APPENDIX B

Transportation Assessment

Niagara Region

Detailed Transportation Assessment

Detailed Transportation Assessment and Municipal Class Environmental Assessment for Casablanca Boulevard, in the Town of Grimsby

October 2018 - 18-7650

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1.0 Introduction

In 2018, Niagara Region retained Dillon Consulting to provide consulting engineering services for the detailed transportation assessment and municipal class environmental assessment (EA) for Casablanca Boulevard, in the Town of Grimsby (Town). Situated alongside the southern shores of Lake Erie, the Town's population was approximately 27,000[1] while Niagara Region's (Region's) population was approximately 450,000[2] as estimated in the 2016 Census. The Region's employment was approximately 203,000 jobs[2].

In support of future population and employment growth within the Town and the planned construction at the Grimsby GO Train Station in the southwest quadrant of the intersection of Casablanca Boulevard and South Service Road, the adjacent transportation network was assessed in terms of traffic operations under existing and future conditions. The detailed transportation assessment is documented within this report and shall act in support to the Environmental Study Report (ESR) for Casablanca Boulevard.

While this report is focused on the needs of the Casablanca Boulevard corridor, it is noted that the transportation analysis completed for this project also considered east-west travel needs including the possibility for the extension of Livingston Avenue. The results of this parallel work are documented in a separate report in support of the Livingston Avenue Extension EA Study.

1.1 Purpose

The purpose of the EA project is to identify the transportation infrastructure requirements, timing, costs and associated approvals to address the area's projected growth and implementation of a GO Station to be located on the south west corner of South Service Road and Casablanca Boulevard. This report documents the detailed transportation analysis undertaken to identify existing and future problems, assess

[1] Statistics Canada, Census 2016, Census Profile: Grimsby, ON
[2] Statistics Canada, Census 2016, Census Profile: Niagara Region, ON

alternatives to address those problems, and identify preferred mitigation strategies for creating a sustainable future multi-modal transportation network.

1.2 Background

Situated immediately south of the Queen Elizabeth Way (QEW), the Canadian National Railway (CNR) Grimsby Subdivision divides the town from its waterfront communities and its central business district and rural lands south of the Niagara Escarpment. As of today, the rail line currently services predominantly freight traffic; however, Metrolinx plans to extend the GO Train Commuter Rail service as far as Niagara Falls from the existing terminus in Hamilton. As part of the extension, stations are being planned and designed for Grimsby, St. Catharines, and Niagara Falls with a potential fourth station to be situated in Beamsville, a community located within the Town of Lincoln.

The Grimsby GO Train Station is to be located in the southwest quadrant of the intersection of Casablanca Boulevard and South Service Road; between the QEW and the Grimsby Rail Subdivision. The station is expected to interface with the local transportation network through the inclusion of active transportation facilities such as sidewalks and multi-use path connections, parking facilities, kiss-and-ride facilities, and connections to local transit services. **Figure 1** illustrates a conceptual site plan for the Grimsby Go Train Station.

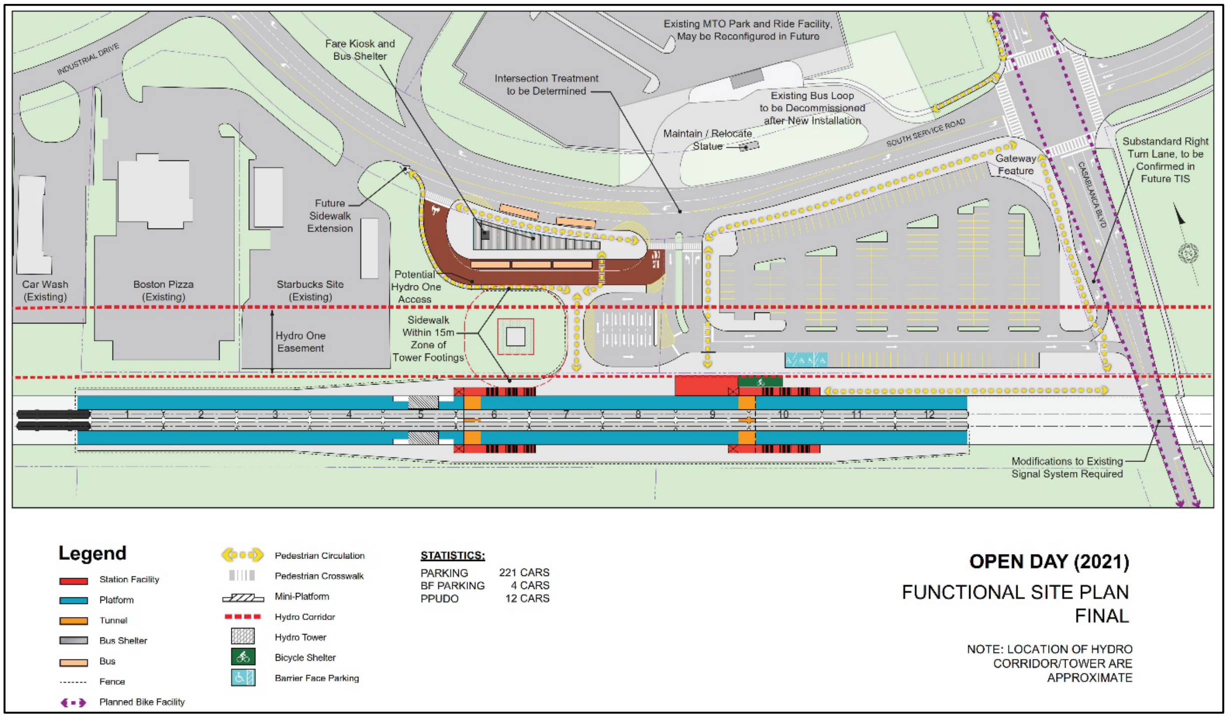

Figure 1: Grimsby GO Train Station Conceptual Plan

The addition of the GO Train service and associated connections to the local transportation network is expected to impact local travel patterns, including at the QEW / Casablanca Boulevard interchange.

The interchange gives access to developing residential areas north of QEW, and also serves to connect those areas to the Town of Grimsby, via Casablanca Boulevard. The Town of Grimsby is expected to experience significant population and employment growth in the future, putting increased travel demand on study area roadways.

1.3 Study Area

To capture the impacts of development, the study area under assessment is bounded to the north by North Service Road, the east by Casablanca Boulevard, the south by Main Street West, and the west by Oakes Road. Contained within these lands are various land uses including, but not limited to, medium density residential north of the QEW, commercial and industrial south of the QEW, low to medium density residential in the southeast, and undeveloped lands with pockets of low density residential in the southwest. The study area and associated intersections explicitly assessed are presented within **Figure 2**.

Figure 2 illustrates the study area and study area intersections.

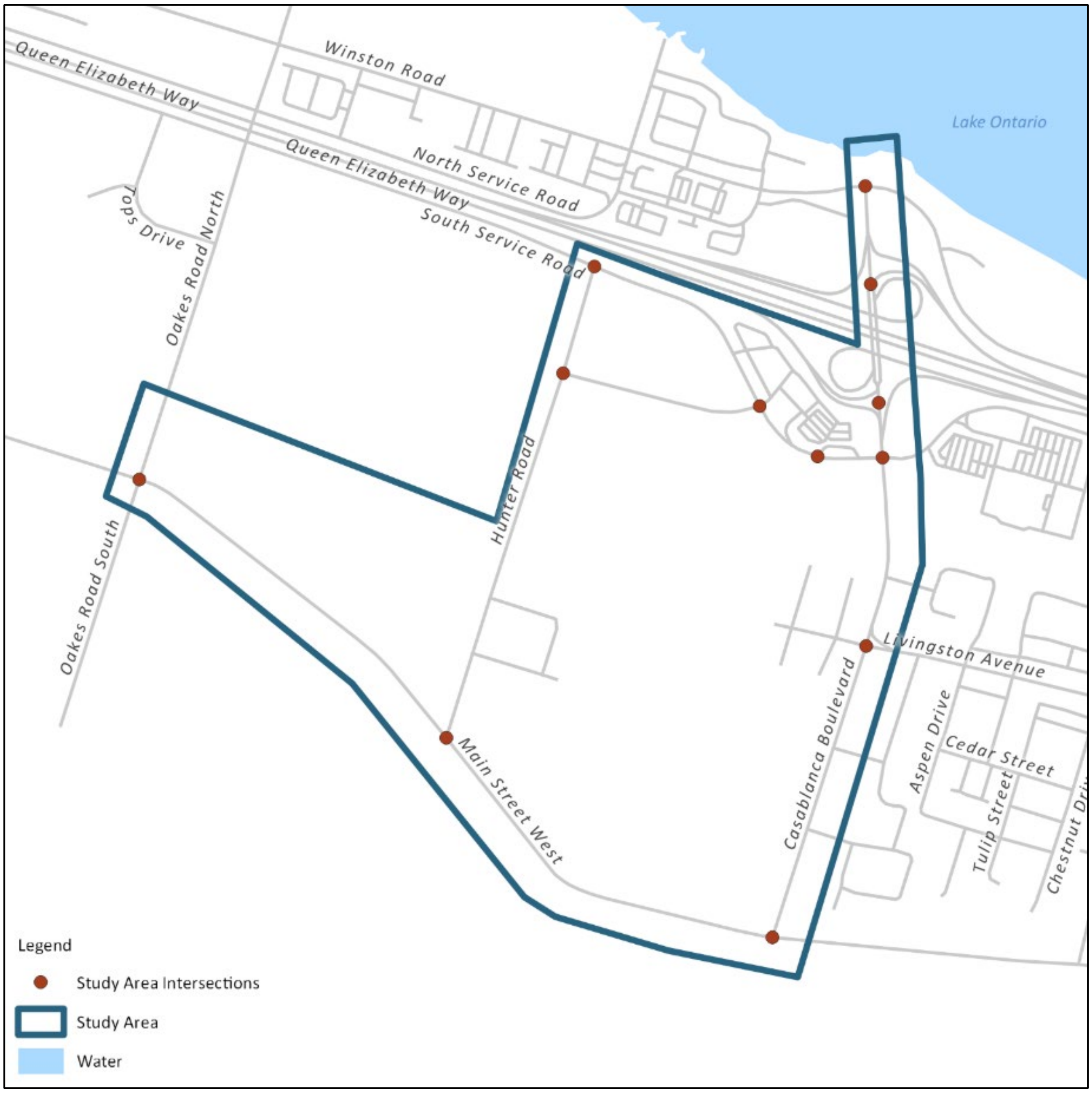

Figure 2: Study Area

1.4 Existing Transportation Network

Streets and roads in the study area include:

Casablanca Boulevard is a minor arterial street running north-south from Main Street West to North Service Road. The AADT (2017) for Casablanca Boulevard was 12,000 between South Service Road and Livingston Boulevard and 5,400 between Livingston Boulevard and Main Street West. Casablanca Boulevard is the only road in the study area that has an interchange with the QEW (Oakes Road—to the west—crosses QEW at a flyover, but does not include ramps to access QEW). Casablanca Boulevard has a two lane cross-section, with added turning lanes at North Service Road, the QEW ramp terminals, South Service Road, and at Livingston Avenue. The posted speed limit is 60 km/h. A sidewalk is provided on the east side from Main Street West to the south ramp terminal at the QEW interchange. The rail crossing at the Grimsby subdivision has crossing gates. South of the Grimsby rail subdivision the land along Casablanca Boulevard is developed with fronting single family homes with driveway access to Casablanca Boulevard. North of the Grimsby rail subdivision, large parcels are developed with industrial and commercial land uses. Casablanca Boulevard is also known as Regional Road 10, but will be referred to simply as Casablanca Boulevard for the purposes of this report.

Livingston Avenue is a three-lane collector street running east-west from west of Livingston Avenue through downtown Grimsby and continuing east as Main Street East. The AADT (2017) of Livingston Avenue is 9,100 to the east of Casablanca Boulevard. Livingston Avenue has a two-way left-turn lane and painted cycle lanes in both directions. The posted speed limit is 50 km/h. Sidewalks are provided on both side of Livingston Avenue through the study area. Lands along Livingston Avenue are developed with fronting single family homes, many with driveway access to Livingston Avenue. Livingston Avenue is also known as Regional Road 512, but will be referred to simply as Livingston Avenue for the purposes of this report.

Queen Elizabeth Way (QEW) is a six-lane divided freeway running east-west through the study area. The cross-section includes wide, paved shoulders, and a Jersey barrier median. The AADT (2016) for the QEW was 107,100 and 112,300 to the east and west of Casablanca Boulevard, respectively. Through the study area, the posted speed limit is 100 km/h. The cross-section includes service roads on each side of QEW. The service roads allow for two-way traffic, with two-lane cross-sections and 50 km/h posted speed limits. Lands adjacent to the service roads are developed with a mix of industrial and commercial developments, with multi-family residential development in the northwest part of the study area.

Main Street West is a minor arterial street running east-west from Hamilton, through downtown Grimsby and further east to St. Catharines. The AADT (2017) for Main Street West is 7,000 to the west of Casablanca Boulevard and 7,600 to the east of Casablanca Boulevard. Through the study area, Main Street West has a two-lane cross-section, with paved shoulders and a posted speed limit of 70 km/h between Oakes Road and Hunter Road, 60 km/h between Hunter Road and Casablanca Boulevard, and 50km/h to the east of Casablanca Boulevard. A sidewalk is provided on the north side through the study area. From Casablanca Boulevard to the east, Main Street West runs along the bottom of a steep slope. Lands along Main Street West are developed with backing single family homes on the north side and fronting single family homes on the south side. West of Casablanca Boulevard, Main Street West curves to the north, and development along the road is mostly sparse single family residential, with several parcels used for agriculture or industrial use. Main Street West is also known as Regional Road 81, but will be referred to simply as Main Street West for the purposes of this report.

