spring / fall rotates approximately 183-degrees from east to west in 12-hours. It is low in the sky rising to approximately 27.23-degrees at this time of day.

• The shadow falls across Green Road and the adjacent commercial and townhouse properties to the West.

4.2B 12:00pm (Diagram 7.03.21.1200)

The noontime sun in spring / fall is higher (approximately 43.03-degrees) in the sky and originates from near-south.

• The shadow falls across the Green Road Frances Avenue intersection and onto the adjacent townhouse properties to the Northwest and apartment buildings to the North.

4.3C 2:00pm (Diagram 7.03.21.200)

The afternoon sun in spring / fall is near its peak. It is approximately 46.52-degrees above the horizon and the shadows are still short at this time of day.

• The shadow falls across Frances Avenue and the adjacent apartment and townhouse properties to the North, stopping short of the mid rise building.

4.4D 4:00pm (Diagram 7.03.21.400)

The late afternoon sun in spring / fall is descending. It is approximately 35.14-degrees above the horizon and the shadows are still short at this time of day.

• The shadow falls across Frances Avenue and the adjacent apartment and townhouse properties to the North

4.3 SUMMER SOLSTICE SHADOWS: (JUNE 21 • Diagrams 7.06.21.1000 through 7.06.21.1600)

A summary of the Summer Shadow affect is as follows. At this day the solar altitude is at a maximum; Shadows are minor and stay short, falling on to Green road and shortly onto the backyards of the townhouses to the west. The times for this period are under Eastern Daylight Time.

4.3A 10:00am (Diagram 7.06.21.1000)

The morning sun is rising and already at 44.47 degrees at this time. The sun will rotate almost 249 degrees in the sky on this day over fourteen and a half hours.

• The shadow falls across Green Road and the adjacent commercial and townhouse properties to the West

4.3B 12:00pm (Diagram 7.06.21.1200)

The noontime sun in summer is high in the sky (64.13-degrees) originating from the south at this time.

• The shadow falls across the Green Road Frances Avenue intersection and onto the adjacent townhouse properties to the West.

4.3C 2:00pm (Diagram 7.06.21.1400)

The afternoon sun in summer is at its peak at about 68.6 degrees altitude. The sun appears to be shining from the southwest.

- The shadow falls across Frances Avenue and the adjacent apartment and townhouse properties to the North, stopping short of the 3 storey towns.
- •

4.4D 4:00pm (Diagram 7.06.21.1600)

The late afternoon sun in summer has begun descending and is still at about 51.81 degrees altitude. The sun appears to be shining from the southwest.

• The shadow falls across Frances Avenue and the adjacent apartment and townhouse properties to the North

5.0 GENERAL OBSERVATIONS: REGARDING THE 14 STOREY DEVELOPMENT

5.1 The shadows cast from this proposed Apartment building are largest in the Winter.

- Shadows fall on the adjacent townhouse units across Green Road and the single family properties to the Northwest across Church St in the morning but no shadows shortly after noon.
- Existing Apartment buildings cast morning shadow in this neighborhood
- Morning shadow will cast along the sidewalks of Green Road, whereas in afternoon Frances road will be in shadow.
- Mid day shadows cast on the adjacent townhouse and apartment building properties across Frances Ave

5.2 The major shadow affect in Spring and Fall is as follows:

- The adjacent commercial and townhouse properties to the west will be affected by shadows in the morning but will be cleared of shadows by noon.
- The adjacent townhouse properties to the Northwest will be affected by shadows between 10 and shortly after 12 noon
- Morning shadow will cast along the sidewalks of Green Road, whereas in afternoon Frances road will be have periods of shadow as the tower shadows rotate.

• Mid day shadows cast on the adjacent townhouse and apartment building properties across Frances Ave, extending to the mid rise building late in the afternoon.

5.3 The major shadow affect in Summer is as follows:

- The adjacent commercial and townhouse properties to the west will be affected by shadows in the morning but will be cleared of shadows by 12 noon.
- Morning shadow will cast along the sidewalks of Green Road, whereas in afternoon Frances road will be have periods of shadow as the tower shadows rotate.
- Mid day shadows cast on the adjacent townhouse and apartment building properties across Frances Ave, however shadows will avoid the actual apartment buildings
- Shadows are very short throughout the whole study period.

5.4 General Comment Regarding Shadow Affect based upon SITE DESIGN:

 With the building being situated as slim point towers the shadow patterns will move quickly and allow for pockets of sunshine between the shadows. Shadows on adjacent buildings to the west and north mostly during Winter and the morning hours of other season and will leave most of the mature surrounding properties unaffected throughout the rest of the day for the majority of the year. The townhouse properties to the north will be free of shadows throughout the morning in all seasons and early afternoon in spring/fall/summer

6.0 SUMMARY OBSERVATIONS: REGARDING SHADOW IMPACT OF A 48,54,59-STOREY BUILDINGS ON THE NEIGHBOURHOOD

- The proposed development will cast winter shadows on the townhouse properties to the west during the morning in all seasons, however the shadows in the spring will be gone by noon and in the summer the shadows will be gone by mid morning.
- It is expected to have a passing impact on the residential properties to the northwest along Chruch St with very short periods of shadow in the winter mornings, however the existing adjacent apartment buildings already provide shadows in this neighborhood.
- Winter shadow will impact the apartment buildings and townhouses across Frances Ave throughout the afternoon in pockets as the tower shadows rotate, but will remain clear in the morning. It is this time of day where shadows can universally be expected to be longcast, and in a season with fleeting daylight hours. The afternoon shadow impact at this time would be generally the same if the towers were half the height.
- Spring morning shadow will be present for the townhouses along Frances Ave but move very quickly, having minimal impact on individual properties, and will be cleared of Green Road shortly after noon.
- Summer morning shadow will be present for the townhouses south of Frances Ave but move very quickly, having minimal impact on individual properties, and will be cleared of Green Road shortly after noon

- Spring shadow will impact the apartment buildings across Frances Ave through mid afternoon in pockets as the tower shadows rotate, but will remain clear in the morning and late afternoon. Summer shadow will not have an impact on the apartment buildings.
- Spring/Summer shadow will impact the townhouses across Frances Ave throughout the afternoon in pockets as the tower shadows rotate, but will remain clear throughout the morning and early afternoon.
- Most of the outdoor areas for the adjacent townhouses to the North are either covered balconies already providing shadow, or, specifically for the 2 storey units fronting Frances avenue, are to the North of their units, therefore their own unit will already be casting shadow into their rear yards.
- It should be noted that the proposed development is zoned for Unlimited height and Density, and has been zoned this way since before the townhouse properties to the North were developed, therefore although an afternoon impact on these units does exist, consideration should be given to the fact that a reality of a proposed development of this scale would have been available and public knowledge, at the time of construction and purchase.

Based upon the analysis it is our opinion that the proposed development and its proposed height of 48,54 and 59 storeys will not have a significant negative effect on the existing mature neighbourhood to the West/Northwest and apartment buildings to the North. The development will have minor impact on the adjacent recently constructed townhouses to the North, mostly the ones fronting Frances Avenue, however the shadows are contained to the mid afternnoon and the spacing of the towers allows for pockets of daylight as the sun rotates maintaining over 5 hours of sunlight for each lot in the spring/fall and 7 hours or more in the summer.

Sincerely,

KNYMH Inc. Marc Begin

SHADOW IMPACT ANALYSIS

PROPOSED DEVELOPMENT

48,54&59 Storey Condominiums 311 Frances Avenue Stoney Creek, Ontario KNYMH FILE # 17305

Prepared by: KNYMH INC. Marc Begin

December 19, 2018

SECTION 7.0: APPENDIX "A"

SHADOW PLAN DIAGRAMS FOR THE 3 STUDY PERIODS

SECTION 7.0: 14 Storey Building Concept: 7.03. 21.1000 – 7.03. 21.1000 SHADOW PLANS AT SPRING(FALL): March 21st

7.03. 21.0930 = 10:00 AM 7.03. 21.1200 = 12:30 PM 7.03. 21.1400 = 2:00 PM 7.03. 21.1600 = 4:00 PM

7.06. 21.1000 - 7.06. 21.1600 SHADOW PLANS AT SUMMER: June 21st

7.06. 21.1000 = 10:00 AM 7.06. 21.1200 = 12:00 PM 7.06. 21.1400 = 2:00 PM 7.06. 21.1600 = 4:00 PM

7.12. 21.1000 – 7.12. 21.1600 SHADOW PLANS AT WINTER: December 21st

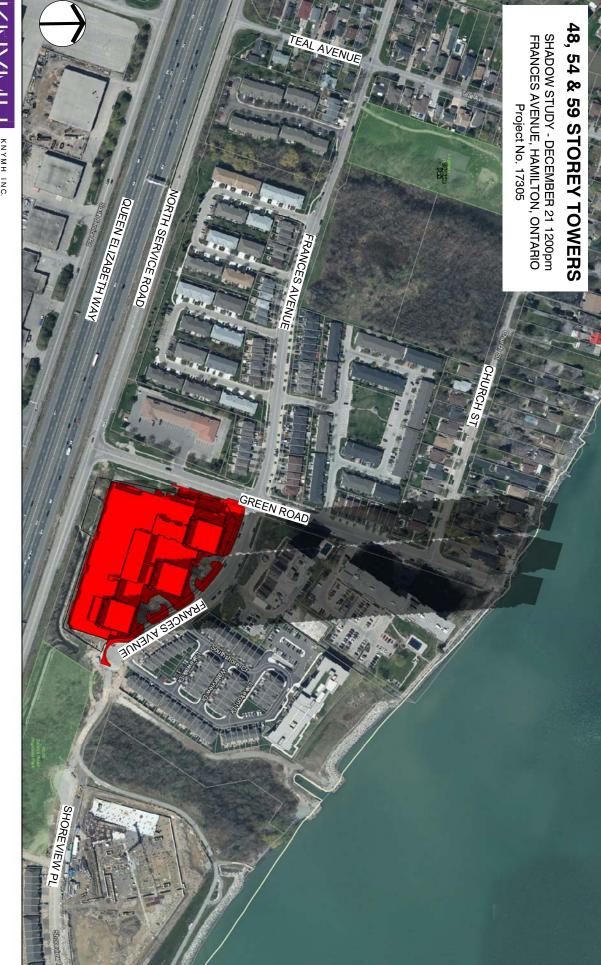
7.12. 21.1000 = 10:00 AM 7.12. 21.1200 = 12:00 P4 7.12. 21.1400 = 2:00 PM 7.12. 21.1600 = 4:00 PM



