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772082 Highway 10, Dundalk

TRANSPORTATION IMPACT STUDY

772082 Highway 10 Inc.

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1 Introduction

Tatham Engineering Limited was retained by 772082 Highway 10 Inc. to conduct a Transportation Impact Study in support of a Settlement Area expansion, through an Official Plan Amendment (OPA) application, for a mixed-use development to be located 772082 Highway 10, Community of Dundalk, Township of Southgate, County of Grey. The location of the development site is illustrated in Figure 1.

1.1 REPORT OBJECTIVE

The objective of the report is to present the findings of the study and address the requirements of the Township of Southgate, County of Grey, County of Dufferin and MTO with respect to the potential impacts of the development on the area road network (which consists of roads under each of the noted jurisdictions). In particular, the following will be discussed:

- the operations of the road system through the study area prior to the subject property's development;
- the growth in the traffic volumes not otherwise attributed to the development (i.e. from overall growth in the area and/or other developments);
- the number of new trips the subject property's development is likely to generate;
- the operations of the study area road system upon completion of the development; and
- the resulting impacts and need for mitigating measures (if required) to ensure acceptable overall road operations.

1.2 REPORT STRUCTURE

The report is structured as follows:

- Chapter 1: introduction and study purpose;
- Chapter 2: existing conditions, detailing the road system and corresponding traffic operations;
- Chapter 3: future conditions, prior to the completion of the subject property's development (referred to as future background conditions), the expected growth in traffic levels and developments; and the resulting operating conditions;
- Chapter 4: proposed development and associated details including land use, access, and traffic volumes;
- Chapter 5: future conditions, with completion of the subject property's development (referred to as future total conditions); and
- Chapter 6: summary of the report and key findings.



2 Existing Conditions

This chapter will detail the current road network, traffic volumes and traffic operations under existing conditions.

2.1 ROAD NETWORK

The road network to be addressed by this study consists of the following roads and intersections:

Roads	Intersections
▪ Highway 10	▪ Highway 10 & Grey Road 9/Dufferin Road 9
▪ Grey Road 9 (Main Street East)	▪ Highway 10 & Sideroad 240
▪ Dufferin Road 9 (Dufferin)	▪ Grey Road 9 & Russell Street
▪ Russell Street	
▪ Sideroad 240	

Aerial mapping and imagery of the road system is provided in Figure 2 with additional details provided below:

2.1.1 Roads

Highway 10

As per the MTO's *Highway Corridor Management Manual*¹, Highway 10 is designated as a 2B Arterial Highway. The highway is oriented northwest-southeast (hereinafter referenced as north-south) and has a 2-lane rural cross-section (i.e. gravel shoulders and open ditches), providing one travel lane per direction. The posted speed limit along Highway 10 through the area is 80 km/h.

Grey Road 9 (Main Street East)

As per the *County of Grey Official Plan*², Grey Road 9 (locally known as Main Street East) is an arterial road under the jurisdiction of the County. The road is oriented northeast-southwest (hereinafter referenced as east-west). Through the built-up area of Dundalk, Grey Road 9 has a 2-lane urban cross-section (i.e. curb, gutter and sidewalks), providing one travel lane per direction. The posted speed limit within Dundalk is 40 km/h.

¹ *Highway Corridor Management Manual*. Corridor Management Office, Ministry of Transportation, April 2025.

² *Recolour Grey - County of Grey Official Plan*. County of Grey, Consolidated May 6, 2025.



Dufferin Road 9

As per the *Dufferin County Official Plan*³, Dufferin Road 9 is an arterial road under the jurisdiction of Dufferin County. The road is oriented northeast-southwest (hereinafter referenced as east-west) and has a 2-lane rural cross-section. Dufferin Road 9 has a posted speed limit of 80 km/h.

Russell Street

As per the *Township of Southgate Official Plan*⁴, Russell Street is a local road under the jurisdiction of the Township. The road is oriented northwest-southeast (hereinafter referenced as north-south) and provides a 2-lane urban cross section. The speed limit is unposted, hence a speed limit of 40 km/h has been assumed as per local policy (40 km/h unless posted otherwise).

Sideroad 240

As per the *Township of Melancthon Official Plan*⁵, Sideroad 240 is a local road under the jurisdiction of the Township of Melancthon. The road is oriented northeast-southwest (hereinafter referenced as east-west) and has a 2-lane rural cross-section with a gravel surface. The speed limit is unposted, thus a speed limit of 80 km/h has been assumed in context of its rural and undeveloped nature.

2.1.2 Intersections

A description of each intersection is provided below, with aerial imagery provided in Figure 3.

Highway 10 & Grey Road 9/Dufferin Road 9

The intersection of Highway 10 with Grey Road 9/Dufferin Road 9 is a 4-leg signalized intersection. The south (Highway 10), west (Grey Road 9) and east (Dufferin Road 9) approaches each consist of an exclusive left turn lane and a shared through-right lane; whereas the north approach (Highway 10) provides an exclusive left turn lane, a through lane and a right turn lane.

Highway 10 & Sideroad 240

The intersection of Highway 10 with Sideroad 240 is an unsignalized three-leg intersection with stop control on the minor leg (Sideroad 240). The south approach (Highway 10) consists of a through lane and a right turn taper, whereas the north approach consists of a shared left- through lane. The east approach (Sideroad 240) provides a shared left-right turn lane.

³ *Dufferin County Official Plan*. Dufferin County, Consolidated August 2025.

⁴ *Township of Southgate Official Plan*. Ron Davidson Land Use Planning Consultant Inc., County Approved October 2022.

⁵ *Township of Melancthon Official Plan*. Township of Melancthon, September 2015.



Russell Street & Grey Road 9

The intersection of Russell Street with Grey Road 9 is a 3-leg intersection with stop control on Russell Street. All approaches have a single lane configuration (i.e. there are no exclusive turn lanes provided at the intersection).

2.2 TRAFFIC VOLUMES

2.2.1 Traffic Counts

To determine existing traffic volumes on the road network, traffic counts were conducted on Tuesday, March 18, 2025 from 7:00 to 9:00, 11:00 to 14:00 and 15:00 to 18:00 at the study area intersections. The corresponding peak hour volumes recorded during the traffic counts are illustrated in Figure 4, whereas detailed count sheets are provided in Appendix A.

2.2.2 Seasonal Adjustment

Given the timing of the traffic counts (March), which is generally considered representative of average annual conditions, the need for a seasonal adjustment has been reviewed. MTO provides seasonal adjustment factors for traffic volumes collected outside the peak summer period.

Based on MTO AADT data, the subject corridor is identified as having a Low Tourist traffic pattern. The corresponding seasonal adjustment factor for this pattern type is 1.34 (as per published MTO seasonal factors). As such, a factor of 1.34 has been applied to the observed traffic volumes on Highway 10, Grey Road 9 and Dufferin Road 9.

For the remaining area roads (Sideroad 240 and Russell Street), the observed traffic volumes are assumed to be reflective of typical peak conditions. Unlike Highway 10, local roads are less impacted by seasonal variations recognizing that they serve a more local function than Highway 10. While there may be increased daily volumes during the summer months, the peak hours are expected to be relatively consistent between seasons - recognizing that summer peak hour volumes do not include school trips and may further be reduced by less commuter traffic.

The resulting 2025 traffic volumes, reflective of peak summer conditions, are illustrated in Figure 5.

2.3 TRAFFIC OPERATIONS

The assessment of existing conditions provides the baseline for which the future traffic operations (both with and without the subject development) can be assessed. As the capacity, and hence operations of a road system are effectively dictated by its intersections, the analysis focused on the operations of the noted key intersection. The analysis is based on the following:

- the 2025 peak hour summer traffic volumes;



- the existing intersection configurations and controls; and
- procedures outlined in the *2000 Highway Capacity Manual*⁶ (using Synchro v.11 software).

For each intersection, the analysis considers:

- the average delay (measured in seconds);
- level of service (LOS); and
- volume to capacity (v/c) for each movement if signalized, or for critical movements only if unsignalized.

With respect to the noted metrics:

- level of service (LOS) - LOS A corresponds to the best operating condition with minimal delays whereas LOS F corresponds to poor operations resulting from high intersection delays (level of service definitions are provided in Appendix B); and
- volume to capacity (v/c) ratios - a v/c ratio of less than 1.0 indicates the intersection movement/approach is operating at less than capacity while v/c of 1.0 indicates capacity has been reached.

A summary of the analysis provided in Table 1; detailed operations worksheets are included in Appendix C.

Table 1: Intersection Operations – 2025

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Highway 10 & Grey Road 9/ Dufferin Road 9	EB L	signal	14	B	0.37	14	B	0.28
	EB TR	signal	14	B	0.40	14	B	0.34
	WB L	signal	13	B	0.10	13	B	0.16
	WB TR	signal	14	B	0.28	15	B	0.46
	NB L	signal	4	A	0.08	6	A	0.32
	NB TR	signal	5	A	0.23	6	A	0.32
	SB L	signal	4	A	0.02	4	A	0.01
	SB T	signal	5	A	0.18	5	A	0.18
	SB R	signal	4	A	0.06	4	A	0.07
overall		signal	9	A	0.28	9	A	0.36

⁶ *Highway Capacity Manual*. Transportation Research Board, Washington DC, 2000.



INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Highway 10 & Sideroad 240	WB LR	stop	13	B	0.02	15	B	0.03
Grey Road 9 & Russell Street	NB LR	stop	13	B	0.19	15	C	0.13
L left lane	T through lane	R right lane	LT left-through	TR through-right	LTR left-through-right			

Based on the existing volumes and intersection configurations, the subject intersections currently provide good overall levels of service (LOS C or better) with average delays during both peak hours. As such, no improvements are required to support existing conditions.



3 Future Background Conditions

This chapter will describe the road network and background traffic volumes expected for the years 2030, 2035, 2040 and 2045. The 2030 horizon year has been adopted to reflect 50% build-out of the subject property's development, whereas the 2035 horizon will reflect the 100% build out. Furthermore, 2040 and 2045 horizons will address the longer-term impact (5 and 10 years beyond full build-out).

3.1 ROAD NETWORK

As per the *Official Plan* for Grey County, there is a planned collector road to be located south of the subject site, connecting Highway 10 to Ida Street. The collector road will include Ida Street from Grey Road 9 to Eco Park Way, and the extension of Eco Park Way from its current terminus through to Highway 10, connecting to Highway 10 opposite Sideroad 240. The collector road location is illustrated in Figure 6.

The collector road is expected to be completed in conjunction with the development of the Dundalk Southeast lands, located immediately south of the subject site. For the purpose of this study, the collector road has been assumed as in place by 2030.

Notwithstanding the above, there are no other planned improvements to the road network.

3.2 TRAFFIC VOLUMES

3.2.1 Background Growth

Population

Based on 2021 census data, the population of the Community of Dundalk increased from 2,046 in 2016 to 2,803 in 2021, which translates to an annual growth rate of approximately 6.5%. As per the Township's *Official Plan*, a population of 4,000 is projected by the year 2046, which translates to an annual growth of 1.40% when considering the 2021 census population. The recent growth is likely attributed to the significant residential development occurring in the area.

Traffic Volumes

Annual Average Daily Traffic (AADT) and Summer Average Daily Traffic (SADT) volumes for Highway 10 through the study area were reviewed for the period 2016 to 2021 (the most recent data available). It is noted that there was not data published for 2020 due to the pandemic. A summary of the seasonal traffic data and resulting seasonal ratios is provided in Table 2.



Table 2: Highway 10 Traffic Volumes

ROAD SECTION	DAILY TRAFFIC VOLUME						G.R ¹
		2016	2017	2018	2019	2021	
Highway 10 Shelburne to Flesherton	AADT	6,450	6,850	6,600	6,650	6,750	0.9%
	SADT	8,400	9,600	9,250	9,300	9,250	1.9%

¹ G.R: Growth rate b/w 2016-2012

AADT: Average Annual Daily Traffic

SADT: Summer Average Daily Traffic

As indicated, AADT volumes increased from approximately 6,450 vehicles per day in 2016 to 6,750 vehicles per day in 2021, representing an average annual growth rate of approximately 0.9%. SADT volumes increased from approximately 8,400 vehicles per day to 9,250 vehicles per day over the same period, corresponding to an average annual growth rate of approximately 1.9%.

Other Studies

The *Dundalk Southeast TIS* completed in 2024 considered a background growth rate of 1.5%.

Background Growth

While historical growth suggests that a background growth rate of 2% would be appropriate, the study has also considered significant volumes attributed to planned developments in the area. As such, a background growth rate of 1.5% per annum has been applied to the volumes on Highway 10, Dufferin Road 9, and Grey Road 9. No background growth has been applied to the remaining local roads, as these function primarily as local streets and are not expected to experience year over year background growth.

3.2.2 Development Growth

In addition to general background growth, consideration has also been given to a number of area developments that are expected to contribute traffic volumes to the study area road network. These developments are illustrated in Figure 7 and detailed below. The assignment of the background development volumes through the study area road network is illustrated in Appendix D for each development. The trip generation and general distribution of such to the road network reflects that provided in the respective traffic studies and/or as identified in the *Dundalk Southeast Eco Park TIS*, which was comprehensive in its consideration of background development.



Dundalk Southeast Eco Park

The Dundalk Southeast Eco Park development will be comprised of approximately 17.96 hectares of industrial land, 8.93 hectares of commercial land, and a residential component consisting of 138 apartment units, 154 townhouse units and 191 single-detached dwellings. Primary access to the development will be provided via the proposed extension of Eco Park Way to Highway 10.

Edgewood Greens

The Edgewood Greens development is located at the northwest corner of the future signalized intersection of Highway 10 and Milliner Avenue. As per the *Edgewood Greens Traffic Impact Study*⁷, the mixed-use development is proceeding in 11 phases, of which Phases 1 to 6 have been constructed and occupied, including McDonalds restaurant. As such, the traffic volumes associated with these phases and uses have been captured in the traffic counts completed for this study.

Phases 7, 8 and 10 are under construction and Phases 9 and 11 are Draft Approved and undergoing detailed design and site plan approval. The remaining phases will consist of 209 single-detached homes and 139 townhouses, with completed expected by 2030.

Glenelg Phase

The Glenelg residential development (Phases 1, 2 and 3) is located at 231 Glenelg Street in the northwest area of Dundalk. The development proposes 300 single family detached units, 24 semi-detached units, 75 townhouse residential units and 700 students Elementary School, as outlined in *Glenelg Phase 3 Traffic Impact Study*⁸. The *Dundalk Southeast Traffic Impact Study*, which was completed in October 2024, reviewed the level of development completed and estimated the trips to be generated by the remaining development units. To ensure a conservative approach, no further adjustments have been made to account for units potentially completed between October 2024 and March 2025 (the time of the traffic counts).

Site-generated trips have been assigned through the study area using the distribution and routing assumptions outlined in the TIS, ensuring consistency with the methodology used in the original study.

White Rose Park Phase 3

The White Rose Park Phase 3 development is located north of Wilcon Crescent and south of the future Glenelg Phase 3 development. Based on the *White Rose Phase 3 Traffic Impact Study*⁹,

⁷ *Edgewood Greens Traffic Impact Study*, Crozier, Update: September 2023.

⁸ *Glenelg Phase 3 Traffic Impact Study*, Crozier, Updated: August 2023

⁹ *White Rose Phase 3 Traffic Impact Study*, Triton Engineering Services, September 2020.



- the 2025 volumes as per Figure 5;
- the noted annual background growth rates; and
- the additional traffic volumes associated with the background developments, assuming the following (as estimated from the respective traffic studies and consideration for current conditions):
 - 50% build-out of Dundalk Southeast by 2030 and 100% by 2035;
 - 100% build-out of Edgewood Greens by 2030;
 - 100% build-out of Glenelg by 2030;
 - 100% build-out of White Rose by 2030;
 - 100% build-out of Ida Street by 2030;
 - 50% build-out of Dundalk Northeast by 2030 and 100% by 2035; and
 - 50% build-out of Industrial Lands by 2030 and 100% by 2035.

The resulting future background traffic volumes for the future horizons are illustrated in Figure 8 through Figure 11. It is acknowledged that the assumed build-out is considered aggressive in context of servicing constraints within Dundalk. Thus, the traffic projections are considered as conservative in context of timeline and will require monitoring as development progresses to ensure the improvements identified herein are implemented at the appropriate time.

It is noted that the 2045 background volumes on Highway 10 reflect annual growth of 5.7% when considering the 2025 existing conditions.

3.3 TRAFFIC OPERATIONS

The key intersections were again analyzed for each horizon year given the projected background volumes and maintaining the existing intersection configurations and controls.

3.3.1 2030 Horizon

The results of the operational assessment for the 2030 Background conditions are summarized in Table 3 (detailed worksheets are provided in Appendix D).



the development consists of 33 single family detached units, 24 condominiums/townhouses and 34 senior adult housing units. Trip generation, distribution and assignment to the area road system are based on what is provided in the noted traffic study.

Ida Street

The Ida Street development is located at the northeast corner of the unsignalized intersection of Ida Street and Grey Road 9. The development consists of 266 single family detached units, 55 multifamily units, a government office building (68,000 ft²) and a recreational community center (68,00 ft²), as outlined in the *Ida Street Development Traffic Impact Study*¹⁰.

At the time of this study, no development has been completed on the Ida Street site. Trip generation estimates and distribution have been taken from the *Traffic Impact Study* for Dundalk Southeast Development and represent total site-generated traffic under full build-out conditions, ensuring consistency and a conservative assessment of potential traffic impacts.

Dundalk Northeast

The proposed Dundalk Northeast development consists of 900 single family detached homes as outlined in the *Dundalk Southeast Eco Park Traffic Impact Study*. As development has yet to commence, all associated traffic volumes and the assignment of such through the study area road system have been determined from the noted study.

Industrial Lands

There are approximately 45 hectares (111 acres) of Township owned industrial land located west of the Grey County Rail Trail that will be served by the future extension of Eco Park Way. Trip generation associated with these lands was considered in the *Industrial Access Road Traffic Impact Study*¹¹ and further summarized as background development in the *Dundalk Southeast Eco Park Traffic Impact Study*.

The trip generation and distribution as presented in the *Dundalk Southeast Eco Park Traffic Impact Study* have been applied herein. For the purpose of this study, 50% build-out of the industrial lands is assumed for the 2030 horizon year, with full (100%) build-out assumed for the 2035 horizon year.

3.2.3 Background Traffic Volumes

Background traffic volumes (i.e. prior to consideration of the subject development) for the 2030, 2035, 2040 and 2045 horizon years have been determined based on the following:

¹⁰ *Ida Street Development Traffic Impact Study*, Crozier, May 2024.

¹¹ *Industrial Access Road Traffic Impact Study*, Triton, June 2017



Table 3: Intersection Operations – 2030 Background

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Highway 10 & Grey Road 9/ Dufferin Road 9	EB L	signal	12	B	0.32	24	C	0.38
	EB TR	signal	13	B	0.48	34	C	0.75
	WB L	signal	11	B	0.12	26	C	0.43
	WB TR	signal	11	B	0.23	24	C	0.51
	NB L	signal	7	A	0.24	18	B	0.78
	NB TR	signal	8	A	0.39	7	A	0.45
	SB L	signal	5	A	0.02	5	A	0.01
	SB T	signal	7	A	0.34	6	A	0.29
	SB R	signal	6	A	0.07	5	A	0.08
overall		signal	9	A	0.42	17	B	0.77
Highway 10 & Eco Park Way/ Sideroad 240	EB LTR	stop	627	F	2.24	Err	F	9.57
	WB LTR	stop	198	F	0.36	675	F	0.91
	NB LT	free	8	A	0.31	9	A	0.35
Grey Road 9 & Russell Street	NB LR	stop	22	C	0.41	35	D	0.42
L left lane T through lane R right lane LT left-through TR through-right LTR left-through-right								

The signalized intersection of Highway 10 with Grey Road 9/Dufferin Road 9 is projected to operate at LOS A during the weekday AM peak hour and LOS B during the weekday PM peak hour. All individual movements operate at acceptable levels of service, with the highest movement v/c ratio remaining below capacity. The unsignalized intersection of Highway 10 with Eco Park Way/Sideroad 240 is forecast to experience LOS F for the minor-street movements during both peak hours due to the increased Highway 10 through volumes and limited gap availability.

Recommended Improvements

To address the significant delays and operational challenges at the intersection of Highway 10 with Eco Park Way/Sideroad 240, the proposed improvements as identified in the *Dundalk Southeast Eco-Park Traffic Impact Study* have been considered, as outlined below:

- traffic signal control;
- northbound left turn lane;



- southbound left- and right-turn lane; and
- eastbound left turn lane.

It noted that the existing northbound right turn taper has also been maintained in the intersection configuration. The results of the operational assessment with consideration for the above improvements are outlined in Table 4.

Table 4: Intersection Operations – 2030 Background + Improvements

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Highway 10 & Eco Park Way/ Sideroad 240	EB L	signal	20	B	0.35	21	C	0.66
	EB TR	signal	19	B	0.17	15	B	0.23
	WB LTR	signal	18	B	0.01	14	B	0.01
	NB L	signal	11	B	0.67	20	B	0.78
	NB T	signal	5	A	0.33	13	B	0.77
	NB R	signal	4	A	0.00	6	A	0.00
	SB L	signal	4	A	0.01	6	A	0.03
	SB T	signal	6	A	0.59	8	A	0.52
	SB R	signal	4	A	0.09	6	A	0.13
overall		signal	9	A	0.60	13	B	0.74
L left lane	T through lane	R right lane	LT left-through	TR through-right	LTR left-through-right			

As indicated, the implementation of traffic signals and dedicated turn lanes result in a substantial improvement in intersection operations - LOS A during the weekday AM peak hour and LOS B during the weekday PM peak hour, with average control delays of approximately 9 seconds and 13 seconds per vehicle, respectively. All individual movements operate at acceptable levels of service, with movement-level delays generally at LOS B or better. The highest v/c ratios occur on the northbound left turn and through movements during the PM peak hour (v/c up to 0.78), indicating that adequate reserve capacity remains available. No approach or movement is projected to operate near capacity.

Overall, the results demonstrate that the proposed signalization and turn lane improvements effectively mitigate the operational deficiencies previously observed under unsignalized conditions and provide acceptable operational performance for the 2030 horizon year.



3.3.2 2035 Horizon

The results of the operational assessment for the 2035 Background conditions are summarized in Table 5, carrying forward the noted intersection improvements recommended for the 2030 horizon. The corresponding detailed worksheets are provided in Appendix D.

Table 5: Intersection Operations – 2035 Background

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Highway 10 & Grey Road 9/ Dufferin Road 9	EB L	signal	16	B	0.36	49	D	0.65
	EB TR	signal	22	C	0.69	169	F	1.23
	WB L	signal	15	B	0.16	63	E	0.69
	WB TR	signal	15	B	0.26	42	D	0.65
	NB L	signal	8	A	0.29	268	F	1.54
	NB TR	signal	11	B	0.67	10	A	0.67
	SB L	signal	6	A	0.05	4	A	0.03
	SB T	signal	8	A	0.45	9	A	0.58
	SB R	signal	6	A	0.07	5	A	0.09
overall		signal	13	B	0.67	83	F	1.47
Highway 10 & Eco Park Way/ Sideroad 240	EB L	signal	48	D	0.68	302	F	1.52
	EB TR	signal	41	D	0.53	55	D	0.74
	WB LTR	signal	36	D	0.01	39	D	0.01
	NB L	signal	44	D	0.94	357	F	1.70
	NB T	signal	6	A	0.49	23	C	0.82
	NB R	signal	3	A	0.00	9	A	0.00
	SB L	signal	3	A	0.01	10	A	0.03
	SB T	signal	7	A	0.60	19	B	0.70
	SB R	signal	4	A	0.12	10	A	0.16
overall		signal	18	B	0.90	110	F	1.64
Grey Road 9 & Russell Street	NB LR	stop	24	C	0.44	49	E	0.52
L left lane	T through lane	R right lane	LT left-through	TR through-right	LTR left-through-right			

As noted, intersection operations deteriorate compared to the 2030 horizon, reflecting continued background traffic growth. Both of the signalized Highway 10 intersections experience capacity deficiencies during the weekday PM peak hour.



The Highway 10 with Grey Road 9/Dufferin Road 9 intersection degrades from LOS B to LOS F by 2035, with an average delay of approximately 83 seconds and an overall v/c ratio of 1.47, indicating oversaturated conditions. Operational deficiencies are driven primarily by the eastbound through-right and northbound left turn movements, which exceed capacity during the PM peak hour.

Similarly, the Highway 10 intersection with Eco Park Way/Sideroad 240, which operated acceptably in 2030 following signalization and provision of exclusive turn lanes, is projected to operate at LOS F during the PM peak hour in 2035, with excessive delay and a v/c ratio of 1.64. Excessive delays are concentrated on the eastbound left and northbound left turn movements, both of which operate over capacity.

In contrast, the Grey Road 9 and Russell Street unsignalized intersection continues to operate within acceptable limits during the AM peak hour but deteriorates to LOS E during the PM peak hour, consistent with increased conflicting volumes.

Recommended Improvements

To mitigate the system operational deficiencies, the following improvements are recommended to accommodate longer-term background traffic growth.

- widen Highway 10 to a 4-lane cross section (2 lanes per direction); and
- provide advanced green phases for northbound left turn movements.

As illustrated in Table 6, the additional recommended improvements significantly enhance intersection operations under 2035 Background conditions.

The Highway 10 intersection with Grey Road 9/Dufferin Road 9 improves from LOS F to LOS C overall in the PM peak. Similarly, the Highway 10 intersection with Eco Park Way/Sideroad 240 intersection improves to LOS D overall in the PM peak. Although some individual movements, particularly northbound left turns, still experience higher delays (LOS D to E), the overall capacity enhancements reduce oversaturation and improve traffic flow compared to the previous 2035 scenario without widening.



Table 6: Intersection Operations – 2035 Background + Improvements

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Highway 10 & Grey Road 9/ Dufferin Road 9	EB L	signal	17	B	0.37	26	C	0.39
	EB TR	signal	24	C	0.71	45	D	0.85
	WB L	signal	16	B	0.17	29	C	0.50
	WB TR	signal	16	B	0.27	26	C	0.51
	NB L	signal	6	A	0.30	42	D	0.94
	NB TR	signal	7	A	0.34	7	A	0.38
	SB L	signal	10	A	0.04	18	B	0.04
	SB TR	signal	12	B	0.40	30	C	0.81
	overall	signal	13	B	0.52	28	C	0.96
Highway 10 & Eco Park Way/ Sideroad 240	EB L	signal	19	B	0.47	61	E	0.98
	EB TR	signal	17	B	0.20	21	C	0.29
	WB LTR	signal	16	B	0.01	18	B	0.01
	NB L	signal	15	B	0.75	67	E	0.96
	NB T	signal	5	A	0.32	20	B	0.55
	NB R	signal	4	A	0.00	15	B	0.00
	SB L	signal	12	B	0.02	31	C	0.03
	SB T	signal	17	B	0.71	50	D	0.09
	SB R	signal	12	B	0.12	32	C	0.15
	overall	signal	13	B	0.73	41	D	1.00
L left lane T through lane R right lane LT left-through TR through-right LTR left-through-right								

3.3.3 2040 Horizon

The results of the operational assessment for the 2040 Background conditions, carrying forward the previously noted road system improvements, are summarized in Table 7; detailed worksheets are provided in Appendix D.



Table 7: Intersection Operations – 2040 Background

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Highway 10 & Grey Road 9/ Dufferin Road 9	EB L	signal	17	B	0.38	26	C	0.43
	EB TR	signal	26	C	0.76	50	D	0.90
	WB L	signal	16	B	0.19	31	C	0.53
	WB TR	signal	16	B	0.27	26	C	0.53
	NB L	signal	7	A	0.33	46	D	0.96
	NB TR	signal	7	A	0.36	7	A	0.39
	SB L	signal	10	A	0.05	19	B	0.04
	SB TR	signal	13	B	0.42	34	C	0.86
overall		signal	14	B	0.55	30	C	0.99
Highway 10 & Eco Park Way/ Sideroad 240	EB L	signal	19	B	0.47	71	E	1.02
	EB TR	signal	18	B	0.20	19	B	0.31
	WB LTR	signal	17	B	0.01	16	B	0.01
	NB L	signal	9	B	0.76	69	E	0.99
	NB T	signal	5	A	0.33	17	B	0.57
	NB R	signal	4	A	0.00	12	B	0.00
	SB L	signal	12	B	0.02	25	C	0.03
	SB T	signal	15	B	0.73	43	D	0.90
	SB R	signal	12	B	0.12	26	C	0.15
overall		signal	14	B	0.73	39	D	1.04
Grey Road 9 & Russell Street	NB LR	stop	26	D	0.47	58	F	0.57
L left lane	T through lane	R right lane	LT left-through	TR through-right	LTR left-through-right			

As noted, the intersection operations exhibit a slight decline in performance compared to the 2035 scenario, driven primarily by continued increases in background traffic volumes. This is reflected in longer average vehicle delays and higher v/c ratios at key intersections along Highway 10.

Critical movements at these intersections, particularly the northbound left turns on Highway 10 and eastbound left turns from the sideroads, exhibit v/c ratios that are at or slightly above capacity thresholds. For example, at the Eco Park Way intersection, the PM peak hour delay on the eastbound left turn movement increases to 71 seconds, corresponding to LOS E, with a v/c



ratio exceeding 1.0, indicating an oversaturated condition where demand exceeds available capacity. This results in longer queues and increased delays, which can negatively impact intersection efficiency and driver experience.

Similarly, the Dufferin Road 9 intersection operates close to capacity during the PM peak hour, with an overall LOS C and a v/c ratio of 0.99, indicating that the intersection is nearing its operational limits. While not yet oversaturated, this level of performance suggests limited remaining capacity to accommodate further growth or additional turning movements without intervention.

Recommended Improvements

To address the noted challenges, the following improvements are proposed:

- eastbound right turn lane on Dufferin Road 9 at Highway 10; and
- additional eastbound left turn storage on Eco Park Way at Highway 10.

Table 8 presents the operational analysis for 2040 Background conditions incorporating the noted further improvements.

With these improvements, both intersections show marked operational improvements compared to the previous 2040 scenario. The Dufferin Road 9 intersection now operates at LOS B during the AM peak and improves to LOS C, with the overall v/c ratio reduced to 0.91. Similarly, the Eco Park Way intersection experiences improved performance, with an overall LOS B during both peak periods.



Table 8: Intersection Operations – 2040 Background + Improvements

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Highway 10 & Grey Road 9/ Dufferin Road 9	EB L	signal	18	B	0.45	37	D	0.62
	EB T	signal	17	B	0.33	28	C	0.35
	EB R	signal	17	B	0.32	27	C	0.24
	WB L	signal	16	B	0.10	27	C	0.23
	WB TR	signal	17	B	0.32	34	C	0.66
	NB L	signal	6	A	0.30	41	D	0.93
	NB TR	signal	6	A	0.34	6	A	0.36
	SB L	signal	9	A	0.05	18	B	0.04
	SB TR	signal	11	B	0.41	27	C	0.77
overall		signal	11	B	0.43	25	C	0.91
Highway 10 & Eco Park Way/ Sideroad 240	EB L	signal	18	B	0.30	29	C	0.81
	EB TR	signal	18	B	0.20	20	B	0.37
	WB LTR	signal	17	B	0.01	17	B	0.01
	NB L	signal	12	B	0.72	27	C	0.84
	NB T	signal	4	A	0.31	8	A	0.49
	NB R	signal	4	A	0.00	6	A	0.00
	SB L	signal	11	B	0.02	15	B	0.03
	SB T	signal	16	B	0.70	24	C	0.78
	SB R	signal	11	B	0.12	16	B	0.15
overall		signal	12	B	0.68	19	B	0.88
Grey Road 9 & Russell Street		NB LR	stop	26	D	0.47	58	F
L left lane	T through lane	R right lane	LT left-through	TR through-right	LTR left-through-right			

3.3.4 2045 Horizon

The results of the operational assessment for the 2045 Background conditions are summarized in Table 9, with consideration for those improvements deemed necessary under the preceding horizon years. Corresponding detailed worksheets are provided in Appendix D.



Table 9: Intersection Operations - 2045 Background

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Highway 10 & Grey Road 9/ Dufferin Road 9	EB L	signal	18	B	0.48	75	E	0.84
	EB T	signal	17	B	0.35	33	C	0.38
	EB R	signal	17	B	0.38	32	C	0.24
	WB L	signal	16	B	0.10	32	C	0.27
	WB TR	signal	17	B	0.34	42	D	0.73
	NB L	signal	6	A	0.32	46	D	0.94
	NB TR	signal	6	A	0.35	6	A	0.37
	SB L	signal	10	A	0.05	19	B	0.04
	SB TR	signal	12	B	0.43	30	C	0.76
	overall	signal	12	B	0.45	29	C	0.95
Highway 10 & Eco Park Way/ Sideroad 240	EB L	signal	20	B	0.31	29	C	0.82
	EB TR	signal	20	B	0.20	20	B	0.37
	WB LTR	signal	19	B	0.01	18	B	0.01
	NB L	signal	11	B	0.65	32	C	0.88
	NB T	signal	4	A	0.31	9	A	0.51
	NB R	signal	3	A	-	6	A	-
	SB L	signal	12	B	0.02	15	B	0.03
	SB T	signal	17	B	0.73	25	C	0.78
	SB R	signal	12	B	0.12	16	B	0.15
	overall	signal	12	B	0.63	21	C	0.90
Grey Road 9 & Russell Street	NB LR	stop	29	D	0.50	70	F	0.63
L left lane	T through lane	R right lane	LT left-through	TR through-right	LTR left-through-right			

Under the 2045 Background conditions, the Highway 10 intersection with Grey Road 9/Dufferin Road 9 will operate at an overall LOS B during the AM peak and LOS C during the PM peak, with average delays of approximately 12 seconds and 29 seconds, respectively. Most movements perform well, though the eastbound left turn experiences increased delay of 75 seconds (LOS E) during the PM peak, and the northbound left turn delays increase to 46 seconds (LOS D). The overall v/c ratio is 0.95, indicating the intersection is near capacity but maintaining acceptable performance.



At the Eco Park Way/Sideroad 240 intersection with Highway 10, the results indicate an overall LOS B during the AM peak and LOS C during the PM peak. Average delays are approximately 12 seconds in the AM and 21 seconds in the PM. The highest delays occur on the eastbound and northbound left turns, with delays of 29 seconds and 32 seconds (both LOS C) in the PM peak. V/c ratios remain below 0.90, indicating sufficient capacity and improved flow due to added turn lane storage.

The Grey Road 9 and Russell Street intersection continues to function as a local road intersection with relatively low traffic volumes. Despite increased PM peak delays reaching 70 seconds (LOS F), major operational improvements are not proposed, given its local road classification and low overall demand.



4 Proposed Development

This chapter will provide additional details with respect to the subject property's development, including its location, the projected site generated traffic volumes and the assignment of such to the adjacent road network.

4.1 LOCATION

The subject property is located at 772082 Highway 10, in the Community of Dundalk, as previously indicated in Figure 1.

4.2 LAND USE

The proposed residential component of the subject property consists of the following unit types, based on a conceptual site plan layout (refer to Figure 12), which will be confirmed as the project advances:

- 40 townhouse units;
- 182 single-family detached units; and
- a 5-storey commercial mixed-use building comprising 550 apartment units and 11,823 m² of ground floor commercial designed to accommodate a variety of professional and business uses, enhancing the mixed-use character of the development.

The conceptual Site Plan is provided for conversation purposes only and should not be considered the final design and layout for the site; the actual use and built form on the subject property will be provided for full review in a subsequent application for a Zoning By-law Amendment and Draft Plan of Subdivision.

4.3 ACCESS

4.3.1 Location & Configuration

Access to the subject property's development will be provided via the future construction of the Eco Park Way extension and a proposed collector road connection to it, which will extend through the site (and connect to the lands immediately north when they are developed).

As illustrated in conceptual site plan of Figure 12, an 'emergency access only' route is provided through the commercial area to connect to Highway 10, thus providing an additional means of access as may be required.



4.3.2 Pedestrian Connections

The extension of Eco Park Way will be designed to accommodate pedestrian movement, ensuring safe and accessible connections throughout the area. The roadway will incorporate pedestrian-friendly features to support walkability and connectivity with surrounding developments. The specific design elements, including sidewalks, crossings and other pedestrian infrastructure, will be outlined in the detailed site plan to be provided at later stages of the development process.

4.3.3 Sightlines

A sight line assessment was conducted to establish the available sight lines along Highway 10 at the future Eco Park Way Extension intersection, which will provide the primary means of access to the development. The assessment has considered both minimum stopping sight distance and intersection sight distance, as defined below and dictated per the standards published in the Transportation Association of Canada's (TAC) *Geometric Design Guide for Canadian Roads*:

- The minimum stopping sight distance provides a sufficient distance for an approaching motorist to observe a stationary hazard in the road and bring their vehicle to a complete stop prior to the hazard.
- The intersection sight distance allows a vehicle to enter a main road from a side street (or site access) and attain the appropriate operating speed without significantly impacting the operating speed of an approaching vehicle.

The minimum stopping sight and intersection sight distance requirements are provided in Table 10 for a design speed of 100 km/h (reflective of the 80 km/h posted speed limit on Highway 10). The available sight distances as determined through field measures are also summarized in Table 10. As indicated, the available sight distances surpass the minimum requirements for noted design speeds and thus are considered appropriate.

Table 10: Highway 10 & Eco Park Way Sight Line Assessment

LOCATION	DESIGN SPEED	STOPPING SIGHT DISTANCE	INTERSECTION SIGHT DISTANCE		AVAILABLE SIGHTLINES TO/FROM	
			Left Turn	Right Turn	East	West
Eco Park Way & Highway 10	100 km/h	185 m	210 m	185 m	> 250 m	> 250 m



4.4 TRAFFIC

4.4.1 Trip Generation

The number of vehicle trips to be generated by the subject property's development has been determined based on type of use, development size and trip generation rates published in the *ITE Trip Generation Manual, 11th Edition*¹². The following trip rates have been employed:

- single family detached (ITE code 210);
- multifamily housing - low rise (ITE code 220) for townhouses;
- multifamily housing - mid-rise 4-10 levels (ITE code 221) for apartments; and
- general office building >10,000 ft² (ITE Code 710).

The associated trip rates and trip estimates are provided in Table 11 and Table 12.

As indicated, the subject property's development is expected to generate 540 trips during the AM peak hour and 589 trips during the PM peak hour.

Table 11: Trip Generation Rates

LAND-USE	ITE CODE	VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			In	Out	Total	In	Out	Total
multifamily housing - low-rise (1-3 levels)	220	units	0.10	0.30	0.40	0.32	0.19	0.51
single family detached	210	units	0.18	0.53	0.70	0.59	0.35	0.94
multifamily housing - mid-rise (4-10 levels)	231	units	0.09	0.28	0.37	0.24	0.15	0.39
general office building (>10,000 ft ²)	710	1000 ft ² GLA	1.34	0.18	1.52	0.24	1.20	1.44

¹² ITE Trip Generation Manual, 11th Edition. Institute of Transportation Engineers. September 2021.