North Service Road is a two-lane minor arterial street running east-west along the majority of the QEW in Niagara Region. AADT was not available for North Service Road. No sidewalk or cycling infrastructure is present along North Service Road within the bounds of the study area. To the east of Casablanca Boulevard, North Service Road provides occasional driveway access to commercial and residential properties and local roads. To the west of Casablanca Avenue, North Service Road is quickly being developed to accommodate a range of commercial and residential development. A traffic control signal was recently installed at the intersection of North Service Road with Casablanca Boulevard.

South Service Road is a two-lane minor arterial road that provides access to a significant amount of big box commercial development (highway rest area, car dealers, grocery, home improvement, fast food) and light industrial / warehousing uses within the study area. AADT (2017) on South Service road was 6,700 and 4,100 to the east and west of Casablanca Boulevard, respectively. As with North Service Road, South Service Road

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runs parallel to the QEW along essentially its whole length within the Niagara Region. Auxiliary turning lanes are provided in the vicinity of major commercial properties and at major intersections (e.g., Casablanca Boulevard). Within the study area, no sidewalks or cycling infrastructure are provided along South Service Road.

Oakes Road is a two-lane collector street running north-south from south of Main Street West to Winston Road, north of North Service Road. AADT was not available for Oakes Road. A sidewalk is provided on the east side between Main Street West and the CNR Grimsby rail subdivision. Several single family homes front onto Oakes Road between Main Street West and the CNR Grimsby rail subdivision. Additionally, Smith School, a Kindergarten to Grade School, fronts onto Oakes Road North just south of the rail line. The rail crossing at the Grimsby subdivision has crossing gates. North of the Grimsby subdivision to the QEW, adjacent lands are largely undeveloped, with the exception of an industrial development south of the QEW. Oakes Road has a grade-separated crossing over the QEW, with multi-family residential development to the east on the north side of the QEW.

Hunter Road is a two-lane collector street running north-south from Main Street West to South Service Road. AADT was not available for Hunter Road. There are no sidewalks, and ditches are present on both sides, leading pedestrians to walk on the pavement. Lands along Hunter Road are developed with fronting single family residential homes at the south towards Main Street West. Further north to the Grimsby subdivision, adjacent lands are undeveloped. The rail crossing at the CNR Grimsby subdivision has crossing gates. Lands north of the Grimsby subdivision to the QEW South Service Road are developed with industrial and commercial land uses.

Figure 3 illustrates the existing road network, lane configurations at intersections, and traffic control at intersections under existing conditions.

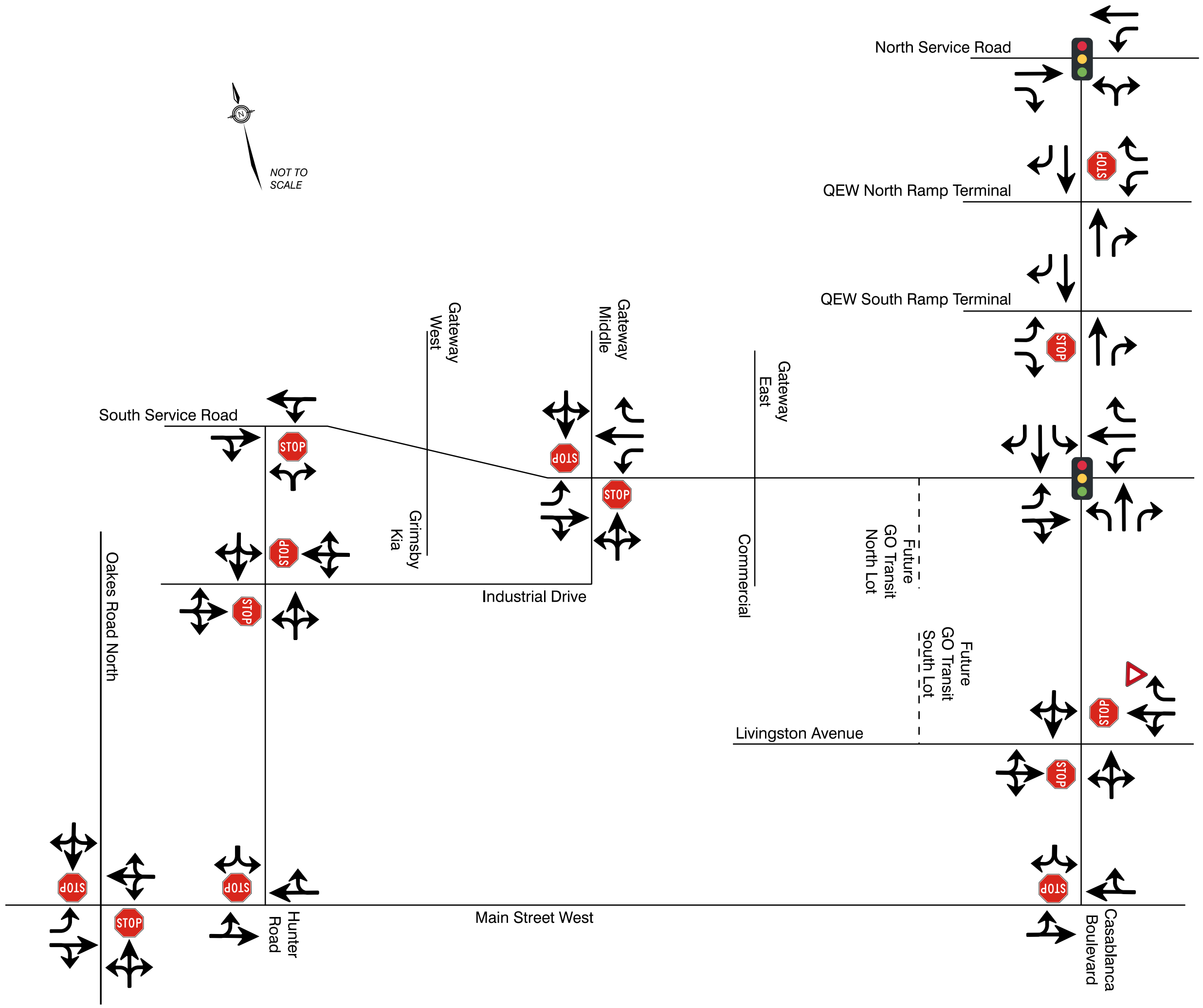

Figure 3: Existing Road Network

1.4.1 Active Transportation Infrastructure

The main walking infrastructure in the study area is the aforementioned sidewalks along the arterial and collector streets. Additionally, some local streets include sidewalks, and many neighborhoods include paths connecting streets across park space.

Dedicated cycling infrastructure in the study area is limited to the cycle lanes on Livingston Avenue. Main Street West has shoulders at least 1.0 m wide in all sections, with widths over 2.0 m in many sections. This provides some utility to cyclists, especially given the long extent of Main Street West, from Hamilton to the west to St. Catharines to the east.

The QEW interchange has several high-speed, free-flowing or yield-controlled ramps which are intimidating for pedestrians and cyclists. The Casablanca Boulevard & Livingston Avenue intersection has a westbound right turn channel and the intersection with two-way stop-control; the westbound right turn channel can be intimidating for pedestrians and cyclists and the lack of a traffic signal prohibits pedestrians and cyclists from safely crossing Casablanca Boulevard. The Town of Grimsby has expressed a desire to improve active transportation connections at these locations.

1.4.2 Transit Service and Infrastructure

In the study area, GO Transit operates a park and ride and bus route 12 between Niagara Falls and Burlington where it connects to the GO Train. The park and ride is located on the northwest corner of the Casablanca Boulevard and SSR intersection. GO bus route 12 operates on weekdays between 4:54 AM and 12:24 AM with service approximately every 30-45 minutes during peak periods. The route operates primarily along the QEW and uses Casablanca Boulevard and SSR to access the park and ride lot. Buses use a bus loop to turn around and access the QEW / Casablanca Boulevard interchange.

1.5 Traffic Data

Niagara Region provided traffic count data to use for the analysis in two forms:

- 8-hour turning movement counts (TMC) - all TMCs were collected on Wednesday, May 9, 2018
- 24-hour Automated Traffic Recorder data (ATR) – collected between May 5 and May 10, 2018

Figure 4 illustrates the existing traffic volumes used for the analysis. **Appendix A** contains the full traffic counts.

In addition, traffic signal timing and phasing plans were received from Niagara Region for applicable intersections within the study area. Dillon's previous work in the area (Niagara Go Hub and Transit Stations Study, 2017) also included field visits in the study area, which informed the understanding of existing conditions and issues in the study area.

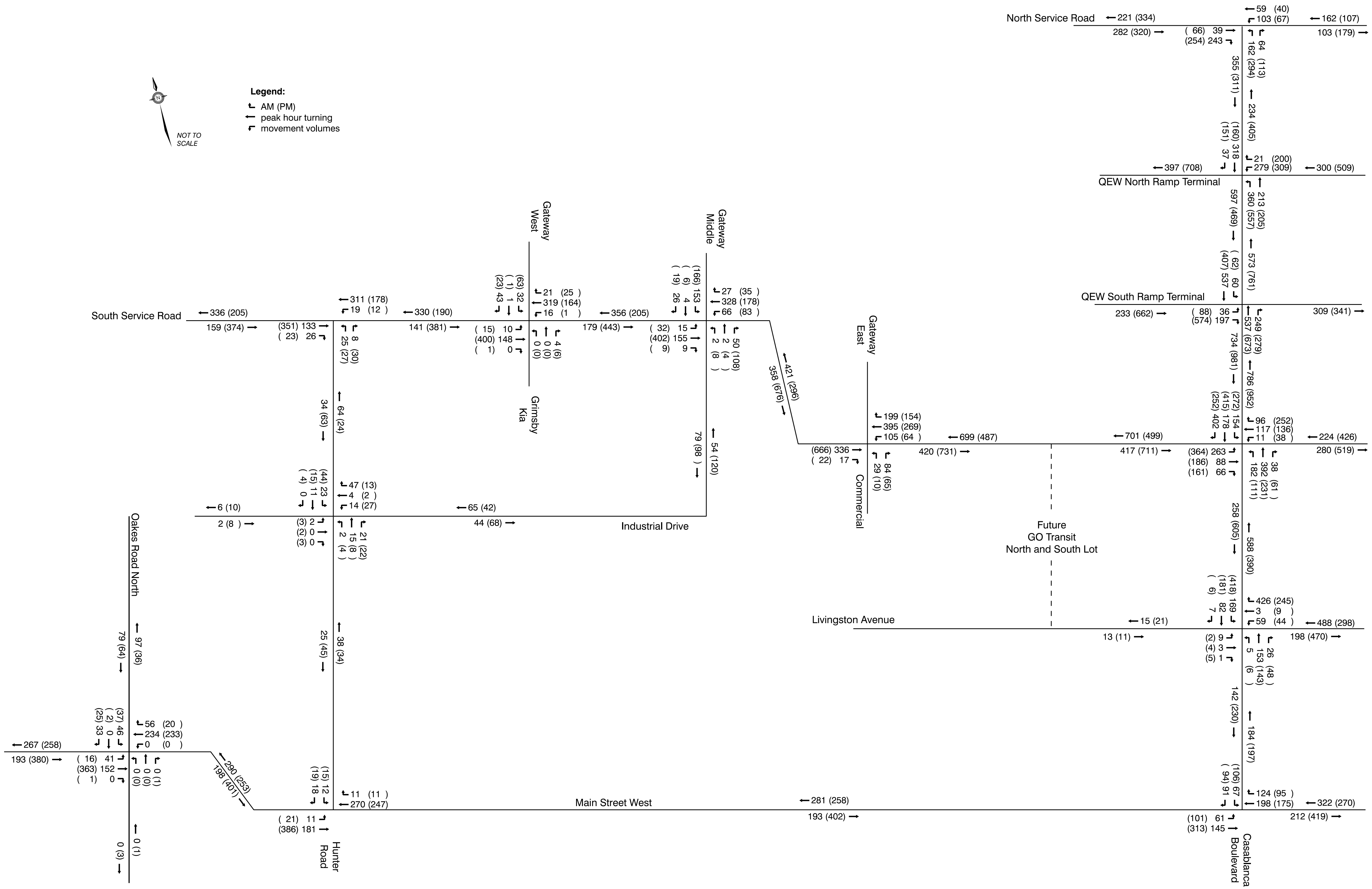

Figure 4: Existing Traffic Volumes

1.6 Niagara GO Hub and Transit Stations Study

Dillon completed an analysis of future GO Rail service and mobility hubs in 2017 for Niagara Region. The study was known as the "Niagara GO Hub and Transit Stations Study"[3] (herein referred to as NGHTSS). This study examined the expansion of GO Rail service through Niagara Region connecting Hamilton's West Harbour GO station to Niagara Falls. Four proposed stations were included in the study:

- Grimsby GO Station (2021 projected opening)
- St. Catharines GO Station (2023 projected opening)
- Niagara Falls GO Station (2023 projected opening)
- Beamsville GO Station (No official timetable for opening)

The foundations of the NGHTSS report, particularly as they relate to the future land use, regional and local travel behaviour, and GO Rail service, serve as foundational elements for the transportation assessment for the Casablanca Boulevard EA. This section summarises the inputs related to background regional growth, changes to local land use, and forecasted rail ridership presented in the preceding report. Section 3 of the NGHTSS report should be referenced for further details.