07.12.21.1000

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07.12.21.1200

Appendix "C" to Report PED19115 Page 250 of 314



07.12.21.1400

Appendix "C" to Report PED19115 Page 251 of 314



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07.12.21.1600

Appendix "C" to Report PED19115 Page 252 of 314



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Appendix "C" to Report PED19115 Page 253 of 314



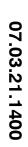


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07.03.21.1200

Appendix "C" to Report PED19115 Page 254 of 314



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Appendix "C" to Report PED19115 Page 255 of 814





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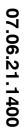
Appendix "C" to Report PED19115 Page 257 of 814



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Appendix "C" to Report PED19115 Page 258 of 314





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Appendix "C" to Report PED19115 Page 259 of 314



48, 54 & 59 STOREY TOWERS

SHADOW STUDY - JUNE 21 400pm FRANCES AVENUE, HAMILTON, ONTARIO Project No. 17305

07.06.21.1600

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December 18th, 2018

Our Project No. 17091

Mr. Monir Moniruzzaman City of Hamilton – Engineering Department 71 Main Street West, Hamilton, Ontario, L8P 4Y5

RE: 310 FRANCES AVENUE, CITY OF HAMILTON (STONEY CREEK) STORM WATER MANAGEMENT (SWM) BRIEF/MEMO

Dear Mr. Monir Moniruzzaman,

Lanhack Consultants Inc. has been retained to review the stormwater impact related to the proposed development located at 310 Frances Avenue in the City of Hamilton (Stoney Creek). The lot is approximately 20,140m² (2.02 ha) in area and is currently vacant except for a temporary sales centre and granular parking lot. It is proposed to construct three (3) condominium towers containing approximately 1,836 residential units and 400m² of commercial space on top of a four(4)-storey parking podium and a two(2)-storey underground parking structure, with a total building footprint of approximately 1.50 ha. See Site Plan by KNYMH Inc. for more detail.

Stormwater Quantity Control

The stormwater from the proposed development will ultimately outlet to Lake Ontario (north of the site) via Watercourse No. #1 (an adjacent storm channel/existing twin 2.71x2.71m concrete box conduit). Therefore, stormwater quantity control will not be required since it is in close proximity of Lake Ontario.

Stormwater Quality Control

The majority of the site consists of clean water; building roof, perimeter sidewalks, and landscaped areas contribute to approximately 96% of the site and is considered to be clean water. The other 4.0% of the site consists of surface parking. Since 96% of the site consists of clean water and does not need to be treated, we recommend that no stormwater quality control measures are to be implemented for this development since there is very minimal treatable surface runoff on site.

Conclusion

In summary, no stormwater quantity control measures are proposed since the stormwater runoff from this development outlets to Lake Ontario. No stormwater quality control measures are proposed since the development is mostly covered by building roof, perimeter sidewalks, and landscaped areas (all surfaces that are considered to be clean stormwater runoff).

Regards,

WATER/WASTEWATER GENERATION REPORT (WWGR)

for

MIXED USE CONDOMINIUM DEVELOPMENT

310 Frances Avenue, Hamilton (Stoney Creek), Ontario

Prepared for:

NHDG (Waterfront) Inc.

Prepared by:

LANHACK CONSULTANTS INC.

1709 Upper James Street Hamilton, ON L9B 1K7

Project No. 17091

December 18th, 2018

Table of Contents

1.0	INTRODUCTION 1				
1.1	Overview1				
1.2	Background Information1				
2.0	Wastewater Assessment2				
2.1	Existing Sanitary Drainage System2				
2.2	Sanitary Demands2				
2.3	Proposed Servicing Plan and Capacity Analysis3				
3.0	Proposed Water Assessment4				
3.1	Existing Water Distribution System4				
4.0	Fire Flow Demand				
5.0	Conclusion (Domestic/Fire and Sanitary)7				
APPE	APPENDIX A: Fire Flow Requirements Calculations8				
APPE	APPENDIX B: Site Plan and Engineering Drawings11				

1.0 INTRODUCTION

1.1 Overview

Lanhack Consultants Inc. has been retained by NHDG (Waterfront) Inc. to prepare a Water/Wastewater Generation Report (WWGR) in support of a proposed mixed use condominium development located at 210 Frances Avenue. The lot is approximately 20,140m² (2.02 ha) in area and is currently vacant except for a temporary sales centre and granular parking lot. It is proposed to construct three (3) condominium towers containing approximately 1,836 residential units and 400m² of commercial space on top of a four(4)-storey parking podium and a two(2)-storey underground parking structure, with a total building footprint of approximately 1.50 ha. See Site Plan in **Appendix B** prepared by KNYMH Inc. for more details.

The site will be serviced by two (2) existing sanitary manholes and a proposed sanitary manhole at the property line along Frances Avenue, six (6) proposed 200mm diameter water services (two for each tower), two (2) proposed storm services on the north property line connecting to the Frances Avenue storm sewer, and two (2) existing storm manholes south of the property outletting into the storm channel. See Servicing Plan in **Appendix B** for more details.

This report will provide the conceptual framework for domestic water distribution, fire flows, and sanitary sewage for the development of this site. This report will also provide design drawings, prepared by Lanhack Consultants Inc., in support of the site plan application.

Please refer to the Lanhack engineering drawings attached in **Appendix B** for additional information.

1.2 Background Information

The following documents were referenced in the preparation of this report:

- Ref. 1: Comprehensive Development Guidelines and Financial Policies Manual (City of Hamilton, 2016)
- Ref 2: Ontario Building Code (OBC 2012)
- *Ref 3: Ministry of the Environment (MOE) Design Guidelines for Drinking Water Systems (2008)*

2.0 Wastewater Assessment

The proposed mixed-use condominium development will consist of three (3) condominium towers containing approximately 1,836 residential units and 400m² of commercial space; 1,227 one-bedroom units and 609 two-bedroom units. Based on the site plan prepared by KNYMH Inc., the design population and equivalent sanitary flow for the development were determined using Part 8 of the Ontario Building Code (OBC, 2012).

2.1 Existing Sanitary Drainage System

The existing sanitary drainage system consists of a 450mmØ concrete sanitary sewer along the north side of the development on Frances Avenue.

2.2 Sanitary Demands

The anticipated sanitary discharge from the proposed development was calculated based on Table 8.2.1.3.A – Residential Occupancies and Table 8.2.1.3.B – Other Occupancies of the OBC (2012). **Table 2.1** summarizes the sanitary sewer discharge rates from the proposed site. Sanitary discharge calculations will be confirmed upon completion of the Wastewater Generation Assessment, which will be prepared as part of the Site Plan Approval process.

Type of Unit	Number of Bedrooms per Unit ⁽¹⁾	Average Daily Flow per Person (L/d) ⁽²⁾	Total Number of Units ⁽³⁾	Design Population (4)	Total Average Flow ⁽⁵⁾ (L/s)
One-Bedroom Unit Two-Bedroom Unit Commercial/Office	1.0 2.0 	275 275 5.0 L/m²/day	1,227 609 	2,454 2,436 	15.59
 (1) Average number of bedrooms based on floor plans and site plan by KNYMH Inc. (2) Average Domestic Sewage Flow Rate from OBC Table 8.2.1.3.A 					
Apartment, Condominiums, Other Multi-family Dwellings = 275 L/person/day (3) Refer to site plan prepared by KNYMH Inc. – Appendix B					
 (4) Residential population based on two (2) persons per bedroom unit. Refer to OBC Section 3.1.17.1(1b) Commercial/Store discharge rate based on 5.0L/m²/day. Refer to OBC Table 8.2.1.3.B. 					
(5) Total Avg. Flow = [(Avg. Daily Flow per Person) x (Total # of Persons)] + [Commercial Discharge Rate] = [(275 L/d/person) x (2,454 persons + 2,436)] + [5.0 L/m²/d x 400m²] /24/60/60 = 15.59 L/s					

Table 2.1: Sanitary Discharge Flow Rate

Therefore, based on the OBC, the estimated average sanitary discharge flow is **15.59 L/s (0.01559 m³/s)**. Applying the City of Hamilton peak factor (based on Babbitt formula = 3.64), the estimated peak sanitary discharge flow would be **56.75 L/s**.

2.3 Proposed Servicing Plan and Capacity Analysis

As calculated in Table 2.1, the total anticipated sanitary sewer discharge (based on OBC calculation) from the proposed development is **15.59 L/s**. The proposed development will be serviced from the existing 450mm diameter concrete sanitary service on Frances Avenue at a final slope of 0.32%. See Servicing Plan in **Appendix B** for more detail. The anticipated peak sanitary discharge of 15.59 L/s will contribute to approximately 9.7% of the total sewer capacity (full capacity approximately 161.3 L/s). It is not expected that the sanitary discharge from the proposed development will negatively impact the receiving system once the local sanitary pump station upgraded.

3.0 Proposed Water Assessment

The proposed mixed-use condominium development will consist of three (3) condominium towers containing approximately 1,836 residential units and 400m² of commercial space; 1,227 one-bedroom units and 609 two-bedroom units. Based on the site plan prepared by KNYMH Inc., the design population and water uses/demand for the development were determined using the "Fixture Unit Method" as per Table 7.6.3.2.A forming part of sentences 7.6.3.1(1) to (3) and 7.6.3.4.(2), (3) and (5) of the Ontario Building Code (OBC, 2012).

3.1 Existing Water Distribution System

The existing municipal water distribution system north of the site consists of a 300mmØ D.I. watermain within the Frances Avenue right-of-way. The development will connect to the existing 300mmØ D.I. watermain. Multiple existing municipal hydrants are located on the north side of Frances Avenue. See Servicing Plan in **Appendix B** for more detail. Available fire flows and heads have been analyzed to determine if the municipal system adjacent to the subject site is adequate to provide the required fire flow, with a minimum pressure of 20 psi.

3.2 Domestic Water Demands

In reference to the OBC, the average water consumption rate can be calculated using the fixture-unit approach as per Tables 7.6.3.2.A and 7.4.10.5 in the OBC as follows:

Component	No. of Fixtures/Unit	Fixture Units/Fixture	No. of Units	Total Fixture Units	
	Residential			•	
Lavatory (8.3L/min or less per head) (Private)	1 2	0.7	1,227 609	858.9 852.6	
Shower Head (9.5L/min or less per head) (Private)	1 2	1.4	1,227 609	1,717.8 1,705.2	
Water Closet (6 LPF or less with flush tank) (Private)	1 2	2.2	1,227 609	2,699.4 2,679.6	
Dishwasher (Domestic)	1	1.4	1,836	2,570.1	
Sink, Kitchen (Domestic, 8.3L/min or less)	1	1.4	1,836	2,570.1	
Clothes Washer (3.5 kg)	1	1.4	1,836	2,570.1	
Commercial					
Lavatory (8.3L/min or less per head) (Public)	-	2.0	24	48.0	
Water Closet (6 LPF or less with flush tank) (Private)	-	2.2	24	52.8	
Total Fixture Units				18,324.6	

Table 3.1: Estimated Domestic Demand via Fixture Units (OBC)

Based on the above table, the total fixture units for the mixed use development is approximately 18,324.6. In reference to Table 7.4.10.5 of the OBC, the approximate maximum probable daily demand is 1,677.6 gal/min (127.1 L/s).