Table 12: Trip Generation Estimates

LANDUSE	SIZE	VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			In	Out	Total	In	Out	Total
Townhouse	40	units	4	12	16	13	8	20
Single Detached	182	units	32	96	127	108	63	171
Apartments	550	units	47	157	204	131	84	215
Office Space	127	1000 ft2 GLA	170	23	193	31	152	183
Total			253	288	540	283	307	589

4.4.2 Trip Distribution

The distribution of the trips generated by the development has been developed based on traffic patterns identified through a review of the traffic count data and distribution data provided in the 2022 *Transportation Tomorrow Survey (TTS)*. The TTS is a comprehensive travel survey conducted in the Greater Golden Horseshoe Area once every 5 years and reports on trip origins and destinations for various travel zones. The subject development falls in Zone 27014 of the TTS system.

Based on the travel zone and in considering the resulting trip origins and destinations, and the immediate road system, the following has been assumed:

- to/from the north via Highway 10 - 15%;
- to/from the south via Highway 10 - 60%;
- to/from the west via Eco Park Way Extension/Ida Street/Grey Road 9 - 25%;

The above distribution assumes that the Eco Park Way extension has been complete by 2030.

As indicated on the TTS data, there were no trips captured to/from the east. For the purpose of this study, it has been assumed that any traffic travelling to/from the east will do so via east-west corridors outside of the study area (i.e. Highway 89).

The resulting assignment of site generated trips to the road network is in Figure 14.



5 Future Total Traffic

This chapter will address the resulting impacts of the subject property's development on the adjacent road system. The following areas are to be addressed:

- road capacity; and
- potential improvements to the study area road network, if necessary.

5.1 TRAFFIC VOLUMES

To assess the impacts of the increased traffic volumes resulting from the subject property's development, the site generated traffic was combined with the 2030, 2035, 2040 and 2045 background traffic volumes. The resulting traffic volumes for each horizon is provided in Figure 15 to Figure 18.

5.2 TRAFFIC OPERATIONS

The intersections within the study area were again investigated considering the total traffic volumes for each horizon year, with horizon years discussed below and detailed worksheets provided in Appendix E. All road system improvements as previously recommended to support the future background conditions (i.e. without the subject property's development) have been maintained as warranted. Additional improvements are noted as required.

5.2.1 2030 Horizon

As identified under the 2030 background conditions, the intersection of Highway 10 with Eco Park Way/Sideroad 240 will not operate at an acceptable level of service under the existing stop control configuration. As such, signalization with exclusive turn lanes was recommended and carried forward. The associated 2030 total operations, are summarized in Table 13.

The intersection of Highway 10 with Grey Road 9/Dufferin Road 9 is expected to operate at LOS A in the AM peak hour and LOS B in the PM peak hour, with overall delays of 10 seconds and 17 seconds, respectively. All individual movements operate within acceptable v/c ratios, indicating adequate capacity and stable operations.

Similarly, the intersection of Highway 10 with Eco Park Way/Sideroad 240, with the proposed improvements, is projected to operate at LOS B during both peak periods. Although some movements, particularly the eastbound left turn and northbound left turn in the PM peak, experience higher delays (LOS D and LOS C), overall intersection performance remains within acceptable thresholds, with v/c ratios below 1.0.



Table 13: Intersection Operations – 2030 Total

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR			
			Delay	LOS	v/c	Delay	LOS	v/c	
Highway 10 & Grey Road 9/ Dufferin Road 9	EB L	signal	12	B	0.32	24	C	0.38	
	EB TR	signal	13	B	0.48	33	C	0.75	
	WB L	signal	11	B	0.12	26	C	0.43	
	WB TR	signal	11	B	0.23	25	C	0.51	
	NB L	signal	7	A	0.24	20	B	0.81	
	NB TR	signal	8	A	0.42	8	A	0.48	
	SB L	signal	6	A	0.03	5	A	0.02	
	SB T	signal	7	A	0.36	6	A	0.31	
	SB R	signal	6	A	0.07	5	A	0.08	
overall		signal	10	A	0.44	17	B	0.79	
Highway 10 & Eco Park Way/ Sideroad 240	EB L	signal	26	C	0.46	36	D	0.79	
	EB TR	signal	26	C	0.43	22	C	0.36	
	WB LTR	signal	23	C	0.01	20	B	0.01	
	NB L	signal	19	B	0.81	29	C	0.88	
	NB T	signal	5	A	0.31	11	B	0.69	
	NB R	signal	4	A	0.00	6	A	0.00	
	SB L	signal	4	A	0.01	6	A	0.02	
	SB T	signal	6	A	0.56	8	A	0.46	
	SB R	signal	4	A	0.10	6	A	0.14	
overall		signal	12	B	0.74	17	B	0.85	
Grey Road 9 & Russell Street		NB LR	stop	22	C	0.41	35	D	0.41
L left lane	T through lane	R right lane	LT left-through	TR through-right	LTR left-through-right				

5.2.2 2035 Horizon

Table 14 illustrates the intersection operation for the 2035 horizon considering previous improvements including the:

- widening of Highway 10 to a 4-lane cross section (2 lanes per direction); and
- providing advanced green phases for northbound left turn movements.



Table 14: Intersection Operations - 2035 Total

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Highway 10 & Grey Road 9/ Dufferin Road 9	EB L	signal	17	B	0.37	26	C	0.39
	EB TR	signal	24	C	0.71	45	D	0.86
	WB L	signal	16	B	0.17	29	C	0.50
	WB TR	signal	16	B	0.27	26	C	0.51
	NB L	signal	6	A	0.31	45	D	0.95
	NB TR	signal	7	A	0.36	7	A	0.40
	SB L	signal	10	A	0.05	18	B	0.04
	SB TR	signal	12	B	0.43	31	C	0.84
	overall	signal	13	B	0.54	28	C	0.97
Highway 10 & Eco Park Way/ Sideroad 240	EB L	signal	30	C	0.64	107	F	1.12
	EB TR	signal	24	C	0.32	25	C	0.49
	WB LTR	signal	22	C	0.01	20	B	0.01
	NB L	signal	25	C	0.84	120	F	1.15
	NB T	signal	5	A	0.29	18	B	0.52
	NB R	signal	4	A	0.00	13	B	0.00
	SB L	signal	17	B	0.02	33	C	0.04
	SB T	signal	26	C	0.79	77	E	1.01
	SB R	signal	18	B	0.14	35	C	0.18
	overall	signal	20	C	0.83	62	E	1.16
Grey Road 9 & Russell Street	NB LR	stop	24	C	0.44	49	E	0.52
L left lane	T through lane	R right lane	LT left-through	TR through-right	LTR left-through-right			

As noted, traffic operations improve noticeably during the AM peak in 2035 given the noted improvements. However, they do not fully resolve the PM peak hour operations, and thus further improvements will be required to accommodate future traffic demands.

Recommended Improvements

The improvements otherwise recommended to serve the 2040 Background operations have been considered for the 2035 Total operations (i.e. the improvements have been accelerated in consideration of the increased volumes from the development site), which include the following:

- eastbound right turn lane on Dufferin Road 9 at Highway 10; and



- additional eastbound left turn storage on Eco Park Way at Highway 10.

The results of the analysis are provided in Table 15, which indicate that accelerating the noted additional improvements will significantly improve operations.

Table 15: Intersection Operations - 2035 Total + Improvements

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR			
			Delay	LOS	v/c	Delay	LOS	v/c	
Highway 10 & Grey Road 9/ Dufferin Road 9	EB L	signal	18	B	0.42	52	D	0.71	
	EB T	signal	17	B	0.31	33	C	0.36	
	EB R	signal	17	B	0.31	32	C	0.24	
	WB L	signal	16	B	0.09	32	C	0.25	
	WB TR	signal	17	B	0.31	41	D	0.70	
	NB L	signal	6	A	0.29	42	D	0.92	
	NB TR	signal	6	A	0.35	5	A	0.37	
	SB L	signal	9	A	0.04	18	B	0.04	
	SB TR	signal	11	B	0.42	28	C	0.74	
overall		signal	11	B	0.43	26	C	0.91	
Highway 10, Eco Park Way and Sideroad 240	EB L	signal	25	C	0.38	48	D	0.91	
	EB TR	signal	25	C	0.32	32	C	0.62	
	WB LTR	signal	23	C	0.01	25	C	0.01	
	NB L	signal	21	C	0.80	49	D	0.96	
	NB T	signal	5	A	0.28	9	A	0.44	
	NB R	signal	4	A	0.00	6	A	0.00	
	SB L	signal	16	B	0.02	23	C	0.03	
	SB T	signal	24	C	0.76	37	D	0.84	
	SB R	signal	17	B	0.15	25	C	0.19	
overall		signal	19	B	0.75	32	C	0.98	
Grey Road 9 & Russell Street		NB LR	stop	24	C	0.44	49	E	0.52
L left lane	T through lane	R right lane	LT left-through	TR through-right	LTR left-through-right				

At the Highway 10 intersection with Grey Road 9/Dufferin Road 9, overall operations improve to LOS B in the AM peak and LOS C in the PM peak, with the overall v/c ratio reduced to 0.91 during the PM peak. At the Eco Park Way/Sideroad 240 intersection, the additional eastbound left turn storage lane improves operational efficiency by reducing spillback and lane blockage during peak



periods. Overall intersection performance improves to LOS B in the AM peak and LOS C in the PM peak, with the PM peak v/c ratio approaching but remaining below capacity.

2040 Horizon

A summary of the operations in 2040 under total traffic conditions is provided in Table 16.

Table 16: Intersection Operations – 2040 Total

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Highway 10 & Grey Road 9/ Dufferin Road 9	EB L	signal	18	B	0.45	58	E	0.75
	EB T	signal	17	B	0.33	33	C	0.37
	EB R	signal	17	B	0.36	32	C	0.24
	WB L	signal	16	B	0.10	32	C	0.25
	WB TR	signal	17	B	0.32	42	D	0.71
	NB L	signal	6	A	0.31	43	D	0.93
	NB TR	signal	6	A	0.36	5	A	0.37
	SB L	signal	9	A	0.05	18	B	0.04
	SB TR	signal	12	B	0.44	28	C	0.74
	overall	signal	11	B	0.45	26	C	0.92
Highway 10, Eco Park Way and Sideroad 240	EB L	signal	32	C	0.42	51	D	0.89
	EB TR	signal	31	C	0.32	36	D	0.58
	WB LTR	signal	29	C	0.01	29	C	0.01
	NB L	signal	22	C	0.76	47	D	0.92
	NB T	signal	4	A	0.28	10	A	0.44
	NB R	signal	3	A	0.00	7	A	0.00
	SB L	signal	19	B	0.02	28	C	0.03
	SB T	signal	27	C	0.75	43	D	0.86
	SB R	signal	20	C	0.15	29	C	0.18
	overall	signal	21	C	0.72	34	C	0.94
Grey Road 9 & Russell Street	NB LR	stop	26	D	0.47	58	F	0.57
L left lane T through lane R right lane LT left-through TR through-right LTR left-through-right								

By 2040, the overall performance at both major intersections operates at acceptable levels, with delays and volume-to-capacity (v/c) ratios remaining within manageable limits. While some



movements continue to experience moderate delays, the intersections function efficiently without exceeding capacity constraints.

2045 Horizon

A summary of the operations in 2045 under total traffic conditions is provided in Table 17.

By 2045, the intersections continue to operate at stable levels, with the intersection of Highway 10 with Grey Road 9/Dufferin Road 9 reaching a v/c ratio of 0.95 in the PM peak and the intersection of Highway 10 with Eco Park Way/Sideroad 240 reaching 0.97. These values indicate that the intersections are operating near capacity but remain functional within acceptable thresholds.

It is important to note that the Dundalk Southeast development contributes significantly to the critical turning movements at the intersection of Highway 10 with Eco Park Way/Sideroad 240. Under total conditions when full build-out of all background developments and the subject development is achieved (assumed by 2035 in this study), the Dundalk Southeast development will account for 68% and 84% of the eastbound left turning volumes during AM and PM peak conditions, respectively.

Overall, with the implementation of the final recommended improvements, the road network is anticipated to accommodate future traffic demands effectively through the 2045 planning horizon. These improvements mitigate congestion issues and maintain satisfactory levels of service without the need for further major interventions.



Table 17: Intersection Operations - 2045 Total

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	v/c	Delay	LOS	v/c
Highway 10 & Grey Road 9/ Dufferin Road 9								
	EB L	signal	18	B	0.48	75	E	0.84
	EB T	signal	17	B	0.35	33	C	0.38
	EB R	signal	18	B	0.44	32	C	0.24
	WB L	signal	16	B	0.10	32	C	0.27
	WB TR	signal	17	B	0.34	42	D	0.73
	NB L	signal	6	A	0.34	47	D	0.95
	NB TR	signal	6	A	0.38	6	A	0.39
	SB L	signal	9	A	0.05	19	B	0.04
	SB TR	signal	12	B	0.45	31	C	0.80
	overall	signal	12	B	0.47	29	C	0.95
Highway 10, Eco Park Way and Sideroad 240								
	EB L	signal	27	C	0.40	57	E	0.92
	EB TR	signal	27	C	0.32	39	D	0.60
	WB LTR	signal	25	C	0.01	31	C	0.01
	NB L	signal	23	C	0.80	57	E	0.96
	NB T	signal	4	A	0.29	10	A	0.46
	NB R	signal	4	A	0.00	7	A	0.00
	SB L	signal	16	B	0.02	27	C	0.03
	SB T	signal	25	C	0.78	42	D	0.82
	SB R	signal	17	B	0.18	29	C	0.18
	overall	signal	19	B	0.75	37	D	0.97
Grey Road 9 & Russell Street								
L left lane	T through lane	R right lane	NB LR	stop	29	D	0.50	70
			LT left-through				F	0.63
			TR through-right					
			LTR left-through-right					

5.3

QUEUE OPERATIONS

Queueing at the Highway 10 intersections were reviewed at the 2045 horizon, considering the future total conditions and the road system improvements required to support such. Results of the queueing assessment are summarized below in Table 18 with detailed worksheets provided in Appendix E.



Table 18: Queue Operations – 2045 Total

INTERSECTION, CONTROL & MOVEMENT		LANE LENGTH (m)	WEEKDAY AM PEAK HOUR		WEEKDAY PM PEAK HOUR	
			50 th	95 th	50 th	95 th
Highway 10 & Grey Road 9/ Dufferin Road 9	NB L	80	5	15	84	148 ¹
Highway 10 & Eco Park Way/ Sideroad 240	EB L	225	12	20	72	109 ¹
	NB L	140	36	93	110	181 ¹

¹ 95th percentile volume exceeds capacity, queue may be longer

At the Highway 10 intersection with Grey Road 9/Dufferin Road 9, the northbound left turn lane has an available storage length of 80 metres. The 95th percentile PM peak queue is estimated at 148 metres, which exceeds the available storage and may result in occasional spillback during peak conditions. However, the 50th percentile queues are substantially shorter and remain within the available storage, indicating that exceedances are limited to infrequent peak demand conditions.

At the Highway 10 intersection with Eco Park Way/Sideroad 240, both the eastbound left turn lane (225 metres) and the northbound left turn lane (approximately 140 metres) are sufficient to accommodate projected queues with the exception of the 95th percentile queues of 181 metres for the northbound left.

5.4 SUMMARY OF RECOMMENDED IMPROVEMENTS

To ensure acceptable operations for the future total traffic through to the 2045 horizon year and beyond, the following improvements are recommended:

- 2030 Horizon (50% build out)
 - Upgrade the intersection of Highway 10 with Eco Park Way/Sideroad 240 from stop control to signalized control.
 - Provide dedicated left- and right- turn lanes with appropriate storage, parallel deceleration, and taper lengths to enhance traffic flow and accommodate peak-hour demands.
- 2035 Horizon (100% build out)
 - Increase capacity on Highway 10 to a 4-lane cross section (2 lanes per direction) with advanced green for left turning movement for northbound traffic at the Highway 10 intersections with Grey Road 9/Dufferin Road 9 and Eco Park Way/Sideroad 240.
 - Provide a right turn storage lane for eastbound traffic on Grey Road 9.



- Provide additional left turn storage lane for eastbound traffic on Eco Park Way

It should be noted, however, that traffic projections are based on assumed build-out and timing of several background developments. Given the uncertainty surrounding the pace and scale at which these developments may proceed, it is recommended that the municipality undertake periodic monitoring of growth and development activity. This will ensure that the transportation network performance is regularly assessed, and that timely adjustments or additional improvements can be implemented if required.



6 Summary

6.1 PROPOSED DEVELOPMENT

This study has addressed the transportation impacts associated with the subject property's development located at 772082 Highway 10. The subject property's development includes 40 townhouses, 182 single-detached homes, and 550 apartment units with 11,823 m² of ground floor commercial area, based on a conceptual site plan layout which will be confirmed as the project advances. Trip generation estimates are based on preliminary land use assumptions provided by the developer. As these details are subject to change, any modifications to unit types or quantities may necessitate updates to the traffic analysis.

6.2 TRANSPORTATION ASSESSMENT

In addressing the study area traffic operations, the intersections of Highway 10 with Dufferin Road 9/Grey Road 9 and the site access of Eco Park Way were analyzed under existing (2025) and future (2030, 2035, 2040 and 2045) horizon years. The review included an assessment of intersection operations and queue operations based on improvements proposed in the TIS for Dundalk SE development. Based on the assessment of existing, background and total conditions, the following improvements are recommended:

- 2030 Horizon (50% build out)
 - upgrading the intersection of Highway 10, Eco Park Way and Sideroad 240 from stop control to signalized intersection. Furthermore, dedicated left- and right-turn lanes with appropriate storage, parallel deceleration, and taper lengths to enhance traffic flow and accommodate peak-hour demands.
- 2035 Horizon (100% build out)
 - Increasing capacity on Highway 10 to a 4-lane cross section (2 lanes per direction) with advanced green for left turning movement for northbound traffic on both Highway 10 intersections with Dufferin Road 9 and Eco Park Way.
 - right turn storage lane for eastbound traffic on Grey Road 9 and additional left turn storage lane for eastbound traffic on Eco Park Way

As with the background conditions, the operating conditions for the future total conditions will be largely dictated by the completion of the background developments identified in the report. Should the developments not proceed as assumed, or the volumes not occur as projected, the need for the timing of the above noted intersection improvements should be confirmed. Thus, it

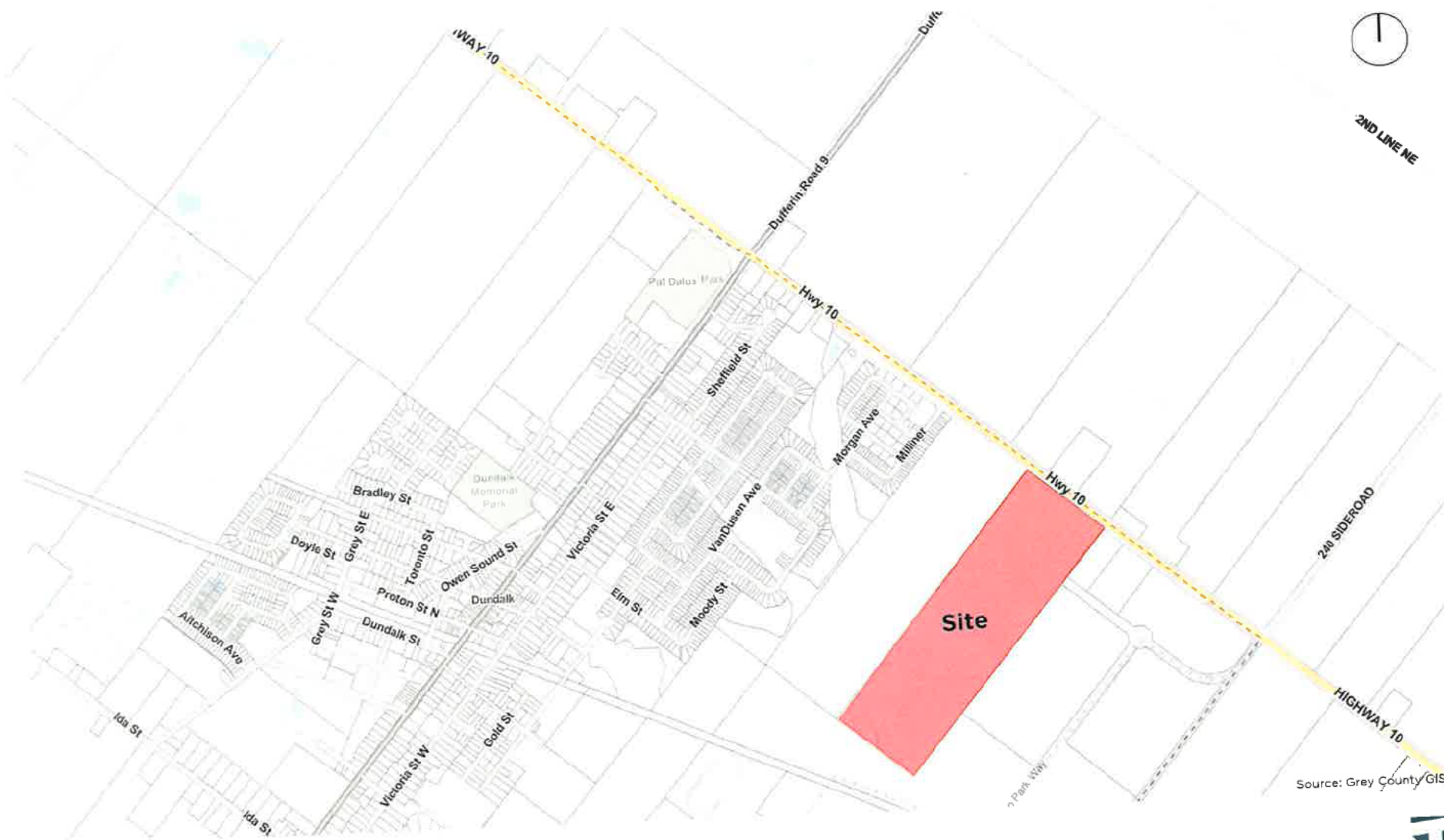


is recommended that ongoing monitoring of development and traffic levels be conducted to confirm the need for the timing of the recommended improvements.

6.3 SIGHT LINES

The available sight lines along Highway 10 at Eco Park Way were reviewed and determined to exceed the Transportation Association of Canada guidelines for sight distance requirements.





772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

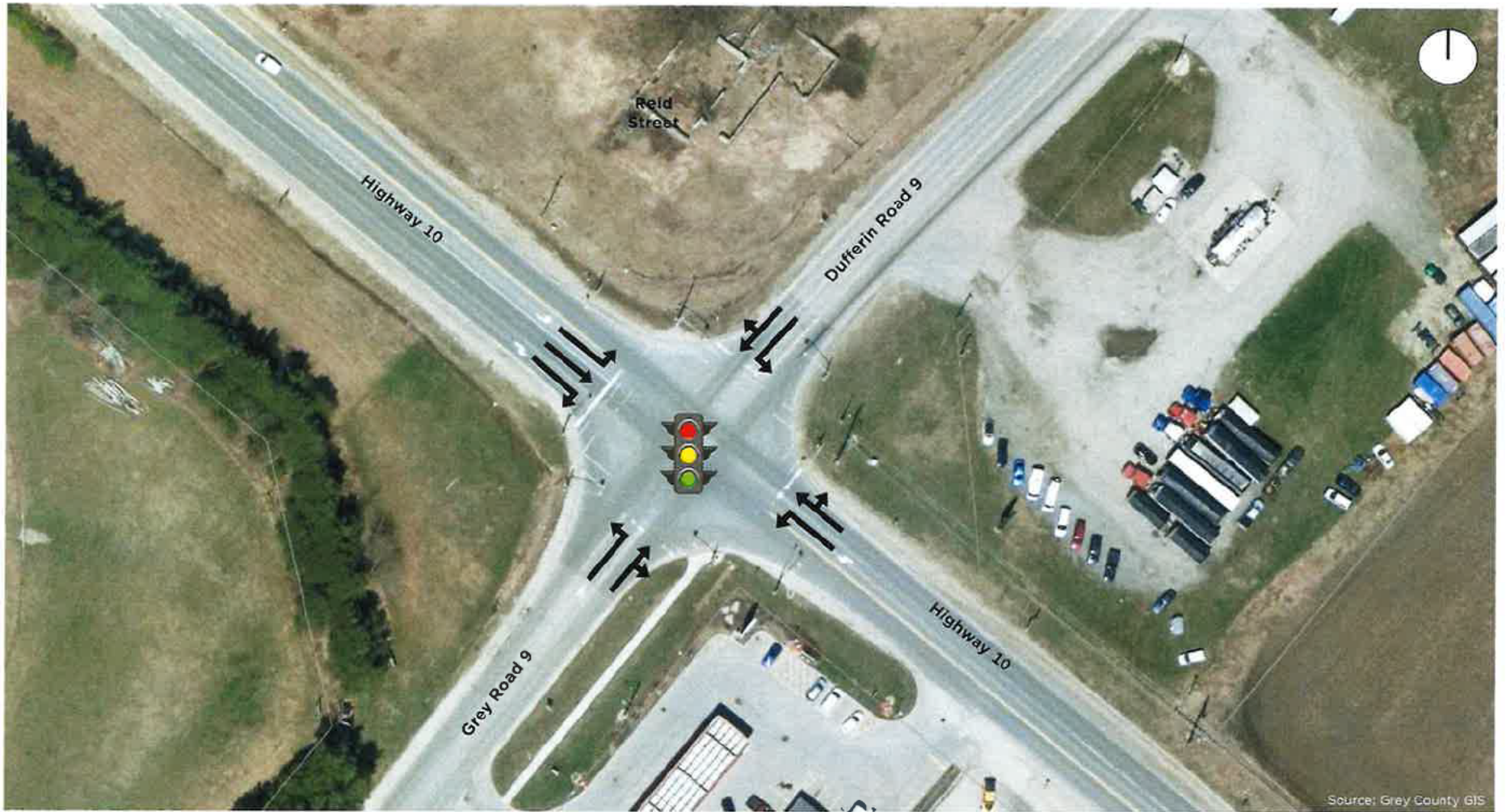
Figure 1: Site Location



772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure 2: Road Network



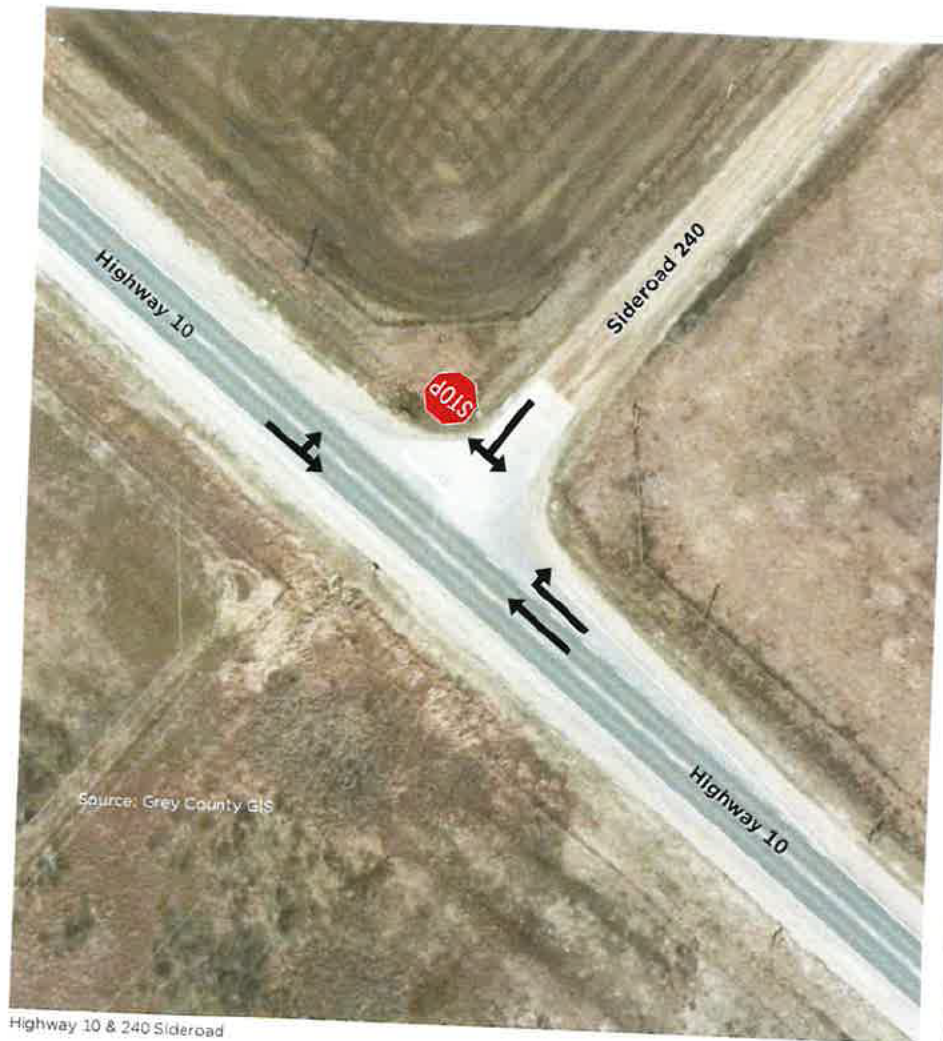


Highway 10 and Grey Road 9/Dufferin Road 9

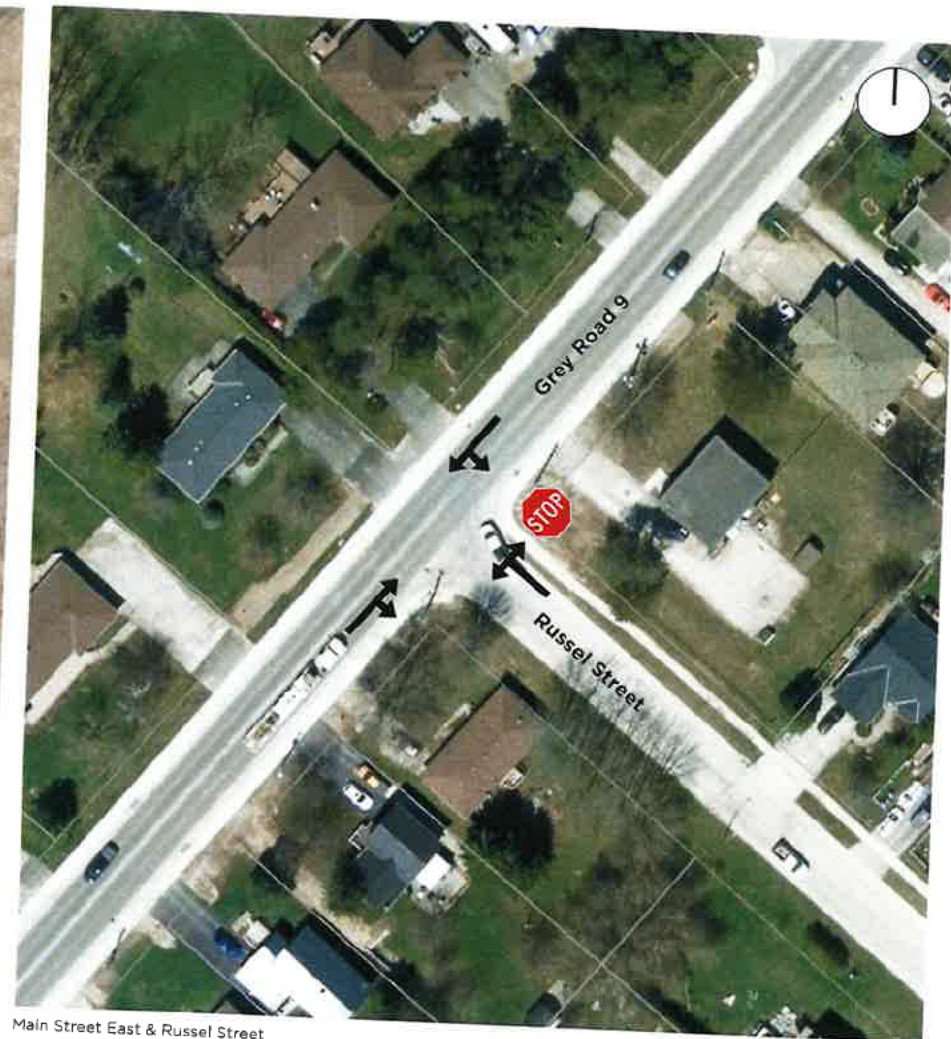
772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure 3: Study Area Intersection





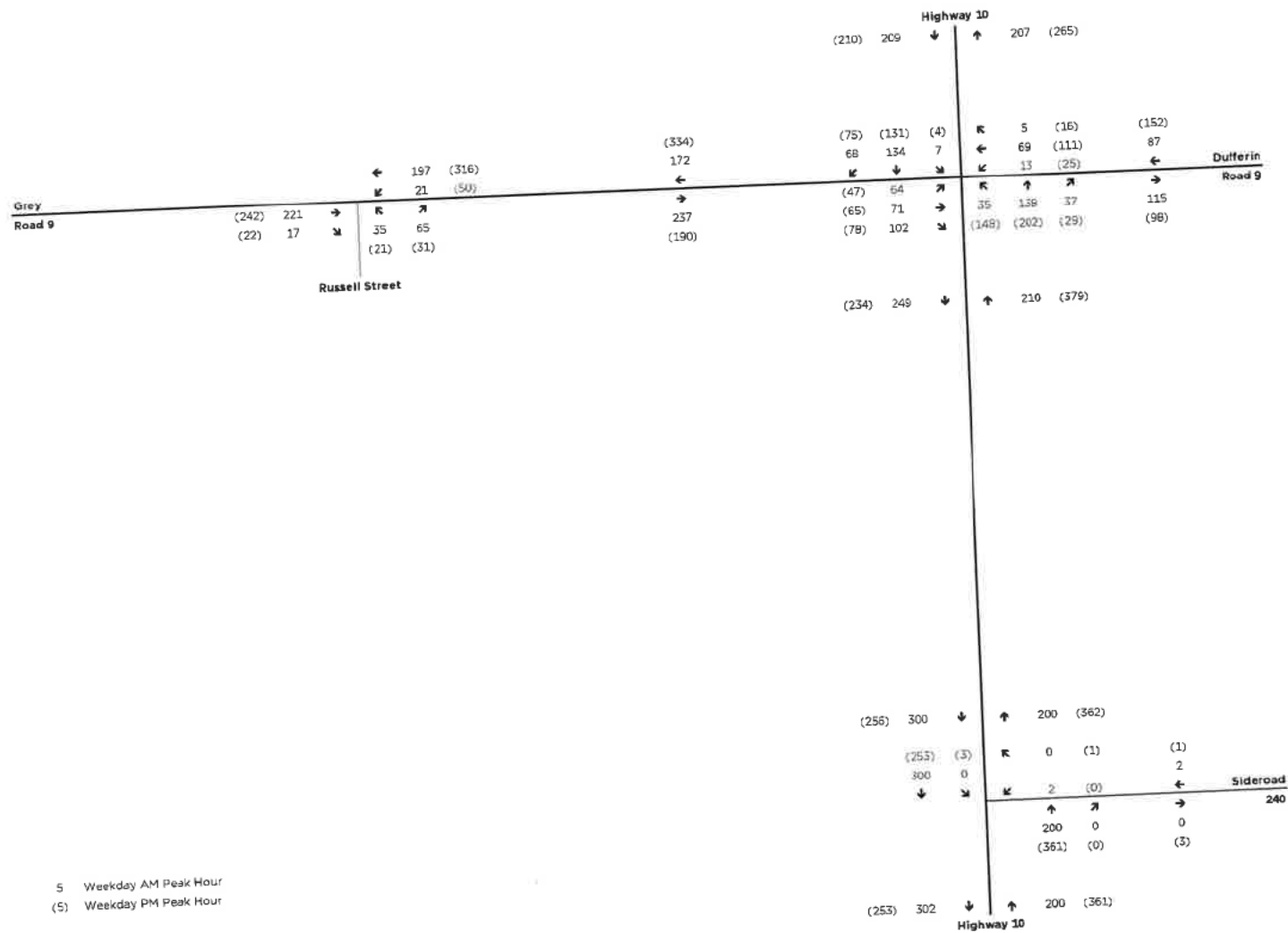
Highway 10 & 240 Sideroad



Main Street East & Russel Street

772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY
Figure 3: Study Area Intersection