1.6.1 Background Growth

Background traffic growth in the model represents the change in external-to-external trips within the region traversing the study area. As opposed to a more generic, regional growth factor applied uniformly to all sub-area models, a more targeted approach to background growth was implemented. The purpose was to capture adjacent or external study area regional growth not explicitly accounted for in the land use concepts internal to the study area.

Growth in regional traffic in the four individual station study areas was calculated through examination of outputs from Niagara Region's EMME travel demand forecasting model. The external roadway links (i.e., those at the edges of the individual study areas) were examined to calculate a representative compound annual growth rate (CAGR) for movement *between external stations only* (i.e., trips travelling through the

[3] Dillon Consulting Limited, Niagara GO Hub and Transit Stations Study (June 2017)

study area unrelated to local land use changes). **Table 1** below summarises the findings from Niagara Region's model. Information for Grimsby is highlighted.

Table 1: External Station CAGR by Station Area

Station Study Area	AM Peak Hour	PM Peak Hour
Grimsby	***2.4%***	***1.5%***
Beamsville	1.4%	1.3%
St. Catharines	1.3%	1.3%
Niagara Falls	2.1%	1.0%

1.6.2 Local Land Use Growth

As part of the NGHTSS, Dillon developed land use concepts for the four station study areas in consultation with Niagara Region, the local municipalities, and the general public. The land use concepts specified the magnitude and distribution of population and employment growth to the 2041 horizon year in the vicinity of the four sub-area models. The land use concepts used the 2041 population and employment assumptions developed for the Region of Niagara's Transportation Master Plan model.

Trip generation rates were developed based on the outputs of Niagara Region's travel demand forecasting model to represent the changes in travel demand in the subarea models created for each of the four study areas. These allowed the forecasted changes in population and employment in the area to be used to project the growth in local traffic related to land use changes in the area. The trip generation rates are summarized in **Table 2**.

Table 2: Trip Generation Rates

Peak Hour	Trip Productions (from) Population	Trip Productions (from) Employment	Trip Attractions (to) Population	Trip Attractions (to) Employment
AM	0.1464	0.0686	0.0413	0.2969
PM	0.0646	0.2856	0.1373	0.1384

The trip generation rates were applied to the forecasted growth in population and employment to project the growth in travel demand related to land use changes in each of the study areas. **Table 3** summarizes the growth in population, employment, and associated changes in person trips in each of the study areas. Information for Grimsby is highlighted.

Table 3: Summary of Land Use Growth and Person Trip Generation

Station Study Area	Land Use Growth (2011-2041) Population	Land Use Growth (2011-2041) Employment	AM Peak Hour	AM Peak Hour	PM Peak Hour	PM Peak Hour
Grimsby	***4,750***	***1,870***	***988***	***902***	***1,009***	***1,093***
Beamsville	1,300	950	307	403	426	372
St. Catharines	1,900	2,300	523	914	936	695
Niagara Falls	2,450	560	477	321	382	497

The person-trips calculated through this process were applied to existing year travel demands to represent the change in local travel due to changes in land use.

1.6.3 GO Station Ridership Forecasts

The final layer of demand representing the future condition were trips related to the implementation of GO Rail service in the four study areas. These trips were implemented and integrated with the other layers of travel demand accordingly.

The basis for the ridership forecasts stemmed from Metrolinx's "Niagara Region GO Expansion Study, Ridership Forecasts"[4] study, completed in March 2015. The forecasts were completed using the 2031 horizon year for three GO Stations – Grimsby, St. Catharines and Niagara Falls. These forecasts did not include a station at Beamsville, nor did it forecast the potential for intra-regional trips within Niagara (e.g. Grimsby to St. Catharines).

The Paradigm/MMM report developed Niagara GO mode share targets of total travel demand in both a low and high scenario. The "low" scenario assumed a "business as usual" condition with ridership primarily dependent on automobile access to the stations, with no major local transit service improvements. The "high" scenario assumed the implementation of Niagara Regional Council's approved transportation strategic priorities that included a commitment to strong transit supportive policies being in place. The "high" scenario was chosen for application in the ridership forecasts and mode share estimates, given the extended horizon year of 2041.

The mode share for regional rail trips as part of total travel demand determined as part of the Metrolinx study was examined for reasonableness with respect to the four study areas, given that the Metrolinx study did not consider intra-regional GO Rail trips (e.g., Grimsby to Niagara Falls) and that trips to and from Toronto would experience significant travel distance without direct service (e.g., especially from Niagara Falls), the mode share for trips to Toronto was disproportionately high. Table 4 below summarizes the modified mode shares of overall travel to regional centres from Urban and Outlying areas of Niagara Region.

[4] Paradigm / MMM, *Niagara Region GO Expansion Study Ridership Forecasts, March 2015*

Table 4: Niagara GO Mode Share of Total Travel Demand during Peak Hour in "Main" and "Off" Direction

Origin / Destination	Urban Niagara "Main"	Urban Niagara "Off"	Outlying Niagara "Main"	Outlying Niagara "Off"
Hamilton	5.2%	4.2%	1.3%	1.0%
Burlington / Oakville	2.6%	2.1%	0.3%	0.3%
Mississauga	2.6%	2.1%	0.3%	0.3%
Toronto	8.9%	7.1%	2.7%	2.1%
Niagara Region	1.0%	1.0%	0.1%	0.1%

Two estimates for future ridership were forecasted for the four station areas: Base and High. The Base scenario represented a 'realistic' forecast of ridership for the new service. The High scenario expanded upon the Base scenario to examine potential risks with the following additional assumptions:

- Utilized the Base Ridership Scenario numbers as basis and doubled ridership to account for higher quality GO service and other unknowns;
- Modified to more auto-centric mode share to account for less realization of active mode and transit mode share targets to access / egress each GO Station;
- Increased Beamsville ridership due to likelihood of residents in northeast St. Catharines adjacent to QEW driving to Beamsville instead of the St. Catharines GO Station (assumed approximately 27% of St. Catharine GO ridership)

Table 5 summarizes the peak hour and peak period travel data arising from this process for Grimsby.

Table 5 – 2041 Peak Hour GO Rail Ridership

Direction to / from	AM Peak Hour On	AM Peak Hour Off	PM Peak Hour On	PM Peak Hour Off
East	13	11	15	16
West	368	149	184	433
Total	381	161	199	449

Table 6 - 2041 Peak Period GO Rail Ridership

Direction to / from	AM Peak Period On	AM Peak Period Off	PM Peak Period On	PM Peak Period Off
East	36	31	40	42
West	1012	411	496	1168
Total	1048	442	536	1209

1.6.3.1 Station Area Mode Share

Mode share estimates to/from each GO Station where based on experience from other existing GO Stations in the network, addressing the potential for active modes first, local transit connections second, and automobile traffic third. Table 7 illustrates the existing mode share to a number of GO Stations, along with the population within walking distance of each GO Station.

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Table 7: Mode Share and Walking Distance from Existing GO Stations

Quantity	Bramalea	Port Credit	Burlington	Milton	Newmarket	Markham Centre	Downtown Brampton
AM Peak Period Departures	2,750	1,940	2,420	2,460	600	2,310	2,060
Pop. within 800m walk	800	7,800	3,600	4,200	5,100	1,400	6,800
People per ha	4	41	18	21	26	7	34

Table 8 - Mode Share from Existing GO Stations

Mode Share	Bramalea	Port Credit	Burlington	Milton	Newmarket	Markham Centre	Downtown Brampton
Walk	0%	26%	6%	2%	15%	1%	8%
Drive	66%	50%	70%	71%	50%	65%	53%
Drop Off	20%	10%	10%	18%	26%	17%	26%
Car Pool	2%	2%	2%	0%	0%	3%	2%
Public Transit	11%	11%	10%	9%	7%	14%	10%
Bike	1%	1%	2%	0%	2%	0%	1%
Total	100%	100%	100%	100%	100%	100%	100%

Table 9 - Trip per capita in 800m buffer

Mode	Bramalea	Port Credit	Burlington	Milton	Newmarket	Markham Centre	Downtown Brampton
Walk	0.00	0.06	0.04	0.01	0.02	0.02	0.02

The characteristics for the existing stations were examined and compared to the four station study areas to create reasonable mode share estimates. **Table 10** shows the resulting mode share values for the four stations for the high ridership scenario. Values for Grimsby are highlighted.

Table 10: Niagara GO Station Mode Share (High Ridership Scenario)

Travel Mode to Station	Grimsby	Beamsville	St. Catharines	Niagara Falls
Drive and Park	***74%***	71%	69%	67%
Walk	***5%***	8%	5%	7%
Kiss and Ride	***15%***	15%	15%	15%
Local Transit	***5%***	5%	10%	10%
Bicycle	***1%***	1%	1%	1%

1.6.3.2 Application of Ridership in Station Areas

The person trips generated by the ridership forecasts were applied to the station area models using the mode share distributions shown in **Table 10**. The overall level of trip-making was maintained in the model to avoid any incidence of double counting though subtraction of an equivalent number of trips for each mode from the background and land use growth forecasted travel demand, as necessary to represent the likely travel patterns for each mode, as follows:

- Trips originating/destined within an 800m network walking distance based on existing pedestrian facilities were assumed to be primarily completed on foot
- Bicycle and local transit trips were assumed to primarily travel to/from the area beyond the 800m walking buffer, as they are conducive to longer trips
- Auto trips in the area (park, and pick up / drop off) were assumed to generally maintain existing longer distance trips within the study area (e.g., to/from QEW)

2.0 Approach

While it was important to understand the current performance of the transportation network under the existing conditions to set a benchmark for comparison, it was equally important to understand the performance at key milestones based on growth and development. The following planning horizons were selected:

- Existing Conditions Baseline (Base Year, 2018)
- GO Station Opening Day (Short-Term Horizon Year, 2021)
- Full-Development of North Grimsby (Long Term Horizon, 2041)

The 2041 horizon was selected to reflect Niagara Region's intent to design for 2041 to accommodate all currently planned growth and development to ensure the long term needs for transportation are met.

Consideration of these three horizons allowed for assessment of strategic and operational transportation needs to ensure that the transportation network is able to accommodate the planned growth. Therefore, the study was completed using the following approach:

- **Consider Existing Conditions** including street and road characteristics, active transportation infrastructure, and traffic volumes. Also assess and identify existing issues and solutions at the strategic level and at the operational level.
- **Plan for 2021 Conditions** to coincide with the start of GO Train service to and through Grimsby. Identify the base road network (based on findings from consideration of the existing conditions), forecast travel demand, and assess and identify strategic and operational issues and solutions.
- **Plan for 2041 Conditions** considering continued GO Train service to and through Grimsby, and future population and employment growth in north Grimsby. Identify the base road network (based on findings from the existing and 2021 assessments), forecast future travel demand, and assess and identify strategic and operational issues and solutions related to the movement of cars, transit, cyclists, and pedestrians.
- **Record Conclusions and Make Recommendations** on transportation infrastructure development for the 2021 and 2041 horizons.

3.0 Methodology

Each horizon was examined from two perspectives to determine the transportation needs for the three analysis years:

- Strategic Analysis: The strategic analysis was conducted through examination of screenlines drawn across important portions of the study area. The purpose of the strategic analysis was to determine that the appropriate *connections* and *capacity* are provided.
- Operational Analysis: The operational analysis was conducted using PTV Group's Vissim transportation microsimulation software. Microsimulation models are used to model traffic operations where interaction between intersections and modes of travel is an important consideration. The purpose of operational analysis was to determine where *intersection-level improvements* may be required.

3.1 Strategic Screenline Analysis

A series of screenlines were developed to assess the capacity for vehicular movement in the cardinal directions across important portions of the study area, as shown in **Figure 5**.