3.3 Proposed Water Servicing Plan and Analysis

Water servicing for the site will include the installation of six (6)-200mmØ fire service lines and six (6)-150mmØ domestic services teed off the existing 300mmØ D.I. watermain on Frances Avenue. Refer to the Servicing Plan in **Appendix B** for more details.

4.0 Fire Flow Demand

The fire flow demand for the development will be governed by the Water Supply for Public Fire Protection (Fire Underwriters Survey, 1999), Ontario Building Code (2012), and various codes and standards published by the National Fire Protection Association (NFPA).

Existing hydrants are located Frances Street and on Green Road. The proposed buildings are within the required 90m separation from at least one of the existing hydrants (as per Sentence 3.2.5.7 of the Ontario Building Code), therefore no additional private fire hydrants are proposed for this development.

It has been determined that the required flow for the proposed development is **183.33 L/s (11,000 L/min).** Refer to **Appendix A** for more detailed calculations and current hydrant flow test data for the development (completed by Jackson Waterworks).

Based on the hydrant flow test data in **Appendix A**, the theoretical maximum available flow rate for the hydrants in close proximity are **292.0 L/s** and **253.0 L/s**, while the maximum required fire flow for the proposed development is **183.33 L/s.** Therefore, the water distribution system has adequate pressure and capacity to service the subject site.

5.0 Conclusion (Domestic/Fire and Sanitary)

Based on the information provided herein, we conclude that the maximum water supply flow and the sanitary discharge at 310 Frances Avenue meet the design requirements of the City of Hamilton (Stoney Creek) and the Ministry of Environment (MOE). The available sanitary flows within the municipal system will be adequate once upgraded and are not expected to be negatively impacted from the proposed development. Water demand and fire flow requirements will be met according to the OBC and FUS requirements. Therefore, it is recommended that:

Sanitary Drainage System

The sanitary discharge for the subject site will drain to the existing 450mmØ concrete sanitary sewer along Frances Avenue. The anticipated average sanitary discharge will be 15.59 L/s, which contributes to 9.7% of the total sewer capacity along Frances Avenue.

Water Supply System

- The water supply for the subject site will be from the existing 300mmØ D.I. watermain along Frances Avenue. The maximum probable daily demand based on the OBC Fixture Unit method is 1,677.6 gal/min (127.1 L/s).
- A minimum fire suppression flow of approximately 11,000 L/min (183.33 L/s) will be required as per the guidelines of the Fire Underwriters Survey (FUS).

We trust the information enclosed herein is satisfactory. Should you have any questions please do not hesitate to contact our office.

Respectfully submitted,

12/18/18

Tu Vu, B.Eng., E.I.T. Lanhack Consultants Inc. Dave Hacking, P.Eng Lanhack Consultants Inc.

APPENDIX A: Fire Flow Requirements Calculations

The following calculations are for the proposed development at 310 Frances Avenue, Hamilton (Stoney Creek), Ontario. The Fire Underwriters Survey (FUS) requires that a minimum water supply source 'F' be provided at a minimum pressure of 140 kPa (20 psi). The minimum flow 'F' can be calculated as:

 $F = 220C\sqrt{A}$

C = coefficient related to construction = **0.6** (fire-resistive construction; protected frames, floors, roof; 1hour rated)

A = total floor area = See below

Determining 'A' – Floor Area for Fire Flow:

As per KNYMH's design, the fire-resistive building is one-hour rated and the vertical openings and exterior vertical communications are properly protected (one hour rating), therefore we will consider only the area of the largest flow plus 25 percent of each of the two immediately adjoining floors. See Site Plan prepared by KNYMH for more detail.

Total floor area required for this analysis will be:

[(15,272.0) + (15,272.0 x 0.25 x 2.0)]:

Determining 'F' including Reduction Factors:

 $F = 220C\sqrt{A}$

$$F = 220 \times 0.6 \times \sqrt{22,908.0}$$

F = 19,978.7 L/min \rightarrow Rounded to the nearest 1,000 L/min = 20,000 L/min

Reduction formula for combustibility:

The mixed use residential condominium is considered to be a low hazard occupancy and limited combustible, so a reduction factor of 15% will be applied:

Reduction formula for sprinkler protection systems:

The building will consist of NFPA 13 approved sprinklers, supplied by the same municipal water system, and will be fully supervised, so a 50% reduction will be applied:

Increase formula for exposure and building separation:

There are existing residential buildings on the west, north, and east side of the proposed building (30.1m to 45m separation), therefore, a 15% charge for the fire flow (F) will be required.

TOTAL F = 17,000 – 8,500 + 2,550 = 11,050 L/min → Rounded to nearest 1,000 L/min = 11,000 L/min

F = 11,000 L/min = 183.33 L/s

Hydrant Flow Data

Table 1 below summarizes the hydrant flow test data completed by Jackson Waterworks and Table 2summarizes the hydrant flow data made available by the City of Hamilton.

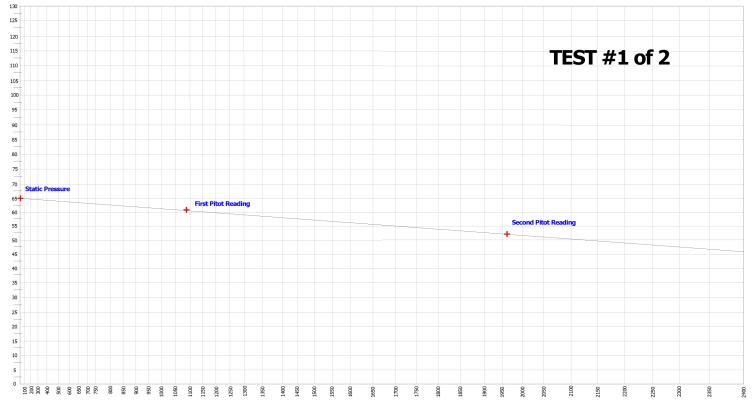
Table 1 - Hydrant Flow Data				
Location	329 Frances Avenue			
Static Pressure	70 psi			
Residual Pressure During Test Flow	66 psi			
Test Flow Rate	1,186 USGPM (74.8 L/s)			
Theoretical Flow @ 20psi	4,641 US GPM (292.8 L/s)			
Location	Green Road			
Static Pressure	65 psi			
Residual Pressure During Test Flow	61 psi			
Test Flow Rate	1,087 USGPM (68.6 L/s)			
Theoretical Flow @ 20 psi	4,018 USGPM (253.5 L/s)			

Table 2 - Hydrant Flow Data			
Hydrant ID	SD01H020		
Location	301 Frances Avenue		
Test Date	24/08/2016 12:58		
Static Pressure	72 psi		
Residual Pressure During Test Flow	68 psi		
Test Flow Rate	1,120 IGPM (84.9 L/s)		
Theoretical Flow @ 20 psi	4,475 IGPM (339.1 L/s)		
Hydrant ID	SD01H021		
Location	311 Frances Avenue 24/08/2016 13:09 74 psi		
Test Date			
Static Pressure			
Residual Pressure During Test Flow	68 psi		
Test Flow Rate	1,010 IGPM (76.5 L/s)		
Theoretical Flow @ 20 psi	3,308 IGPM (250.6 L/s)		
Hydrant ID	SD01H022		
Location	311 Frances Avenue		
Test Date	24/08/2016 12:49		
Static Pressure	72 psi		
Residual Pressure During Test Flow	68 psi		
Test Flow Rate	1,150 IGPM (87.1 L/s)		

Theoretical Flow @ 20 psi	4,475 IGPM (348.1 L/s)	
Hydrant ID	SD01H030	
Location	Green Road	
Test Date	18/07/2016 10:34	
Static Pressure	80 psi	
Residual Pressure During Test Flow	74 psi	
Test Flow Rate	1,050 IGPM (79.6 L/s)	
Theoretical Flow @ 20 psi	3,641 IGPM (275.9 L/s)	
Hydrant ID	SD01H091	
Location	Green Road	
Test Date	18/07/2016 10:33	
Static Pressure	80 psi	
Residual Pressure During Test Flow	74 psi	
Test Flow Rate	1,250 IGPM (94.7 L/s)	
Theoretical Flow @ 20 psi	4,334 IGPM (328.4 L/s)	



FIRE HYDRANT FLOW TEST RESULTS



TEST HYDRANT FLOW (USGPM)

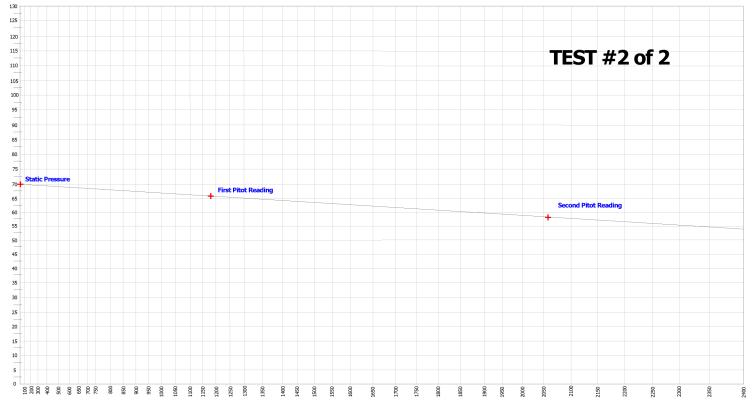
No. of Ports Open	Port Dia. (in)	Pitot Reading (psig)	Pitot Conversion (usgpm) Conversion Factor = 0	Residual Pressure (psig)
1	2.50	42	1087	61
2	2.50	34/34	1956	52
THEORETICAL FLOW @ 20psi			4018	

Test Date	19 September 2017
Test Time	1:15pm
Pipe Diameter (in)	Unknown
Static Pressure (psig)	65

SITE INFORMATION					
Site Name or Developer Name	Not Provided Engineer: S. Llewellyn & Associates				
Site Address/Municipality	Green Road & Frances Averue, Hamilton				
Location of Test Hydrant	Corner of Green Road & North Service Road				
Location of Base Hydrant	Green Road, 1st South of Frances Avenue				
Comments	Testing has been completed in accordance with NFPA-291 guidelines wherever and whenever possible and practical. Conversion factors for plot tube readings have been used depending on hose nozzle internal design and installation profile. Refer to attached cover letter for additional information.				
Verified By	all Mark Schmidt				