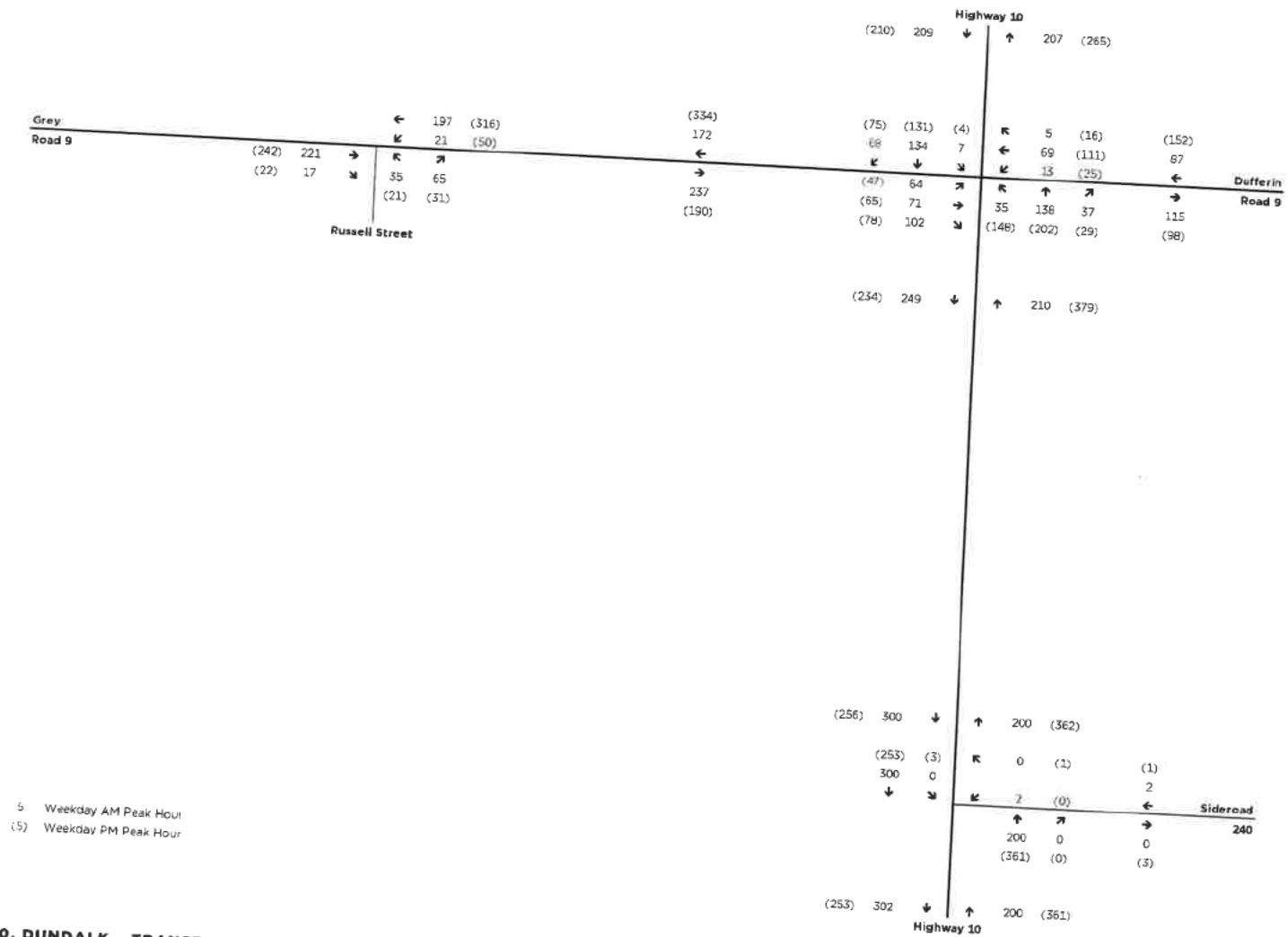




772082 HIGHWAY 10, DUNDALK – TRANSPORTATION IMPACT STUDY

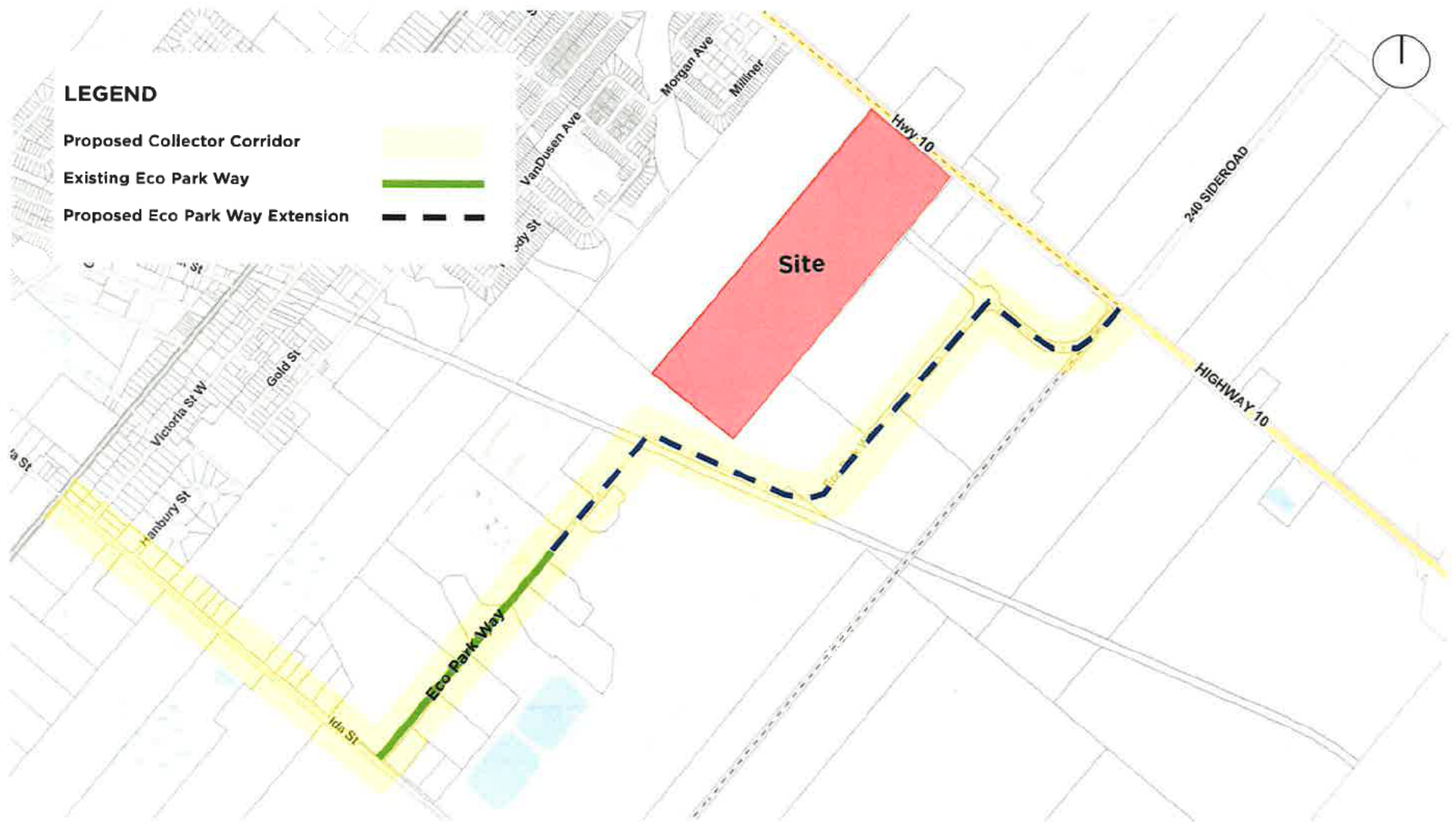
Figure 4: Traffic Volumes – 2025 Counts





772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY
 Figure 5: Traffic Volumes - 2025 (Seasonal Adjustment)





772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure 6: Eco Park Way Extension



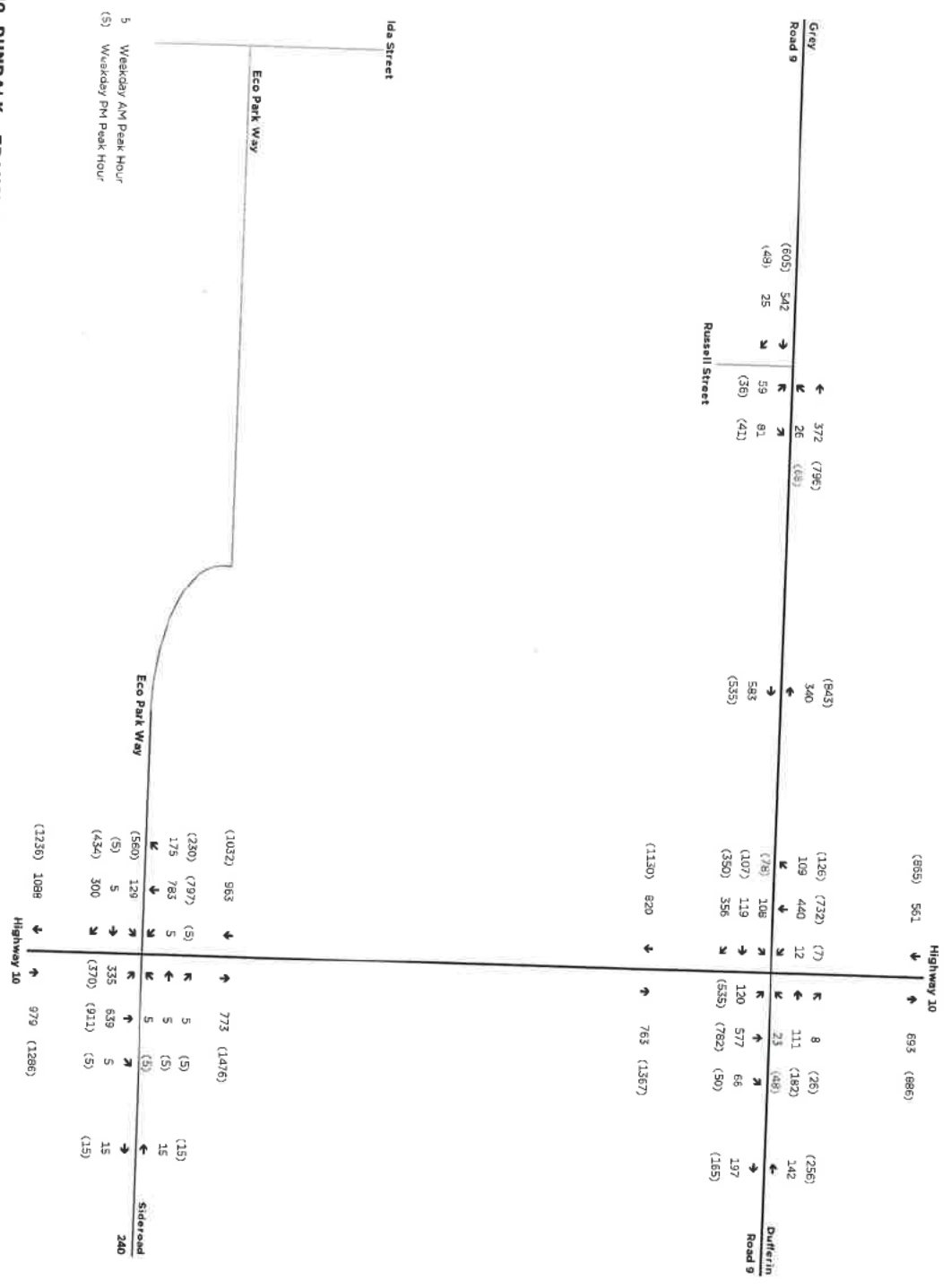


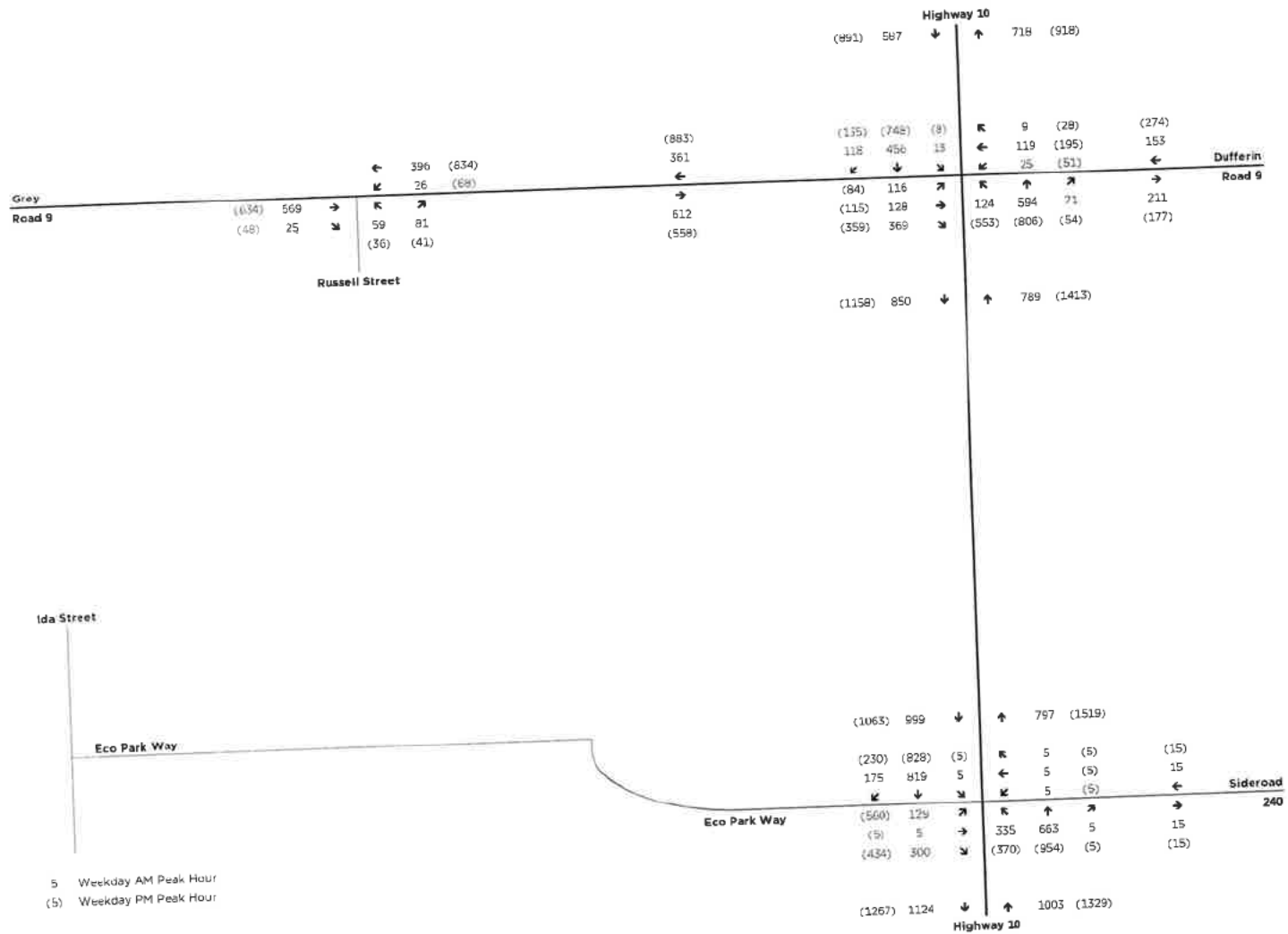
772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure 7: Background Developments



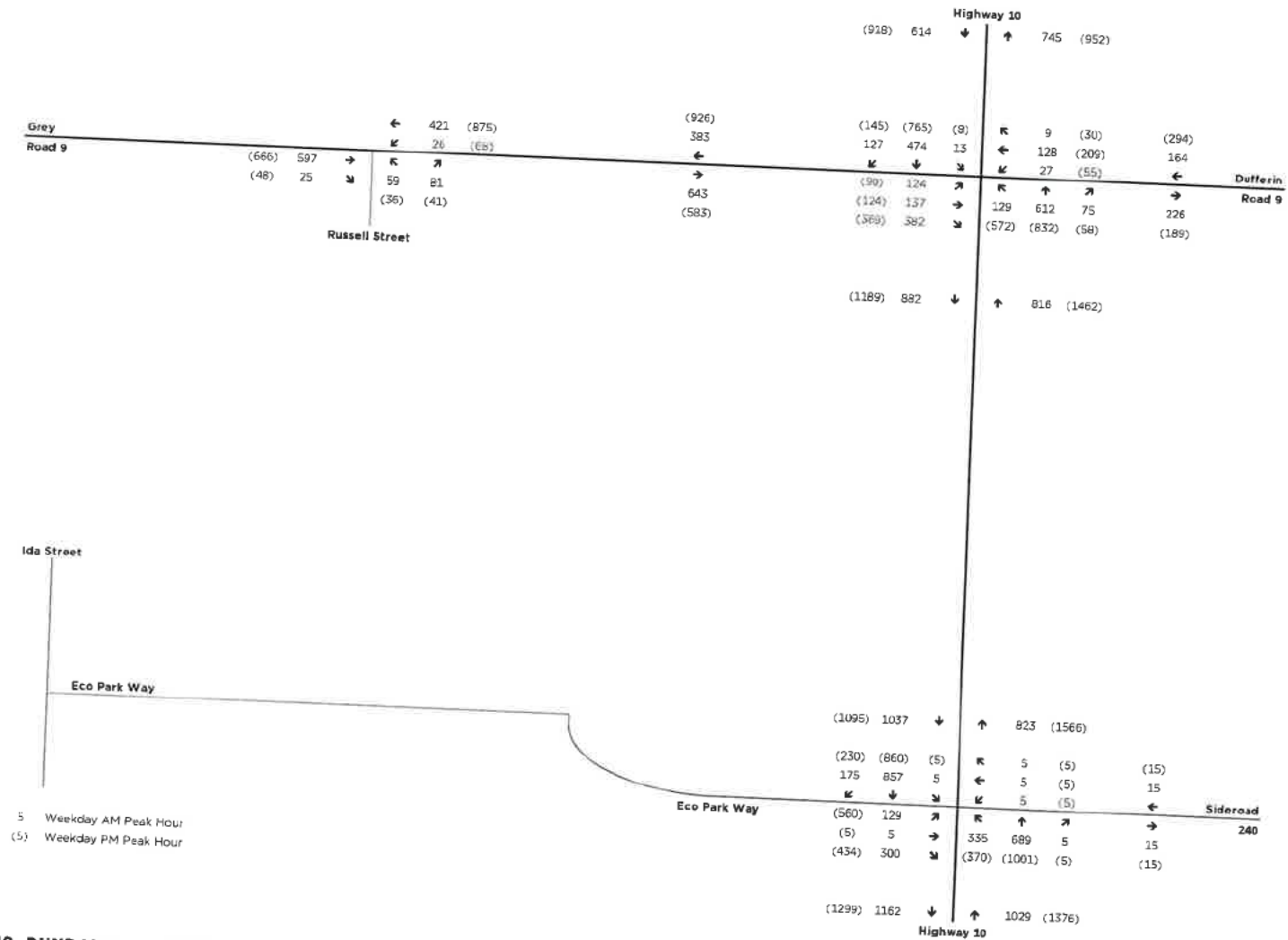
772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY
 Figure 9: Traffic Volumes - 2035 Background





772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure 10: Traffic Volumes - 2040 Background



772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY
 Figure 11: Traffic Volumes - 2045 Background



LEGEND

-  Subject Lands (313,283.95m² / 31.33 ha)
-  Development Limit (242,104.55m² / 24.21 ha)
-  Single Detached Dwellings (92,788.69m² / 9.28 ha)
-  Standard Townhouse Dwellings (8,069.15m² / 0.81 ha)
-  Commercial Mixed-Use (61,292.33m² / 6.13 ha)
-  Park (4,087.05m² / 0.41 ha)
-  Walkways (720.00m² / 0.07 ha)
-  S.W.M. Ponds (19,631.88m² / 1.96 ha)
-  Open Space (1,921.65m² / 0.19 ha)
-  Environmental Protection (64,437.32m² / 6.44 ha)



772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure 12: Site Plan





Looking North on Highway 10 from Site Access (Eco Park Way)



Looking South on Highway 10 from Site Access (Eco Park Way)

772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure 13A: Highway 10 & Eco Park Way Sight Lines

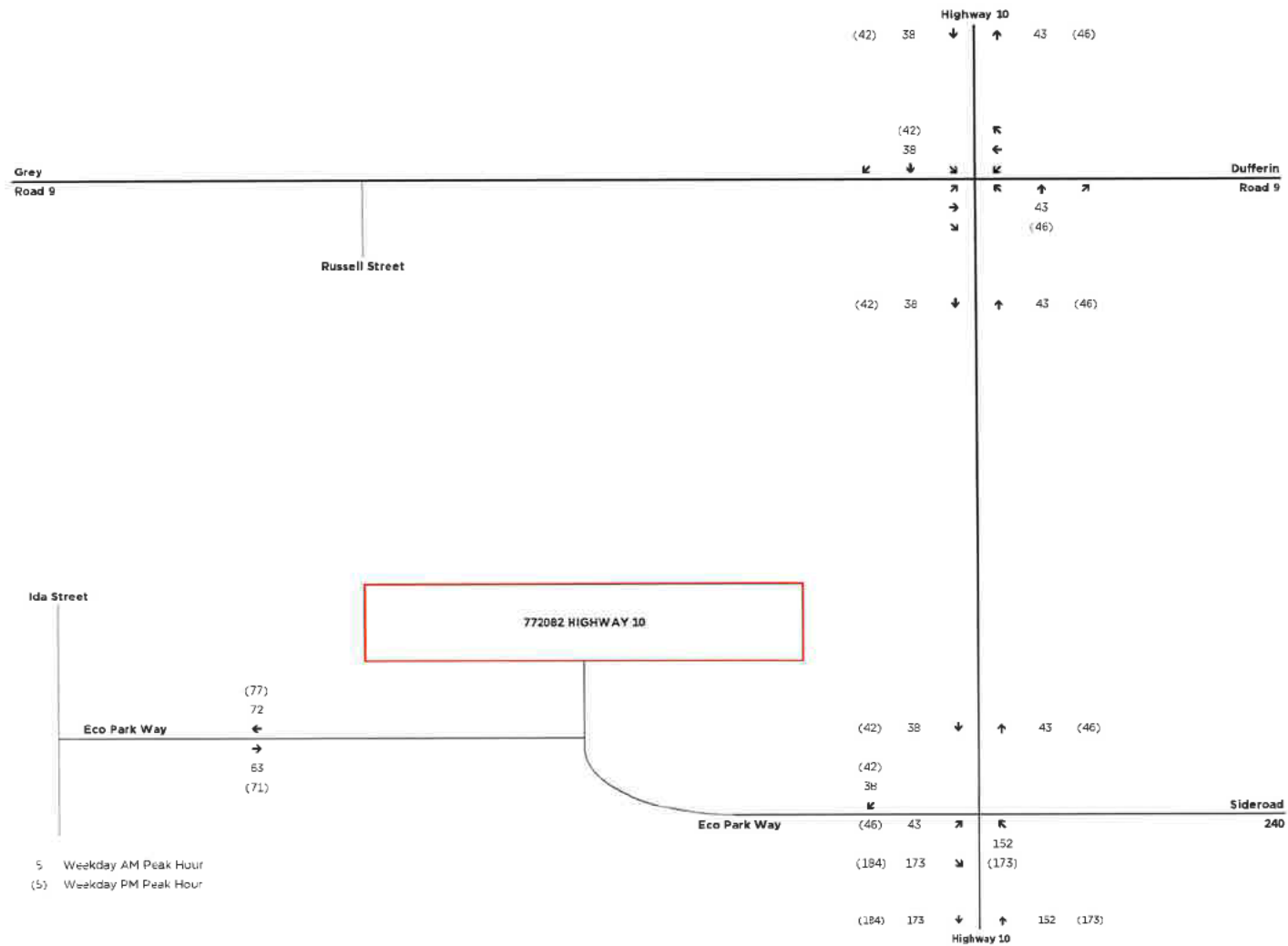


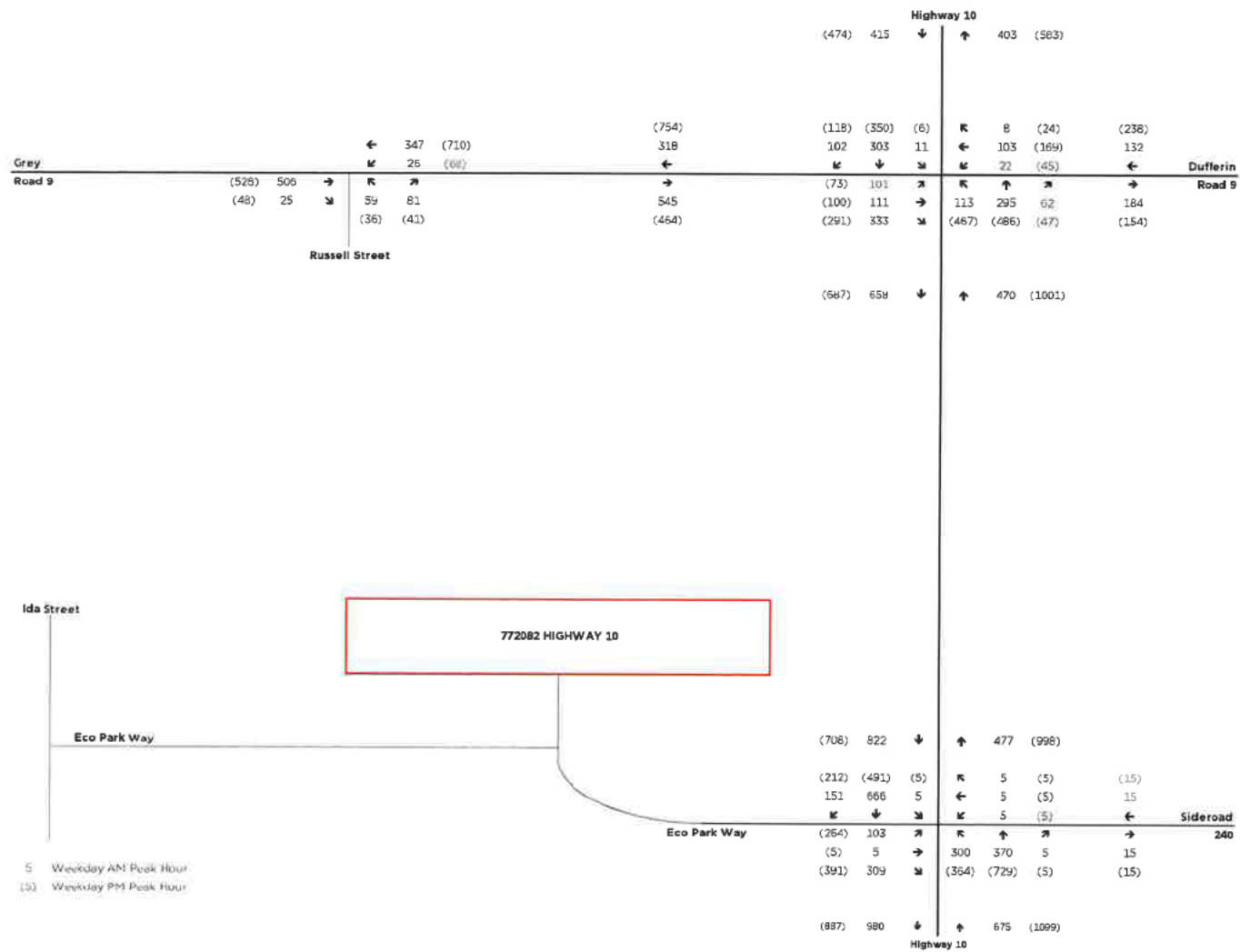


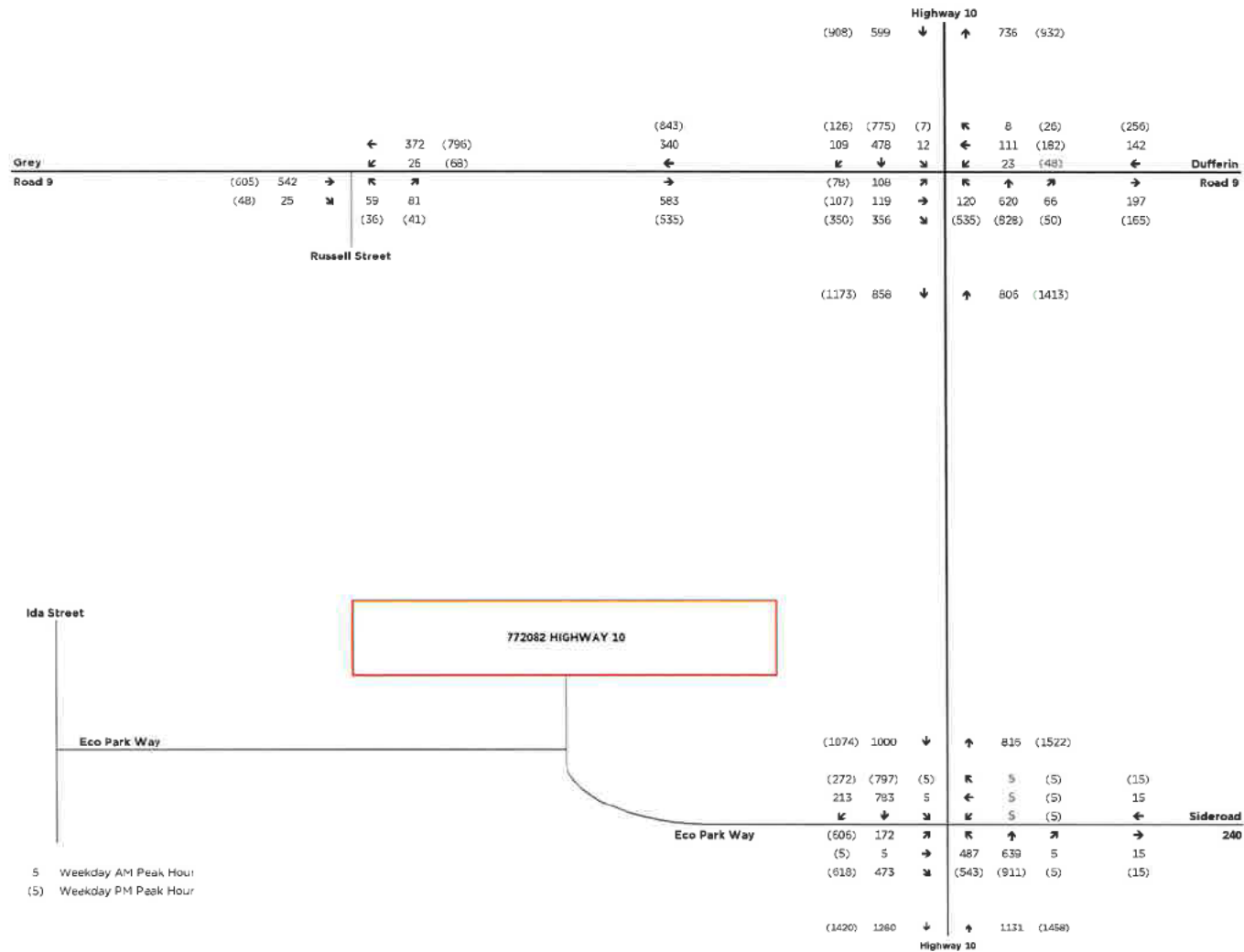
772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

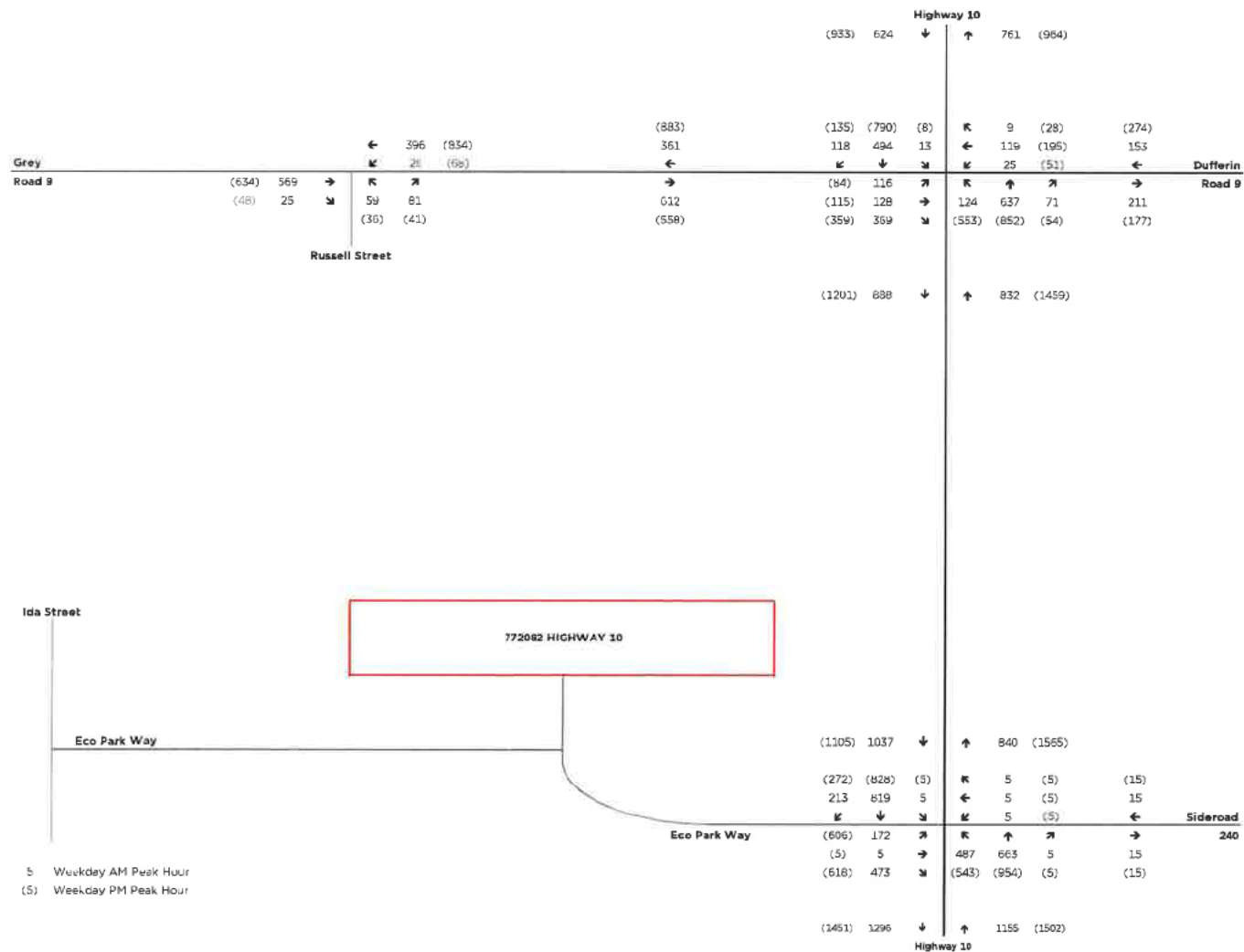
Figure 13B: Highway 10 & Eco Park Way Sight Lines







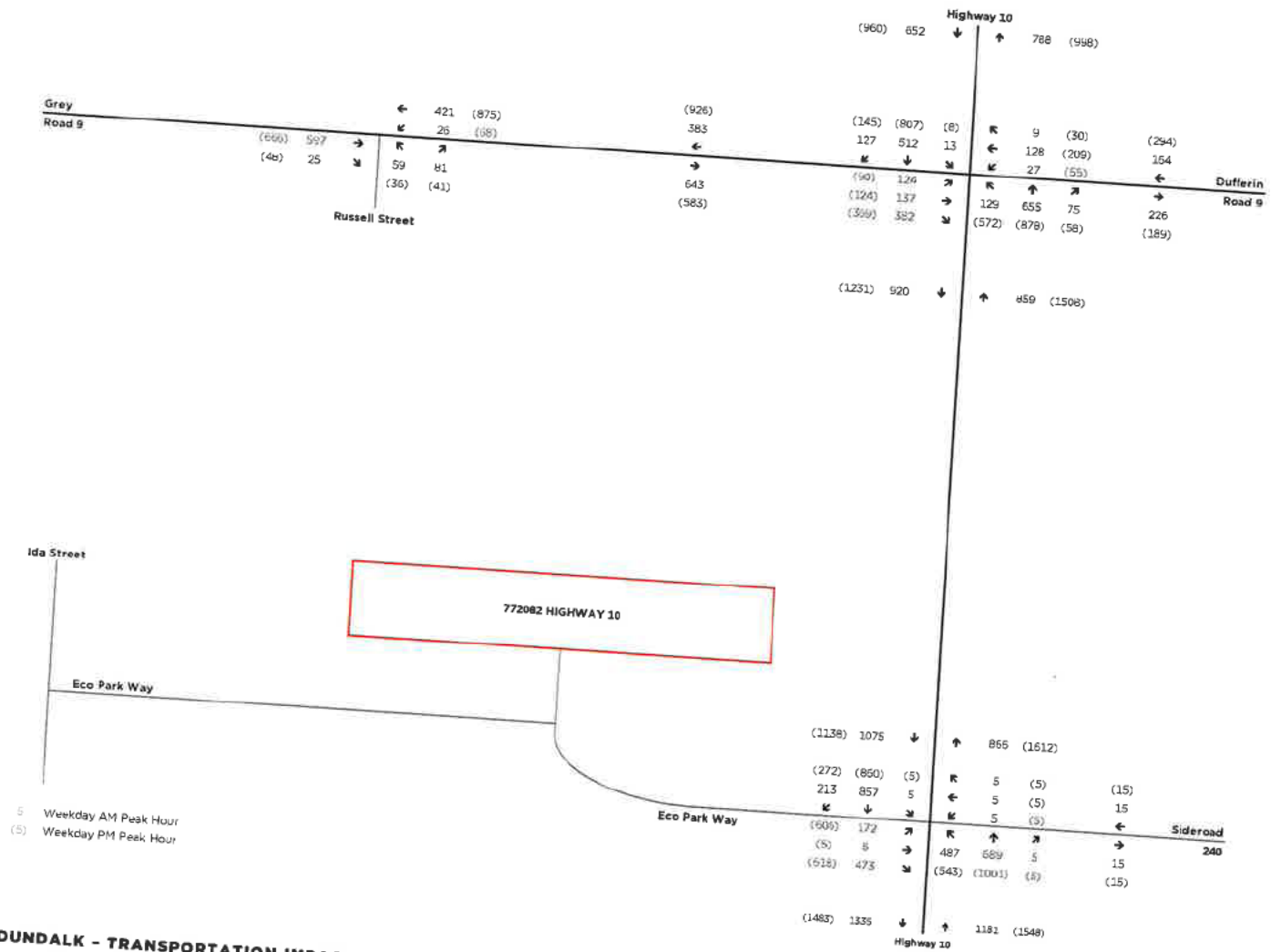




772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure 17: Traffic Volumes - 2040 Total





772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY
 Figure 18: Traffic Volumes - 2045 Total



Appendix A: Traffic Counts

Highway 10 & County Road 9

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 18:00:00

One Hour Peak

From: 16:30:00

To: 17:30:00

Municipality: Dundalk

Site #: 0000001202

Intersection: Highway 10 & County Road 9

TFR File #: 1

Count date: 18-Mar-2025

Weather conditions:

Clear

Person(s) who counted:

**** Signalized Intersection ****

Major Road: Highway 10 runs N/S

North Leg Total: 475

North Entering: 210

North Peds: 0

Peds Cross: 0

Heavys	3	6	3	12
Trucks	2	5	0	7
Cars	70	120	1	191
Totals	75	131	4	

Heavys 14

Trucks 5

Cars 246

Totals 265

East Leg Total: 250

East Entering: 152

East Peds: 0

Peds Cross: 0

Heavys	Trucks	Cars	Totals
5	8	321	334



County Road 9

Heavys	Trucks	Cars	Totals
2	0	45	47
0	3	62	65
2	2	74	78
4	5	181	

Peds Cross: 0

West Peds: 0

West Entering: 190

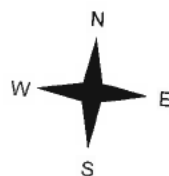
West Leg Total: 524

Cars 218

Trucks 7

Heavys 9

Totals 234



Highway 10

Cars	146	191	29	366
Trucks	2	4	0	6
Heavys	0	7	0	7
Totals	148	202	29	

Cars	Trucks	Heavys	Totals
10	1	5	16
105	4	2	111
24	0	1	25
139	5	8	

County Road 9



Cars	Trucks	Heavys	Totals
92	3	3	98

Peds Cross: 0

South Peds: 0

South Entering: 379

South Leg Total: 613

Comments

There were no cyclists.

Highway 10 & County Road 9

Total Count Diagram

Municipality: Dundalk
Site #: 0000001202
Intersection: Highway 10 & County Road 9
TFR File #: 1
Count date: 18-Mar-2025

Weather conditions:

Clear

Person(s) who counted:

Major Road: Highway 10 runs N/S

** Signalized Intersection **

North Leg Total: 3141
 North Entering: 1504
 North Peds: 0
 Peds Cross: ∞

	Heavys	Trucks	Cars	Totals
North	22	9	435	466
South	78	33	879	990
East	16	3	29	48
West	116	45	1343	1472

Heavys 116
 Trucks 49
 Cars 1472
 Totals 1637

East Leg Total: 1441
 East Entering: 761
 East Peds: 0
 Peds Cross: ∞

Heavys	Trucks	Cars	Totals
68	49	1612	1729

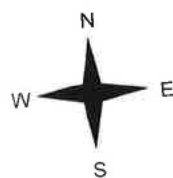


County Road 9

Heavys	Trucks	Cars	Totals
20	9	362	391
21	25	397	443
16	9	657	682
57	43	1416	

Peds Cross: ∞
 West Peds: 0
 West Entering: 1516
 West Leg Total: 3245

Cars 1655
 Trucks 55
 Heavys 107
 Totals 1817



Highway 10

Highway 10

Cars	Trucks	Heavys	Totals
696	11	20	727
1054	34	78	1166
172	10	7	189
1922	55	105	

Cars	Trucks	Heavys	Totals
56	6	18	80
481	29	26	536
119	13	13	145
656	48	57	

County Road 9

Cars	Trucks	Heavys	Totals
598	38	44	680

Peds Cross: ∞
 South Peds: 4
 South Entering: 2082
 South Leg Total: 3899

Comments

There were no cyclists.