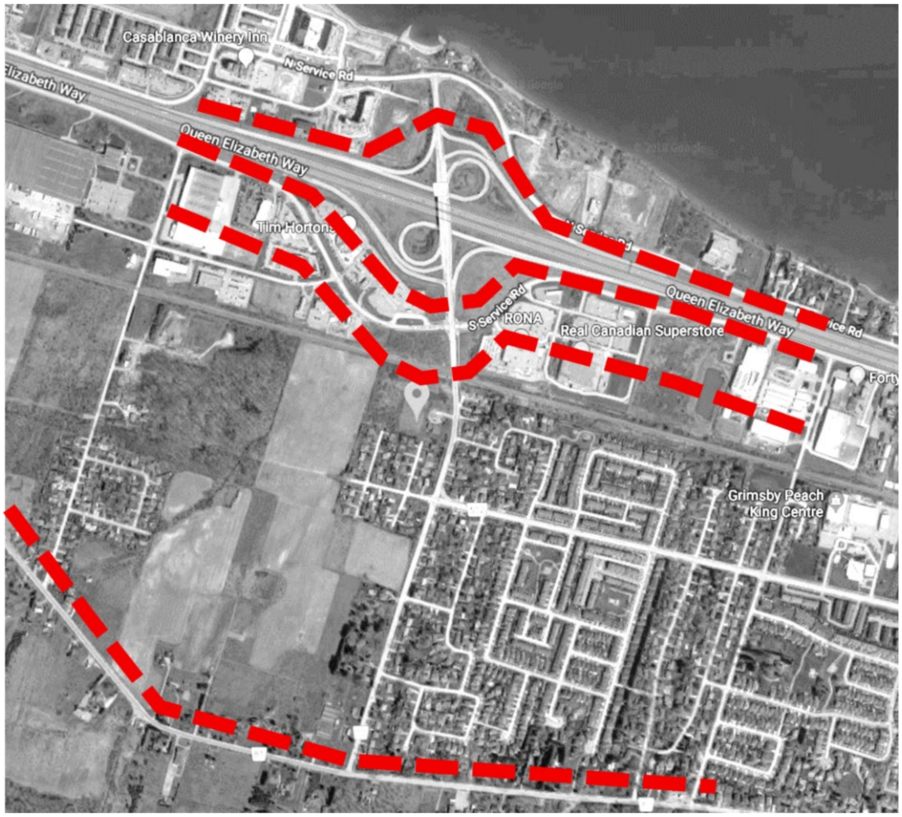


Figure 5: Strategic Analysis Screenlines

Link capacities were assigned with a base capacity of 900 vehicles per hour per lane (vphpl). The base capacity of 900 vphpl stems from guidance provided by the Highway Capacity Manual 2010 (HCM2010), which lists the saturation flow rate in a metropolitan area with population >250,000 as 1900 vphpl[5]. This assumes an idealised condition that **"represents the maximum rate of flow for a traffic lane as measured at the stop line during the green indication. The base saturation flow rate represents the saturation flow rate for a traffic lane that 12 ft. wide and has no heavy vehicles, a flat grade, no parking, no buses that stop at the intersection, even lane utilization, and no turning vehicles."** Assuming a general condition at most intersections where 50% of available green time (or all-way stop control) is given to each approaching corridor, it is reasonable to assume that the capacity of a roadway is generally half of the saturation flow rate, which results in a capacity of 950 vphpl. This should be further reduced by a nominal amount to account for the presence of heavy vehicles (trucks, buses), mid-block

[5] Transportation Research Board, Highway Capacity Manual 2010, p. 18-14, Exhibit 18-28

turning vehicles, interaction with active transportation users, and inefficiencies at traffic controls, all of which are specifically excluded from the HCM's recommended saturation flow rate. Therefore, 900 vphpl is a reasonable assumption for a base capacity for this analysis. Professional judgement was subsequently applied to modify the base capacity for roads in the study area based on the roadway type, level and type traffic control, frequency of access, presence of on-street parking, and other factors that were considered to have an effect on lane capacity.

The existing or forecasted volumes for the individual facilities across the screenline were subsequently compared to the available capacity via a simple ratio of volume to capacity (v/c ratio), which provides an indication of the sufficiency of the capacity for movement across the screenline. Taken together, the facilities that cross the screenlines illustrate the overall 'carrying capacity' for movement across the screenline. They serve to illustrate where issues may be present for movement across the screenlines and for individual facilities.

3.2 Microsimulation Analysis

Transportation microsimulation models present a realistic representation of how various modes of travel will interact with each other, the roadway infrastructure, and traffic controls present in a transportation network. They focus on the calibration of behaviour of the various modes in these interactions to allow the individuals in the model to react realistically as they move through the network in a single connected environment. For this project, the Vissim microsimulation software was applied.

Outputs from the microsimulation analysis for this work included the average vehicle delay, queuing (average and maximum), and resultant level of service for each turning movement in the study area. These were compared across a range of infrastructure alternatives to determine the necessary modifications to infrastructure, controls, or traffic signal timing that will maintain an adequate level of service in the study area.

3.2.1 Microsimulation Model Calibration

Prior to testing alternatives, the Vissim model was developed and calibrated to existing conditions. The model was calibrated according to the guidance provided in FHWA's "Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation

Modeling Software"[6]. Based on the data available from Niagara Region, the calibration involved the comparison of field-observed and modelled turning movement and link level volumes.

The industry-standard GEH statistic was applied along with percentage and absolute differences to compare counted traffic volumes to simulated traffic volumes present within the microsimulation model. For the model application in this assessment, the FHWA guidance that a GEH value of 5.0 or less be met for 85% or more of turning movement and link count locations was met. Table **11** shows that this key criterion was met for the model among five other tests.

[6] Federal Highway Administration, Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Software, (2004), p. 64, Table 4

Table 11: Vissim Model Calibration

AM Peak Hour

LINKS	Passed 6 of 6								ON
*Criteria**	*Flow Range*		*Criteria*		*Goal*	*Current*	*Count*	*Model*	*Pass/Fail*
Within 100 veh/h, for Flow < 700 veh/h > 85% of cases	0	700	100	veh	85%	97%	30	29	✓
Within 15%, for 700 veh/h < Flow < 2700 >85% of cases	700	2700	15	%	85%	100%	1	1	✓
Within 400 veh/h, for Flow > 2700 veh/h > 85% of cases	2700		400	veh	85%	--	0	0	
Sum of All Link Flows within 5% of sum of all link counts	Overall		5	%	5%	-3%	7209	7406	✓
GEH < 5 for Individual Link Flows, > 85% of cases	Overall		5	GEH	85%	87%	31	27	✓
GEH < 10 for individual link flows, 95% of cases	Overall		10	GEH	95%	100%	31	31	✓
GEH < 4 for sum of all link counts	Overall		4	GEH	4.0	2.3	7209	7406	✓

**Source: FHWA Traffic Toolbox Vol 3 'Calibration of Microsimulation Models', Table 4 "Wisconsin DOT Freeway Model Calibration Criteria"*

TURNS	Passed 6 of 6								ON
Criteria	*Flow Range*		*Criteria*		*Goal*	*Current*	*Count*	*Model*	
Within 50 veh/h, for Flow < 400 veh/h > 85% of cases	0	400	50	veh	85%	91%	76	69	✓
Within 10%, for 400 veh/h < Flow < 1200 >85% of cases	400	1200	10	%	85%	100%	2	2	✓
Within 200 veh/h, for Flow > 1200 veh/h > 85% of cases	1200		200	veh	85%	--	0	0	
Sum of all turn flows within 5% of sum of all turn counts	Overall		5	%	5%	-3%	7209	7406	✓
GEH < 5 for Individual turn Flows > 85% of cases	Overall		5	GEH	85%	99%	79	78	✓
GEH < 10 for individual turn flows, 95% of cases	Overall		10	GEH	95%	99%	79	78	✓
GEH < 4 for sum of all turn counts	Overall		4	GEH	4.0	2.3	7209	7406	✓

PM Peak Hour

LINKS	Passed 6 of 6								ON
*Criteria**	*Flow Range*		*Criteria*		*Goal*	*Current*	*Count*	*Model*	*Pass/Fail*
Within 100 veh/h, for Flow < 700 veh/h > 85% of cases	0	700	100	veh	85%	91%	33	30	✓
Within 15%, for 700 veh/h < Flow < 2700 >85% of cases	700	2700	15	%	85%	100%	2	2	✓
Within 400 veh/h, for Flow > 2700 veh/h > 85% of cases	2700		400	veh	85%	--	0	0	
Sum of All Link Flows within 5% of sum of all link counts	Overall		5	%	5%	2%	9749	9518	✓
GEH < 5 for Individual Link Flows, > 85% of cases	Overall		5	GEH	85%	86%	35	30	✓
GEH < 10 for individual link flows, 95% of cases	Overall		10	GEH	95%	97%	35	34	✓
GEH < 4 for sum of all link counts	Overall		4	GEH	4.0	2.4	9749	9518	✓

**Source: FHWA Traffic Toolbox Vol 3 'Calibration of Microsimulation Models', Table 4 "Wisconsin DOT Freeway Model Calibration Criteria"*

TURNS	Passed 5 of 6								ON
Criteria	*Flow Range*		*Criteria*		*Goal*	*Current*	*Count*	*Model*	
Within 50 veh/h, for Flow < 400 veh/h > 85% of cases	0	400	50	veh	85%	85%	87	74	✓
Within 10%, for 400 veh/h < Flow < 1200 >85% of cases	400	1200	10	%	85%	67%	3	2	✗
Within 200 veh/h, for Flow > 1200 veh/h > 85% of cases	1200		200	veh	85%	--	0	0	
Sum of all turn flows within 5% of sum of all turn counts	Overall		5	%	5%	2%	9749	9518	✓
GEH < 5 for Individual turn Flows > 85% of cases	Overall		5	GEH	85%	86%	91	78	✓
GEH < 10 for individual turn flows, 95% of cases	Overall		10	GEH	95%	98%	91	89	✓
GEH < 4 for sum of all turn counts	Overall		4	GEH	4.0	2.4	9749	9518	✓

One exception to the calibration of the model is the category examining the percentage match of volume between 400 and 1200 turning vehicles, as shown in the PM Peak Hour table, where one of the three records in this range did not match the criteria of less than 10% difference. It was determined that correction of the issue would not be possible without modification of the zone structure in the model, which would break the connection with modelling work done on the previous NGHTSS and make future transfers and comparisons of model data more difficult.

Further investigation of the problematic record showed that the difference between the modelled and observed values for this record was fewer than 100 vehicles (89) with a GEH of 4.6. This indicated that the difference for this record was not significant and that the overall calibration could be considered valid.

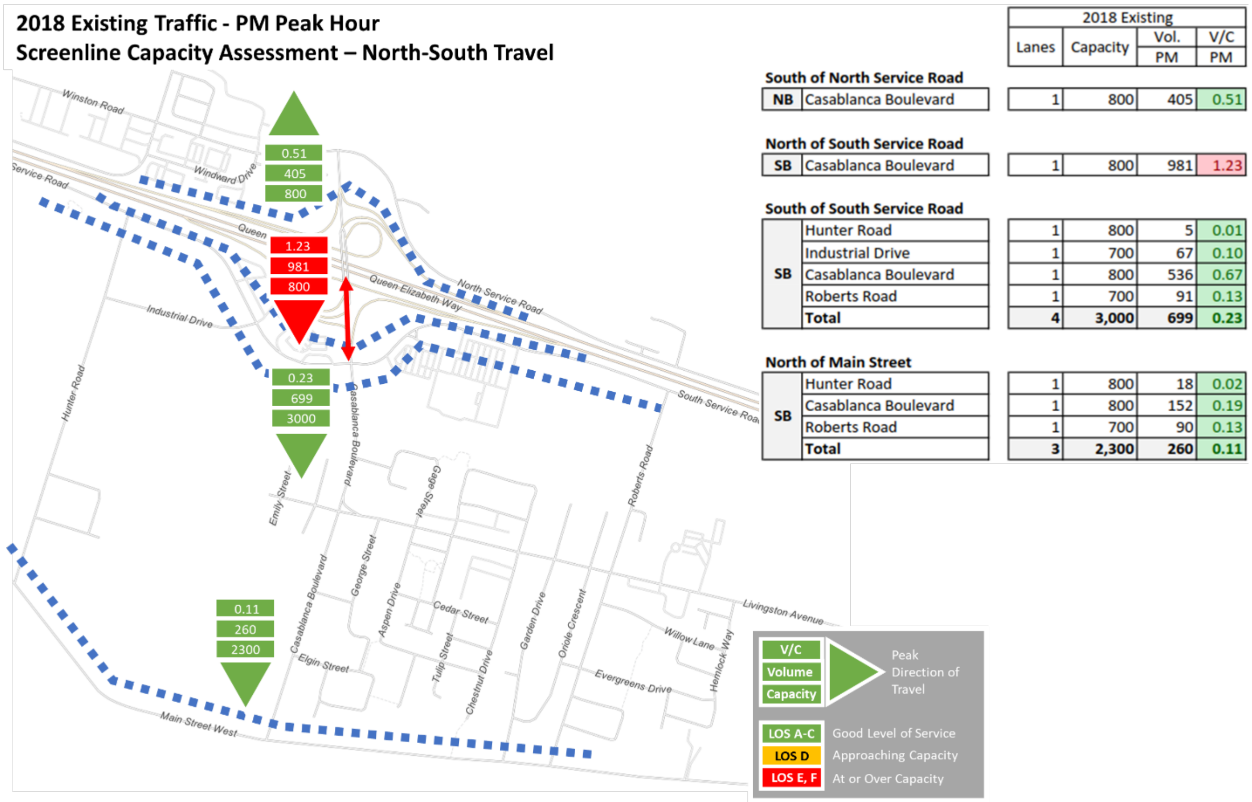
4.0 Existing Conditions Analysis

4.1 Strategic Screenline Analysis

Existing AM and PM peak hour traffic volumes were compared to the link capacities, and streets with volume nearing capacity were identified. In nearly all cases the PM peak hour volume to capacity ratios (v/c ratios) were higher than those in the AM peak hour, so discussion herein is limited to the PM peak hour.

For the purposes of this analysis, a screenline or individual facility was deemed to be at a 'critical' v/c ratio, when it exceeded 0.85, which indicates that the roadway is operating at 85% of its available capacity or above and is providing a level of service (LOS) of E or F to the roadway users. Above this threshold of 0.85, operations along the road tend to degrade and become unstable, which can lead to fairly common (LOS E) or chronic (LOS F) congestion issues.

Figure 6 shows the results of the screenline analysis for north-south travel in the PM peak hour. The colored arrows show particular streets that were nearing or over capacity. **Appendix B** contains the full screenline calculations.