FIRE HYDRANT FLOW TEST RESULTS



TEST HYDRANT FLOW (USGPM)

No. of Ports Open	Port Dia. (in)	Pitot Reading (psig)	Pitot Conversion (usgpm) Conversion Factor = 0	Residual Pressure (psig)
1	2.50	50	1186	66
2	2.50	38/38	2068	58
THEORETICAL FLOW @ 20psi			4641	

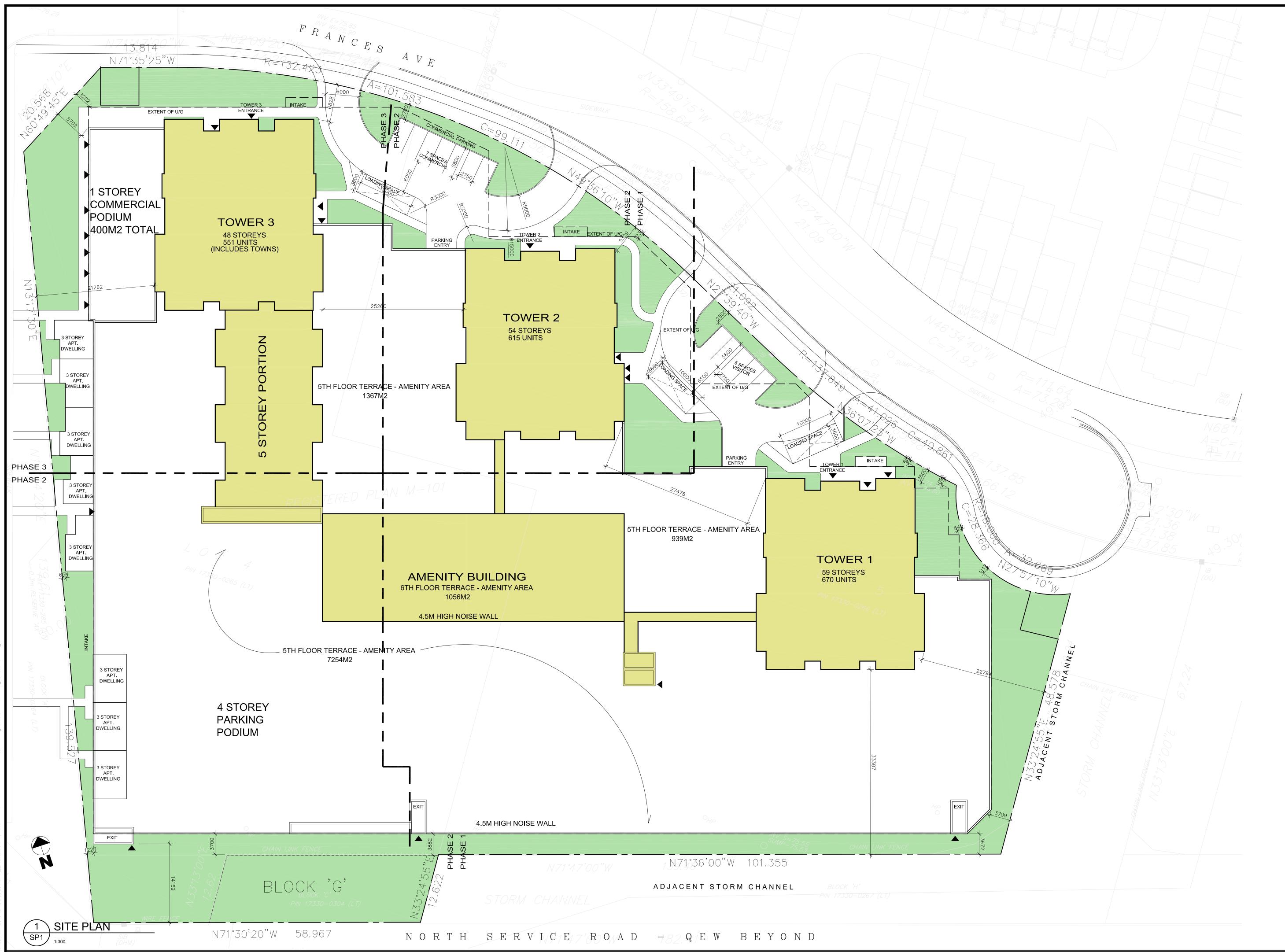
Test Date	19 September 2017
Test Time	1:45pm
Pipe Diameter (in)	Unknown
Static Pressure (psig)	70

SITE INFORMATION					
Site Name or Developer Name	Not Provided Engineer: S. Liewellyn & Associates				
Site Address/Municipality	Green Road & Frances Averue, Hamilton				
Location of Test Hydrant	In Front of 329 Frances Avenue				
Location of Base Hydrant	Frances Avenue, 1st East of Green Road				
Comments	Testing has been completed in accordance with NFPA-291 guidelines wherever and whenever possible and practical. Conversion factors for plot tube readings have been used depending on hose nozzle internal design and installation profile. Refer to attached cover letter for additional information.				
Verified By	all Mark Schmidt				

221 Sherman Avenue North, Hamilton, Ontario L8L 6N2

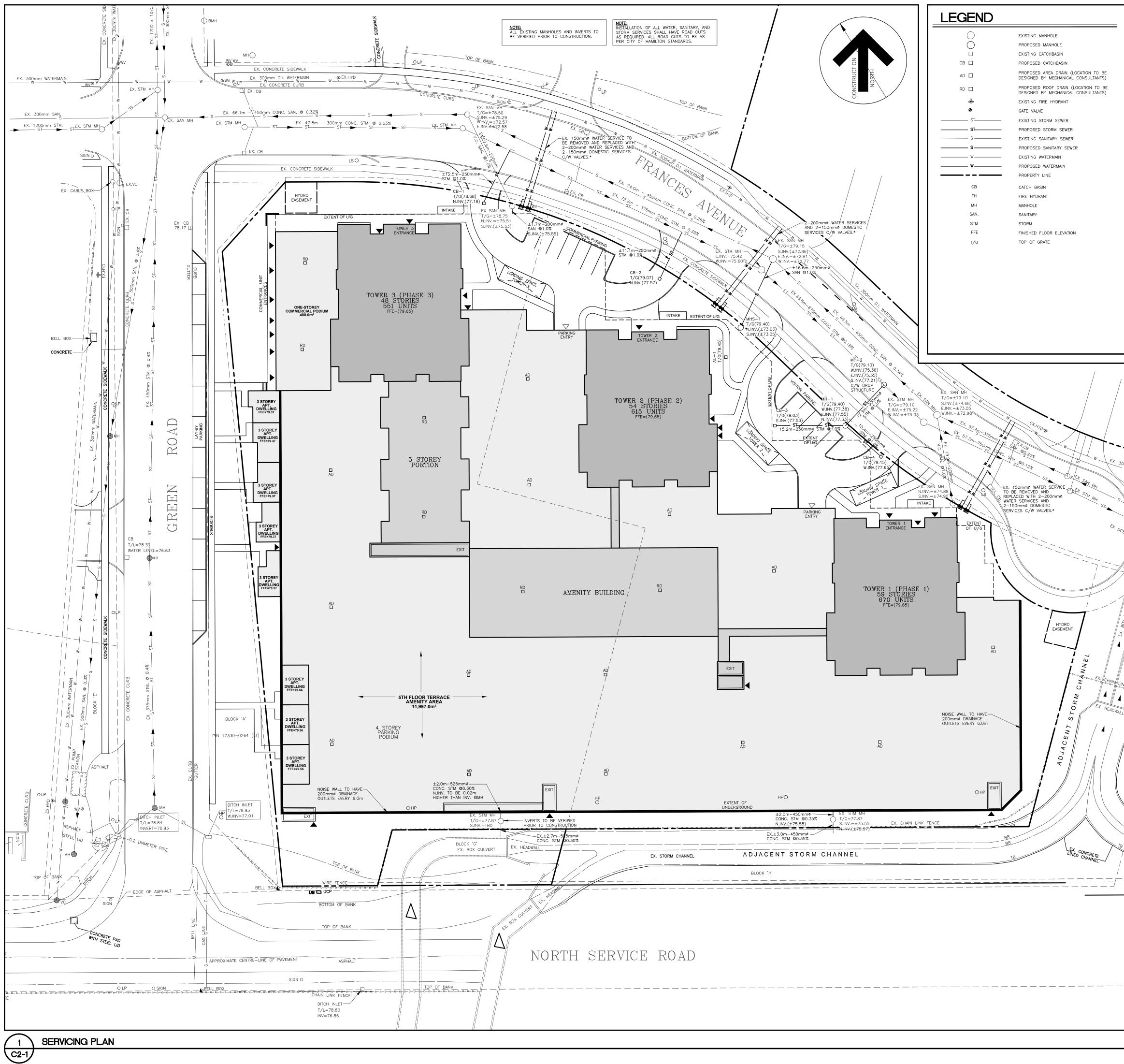
APPENDIX B: Site Plan and Engineering Drawings

- Site Plan prepared by KNYMH Inc.
- Servicing Plan prepared by Lanhack Consultants Inc.





CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND JOB CONDITIONS BEFORE PROCEEDING WITH WORK ALL DRAWINGS MAY BE SUBJECT TO CHANGE DUE TO COMMENTS FROM MUNICIPAL DEPARTMENTS AND OTHER AGENCIES WITH AUTHORITY ALL DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF THE ARCHITECTS AND MUST BE RETURNED AT THE COMPLETION OF THE WORK THE CONTRACTOR WORKING FROM DRAWINGS NOT SPECIFICALLY MARKED 'FOR CONSTRUCTION'' MUST ASSUME FULL RESPONSIBILITY AND BEAR COSTS					
FOR ANY CORRECTIONS OR DAMAGES F	FOR ANY CORRECTIONS OR DAMAGES RESULTING FROM HIS OR HER WORK				
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ARCHITECTURE • SOLUTIONS KNYMH INC. 1006 SKYVIEW DRIVE • SUITE 101 BURLINGTON, ONTARIO • L7P 0V1 T 905.639.6595 F 905.639.0394					
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GENERAL SERVICING NOTES:			URCH ST.	
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2. MINIMUM HORIZONTAL SEPARATION BETWEEN WATER SERVICES AND SEWERS SHALL BE 2.5m THE CLOSEST PIPE EDGE TO CLOSEST PIPE EDGE. VERTICAL SEPARATION BETWEEN WATERM WHICH CROSS MUST BE 0.5m BETWEEN THE OUTSIDE OF THE WATERMAIN AND THE OUTSID WITH THE LENGTH OF THE WATER PIPE BEING CENTRED AT THE POINT OF CROSSING SUCH THE WATERMAIN WILL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER, CROSS	IAINS AND SEWERS DE OF THE SEWER, I THAT JOINTS IN	\bigcup		
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5. APPROVAL OF THIS DRAWING IS FOR MATERIAL ACCEPTABILITY AND COMPLIANCE WITH MUNIN PROVINCIAL SPECIFICATIONS AND STANDARDS ONLY. APPROVAL AND INSPECTION BY THE C DOES NOT CERTIFY THE LINE AND GRADE OF THE WORKS AND IT IS THE OWNER'S RESPON THEIR ENGINEER CERTIFY THIS ACCORDINGLY.	ITY OF THE WORKS	GREEN	KEY PLAN	RD.
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		with a	nents and is to be read II other Contract Docume PYRIGHT – LANHACK Cons	ents.
		All rig	hts reserved.	
		INFORMA	BOUNDARY SURVEY AND TOPOGRA TION OBTAINED FROM A.T. MCLAREI 0. 32505, DATED MAY 31, 2011.	N LTD., PLAN
BEFORE STARTING WORK		THE PO	SITION OF THE POLE LINES, CONDI	JITS, WATERMAINS,
 THE CONTRACTOR SHALL NOTIFY THE CITY OF HAMILTON AND LANHACK CONSULTANTS INC. HOURS PRIOR TO COMMENCING CONSTRUCTION. THE POSITION OF THE POLE LINES, CONDUITS, WATERMAINS, SEWERS, AND OTHER UTILITIES ARE NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCONTRACT DRAWINGS, AND DRAWINGS, AND	S AND STRUCTURES	WHERE	, AND OTHER UTILITIES AND STRUC ARILY SHOWN ON THE CONTRACT E SHOWN, THE ACCURACY OF THE P & AND STRUCTURES IS NOT GUARA	OSITION OF SUCH
POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. 3. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, ALL BENCHMARKS, ELEVATIONS, DIMENS MUST BE CHECKED BY THE CONTRACTOR AND ANY DISCREPANCIES REPORTED TO THE ENG	IONS, AND GRADES INEER.	Rev	ision Record	Date
4. ALL EXISTING UNDERGROUND UTILITIES SHALL BE LOCATED, MARKED AND PROTECTED. AT DAMAGED OR DISTURBED DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED TO TH OF THE ENGINEER, AT THE CONTRACTOR'S EXPENSE.	IY UTILITIES IE SATISFACTION	No.	Description	(m/d/y)
5. AT LEAST TWO DIFFERENT BENCHMARKS MUST BE REFERRED TO AT ALL TIMES.				
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Appendix "C" to Report PED19115 Page 278 of 314

ENVIRONMENTAL NOISE IMPACT STUDY

"WATERFRONT TRAILS PH 3" 310 FRANCES AVENUE CITY OF STONEY CREEK NOW THE CITY OF HAMILTON

Prepared for:

New Horizon Development Group 69 John Street South Suite 400 Hamilton, ON L8N 2B9

Prepared By:

Melissa MacLean Vice President

Our File No: 2018-1073 November 2018

dBA Acoustical Consultants Inc. P.O Box 32059 1447 Upper Ottawa Hamilton, ON L8W 3K0

TABLE OF CONTENTS

1.0 INTROI	DUCTION	Page 3
2.0 SITE DI	ESCRIPTION	Page 3
3.0 NOISE 3.1 3.2	IMPACT ASSESSMENT Noise Criteria Road Noise	Page 3 Page 3 Page 4
4.0 RECOM 4.1 4.2	IMENDATIONS Outdoor Living Areas Indoor Noise levels	Page 5 Page 5 Page 5
5.0 VENTII	LATION/WARNING CLAUSES	Page 6
6.0 SUMM	ARY OF CONCLUSIONS	Page 6
7.0 CONCL	USIONS	Page 6
Figure 2 –	SITE PLAN SITE LOCATION RECEPTOR LOCATIONS NOISE BARRIER LOCATION	
	T"A" Traffic Data North Service Road Traffic Data QEW	

Stamson Traffic Data Calculations

1.0 INTRODUCTION

dBA Acoustical Consulting Inc. has been retained to provide a noise impact study on behalf of New Horizon Development Group for the proposed mixed use "Waterfront Trails PH 3" also known as 310 Francis Avenue, located at the corners of Green Road, North Service Road and Frances Avenue, Stoney Creek, ON. The purpose of the study is to determine the noise impact from the QEW and North Service Road vehicular traffic that may impact the proposed residential buildings as required for site plan approval for the City of Hamilton.

Proposed for the development are three separate towers totaling 1836 residential units with a 1-storey commercial podium. Tower 1- a 59 storey building consisting of 670 units. Tower 2- a 54 storey building consisting of 615 units and Tower 3- a 48 storey building consisting of 551 units. These towers will sit within a 5-storey parking structure with a 5th-storey rooftop terrace. This study will detail the noise impact relative to the site plan and recommend noise control measures necessary (if applicable) to meet MOE Publication NPC-300 entitled "Stationary & Transportation Sources-Approval & Planning guidelines while satisfying the planning requirements of the City of Hamilton.

Vibration is not considered as there are no heavy industry or railway lines within the required setback distances of 300m. CN/CP Rail is located 585m outside the setback requirements for rail therefore is not a concern with noise. Aircraft is not a concern as the development is located outside the NEF 25 contour of the any area Airports.

2.0 SITE DESCRIPTION

The proposed three tower residential development property is located on the north corner of North Service Road, east of Green Road, and south of Frances Ave, Stoney Creek, ON.

The North Service Rd is a 2-lane roadway running east and west with a posted speed of 80 km/hr and is a heavy truck route located approximately 45m south of the proposed development.

The QEW is a 6-lane is the major traffic noise source, running east-west, located approximately 140m south of the proposed development with a posted speed limit of 100 km/hr. To the west of the proposed development, along the QEW and the North Service Rd. are 5.5m noise barriers, that shield a portion of the QEW and North Service Rd traffic noise at the proposed development. To the west of the proposed site is a small 2 storey commercial building on Green Road and 2.5 storey residential townhouses and a 5.5m noise barrier at the rear yard amenity spaces abutting the North Service Rd as [previously stated. To the north is Lake Ontario, a large 18 storey apartment condo building and 2.5 storey townhouses. To the east are 2.5 storey townhouses with a 4.5m rear yard noise barrier abutting the North Service Road. Further east is Millen Road with an overpass on the QEW. Site Location is attached as Figure 1.

3.0 NOISE IMPACT ASSESSMENT 3.1 NOISE CRITERIA

The Ministry of Environment (MOE) specifies limits for road noise relative to new residential developments. The MOE Publication NPC-300 entitled "Stationary & Transportation Sources-Approval & Planning, specifies the criteria, summarized as follows:

TABLE1- Road Traffic Sound Levels Limits		
Time Period	Leq (dBA)	
07:00 – 23:00 (16 hr.)	55 Outdoor Living area	
07:00 – 23:00 (16 hr.)	55 Plane of Window	
23:00 – 07:00 (8 hr.)	50 Plane of Bedroom window	

Where noise levels estimated at the Plane of the Window (POW) are equal to or less than the values listed in Table 1, no noise control measures are required. Where noise levels exceed Table 1 values, the following action is required:

TABLE 2 – Noise Control Requirements		
Time Period	Noise Level Leq (dBA)	Action Required
07:00 - 23:00 Daytime (OLA)	56 to 60	Warning Clause Type "A"
	> 60	Barrier & Warning Clause Type "B"
	>55	Provision for A/C, Warning Clause "C"
07:00 – 23:00 Daytime (POW)	>65	Central A/C, Warning Clause "D"
	>65	Building Component Specification
	> 50	Provision for A/C and Warning Clause Type "C"
23:00 to 07:00 Nighttime (POW)	> 60	Building Component Specification
	> 60	Central Air and Warning Clause Type "D"

Where nighttime noise levels exceed 60 dBA, building components must be designed to meet Table 3 indoor sound level limits.

TABLE 3 - Indoor Road Sound Levels Limits		
	Leq (dBA)	
Indoor Location	Road	
Living/Dining 7:00 – 23:00	45	
Bedroom 23:00 - 07:00	40	

3.2 ROAD NOISE

Predicted road traffic noise levels were calculated for QEW and North Service Road, the main road noise sources in the proposed site area. The 2016 AADT road traffic volumes for the QEW was sourced from the Ministry of Transportation Traffic Volumes on Demand website. The 2016 AADT road traffic volumes for North Service Road was sourced from the City of Hamilton AADT Transportation Data Management System Online Map. See Appendix "A".

The MOE computer program STAMSON version 5.04 was used to carry out prediction calculations (See Appendix "A"). Traffic data is summarized in Table 4. The daytime/nighttime volume ratios relative to the QEW is calculated using a 24 hr assessment as required by the MOE and City of Hamilton and the North Service Road is calculated using a 90/10 split and a 16/8 hr assessment required by the MOE.

The percentage of annual growth for the QEW was figured at 2.0% over 12 years. The AADT (Annual Average Daily Traffic) volumes used are reflective of the worst-case scenario. Truck volumes were factored at 6.0% medium and 14.0% heavy of the total vehicle volumes for each roadway segment. Calculated noise levels were modeled at 18 receptor locations representative of the Plain of the Window (POW) of the building facade of the three towers at specific storeys. (See Figure 3 Receptor Locations).

The percentage of annual growth for the North Service Road was figured at 2.0% over 12 years. The AADT (Annual Average Daily Traffic) volumes used are reflective of the worst-case scenario. Truck volumes were factored at 2.0% medium and 2.0% heavy of the total vehicle volumes for the roadway segment. Calculated noise levels were modeled at 3 receptor locations representative of the Plain of the Window (POW) of the building facade of Tower 1 at specific locations. The North Service Road, as confirmed by the attached Stamson calculation sheets, will not have a significant acoustical impact on the proposed development as the levels are 10 dBA lower than traffic noise levels from the QEW. Area roadways have no acoustical impact on the proposed site due to lower speed and traffic volumes. (See Figure 3 Receptor

	TABLE 4 – Future Road Traffic Volumes		
QEW	AADT 150921 Vehicles		
	Cars Medium Trucks Heavy Trucks		
24 Hour	117718	12074	21129
North Service Road	AADT 8997 Vehicles		
	Cars	Medium Trucks	Heavy Trucks
Day	7775	162	162
Night	862	18	18

Locations).

The following Table 5 represents the free field noise levels of future road traffic from the QEW at 18 receptor locations.