Highway 10 & County Road 9

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 14:00:00

One Hour Peak

From: 11:15:00

To: 12:15:00

Municipality: Dundalk

Site #: 0000001202

Intersection: Highway 10 & County Road 9

TFR File #: 1

Count date: 18-Mar-2025

Weather conditions:

Clear

Person(s) who counted:

**** Signalized Intersection ****

Major Road: Highway 10 runs N/S

North Leg Total: 344

North Entering: 169

North Peds: 0

Peds Cross: ∞

Heavys	3	11	2	16
Trucks	0	3	1	4
Cars	36	107	6	149
Totals	39	121	9	

Heavys 14

Trucks 3

Cars 158

Totals 175

East Leg Total: 180

East Entering: 95

East Peds: 0

Peds Cross: ∞

Heavys	Trucks	Cars	Totals
11	7	153	171



County Road 9

Heavys	Trucks	Cars	Totals
3	1	32	36
4	5	46	55
2	0	63	65
9	6	141	



Highway 10



Cars	Trucks	Heavys	Totals
8	0	2	10
57	4	4	65
15	5	0	20
80	9	6	

County Road 9



Cars	Trucks	Heavys	Totals
71	7	7	85

Peds Cross: ∞
West Peds: 0
West Entering: 156
West Leg Total: 327

Cars	185
Trucks	8
Heavys	13
Totals	206



Cars	60	118	19	197
Trucks	3	2	1	6
Heavys	4	9	1	14
Totals	67	129	21	

Peds Cross: ∞
South Peds: 1
South Entering: 217
South Leg Total: 423

Comments

There were no cyclists.

Highway 10 & County Road 9

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 9:00:00

One Hour Peak

From: 7:30:00

To: 8:30:00

Municipality: Dundalk

Site #: 0000001202

Intersection: Highway 10 & County Road 9

TFR File #: 1

Count date: 18-Mar-2025

Weather conditions:

Clear

Person(s) who counted:

**** Signalized Intersection ****

Major Road: Highway 10 runs N/S

North Leg Total: 416

North Entering: 209

North Peds: 0

Peds Cross: ∞

Heavys	2	7	4	13
Trucks	1	7	0	8
Cars	65	120	3	188
Totals	68	134	7	

Heavys 15

Trucks 15

Cars 177

Totals 207

East Leg Total: 202

East Entering: 87

East Peds: 0

Peds Cross: ∞

Heavys	Trucks	Cars	Totals
10	5	157	172

Heavys	Trucks	Cars	Totals
3	5	56	64
5	3	63	71
1	1	100	102
9	9	219	

Peds Cross: ∞

West Peds: 0

West Entering: 237

West Leg Total: 409

Cars	230
Trucks	9
Heavys	10
Totals	249

Cars	31	119	33	183
Trucks	0	8	2	10
Heavys	4	11	2	17
Totals	35	138	37	

Peds Cross: ∞

South Peds: 0

South Entering: 210

South Leg Total: 459

Comments

There were no cyclists.

Highway 10 & County Road 9

Traffic Count Summary

Intersection: Highway 10 & County Road 9

Count Date: 18-Mar-2025

Municipality: Dundalk

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	10	129	68	207	0	385	8:00:00	24	120	34	178	0
9:00:00	2	130	65	197	0	398	9:00:00	50	119	32	201	0
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	9	111	38	158	0	384	12:00:00	68	132	26	226	1
13:00:00	4	100	37	141	0	346	13:00:00	67	123	15	205	0
14:00:00	3	131	44	178	0	391	14:00:00	85	114	14	213	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	12	129	78	219	0	551	16:00:00	129	178	25	332	1
17:00:00	6	120	65	191	0	570	17:00:00	155	203	21	379	2
18:00:00	2	140	71	213	0	561	18:00:00	149	177	22	348	0
Totals:	48	990	466	1504	0	3586		727	1166	189	2082	4
East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	10	45	7	62	0	292	8:00:00	55	62	113	230	0
9:00:00	16	71	8	95	0	305	9:00:00	63	56	91	210	0
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	15	60	12	87	0	242	12:00:00	37	53	65	155	0
13:00:00	19	55	8	82	0	257	13:00:00	44	53	78	175	0
14:00:00	25	48	5	78	0	242	14:00:00	45	31	88	164	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	19	72	14	105	0	310	16:00:00	61	61	83	205	0
17:00:00	20	76	15	111	0	300	17:00:00	50	61	78	189	0
18:00:00	21	109	11	141	0	329	18:00:00	36	66	86	188	0
Totals:	145	536	80	761	0	2277		391	443	682	1516	0
Calculated Values for Traffic Crossing Major Street												
Hours Ending:	8:00	9:00	12:00	13:00			14:00	16:00	17:00	18:00		
Crossing Values:	127	150	113	118			118	153	148	166		

Highway 10 & 240 Sideroad

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 9:00:00

One Hour Peak

From: 7:30:00

To: 8:30:00

Municipality: Dundalk

Site #: 0000001201

Intersection: Highway 10 & 240 Sideroad

TFR File #: 1

Count date: 18-Mar-2025

Weather conditions:

Clear

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 10 runs N/S

North Leg Total: 500

North Entering: 300

North Peds: 0

Peds Cross: ∅

Heavys	8	0	8
Trucks	9	0	9
Cars	283	0	283
Totals	300	0	

Heavys	19
Trucks	8
Cars	173
Totals	200

East Leg Total: 2

East Entering: 2

East Peds: 0

Peds Cross: ∅



	Cars	Trucks	Heavys	Totals
Northbound	0	0	0	0
Southbound	1	1	0	2
	1	1	0	

240 Sideroad



	Cars	Trucks	Heavys	Totals
Eastbound	0	0	0	0
Westbound	0	0	0	0

Cars	284	Cars	173	0	173
Trucks	10	Trucks	8	0	8
Heavys	8	Heavys	19	0	19
Totals	302	Totals	200	0	

Peds Cross: ∅

South Peds: 0

South Entering: 200

South Leg Total: 502

Comments

There were no cyclists

Highway 10 & 240 Sideroad

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 14:00:00

One Hour Peak

From: 13:00:00

To: 14:00:00

Municipality: Dundalk

Site #: 0000001201

Intersection: Highway 10 & 240 Sideroad

TFR File #: 1

Count date: 18-Mar-2025

Weather conditions:

Clear

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 10 runs N/S

North Leg Total: 444

North Entering: 248

North Peds: 0

Peds Cross: ∞

Heavys	17	0	17
Trucks	6	0	6
Cars	223	2	225
Totals	246	2	

Heavys	15
Trucks	4
Cars	177
Totals	196

East Leg Total: 4

East Entering: 2

East Peds: 0

Peds Cross: ∞

Highway 10



Cars	Trucks	Heavys	Totals
1	0	0	1
1	0	0	1
2	0	0	

240 Sideroad

Highway 10

Cars	224
Trucks	6
Heavys	17
Totals	247

Cars	176	0	176
Trucks	4	0	4
Heavys	15	0	15
Totals	195	0	

Cars	Trucks	Heavys	Totals
2	0	0	2

Peds Cross: ∞

South Peds: 0

South Entering: 195

South Leg Total: 442

Comments

There were no cyclists

Highway 10 & 240 Sideroad

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 18:00:00

One Hour Peak

From: 15:15:00

To: 16:15:00

Municipality: Dundalk
Site #: 0000001201
Intersection: Highway 10 & 240 Sideroad
TFR File #: 1
Count date: 18-Mar-2025

Weather conditions:

Clear

Person(s) who counted:

** Non-Signalized Intersection **

Major Road: Highway 10 runs N/S

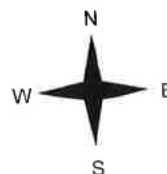
North Leg Total: 618
 North Entering: 256
 North Peds: 0
 Peds Cross: ∞

Heavys	18	0	18
Trucks	6	0	6
Cars	229	3	232
Totals	253	3	

Heavys	14
Trucks	1
Cars	347
Totals	362

East Leg Total: 4
 East Entering: 1
 East Peds: 0
 Peds Cross: ∞

Highway 10



	Cars	Trucks	Heavys	Totals
Left Turn	1	0	0	1
Through/Right	0	0	0	0
Total	1	0	0	

240 Sideroad

	Cars	Trucks	Heavys	Totals
Through/Right	3	0	0	3

Highway 10

Cars	229
Trucks	6
Heavys	18
Totals	253

Cars	346	0	346
Trucks	1	0	1
Heavys	14	0	14
Totals	361	0	

Peds Cross: ∞
 South Peds: 0
 South Entering: 361
 South Leg Total: 614

Comments

There were no cyclists

Highway 10 & 240 Sideroad

Total Count Diagram

Municipality: Dundalk
Site #: 0000001201
Intersection: Highway 10 & 240 Sideroad
TFR File #: 1
Count date: 18-Mar-2025

Weather conditions:

Clear

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Highway 10 runs N/S

North Leg Total: 3903

North Entering: 1918

North Peds: 0

Peds Cross: ∞

Heavys	105	0	105
Trucks	45	1	46
Cars	1757	10	1767
Totals	1907	11	

Heavys	100
Trucks	51
Cars	1834
Totals	1985

East Leg Total:	27
East Entering:	12
East Peds:	0
Peds Cross:	∞

Highway 10



Cars	Trucks	Heavys	Totals
7	1	0	8
2	1	1	4
9	2	1	

240 Sideroad

Highway 10

Cars	1759
Trucks	46
Heavys	106
Totals	1911

Cars	1827	3	1830
Trucks	50	0	50
Heavys	100	1	101
Totals	1977	4	

Cars	Trucks	Heavys	Totals
13	1	1	15

Peds Cross:	∞
South Peds:	0
South Entering:	1981
South Leg Total:	3892

Comments

There were no cyclists

Highway 10 & 240 Sideroad Traffic Count Summary

Intersection: Highway 10 & 240 Sideroad

Count Date: 18-Mar-2025

Municipality: Dundalk

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	0	318	0	318	0	477	8:00:00	0	159	0	159	0
9:00:00	1	270	0	271	0	454	9:00:00	0	183	0	183	0
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	2	191	0	193	0	416	12:00:00	0	222	1	223	0
13:00:00	2	195	0	197	0	372	13:00:00	0	174	1	175	0
14:00:00	2	246	0	248	0	443	14:00:00	0	195	0	195	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	3	233	0	236	0	575	16:00:00	0	339	0	339	0
17:00:00	0	211	0	211	0	553	17:00:00	0	341	1	342	0
18:00:00	1	243	0	244	0	609	18:00:00	0	364	1	365	0
Totals:	11	1907	0	1918	0	3899		0	1977	4	1981	0
East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	1	0	0	1	0	1	8:00:00	0	0	0	0	0
9:00:00	1	0	1	2	0	2	9:00:00	0	0	0	0	0
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	0	0	1	1	0	1	12:00:00	0	0	0	0	0
13:00:00	0	0	3	3	0	3	13:00:00	0	0	0	0	0
14:00:00	1	0	1	2	0	2	14:00:00	0	0	0	0	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	0	0	1	1	0	1	16:00:00	0	0	0	0	0
17:00:00	1	0	0	1	0	1	17:00:00	0	0	0	0	0
18:00:00	0	0	1	1	0	1	18:00:00	0	0	0	0	0
Totals:	4	0	8	12	0	12		0	0	0	0	0

Calculated Values for Traffic Crossing Major Street

Hours Ending: 8:00 9:00 12:00 13:00 14:00 16:00 17:00 18:00
 Crossing Values: 1 1 0 0 1 0 1 0

Grey Road 9 (Main Street E) & Russell St

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 9:00:00

One Hour Peak

From: 8:00:00

To: 9:00:00

Municipality: Dundalk

Site #: 0000001203

Intersection: Grey Road 9 (Main Street E) & Rus

TFR File #: 1

Count date: 18-Mar-2025

Weather conditions:

Clear

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Grey Road 9 (Main Street E) runs V

East Leg Total: 504

East Entering: 218

East Peds: 0

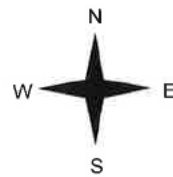
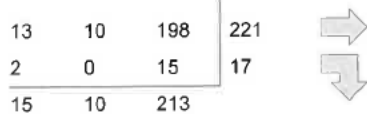
Peds Cross: X

Heavys	Trucks	Cars	Totals
14	5	213	232



Grey Road 9 (Main Street E)

Heavys	Trucks	Cars	Totals
13	10	198	221
2	0	15	17
15	10	213	



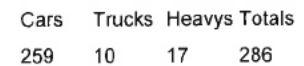
Russell St

Cars	Trucks	Heavys	Totals
182	5	10	197
19	0	2	21
201	5	12	



Grey Road 9 (Main Street E)

Cars	Trucks	Heavys	Totals
259	10	17	286



Peds Cross: X
West Peds: 2
West Entering: 238
West Leg Total: 470

Cars	Trucks	Heavys	Totals
34	0	4	38



Cars	Trucks	Heavys	Totals
31	0	4	35
61	0	4	65

Peds Cross: X
South Peds: 8
South Entering: 100
South Leg Total: 138

Comments

Grey Road 9 (Main Street E) & Russell St

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 14:00:00

One Hour Peak

From: 11:45:00

To: 12:45:00

Municipality: Dundalk

Site #: 0000001203

Intersection: Grey Road 9 (Main Street E) & Rus

TFR File #: 1

Count date: 18-Mar-2025

Weather conditions:

Clear

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Grey Road 9 (Main Street E) runs W

East Leg Total: 417

East Entering: 197

East Peds: 0

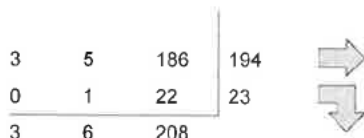
Peds Cross: X

Heavys	Trucks	Cars	Totals
4	12	187	203



Grey Road 9 (Main Street E)

Heavys	Trucks	Cars	Totals
3	5	186	194
0	1	22	23
3	6	208	



Peds Cross: X
West Peds: 5
West Entering: 217
West Leg Total: 420

Cars	36
Trucks	1
Heavys	0
Totals	37



Russell St



Cars	19	26	45
Trucks	1	0	1
Heavys	0	0	0
Totals	20	26	

Cars	Trucks	Heavys	Totals
168	11	4	183
14	0	0	14
182	11	4	



Grey Road 9 (Main Street E)

Cars	Trucks	Heavys	Totals
212	5	3	220

Peds Cross: X
South Peds: 2
South Entering: 46
South Leg Total: 83

Comments

#

Grey Road 9 (Main Street E) & Russell St

Total Count Diagram

Municipality: Dundalk
Site #: 0000001203
Intersection: Grey Road 9 (Main Street E) & Rus
TFR File #: 1
Count date: 18-Mar-2025

Weather conditions:
 Clear
Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Grey Road 9 (Main Street E) runs W

East Leg Total: 3929
 East Entering: 1943
 East Peds: 32
 Peds Cross: 8

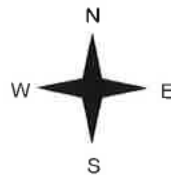
Heavys	Trucks	Cars	Totals
63	50	1738	1851



Grey Road 9 (Main Street E)

Heavys	Trucks	Cars	Totals
50	43	1601	1694

4	2	152	158
54	45	1753	



Russell St

Cars	Trucks	Heavys	Totals
1590	49	59	1698
234	2	9	245
1824	51	68	

Grey Road 9 (Main Street E)

Cars	Trucks	Heavys	Totals
1881	46	59	1986

Peds Cross: 8
 West Peds: 11
 West Entering: 1852
 West Leg Total: 3703

Cars	386
Trucks	4
Heavys	13
Totals	403



Cars	148	280	428
Trucks	1	3	4
Heavys	4	9	13
Totals	153	292	

Peds Cross: 28
 South Peds: 28
 South Entering: 445
 South Leg Total: 848

Comments

Grey Road 9 (Main Street E) & Russell St Traffic Count Summary

Intersection: Grey Road 9 (Main Street E) & Russell St

Count Date: 18-Mar-2025

Municipality: Dundalk

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	0	0	0	0	0	67	8:00:00	15	0	52	67	0
9:00:00	0	0	0	0	0	100	9:00:00	35	0	65	100	8
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	0	0	0	0	0	39	12:00:00	13	0	26	39	1
13:00:00	0	0	0	0	0	44	13:00:00	19	0	25	44	1
14:00:00	0	0	0	0	0	42	14:00:00	10	0	32	42	4
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	0	0	0	0	0	45	16:00:00	18	0	27	45	2
17:00:00	0	0	0	0	0	61	17:00:00	25	0	36	61	5
18:00:00	0	0	0	0	0	47	18:00:00	18	0	29	47	7
Totals:	0	0	0	0	0	445		153	0	292	445	28

East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds		Hour Ending	Includes Cars, Trucks, & Heavys				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	20	119	0	139	0	403	8:00:00	0	257	7	264	2
9:00:00	21	197	0	218	0	456	9:00:00	0	221	17	238	2
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	19	181	0	200	1	388	12:00:00	0	170	18	188	0
13:00:00	20	172	0	192	0	407	13:00:00	0	194	21	215	5
14:00:00	22	183	0	205	0	404	14:00:00	0	185	14	199	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	39	272	0	311	20	577	16:00:00	0	232	34	266	0
17:00:00	54	279	0	333	7	581	17:00:00	0	228	20	248	0
18:00:00	50	295	0	345	4	579	18:00:00	0	207	27	234	2
Totals:	245	1698	0	1943	32	3795		0	1694	158	1852	11

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00
Crossing Values:	17	37	14	24	10	38	32	24

Appendix B: LOS Definitions

Level of Service – Unsignalized Intersections

Level of Service (LOS) for unsignalized intersections is defined in terms of control delay for each critical lane. Control delay includes initial deceleration, queue move-up time, stopped delay and final acceleration delay, and is a function of the service rate or capacity of the approach and degree of saturation.

The following table describes in detail the characteristics of each level of service, with A being the best and F being the worst.

LOS	EXPECTED DELAY TO STREET TRAFFIC	DELAY (sec/veh)
A	Little or no delays	$0 < d \leq 10$
B	Short traffic delays	$10 < d \leq 15$
C	Average traffic delays	$15 < d \leq 25$
D	Long traffic delays	$25 < d \leq 35$
E	Very long traffic delays	$35 < d \leq 50$
F	Extreme delays with queuing which may cause congestion affecting other traffic movements in the intersection	$50 < d$

source: 2010 Highway Capacity Manual

Level of Service – Signalized Intersections

Level of Service (LOS) for signalized intersections is defined in terms of delay, which is made up of a number of factors that relate to control, geometrics, traffic and incidents. Only the portion of total delay attributed to the control facility is quantified. This control delay includes initial deceleration, queue move-up time, stopped delay and final acceleration delay.

The following table describes in detail the characteristics of each level of service, with A being the best and F being the worst.

LOS	EXPECTED DELAY TO STREET TRAFFIC	DELAY (sec/veh)
A	This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all at this LOS. Short cycle lengths may also contribute to low delay.	$0 < d \leq 10$
B	This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop at this level than at LOS A, causing longer average delays.	$10 < d \leq 20$
C	These higher delays may result from fair progression, longer cycle length, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, though many still pass through the intersection without stopping.	$20 < d \leq 35$
D	At this level, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavourable progression, long cycle lengths, or high volume to capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures become noticeable.	$35 < d \leq 55$
E	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.	$55 < d \leq 80$
F	At this level, oversaturation occurs when arrival flow rates exceed the design capacity of the intersection. It may also occur at high v/c ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors to such high delay levels. LOS F is considered to be unacceptable to most drivers.	$80 < d$

source: 2010 Highway Capacity Manual

Appendix C: Existing Conditions

HCM Signalized Intersection Capacity Analysis
1: Highway 10 & Grey Road 9/County Road 9

2025 - Existing Traffic
AM PEAK HOUR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	86	96	137	18	93	7	47	185	50	10	180	92
Future Volume (vph)	86	96	137	18	93	7	47	185	50	10	180	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.91		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1717		1789	1863		1789	1824		1789	1883	1601
Flt Permitted	0.69	1.00		0.57	1.00		0.63	1.00		0.60	1.00	1.00
Satd. Flow (perm)	1293	1717		1071	1863		1195	1824		1132	1883	1601
Peak-hour factor, PHF	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)	93	104	149	20	101	8	51	201	54	11	196	100
RTOR Reduction (vph)	0	120	0	0	6	0	0	16	0	0	0	44
Lane Group Flow (vph)	93	133	0	20	103	0	51	239	0	11	196	56
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	7.3	7.3		7.3	7.3		21.0	21.0		21.0	21.0	21.0
Effective Green, g (s)	7.3	7.3		7.3	7.3		21.0	21.0		21.0	21.0	21.0
Actuated g/C Ratio	0.20	0.20		0.20	0.20		0.56	0.56		0.56	0.56	0.56
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	253	336		209	364		672	1026		637	1060	901
v/s Ratio Prot		c0.08			0.06			c0.13			0.10	
v/s Ratio Perm	0.07			0.02			0.04			0.01		0.04
v/c Ratio	0.37	0.40		0.10	0.28		0.08	0.23		0.02	0.18	0.06
Uniform Delay, d1	13.0	13.1		12.3	12.8		3.7	4.1		3.6	4.0	3.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.9	0.8		0.2	0.4		0.2	0.5		0.0	0.4	0.1
Delay (s)	13.9	13.9		12.5	13.2		3.9	4.6		3.6	4.4	3.8
Level of Service	B	B		B	B		A	A		A	A	A
Approach Delay (s)		13.9			13.1			4.5			4.2	
Approach LOS		B			B			A			A	
Intersection Summary												
HCM 2000 Control Delay		8.4					HCM 2000 Level of Service		A			
HCM 2000 Volume to Capacity ratio		0.28										
Actuated Cycle Length (s)		37.3					Sum of lost time (s)		9.0			
Intersection Capacity Utilization		43.2%					ICU Level of Service		A			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2: Highway 10 & 240 Sideroad

2025 - Existing Traffic
AM PEAK HOUR

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	5	5	286	5	5	402
Future Volume (Veh/h)	5	5	286	5	5	402
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	5	311	5	5	437
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	758	311			316	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	758	311			316	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			100	
cM capacity (veh/h)	373	729			1244	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1		
Volume Total	10	311	5	442		
Volume Left	5	0	0	5		
Volume Right	5	0	5	0		
cSH	494	1700	1700	1244		
Volume to Capacity	0.02	0.18	0.00	0.00		
Queue Length 95th (m)	0.5	0.0	0.0	0.1		
Control Delay (s)	12.4	0.0	0.0	0.1		
Lane LOS	B			A		
Approach Delay (s)	12.4	0.0		0.1		
Approach LOS	B					
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			35.1%		ICU Level of Service	A
Analysis Period (min)			15			

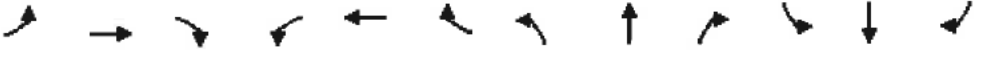
HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Grey Road 9

2025 - Existing Traffic
AM PEAK HOUR

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Traffic Volume (veh/h)	297	17	21	264	35	65
Future Volume (Veh/h)	297	17	21	264	35	65
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)	323	18	23	287	38	71
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			341		665	332
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			341		665	332
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		91	90
cM capacity (veh/h)			1218		417	710
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	341	310	109			
Volume Left	0	23	38			
Volume Right	18	0	71			
cSH	1700	1218	570			
Volume to Capacity	0.20	0.02	0.19			
Queue Length 95th (m)	0.0	0.4	5.3			
Control Delay (s)	0.0	0.8	12.8			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.8	12.8			
Approach LOS			B			
Intersection Summary						
Average Delay		2.1				
Intersection Capacity Utilization		43.8%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis 1: Highway 10 & Grey Road 9/County Road 9

2025 - Existing Traffic
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	88	105	34	149	22	199	271	39	6	176	101
Future Volume (vph)	63	88	105	34	149	22	199	271	39	6	176	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.92		1.00	0.98		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1730		1789	1847		1789	1848		1789	1883	1601
Flt Permitted	0.64	1.00		0.63	1.00		0.64	1.00		0.56	1.00	1.00
Satd. Flow (perm)	1206	1730		1180	1847		1200	1848		1051	1883	1601
Peak-hour factor, PHF	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)	68	96	114	37	162	24	216	295	42	7	191	110
RTOR Reduction (vph)	0	91	0	0	16	0	0	8	0	0	0	48
Lane Group Flow (vph)	68	119	0	37	170	0	216	329	0	7	191	62
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	7.5	7.5		7.5	7.5		21.0	21.0		21.0	21.0	21.0
Effective Green, g (s)	7.5	7.5		7.5	7.5		21.0	21.0		21.0	21.0	21.0
Actuated g/C Ratio	0.20	0.20		0.20	0.20		0.56	0.56		0.56	0.56	0.56
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	241	346		236	369		672	1034		588	1054	896
v/s Ratio Prot		0.07			c0.09			0.18			0.10	
v/s Ratio Perm	0.06			0.03			c0.18			0.01		0.04
v/c Ratio	0.28	0.34		0.16	0.46		0.32	0.32		0.01	0.18	0.07
Uniform Delay, d1	12.7	12.9		12.4	13.2		4.4	4.4		3.7	4.0	3.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.6	0.6		0.3	0.9		1.3	0.8		0.0	0.4	0.1
Delay (s)	13.4	13.5		12.7	14.1		5.7	5.2		3.7	4.4	3.9
Level of Service	B	B		B	B		A	A		A	A	A
Approach Delay (s)		13.5			13.9			5.4			4.2	
Approach LOS		B			B			A			A	

Intersection Summary

HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	37.5	Sum of lost time (s)	9.0
Intersection Capacity Utilization	51.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 2: Highway 10 & 240 Sideroad

2025 - Existing Traffic
PM Peak Hour

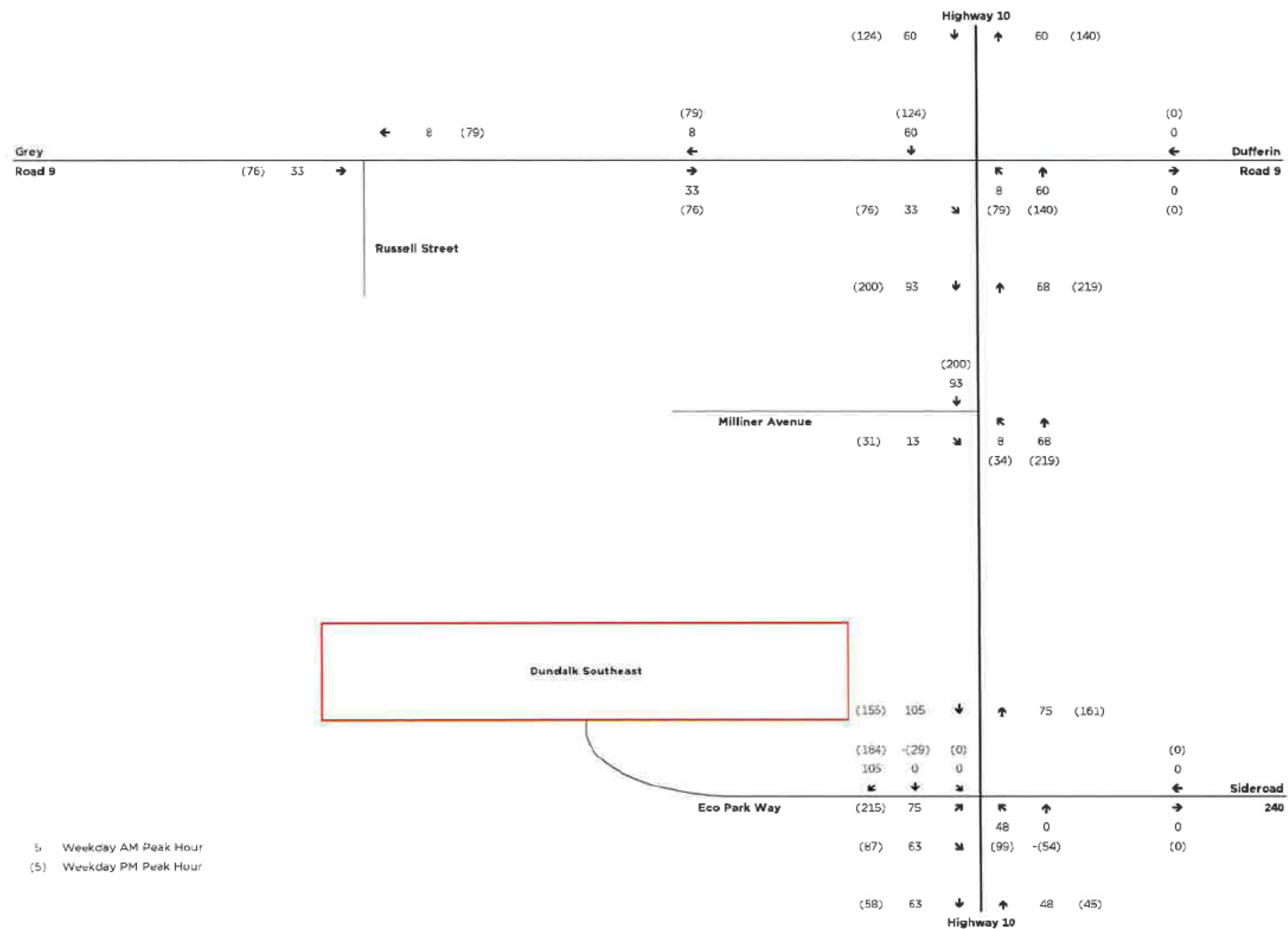
						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	5	5	484	5	5	340
Future Volume (Veh/h)	5	5	484	5	5	340
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	5	526	5	5	370
Pedestrians						
Lane Width (m)						
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	906	526			531	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	906	526			531	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	99			100	
cM capacity (veh/h)	305	552			1036	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1		
Volume Total	10	526	5	375		
Volume Left	5	0	0	5		
Volume Right	5	0	5	0		
cSH	393	1700	1700	1036		
Volume to Capacity	0.03	0.31	0.00	0.00		
Queue Length 95th (m)	0.6	0.0	0.0	0.1		
Control Delay (s)	14.4	0.0	0.0	0.2		
Lane LOS	B			A		
Approach Delay (s)	14.4	0.0		0.2		
Approach LOS	B					
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			35.5%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Grey Road 9

2025 - Existing Traffic
PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↗	↘	
Traffic Volume (veh/h)	294	17	50	443	21	31
Future Volume (Veh/h)	294	17	50	443	21	31
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)	320	18	54	482	23	34
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			338		919	329
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			338		919	329
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		92	95
cM capacity (veh/h)			1221		288	712
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	338	536	57			
Volume Left	0	54	23			
Volume Right	18	0	34			
cSH	1700	1221	447			
Volume to Capacity	0.20	0.04	0.13			
Queue Length 95th (m)	0.0	1.1	3.3			
Control Delay (s)	0.0	1.3	14.2			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.3	14.2			
Approach LOS			B			
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization		55.9%		ICU Level of Service		B
Analysis Period (min)		15				

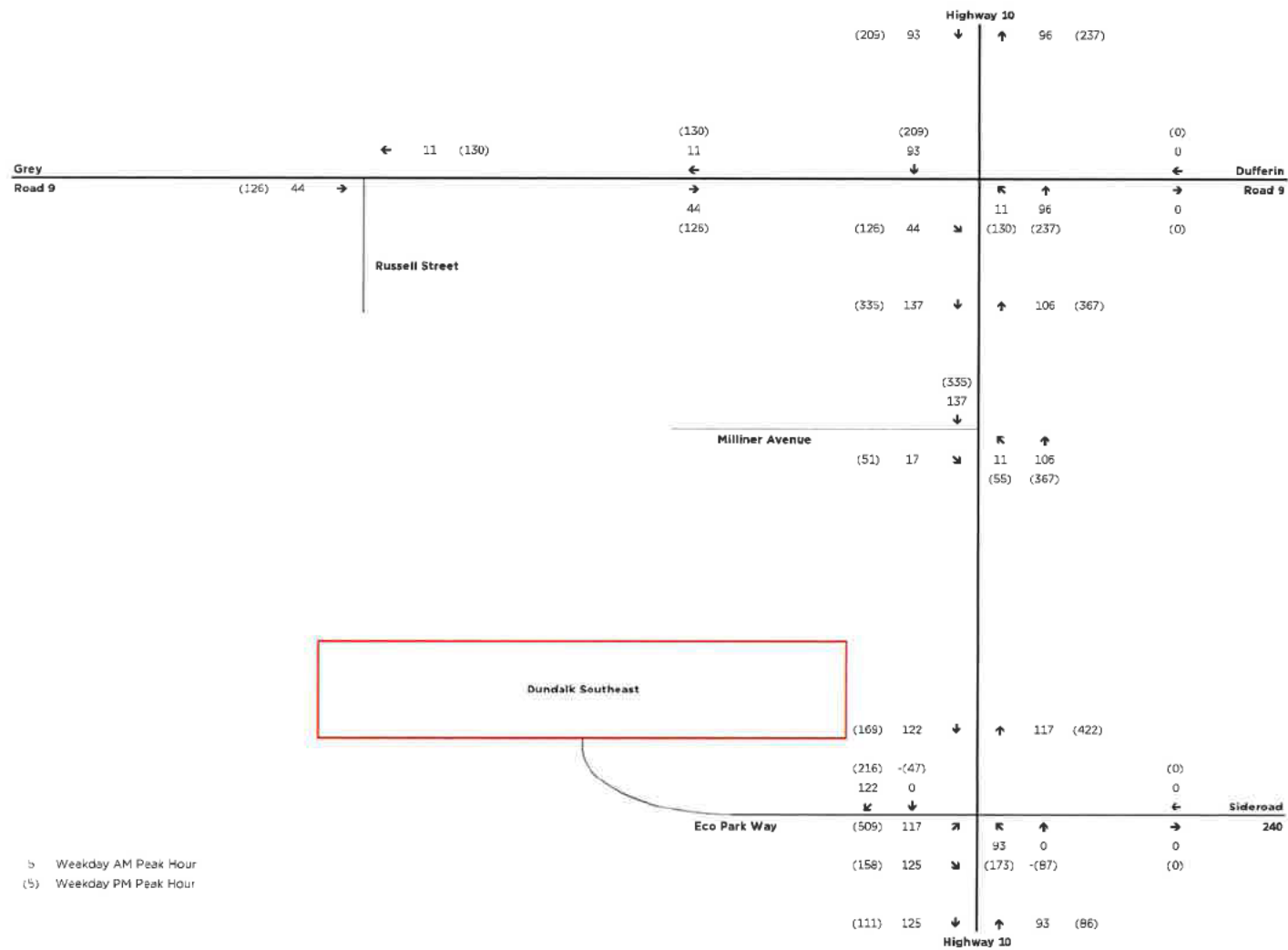
Appendix D: Future Background Conditions



772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure : Background Development - Dundalk Southeast (2030)

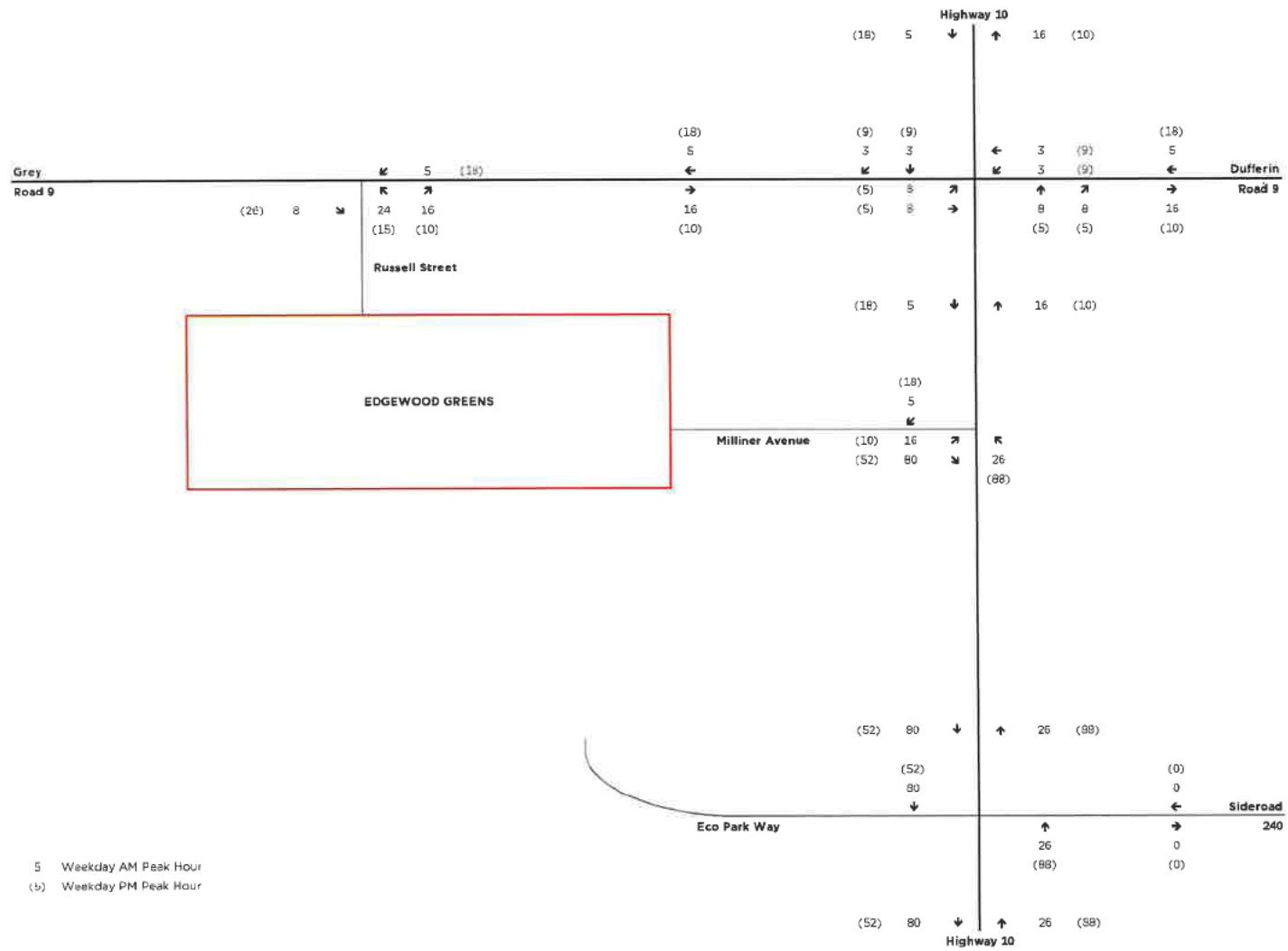




772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure : Background Development - Dundalk Southeast (2035)