		Lanes	Capacity	2018 Existing Vol. PM	V/C PM
South of North Service Road					
NB	Casablanca Boulevard	1	800	405	0.51
North of South Service Road					
SB	Casablanca Boulevard	1	800	981	1.23
South of South Service Road					
SB	Hunter Road	1	800	5	0.01
	Industrial Drive	1	700	67	0.10
	Casablanca Boulevard	1	800	536	0.67
	Roberts Road	1	700	91	0.13
	Total	4	3,000	699	0.23
North of Main Street					
SB	Hunter Road	1	800	18	0.02
	Casablanca Boulevard	1	800	152	0.19
	Roberts Road	1	700	90	0.13
	Total	3	2,300	260	0.11

Figure 6: 2018 PM Peak Hour Screenline Analysis – North-South Travel

The following points outline the findings for existing north-south travel in the PM peak hour:

- South of North Service Road, north-south capacity on Casablanca Boulevard was sufficient, with v/c ratios of no more than 0.51.
- North of South Service Road, Casablanca Boulevard was over capacity in both directions, with v/c ratios of 1.19 northbound, and 1.23 southbound.
- South of the South Service Road, north-south capacity was sufficient on Hunter Road, Casablanca Road, and Roberts Road. Each road had v/c ratios of 0.67 or less.
- North of Main Street West, all streets had significant unused capacity, with v/c ratios of 0.19 or less.

The screenline analysis of existing conditions showed generally sufficient capacity for north-south travel, with the exception of hot-spots on Casablanca Boulevard between North Service Road and South Service Road. These existing issues can be addressed through the following link-level modifications:

- Casablanca Boulevard widened to a four-lane cross-section from North Service Road to Livingston Avenue;
- Casablanca Boulevard widened to include a two-way left-turn lane from Livingston Avenue to Main Street West.

These modifications were included in the base network considered in the 2021 assessment.

4.2 Operational Assessment

The purpose of the operational assessment is to identify issues with the existing road network that may not be evident during the strategic assessment. **Table 12** summarizes the results of the analysis. Detailed results are available in **Appendix C**.

The Casablanca Boulevard and south ramp terminal and the Casablanca Boulevard and South Service Road intersections show long queues and poor level of service. The widening of Casablanca Boulevard to a four lane cross-section between North Service Road and Livingston Avenue will assist in mitigating issues at the South Service Road but this will not mitigate the issues with the south ramp terminal. It is recommended that the north and south ramp terminals be signalized.

Otherwise, operations at the remaining study area intersections are acceptable and do not show significant delays or queues.

Table 12: Existing Conditions Operational Assessment Results

AM Peak Hour

Intersection Name	Control Type	# Vehicles Entering Intersection	Intersection Average (Weighted by Movement and Volume)				Critical Movement			Overall Intersection LOS
			Average Queue Length (m)	Max Queue Length (m)	Total Delay (sec)	Stopping Delay (sec)	Movement	Max Queue Length (m)	Average Delay (s)	
Casablanca Blvd & North Service Rd	Sig.	670	5.6	39.5	16.5	12.5	NBR	80.5	30.0	B
Casablanca Blvd & North Ramp Terminal	TWSC	1,187	1.9	11.9	2.8	0.2	WBL	50.1	11.6	-
Casablanca Blvd & South Ramp Terminal	TWSC	1,558	0.0	0.4	0.6	0.1	EBL	15.7	13.6	-
Casablanca Blvd & S Service Rd	Sig.	1,948	58.8	125.2	38.0	30.1	NBR	267.2	42.3	D
Casablanca Blvd & Livingston	TWSC	876	6.4	37.6	10.2	6.6	WBR	56.4	18.6	-
Casablanca Blvd & Main St W	TWSC	756	0.5	11.2	2.4	0.3	SBR	38.2	9.8	-
S Service Rd & Industrial Dr	TWSC	757	0.6	12.2	3.2	0.2	SBT	40.1	9.8	-
S Service Rd & Hunter Rd	TWSC	540	0.1	3.1	1.2	0.1	NBL	18.6	7.3	-
Hunter Rd & Industrial Dr	TWSC	259	0.5	9.9	2.5	0.1	WBR	20.2	5.0	-
Hunter Rd & Livingston Ave	TWSC	128	0.0	0.0	0.0	0.0	None	0.0	0.0	-
Hunter Rd & Main St W	TWSC	688	0.1	7.6	0.9	0.1	EBL	19.8	2.3	-
Main St W & Oakes Rd N	TWSC	764	0.4	7.3	2.2	0.1	SBR	30.4	7.6	-

PM Peak Hour

Intersection Name	Control Type	# Vehicles Entering Intersection	Intersection Average (Weighted by Movement and Volume)				Critical Movement			Overall Intersection LOS
			Average Queue Length (m)	Max Queue Length (m)	Total Delay (sec)	Stopping Delay (sec)	Movement	Max Queue Length (m)	Average Delay (s)	
Casablanca Blvd & North Service Rd	Signalized	809	14.7	67.8	22.8	17.6	NBR	124.8	35.3	C
Casablanca Blvd & North Ramp Terminal	TWSC	1,529	1.8	13.9	2.8	0.3	WBL	52.6	11.1	-
Casablanca Blvd & South Ramp Terminal	TWSC	1,850	40.0	67.1	30.2	23.8	EBR	241.7	120.0	-
Casablanca Blvd & S Service Rd	Signalized	2,243	49.5	117.2	52.2	41.7	NBR	220.1	43.2	D
Casablanca Blvd & Livingston	TWSC	831	0.3	21.8	1.6	0.3	SBL	50.4	2.7	-
Casablanca Blvd & Main St W	TWSC	732	0.2	12.3	1.6	0.2	SBR	26.0	7.2	-
S Service Rd & Industrial Dr	TWSC	905	1.7	17.9	5.4	0.7	SBL	41.4	12.5	-
S Service Rd & Hunter Rd	TWSC	537	0.0	0.4	0.3	0.0	NBR	15.4	7.5	-
Hunter Rd & Industrial Dr	TWSC	285	0.2	10.0	2.6	0.2	WBR	19.7	4.4	-
Hunter Rd & Livingston Ave	TWSC	146	0.0	0.0	0.0	0.0	None	0.0	0.0	-
Hunter Rd & Main St W	TWSC	733	0.1	10.9	0.9	0.1	EBL	17.2	0.9	-
Main St W & Oakes Rd N	TWSC	783	0.2	3.2	1.1	0.1	SBR	28.5	7.2	-

**The maximum queue listed in the table may be related to a blocked condition at an adjacent movement*

5.0 2021 Conditions Analysis

A 2021 scenario was developed to represent conditions when GO Train service is extended to and through Grimsby. A base road network was developed based on the findings from the assessment of the existing road network. Future travel demand was forecast to represent the addition of GO Train service to and through Grimsby. The base road network was then considered at strategic and operational levels to identify any capacity or operational issues.

5.1 Base Road Network

The 2021 base road network included the following modifications based on the existing conditions analysis and the desire to improve active transportation connections.

- Casablanca Boulevard widened to a four-lane cross-section from North Service Road to South Service Road;
- Casablanca Boulevard widened to a four-lane cross-section with two-way left-turn lane (TWLTL) from South Service Road to Livingston Avenue. The TWLTL will be a short segment between the southbound left turn lane to Livingston Avenue and the northbound left turn lane to SSR;
- Casablanca Boulevard widened to include a two-way left-turn lane from Livingston Avenue to Main Street West;
- Traffic signals installed at the north and south ramp terminals;
- Traffic signal installed at the intersection of Casablanca Boulevard & Livingston Avenue; and,
- Separate southbound left and right turn lanes at the intersection of Casablanca Boulevard and Main Street West.

The following modifications were included as part of the GO Train station conceptual plan:

- Access to the GO Train station provided at a signalized intersection on South Service Road.

Figure 7 illustrates the 2021 Base road network lane geometry and traffic control. Red arrows or a red border indicate changes compared to the 2018 existing lane geometry and traffic control.

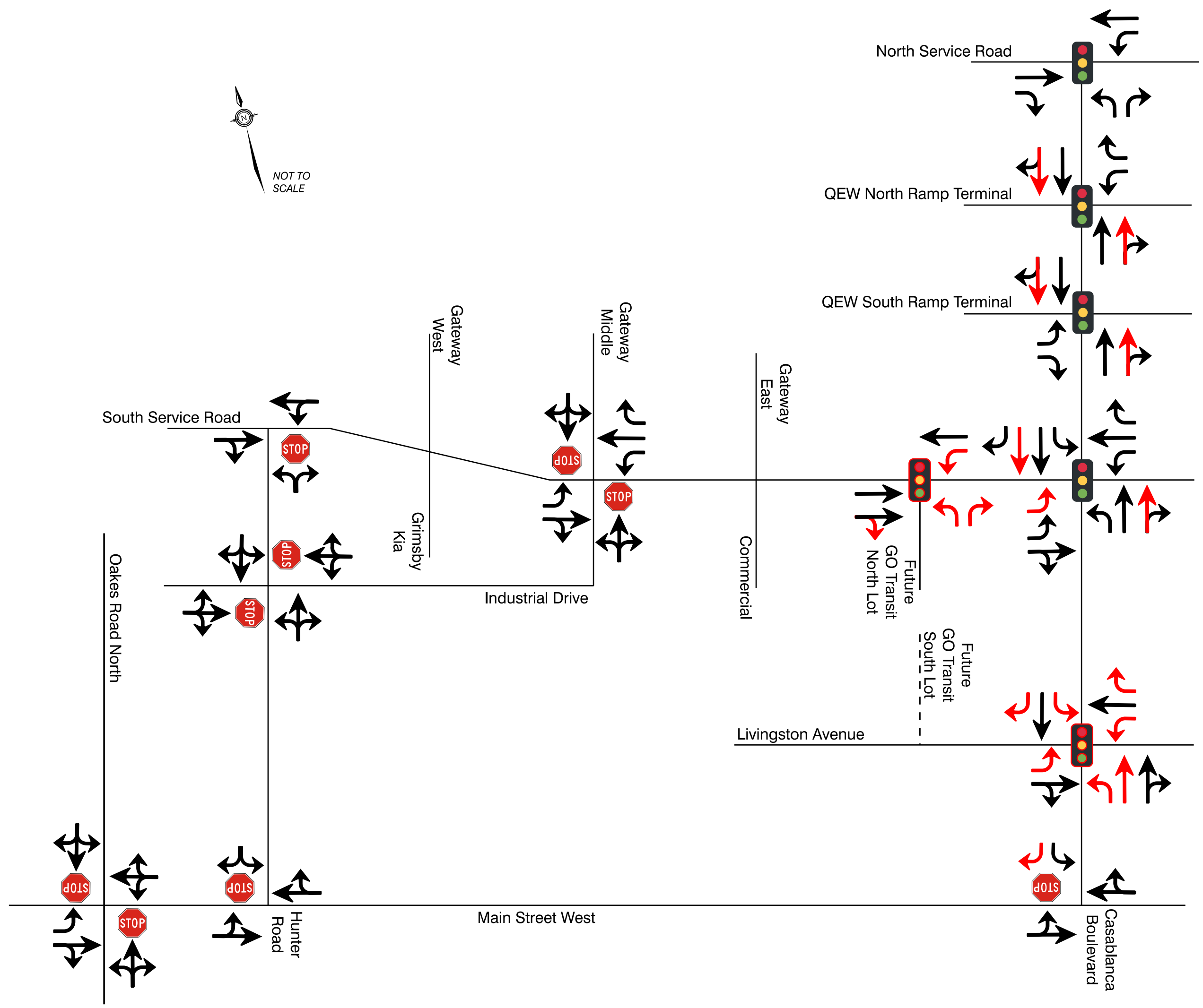


Figure 7: 2021 Base Road Network Lane Geometry and Traffic Control

5.2 Travel Demand Forecasts

For this study, traffic forecasts were taken from the NGHTSS, as described in Section 1.6. The NGHTSS accounted for background growth in Niagara Region's EMME model, land use concepts in the vicinity of the station area, and GO station ridership forecasts. The only change to this work was to update the existing traffic volumes and the future background traffic volumes using traffic counts from May 2018.

5.2.1 Background Growth

Background traffic growth was forecast by accounting for population and employment growth within the study area and regional growth outside the study area.

Within the study area, population and employment growth forecasts were based on land use concepts developed as part of the NGHTSS. Population and employment forecasts for the 2021 horizon were not created as part of the NGHTSS, so the 2041 population and employment forecast were applied, assuming that half of this growth would occur by the 2021 horizon. This is not overly conservative given the large developments on North Service Road which are planned for occupancy by the 2021 horizon.

The population and employment forecasts were then converted to auto trips using auto trip generation factors taken from the Niagara Region's regional travel demand forecasting model.

Regional growth outside of the study area was anticipated to be negligible between 2018 and 2021 and therefore it was ignored. **Table 13** summarizes the 2021 background growth assumptions and the resultant traffic volume growth.

Table 13: 2021 Background Growth

Type of Growth	Growth Assumptions	AM Peak Hour Growth	PM Peak Hour Growth
Within study area	+2,189 population +400 employment	557	611
Regional growth	None	0	0
Total		**557**	**611**

5.2.2 GO Station Traffic

In the NGHTSS, GO Station Traffic forecasts were not created for the 2021 horizon, but forecasts were created for “low” and “high” ridership forecasts for 2041 based on the information in Metrolinx’s “Niagara Region GO Expansion Study, Ridership Forecasts” study. The 2041 “low” ridership forecast was considered reflective of ‘opening day’ ridership for the 2021 horizon.