TABLE 5 – Predicted Future Traffic Noise for the QEW (dBA)		
Location	24 HOURS	
R1- Tower 1 – South Façade First Floor	76.0 dba (20.0m)	
R2- Tower 1 – South Façade 19 Floor	77.0 dba (58.0m)	
R3- Tower 1 – South Façade Top Floor	77.0 dba (117.0m)	
R4- Tower 1 – East/West Façade First Floor	73 .0 dba (20.0m)	
R5- Tower 1 – East/West Façade 19 Floor	74.0 dba (58.0m)	
R6- Tower 1 – East/West Façade Top Floor	74.0 dba (117.0m)	
R7- Tower 2 – South Façade First Floor	73.0 dba (20.0m)	
R8- Tower 2 – South Façade 19 Floor	74.0 dba (58.0m)	
R9- Tower 2 – South Façade Top Floor	74.0 dba (132.0m)	
R10- Tower 2 – East/West Façade First Floor	70.0 dba (20.0m)	
R11- Tower 2 – East/West Façade 22 Floor	71.0 dba (66.0m)	
R12- Tower 2 – East/West Façade Top Floor	71.0 dba (132.0m)	
R13- Tower 3 – South Façade First Floor	72.0 dba (20.0m)	
R14- Tower 3 – South Façade 22 Floor	74.0 dba (66.0m)	
R15- Tower 3 – South Façade Top Floor	74.0 dba (132.0m)	
R16- Tower 3 – East/West Façade First Floor	69.0 dba (20.0m)	
R17- Tower 3 – East/West Façade 19 Floor	70.0 dba (57.0m)	
R18- Tower 3 – East/West Façade Top Floor	71.0 dba (132.0m)	

The following Table 5A represents the free field noise levels of future road traffic from the North Service Road at specific receptor locations to confirm that the North Service Road will have no significant acoustical impact on the proposed development.

TABLE 5A – Predicted Future Traffic Noise for the North Service Road (dBA)			
Location 07:00 - 23:00 23:00 - 07:00			
R1- Tower 1 – South Façade First Floor	61.0 dba (20.0m)	54.0 dba (20.0m)	
R2- Tower 1 – South Façade 19 Floor	62.0 dba (58.0m)	55.0 dba (58.0m)	
R3- Tower 1 – South Façade Top Floor	62.0 dba (177.0m)	55.0 dba (117.0m)	

The following Table 5B represents the mitigated noise levels for the 5th Floor Rooftop OLA with a 3.0m concrete noise barrier.

TABLE 5B – Mitigated Noise Levels 5 th Floor Rooftop OLA 4.5m Concrete Noise Barrier (dBA)		
Location 07:00 – 23:00		
5 th Floor Rooftop OLA 4.5m Noise Barrier 56.0 (15.0m)		

4.0 RECOMMENDATIONS - NOISE CONTROL

4.1 OUTDOOR LIVING AREAS

Calculated road noise levels for the proposed development exceed the 55 dBA daytime criteria outlined in Table 1. The proposed tower designs included standard balconies for all units for the front and back facades. All balconies less than 4m in depth and are not considered OLA's (Outdoor Living Areas) and as such, no mitigation will be required.

A fifth-floor outdoor amenity terrace space (OLA) is proposed for this development. Mitigation measures are required to mitigate the noise levels to achieve Table 1 daytime noise criteria. Road noise levels for the proposed fifth floor terrace and amenity space exceed the 55 dBA daytime criteria and as such a Warning Clause Type "A" is required to be inserted into all Offers of Purchase of Lease for all units. A 4.5m concrete wall extending from the south parapet will suffice with 3.0m return ends. Material specification of a continuous concrete noise wall exceeds a minimum surface density be 20kg/m² and free of gaps and cracks within or at the return ends. See Figure 4 Noise Barrier Locations.

4.2 INDOOR NOISE LEVELS

Calculated nighttime road noise levels at the Plane of Window (POW) exceed the 50 dBA criteria outlined in Table 1 for indoor space for residential units exposed to the QEW. Specific building components (walls, windows, doors etc.) are required and confirmed using the STC (Sound Transmission Class) method. Building design specifications were not made available and STC value calculations (Sound Transmission Class) method are summarized in Table 6 following.

TABLE 6 – Recommended Door and Window Construction		
LOCATION	STC	Wall
	To Be Used	STC
All South & East & West Facing Units		
Bedroom	36	EW4
Living room	36	EW4
All Other Units		
Bedroom	26	OBC
Living room	26	OBC

5.0 VENTILATION / WARNING CLAUSES

TABLE 7 - Ventilation and Warning Clause Requirements All Buildings			
LOCATION VENTILATION WARNING CLAUSE			
South & East & West Facing Units	A/C,	Warning Clause "D"	
5 Th Floor OLA – All Units	NA	Warning Clause "A"	

Ventilation and warning clause requirements are required for this project as noted in Table 7 following.

TYPE A: All Buildings

"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the Municipality's and the Ministry of the Environment's noise criteria."

TYPE D: All Buildings

"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the Municipality's and the Ministry of the Environment's noise criteria."

6.0 SUMMARY OF RECOMMENDATIONS

The following noise control measures are required to satisfy the indoor and outdoor noise level criterion:

- Central Air Conditioning as recommended in Table 7 for all Buildings all units.
- Specific Window, Door, and Wall construction as recommended in Table 6.
- Registered Warning Clause Type "D" on title for specific residential units in Table 7.
- EW4 for all south, east, and west facing residential units as recommended in Table 6.
- Registered Warning Clause Type "A" for the OLA for all residential units in Table 7.
- It is recommended that a qualified acoustical consultant certify that the required noise control measures have been incorporated into the builder's plans prior to issuance of a building permit.
- It is recommended that a qualified acoustical consultant certify that the required control measures have been properly installed prior to an occupancy permit.

7.0 CONCLUSIONS

dBA Acoustical Consulting Inc. has provided a noise impact study on behalf of New Horizon Development Group for the proposed "Waterfront Trails PH 3" also known as 310 Francis Avenue, located at the corners of Green Road, North Service Road and Frances Avenue, Stoney Creek, ON.

This noise study determined the noise impact from the QEW and North Service Road vehicular traffic that impacts the proposed residential buildings and recommend noise control measures necessary to meet MOE Publication NPC-300 entitled "Stationary & Transportation Sources-Approval & Planning guidelines while satisfying the planning requirements of the City of Hamilton. Noise mitigation measures are required.

Appendix "C" to Report PED19115 Page 286 of 314

FIGURE 1 SITE PLAN



FIGURE 2 SITE PLAN

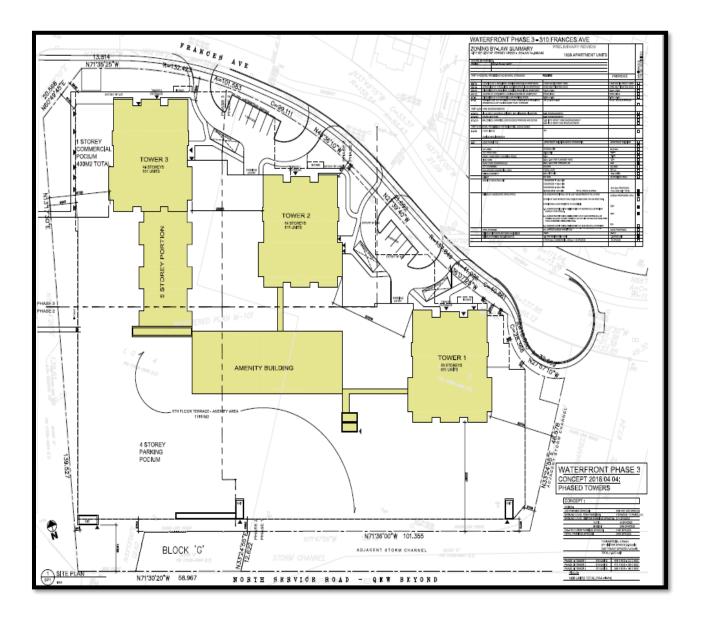


FIGURE 3 RECEPTOR LOCATIONS

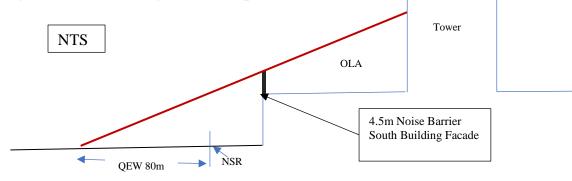


Appendix "C" to Report PED19115 Page 289 of 314

FIGURE 4 NOISE BARRIER LOCATIONS



Note: Red line represents the 4.5m height noise barrier that will be constructed of concrete extending from the parapet walls to the south, east, and west. The east and west wing walls will be staged to a minimum 3.0m height wall and confirmed length once final designs are completed.



Appendix "C" to Report PED19115 Page 290 of 314

APPENDIX "A"