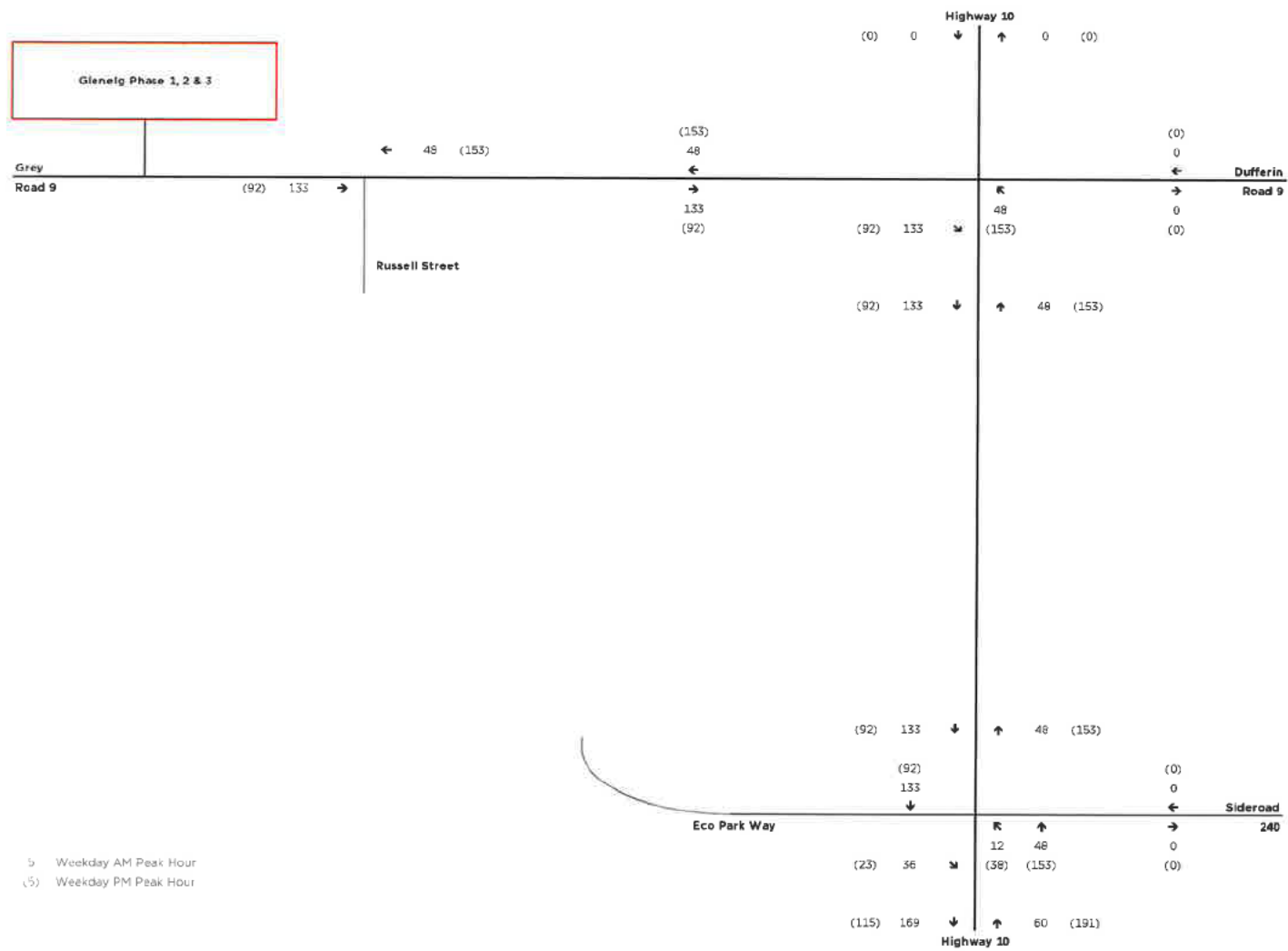




772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure Background Development - Edgewood Green (2030)

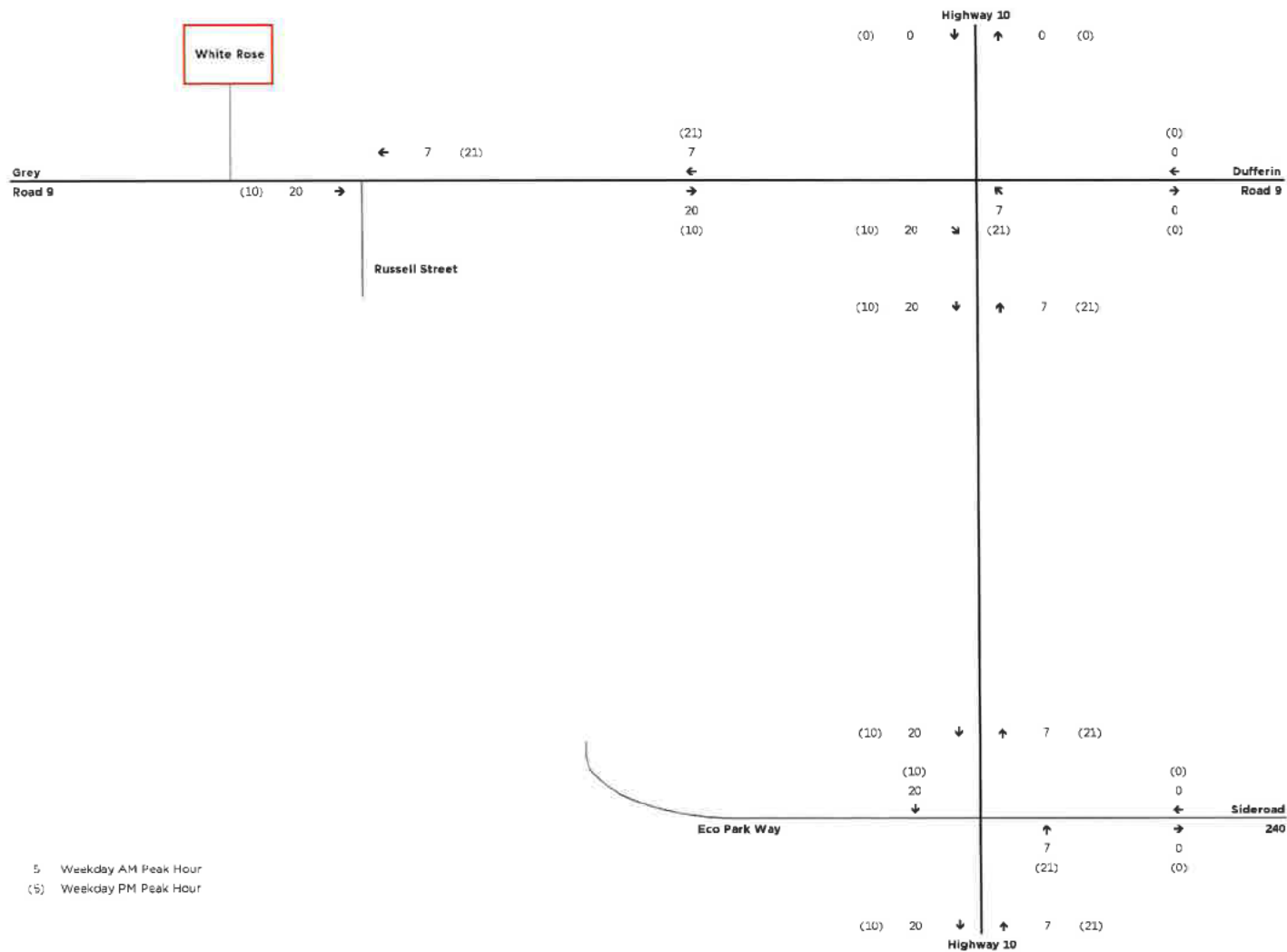




772082 HIGHWAY 10, DUNDALK – TRANSPORTATION IMPACT STUDY

Figure : Background Development – Gleneig (2030)

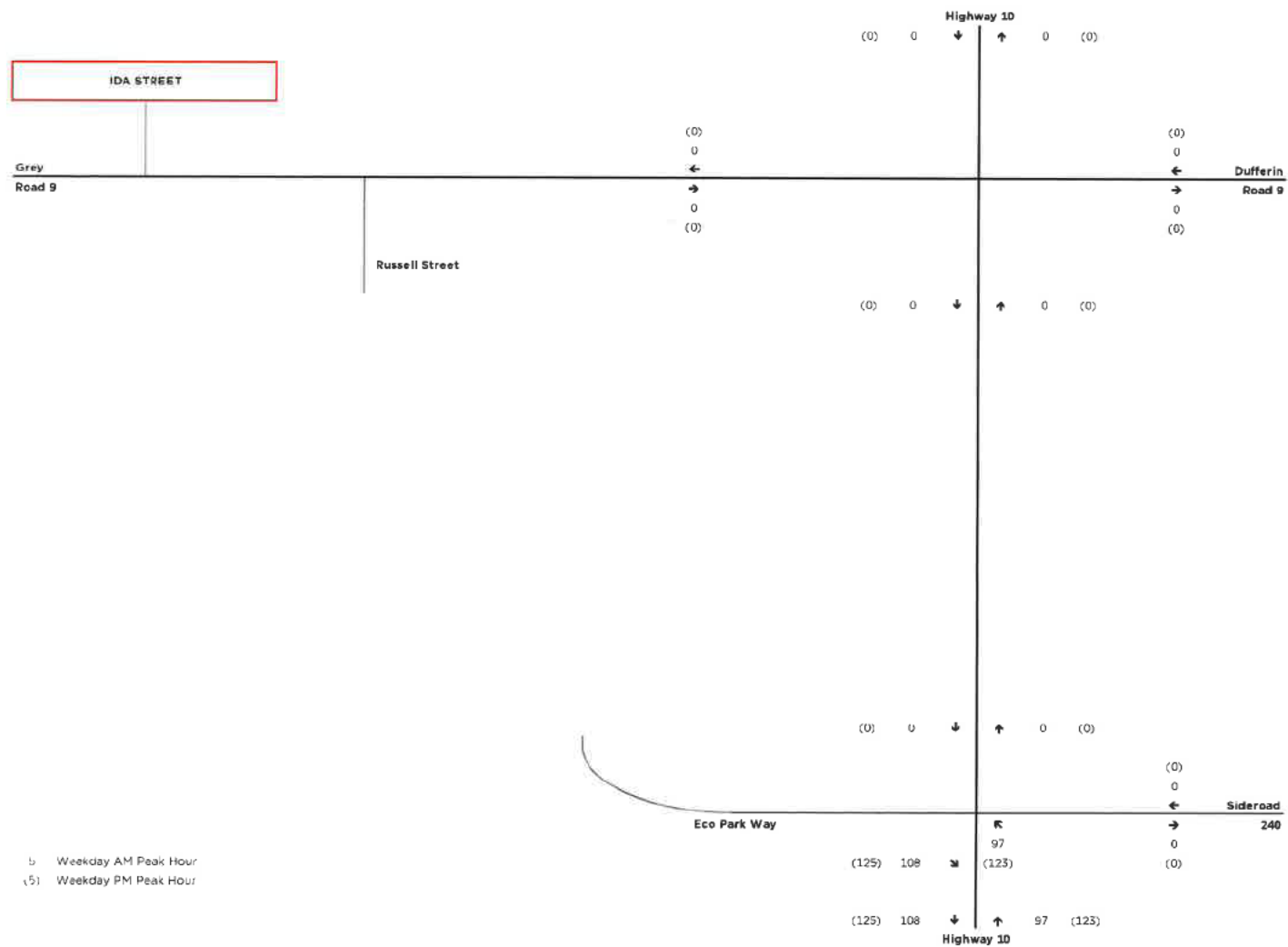




772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure : Background Development - White Rose (2030)

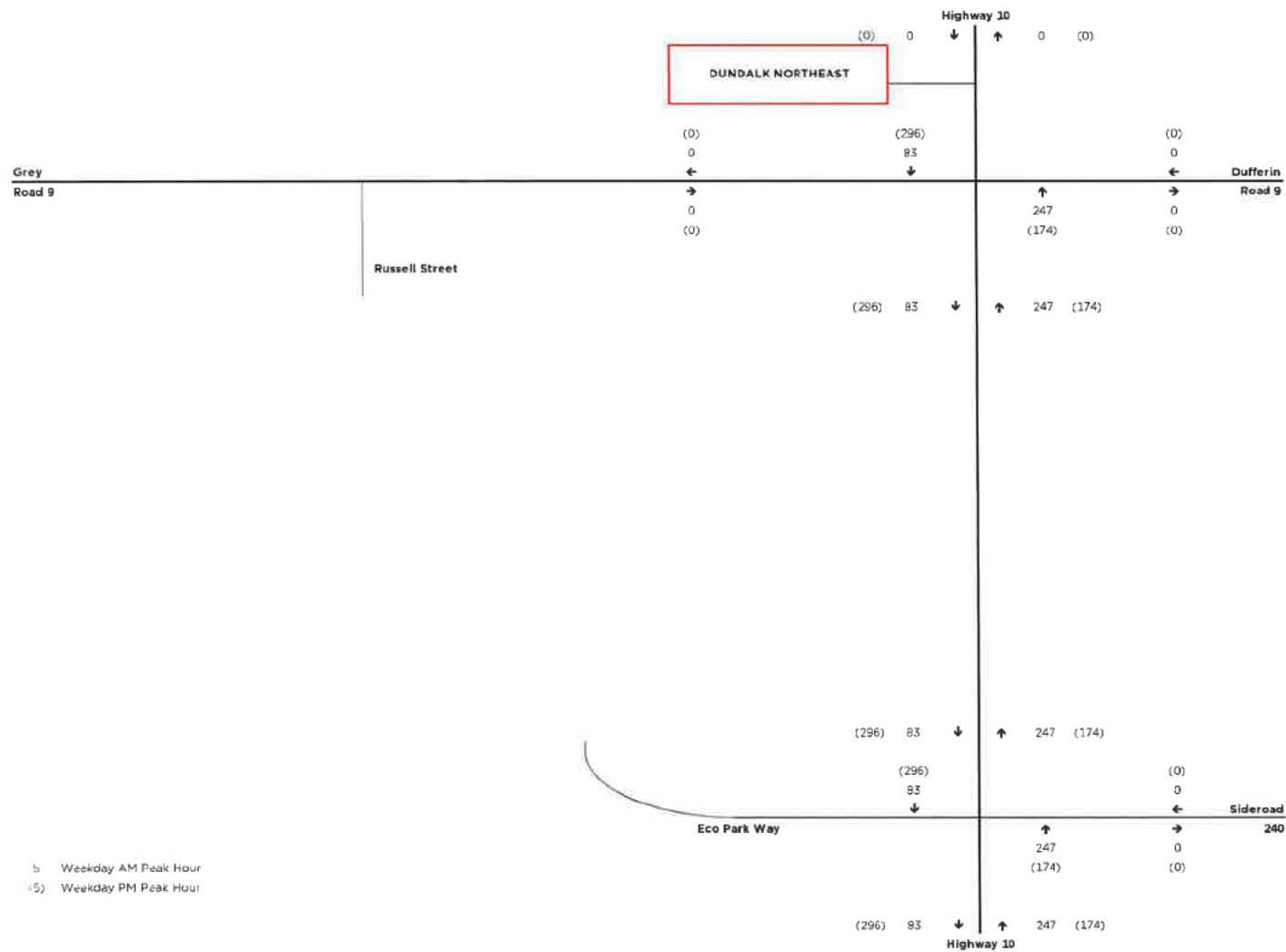




772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure : Background Development - IDA Street (2030)

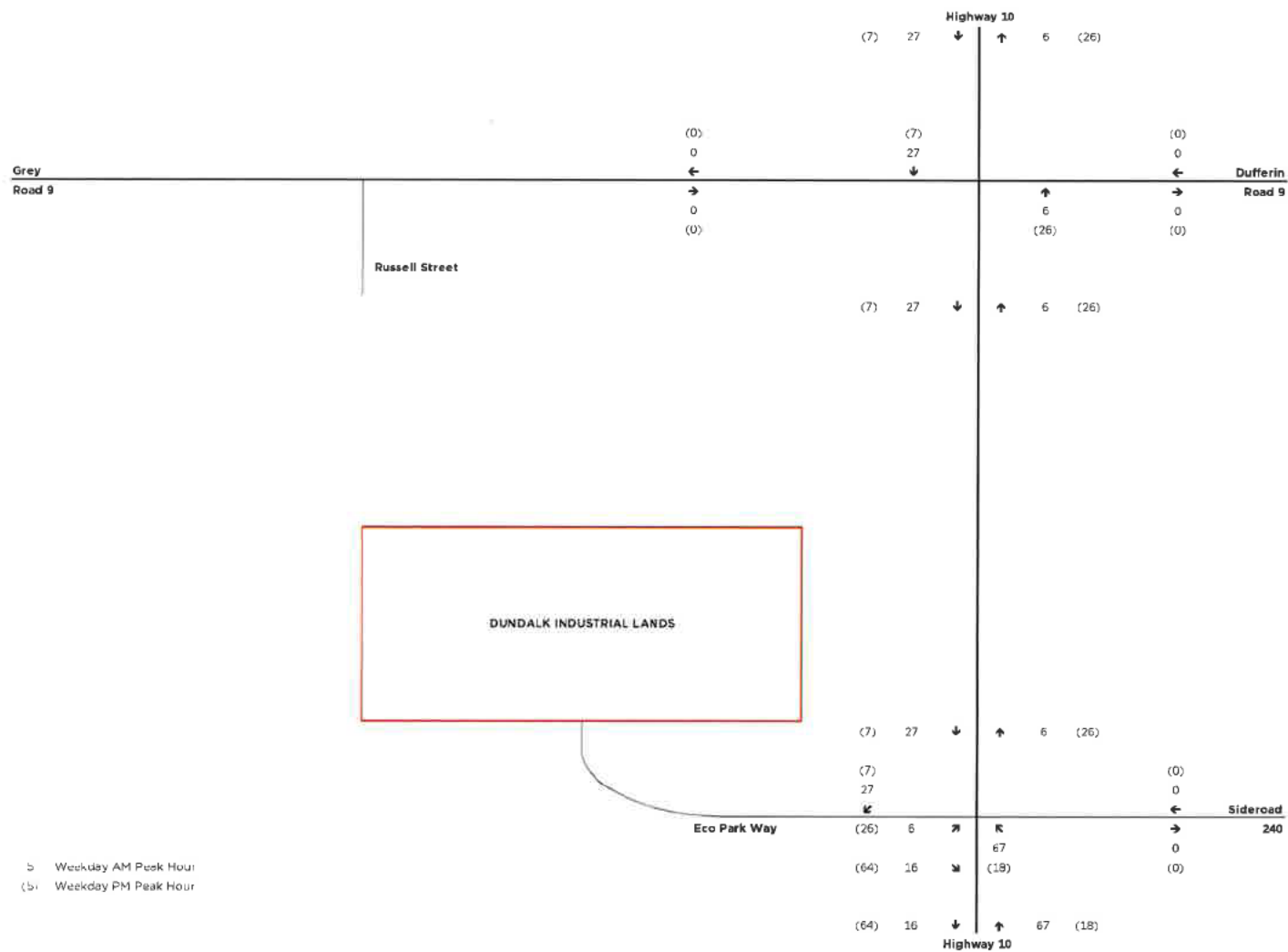




772082 HIGHWAY 10, DUNDALK – TRANSPORTATION IMPACT STUDY

Figure : Background Development – Dundalk Northeast (2035)

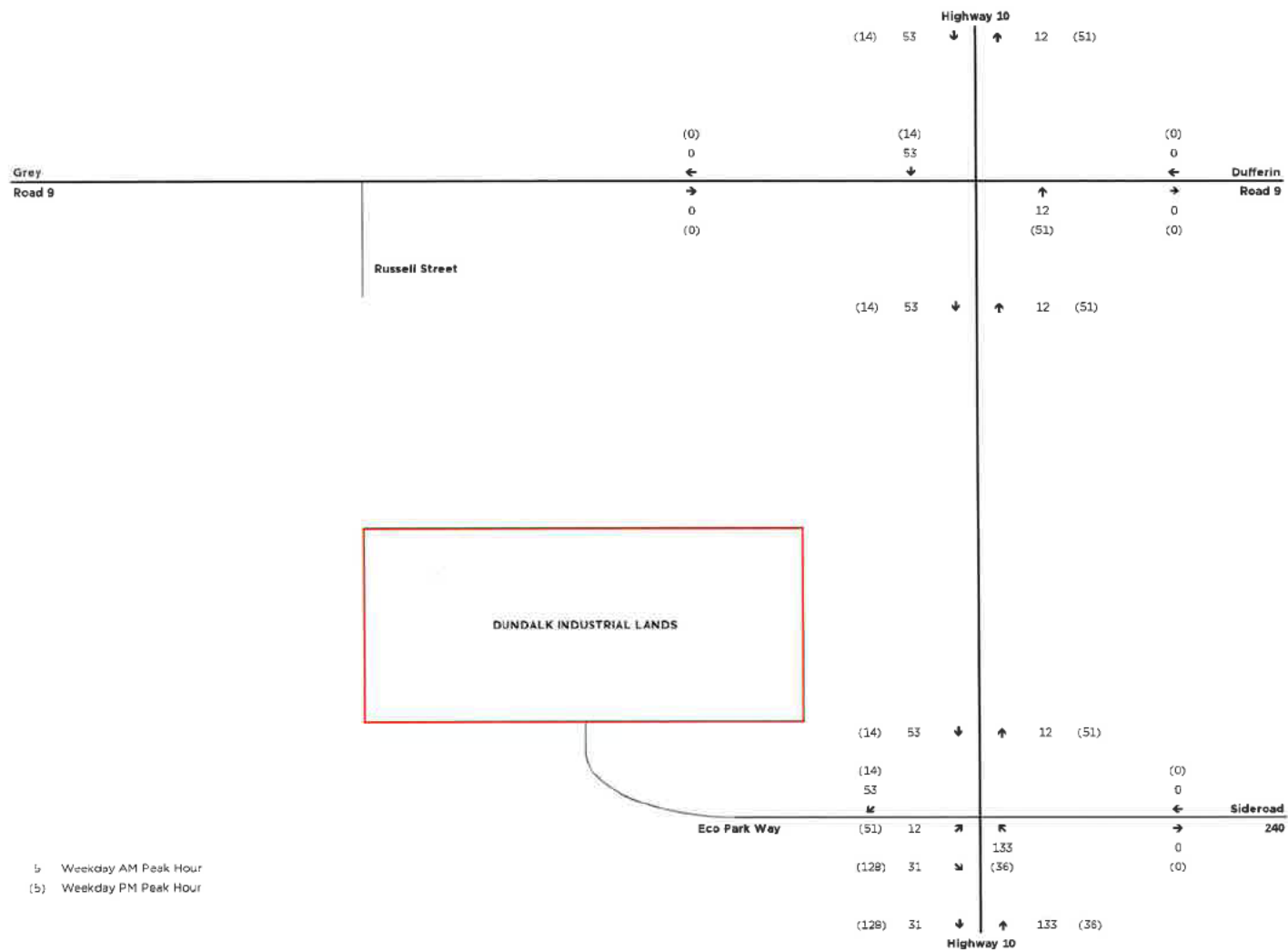




772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure : Background Development – Industrial Lands (2030)





772082 HIGHWAY 10, DUNDALK - TRANSPORTATION IMPACT STUDY

Figure : Background Development - Industrial Lands (2035)



HCM Signalized Intersection Capacity Analysis

1: Highway 10 & Grey Road 9/County Road 9

2030 - Background Traffic
AM PEAK HOUR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	101	111	333	22	103	8	117	270	62	11	284	102
Future Volume (vph)	101	111	333	22	103	8	117	270	62	11	284	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.89		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1672		1789	1862		1789	1831		1789	1883	1601
Flt Permitted	0.68	1.00		0.40	1.00		0.57	1.00		0.54	1.00	1.00
Satd. Flow (perm)	1279	1672		746	1862		1078	1831		1013	1883	1601
Peak-hour factor, PHF	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)	110	121	362	24	112	9	127	293	67	12	309	111
RTOR Reduction (vph)	0	264	0	0	7	0	0	15	0	0	0	57
Lane Group Flow (vph)	110	219	0	24	114	0	127	345	0	12	309	54
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	10.1	10.1		10.1	10.1		18.2	18.2		18.2	18.2	18.2
Effective Green, g (s)	10.1	10.1		10.1	10.1		18.2	18.2		18.2	18.2	18.2
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.49	0.49		0.49	0.49	0.49
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	346	452		202	504		525	893		494	918	781
v/s Ratio Prot		c0.13			0.06			c0.19			0.16	
v/s Ratio Perm	0.09			0.03			0.12			0.01		0.03
v/c Ratio	0.32	0.48		0.12	0.23		0.24	0.39		0.02	0.34	0.07
Uniform Delay, d1	10.9	11.4		10.2	10.6		5.5	6.0		4.9	5.9	5.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.8		0.3	0.2		1.1	1.3		0.1	1.0	0.2
Delay (s)	11.4	12.2		10.5	10.8		6.6	7.3		5.0	6.8	5.2
Level of Service	B	B		B	B		A	A		A	A	A
Approach Delay (s)		12.1			10.8			7.1			6.4	
Approach LOS		B			B			A			A	

Intersection Summary

HCM 2000 Control Delay	9.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	37.3	Sum of lost time (s)	9.0
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 2: Highway 10 & Eco Park Way/240 Sideroad

2030 - Background Traffic
AM PEAK HOUR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	81	0	223	5	0	5	224	370	5	5	666	132
Future Volume (Veh/h)	81	0	223	5	0	5	224	370	5	5	666	132
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	0.92
Hourly flow rate (vph)	88	0	242	5	0	5	243	402	5	5	724	143
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	1698	1698	796	1936	1765	402	867			407		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1698	1698	796	1936	1765	402	867			407		
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 %	0	100	38	64	100	99	69			100		
cM capacity (veh/h)	55	63	387	14	57	648	777			1152		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1							
Volume Total	330	10	645	5	872							
Volume Left	88	5	243	0	5							
Volume Right	242	5	0	5	143							
cSH	148	28	777	1700	1152							
Volume to Capacity	2.24	0.36	0.31	0.00	0.00							
Queue Length 95th (m)	207.7	8.6	10.2	0.0	0.1							
Control Delay (s)	626.4	197.5	7.4	0.0	0.1							
Lane LOS	F	F	A		A							
Approach Delay (s)	626.4	197.5	7.4		0.1							
Approach LOS	F	F										
Intersection Summary												
Average Delay			114.7									
Intersection Capacity Utilization			104.8%	ICU Level of Service						G		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Grey Road 9

2030 - Background Traffic
AM PEAK HOUR

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↗	↘	↘
Traffic Volume (veh/h)	506	25	26	351	59	81
Future Volume (Veh/h)	506	25	26	351	59	81
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)	550	27	28	382	64	88
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			577		1002	564
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			577		1002	564
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		76	83
cM capacity (veh/h)			996		261	525
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	577	410	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	996	369			
Volume to Capacity	0.34	0.03	0.41			
Queue Length 95th (m)	0.0	0.7	14.9			
Control Delay (s)	0.0	0.9	21.4			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.9	21.4			
Approach LOS			C			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			54.8%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis 1: Highway 10 & Grey Road 9/County Road 9

2030 - Background Traffic
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	100	291	45	169	24	474	456	47	6	329	118
Future Volume (vph)	73	100	291	45	169	24	474	456	47	6	329	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.89		1.00	0.98		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1673		1789	1848		1789	1857		1789	1883	1601
Flt Permitted	0.52	1.00		0.28	1.00		0.53	1.00		0.40	1.00	1.00
Satd. Flow (perm)	981	1673		531	1848		1001	1857		753	1883	1601
Peak-hour factor, PHF	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)	79	109	316	49	184	26	515	496	51	7	358	128
RTOR Reduction (vph)	0	158	0	0	8	0	0	5	0	0	0	45
Lane Group Flow (vph)	79	267	0	49	202	0	515	542	0	7	358	83
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	14.2	14.2		14.2	14.2		43.2	43.2		43.2	43.2	43.2
Effective Green, g (s)	14.2	14.2		14.2	14.2		43.2	43.2		43.2	43.2	43.2
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.65	0.65		0.65	0.65	0.65
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	209	357		113	395		651	1208		489	1225	1041
v/s Ratio Prot		c0.16			0.11			0.29			0.19	
v/s Ratio Perm	0.08			0.09			c0.51			0.01		0.05
v/c Ratio	0.38	0.75		0.43	0.51		0.79	0.45		0.01	0.29	0.08
Uniform Delay, d1	22.3	24.4		22.6	23.0		8.4	5.7		4.1	5.0	4.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.1	8.3		2.7	1.1		9.5	1.2		0.1	0.6	0.2
Delay (s)	23.5	32.7		25.3	24.2		17.9	6.9		4.1	5.6	4.4
Level of Service	C	C		C	C		B	A		A	A	A
Approach Delay (s)		31.3			24.4			12.2			5.3	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM 2000 Control Delay		16.3					HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio		0.78										
Actuated Cycle Length (s)		66.4					Sum of lost time (s)		9.0			
Intersection Capacity Utilization		85.9%					ICU Level of Service		E			
Analysis Period (min)		15										

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

2: Highway 10 & Eco Park Way/240 Sideroad

2030 - Background Traffic
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	241	0	299	5	0	5	278	729	5	5	491	191
Future Volume (Veh/h)	241	0	299	5	0	5	278	729	5	5	491	191
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	0.92
Hourly flow rate (vph)	262	0	325	5	0	5	302	792	5	5	534	208
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None											
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	2049	2049	638	2369	2148	792	742			797		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2049	2049	638	2369	2148	792	742			797		
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 %	0	100	32	11	100	99	65			99		
cM capacity (veh/h)	29	36	477	6	31	389	865			825		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1							
Volume Total	587	10	1094	5	747							
Volume Left	262	5	302	0	5							
Volume Right	325	5	0	5	208							
cSH	61	11	865	1700	825							
Volume to Capacity	9.57	0.91	0.35	0.00	0.01							
Queue Length 95th (m)	Err	14.2	12.0	0.0	0.1							
Control Delay (s)	Err	675.0	8.5	0.0	0.2							
Lane LOS	F	F	A		A							
Approach Delay (s)	Err	675.0	8.5		0.2							
Approach LOS	F	F										
Intersection Summary												
Average Delay			2409.2									
Intersection Capacity Utilization			139.6%	ICU Level of Service					H			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Grey Road 9

2030 - Background Traffic
PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	528	48	68	716	36	41
Future Volume (Veh/h)	528	48	68	716	36	41
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)	574	52	74	778	39	45
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			626		1526	600
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			626		1526	600
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		67	91
cM capacity (veh/h)			956		120	501
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	626	852	84			
Volume Left	0	74	39			
Volume Right	52	0	45			
cSH	1700	956	202			
Volume to Capacity	0.37	0.08	0.42			
Queue Length 95th (m)	0.0	1.9	14.4			
Control Delay (s)	0.0	2.0	35.0			
Lane LOS		A	D			
Approach Delay (s)	0.0	2.0	35.0			
Approach LOS			D			
Intersection Summary						
Average Delay		3.0				
Intersection Capacity Utilization		86.7%	ICU Level of Service	E		
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

1: Highway 10 & Grey Road 9/County Road 9

2030 - Background Traffic + improvement 1

AM PEAK HOUR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	101	111	333	22	103	8	117	270	62	11	284	102
Future Volume (vph)	101	111	333	22	103	8	117	270	62	11	284	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.89		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1672		1789	1862		1789	1831		1789	1883	1601
Flt Permitted	0.68	1.00		0.40	1.00		0.57	1.00		0.54	1.00	1.00
Satd. Flow (perm)	1279	1672		746	1862		1078	1831		1013	1883	1601
Peak-hour factor, PHF	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)	110	121	362	24	112	9	127	293	67	12	309	111
RTOR Reduction (vph)	0	264	0	0	7	0	0	15	0	0	0	57
Lane Group Flow (vph)	110	219	0	24	114	0	127	345	0	12	309	54
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	10.1	10.1		10.1	10.1		18.2	18.2		18.2	18.2	18.2
Effective Green, g (s)	10.1	10.1		10.1	10.1		18.2	18.2		18.2	18.2	18.2
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.49	0.49		0.49	0.49	0.49
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	346	452		202	504		525	893		494	918	781
v/s Ratio Prot		c0.13			0.06			c0.19			0.16	
v/s Ratio Perm	0.09			0.03			0.12			0.01		0.03
v/c Ratio	0.32	0.48		0.12	0.23		0.24	0.39		0.02	0.34	0.07
Uniform Delay, d1	10.9	11.4		10.2	10.6		5.5	6.0		4.9	5.9	5.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.8		0.3	0.2		1.1	1.3		0.1	1.0	0.2
Delay (s)	11.4	12.2		10.5	10.8		6.6	7.3		5.0	6.8	5.2
Level of Service	B	B		B	B		A	A		A	A	A
Approach Delay (s)		12.1			10.8			7.1			6.4	
Approach LOS		B			B			A			A	

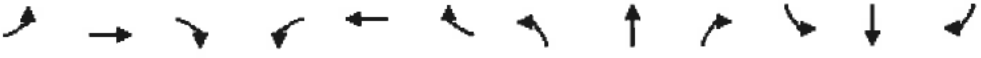
Intersection Summary

HCM 2000 Control Delay	9.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	37.3	Sum of lost time (s)	9.0
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis 2: Highway 10 & Eco Park Way/240 Sideroad

2030 - Background Traffic + improvement 1
AM PEAK HOUR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	0	223	5	0	5	224	370	5	5	666	132
Future Volume (vph)	81	0	223	5	0	5	224	370	5	5	666	132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1601			1713		1789	1883	1601	1789	1883	1601
Flt Permitted	0.75	1.00			0.82		0.30	1.00	1.00	0.51	1.00	1.00
Satd. Flow (perm)	1415	1601			1440		565	1883	1601	969	1883	1601
Peak-hour factor, PHF	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)	88	0	242	5	0	5	243	402	5	5	724	143
RTOR Reduction (vph)	0	192	0	0	8	0	0	0	2	0	0	50
Lane Group Flow (vph)	88	50	0	0	2	0	243	402	3	5	724	93
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	9.1	9.1			9.1		33.2	33.2	33.2	33.2	33.2	33.2
Effective Green, g (s)	9.1	9.1			9.1		33.2	33.2	33.2	33.2	33.2	33.2
Actuated g/C Ratio	0.18	0.18			0.18		0.65	0.65	0.65	0.65	0.65	0.65
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	251	283			255		365	1218	1036	627	1218	1036
v/s Ratio Prot		0.03						0.21			0.38	
v/s Ratio Perm	c0.06			0.00			c0.43		0.00	0.01		0.06
v/c Ratio	0.35	0.17		0.01			0.67	0.33	0.00	0.01	0.59	0.09
Uniform Delay, d1	18.5	17.9		17.4			5.6	4.1	3.2	3.2	5.2	3.4
Progression Factor	1.00	1.00		1.00			1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	0.3		0.0			4.5	0.2	0.0	0.0	0.8	0.0
Delay (s)	19.4	18.2		17.4			10.1	4.2	3.2	3.2	6.0	3.4
Level of Service	B	B		B			B	A	A	A	A	A
Approach Delay (s)		18.5		17.4				6.4			5.5	
Approach LOS		B		B				A			A	

Intersection Summary

HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	51.3	Sum of lost time (s)	9.0
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 2030 - Background Traffic + improvement 1 3: Russel Street & Grey Road 9

AM PEAK HOUR

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↶			↶	↶	
Traffic Volume (veh/h)	506	25	26	351	59	81
Future Volume (Veh/h)	506	25	26	351	59	81
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)	550	27	28	382	64	88
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			577		1002	564
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			577		1002	564
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		76	83
cM capacity (veh/h)			996		261	525
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	577	410	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	996	369			
Volume to Capacity	0.34	0.03	0.41			
Queue Length 95th (m)	0.0	0.7	14.9			
Control Delay (s)	0.0	0.9	21.4			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.9	21.4			
Approach LOS			C			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization		54.8%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis 1: Highway 10 & Grey Road 9/County Road 9

2030 - Background Traffic + improvement 1
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	100	291	45	169	24	474	460	47	6	329	118
Future Volume (vph)	73	100	291	45	169	24	474	460	47	6	329	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.89		1.00	0.98		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1673		1789	1848		1789	1857		1789	1883	1601
Flt Permitted	0.52	1.00		0.28	1.00		0.53	1.00		0.40	1.00	1.00
Satd. Flow (perm)	981	1673		531	1848		1001	1857		748	1883	1601
Peak-hour factor, PHF	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)	79	109	316	49	184	26	515	500	51	7	358	128
RTOR Reduction (vph)	0	158	0	0	8	0	0	5	0	0	0	45
Lane Group Flow (vph)	79	267	0	49	202	0	515	546	0	7	358	83
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	14.2	14.2		14.2	14.2		43.2	43.2		43.2	43.2	43.2
Effective Green, g (s)	14.2	14.2		14.2	14.2		43.2	43.2		43.2	43.2	43.2
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.65	0.65		0.65	0.65	0.65
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	209	357		113	395		651	1208		486	1225	1041
v/s Ratio Prot		c0.16			0.11			0.29			0.19	
v/s Ratio Perm	0.08			0.09			c0.51			0.01		0.05
v/c Ratio	0.38	0.75		0.43	0.51		0.79	0.45		0.01	0.29	0.08
Uniform Delay, d1	22.3	24.4		22.6	23.0		8.4	5.7		4.1	5.0	4.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.1	8.3		2.7	1.1		9.5	1.2		0.1	0.6	0.2
Delay (s)	23.5	32.7		25.3	24.2		17.9	7.0		4.1	5.6	4.4
Level of Service	C	C		C	C		B	A		A	A	A
Approach Delay (s)		31.3			24.4			12.2			5.3	
Approach LOS		C			C			B			A	

Intersection Summary

HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	66.4	Sum of lost time (s)	9.0
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Highway 10 & Eco Park Way/240 Sideroad

2030 - Background Traffic + improvement 1

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	241	0	299	5	0	5	278	729	5	5	491	191
Future Volume (vph)	241	0	299	5	0	5	278	729	5	5	491	191
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1601			1713		1789	1883	1601	1789	1883	1601
Flt Permitted	0.75	1.00			0.85		0.38	1.00	1.00	0.18	1.00	1.00
Satd. Flow (perm)	1415	1601			1496		709	1883	1601	348	1883	1601
Peak-hour factor, PHF	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)	262	0	325	5	0	5	302	792	5	5	534	208
RTOR Reduction (vph)	0	223	0	0	7	0	0	0	2	0	0	95
Lane Group Flow (vph)	262	102	0	0	3	0	302	792	3	5	534	113
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	14.2	14.2			14.2		27.7	27.7	27.7	27.7	27.7	27.7
Effective Green, g (s)	14.2	14.2			14.2		27.7	27.7	27.7	27.7	27.7	27.7
Actuated g/C Ratio	0.28	0.28			0.28		0.54	0.54	0.54	0.54	0.54	0.54
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	394	446			417		385	1024	871	189	1024	871
v/s Ratio Prot		0.06						0.42			0.28	
v/s Ratio Perm	c0.19			0.00			c0.43		0.00	0.01		0.07
v/c Ratio	0.66	0.23		0.01			0.78	0.77	0.00	0.03	0.52	0.13
Uniform Delay, d1	16.2	14.1			13.3		9.2	9.1	5.3	5.4	7.4	5.7
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.2	0.3			0.0		10.1	3.7	0.0	0.1	0.5	0.1
Delay (s)	20.4	14.4			13.3		19.3	12.8	5.3	5.4	7.9	5.8
Level of Service	C	B			B		B	B	A	A	A	A
Approach Delay (s)		17.1			13.3			14.6			7.3	
Approach LOS		B			B			B			A	
Intersection Summary												
HCM 2000 Control Delay		12.9										
HCM 2000 Volume to Capacity ratio		0.74										
Actuated Cycle Length (s)		50.9										
Intersection Capacity Utilization		73.8%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2030 - Background Traffic + improvement 1 3: Russel Street & Grey Road 9 PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↗	↘	
Traffic Volume (veh/h)	528	48	68	716	36	41
Future Volume (Veh/h)	528	48	68	716	36	41
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)	574	52	74	778	39	45
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			626		1526	600
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			626		1526	600
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		67	91
cM capacity (veh/h)			956		120	501
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	626	852	84			
Volume Left	0	74	39			
Volume Right	52	0	45			
cSH	1700	956	202			
Volume to Capacity	0.37	0.08	0.42			
Queue Length 95th (m)	0.0	1.9	14.4			
Control Delay (s)	0.0	2.0	35.0			
Lane LOS		A	D			
Approach Delay (s)	0.0	2.0	35.0			
Approach LOS			D			
Intersection Summary						
Average Delay			3.0			
Intersection Capacity Utilization		86.7%		ICU Level of Service	E	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