Table 14 summarizes the 2021 GO Station auto traffic forecasts. All station trips were assigned to the north station access since the south station access will not exist by the 2021 horizon.

Table 14: GO Station Auto Traffic Forecasts for AM and PM Peak Hours(2021)

Station Access	AM Peak Hour Out	AM Peak Hour In	PM Peak Hour Out	PM Peak Hour In
North Station Access (South Service Road)	51	101	143	63
South Station Access (Livingston Avenue)	0	0	0	0
Total	**51**	**101**	**143**	**63**

5.2.3 Traffic Volumes

Figure 8 illustrates the 2021 traffic volume forecasts. The 2021 traffic forecast was developed by adding existing traffic volumes, background growth, and GO station traffic.

5.3 Strategic Screenline Analysis

The strategic assessment was not performed for the 2021 horizon due to the relatively limited increase in vehicle traffic growth in the study area. The focus of the analysis was on the operational assessment.

5.4 Operational Assessment

The microsimulation analysis identified the following discussion topics:

- Casablanca Boulevard & QEW Interchange
- Casablanca Boulevard & South Service Road
- South Service Road and GO North Parking Lot Access

Summary tables are presented in the sections below to discuss specific study area issues. Full Vissim model outputs are provided in **Appendix C**.

5.4.1 QEW Interchange

Table 15 summarizes the results of the analysis. During the PM peak hour, the 2021 "Do Nothing" analysis shows that the QEW ramp terminals are not able to process the demand; the eastbound and westbound off-ramps experience long delays (2-4 minutes) and queues (250-500 metres).

The analysis confirms the need to improve the QEW ramp terminals by the 2021 horizon. The 2021 Base road network analysis shows that traffic signals at the ramp terminals will increase capacity and reduce delays and queues.

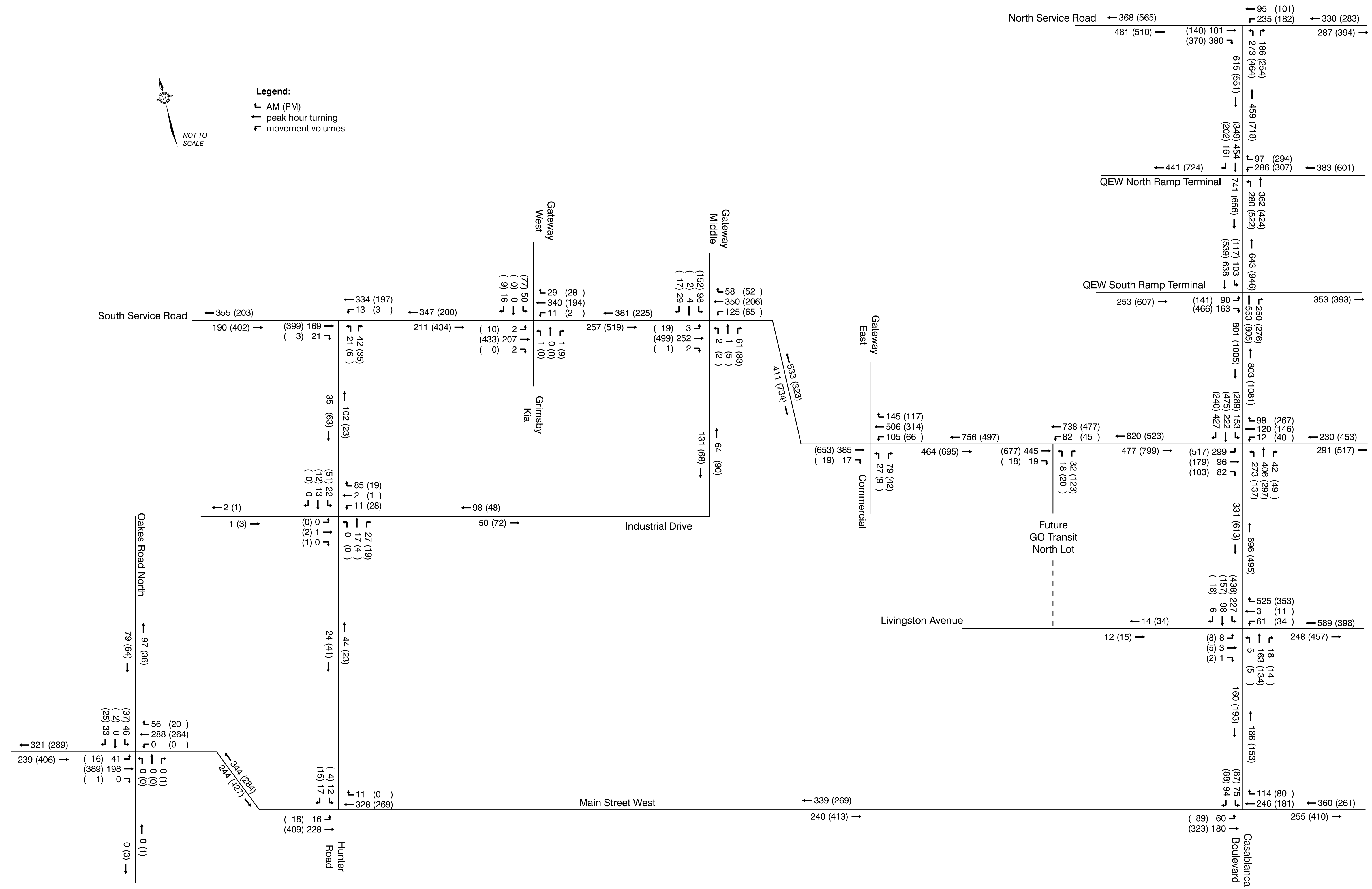


Figure 8: 2021 Traffic Volume Forecast

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Table 15: 2021 QEW Interchange Analysis Results

Alt	Control Type	# Veh. Entering Int.	Int. Avg. (Weighted by Mvmt. and Vol.) Avg. Queue (m)	Max Queue (m)	Total Delay (sec)	Stopping Delay (sec)	Critical Movement Mvmt	Max Queue (m)	Avg. Delay (s)	Overall Int. LOS
AM Peak Hour										
Casablanca Blvd & North Ramp Terminal										
2021 Do Nothing	TWSC	1577	2	14	4	1	WBL	59	17	-
2021 Base	Sig.	1614	4	29	10	7	WBL	68	22	A
Casablanca Blvd & South Ramp Terminal										
2021 Do Nothing	TWSC	1720	0	2	1	0	EBL	32	18	-
2021 Base	Sig.	1778	2	33	5	3	SBT	44	3	A
PM Peak Hour										
Casablanca Blvd & North Ramp Terminal										
2021 Do Nothing	TWSC	1809	57	131	48	37	WBR	505	269	-
2021 Base	Sig.	2078	3	33	7	5	WBL	75	23	A
Casablanca Blvd & South Ramp Terminal										
2021 Do Nothing	TWSC	2028	42	67	35	28	EBR	242	145	-
2021 Base	Sig.	2330	6	49	9	4	EBR	84	19	A

**The maximum queue listed in the table may be related to a blocked condition at an adjacent movement*

5.4.2 Casablanca Boulevard & South Service Road

Table 16 summarizes the results of the analysis. The 2021 "Do Nothing" analysis demonstrates that the intersection is also not able to process the demand, resulting in long delays, long queues, and a poor level of service for several turning movements.

Traffic to and from the GO Station will put pressure on the eastbound approach and therefore it is recommended to increase the turning capacity. The 2021 Base road network geometry includes dual eastbound left turn lanes and a shared eastbound through/right turn lane. These improvements are sufficient for the 2021 horizon and greatly improve intersection operations. With these improvements the intersection is anticipated to operate acceptably.

Table 16: 2021 Casablanca Boulevard & South Service Road Analysis Results

Period	Alt	Control Type	# Veh. Entering Int.	Int. Avg. (Weighted by Mvmt. and Vol.) Avg. Queue (m)	Max Queue (m)	Total Delay (sec)	Stopping Delay (sec)	Critical Movement Mvmt	Max Queue (m)	Avg. Delay (s)	Overall Int. LOS
AM	2021 Do Nothing	Sig.	2062	61	134	38	30	NBR	267	45	D
AM	2021 Base	Sig.	2176	12	69	20	15	NBT	94	24	C
PM	2021 Do Nothing	Sig.	2373	67	135	59	48	NBR	267	72	E
PM	2021 Base	Sig.	2694	17	80	24	18	EBR	125	14	C

**The maximum queue listed in the table may be related to a blocked condition at an adjacent movement*

5.4.3 South Service Road & GO North Parking Lot

Table 17 shows the results of the analysis. Both alternatives have the same geometry and traffic control, which includes a traffic signal and a westbound left turn lane into the north parking lot.

The "Do Nothing" alternative shows better performance than the Base road network alternative because traffic is being metered in the "Do Nothing" scenario by the QEW ramp terminals and the Casablanca Boulevard & South Service Road intersection. The Base scenario implemented traffic signals at the QEW ramp terminals, which alleviated much of the congestion and queuing there and allowed more vehicles to progress through the study area than in the Do Nothing scenario.

Queues from the westbound left turn lane into the GO station average less than 10 metres in both peak hours, though the maximum queue was shown to be in the range of 60 to 70 metres. Given the proximity to the Casablanca Boulevard intersection and the need for abutting left turn lanes for the westbound left turn at the station entrance and eastbound left turn lanes for the Casablanca Boulevard intersection, the space for westbound left turn queuing at this location will be approximately 40 metres. This indicates that overall performance of westbound traffic will overall be good, however, queues may occasionally exceed the storage length for the westbound left turn. Model outputs indicate that overall the queues will be well controlled and will not interfere with operations on Casablanca Boulevard or the QEW interchange. Otherwise, the intersection performs well and no additional mitigation is required.

Table 17: 2021 South service Road & GO North Parking Lot Analysis Results

Period	Alt	Control Type	# Veh. Entering Int.	Int. Avg. (Weighted by Mvmt. and Vol.) Avg. Queue (m)	Max Queue (m)	Total Delay (sec)	Stopping Delay (sec)	Critical Movement Mvmt	Max Queue (m)	Avg. Delay (s)	Overall Int. LOS
AM	2021 Do Nothing	Sig.	1279	1	37	2	1	WBL	70	8	A
AM	2021 Base	Sig.	1334	8	95	9	5	WBT	118	8	A
PM	2021 Do Nothing	Sig.	1325	1	23	2	1	WBL	58	12	A
PM	2021 Base	Sig.	1422	8	92	10	5	EBT	109	11	A

**The maximum queue listed in the table may be related to a blocked condition at an adjacent movement*

6.0 2041 Conditions Analysis

A 2041 scenario was developed to represent conditions with future population and employment growth in Grimsby, including continued GO Train service to and through Grimsby, with additional station development between 2021 and 2041.

Future travel demand was forecast to represent increased GO Train ridership as compared to 2021, as well as population and employment growth. This 2041 forecast demand was then compared to link capacity in the existing network. The road network analyses were then analyzed at an operational level and a preferred alternative was identified.

6.1 Base Road Network

The Base road network from the 2021 analysis, illustrated in Figure 7, was carried forward for the 2041 analysis.

6.2 Travel Demand Forecasts

As described in Section 5.2, for this study, traffic growth rates were taken from the NGHTSS with updates for data collected in May of 2018.

6.2.1 Background Growth

As with the 2021 horizon, background traffic growth was forecasted by accounting for population and employment growth within the study area and regional growth outside the study area.

Within the study area, population and employment growth forecasts were based on land use concepts developed for 2041 as part of the NGHTSS. The population and employment forecasts were then converted to auto trips using auto trip generation factors. The auto trip generation factors were taken from Niagara Region's regional travel demand forecasting model.

To account for regional growth in areas surrounding the study area, Niagara Region's regional travel demand forecasting model was reviewed to determine an appropriate compound annual growth rate (CAGR) to apply to auto traffic travelling through the study area. The CAGR was applied to traffic on roadways crossing the study area boundary, such as North Service Road, the South Service Road, Main Street West, etc.

Table 18 summarizes the 2041 background growth assumptions and the resultant traffic volume growth.

Table 18: 2041 Background Traffic Volume Growth

Type of Growth	Growth Assumptions	AM Peak Hour Growth	PM Peak Hour Growth
Within study area	+4,750 population +1,870 employment	+899	+1,393
Regional growth	2.4% CAGR (AM Peak Hour) 1.5% CAGR (PM Peak Hour)	+1,448	+1,004
Total		**+2,347**	**+2,397**

6.2.2 GO Station Traffic

In the NGHTSS, "base" and "high" ridership forecasts were developed for the 2041 horizon. The NGHTSS used the high ridership forecast since it was "beneficial as a sensitivity test to better assess the risks associated with unclear future influences with the potential increase to GO ridership". To be consistent with the NGHTSS, we also used the high ridership forecast for the 2041 horizon.

By 2041 is was assumed that a GO station south parking lot would also be in operation along with the north parking lot. The north station access was assumed to be the primary access. For the AM peak hour, the north parking lot was assumed to be 85% filled before the south parking lot began to be used. For the PM peak hour, the north parking lot was assumed to empty before the south parking lot.

Table 19 summarizes the assumed GO station auto traffic forecasts for the 2041 horizon.