2016 City of Hamilton Traffic Data



2016 Ministry of Transportation QEW Traffic Data

			Dist.	
Highway	Location Description From	Location Description To	(KM)	2016 AADT
QEW	FORT ERIE-GODERICH ST-PEACE BRIDGE PLAZA	CENTRAL AV IC	0.2	14,600
QEW	CENTRAL AV IC	CONCESSION RD IC-1	0.9	18,700
QEW	CONCESSION RD IC-1	THOMPSON RD IC-2	1.0	15,500
QEW	THOMPSON RD IC-2	GILMORE RD IC-5	2.4	17,700
QEW	GILMORE RD IC-5	BOWEN RD IC-7	2.0	24,200
QEW	BOWEN RD IC-7	NETHERBY RD IC-12 NIAGARA FALLS LTS	5.5	25,700
QEW	NETHERBY RD IC-12 NIAGARA FALLS LTS	SODOM RD IC-16	3.2	22,000
QEW	SODOM RD IC-16	LYONS CREEK RD IC-21	6.6	29,000
QEW	LYONS CREEK RD IC-21	MCLEOD RD IC-27	4.4	36,700
QEW	MCLEOD RD IC-27	HWY 420 IC-30	2.9	45,100
QEW	HWY 420 IC-30	THOROLD STONE RD IC-32	2.0	70,400
QEW	THOROLD STONE RD IC-32	MOUNTAIN RD IC-34	2.5	67,400
QEW	MOUNTAIN RD IC-34	HWY 405(WBL)IC-37	2.4	71,000
QEW	HWY 405(WBL)IC-37	GLENDALE AV IC-38	1.3	88,100
QEW	GLENDALE AV IC-38	NIAGARA ST SERVICE RDS	4.8	90,500
QEW	NIAGARA ST SERVICE RDS	NIAGARA ST IC-44	1.2	78,600
QEW	NIAGARA ST IC-44	LAKE ST IC-46	1.6	81,900
QEW	LAKE ST IC-46	ONTARIO ST IC-47	1.3	117,000
QEW	ONTARIO ST IC-47	MARTINDALE RD IC-48	0.7	97,400
QEW	MARTINDALE RD IC-48	HWY 406 IC-49	0.7	74,400
QEW	HWY 406 IC-49	SEVENTH ST IC-51	1.9	97,100
QEW	SEVENTH ST IC-51	JORDAN RD IC-55	4.3	98,100
QEW	JORDAN RD IC-55	VICTORIA AV IC-57	2.8	104,300
QEW	VICTORIA AV IC-57	ONTARIO ST IC-64	6.7	105,100
QEW	ONTARIO ST IC-64	BARTLETT AV IC-68	3.8	99,800
QEW	BARTLETT AV IC-68	MAPLE AV IC-71	2.5	99,300
QEW	MAPLE AV IC-71	CASABLANCA BV IC-74	3.6	107,100
QEW	CASABLANCA BV IC-74	FIFTY RD IC-78	3.5	112,300
QEW	FIFTY RD IC-78	FRUITLAND RD IC-83	5.1	120,300
QEW	FRUITLAND RD IC-83	HAMILTON 20 IC 88-CENTENNIAL PKWY	5.2	119,000
QEW	HAMILTON 20 IC 88-CENTENNIAL PKWY	BURLINGTON ST IC-89	1.6	130,000
QEW	BURLINGTON ST IC-89	EASTPORT RD IC-93 (7189)	4.0	135,000
QEW	EASTPORT RD IC-93 (7189)	HAMILTON HARBOUR ENTRANCE	0.9	149,400
QEW	HAMILTON HARBOUR ENTRANCE	NORTH SHORE BLVD IC 97	2.3	271,300
QEW	NORTH SHORE BLVD IC 97	FAIRVIEW ST IC-99	2.3	161,300
QEW	FAIRVIEW ST IC-99	HWY 403/407 IC-100	1.0	172,900
QEW	HWY 403/407 IC-100	BRANT ST IC 101	0.8	164,300
QEW	BRANT ST IC 101	GUELPH LINE IC-102	1.8	162,100
QEW	GUELPH LINE IC-102	WALKERS LINE IC-105	2.0	195,000
QEW	WALKERS LINE IC-105	APPLEBY LINE IC-107	2.0	190,000

Appendix "C" to Report PED19115 Page 292 of 314

STAMSON CALCULATIONS

STAMSON 5.04 SUMMARY REPORT Date: 14-11-2018 11:08:50 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Time Period: Day/Night 16/8 hours Filename: r1nserv.te Description: R1-First Floor Residential Free Field TOTAL Leq FROM ALL SOURCES (DAY): 60.55 (NIGHT): 54.02 Road data, segment # 1: North Serv (day/night) _____ Car traffic volume : 7755/862 veh/TimePeriod * Medium truck volume : 162/18 veh/TimePeriod * Heavy truck volume : 162/18 veh/TimePeriod * Posted speed limit : 80 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) * Refers to calculated road volumes based on the following input: 24 hr Traffic Volume (AADT or SADT): 7077 Percentage of Annual Growth : 2.00 Number of Years of Growth: 12.00Medium Truck % of Total Volume: 2.00Heavy Truck % of Total Volume: 2.00Day (16 hrs) % of Total Volume: 90.00 Data for Segment # 1: North Serv (day/night) _____ Angle1Angle2: -90.00 deg90.00 degWood depth:0(No woods.)No of house rows:0 / 0Surface:1(Absorptive ground surface)Receiver source distance:60.00 / 60.00 m Receiver height:20.00 / 20.00 mTopography:1Reference angle:0.00 Result summary (day) _____ ! source ! Road ! Total ! height ! Leq ! Leq ! (m) ! (dBA) ! (dBA) 1.North Serv ! 1.19 ! 60.55 ! 60.55 _____ Total 60.55 dBA Result summary (night) _____ ! source ! Road ! Total ! height ! Leq ! Leq ! (m) ! (dBA) ! (dBA) 1.North Serv ! 1.19 ! 54.02 ! 54.02 Total 54.02 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 13:16:16 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Time Period: 24 hours Filename: R1Water.te Description: R1 Tower 1 1st Floor Residential South Facade QEW TOTAL Leq FROM ALL SOURCES: 75.95 Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -90.00 deg90.00 degWood depth: 0(No woods Wood deptn No of house rows (No woods.) 0 : 1 (Absorptive ground surface) : Receiver source distance : 109.00 m Receiver height : 20.00 m : 1 (Flat/gentle slope; no barrier) Topography : 0.00 Reference angle Results segment # 1: QEW Source height = 1.93 mROAD (0.00 + 75.95 + 0.00) = 75.95 dBA Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -90 90 0.09 85.62 0.00 -9.41 -0.26 0.00 0.00 0.00 75.95 _____ Segment Leq : 75.95 dBA

Total Leq All Segments: 75.95 dBA

STAMSON 5.04 SUMMARY REPORT Date: 14-11-2018 11:11:50 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: r2nserv.te Time Period: Day/Night 16/8 hours Description: R2- 19th Floor Residential Free Field TOTAL Leq FROM ALL SOURCES (DAY): 61.56 (NIGHT): 55.03 Road data, segment # 1: North Serv (day/night) _____ Car traffic volume : 7755/862 veh/TimePeriod * Medium truck volume : 162/18 veh/TimePeriod * Heavy truck volume : 162/18 veh/TimePeriod * Posted speed limit : 80 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) * Refers to calculated road volumes based on the following input: 24 hr Traffic Volume (AADT or SADT): 7077 Percentage of Annual Growth : 2.00 Number of Years of Growth: 12.00Medium Truck % of Total Volume: 2.00Heavy Truck % of Total Volume: 2.00Day (16 hrs) % of Total Volume: 90.00 Data for Segment # 1: North Serv (day/night) _____ Angle1Angle2: -90.00 deg90.00 degWood depth:0(No woods.)No of house rows:0 / 0Surface:1(Absorptive ground surface)Receiver source distance:60.00 / 60.00 m Receiver height:57.00 / 57.00 mTopography:1Reference angle:0.00 Result summary (day) _____ ! source ! Road ! Total ! height ! Leq ! Leq ! (m) ! (dBA) ! (dBA) 1.North Serv ! 1.19 ! 61.56 ! 61.56 _____ Total 61.56 dBA Result summary (night) _____ ! source ! Road ! Total ! height ! Leq ! Leq ! (m) ! (dBA) ! (dBA) 1.North Serv ! 1.19 ! 55.03 ! 55.03 Total 55.03 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 13:18:36 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: R2Water.te Time Period: 24 hours Description: R2 Tower 1 South 19 floor Facade QEW Total Leq All Segments: 77.00 dBA Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -90.00 deg90.00 degWood depth:0(No woods)No of house rows:0Surface:1(Absorptive) (No woods.) : Surface 1 (Absorptive ground surface) Receiver source distance : 109.00 m Receiver height: 58.00 mTopography: 1Reference angle: 0.00 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 77.00 + 0.00) = 77.00 dBAAngle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -90 90 0.00 85.62 0.00 -8.61 0.00 0.00 0.00 0.00 77.00 _____

Segment Leq : 77.00 dBA

Appendix "C" to Report PED19115 Page 297 of 314

STAMSON 5.04 SUMMARY REPORT Date: 14-11-2018 11:13:16 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: r3nserv.te Time Period: Day/Night 16/8 hours Description: R3- Top Floor Residential Free Field TOTAL Leg FROM ALL SOURCES (DAY): 61.56 (NIGHT): 55.03 Road data, segment # 1: North Serv (day/night) _____ Car traffic volume : 7755/862 veh/TimePeriod * Medium truck volume : 162/18 veh/TimePeriod * Heavy truck volume : 162/18 veh/TimePeriod * Posted speed limit : 80 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) * Refers to calculated road volumes based on the following input: 24 hr Traffic Volume (AADT or SADT): 7077 Percentage of Annual Growth : 2.00 Number of Years of Growth: 12.00Medium Truck % of Total Volume: 2.00Heavy Truck % of Total Volume: 2.00Day (16 hrs) % of Total Volume: 90.00 Data for Segment # 1: North Serv (day/night) _____ Angle1Angle2: -90.00 deg90.00 degWood depth:0(No woods.)No of house rows:0 / 0Surface:1(Absorptive ground surface)Receiver source distance:60.00 / 60.00 m Receiver height : 117.00 / 117.00 m Topography : 1 (Flat/gentle slope; no barrier) Reference angle : 0.00 Result summary (day) _____ ! source ! Road ! Total ! height ! Leg ! Leg ! (m) ! (dBA) ! (dBA) 1.North Serv ! 1.19 ! 61.56 ! 61.56 61.56 dBA Total Result summary (night) _____ ! source ! Road ! Total ! height ! Leq ! Leq ! (m) ! (dBA) ! (dBA) 1.North Serv ! 1.19 ! 55.03 ! 55.03

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 13:23:50 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Time Period: 24 hours Filename: R3Water.te Description: R3 Tower 1 South Facade Top Floor QEW TOTAL Leq FROM ALL SOURCES: 77.00 dBA Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -90.00 deg90.00 degWood depth: 0(No woods.)No of house rows: 0Surface: 1(Absorptive) (Absorptive ground surface) Receiver source distance : 109.00 m Receiver height : 117.00 m Topography : 1 Reference angle : 0.00 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 77.00 + 0.00) = 77.00 dBAAngle1 Angle2 Alpha RefLeg P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -90 90 0.00 85.62 0.00 -8.61 0.00 0.00 0.00 0.00 77.00 _____

Segment Leq : 77.00 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 13:26:52 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: R4Water.te Time Period: 24 hours Description: R4 Tower 1 East/West Facade First Floor QEW TOTAL Leq FROM ALL SOURCES: 72.69 dBA Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -0.00 deg90.00 degWood depth: 0(No woods.)No of house rows: 0Surface: 1(Absorptive) (Absorptive ground surface) Receiver source distance : 115.00 m Receiver height : 20.00 m Topography : 1 Reference angle : 0.00 1 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 72.69 + 0.00) = 72.69 dBAAngle1 Angle2 Alpha RefLeg P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -0 90 0.09 85.62 0.00 -9.66 -3.27 0.00 0.00 0.00 72.69 _____

Segment Leq : 72.69 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 13:30:06 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: r5water.te Time Period: 24 hours Description: R5 Tower 1 East/West Facade 19 Floor QEW TOTAL Leg FROM ALL SOURCES: 73.76 Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -0.00 deg90.00 degWood depth: 0(No woods) Wood deptn No of house rows 0 (No woods.) 0 : 1 (Absorptive ground surface) : Receiver source distance : 115.00 m Receiver height : 58.00 m : 1 (Flat/gentle slope; no barrier) Topography Reference angle : 0.00 Results segment # 1: QEW Source height = 1.93 mROAD (0.00 + 73.76 + 0.00) = 73.76 dBAAngle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -0 90 0.00 85.62 0.00 -8.85 -3.01 0.00 0.00 0.00 73.76 _____