1: Highway 10 & Grey Road 9/County Road 9

2035 - Background Traffic + improvement 1

AM PEAK HOUR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	119	356	23	111	8	120	577	66	12	440	109
Future Volume (vph)	108	119	356	23	111	8	120	577	66	12	440	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.89		1.00	0.99		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1672		1789	1864		1789	1854		1789	1883	1601
Flt Permitted	0.67	1.00		0.31	1.00		0.43	1.00		0.27	1.00	1.00
Satd. Flow (perm)	1269	1672		589	1864		811	1854		499	1883	1601
Peak-hour factor, PHF	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)	117	129	387	25	121	9	130	627	72	13	478	118
RTOR Reduction (vph)	0	220	0	0	5	0	0	7	0	0	0	52
Lane Group Flow (vph)	117	296	0	25	125	0	130	692	0	13	478	66
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	12.8	12.8		12.8	12.8		27.8	27.8		27.8	27.8	27.8
Effective Green, g (s)	12.8	12.8		12.8	12.8		27.8	27.8		27.8	27.8	27.8
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.56	0.56		0.56	0.56	0.56
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	327	431		152	481		454	1039		279	1055	897
v/s Ratio Prot		c0.18			0.07			c0.37			0.25	
v/s Ratio Perm	0.09			0.04			0.16			0.03		0.04
v/c Ratio	0.36	0.69		0.16	0.26		0.29	0.67		0.05	0.45	0.07
Uniform Delay, d1	15.0	16.6		14.3	14.6		5.7	7.6		4.9	6.4	5.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	4.5		0.5	0.3		1.6	3.4		0.3	1.4	0.2
Delay (s)	15.7	21.1		14.8	14.9		7.3	11.0		5.2	7.8	5.2
Level of Service	B	C		B	B		A	B		A	A	A
Approach Delay (s)		20.1			14.9			10.4			7.3	
Approach LOS		C			B			B			A	
Intersection Summary												
HCM 2000 Control Delay		12.6										
HCM 2000 Volume to Capacity ratio		0.67										
Actuated Cycle Length (s)		49.6								9.0		
Intersection Capacity Utilization		78.0%								D		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis 2035 - Background Traffic + improvement 1 2: Highway 10 & Eco Park Way/240 Sideroad AM PEAK HOUR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	129	0	300	5	0	5	335	639	5	5	783	175
Future Volume (vph)	129	0	300	5	0	5	335	639	5	5	783	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1601			1713		1789	1883	1601	1789	1883	1601
Flt Permitted	0.75	1.00			0.49		0.27	1.00	1.00	0.35	1.00	1.00
Satd. Flow (perm)	1415	1601			855		508	1883	1601	651	1883	1601
Peak-hour factor, PHF	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)	140	0	326	5	0	5	364	695	5	5	851	190
RTOR Reduction (vph)	0	203	0	0	9	0	0	0	1	0	0	46
Lane Group Flow (vph)	140	123	0	0	1	0	364	695	4	5	851	144
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	14.1	14.1			14.1		73.1	73.1	73.1	73.1	73.1	73.1
Effective Green, g (s)	14.1	14.1			14.1		73.1	73.1	73.1	73.1	73.1	73.1
Actuated g/C Ratio	0.15	0.15			0.15		0.76	0.76	0.76	0.76	0.76	0.76
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	207	234			125		386	1430	1216	494	1430	1216
v/s Ratio Prot		0.08						0.37			0.45	
v/s Ratio Perm	c0.10			0.00			c0.72		0.00	0.01		0.09
v/c Ratio	0.68	0.53		0.01			0.94	0.49	0.00	0.01	0.60	0.12
Uniform Delay, d1	38.9	38.0		35.1			9.8	4.4	2.8	2.8	5.1	3.0
Progression Factor	1.00	1.00		1.00			1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.4	2.1		0.0			33.5	1.2	0.0	0.0	1.8	0.2
Delay (s)	47.3	40.1		35.1			43.3	5.6	2.8	2.8	6.9	3.2
Level of Service	D	D		D			D	A	A	A	A	A
Approach Delay (s)		42.3		35.1			18.5				6.2	
Approach LOS		D		D			B				A	
Intersection Summary												
HCM 2000 Control Delay		17.9					HCM 2000 Level of Service		B			
HCM 2000 Volume to Capacity ratio		0.90										
Actuated Cycle Length (s)		96.2					Sum of lost time (s)		9.0			
Intersection Capacity Utilization		89.6%					ICU Level of Service		E			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2035 - Background Traffic + improvement 1 3: Russel Street & Grey Road 9 AM PEAK HOUR

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰	↱
Traffic Volume (veh/h)	542	25	26	372	59	81
Future Volume (Veh/h)	542	25	26	372	59	81
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)	589	27	28	404	64	88
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			616		1062	602
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			616		1062	602
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		73	82
cM capacity (veh/h)			964		240	499
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	616	432	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	964	343			
Volume to Capacity	0.36	0.03	0.44			
Queue Length 95th (m)	0.0	0.7	16.6			
Control Delay (s)	0.0	0.9	23.6			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.9	23.6			
Approach LOS			C			
Intersection Summary						
Average Delay			3.3			
Intersection Capacity Utilization		55.9%		ICU Level of Service		B
Analysis Period (min)		15				

2035 - Background Traffic + improvement 1
PM PEAK HOUR

PM PEAK HOUR

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	78	107	350	48	182	26	535	782	50	7	732	126
Future Volume (vph)	78	107	350	48	182	26	535	782	50	7	732	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.89		1.00	0.98		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1667		1789	1848		1789	1867		1789	1883	1601
Flt Permitted	0.38	1.00		0.22	1.00		0.28	1.00		0.22	1.00	1.00
Satd. Flow (perm)	710	1667		407	1848		523	1867		422	1883	1601
Peak-hour factor, PHF	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)	85	116	380	52	198	28	582	850	54	8	796	137
RTOR Reduction (vph)	0	118	0	0	5	0	0	2	0	0	0	38
Lane Group Flow (vph)	85	378	0	52	221	0	582	902	0	8	796	99
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	18.5	18.5		18.5	18.5		72.5	72.5		72.5	72.5	72.5
Effective Green, g (s)	18.5	18.5		18.5	18.5		72.5	72.5		72.5	72.5	72.5
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.72	0.72		0.72	0.72	0.72
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	131	308		75	341		379	1353		305	1365	1160
v/s Ratio Prot		c0.23			0.12			0.48			0.42	
v/s Ratio Perm	0.12			0.13			c1.11			0.02		0.06
v/c Ratio	0.65	1.23		0.69	0.65		1.54	0.67		0.03	0.58	0.09
Uniform Delay, d1	37.7	40.8		38.1	37.7		13.8	7.3		3.9	6.6	4.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	10.6	127.3		24.2	4.2		254.0	2.6		0.2	1.8	0.1
Delay (s)	48.3	168.1		62.3	41.9		267.7	9.9		4.0	8.4	4.2
Level of Service	D	F		E	D		F	A		A	A	A
Approach Delay (s)		150.6			45.8			110.9			7.7	
Approach LOS		F			D			F			A	
Intersection Summary												
HCM 2000 Control Delay		82.9		HCM 2000 Level of Service				F				
HCM 2000 Volume to Capacity ratio		1.47										
Actuated Cycle Length (s)		100.0		Sum of lost time (s)				9.0				
Intersection Capacity Utilization		114.5%		ICU Level of Service				H				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis 2: Highway 10 & Eco Park Way/240 Sideroad

2035 - Background Traffic + improvement 1
PM PEAK HOUR

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	↰	↰			↰		↰	↰	↰	↰	↰	↰
Traffic Volume (vph)	560	0	434	5	0	5	370	911	5	5	797	230
Future Volume (vph)	560	0	434	5	0	5	370	911	5	5	797	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1601			1713		1789	1883	1601	1789	1883	1601
Flt Permitted	0.75	1.00			0.78		0.18	1.00	1.00	0.11	1.00	1.00
Satd. Flow (perm)	1415	1601			1371		342	1883	1601	208	1883	1601
Peak-hour factor, PHF	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)	609	0	472	5	0	5	402	990	5	5	866	250
RTOR Reduction (vph)	0	131	0	0	7	0	0	0	2	0	0	91
Lane Group Flow (vph)	609	341	0	0	3	0	402	990	3	5	866	159
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2		2	6	6
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	34.5	34.5			34.5		76.5	76.5	76.5	76.5	76.5	76.5
Effective Green, g (s)	34.5	34.5			34.5		76.5	76.5	76.5	76.5	76.5	76.5
Actuated g/C Ratio	0.29	0.29			0.29		0.64	0.64	0.64	0.64	0.64	0.64
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	406	460			394		218	1200	1020	132	1200	1020
v/s Ratio Prot		0.21					0.53				0.46	
v/s Ratio Perm	c0.43				0.00		c1.18		0.00	0.02		0.10
v/c Ratio	1.50	0.74			0.01		1.84	0.82	0.00	0.04	0.72	0.16
Uniform Delay, d1	42.8	38.7			30.5		21.8	16.6	7.9	8.1	14.6	8.8
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	237.6	6.3			0.0		397.1	4.7	0.0	0.1	2.2	0.1
Delay (s)	280.3	45.0			30.5		418.8	21.4	7.9	8.2	16.8	8.8
Level of Service	F	D			C		F	C	A	A	B	A
Approach Delay (s)		177.6			30.5			135.7			15.0	
Approach LOS		F			C			F			B	
Intersection Summary												
HCM 2000 Control Delay			110.5				HCM 2000 Level of Service				F	
HCM 2000 Volume to Capacity ratio			1.74									
Actuated Cycle Length (s)			120.0							9.0		
Intersection Capacity Utilization			111.4%							H		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2035 - Background Traffic + improvement 1 3: Russel Street & Grey Road 9

PM PEAK HOUR

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↘
Traffic Volume (veh/h)	605	48	68	796	36	41
Future Volume (Veh/h)	605	48	68	796	36	41
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)	658	52	74	865	39	45
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			710		1697	684
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			710		1697	684
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		58	90
cM capacity (veh/h)			889		93	449
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	710	939	84			
Volume Left	0	74	39			
Volume Right	52	0	45			
cSH	1700	889	162			
Volume to Capacity	0.42	0.08	0.52			
Queue Length 95th (m)	0.0	2.1	19.5			
Control Delay (s)	0.0	2.2	49.0			
Lane LOS		A	E			
Approach Delay (s)	0.0	2.2	49.0			
Approach LOS			E			
Intersection Summary						
Average Delay		3.6				
Intersection Capacity Utilization		94.9%		ICU Level of Service		F
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

1: Highway 10 & Grey Road 9/County Road 9

2035 - Background Traffic + improvement 2

AM PEAK HOUR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	119	356	23	111	8	120	577	66	12	440	109
Future Volume (vph)	108	119	356	23	111	8	120	577	66	12	440	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.89		1.00	0.99		1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1672		1789	1864		1789	3523		1789	3472	
Flt Permitted	0.67	1.00		0.31	1.00		0.32	1.00		0.39	1.00	
Satd. Flow (perm)	1269	1672		593	1864		601	3523		727	3472	
Peak-hour factor, PHF	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)	117	129	387	25	121	9	130	627	72	13	478	118
RTOR Reduction (vph)	0	219	0	0	5	0	0	14	0	0	35	0
Lane Group Flow (vph)	117	297	0	25	125	0	130	685	0	13	561	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.7	12.7		12.7	12.7		29.3	29.3		20.8	20.8	
Effective Green, g (s)	12.7	12.7		12.7	12.7		29.3	29.3		20.8	20.8	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.57	0.57		0.41	0.41	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	316	416		147	464		438	2023		296	1416	
v/s Ratio Prot		c0.18			0.07		0.02	c0.19			c0.16	
v/s Ratio Perm	0.09			0.04			0.15			0.02		
v/c Ratio	0.37	0.71		0.17	0.27		0.30	0.34		0.04	0.40	
Uniform Delay, d1	15.8	17.5		15.0	15.4		5.5	5.7		9.1	10.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	5.7		0.6	0.3		0.4	0.5		0.3	0.8	
Delay (s)	16.6	23.2		15.6	15.7		5.8	6.2		9.4	11.5	
Level of Service	B	C		B	B		A	A		A	B	
Approach Delay (s)		22.0			15.7			6.1			11.5	
Approach LOS		C			B			A			B	
Intersection Summary												
HCM 2000 Control Delay		12.8			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.52										
Actuated Cycle Length (s)		51.0			Sum of lost time (s)			13.5				
Intersection Capacity Utilization		61.7%			ICU Level of Service			B				
Analysis Period (min)		15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis 2035 - Background Traffic + improvement 2 2: Highway 10 & 240 Sideroad AM PEAK HOUR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	129	0	300	5	0	5	335	639	5	5	783	175
Future Volume (vph)	129	0	300	5	0	5	335	639	5	5	783	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.82		0.18	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	1415	1601			1440		347	3579	1601	730	3579	1601
Peak-hour factor, PHF	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)	140	0	326	5	0	5	364	695	5	5	851	190
RTOR Reduction (vph)	0	257	0	0	8	0	0	0	2	0	0	126
Lane Group Flow (vph)	140	69	0	0	2	0	364	695	3	5	851	64
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	10.8	10.8			10.8		31.3	31.3	31.3	17.2	17.2	17.2
Effective Green, g (s)	10.8	10.8			10.8		31.3	31.3	31.3	17.2	17.2	17.2
Actuated g/C Ratio	0.21	0.21			0.21		0.61	0.61	0.61	0.34	0.34	0.34
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	299	338			304		483	2192	980	245	1204	538
v/s Ratio Prot		0.04					c0.14	0.19			0.24	
v/s Ratio Perm	c0.10				0.00		c0.32		0.00	0.01		0.04
v/c Ratio	0.47	0.20			0.01		0.75	0.32	0.00	0.02	0.71	0.12
Uniform Delay, d1	17.6	16.6			15.9		7.8	4.8	3.8	11.3	14.8	11.7
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.3			0.0		6.6	0.1	0.0	0.0	1.9	0.1
Delay (s)	18.8	16.9			15.9		14.4	4.8	3.8	11.4	16.7	11.8
Level of Service	B	B			B		B	A	A	B	B	B
Approach Delay (s)		17.5			15.9			8.1			15.8	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM 2000 Control Delay		12.9			HCM 2000 Level of Service				B			
HCM 2000 Volume to Capacity ratio		0.73										
Actuated Cycle Length (s)		51.1			Sum of lost time (s)			13.5				
Intersection Capacity Utilization		70.0%			ICU Level of Service				C			
Analysis Period (min)		15										

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 2035 - Background Traffic + improvement 2
 3: Russel Street & Grey Road 9 AM PEAK HOUR

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↰	↰	
Traffic Volume (veh/h)	542	25	26	372	59	81
Future Volume (Veh/h)	542	25	26	372	59	81
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)	589	27	28	404	64	88
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			616		1062	602
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			616		1062	602
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		73	82
cM capacity (veh/h)			964		240	499
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	616	432	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	964	343			
Volume to Capacity	0.36	0.03	0.44			
Queue Length 95th (m)	0.0	0.7	16.6			
Control Delay (s)	0.0	0.9	23.6			
Lane LOS		A	C			
Approach Delay (s)	0.0	0.9	23.6			
Approach LOS			C			
Intersection Summary						
Average Delay			3.3			
Intersection Capacity Utilization			55.9%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis 1: Highway 10 & Grey Road 9/County Road 9

2035 - Background Traffic + improvement 2
PM PEAK HOUR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	78	107	350	48	182	26	535	782	50	7	732	126
Future Volume (vph)	78	107	350	48	182	26	535	782	50	7	732	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.89		1.00	0.98		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1667		1789	1849		1789	3546		1789	3498	
Flt Permitted	0.49	1.00		0.24	1.00		0.15	1.00		0.32	1.00	
Satd. Flow (perm)	932	1667		459	1849		275	3546		610	3498	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92
Adj. Flow (vph)	82	113	368	51	192	27	563	823	53	7	771	137
RTOR Reduction (vph)	0	161	0	0	7	0	0	6	0	0	19	0
Lane Group Flow (vph)	82	320	0	51	212	0	563	870	0	7	889	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.4	16.4		16.4	16.4		47.6	47.6		22.9	22.9	
Effective Green, g (s)	16.4	16.4		16.4	16.4		47.6	47.6		22.9	22.9	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.65	0.65		0.31	0.31	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	209	374		103	415		598	2312		191	1097	
v/s Ratio Prot		c0.19			0.11		c0.26	0.25			0.25	
v/s Ratio Perm	0.09			0.11			c0.35			0.01		
v/c Ratio	0.39	0.85		0.50	0.51		0.94	0.38		0.04	0.81	
Uniform Delay, d1	24.1	27.2		24.7	24.8		18.5	5.9		17.4	23.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	17.1		3.7	1.1		23.2	0.5		0.4	6.5	
Delay (s)	25.3	44.2		28.4	25.9		41.7	6.3		17.8	29.6	
Level of Service	C	D		C	C		D	A		B	C	
Approach Delay (s)		41.5			26.3			20.2			29.5	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM 2000 Control Delay		27.1					HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio		0.96										
Actuated Cycle Length (s)		73.0					Sum of lost time (s)		13.5			
Intersection Capacity Utilization		100.2%					ICU Level of Service		G			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis 2: Highway 10 & 240 Sideroad

2035 - Background Traffic + improvement 2

PM PEAK HOUR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	560	0	434	5	0	5	370	911	5	5	797	230
Future Volume (vph)	560	0	434	5	0	5	370	911	5	5	797	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.87		0.11	1.00	1.00	0.29	1.00	1.00
Satd. Flow (perm)	1415	1601			1536		211	3579	1601	551	3579	1601
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	602	0	467	5	0	5	398	980	5	5	857	247
RTOR Reduction (vph)	0	264	0	0	6	0	0	0	3	0	0	183
Lane Group Flow (vph)	602	203	0	0	4	0	398	980	2	5	857	64
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	52.0	52.0			52.0		58.8	58.8	58.8	31.2	31.2	31.2
Effective Green, g (s)	52.0	52.0			52.0		58.8	58.8	58.8	31.2	31.2	31.2
Actuated g/C Ratio	0.43	0.43			0.43		0.49	0.49	0.49	0.26	0.26	0.26
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	614	694			666		407	1756	785	143	932	416
v/s Ratio Prot		0.13					c0.19	0.27			0.24	
v/s Ratio Perm	c0.43				0.00		c0.29		0.00	0.01		0.04
v/c Ratio	0.98	0.29			0.01		0.98	0.56	0.00	0.03	0.92	0.15
Uniform Delay, d1	33.4	22.0			19.2		36.1	21.4	15.6	33.1	43.1	34.1
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	31.3	0.2			0.0		38.4	0.4	0.0	0.1	13.7	0.2
Delay (s)	64.7	22.2			19.2		74.5	21.8	15.6	33.2	56.8	34.3
Level of Service	E	C			B		E	C	B	C	E	C
Approach Delay (s)		46.1			19.2			36.9			51.7	
Approach LOS		D			B			D			D	
Intersection Summary												
HCM 2000 Control Delay		44.2					HCM 2000 Level of Service		D			
HCM 2000 Volume to Capacity ratio		1.00										
Actuated Cycle Length (s)		119.8					Sum of lost time (s)		13.5			
Intersection Capacity Utilization		91.5%					ICU Level of Service		F			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2035 - Background Traffic + improvement 2 3: Russel Street & Grey Road 9 PM PEAK HOUR

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰	↱
Traffic Volume (veh/h)	605	48	68	796	36	41
Future Volume (Veh/h)	605	48	68	796	36	41
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)	658	52	74	865	39	45
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			710		1697	684
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			710		1697	684
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		58	90
cM capacity (veh/h)			889		93	449
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	710	939	84			
Volume Left	0	74	39			
Volume Right	52	0	45			
cSH	1700	889	162			
Volume to Capacity	0.42	0.08	0.52			
Queue Length 95th (m)	0.0	2.1	19.5			
Control Delay (s)	0.0	2.2	49.0			
Lane LOS		A	E			
Approach Delay (s)	0.0	2.2	49.0			
Approach LOS			E			
Intersection Summary						
Average Delay			3.6			
Intersection Capacity Utilization		94.9%		ICU Level of Service	F	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis 1: Highway 10 & Grey Road 9/County Road 9

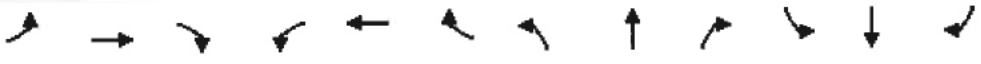
2040 - Background Traffic + Improvement 2

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	128	369	25	119	9	124	594	71	13	456	118
Future Volume (vph)	116	128	369	25	119	9	124	594	71	13	456	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.89		1.00	0.99		1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1674		1789	1863		1789	3521		1789	3468	
Flt Permitted	0.67	1.00		0.29	1.00		0.30	1.00		0.38	1.00	
Satd. Flow (perm)	1259	1674		554	1863		568	3521		710	3468	
Peak-hour factor, PHF	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)	126	139	401	27	129	10	135	646	77	14	496	128
RTOR Reduction (vph)	0	207	0	0	6	0	0	15	0	0	38	0
Lane Group Flow (vph)	126	333	0	27	133	0	135	708	0	14	586	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	13.6	13.6		13.6	13.6		29.2	29.2		20.8	20.8	
Effective Green, g (s)	13.6	13.6		13.6	13.6		29.2	29.2		20.8	20.8	
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.56	0.56		0.40	0.40	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	330	439		145	489		412	1984		285	1392	
v/s Ratio Prot		c0.20			0.07		0.02	c0.20			c0.17	
v/s Ratio Perm	0.10			0.05			0.16			0.02		
v/c Ratio	0.38	0.76		0.19	0.27		0.33	0.36		0.05	0.42	
Uniform Delay, d1	15.7	17.6		14.8	15.2		5.9	6.2		9.5	11.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	7.3		0.6	0.3		0.5	0.5		0.3	0.9	
Delay (s)	16.4	24.9		15.4	15.5		6.4	6.7		9.8	12.1	
Level of Service	B	C		B	B		A	A		A	B	
Approach Delay (s)		23.3			15.5			6.6			12.1	
Approach LOS		C			B			A			B	
Intersection Summary												
HCM 2000 Control Delay		13.5										
HCM 2000 Volume to Capacity ratio		0.55										
Actuated Cycle Length (s)		51.8										
Intersection Capacity Utilization		71.8%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis 2: Highway 10 & Eco Park Way/240 Sideroad

2040 - Background Traffic + Improvement 2
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			↕		↰	↕	↱	↰	↕	↱
Traffic Volume (vph)	129	0	300	5	0	5	335	663	5	5	819	175
Future Volume (vph)	129	0	300	5	0	5	335	663	5	5	819	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.82		0.18	1.00	1.00	0.38	1.00	1.00
Satd. Flow (perm)	1415	1601			1440		342	3579	1601	711	3579	1601
Peak-hour factor, PHF	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)	140	0	326	5	0	5	364	721	5	5	890	190
RTOR Reduction (vph)	0	258	0	0	8	0	0	0	2	0	0	125
Lane Group Flow (vph)	140	68	0	0	2	0	364	721	3	5	890	65
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	10.8	10.8			10.8		31.6	31.6	31.6	17.5	17.5	17.5
Effective Green, g (s)	10.8	10.8			10.8		31.6	31.6	31.6	17.5	17.5	17.5
Actuated g/C Ratio	0.21	0.21			0.21		0.61	0.61	0.61	0.34	0.34	0.34
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	297	336			302		480	2200	984	242	1218	545
v/s Ratio Prot		0.04					c0.14	0.20			0.25	
v/s Ratio Perm	c0.10				0.00		c0.32		0.00	0.01		0.04
v/c Ratio	0.47	0.20			0.01		0.76	0.33	0.00	0.02	0.73	0.12
Uniform Delay, d1	17.8	16.8			16.1		8.1	4.8	3.8	11.3	14.9	11.6
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.3			0.0		6.8	0.1	0.0	0.0	2.3	0.1
Delay (s)	19.0	17.1			16.1		14.9	4.9	3.8	11.3	17.2	11.7
Level of Service	B	B			B		B	A	A	B	B	B
Approach Delay (s)		17.6			16.1			8.2			16.2	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM 2000 Control Delay		13.2										B
HCM 2000 Volume to Capacity ratio		0.73										
Actuated Cycle Length (s)		51.4								13.5		
Intersection Capacity Utilization		71.0%									C	
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2040 - Background Traffic + Improvement 2 3: Russel Street & Grey Road 9

AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰	↱
Traffic Volume (veh/h)	569	25	26	396	59	81
Future Volume (Veh/h)	569	25	26	396	59	81
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)	618	27	28	430	64	88
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			645		1118	632
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			645		1118	632
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		71	82
cM capacity (veh/h)			940		222	481
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	645	458	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	940	323			
Volume to Capacity	0.38	0.03	0.47			
Queue Length 95th (m)	0.0	0.7	18.2			
Control Delay (s)	0.0	0.9	25.7			
Lane LOS		A	D			
Approach Delay (s)	0.0	0.9	25.7			
Approach LOS			D			
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			57.1%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis 2040 - Background Traffic + Improvement 2 1: Highway 10 & Grey Road 9/County Road 9 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	115	359	51	195	28	553	806	54	8	748	135
Future Volume (vph)	84	115	359	51	195	28	553	806	54	8	748	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.89		1.00	0.98		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1669		1789	1848		1789	3545		1789	3494	
Flt Permitted	0.47	1.00		0.23	1.00		0.15	1.00		0.31	1.00	
Satd. Flow (perm)	887	1669		438	1848		280	3545		593	3494	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92
Adj. Flow (vph)	88	121	378	54	205	29	582	848	57	8	787	147
RTOR Reduction (vph)	0	152	0	0	7	0	0	6	0	0	20	0
Lane Group Flow (vph)	88	347	0	54	227	0	582	899	0	8	914	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	17.2	17.2		17.2	17.2		47.8	47.8		22.4	22.4	
Effective Green, g (s)	17.2	17.2		17.2	17.2		47.8	47.8		22.4	22.4	
Actuated g/C Ratio	0.23	0.23		0.23	0.23		0.65	0.65		0.30	0.30	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	206	387		101	429		607	2289		179	1057	
v/s Ratio Prot		c0.21			0.12		c0.27	0.25			0.26	
v/s Ratio Perm	0.10			0.12			c0.35			0.01		
v/c Ratio	0.43	0.90		0.53	0.53		0.96	0.39		0.04	0.86	
Uniform Delay, d1	24.2	27.5		24.9	24.9		19.1	6.2		18.2	24.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	22.4		5.4	1.2		26.3	0.5		0.5	9.4	
Delay (s)	25.6	50.0		30.2	26.0		45.3	6.7		18.7	33.8	
Level of Service	C	D		C	C		D	A		B	C	
Approach Delay (s)		46.3			26.8			21.8			33.7	
Approach LOS		D			C			C			C	
Intersection Summary												
HCM 2000 Control Delay		30.0			HCM 2000 Level of Service			C				
HCM 2000 Volume to Capacity ratio		0.99										
Actuated Cycle Length (s)		74.0			Sum of lost time (s)			13.5				
Intersection Capacity Utilization		102.9%			ICU Level of Service			G				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis 2: Highway 10 & Eco Park Way/240 Sideroad

2040 - Background Traffic + Improvement 2

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	560	0	434	5	0	5	370	954	5	5	828	230
Future Volume (vph)	560	0	434	5	0	5	370	954	5	5	828	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.88		0.14	1.00	1.00	0.28	1.00	1.00
Satd. Flow (perm)	1415	1601			1538		271	3579	1601	526	3579	1601
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	602	0	467	5	0	5	398	1026	5	5	890	247
RTOR Reduction (vph)	0	260	0	0	6	0	0	0	3	0	0	183
Lane Group Flow (vph)	602	207	0	0	4	0	398	1026	2	5	890	64
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	37.5	37.5			37.5		43.5	43.5	43.5	23.3	23.3	23.3
Effective Green, g (s)	37.5	37.5			37.5		43.5	43.5	43.5	23.3	23.3	23.3
Actuated g/C Ratio	0.42	0.42			0.42		0.48	0.48	0.48	0.26	0.26	0.26
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	589	667			640		395	1729	773	136	926	414
v/s Ratio Prot		0.13					c0.18	0.29			0.25	
v/s Ratio Perm	c0.43				0.00		c0.31		0.00	0.01		0.04
v/c Ratio	1.02	0.31			0.01		1.01	0.59	0.00	0.04	0.96	0.15
Uniform Delay, d1	26.2	17.6			15.4		25.2	16.8	12.0	25.0	32.9	25.7
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	42.8	0.3			0.0		47.2	0.6	0.0	0.1	20.6	0.2
Delay (s)	69.0	17.9			15.4		72.4	17.4	12.0	25.1	53.5	25.9
Level of Service	E	B			B		E	B	B	C	D	C
Approach Delay (s)		46.7			15.4			32.7			47.4	
Approach LOS		D			B			C			D	

Intersection Summary

HCM 2000 Control Delay	41.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	92.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 2040 - Background Traffic + Improvement 2 3: Russel Street & Grey Road 9 PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↗	↘	
Traffic Volume (veh/h)	634	48	68	834	36	41
Future Volume (Veh/h)	634	48	68	834	36	41
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)	689	52	74	907	39	45
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			741		1770	715
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			741		1770	715
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		53	90
cM capacity (veh/h)			866		84	431
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	741	981	84			
Volume Left	0	74	39			
Volume Right	52	0	45			
cSH	1700	866	147			
Volume to Capacity	0.44	0.09	0.57			
Queue Length 95th (m)	0.0	2.1	22.1			
Control Delay (s)	0.0	2.3	57.7			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.3	57.7			
Approach LOS			F			
Intersection Summary						
Average Delay			4.0			
Intersection Capacity Utilization		98.4%		ICU Level of Service		F
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

1: Highway 10 & Grey Road 9/County Road 9

2040 - Background Traffic + Improvement 3

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	128	369	25	119	9	124	594	71	13	456	118
Future Volume (vph)	116	128	369	25	119	9	124	594	71	13	456	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1863		1789	3521		1789	3468	
Flt Permitted	0.67	1.00	1.00	0.67	1.00		0.31	1.00		0.38	1.00	
Satd. Flow (perm)	1259	1883	1601	1259	1863		580	3521		710	3468	
Peak-hour factor, PHF	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)	126	139	401	27	129	10	135	646	77	14	496	128
RTOR Reduction (vph)	0	0	287	0	6	0	0	14	0	0	36	0
Lane Group Flow (vph)	126	139	115	27	133	0	135	709	0	14	588	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	11.0	11.0	11.0	11.0	11.0		29.2	29.2		20.4	20.4	
Effective Green, g (s)	11.0	11.0	11.0	11.0	11.0		29.2	29.2		20.4	20.4	
Actuated g/C Ratio	0.22	0.22	0.22	0.22	0.22		0.59	0.59		0.41	0.41	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	281	420	357	281	416		449	2089		294	1437	
v/s Ratio Prot		0.07			0.07		0.03	c0.20			c0.17	
v/s Ratio Perm	c0.10		0.07	0.02			0.15			0.02		
v/c Ratio	0.45	0.33	0.32	0.10	0.32		0.30	0.34		0.05	0.41	
Uniform Delay, d1	16.5	16.0	16.0	15.2	16.0		4.9	5.1		8.6	10.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.5	0.5	0.1	0.4		0.4	0.4		0.3	0.9	
Delay (s)	17.6	16.5	16.5	15.3	16.4		5.3	5.5		8.9	11.0	
Level of Service	B	B	B	B	B		A	A		A	B	
Approach Delay (s)		16.7			16.2			5.5			11.0	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM 2000 Control Delay		11.0										
HCM 2000 Volume to Capacity ratio		0.43										
Actuated Cycle Length (s)		49.2								13.5		
Intersection Capacity Utilization		54.6%								A		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis 2040 - Background Traffic + Improvement 3 2: Highway 10 & Eco Park Way/240 Sideroad AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	129	0	300	5	0	5	335	663	5	5	819	175
Future Volume (vph)	129	0	300	5	0	5	335	663	5	5	819	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3471	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.64		0.18	1.00	1.00	0.38	1.00	1.00
Satd. Flow (perm)	2744	1601			1124		346	3579	1601	711	3579	1601
Peak-hour factor, PHF	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)	140	0	326	5	0	5	364	721	5	5	890	190
RTOR Reduction (vph)	0	270	0	0	8	0	0	0	2	0	0	123
Lane Group Flow (vph)	140	56	0	0	2	0	364	721	3	5	890	67
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	8.4	8.4			8.4		31.4	31.4	31.4	17.3	17.3	17.3
Effective Green, g (s)	8.4	8.4			8.4		31.4	31.4	31.4	17.3	17.3	17.3
Actuated g/C Ratio	0.17	0.17			0.17		0.64	0.64	0.64	0.35	0.35	0.35
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	472	275			193		506	2302	1030	252	1268	567
v/s Ratio Prot		0.04					c0.14	0.20			0.25	
v/s Ratio Perm	c0.05				0.00		c0.32		0.00	0.01		0.04
v/c Ratio	0.30	0.20			0.01		0.72	0.31	0.00	0.02	0.70	0.12
Uniform Delay, d1	17.6	17.3			16.7		7.0	3.9	3.1	10.2	13.5	10.6
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.4			0.0		4.9	0.1	0.0	0.0	1.8	0.1
Delay (s)	18.0	17.7			16.8		11.9	4.0	3.1	10.3	15.3	10.7
Level of Service	B	B			B		B	A	A	B	B	B
Approach Delay (s)		17.8			16.8			6.6			14.5	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM 2000 Control Delay		11.8										
HCM 2000 Volume to Capacity ratio		0.68										
Actuated Cycle Length (s)		48.8										
Intersection Capacity Utilization		71.0%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2040 - Background Traffic + Improvement 3 3: Russel Street & Grey Road 9

AM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	569	25	26	396	59	81
Future Volume (Veh/h)	569	25	26	396	59	81
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)	618	27	28	430	64	88
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			645		1118	632
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			645		1118	632
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		71	82
cM capacity (veh/h)			940		222	481
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	645	458	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	940	323			
Volume to Capacity	0.38	0.03	0.47			
Queue Length 95th (m)	0.0	0.7	18.2			
Control Delay (s)	0.0	0.9	25.7			
Lane LOS		A	D			
Approach Delay (s)	0.0	0.9	25.7			
Approach LOS			D			
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			57.1%	ICU Level of Service	B	
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis 2040 - Background Traffic + Improvement 3 1: Highway 10 & Grey Road 9/County Road 9 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	115	359	51	195	28	553	806	54	8	748	135
Future Volume (vph)	84	115	359	51	195	28	553	806	54	8	748	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1848		1789	3545		1789	3494	
Flt Permitted	0.41	1.00	1.00	0.68	1.00		0.13	1.00		0.31	1.00	
Satd. Flow (perm)	767	1883	1601	1279	1848		246	3545		593	3494	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92
Adj. Flow (vph)	88	121	378	54	205	29	582	848	57	8	787	147
RTOR Reduction (vph)	0	0	308	0	7	0	0	5	0	0	18	0
Lane Group Flow (vph)	88	121	70	54	227	0	582	900	0	8	916	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	14.2	14.2	14.2	14.2	14.2		53.0	53.0		26.1	26.1	
Effective Green, g (s)	14.2	14.2	14.2	14.2	14.2		53.0	53.0		26.1	26.1	
Actuated g/C Ratio	0.19	0.19	0.19	0.19	0.19		0.70	0.70		0.34	0.34	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	142	350	298	238	344		624	2465		203	1196	
v/s Ratio Prot		0.06			c0.12		c0.27	0.25			0.26	
v/s Ratio Perm	0.11		0.04	0.04			c0.37			0.01		
v/c Ratio	0.62	0.35	0.24	0.23	0.66		0.93	0.36		0.04	0.77	
Uniform Delay, d1	28.5	27.0	26.4	26.3	28.8		19.3	4.7		16.7	22.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.8	0.6	0.4	0.5	4.7		21.0	0.4		0.4	4.7	
Delay (s)	36.3	27.6	26.8	26.8	33.5		40.3	5.2		17.1	27.0	
Level of Service	D	C	C	C	C		D	A		B	C	
Approach Delay (s)		28.4			32.2			18.9			27.0	
Approach LOS		C			C			B			C	
Intersection Summary												
HCM 2000 Control Delay		24.1					HCM 2000 Level of Service			C		
HCM 2000 Volume to Capacity ratio		0.91										
Actuated Cycle Length (s)		76.2					Sum of lost time (s)		13.5			
Intersection Capacity Utilization		87.2%					ICU Level of Service		E			
Analysis Period (min)		15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis 2040 - Background Traffic + Improvement 3 2: Highway 10 & Eco Park Way/240 Sideroad PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	560	0	434	5	0	5	370	954	5	5	828	230
Future Volume (vph)	560	0	434	5	0	5	370	954	5	5	828	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3471	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.77		0.16	1.00	1.00	0.28	1.00	1.00
Satd. Flow (perm)	2744	1601			1345		308	3579	1601	526	3579	1601
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	602	0	467	5	0	5	398	1026	5	5	890	247
RTOR Reduction (vph)	0	308	0	0	7	0	0	0	2	0	0	169
Lane Group Flow (vph)	602	159	0	0	3	0	398	1026	3	5	890	78
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	17.1	17.1			17.1		37.0	37.0	37.0	20.0	20.0	20.0
Effective Green, g (s)	17.1	17.1			17.1		37.0	37.0	37.0	20.0	20.0	20.0
Actuated g/C Ratio	0.27	0.27			0.27		0.59	0.59	0.59	0.32	0.32	0.32
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	743	433			364		473	2098	938	166	1134	507
v/s Ratio Prot		0.10					c0.17	0.29			0.25	
v/s Ratio Perm	c0.22				0.00		c0.33		0.00	0.01		0.05
v/c Ratio	0.81	0.37			0.01		0.84	0.49	0.00	0.03	0.78	0.15
Uniform Delay, d1	21.5	18.6			16.8		13.3	7.6	5.4	14.9	19.6	15.5
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.7	0.5			0.0		12.7	0.2	0.0	0.1	3.6	0.1
Delay (s)	28.2	19.1			16.8		26.1	7.7	5.4	14.9	23.2	15.6
Level of Service	C	B			B		C	A	A	B	C	B
Approach Delay (s)		24.2			16.8			12.8			21.5	
Approach LOS		C			B			B			C	
Intersection Summary												
HCM 2000 Control Delay		18.9			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.88										
Actuated Cycle Length (s)		63.1			Sum of lost time (s)			13.5				
Intersection Capacity Utilization		81.5%			ICU Level of Service			D				
Analysis Period (min)		15										