Table 19: GO Station Auto Traffic Forecasts (2041)

Station Access	AM Peak Hour Out	AM Peak Hour In	PM Peak Hour Out	PM Peak Hour In
North Station Access (South Service Road)	130	306	345	169
South Station Access (Livingston Avenue)	6	99	59	13
Total	**136**	**405**	**404**	**182**

6.2.3 Traffic Volumes

Figure 9 illustrates the 2041 forecasted traffic volumes for study area intersections assuming no new roads are constructed or extended.

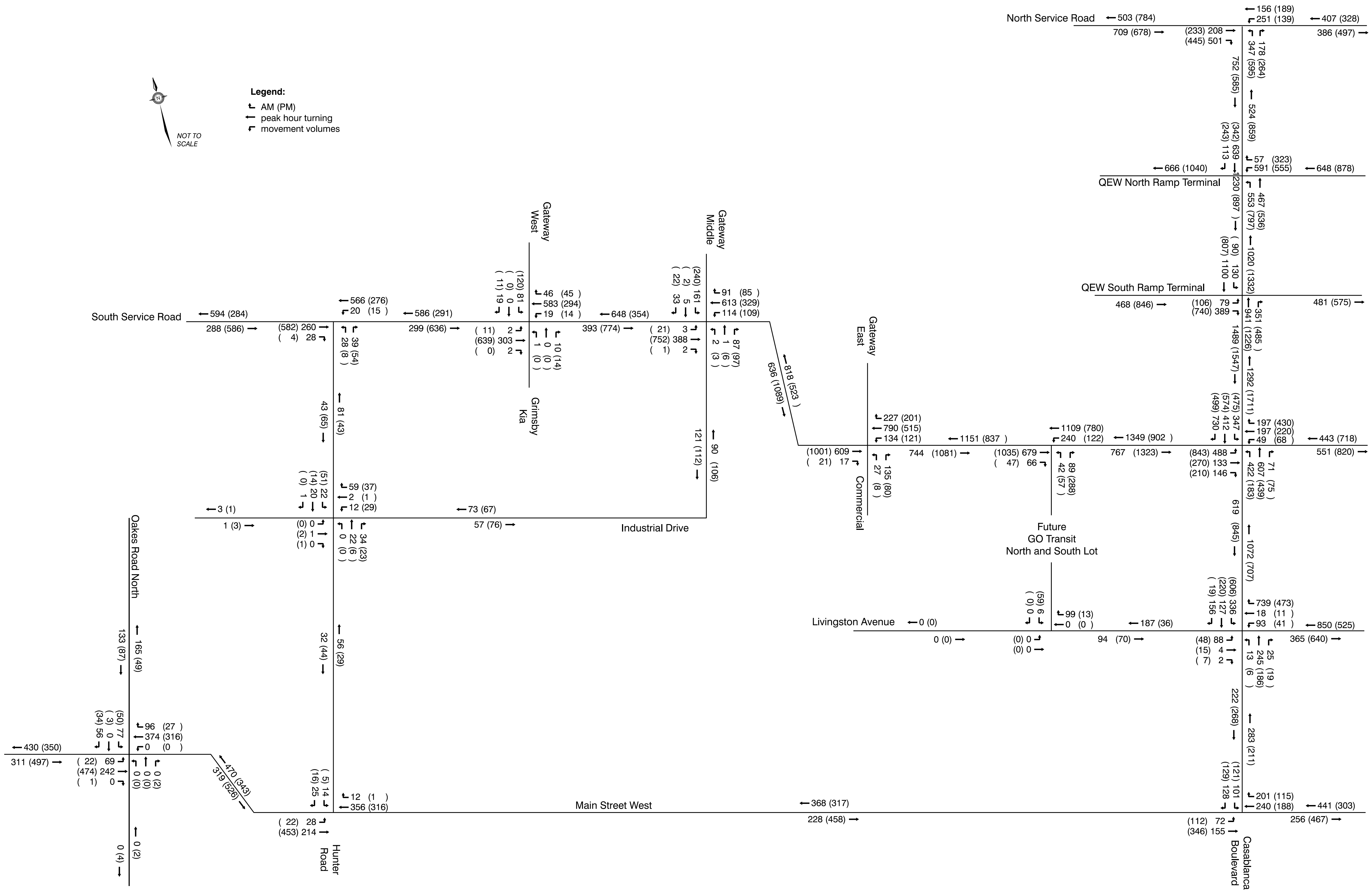

Figure 9: 2041 Traffic Volume Forecasts

6.2.4 Pedestrian and Cycling Volumes

Figure 10 and **Figure 11**, respectively, illustrate the 2041 pedestrian and cycling volume forecasts. These forecasts were developed using the 2041 auto traffic volume forecasts to estimate person volumes on roadways. The person volumes on the roadways were then converted to pedestrian and cycling volumes using the station area mode shares assumed in the NGHTSS for the High Ridership scenario (74% Drive and Park, 15% Kiss and Ride, 5% Local Transit, *5% Walk, 1% Bicycle*). The pedestrian and cycling volumes were reviewed and rounded to the nearest five trips. Manual adjustments were also made in some cases since pedestrians and cyclists will not use the QEW.

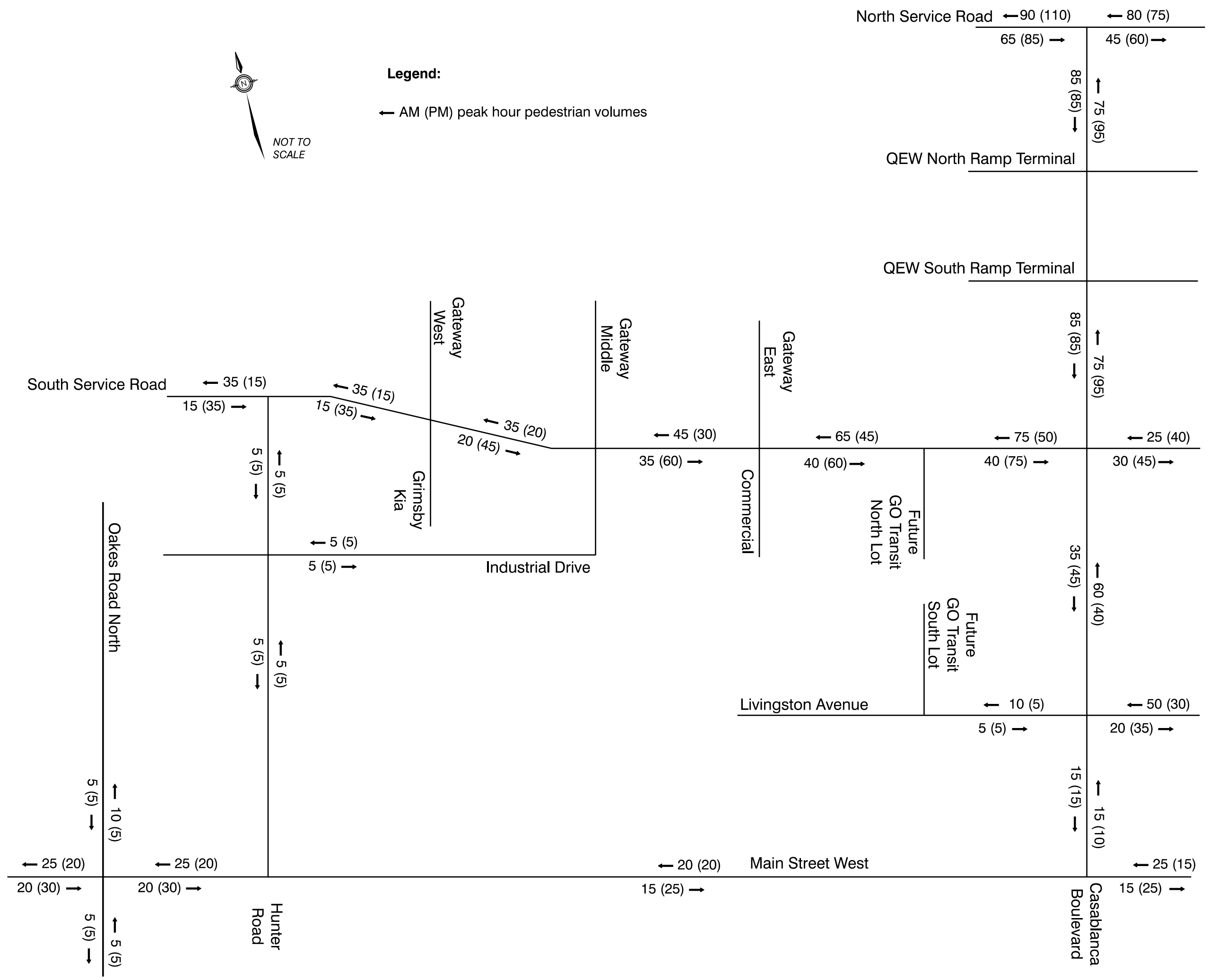

Figure 10: 2041 Pedestrian Volume Forecasts

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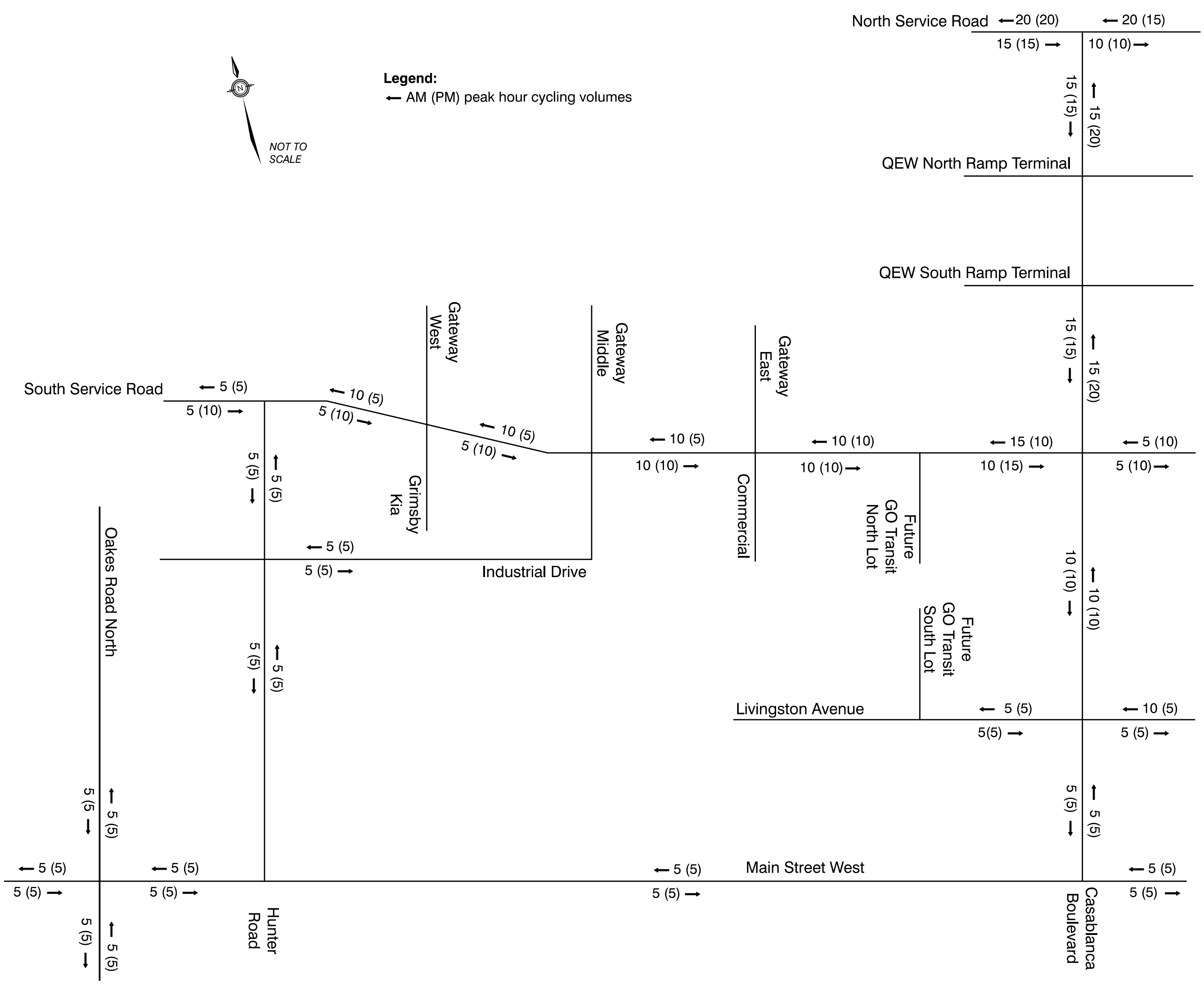


Figure 11: 2041 Cycling Volume Forecasts

6.3 Strategic Screenline Analysis

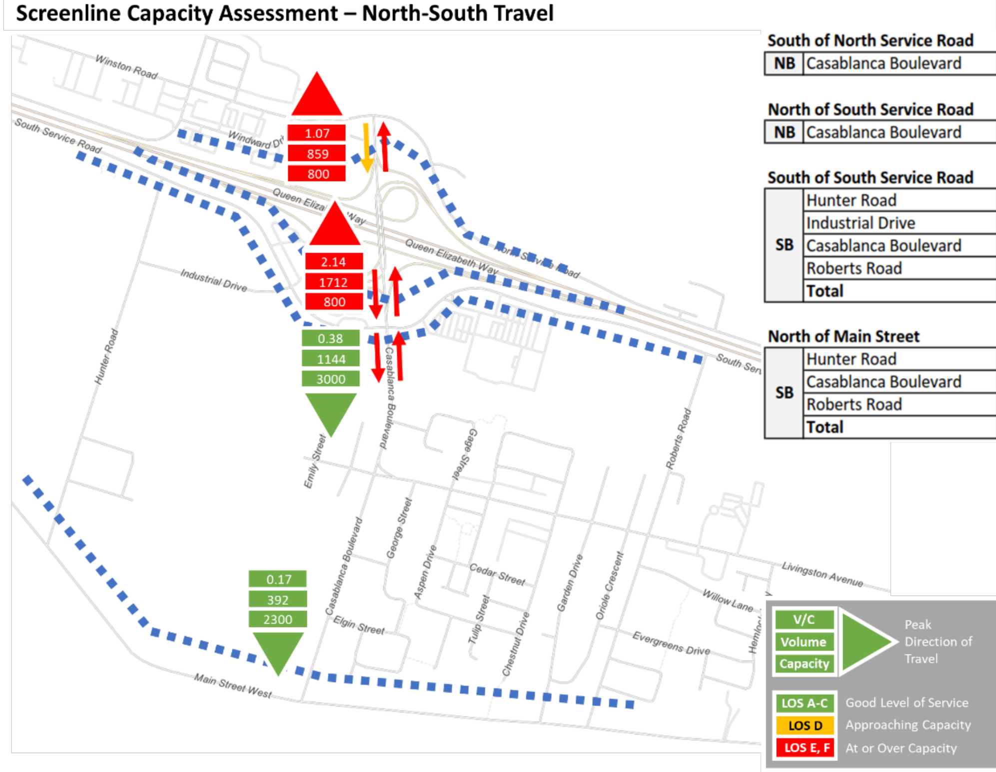
The 2041 strategic analysis considered volume to capacity (v/c) ratios at the study area "screenlines", as in the 2018 strategic analysis.