Segment Leq : 73.76 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 13:31:22 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: r6water.te Time Period: 24 hours Description: R6 Tower 1 East/West Facade Top Floor QEW TOTAL Leg FROM ALL SOURCES: 73.76 Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -0.00 deg90.00 degWood depth: 0(No woods.)No of house rows: 0Surface: 1(Absorptive) (Absorptive ground surface) Receiver source distance : 115.00 m Receiver height : 117.00 m Topography : 1 Reference angle : 0.00 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 mROAD (0.00 + 73.76 + 0.00) = 73.76 dBAAngle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -0 90 0.00 85.62 0.00 -8.85 -3.01 0.00 0.00 0.00 73.76 _____

Segment Leq : 73.76 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 13:34:52 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Time Period: 24 hours Filename: r7water.te Description: R7 Tower 2 South Facade First Floor QEW TOTAL Leg FROM ALL SOURCES: 72.91 Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -90.00 deg90.00 degWood depth: 0(No woods.)No of house rows: 0Surface: 1(Absorptive) (Absorptive ground surface) Receiver source distance : 207.00 m Receiver height : 20.00 m Topography:1Reference angle:0.00 1 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 72.91 + 0.00) = 72.91 dBAAngle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -90 90 0.09 85.62 0.00 -12.45 -0.26 0.00 0.00 0.00 72.91 _____ ___

Segment Leq : 72.91 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 13:36:16 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: r8water.te Time Period: 24 hours Description: R8 Tower 2 South Facade 19 Floor QEW TOTAL Leg FROM ALL SOURCES: 74.22 Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -90.00 deg90.00 degWood depth: 0(No woods.)No of house rows: 0Surface: 1(Absorptive) (Absorptive ground surface) Receiver source distance : 207.00 m Receiver height : 58.00 m Topography : 1 Reference angle : 0.00 1 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 74.22 + 0.00) = 74.22 dBAAngle1 Angle2 Alpha RefLeg P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -90 90 0.00 85.62 0.00 -11.40 0.00 0.00 0.00 0.00 74.22 _____

Segment Leq : 74.22 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 13:49:02 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: r9water.te Time Period: 24 hours Description: R9 Tower 2 South Facade Top Floor QEW TOTAL Leq FROM ALL SOURCES: 74.22 Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -90.00 deg90.00 degWood depth: 0(No woods.)No of house rows: 0Surface: 1(Absorptive) (Absorptive ground surface) Receiver source distance : 207.00 m Receiver height : 132.00 m Topography : 1 Reference angle : 0.00 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 74.22 + 0.00) = 74.22 dBAAngle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -90 90 0.00 85.62 0.00 -11.40 0.00 0.00 0.00 0.00 74.22 _____ ___

Segment Leq : 74.22 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 13:55:41 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: r10water.te Time Period: 24 hours Description: R10 Tower 2 East/West Facade First Floor QEW TOTAL Leq FROM ALL SOURCES: 69.78 Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -0.00 deg90.00 degWood depth: 0(No woods.)No of house rows: 0Surface: 1(Absorptive) (Absorptive ground surface) Receiver source distance : 212.00 m Receiver height : 20.00 m Topography : 1 Reference angle : 0.00 1 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 69.78 + 0.00) = 69.78 dBAAngle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ 90 0.09 85.62 0.00 -12.56 -3.27 0.00 0.00 0.00 -0 69.78 _____ ___

Segment Leq : 69.78 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 13:57:05 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: r11water.te Time Period: 24 hours Description: R11 Tower 2 East/West Facade 22nd Floor QEW TOTAL Leq FROM ALL SOURCES: 71.10 Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -0.00 deg90.00 degWood depth: 0(No woods.)No of house rows: 0Surface: 1(Absorptive) (Absorptive ground surface) Receiver source distance : 212.00 m Receiver height : 66.00 m Topography : 1 Reference angle : 0.00 1 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 71.10 + 0.00) = 71.10 dBAAngle1 Angle2 Alpha RefLeg P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ 90 0.00 85.62 0.00 -11.50 -3.01 0.00 0.00 0.00 -0 71.10 _____ ___

Segment Leq : 71.10 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 13:58:18 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: r12water.te Time Period: 24 hours Description: R12 Tower 2 East/West Facade Top Floor QEW TOTAL Leg FROM ALL SOURCES: 71.10 Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -0.00 deg90.00 degWood depth: 0(No woods.)No of house rows: 0Surface: 1(Absorptive) (Absorptive ground surface) Receiver source distance : 212.00 m Receiver height : 132.00 m Topography : 1 Reference angle : 0.00 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 71.10 + 0.00) = 71.10 dBAAngle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -0 90 0.00 85.62 0.00 -11.50 -3.01 0.00 0.00 0.00 71.10 _____ ___

Segment Leq : 71.10 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 14:00:17 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: r13water.te Time Period: 24 hours Description: R13 Tower 3 South Facade First Floor QEW TOTAL Leq FROM ALL SOURCES: 72.37 Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -90.00 deg90.00 degWood depth: 0(No woods.)No of house rows: 0Surface: 1(Absorptive) (Absorptive ground surface) Receiver source distance : 232.00 m Receiver height : 20.00 m Topography : 1 Reference angle : 0.00 1 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 72.37 + 0.00) = 72.37 dBA Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -90 90 0.09 85.62 0.00 -12.99 -0.26 0.00 0.00 0.00 72.37 _____ ___

Segment Leq : 72.37 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 14:03:15 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: r14water.te Time Period: 24 hours Description: R14 Tower 3 South Facade 19th Floor QEW TOTAL Leq FROM ALL SOURCES: 73.72 Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -90.00 deg90.00 degWood depth: 0(No woods.)No of house rows: 0Surface: 1(Absorptive) (Absorptive ground surface) Receiver source distance : 232.00 m Receiver height : 66.00 m Topography : 1 Reference angle : 0.00 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 73.72 + 0.00) = 73.72 dBA Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -90 90 0.00 85.62 0.00 -11.89 0.00 0.00 0.00 0.00 73.72 _____ ___

Segment Leq : 73.72 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 14:04:17 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: r15water.te Time Period: 24 hours Description: R15 Tower 3 South Facade Top Floor QEW TOTAL Leq FROM ALL SOURCES: 73.72 Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -90.00 deg90.00 degWood depth: 0(No woods.)No of house rows: 0Surface: 1(Absorptive) (Absorptive ground surface) Receiver source distance : 232.00 m Receiver height : 132.00 m Topography : 1 Reference angle : 0.00 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 73.72 + 0.00) = 73.72 dBA Angle1 Angle2 Alpha RefLeg P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -90 90 0.00 85.62 0.00 -11.89 0.00 0.00 0.00 0.00 73.72 _____

Segment Leq : 73.72 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 14:19:17 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: r16water.te Time Period: 24 hours Description: R16 Tower 3 East/West Facade First Floor QEW TOTAL Leq FROM ALL SOURCES: 69.26 Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -0.00 deg90.00 degWood depth: 0(No woods.)No of house rows: 0Surface: 1(Absorptive) (Absorptive ground surface) Receiver source distance : 237.00 m Receiver height : 20.00 m Topography:1Reference angle:0.00 1 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 69.26 + 0.00) = 69.26 dBAAngle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ 90 0.09 85.62 0.00 -13.09 -3.27 0.00 0.00 0.00 -0 69.26 _____ ___

Segment Leq : 69.26 dBA

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 14:22:16 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: r17water.te Time Period: 24 hours Description: R17 Tower 3 East/West Facade 19 Floor QEW TOTAL Leg FROM ALL SOURCES: 70.62 Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -0.00 deg90.00 degWood depth: 0(No woods.)No of house rows: 0Surface: 1(Absorptive) (Absorptive ground surface) Receiver source distance : 237.00 m Receiver height : 57.00 m Topography : 1 Reference angle : 0.00 1 (Flat/gentle slope; no barrier) Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 70.62 + 0.00) = 70.62 dBA Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq _____ -0 90 0.00 85.62 0.00 -11.99 -3.01 0.00 0.00 0.00 70.62 _____ ___

Segment Leq : 70.62 dBA

Appendix "C" to Report PED19115 Page 313 of 314

STAMSON 5.04 NORMAL REPORT Date: 11-10-2018 14:23:14 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Time Period: 24 hours Filename: r17water.te Description: R18 Tower 3 East/West Facade Top Floor QEW TOTAL Leg FROM ALL SOURCES: 70.62 dBA Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW _____ Angle1Angle2: -0.00 deg90.00 degWood depth: 0(No woods.) Wood depth No of house rows : : 0 1 (Absorptive ground surface) Receiver source distance : 237.00 m Receiver height : 132.00 m Topography : 1 (Flat/gentle slope; no barrier) Reference angle : 0.00 Results segment # 1: QEW _____ Source height = 1.93 m ROAD (0.00 + 70.62 + 0.00) = 70.62 dBAAngle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq -0 90 0.00 85.62 0.00 -11.99 -3.01 0.00 0.00 0.00 70.62 _____ Segment Leq : 70.62 dBA

Total Leq All Segments: 70.62 dBA

Appendix "C" to Report PED19115 Page 314 of 314

STAMSON 5.04 SUMMARY REPORT Date: 03-12-2018 14:58:58 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT Filename: rlqewola.te Time Period: 24 hours Description: 5th Floor Rooftop Amenity Space with 4.5m Noise TOTAL Leq FROM ALL SOURCES: 55.89(OLA) Road data, segment # 1: QEW _____ Car traffic volume : 117718 veh/TimePeriod * Medium truck volume : 12074 veh/TimePeriod * Heavy truck volume : 21129 veh/TimePeriod * Posted speed limit : 100 km/h Road gradient : 0 % Road pavement : 1 (Typical asphalt or concrete) Data for Segment # 1: QEW -----Angle1Angle2: -45.00 deg45.00 degWood depth: 0(No woods)No of house rows: 0Surface: 1(Absorptive) (No woods.) (Absorptive ground surface) Receiver source distance : 80.00 m Receiver height:12.00 mTopography:2Barrier angle1:-45.00 degBarrier height:4.50 m (Flat/gentle slope; with barrier) Barrier receiver distance : 20.00 m Source elevation:0.00 mReceiver elevation:15.00 mBarrier elevation:15.00 mReference angle:0.00 Result summary _____ ! source ! Road ! Total ! height ! Leq ! Leq ! (m) ! (dBA) ! (dBA) 1.QEW ! 1.93 ! 55.89 ! 55.89 Total 55.89 dBA