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 2040 - Background Traffic + Improvement 3 3: Russel Street & Grey Road 9

PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↰	↰	↰
Traffic Volume (veh/h)	634	48	68	834	36	41
Future Volume (Veh/h)	634	48	68	834	36	41
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)	689	52	74	907	39	45
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			741		1770	715
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			741		1770	715
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		53	90
cM capacity (veh/h)			866		84	431
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	741	981	84			
Volume Left	0	74	39			
Volume Right	52	0	45			
cSH	1700	866	147			
Volume to Capacity	0.44	0.09	0.57			
Queue Length 95th (m)	0.0	2.1	22.1			
Control Delay (s)	0.0	2.3	57.7			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.3	57.7			
Approach LOS			F			
Intersection Summary						
Average Delay		4.0				
Intersection Capacity Utilization		98.4%		ICU Level of Service	F	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis 2045 - Background Traffic + Improvement 3 1: Highway 10 & Grey Road 9/County Road 9 AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	↖	↑	↗	↖	↗		↖	↕		↖	↕	
Traffic Volume (vph)	124	137	382	27	128	9	129	612	75	13	474	127
Future Volume (vph)	124	137	382	27	128	9	129	612	75	13	474	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1864		1789	3520		1789	3465	
Flt Permitted	0.66	1.00	1.00	0.66	1.00		0.29	1.00		0.37	1.00	
Satd. Flow (perm)	1247	1883	1601	1247	1864		551	3520		693	3465	
Peak-hour factor, PHF	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)	135	149	415	29	139	10	140	665	82	14	515	138
RTOR Reduction (vph)	0	0	278	0	5	0	0	14	0	0	38	0
Lane Group Flow (vph)	135	149	137	29	144	0	140	733	0	14	615	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	11.3	11.3	11.3	11.3	11.3		29.2	29.2		20.4	20.4	
Effective Green, g (s)	11.3	11.3	11.3	11.3	11.3		29.2	29.2		20.4	20.4	
Actuated g/C Ratio	0.23	0.23	0.23	0.23	0.23		0.59	0.59		0.41	0.41	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	284	429	365	284	425		432	2076		285	1428	
v/s Ratio Prot		0.08			0.08		0.03	c0.21			c0.18	
v/s Ratio Perm	c0.11		0.09	0.02			0.16			0.02		
v/c Ratio	0.48	0.35	0.38	0.10	0.34		0.32	0.35		0.05	0.43	
Uniform Delay, d1	16.5	16.0	16.1	15.1	16.0		5.1	5.3		8.7	10.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.3	0.5	0.7	0.2	0.5		0.4	0.5		0.3	0.9	
Delay (s)	17.8	16.5	16.8	15.3	16.4		5.5	5.7		9.1	11.3	
Level of Service	B	B	B	B	B		A	A		A	B	
Approach Delay (s)		16.9			16.3			5.7			11.3	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM 2000 Control Delay			11.2			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.45									
Actuated Cycle Length (s)			49.5			Sum of lost time (s)				13.5		
Intersection Capacity Utilization			56.2%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

AM Peak Hour

Synchro 11 Report
Page 2

HCM Unsignalized Intersection Capacity Analysis 2045 - Background Traffic + Improvement 33: Russel Street & Grey Road 9

AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Traffic Volume (veh/h)	597	25	26	421	59	81
Future Volume (Veh/h)	597	25	26	421	59	81
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)	649	27	28	458	64	88
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			676		1176	662
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			676		1176	662
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		69	81
cM capacity (veh/h)			915		205	462
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	676	486	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	915	302			
Volume to Capacity	0.40	0.03	0.50			
Queue Length 95th (m)	0.0	0.7	20.2			
Control Delay (s)	0.0	0.9	28.4			
Lane LOS		A	D			
Approach Delay (s)	0.0	0.9	28.4			
Approach LOS			D			
Intersection Summary						
Average Delay			3.6			
Intersection Capacity Utilization			58.4%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis 2045 - Background Traffic + Improvement 3 1: Highway 10 & Grey Road 9/County Road 9 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	124	369	55	209	30	572	832	58	8	765	145
Future Volume (vph)	90	124	369	55	209	30	572	832	58	8	765	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1848		1789	3544		1789	3490	
Flt Permitted	0.33	1.00	1.00	0.63	1.00		0.11	1.00		0.31	1.00	
Satd. Flow (perm)	625	1883	1601	1178	1848		212	3544		575	3490	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92
Adj. Flow (vph)	95	131	388	58	220	32	602	876	61	8	805	158
RTOR Reduction (vph)	0	0	317	0	6	0	0	5	0	0	17	0
Lane Group Flow (vph)	95	131	71	58	246	0	602	932	0	8	946	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0		62.8	62.8		31.2	31.2	
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0		62.8	62.8		31.2	31.2	
Actuated g/C Ratio	0.18	0.18	0.18	0.18	0.18		0.72	0.72		0.36	0.36	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	113	343	291	214	336		638	2534		204	1240	
v/s Ratio Prot		0.07			0.13		c0.29	0.26			0.27	
v/s Ratio Perm	c0.15		0.04	0.05			c0.38			0.01		
v/c Ratio	0.84	0.38	0.24	0.27	0.73		0.94	0.37		0.04	0.76	
Uniform Delay, d1	34.7	31.6	30.7	30.9	33.9		23.1	4.8		18.5	25.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	40.1	0.7	0.4	0.7	8.0		22.6	0.4		0.4	4.5	
Delay (s)	74.8	32.3	31.2	31.6	41.9		45.7	5.2		18.9	29.5	
Level of Service	E	C	C	C	D		D	A		B	C	
Approach Delay (s)		38.1			40.0			21.1			29.4	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM 2000 Control Delay			28.2			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			87.8			Sum of lost time (s)				13.5		
Intersection Capacity Utilization			90.3%			ICU Level of Service				E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis 2: Highway 10 & Eco Park Way/240 Sideroad

2045 - Background Traffic + Improvement 3
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	560	0	434	5	0	5	370	1001	5	5	860	230
Future Volume (vph)	560	0	434	5	0	5	370	1001	5	5	860	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3471	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.76		0.15	1.00	1.00	0.27	1.00	1.00
Satd. Flow (perm)	2744	1601			1334		291	3579	1601	500	3579	1601
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	602	0	467	5	0	5	398	1076	5	5	925	247
RTOR Reduction (vph)	0	308	0	0	7	0	0	0	2	0	0	165
Lane Group Flow (vph)	602	159	0	0	3	0	398	1076	3	5	925	82
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	17.3	17.3			17.3		38.0	38.0	38.0	21.4	21.4	21.4
Effective Green, g (s)	17.3	17.3			17.3		38.0	38.0	38.0	21.4	21.4	21.4
Actuated g/C Ratio	0.27	0.27			0.27		0.59	0.59	0.59	0.33	0.33	0.33
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	738	430			358		453	2115	946	166	1191	532
v/s Ratio Prot		0.10					c0.16	0.30			0.26	
v/s Ratio Perm	c0.22				0.00		c0.35		0.00	0.01		0.05
v/c Ratio	0.82	0.37			0.01		0.88	0.51	0.00	0.03	0.78	0.15
Uniform Delay, d1	22.0	19.1			17.2		14.4	7.7	5.4	14.5	19.3	15.1
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.9	0.5			0.0		17.3	0.9	0.0	0.3	5.0	0.6
Delay (s)	28.9	19.6			17.2		31.7	8.6	5.4	14.8	24.3	15.7
Level of Service	C	B			B		C	A	A	B	C	B
Approach Delay (s)		24.9			17.2			14.8			22.5	
Approach LOS		C			B			B			C	

Intersection Summary

HCM 2000 Control Delay	20.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	64.3	Sum of lost time (s)	13.5
Intersection Capacity Utilization	82.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 2045 - Background Traffic + Improvement 3 3: Russel Street & Grey Road 9 PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Traffic Volume (veh/h)	666	48	68	875	36	41
Future Volume (Veh/h)	666	48	68	875	36	41
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)	724	52	74	951	39	45
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			776		1849	750
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			776		1849	750
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		48	89
cM capacity (veh/h)			840		75	411
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	776	1025	84			
Volume Left	0	74	39			
Volume Right	52	0	45			
cSH	1700	840	133			
Volume to Capacity	0.46	0.09	0.63			
Queue Length 95th (m)	0.0	2.2	25.3			
Control Delay (s)	0.0	2.5	70.0			
Lane LOS		A	F			
Approach Delay (s)	0.0	2.5	70.0			
Approach LOS			F			
Intersection Summary						
Average Delay		4.5				
Intersection Capacity Utilization		102.3%	ICU Level of Service	G		
Analysis Period (min)		15				

Appendix E: Future Total Conditions

HCM Signalized Intersection Capacity Analysis 1: Highway 10 & Main Street E/Dufferin Road 9

01/13/2026

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	101	111	333	22	103	8	114	295	62	11	303	102
Future Volume (vph)	101	111	333	22	103	8	114	295	62	11	303	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.89		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1672		1789	1862		1789	1835		1789	1883	1601
Flt Permitted	0.68	1.00		0.40	1.00		0.56	1.00		0.51	1.00	1.00
Satd. Flow (perm)	1279	1672		746	1862		1058	1835		961	1883	1601
Peak-hour factor, PHF	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)	110	121	362	24	112	9	124	321	67	12	329	111
RTOR Reduction (vph)	0	264	0	0	7	0	0	14	0	0	0	57
Lane Group Flow (vph)	110	219	0	24	114	0	124	374	0	12	329	54
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	10.1	10.1		10.1	10.1		18.2	18.2		18.2	18.2	18.2
Effective Green, g (s)	10.1	10.1		10.1	10.1		18.2	18.2		18.2	18.2	18.2
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.49	0.49		0.49	0.49	0.49
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	346	452		202	504		516	895		468	918	781
v/s Ratio Prot		c0.13			0.06			c0.20			0.17	
v/s Ratio Perm	0.09			0.03			0.12			0.01		0.03
v/c Ratio	0.32	0.48		0.12	0.23		0.24	0.42		0.03	0.36	0.07
Uniform Delay, d1	10.9	11.4		10.2	10.6		5.5	6.1		5.0	5.9	5.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.8		0.3	0.2		1.1	1.4		0.1	1.1	0.2
Delay (s)	11.4	12.2		10.5	10.8		6.6	7.6		5.1	7.0	5.2
Level of Service	B	B		B	B		A	A		A	A	A
Approach Delay (s/veh)		12.1			10.8			7.3			6.5	
Approach LOS		B			B			A			A	
Intersection Summary												
HCM 2000 Control Delay (s/veh)		9.1			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.44										
Actuated Cycle Length (s)		37.3			Sum of lost time (s)			9.0				
Intersection Capacity Utilization		61.0%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2: Highway 10 & Eco Park Way/240 Sideroad

01/13/2026

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔	↔		↔	
Traffic Volume (veh/h)	103	0	309	5	0	5	300	370	5	5	666	151
Future Volume (Veh/h)	103	0	309	5	0	5	300	370	5	5	666	151
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	0.92
Hourly flow rate (vph)	112	0	336	5	0	5	326	402	5	5	724	164
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	1875	1875	806	2206	1952	402	888			407		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1875	1875	806	2206	1952	402	888			407		
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 %	0	100	12	0	100	99	57			100		
cM capacity (veh/h)	36	41	382	3	37	648	763			1152		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1							
Volume Total	448	10	728	5	893							
Volume Left	112	5	326	0	5							
Volume Right	336	5	0	5	164							
cSH	112	5	763	1700	1152							
Volume to Capacity	3.99	1.98	0.43	0.00*	0.00*							
Queue Length 95th (m)	Err	17.3	16.4	0.0	0.1							
Control Delay (s/veh)	Err	1762.3	10.0	0.0	0.1							
Lane LOS	F	F	A		A							
Approach Delay (s/veh)	Err	1762.3	9.9		0.1							
Approach LOS	F	F										
Intersection Summary												
Average Delay			2161.5									
Intersection Capacity Utilization			116.9%			ICU Level of Service				H		
Analysis Period (min)			15									

* Value less than 0.01.

HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Main Street E

01/13/2026

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	506	25	26	348	59	81
Future Volume (Veh/h)	506	25	26	348	59	81
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)	550	27	28	378	64	88
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			577		998	564
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			577		998	564
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		76	83
cM capacity (veh/h)			996		263	525
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	577	406	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	996	370			
Volume to Capacity	0.34	0.03	0.41			
Queue Length 95th (m)	0.0	0.7	14.8			
Control Delay (s/veh)	0.0	0.9	21.4			
Lane LOS		A	C			
Approach Delay (s/veh)	0.0	0.9	21.4			
Approach LOS			C			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			54.6%	ICU Level of Service	A	
Analysis Period (min)			15			

* Value less than 0.01.

HCM Signalized Intersection Capacity Analysis

1: Highway 10 & Main Street E/Dufferin Road 9

01/13/2026

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	100	291	45	169	24	470	479	47	6	353	118
Future Volume (vph)	73	100	291	45	169	24	470	479	47	6	353	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.89		1.00	0.98		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1673		1789	1848		1789	1858		1789	1883	1601
Flt Permitted	0.52	1.00		0.28	1.00		0.51	1.00		0.38	1.00	1.00
Satd. Flow (perm)	981	1673		531	1848		965	1858		723	1883	1601
Peak-hour factor, PHF	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)	79	109	316	49	184	26	511	521	51	7	384	128
RTOR Reduction (vph)	0	158	0	0	8	0	0	5	0	0	0	45
Lane Group Flow (vph)	79	267	0	49	202	0	511	567	0	7	384	83
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	14.2	14.2		14.2	14.2		43.2	43.2		43.2	43.2	43.2
Effective Green, g (s)	14.2	14.2		14.2	14.2		43.2	43.2		43.2	43.2	43.2
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.65	0.65		0.65	0.65	0.65
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	209	357		113	395		627	1208		470	1225	1041
v/s Ratio Prot		c0.16			0.11			0.31			0.20	
v/s Ratio Perm	0.08			0.09			c0.53			0.01		0.05
v/c Ratio	0.38	0.75		0.43	0.51		0.81	0.47		0.01	0.31	0.08
Uniform Delay, d1	22.3	24.4		22.6	23.0		8.6	5.8		4.1	5.1	4.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.1	8.3		2.7	1.1		11.2	1.3		0.1	0.7	0.2
Delay (s)	23.5	32.7		25.3	24.2		19.8	7.1		4.2	5.8	4.4
Level of Service	C	C		C	C		B	A		A	A	A
Approach Delay (s/veh)		31.3			24.4			13.1			5.4	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM 2000 Control Delay (s/veh)	16.5			HCM 2000 Level of Service			B					
HCM 2000 Volume to Capacity ratio	0.80											
Actuated Cycle Length (s)	66.4			Sum of lost time (s)			9.0					
Intersection Capacity Utilization	86.9%			ICU Level of Service			E					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: Highway 10 & Eco Park Way/240 Sideroad

01/13/2026

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	260	0	374	5	0	5	374	729	5	5	491	215
Future Volume (Veh/h)	260	0	374	5	0	5	374	729	5	5	491	215
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	0.92
Hourly flow rate (vph)	283	0	407	5	0	5	407	792	5	5	534	234
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	2272	2272	651	2674	2384	792	768			797		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2272	2272	651	2674	2384	792	768			797		
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 %	0	100	13	0	100	99	52			99		
cM capacity (veh/h)	17	21	469	1	18	389	846			825		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1							
Volume Total	690	10	1199	5	773							
Volume Left	283	5	407	0	5							
Volume Right	407	5	0	5	234							
cSH	40	2	846	1700	825							
Volume to Capacity	17.11	4.23	0.48	0.00*	0.00*							
Queue Length 95th (m)	Err	Err	20.2	0.0	0.1							
Control Delay (s/veh)	Err	Err	12.3	0.0	0.2							
Lane LOS	F	F	B		A							
Approach Delay (s/veh)	Err	Err	12.2		0.2							
Approach LOS	F	F										
Intersection Summary												
Average Delay			2620.2									
Intersection Capacity Utilization			152.1%		ICU Level of Service				H			
Analysis Period (min)			15									

* Value less than 0.01.

HCM Unsignalized Intersection Capacity Analysis

3: Russel Street & Main Street E

01/13/2026

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰	↱
Traffic Volume (veh/h)	528	48	68	712	36	41
Future Volume (Veh/h)	528	48	68	712	36	41
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)	574	52	74	774	39	45
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			626		1522	600
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			626		1522	600
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		68	91
cM capacity (veh/h)			956		120	501
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	626	848	84			
Volume Left	0	74	39			
Volume Right	52	0	45			
cSH	1700	956	203			
Volume to Capacity	0.37	0.08	0.41			
Queue Length 95th (m)	0.0	1.9	14.3			
Control Delay (s/veh)	0.0	2.0	34.8			
Lane LOS		A	D			
Approach Delay (s/veh)	0.0	2.0	34.8			
Approach LOS			D			
Intersection Summary						
Average Delay			2.9			
Intersection Capacity Utilization			86.4%	ICU Level of Service	E	
Analysis Period (min)			15			

* Value less than 0.01.

HCM Signalized Intersection Capacity Analysis

1: Highway 10 & Main Street E/Dufferin Road 9

01/13/2026

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	101	111	333	22	103	8	114	295	62	11	303	102
Future Volume (vph)	101	111	333	22	103	8	114	295	62	11	303	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.89		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1672		1789	1862		1789	1835		1789	1883	1601
Flt Permitted	0.68	1.00		0.40	1.00		0.56	1.00		0.51	1.00	1.00
Satd. Flow (perm)	1279	1672		746	1862		1058	1835		961	1883	1601
Peak-hour factor, PHF	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)	110	121	362	24	112	9	124	321	67	12	329	111
RTOR Reduction (vph)	0	264	0	0	7	0	0	14	0	0	0	57
Lane Group Flow (vph)	110	219	0	24	114	0	124	374	0	12	329	54
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	10.1	10.1		10.1	10.1		18.2	18.2		18.2	18.2	18.2
Effective Green, g (s)	10.1	10.1		10.1	10.1		18.2	18.2		18.2	18.2	18.2
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.49	0.49		0.49	0.49	0.49
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	346	452		202	504		516	895		468	918	781
v/s Ratio Prot		c0.13			0.06			c0.20			0.17	
v/s Ratio Perm	0.09			0.03			0.12			0.01		0.03
v/c Ratio	0.32	0.48		0.12	0.23		0.24	0.42		0.03	0.36	0.07
Uniform Delay, d1	10.9	11.4		10.2	10.6		5.5	6.1		5.0	5.9	5.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.5	0.8		0.3	0.2		1.1	1.4		0.1	1.1	0.2
Delay (s)	11.4	12.2		10.5	10.8		6.6	7.6		5.1	7.0	5.2
Level of Service	B	B		B	B		A	A		A	A	A
Approach Delay (s/veh)		12.1			10.8			7.3			6.5	
Approach LOS		B			B			A			A	

Intersection Summary

HCM 2000 Control Delay (s/veh)	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	37.3	Sum of lost time (s)	9.0
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Highway 10 & Eco Park Way/240 Sideroad

01/13/2026

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	0	309	5	0	5	300	370	5	5	666	151
Future Volume (vph)	103	0	309	5	0	5	300	370	5	5	666	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1601			1713		1789	1883	1601	1789	1883	1601
Flt Permitted	0.75	1.00			0.63		0.31	1.00	1.00	0.51	1.00	1.00
Satd. Flow (perm)	1415	1601			1106		586	1883	1601	960	1883	1601
Peak-hour factor, PHF	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)	112	0	336	5	0	5	326	402	5	5	724	164
RTOR Reduction (vph)	0	218	0	0	8	0	0	0	2	0	0	51
Lane Group Flow (vph)	112	118	0	0	2	0	326	402	3	5	724	113
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	11.3	11.3			11.3		45.2	45.2	45.2	45.2	45.2	45.2
Effective Green, g (s)	11.3	11.3			11.3		45.2	45.2	45.2	45.2	45.2	45.2
Actuated g/C Ratio	0.17	0.17			0.17		0.69	0.69	0.69	0.69	0.69	0.69
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	244	276			190		404	1299	1104	662	1299	1104
v/s Ratio Prot		0.07						0.21			0.38	
v/s Ratio Perm	c0.08				0.00		c0.56		0.00	0.01		0.07
v/c Ratio	0.46	0.43			0.01		0.81	0.31	0.00	0.01	0.56	0.10
Uniform Delay, d1	24.4	24.2			22.5		7.1	4.0	3.2	3.2	5.1	3.4
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	1.1			0.0		11.2	0.1	0.0	0.0	0.5	0.0
Delay (s)	25.7	25.3			22.5		18.3	4.1	3.2	3.2	5.6	3.4
Level of Service	C	C			C		B	A	A	A	A	A
Approach Delay (s/veh)		25.4			22.5			10.4			5.2	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM 2000 Control Delay (s/veh)		11.5										
HCM 2000 Volume to Capacity ratio		0.74										
Actuated Cycle Length (s)		65.5										
Intersection Capacity Utilization		82.1%										
Analysis Period (min)		15										
c Critical Lane Group												

3: Russel Street & Main Street E

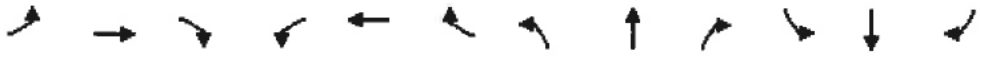
01/13/2026

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↰	↰	
Traffic Volume (veh/h)	506	25	26	348	59	81
Future Volume (Veh/h)	506	25	26	348	59	81
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)	550	27	28	378	64	88
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			577		998	564
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			577		998	564
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		76	83
cM capacity (veh/h)			996		263	525
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	577	406	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	996	370			
Volume to Capacity	0.34	0.03	0.41			
Queue Length 95th (m)	0.0	0.7	14.8			
Control Delay (s/veh)	0.0	0.9	21.4			
Lane LOS		A	C			
Approach Delay (s/veh)	0.0	0.9	21.4			
Approach LOS			C			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			54.6%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

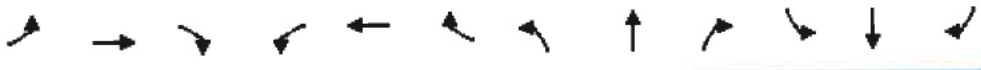
1: Highway 10 & Main Street E/Dufferin Road 9

01/13/2026

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	100	291	45	169	24	467	486	47	6	350	118
Future Volume (vph)	73	100	291	45	169	24	467	486	47	6	350	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.89		1.00	0.98		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1673		1789	1848		1789	1859		1789	1883	1601
Flt Permitted	0.52	1.00		0.28	1.00		0.52	1.00		0.38	1.00	1.00
Satd. Flow (perm)	981	1673		531	1848		970	1859		714	1883	1601
Peak-hour factor, PHF	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)	79	109	316	49	184	26	508	528	51	7	380	128
RTOR Reduction (vph)	0	158	0	0	8	0	0	5	0	0	0	45
Lane Group Flow (vph)	79	267	0	49	202	0	508	574	0	7	380	83
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	14.2	14.2		14.2	14.2		43.2	43.2		43.2	43.2	43.2
Effective Green, g (s)	14.2	14.2		14.2	14.2		43.2	43.2		43.2	43.2	43.2
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.65	0.65		0.65	0.65	0.65
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	209	357		113	395		631	1209		464	1225	1041
v/s Ratio Prot		c0.16			0.11			0.31			0.20	
v/s Ratio Perm	0.08			0.09			c0.52			0.01		0.05
v/c Ratio	0.38	0.75		0.43	0.51		0.81	0.48		0.02	0.31	0.08
Uniform Delay, d1	22.3	24.4		22.6	23.0		8.5	5.9		4.1	5.1	4.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.1	8.3		2.7	1.1		10.5	1.3		0.1	0.7	0.2
Delay (s)	23.5	32.7		25.3	24.2		19.0	7.2		4.2	5.7	4.4
Level of Service	C	C		C	C		B	A		A	A	A
Approach Delay (s/veh)		31.3			24.4			12.7			5.4	
Approach LOS		C			C			B			A	
Intersection Summary												
HCM 2000 Control Delay (s/veh)		16.4					HCM 2000 Level of Service		B			
HCM 2000 Volume to Capacity ratio		0.79										
Actuated Cycle Length (s)		66.4					Sum of lost time (s)		9.0			
Intersection Capacity Utilization		86.6%					ICU Level of Service		E			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis 2: Highway 10 & Eco Park Way/240 Sideroad

01/13/2026

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	264	0	391	5	0	5	364	729	5	5	491	212
Future Volume (vph)	264	0	391	5	0	5	364	729	5	5	491	212
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1601			1713		1789	1883	1601	1789	1883	1601
Flt Permitted	0.75	1.00			0.79		0.39	1.00	1.00	0.22	1.00	1.00
Satd. Flow (perm)	1415	1601			1395		737	1883	1601	422	1883	1601
Peak-hour factor, PHF	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)	287	0	425	5	0	5	396	792	5	5	534	230
RTOR Reduction (vph)	0	277	0	0	7	0	0	0	2	0	0	89
Lane Group Flow (vph)	287	148	0	0	3	0	396	792	3	5	534	141
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	17.8	17.8			17.8		42.7	42.7	42.7	42.7	42.7	42.7
Effective Green, g (s)	17.8	17.8			17.8		42.7	42.7	42.7	42.7	42.7	42.7
Actuated g/C Ratio	0.26	0.26			0.26		0.61	0.61	0.61	0.61	0.61	0.61
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	362	410			357		452	1156	983	259	1156	983
v/s Ratio Prot		0.09						0.42			0.28	
v/s Ratio Perm	c0.20			0.00			c0.54		0.00	0.01		0.09
v/c Ratio	0.79	0.36		0.01			0.88	0.69	0.00	0.02	0.46	0.14
Uniform Delay, d1	24.1	21.2			19.3		11.2	8.9	5.2	5.2	7.2	5.7
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.3	0.5			0.0		17.1	1.7	0.0	0.0	0.3	0.1
Delay (s)	35.4	21.7			19.3		28.3	10.6	5.2	5.3	7.5	5.7
Level of Service	D	C			B		C	B	A	A	A	A
Approach Delay (s/veh)		27.2			19.3			16.5			7.0	
Approach LOS		C			B			B			A	
Intersection Summary												
HCM 2000 Control Delay (s/veh)		16.6			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.85										
Actuated Cycle Length (s)		69.5			Sum of lost time (s)			9.0				
Intersection Capacity Utilization		81.5%			ICU Level of Service			D				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Main Street E

01/13/2026

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰	↱
Traffic Volume (veh/h)	528	48	68	710	36	41
Future Volume (Veh/h)	528	48	68	710	36	41
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)	574	52	74	772	39	45
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			626		1520	600
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			626		1520	600
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		68	91
cM capacity (veh/h)			956		121	501
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	626	846	84			
Volume Left	0	74	39			
Volume Right	52	0	45			
cSH	1700	956	203			
Volume to Capacity	0.37	0.08	0.41			
Queue Length 95th (m)	0.0	1.9	14.3			
Control Delay (s/veh)	0.0	2.0	34.7			
Lane LOS		A	D			
Approach Delay (s/veh)	0.0	2.0	34.7			
Approach LOS			D			
Intersection Summary						
Average Delay		2.9				
Intersection Capacity Utilization		86.3%	ICU Level of Service	E		
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

1: Highway 10 & Main Street E/Dufferin Road 9

01/13/2026

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	119	356	23	111	8	120	620	66	12	478	109
Future Volume (vph)	108	119	356	23	111	8	120	620	66	12	478	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.89		1.00	0.99		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1672		1789	1864		1789	1856		1789	1883	1601
Flt Permitted	0.67	1.00		0.28	1.00		0.40	1.00		0.24	1.00	1.00
Satd. Flow (perm)	1269	1672		534	1864		751	1856		452	1883	1601
Peak-hour factor, PHF	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)	117	129	387	25	121	9	130	674	72	13	520	118
RTOR Reduction (vph)	0	198	0	0	5	0	0	5	0	0	0	50
Lane Group Flow (vph)	117	318	0	25	125	0	130	741	0	13	520	68
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	14.1	14.1		14.1	14.1		31.8	31.8		31.8	31.8	31.8
Effective Green, g (s)	14.1	14.1		14.1	14.1		31.8	31.8		31.8	31.8	31.8
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.58	0.58		0.58	0.58	0.58
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	325	429		137	478		435	1075		261	1090	927
v/s Ratio Prot		c0.19			0.07			c0.40			0.28	
v/s Ratio Perm	0.09			0.05			0.17			0.03		0.04
v/c Ratio	0.36	0.74		0.18	0.26		0.30	0.69		0.05	0.48	0.07
Uniform Delay, d1	16.7	18.7		15.9	16.3		5.9	8.1		5.0	6.7	5.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	6.7		0.6	0.3		1.8	3.6		0.4	1.5	0.2
Delay (s)	17.4	25.5		16.6	16.5		7.6	11.7		5.4	8.2	5.2
Level of Service	B	C		B	B		A	B		A	A	A
Approach Delay (s/veh)		24.0			16.5			11.1			7.6	
Approach LOS		C			B			B			A	

Intersection Summary

HCM 2000 Control Delay (s/veh)	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	54.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Highway 10 & Eco Park Way/240 Sideroad

01/13/2026

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	172	0	473	5	0	5	487	639	5	5	783	213
Future Volume (vph)	172	0	473	5	0	5	487	639	5	5	783	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1601			1713		1789	1883	1601	1789	1883	1601
Flt Permitted	0.75	1.00			0.53		0.25	1.00	1.00	0.33	1.00	1.00
Satd. Flow (perm)	1415	1601			931		476	1883	1601	626	1883	1601
Peak-hour factor, PHF	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)	187	0	514	5	0	5	529	695	5	5	851	232
RTOR Reduction (vph)	0	195	0	0	8	0	0	0	1	0	0	63
Lane Group Flow (vph)	187	319	0	0	2	0	529	695	4	5	851	169
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2		6		6
Permitted Phases	4			8			2		2			6
Actuated Green, G (s)	18.0	18.0			18.0		73.0	73.0	73.0	73.0	73.0	73.0
Effective Green, g (s)	18.0	18.0			18.0		73.0	73.0	73.0	73.0	73.0	73.0
Actuated g/C Ratio	0.18	0.18			0.18		0.73	0.73	0.73	0.73	0.73	0.73
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	254	288			167		347	1374	1168	456	1374	1168
v/s Ratio Prot		c0.20						0.37			0.45	
v/s Ratio Perm	0.13				0.00		c1.11		0.00	0.01		0.11
v/c Ratio	0.74	1.11			0.01		1.52	0.51	0.00	0.01	0.62	0.15
Uniform Delay, d1	38.8	41.0			33.7		13.5	5.8	3.7	3.7	6.7	4.1
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.6	84.9			0.0		250.2	1.3	0.0	0.0	2.1	0.3
Delay (s)	49.3	125.9			33.7		263.7	7.1	3.7	3.7	8.8	4.3
Level of Service	D	F			C		F	A	A	A	A	A
Approach Delay (s/veh)		105.5			33.7			117.6			7.8	
Approach LOS		F			C			F			A	
Intersection Summary												
HCM 2000 Control Delay (s/veh)	75.0			HCM 2000 Level of Service			E					
HCM 2000 Volume to Capacity ratio	1.44											
Actuated Cycle Length (s)	100.0			Sum of lost time (s)			9.0					
Intersection Capacity Utilization	108.7%			ICU Level of Service			G					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Main Street E

01/13/2026

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→	→	←	←	←	←
Traffic Volume (veh/h)	542	25	26	372	59	81
Future Volume (Veh/h)	542	25	26	372	59	81
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)	589	27	28	404	64	88
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			616		1063	603
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			616		1063	603
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		73	82
cM capacity (veh/h)			964		240	499
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	616	432	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	964	343			
Volume to Capacity	0.36	0.03	0.44			
Queue Length 95th (m)	0.0	0.7	16.6			
Control Delay (s/veh)	0.0	0.9	23.6			
Lane LOS		A	C			
Approach Delay (s/veh)	0.0	0.9	23.6			
Approach LOS			C			
Intersection Summary						
Average Delay		3.3				
Intersection Capacity Utilization		55.9%		ICU Level of Service		B
Analysis Period (min)		15				

01/13/2026

2035 TT PM + IMP 1 2035 - Total Traffic + improvement 1 3:00 pm 03/27/2025 By Mr. B.A.R. Riddick Page 1

HCM Signalized Intersection Capacity Analysis 2: Highway 10 & Eco Park Way/240 Sideroad

01/13/2026

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	606	0	618	5	0	5	543	911	5	5	797	272
Future Volume (vph)	606	0	618	5	0	5	543	911	5	5	797	272
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1601			1713		1789	1883	1601	1789	1883	1601
Flt Permitted	0.75	1.00			0.63		0.17	1.00	1.00	0.10	1.00	1.00
Satd. Flow (perm)	1415	1601			1113		318	1883	1601	180	1883	1601
Peak-hour factor, PHF	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)	659	0	672	5	0	5	590	990	5	5	866	296
RTOR Reduction (vph)	0	122	0	0	7	0	0	0	2	0	0	112
Lane Group Flow (vph)	659	550	0	0	3	0	590	990	3	5	866	184
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	36.5	36.5			36.5		74.5	74.5	74.5	74.5	74.5	74.5
Effective Green, g (s)	36.5	36.5			36.5		74.5	74.5	74.5	74.5	74.5	74.5
Actuated g/C Ratio	0.30	0.30			0.30		0.62	0.62	0.62	0.62	0.62	0.62
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	430	486			338		197	1169	993	111	1169	993
v/s Ratio Prot		0.34						0.53			0.46	
v/s Ratio Perm	c0.47				0.00		c1.86		0.00	0.03		0.11
v/c Ratio	1.53	1.13			0.01		2.99	0.85	0.00	0.05	0.74	0.19
Uniform Delay, d1	41.8	41.8			29.1		22.8	18.2	8.6	8.9	16.0	9.7
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	251.1	82.4			0.0		911.2	5.8	0.0	0.2	2.6	0.1
Delay (s)	292.9	124.1			29.1		934.0	24.0	8.6	9.0	18.5	9.8
Level of Service	F	F			C		F	C	A	A	B	A
Approach Delay (s/veh)		207.7			29.1			362.7			16.3	
Approach LOS		F			C			F			B	
Intersection Summary												
HCM 2000 Control Delay (s/veh)		212.7										F
HCM 2000 Volume to Capacity ratio		2.51										
Actuated Cycle Length (s)		120.0							9.0			
Intersection Capacity Utilization		123.5%										H
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Main Street E

01/13/2026

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩	↩	↩
Traffic Volume (veh/h)	605	48	68	796	36	41
Future Volume (Veh/h)	605	48	68	796	36	41
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)	658	52	74	865	39	45
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			710		1697	684
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			710		1697	684
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		58	90
cM capacity (veh/h)			889		93	449
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	710	939	84			
Volume Left	0	74	39			
Volume Right	52	0	45			
cSH	1700	889	162			
Volume to Capacity	0.42	0.08	0.52			
Queue Length 95th (m)	0.0	2.1	19.5			
Control Delay (s/veh)	0.0	2.2	49.0			
Lane LOS		A	E			
Approach Delay (s/veh)	0.0	2.2	49.0			
Approach LOS			E			
Intersection Summary						
Average Delay			3.6			
Intersection Capacity Utilization			94.9%	ICU Level of Service		F
Analysis Period (min)			15			

2035 - Total Traffic + improvement 2
AM PEAK HOUR

Synchro 12 Report
Page 1

HCM Signalized Intersection Capacity Analysis 2: Highway 10 & Eco Park Way/240 Sideroad

2035 - Total Traffic + improvement 2
AM PEAK HOUR

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations	↰	↱			↕		↰	↱	↱	↰	↱	↱
Traffic Volume (vph)	177	0	473	5	0	5	487	639	5	5	783	213
Future Volume (vph)	177	0	473	5	0	5	487	639	5	5	783	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1789	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.51		0.16	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	1415	1601			898		299	3579	1601	730	3579	1601
Peak-hour factor, PHF	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)	192	0	514	5	0	5	529	695	5	5	851	232
RTOR Reduction (vph)	0	406	0	0	8	0	0	0	2	0	0	162
Lane Group Flow (vph)	192	108	0	0	2	0	529	695	3	5	851	70
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	14.5	14.5			14.5		45.3	45.3	45.3	20.7	20.7	20.7
Effective Green, g (s)	14.5	14.5			14.5		45.3	45.3	45.3	20.7	20.7	20.7
Actuated g/C Ratio	0.21	0.21			0.21		0.66	0.66	0.66	0.30	0.30	0.30
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	298	337			189		632	2356	1054	219	1076	481
v/s Ratio Prot		0.07					c0.24	0.19			0.24	
v/s Ratio Perm	c0.14				0.00		c0.31		0.00	0.01		0.04
v/c Ratio	0.64	0.32			0.01		0.84	0.29	0.00	0.02	0.79	0.15
Uniform Delay, d1	24.8	23.0			21.5		15.0	5.0	4.0	16.9	22.1	17.6
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.7	0.6			0.0		9.4	0.1	0.0	0.0	4.0	0.1
Delay (s)	29.5	23.5			21.5		24.5	5.1	4.0	17.0	26.1	17.7
Level of Service	C	C			C		C	A	A	B	C	B
Approach Delay (s/veh)		25.2			21.5			13.4			24.3	
Approach LOS		C			C			B			C	
Intersection Summary												
HCM 2000 Control Delay (s/veh)			20.1				HCM 2000 Level of Service				C	
HCM 2000 Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			68.8							13.5		
Intersection Capacity Utilization			89.2%							E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
3: Russel Street & Main Street E

2035 - Total Traffic + improvement 2
AM PEAK HOUR

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Traffic Volume (veh/h)	542	25	26	372	59	81
Future Volume (Veh/h)	542	25	26	372	59	81
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)	589	27	28	404	64	88
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			616		1063	603
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			616		1063	603
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		73	82
cM capacity (veh/h)			964		240	499
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	616	432	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	964	343			
Volume to Capacity	0.36	0.03	0.44			
Queue Length 95th (m)	0.0	0.7	16.6			
Control Delay (s/veh)	0.0	0.9	23.6			
Lane LOS		A	C			
Approach Delay (s/veh)	0.0	0.9	23.6			
Approach LOS			C			
Intersection Summary						
Average Delay		3.3				
Intersection Capacity Utilization		55.9%	ICU Level of Service		B	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
1: Highway 10 & Main Street E/Dufferin Road 9

2035 - Total Traffic + improvement 2
PM PEAK HOUR

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	78	107	350	48	182	26	535	828	50	7	775	126
Future Volume (vph)	78	107	350	48	182	26	535	828	50	7	775	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.89		1.00	0.98		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1667		1789	1849		1789	3548		1789	3501	
Flt Permitted	0.49	1.00		0.24	1.00		0.15	1.00		0.31	1.00	
Satd. Flow (perm)	932	1667		459	1849		275	3548		582	3501	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92
Adj. Flow (vph)	82	113	368	51	192	27	563	872	53	7	816	137
RTOR Reduction (vph)	0	161	0	0	7	0	0	6	0	0	17	0
Lane Group Flow (vph)	82	320	0	51	212	0	563	919	0	7	936	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.4	16.4		16.4	16.4		47.6	47.6		22.9	22.9	
Effective Green, g (s)	16.4	16.4		16.4	16.4		47.6	47.6		22.9	22.9	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.65	0.65		0.31	0.31	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	209	374		103	415		598	2313		182	1098	
v/s Ratio Prot		c0.19			0.11		c0.26	0.26			0.27	
v/s Ratio Perm	0.09			0.11			c0.35			0.01		
v/c Ratio	0.39	0.85		0.50	0.51		0.94	0.40		0.04	0.85	
Uniform Delay, d1	24.1	27.2		24.7	24.8		18.6	6.0		17.4	23.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	17.1		3.7	1.1		23.2	0.5		0.4	8.4	
Delay (s)	25.3	44.2		28.4	25.9		41.8	6.5		17.8	31.9	
Level of Service	C	D		C	C		D	A		B	C	
Approach Delay (s/veh)		41.5			26.3			19.9			31.8	
Approach LOS		D			C			B			C	
Intersection Summary												
HCM 2000 Control Delay (s/veh)		27.6					HCM 2000 Level of Service		C			
HCM 2000 Volume to Capacity ratio		0.96										
Actuated Cycle Length (s)		73.0					Sum of lost time (s)		13.5			
Intersection Capacity Utilization		101.4%					ICU Level of Service		G			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis 2: Highway 10 & Eco Park Way/240 Sideroad

2035 - Total Traffic + improvement 2
PM PEAK HOUR

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑		↰	↱		↰	↱	↱	↰	↱	↱
Traffic Volume (vph)	602	0	618	5	0	5	543	911	5	5	797	272
Future Volume (vph)	602	0	618	5	0	5	543	911	5	5	797	272
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	0.85
Satd. Flow (prot)	1789	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.81		0.13	1.00	1.00	0.30	1.00	1.00
Satd. Flow (perm)	1415	1601			1427		251	3579	1601	562	3579	1601
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	634	0	651	5	0	5	572	959	5	5	839	286
RTOR Reduction (vph)	0	333	0	0	6	0	0	0	2	0	0	220
Lane Group Flow (vph)	634	318	0	0	4	0	572	959	3	5	839	66
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	44.5	44.5			44.5		56.5	56.5	56.5	25.5	25.5	25.5
Effective Green, g (s)	44.5	44.5			44.5		56.5	56.5	56.5	25.5	25.5	25.5
Actuated g/C Ratio	0.40	0.40			0.40		0.51	0.51	0.51	0.23	0.23	0.23
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	572	647			577		499	1838	822	130	829	371
v/s Ratio Prot		0.20					c0.28	0.27			0.23	
v/s Ratio Perm	c0.45				0.00		c0.31		0.00	0.01		0.04
v/c Ratio	1.11	0.49			0.01		1.15	0.52	0.00	0.04	1.01	0.18
Uniform Delay, d1	32.8	24.3			19.6		32.3	17.8	13.0	32.7	42.3	33.9
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	70.9	0.6			0.0		87.2	0.3	0.0	0.1	34.3	0.2
Delay (s)	103.7	24.9			19.6		119.5	18.0	13.0	32.9	76.5	34.1
Level of Service	F	C			B		F	B	B	C	E	C
Approach Delay (s/veh)		63.8			19.6			55.8			65.6	
Approach LOS		E			B			E			E	
Intersection Summary												
HCM 2000 Control Delay (s/veh)		61.1										
HCM 2000 Volume to Capacity ratio		1.16										
Actuated Cycle Length (s)		110.0										
Intersection Capacity Utilization		103.4%										
Analysis Period (min)		15										
c Critical Lane Group												
HCM 2000 Level of Service									E			
Sum of lost time (s)									13.5			
ICU Level of Service									G			

HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Main Street E

2035 - Total Traffic + improvement 2
PM PEAK HOUR

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Volume (veh/h)	605	48	68	796	36	41
Future Volume (Veh/h)	605	48	68	796	36	41
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)	658	52	74	865	39	45
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			710		1697	684
vC1, stage 1 conf vol						
vC2, stage 2 conf vol			710		1697	684
vCu, unblocked vol			4.1		6.4	6.2
tC, single (s)						
tC, 2 stage (s)			2.2		3.5	3.3
tF (s)			92		58	90
p0 queue free %			889		93	449
cM capacity (veh/h)						
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	710	939	84			
Volume Left	0	74	39			
Volume Right	52	0	45			
cSH	1700	889	162			
Volume to Capacity	0.42	0.08	0.52			
Queue Length 95th (m)	0.0	2.1	19.5			
Control Delay (s/veh)	0.0	2.2	49.0			
Lane LOS		A	E			
Approach Delay (s/veh)	0.0	2.2	49.0			
Approach LOS			E			
Intersection Summary						
Average Delay			3.6			
Intersection Capacity Utilization			94.9%	ICU Level of Service		F
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
1: Highway 10 & Main Street E/Dufferin Road 9

2035 - Total Traffic + Improvement 3
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	119	356	23	111	8	120	625	66	12	466	109
Future Volume (vph)	108	119	356	23	111	8	120	625	66	12	466	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1864		1789	3527		1789	3477	
Flt Permitted	0.67	1.00	1.00	0.67	1.00		0.31	1.00		0.37	1.00	
Satd. Flow (perm)	1269	1883	1601	1270	1864		581	3527		691	3477	
Peak-hour factor, PHF	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)	117	129	387	25	121	9	130	679	72	13	507	118
RTOR Reduction (vph)	0	0	284	0	5	0	0	12	0	0	31	0
Lane Group Flow (vph)	117	129	103	25	125	0	130	739	0	13	594	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	10.7	10.7	10.7	10.7	10.7		29.2	29.2		20.4	20.4	
Effective Green, g (s)	10.7	10.7	10.7	10.7	10.7		29.2	29.2		20.4	20.4	
Actuated g/C Ratio	0.22	0.22	0.22	0.22	0.22		0.60	0.60		0.42	0.42	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	277	412	350	277	407		453	2106		288	1450	
v/s Ratio Prot		0.07			0.07		0.03	c0.21			c0.17	
v/s Ratio Perm	c0.09		0.06	0.02			0.15			0.02		
v/c Ratio	0.42	0.31	0.29	0.09	0.31		0.29	0.35		0.05	0.41	
Uniform Delay, d1	16.4	16.0	15.9	15.2	16.0		4.8	5.0		8.5	10.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.4	0.5	0.1	0.4		0.4	0.5		0.3	0.9	
Delay (s)	17.5	16.5	16.4	15.4	16.4		5.1	5.5		8.8	10.9	
Level of Service	B	B	B	B	B		A	A		A	B	
Approach Delay (s/veh)		16.6			16.2			5.4			10.8	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM 2000 Control Delay (s/veh)		10.7										
HCM 2000 Volume to Capacity ratio		0.43										
Actuated Cycle Length (s)		48.9								13.5		
Intersection Capacity Utilization		53.8%								A		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
2: Highway 10 & Eco Park Way/240 Sideroad

2035 - Total Traffic + Improvement 3
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	177	0	497	5	0	5	438	639	5	5	783	201
Future Volume (vph)	177	0	497	5	0	5	438	639	5	5	783	201
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3471	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.45		0.17	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	2744	1601			793		321	3579	1601	730	3579	1601
Peak-hour factor, PHF	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)	192	0	540	5	0	5	476	695	5	5	851	218
RTOR Reduction (vph)	0	411	0	0	8	0	0	0	2	0	0	151
Lane Group Flow (vph)	192	129	0	0	2	0	476	695	3	5	851	67
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	11.8	11.8			11.8		40.6	40.6	40.6	19.0	19.0	19.0
Effective Green, g (s)	11.8	11.8			11.8		40.6	40.6	40.6	19.0	19.0	19.0
Actuated g/C Ratio	0.19	0.19			0.19		0.66	0.66	0.66	0.31	0.31	0.31
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	527	307			152		621	2366	1058	225	1107	495
v/s Ratio Prot		c0.08					c0.21	0.19			0.24	
v/s Ratio Perm	0.07				0.00		c0.29		0.00	0.01		0.04
v/c Ratio	0.36	0.42			0.01		0.77	0.29	0.00	0.02	0.77	0.14
Uniform Delay, d1	21.5	21.8			20.1		11.8	4.4	3.5	14.7	19.2	15.3
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.9			0.0		5.6	0.1	0.0	0.0	3.3	0.1
Delay (s)	22.0	22.7			20.1		17.4	4.4	3.5	14.8	22.5	15.4
Level of Service	C	C			C		B	A	A	B	C	B
Approach Delay (s/veh)		22.5			20.1			9.7			21.0	
Approach LOS		C			C			A			C	

Intersection Summary

HCM 2000 Control Delay (s/veh)	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	61.4	Sum of lost time (s)	13.5
Intersection Capacity Utilization	87.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Main Street E

2035 - Total Traffic + Improvement 3
AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↗	↘	
Traffic Volume (veh/h)	542	25	26	372	59	81
Future Volume (Veh/h)	542	25	26	372	59	81
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)	589	27	28	404	64	88
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			616		1063	603
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			616		1063	603
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		73	82
cM capacity (veh/h)			964		240	499
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	616	432	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	964	343			
Volume to Capacity	0.36	0.03	0.44			
Queue Length 95th (m)	0.0	0.7	16.6			
Control Delay (s/veh)	0.0	0.9	23.6			
Lane LOS		A	C			
Approach Delay (s/veh)	0.0	0.9	23.6			
Approach LOS			C			
Intersection Summary						
Average Delay		3.3				
Intersection Capacity Utilization		55.9%	ICU Level of Service		B	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis 1: Highway 10 & Main Street E/Dufferin Road 9

2035 - Total Traffic + Improvement 3
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	119	356	23	111	8	120	625	66	12	466	109
Future Volume (vph)	108	119	356	23	111	8	120	625	66	12	466	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1864		1789	3527		1789	3477	
Flt Permitted	0.67	1.00	1.00	0.67	1.00		0.31	1.00		0.37	1.00	
Satd. Flow (perm)	1269	1883	1601	1270	1864		581	3527		691	3477	
Peak-hour factor, PHF	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)	117	129	387	25	121	9	130	679	72	13	507	118
RTOR Reduction (vph)	0	0	284	0	5	0	0	12	0	0	31	0
Lane Group Flow (vph)	117	129	103	25	125	0	130	739	0	13	594	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	10.7	10.7	10.7	10.7	10.7		29.2	29.2		20.4	20.4	
Effective Green, g (s)	10.7	10.7	10.7	10.7	10.7		29.2	29.2		20.4	20.4	
Actuated g/C Ratio	0.22	0.22	0.22	0.22	0.22		0.60	0.60		0.42	0.42	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	277	412	350	277	407		453	2106		288	1450	
v/s Ratio Prot		0.07			0.07		0.03	c0.21			c0.17	
v/s Ratio Perm	c0.09		0.06	0.02			0.15			0.02		
v/c Ratio	0.42	0.31	0.29	0.09	0.31		0.29	0.35		0.05	0.41	
Uniform Delay, d1	16.4	16.0	15.9	15.2	16.0		4.8	5.0		8.5	10.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.4	0.5	0.1	0.4		0.4	0.5		0.3	0.9	
Delay (s)	17.5	16.5	16.4	15.4	16.4		5.1	5.5		8.8	10.9	
Level of Service	B	B	B	B	B		A	A		A	B	
Approach Delay (s/veh)		16.6			16.2			5.4			10.8	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM 2000 Control Delay (s/veh)		10.7										
HCM 2000 Volume to Capacity ratio		0.43										
Actuated Cycle Length (s)		48.9								13.5		
Intersection Capacity Utilization		53.8%								A		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis 2: Highway 10 & Eco Park Way/240 Sideroad

2035 - Total Traffic + Improvement 3
PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↱	↱			↰↱		↰	↰↱	↱	↰	↰↱	↱
Traffic Volume (vph)	597	0	584	5	0	5	438	639	5	5	783	201
Future Volume (vph)	597	0	584	5	0	5	438	639	5	5	783	201
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3471	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.58		0.18	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	2744	1601			1016		330	3579	1601	730	3579	1601
Peak-hour factor, PHF	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)	649	0	635	5	0	5	476	695	5	5	851	218
RTOR Reduction (vph)	0	349	0	0	7	0	0	0	2	0	0	156
Lane Group Flow (vph)	649	286	0	0	3	0	476	695	3	5	851	62
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	18.0	18.0			18.0		37.3	37.3	37.3	18.3	18.3	18.3
Effective Green, g (s)	18.0	18.0			18.0		37.3	37.3	37.3	18.3	18.3	18.3
Actuated g/C Ratio	0.28	0.28			0.28		0.58	0.58	0.58	0.28	0.28	0.28
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	768	448			284		520	2076	928	207	1018	455
v/s Ratio Prot		0.18					c0.21	0.19			0.24	
v/s Ratio Perm	c0.24				0.00		c0.32		0.00	0.01		0.04
v/c Ratio	0.85	0.64			0.01		0.92	0.33	0.00	0.02	0.84	0.14
Uniform Delay, d1	21.8	20.3			16.7		15.0	7.0	5.7	16.6	21.6	17.1
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.5	3.0			0.0		20.7	0.1	0.0	0.0	6.1	0.1
Delay (s)	30.3	23.3			16.7		35.7	7.1	5.7	16.6	27.7	17.3
Level of Service	C	C			B		D	A	A	B	C	B
Approach Delay (s/veh)		26.8			16.7			18.7			25.5	
Approach LOS		C			B			B			C	
Intersection Summary												
HCM 2000 Control Delay (s/veh)	23.7			HCM 2000 Level of Service			C					
HCM 2000 Volume to Capacity ratio	0.94											
Actuated Cycle Length (s)	64.3			Sum of lost time (s)			13.5					
Intersection Capacity Utilization	93.3%			ICU Level of Service			F					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Main Street E

2035 - Total Traffic + Improvement 3
PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↘
Traffic Volume (veh/h)	605	25	26	796	59	81
Future Volume (Veh/h)	605	25	26	796	59	81
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)	658	27	28	865	64	88
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			685		1593	672
vC, conflicting volume						
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			685		1593	672
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		44	81
cM capacity (veh/h)			908		114	456
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	685	893	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	908	202			
Volume to Capacity	0.40	0.03	0.75			
Queue Length 95th (m)	0.0	0.7	38.4			
Control Delay (s/veh)	0.0	0.8	62.8			
Lane LOS		A	F			
Approach Delay (s/veh)	0.0	0.8	62.8			
Approach LOS			F			
Intersection Summary						
Average Delay			6.0			
Intersection Capacity Utilization			77.8%	ICU Level of Service		D
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
1: Highway 10 & Main Street E/Dufferin Road 9

2040 - Total Traffic + Improvement 3
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	128	369	25	119	9	124	642	71	13	482	118
Future Volume (vph)	116	128	369	25	119	9	124	642	71	13	482	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1863		1789	3525		1789	3473	
Flt Permitted	0.67	1.00	1.00	0.67	1.00		0.29	1.00		0.36	1.00	
Satd. Flow (perm)	1259	1883	1601	1259	1863		554	3525		674	3473	
Peak-hour factor, PHF	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)	126	139	401	27	129	10	135	698	77	14	524	128
RTOR Reduction (vph)	0	0	276	0	6	0	0	13	0	0	34	0
Lane Group Flow (vph)	126	139	125	27	133	0	135	762	0	14	618	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	11.0	11.0	11.0	11.0	11.0		29.2	29.2		20.4	20.4	
Effective Green, g (s)	11.0	11.0	11.0	11.0	11.0		29.2	29.2		20.4	20.4	
Actuated g/C Ratio	0.22	0.22	0.22	0.22	0.22		0.59	0.59		0.41	0.41	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	281	420	357	281	416		436	2092		279	1440	
v/s Ratio Prot		0.07			0.07		0.03	c0.22			c0.18	
v/s Ratio Perm	c0.10		0.08	0.02			0.16			0.02		
v/c Ratio	0.45	0.33	0.35	0.10	0.32		0.31	0.36		0.05	0.43	
Uniform Delay, d1	16.5	16.0	16.1	15.2	16.0		5.0	5.2		8.6	10.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.5	0.6	0.1	0.4		0.4	0.5		0.3	0.9	
Delay (s)	17.6	16.5	16.7	15.3	16.4		5.4	5.7		8.9	11.2	
Level of Service	B	B	B	B	B		A	A		A	B	
Approach Delay (s/veh)		16.8			16.2			5.6			11.1	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM 2000 Control Delay (s/veh)		11.0										
HCM 2000 Volume to Capacity ratio		0.45										
Actuated Cycle Length (s)		49.2							13.5			
Intersection Capacity Utilization		55.4%										
Analysis Period (min)		15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Highway 10 & Eco Park Way/240 Sideroad

2040 - Total Traffic + Improvement 3
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 				 			 		 	 	
Traffic Volume (vph)	177	0	491	5	0	5	438	663	5	5	819	201
Future Volume (vph)	177	0	491	5	0	5	438	663	5	5	819	201
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3471	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.46		0.16	1.00	1.00	0.38	1.00	1.00
Satd. Flow (perm)	2744	1601			803		309	3579	1601	711	3579	1601
Peak-hour factor, PHF	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)	192	0	534	5	0	5	476	721	5	5	890	218
RTOR Reduction (vph)	0	389	0	0	8	0	0	0	2	0	0	148
Lane Group Flow (vph)	192	145	0	0	2	0	476	721	3	5	890	70
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	12.0	12.0			12.0		40.9	40.9	40.9	19.9	19.9	19.9
Effective Green, g (s)	12.0	12.0			12.0		40.9	40.9	40.9	19.9	19.9	19.9
Actuated g/C Ratio	0.19	0.19			0.19		0.66	0.66	0.66	0.32	0.32	0.32
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	531	310			155		598	2364	1057	228	1150	514
v/s Ratio Prot		c0.09					c0.21	0.20			0.25	
v/s Ratio Perm	0.07				0.00		c0.31		0.00	0.01		0.04
v/c Ratio	0.36	0.47			0.01		0.80	0.30	0.00	0.02	0.77	0.14
Uniform Delay, d1	21.6	22.1			20.2		12.6	4.5	3.6	14.3	19.0	14.9
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	1.1			0.0		7.2	0.1	0.0	0.0	3.3	0.1
Delay (s)	22.1	23.2			20.2		19.9	4.5	3.6	14.4	22.3	15.0
Level of Service	C	C			C		B	A	A	B	C	B
Approach Delay (s/veh)		22.9			20.2			10.6			20.8	
Approach LOS		C			C			B			C	
Intersection Summary												
HCM 2000 Control Delay (s/veh)			17.3				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.76									
Actuated Cycle Length (s)			61.9				Sum of lost time (s)			13.5		
Intersection Capacity Utilization			88.6%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Main Street E

2040 - Total Traffic + Improvement 3
AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↗	↘	↗
Traffic Volume (veh/h)	569	25	26	396	59	81
Future Volume (Veh/h)	569	25	26	396	59	81
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)	618	27	28	430	64	88
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			645		1118	632
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			645		1118	632
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		71	82
cM capacity (veh/h)			940		222	481
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	645	458	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	940	323			
Volume to Capacity	0.38	0.03	0.47			
Queue Length 95th (m)	0.0	0.7	18.2			
Control Delay (s/veh)	0.0	0.9	25.7			
Lane LOS		A	D			
Approach Delay (s/veh)	0.0	0.9	25.7			
Approach LOS			D			
Intersection Summary						
Average Delay		3.4				
Intersection Capacity Utilization		57.1%	ICU Level of Service		B	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis 1: Highway 10 & Main Street E/Dufferin Road 9

2040 - Total Traffic + Improvement 3
PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	↰	→	↱	↰	→	↱	↰	↱	→	↰	↱	→
Lane Configurations	↰	→	↱	↰	→		↰	↱	→	↰	↱	→
Traffic Volume (vph)	84	115	359	51	195	28	553	844	54	8	795	135
Future Volume (vph)	84	115	359	51	195	28	553	844	54	8	795	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5		1.00	0.95		1.00	0.95	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.99		1.00	0.98	
Frt	1.00	1.00	0.85	1.00	0.98		0.95	1.00		0.95	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00		1789	3546		1789	3498	
Satd. Flow (prot)	1789	1883	1601	1789	1848		0.12	1.00		0.30	1.00	
Flt Permitted	0.36	1.00	1.00	0.65	1.00		221	3546		570	3498	
Satd. Flow (perm)	678	1883	1601	1222	1848							
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92
Adj. Flow (vph)	88	121	378	54	205	29	582	888	57	8	837	147
RTOR Reduction (vph)	0	0	312	0	6	0	0	5	0	0	15	0
Lane Group Flow (vph)	88	121	66	54	228	0	582	940	0	8	969	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8			2			32.4	32.4	
Actuated Green, G (s)	15.1	15.1	15.1	15.1	15.1		62.8	62.8		32.4	32.4	
Effective Green, g (s)	15.1	15.1	15.1	15.1	15.1		62.8	62.8		32.4	32.4	
Actuated g/C Ratio	0.17	0.17	0.17	0.17	0.17		0.72	0.72		0.37	0.37	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	117	327	278	212	321		627	2562		212	1304	
v/s Ratio Prot		0.06			0.12		c0.28	0.27			0.28	
v/s Ratio Perm	c0.13		0.04	0.04			c0.39			0.01		
v/c Ratio	0.75	0.37	0.24	0.25	0.71		0.93	0.37		0.04	0.74	
Uniform Delay, d1	34.1	31.7	30.9	31.0	33.8		22.4	4.5		17.3	23.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	23.5	0.7	0.4	0.6	7.2		20.0	0.4		0.3	3.9	
Delay (s)	57.6	32.4	31.4	31.7	41.1		42.4	5.0		17.7	27.5	
Level of Service	E	C	C	C	D		D	A		B	C	
Approach Delay (s/veh)		35.5			39.3			19.2			27.4	
Approach LOS		D			D			B			C	
Intersection Summary												
HCM 2000 Control Delay (s/veh)			26.2			HCM 2000 Level of Service					C	
HCM 2000 Volume to Capacity ratio			0.93									
Actuated Cycle Length (s)			86.9			Sum of lost time (s)					13.5	
Intersection Capacity Utilization			88.5%			ICU Level of Service					E	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
2: Highway 10 & Eco Park Way/240 Sideroad

2040 - Total Traffic + Improvement 3
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 				 			 			 	
Traffic Volume (vph)	597	0	584	5	0	5	561	945	5	5	828	277
Future Volume (vph)	597	0	584	5	0	5	561	945	5	5	828	277
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3471	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.61		0.11	1.00	1.00	0.28	1.00	1.00
Satd. Flow (perm)	2744	1601			1072		212	3579	1601	531	3579	1601
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	642	0	628	5	0	5	603	1016	5	5	890	298
RTOR Reduction (vph)	0	428	0	0	7	0	0	0	2	0	0	212
Lane Group Flow (vph)	642	200	0	0	3	0	603	1016	3	5	890	86
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	28.0	28.0			28.0		70.6	70.6	70.6	31.1	31.1	31.1
Effective Green, g (s)	28.0	28.0			28.0		70.6	70.6	70.6	31.1	31.1	31.1
Actuated g/C Ratio	0.26	0.26			0.26		0.66	0.66	0.66	0.29	0.29	0.29
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	714	416			278		652	2348	1050	153	1034	462
v/s Ratio Prot		0.13					c0.30	0.28			0.25	
v/s Ratio Perm	c0.23			0.00			c0.31		0.00	0.01		0.05
v/c Ratio	0.90	0.48		0.01			0.92	0.43	0.00	0.03	0.86	0.19
Uniform Delay, d1	38.4	33.7		29.5			28.2	8.9	6.4	27.5	36.2	28.7
Progression Factor	1.00	1.00		1.00			1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.1	0.9		0.0			19.0	0.1	0.0	0.1	7.5	0.2
Delay (s)	52.6	34.5		29.5			47.2	9.0	6.4	27.5	43.7	28.9
Level of Service	D	C		C			D	A	A	C	D	C
Approach Delay (s/veh)		43.7		29.5				23.2			39.9	
Approach LOS		D		C				C			D	
Intersection Summary												
HCM 2000 Control Delay (s/veh)		34.4										
HCM 2000 Volume to Capacity ratio		0.94										
Actuated Cycle Length (s)		107.6							13.5			
Intersection Capacity Utilization		101.4%							G			
Analysis Period (min)		15										

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Main Street E

2040 - Total Traffic + Improvement 3
PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	634	48	68	834	36	41
Future Volume (Veh/h)	634	48	68	834	36	41
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)	689	52	74	907	39	45
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			741		1770	715
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			741		1770	715
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		53	90
cM capacity (veh/h)			866		84	431
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	741	981	84			
Volume Left	0	74	39			
Volume Right	52	0	45			
cSH	1700	866	147			
Volume to Capacity	0.44	0.09	0.57			
Queue Length 95th (m)	0.0	2.1	22.1			
Control Delay (s/veh)	0.0	2.3	57.7			
Lane LOS		A	F			
Approach Delay (s/veh)	0.0	2.3	57.7			
Approach LOS			F			
Intersection Summary						
Average Delay			4.0			
Intersection Capacity Utilization		98.4%		ICU Level of Service	F	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
1: Highway 10 & Main Street E/Dufferin Road 9

2045 - Total Traffic + Improvement 3
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	124	137	382	27	128	9	129	659	75	13	499	127
Future Volume (vph)	124	137	382	27	128	9	129	659	75	13	499	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1864		1789	3523		1789	3470	
Flt Permitted	0.66	1.00	1.00	0.66	1.00		0.28	1.00		0.35	1.00	
Satd. Flow (perm)	1247	1883	1601	1247	1864		526	3523		659	3470	
Peak-hour factor, PHF	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)	135	149	415	29	139	10	140	716	82	14	542	138
RTOR Reduction (vph)	0	0	269	0	5	0	0	13	0	0	36	0
Lane Group Flow (vph)	135	149	146	29	144	0	140	785	0	14	644	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	11.3	11.3	11.3	11.3	11.3		29.2	29.2		20.4	20.4	
Effective Green, g (s)	11.3	11.3	11.3	11.3	11.3		29.2	29.2		20.4	20.4	
Actuated g/C Ratio	0.23	0.23	0.23	0.23	0.23		0.59	0.59		0.41	0.41	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	284	429	365	284	425		420	2078		271	1430	
v/s Ratio Prot		0.08			0.08		0.03	c0.22			c0.19	
v/s Ratio Perm	c0.11		0.09	0.02			0.17			0.02		
v/c Ratio	0.48	0.35	0.40	0.10	0.34		0.33	0.38		0.05	0.45	
Uniform Delay, d1	16.5	16.0	16.2	15.1	16.0		5.2	5.4		8.7	10.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.3	0.5	0.7	0.2	0.5		0.5	0.5		0.4	1.0	
Delay (s)	17.8	16.5	16.9	15.3	16.4		5.6	5.9		9.1	11.5	
Level of Service	B	B	B	B	B		A	A		A	B	
Approach Delay (s/veh)		17.0			16.3			5.8			11.5	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM 2000 Control Delay (s/veh)		11.3										
HCM 2000 Volume to Capacity ratio		0.47										
Actuated Cycle Length (s)		49.5								13.5		
Intersection Capacity Utilization		56.9%								B		
Analysis Period (min)		15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis 2: Highway 10 & Eco Park Way/240 Sideroad

2045 - Total Traffic + Improvement 3
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	177	0	491	5	0	5	438	689	5	5	857	201
Future Volume (vph)	177	0	491	5	0	5	438	689	5	5	857	201
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3471	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.45		0.15	1.00	1.00	0.37	1.00	1.00
Satd. Flow (perm)	2744	1601			788		290	3579	1601	697	3579	1601
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	190	0	528	5	0	5	471	741	5	5	922	216
RTOR Reduction (vph)	0	411	0	0	8	0	0	0	2	0	0	145
Lane Group Flow (vph)	190	117	0	0	2	0	471	741	3	5	922	71
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	11.9	11.9			11.9		44.6	44.6	44.6	21.5	21.5	21.5
Effective Green, g (s)	11.9	11.9			11.9		44.6	44.6	44.6	21.5	21.5	21.5
Actuated g/C Ratio	0.18	0.18			0.18		0.68	0.68	0.68	0.33	0.33	0.33
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	498	290			143		623	2436	1090	228	1174	525
v/s Ratio Prot		c0.07					c0.21	0.21			0.26	
v/s Ratio Perm	0.07				0.00		c0.30		0.00	0.01		0.04
v/c Ratio	0.38	0.40			0.01		0.76	0.30	0.00	0.02	0.79	0.14
Uniform Delay, d1	23.6	23.7			22.0		13.1	4.2	3.3	14.9	19.9	15.5
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.9			0.0		5.2	0.1	0.0	0.0	3.5	0.1
Delay (s)	24.1	24.6			22.0		18.3	4.3	3.3	14.9	23.4	15.6
Level of Service	C	C			C		B	A	A	B	C	B
Approach Delay (s/veh)		24.4			22.0			9.7			21.9	
Approach LOS		C			C			A			C	
Intersection Summary												
HCM 2000 Control Delay (s/veh)		17.7										
HCM 2000 Volume to Capacity ratio		0.72										
Actuated Cycle Length (s)		65.5								13.5		
Intersection Capacity Utilization		89.6%								E		
Analysis Period (min)		15										

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Main Street E

2045 - Total Traffic + Improvement 3
AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↗	↘	
Traffic Volume (veh/h)	597	25	26	421	59	81
Future Volume (Veh/h)	597	25	26	421	59	81
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)	649	27	28	458	64	88
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			676		1177	663
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			676		1177	663
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		69	81
cM capacity (veh/h)			915		205	462
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	676	486	152			
Volume Left	0	28	64			
Volume Right	27	0	88			
cSH	1700	915	302			
Volume to Capacity	0.40	0.03	0.50			
Queue Length 95th (m)	0.0	0.7	20.2			
Control Delay (s/veh)	0.0	0.9	28.4			
Lane LOS		A	D			
Approach Delay (s/veh)	0.0	0.9	28.4			
Approach LOS			D			
Intersection Summary						
Average Delay			3.6			
Intersection Capacity Utilization		58.4%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
1: Highway 10 & Main Street E/Dufferin Road 9

2045 - Total Traffic + Improvement 3
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	124	369	55	209	30	572	870	58	8	812	145
Future Volume (vph)	90	124	369	55	209	30	572	870	58	8	812	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1848		1789	3545		1789	3495	
Flt Permitted	0.33	1.00	1.00	0.63	1.00		0.11	1.00		0.29	1.00	
Satd. Flow (perm)	625	1883	1601	1178	1848		211	3545		552	3495	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.92
Adj. Flow (vph)	95	131	388	58	220	32	602	916	61	8	855	158
RTOR Reduction (vph)	0	0	317	0	6	0	0	5	0	0	16	0
Lane Group Flow (vph)	95	131	71	58	246	0	602	972	0	8	997	0
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0		62.8	62.8		31.2	31.2	
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0		62.8	62.8		31.2	31.2	
Actuated g/C Ratio	0.18	0.18	0.18	0.18	0.18		0.72	0.72		0.36	0.36	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	113	343	291	214	336		637	2535		196	1241	
v/s Ratio Prot		0.07			0.13		c0.29	0.27			0.29	
v/s Ratio Perm	c0.15		0.04	0.05			c0.38			0.01		
v/c Ratio	0.84	0.38	0.24	0.27	0.73		0.95	0.38		0.04	0.80	
Uniform Delay, d1	34.7	31.6	30.7	30.9	33.9		23.3	4.9		18.5	25.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	40.1	0.7	0.4	0.7	8.0		22.8	0.4		0.4	5.6	
Delay (s)	74.8	32.3	31.2	31.6	41.9		46.1	5.3		18.9	31.1	
Level of Service	E	C	C	C	D		D	A		B	C	
Approach Delay (s/veh)		38.1			40.0			20.9			31.0	
Approach LOS		D			D			C			C	
Intersection Summary												
HCM 2000 Control Delay (s/veh)			28.5			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			87.8			Sum of lost time (s)				13.5		
Intersection Capacity Utilization			91.6%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
2: Highway 10 & Eco Park Way/240 Sideroad

2045 - Total Traffic + Improvement 3
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 				 			 			 	
Traffic Volume (vph)	597	0	584	5	0	5	561	1001	5	5	860	277
Future Volume (vph)	597	0	584	5	0	5	561	1001	5	5	860	277
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	0.97	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3471	1601			1713		1789	3579	1601	1789	3579	1601
Flt Permitted	0.75	1.00			0.60		0.10	1.00	1.00	0.27	1.00	1.00
Satd. Flow (perm)	2744	1601			1051		187	3579	1601	500	3579	1601
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	642	0	628	5	0	5	603	1076	5	5	925	298
RTOR Reduction (vph)	0	427	0	0	8	0	0	0	2	0	0	201
Lane Group Flow (vph)	642	201	0	0	2	0	603	1076	3	5	925	97
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	26.5	26.5			26.5		74.5	74.5	74.5	35.7	35.7	35.7
Effective Green, g (s)	26.5	26.5			26.5		74.5	74.5	74.5	35.7	35.7	35.7
Actuated g/C Ratio	0.24	0.24			0.24		0.68	0.68	0.68	0.32	0.32	0.32
Clearance Time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	661	385			253		626	2423	1084	162	1161	519
v/s Ratio Prot		0.13					c0.30	0.30			0.26	
v/s Ratio Perm	c0.23				0.00		c0.35		0.00	0.01		0.06
v/c Ratio	0.97	0.52			0.01		0.96	0.44	0.00	0.03	0.80	0.19
Uniform Delay, d1	41.4	36.2			31.8		30.5	8.2	5.7	25.3	33.8	26.7
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	27.8	1.3			0.0		26.9	0.6	0.0	0.4	5.7	0.8
Delay (s)	69.2	37.5			31.8		57.4	8.8	5.7	25.7	39.6	27.5
Level of Service	E	D			C		E	A	A	C	D	C
Approach Delay (s/veh)		53.5			31.8			26.2			36.6	
Approach LOS		D			C			C			D	

Intersection Summary

HCM 2000 Control Delay (s/veh)	37.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	102.3%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 3: Russel Street & Main Street E

2045 - Total Traffic + Improvement 3
PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰	↱
Traffic Volume (veh/h)	666	48	68	875	36	41
Future Volume (Veh/h)	666	48	68	875	36	41
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)	724	52	74	951	39	45
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			776		1849	750
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			776		1849	750
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		48	89
cM capacity (veh/h)			840		75	411
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	776	1025	84			
Volume Left	0	74	39			
Volume Right	52	0	45			
cSH	1700	840	133			
Volume to Capacity	0.46	0.09	0.63			
Queue Length 95th (m)	0.0	2.2	25.3			
Control Delay (s/veh)	0.0	2.5	70.0			
Lane LOS		A	F			
Approach Delay (s/veh)	0.0	2.5	70.0			
Approach LOS			F			
Intersection Summary						
Average Delay		4.5				
Intersection Capacity Utilization		102.3%		ICU Level of Service		G
Analysis Period (min)		15				

Queues

2045 - Total Traffic + Improvement 3

1: Highway 10 & Main Street E/Dufferin Road 9

AM Peak Hour

									
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	135	149	415	29	149	140	798	14	680
v/c Ratio	0.47	0.34	0.65	0.10	0.34	0.31	0.39	0.05	0.46
Control Delay (s/veh)	21.1	17.1	8.9	14.4	16.4	7.9	6.7	12.6	12.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	21.1	17.1	8.9	14.4	16.4	7.9	6.7	12.6	12.3
Queue Length 50th (m)	10.1	10.8	4.6	2.0	10.2	4.6	15.6	0.8	20.5
Queue Length 95th (m)	21.9	21.9	21.7	6.5	21.3	14.2	34.4	4.2	40.6
Internal Link Dist (m)		552.4			720.6		2029.3		434.2
Turn Bay Length (m)	90.0		15.0	60.0		80.0		120.0	
Base Capacity (vph)	465	703	816	465	700	449	2061	277	1493
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.21	0.51	0.06	0.21	0.31	0.39	0.05	0.46
Intersection Summary									

Queues

2045 - Total Traffic + Improvement 3

2: Highway 10 & Eco Park Way/240 Sideroad

AM Peak Hour

									
Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	190	528	10	471	741	5	5	922	216
v/c Ratio	0.38	0.75	0.05	0.76	0.31	0.00	0.02	0.79	0.32
Control Delay (s/veh)	26.6	11.1	0.4	22.8	5.1	0.4	17.4	26.9	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	26.6	11.1	0.4	22.8	5.1	0.4	17.4	26.9	4.6
Queue Length 50th (m)	11.4	2.9	0.0	35.4	15.7	0.0	0.4	54.4	0.0
Queue Length 95th (m)	19.7	29.6	0.0	#92.2	30.6	0.3	2.7	#85.5	13.6
Internal Link Dist (m)		295.2	150.6		391.6			2029.3	
Turn Bay Length (m)	255.0			140.0		3.0	85.0		100.0
Base Capacity (vph)	772	811	283	651	2665	1197	259	1329	730
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.65	0.04	0.72	0.28	0.00	0.02	0.69	0.30

Intersection Summary

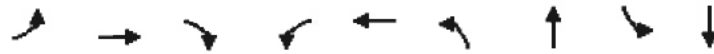
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues

2045 - Total Traffic + Improvement 3

1: Highway 10 & Main Street E/Dufferin Road 9

PM Peak Hour



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	95	131	388	58	252	602	977	8	1013
v/c Ratio	0.83	0.38	0.64	0.27	0.74	0.95	0.38	0.04	0.80
Control Delay (s/veh)	86.0	34.8	8.8	34.1	46.4	47.3	5.6	22.1	32.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	86.0	34.8	8.8	34.1	46.4	47.3	5.6	22.1	32.5
Queue Length 50th (m)	15.8	19.9	0.0	8.6	39.9	83.4	31.6	1.0	86.6
Queue Length 95th (m)	#41.5	36.0	23.4	19.4	65.0	#147.9	41.3	4.2	#123.7
Internal Link Dist (m)		552.4			720.6		2029.3		434.2
Turn Bay Length (m)	90.0		15.0	60.0		80.0		120.0	
Base Capacity (vph)	130	392	641	245	391	682	2541	196	1259
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.33	0.61	0.24	0.64	0.88	0.38	0.04	0.80

Intersection Summary

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

Queue shown is maximum after two cycles.

Queues

2045 - Total Traffic + Improvement 3

2: Highway 10 & Eco Park Way/240 Sideroad

PM Peak Hour

									
Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	642	628	10	603	1076	5	5	925	298
v/c Ratio	0.97	0.77	0.03	0.96	0.44	0.00	0.03	0.80	0.41
Control Delay (s/veh)	70.7	12.7	0.2	57.3	8.9	1.0	27.2	40.4	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	70.7	12.7	0.2	57.3	8.9	1.0	27.2	40.4	5.1
Queue Length 50th (m)	71.8	11.3	0.0	109.9	51.3	0.0	0.8	97.8	0.0
Queue Length 95th (m)	#108.2	55.6	0.0	#180.4	63.7	0.5	3.6	123.0	18.7
Internal Link Dist (m)		295.2	150.6		391.6			2029.3	
Turn Bay Length (m)	255.0			140.0		3.0	85.0		100.0
Base Capacity (vph)	661	813	298	644	2423	1089	162	1160	720
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.97	0.77	0.03	0.94	0.44	0.00	0.03	0.80	0.41

Intersection Summary

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