Traffic volumes at the screenlines were taken from the forecast 2041 peak hour volumes. Link capacities were considered for a "Do Nothing" scenario with no changes to the existing road network.

The following outlines the results of the 2041 Strategic Analysis with the existing road network. Note that all streets encountered their highest v/c ratios in the PM peak hour, so the key findings discussed below are limited to the PM peak hour. **Appendix B** contains the full screenline (AM and PM periods, both peak and off-peak directions) calculations.

Figure 12 shows the results of the analysis for the screenlines crossing the north-south streets.

2041 "Do Nothing" - PM Peak Hour
Screenline Capacity Assessment – North-South Travel



		Lanes	Capacity	Vol. PM (2041 Horizon)	V/C PM (2041 Horizon)
South of North Service Road					
NB	Casablanca Boulevard	1	800	859	1.07
North of South Service Road					
NB	Casablanca Boulevard	1	800	1,712	2.14
South of South Service Road					
SB	Hunter Road	1	800	19	0.02
SB	Industrial Drive	1	700	113	0.16
SB	Casablanca Boulevard	1	800	890	1.11
SB	Roberts Road	1	700	122	0.17
SB	**Total**	**4**	**3,000**	**1,144**	**0.38**
North of Main Street					
SB	Hunter Road	1	800	21	0.03
SB	Casablanca Boulevard	1	800	250	0.31
SB	Roberts Road	1	700	121	0.17
SB	**Total**	**3**	**2,300**	**392**	**0.17**

Figure 12: 2041 Screenline Analysis – North-South Travel

The findings from the north-south capacity analysis are as follows:

- North of North Service Road, screenline volume (i.e. Casablanca Boulevard volumes) is nearing capacity southbound, and is over capacity northbound.
- North of South Service Road, screenline volume (i.e. Casablanca Boulevard volumes) exceeds the capacity of the roadway, with an overall volume to capacity ratio of 2.14 (volume is forecast to be two times its existing capacity).
- South of South Service Road, overall screenline volumes are under capacity, with an overall v/c ratio of 0.38. However, the intent of the strategic analysis is to consider the corridor demands and associated capacity that serves demands in the corridor. Of the links on the screenline, Casablanca Boulevard is the only arterial link that connects across the full length of the corridor and that provide access to the QEW. Therefore, significantly more volume is drawn to this road compared to the other discontinuous north south links (Hunter Road or Roberts Road). The v/c ratio for Casablanca Boulevard only is 1.28 for the northbound direction during the AM peak hour and 1.11 for the southbound direction during the PM peak hour. This means that for Casablanca demand exceeded capacity by 11-28%. For the off-peak direction on Casablanca Boulevard, volumes are also significant. The v/c ratio is identified as 0.87 which while it is below capacity, is considered congested and road users will experience delay during peak periods.
- North of Main Street West, north/south capacity carrying capacity for both the screenline and Casablanca Boulevard is considered sufficient (within capacity). However, it is noted that volumes are expected to increase significantly on Casablanca Boulevard. As it increases, conflicts with turning movements accessing private driveways on the east side of the road and midblock movements at collector roads will increase. This has the potential to result in safety issues. To mitigate these conflicts, dedicated turn lanes / center turn lane will be considered in alternatives moving forward.

The strategic analysis reconfirmed the need to widen Casablanca Boulevard to four lanes between North Service Road and Livingston Avenue, and potentially provide dedicated turning lanes and intersections and mid-block locations. This will be carried forward from the 2021 analysis.

6.4 Road Network Alternatives

The alternatives described below were developed to address issues identified during the strategic assessment and to confirm that the improvements implemented for the 2021 analysis are still required and still perform adequately.

The lack of north-south capacity is not discussed here because it has been addressed by the widening of Casablanca Avenue which is assumed to take place prior to the 2021 horizon.

The 2021 analysis recommended installing traffic control signals at the north and south ramp terminals. Although this improves traffic operations, it was considered an interim measure since it does not improve active transportation connections at the ramp terminals. The following alternatives were developed to address capacity issues and improve traffic operations at the north and south ramp terminals:

- **1A:** Maintain the Partial Cloverleaf (Parclo) interchange with the two-way stop-control for the off-ramps. The purpose of this alternative is to confirm the need for traffic signals for the 2041 horizon.
- **1B:** Improve the Parclo interchange by realigning the ramps to form a 90-degree angle with Casablanca Boulevard and install traffic control signals at the north and south ramp terminals.
- **1C:** Replace the Partial Clover interchange with a diverging diamond interchange (DDI)
- **1D:** Replace the Parclo interchange with a straight diamond interchange

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Figure 13 illustrates the lane configuration and traffic control for the alternatives 1A, 1B, 1C, and 1D.

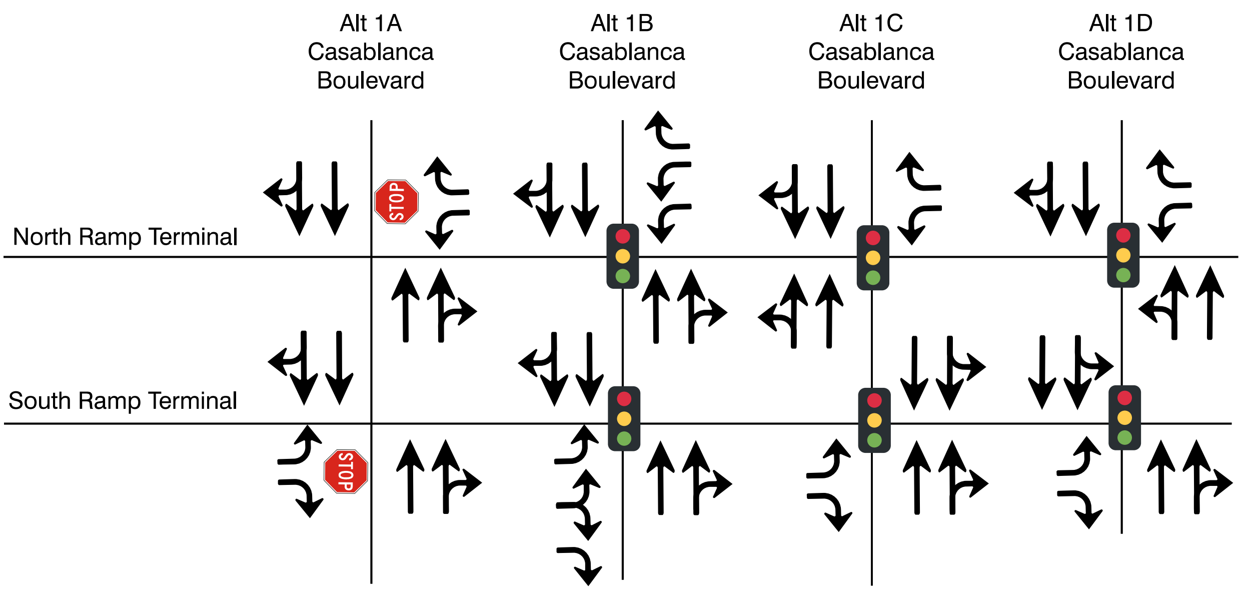

Figure 13: Alternatives 1A, 1B, 1C, 1D Lane Configuration and Traffic Control

6.5 Operational Assessment

The microsimulation analysis identified the following discussion topics:

- Casablanca Boulevard and North Service Road
- Casablanca Boulevard and QEW Interchange
- Casablanca Boulevard and South Service Road
- South Service Road and GO North Parking Lot Access
- Active Transportation

The results of the operational assessment are summarized and discussed below. **Appendix C** contains the full Vissim results.

6.5.1 South Service Road Analysis

During the operational assessment it became evident that traffic in the model was being metered by poor operations on South Service Road between Industrial Drive and Casablanca Boulevard. To properly assess the Alternatives, it was decided that all Alternatives would include the widening of South Service Road to a four-lane cross-section between Industrial Drive and Casablanca Boulevard.

6.5.2 Casablanca Boulevard & North Service Road Analysis

Table 20 summarizes the results of the analysis. The 2041 base alternative includes the widening of Casablanca Boulevard to a four lane cross-section. The intersection was shown to operate well following the widening of Casablanca Boulevard and under all interchange scenarios.

Table 20: 2041 Casablanca Boulevard & North Service Road Analysis Results

Period	Alt	Control Type	# Veh. Entering Int.	Int. Avg. (Weighted by Mvmt. and Vol.) Avg. Queue (m)	Max Queue (m)	Total Delay (sec)	Stopping Delay (sec)	Critical Movement Mvmt	Max Queue (m)	Avg. Delay (s)	Overall Int. LOS
AM	2041 Do Nothing	Sig.	1446	32	119	46	34	WBT	202	69	D
AM	2041 Base	Sig.	1563	7	57	12	7	NBR	95	11	B
AM	2041 Alt 1A	Sig.	1595	8	62	13	7	NBR	112	8	B
AM	2041 Alt 1B	Sig.	1543	10	89	12	7	NBR	105	10	B
AM	2041 Alt 1C	Sig.	1607	9	64	14	8	NBR	99	13	B
AM	2041 Alt 1D	Sig.	1598	8	66	13	7	NBR	122	9	B
PM	2041 Do Nothing	Sig.	1554	30	73	29	22	NBR	126	57	C
PM	2041 Base	Sig.	1790	18	80	20	13	NBR	115	17	C
PM	2041 Alt 1A	Sig.	1757	17	85	18	12	NBR	130	13	B
PM	2041 Alt 1B	Sig.	1814	17	81	19	12	NBR	122	17	B
PM	2041 Alt 1C	Sig.	1807	19	93	19	12	NBR	143	14	B
PM	2041 Alt 1D	Sig.	1768	20	103	18	12	NBR	163	10	B

**The maximum queue listed in the table may be related to a blocked condition at an adjacent movement*

6.5.3 QEW Interchange Analysis

Table 21 summarizes the results of the analysis. Neither the existing road network, "Do Nothing", nor Alternative 1A, two-way stop-control on the ramp terminals, have the capacity required for the forecasted traffic volumes. This confirms the need to signalize the ramp terminals.

Alternative 1B, the signalized Parclo interchange, performs the best of the alternatives, but it maintains the high-speed, low-angle movements which can be intimidating for active transportation.

Alternative 1C, the diverging diamond interchange, significantly improves the performance of the intersections and offers benefits to people walking and cycling, as high-speed, low-angle ramp movements are replaced by lower-speed, high-angle movements.

Alternative 1D, the straight diamond interchange, is not viable since the QEW underpass structure will not be replaced and the existing underpass structure is not wide enough to accommodate northbound and southbound left turn lanes (S-W and N-E movements, respectively), and therefore these left turns would occur from a shared through lane. Without a dedicated left turn lane and a left turn phase, there is not sufficient capacity to accommodate left turning vehicles. Queues from vehicles attempting to turn left were shown to negatively affect adjacent intersections.

The recommended alternative from a transportation perspective is Alternative 1C, the diverging diamond interchange.

Table 21: 2041 QEW Interchange Analysis Results

Peak Hour	Alt	Control Type	# Veh. Entering Int.	Int. Avg. (Weighted by Mvmt. and Vol.) Avg. Queue (m)	Max Queue (m)	Total Delay (sec)	Stopping Delay (sec)	Critical Movement Mvmt	Max Queue (m)	Avg. Delay (s)	Overall Int. LOS
AM Peak Hour	Casablanca Blvd & North Ramp Terminal										
	2041 Do Nothing	TWSC	1657	55	100	48	33	WBL	505	377	-
	2041 Base	Sig.	2269	11	67	13	10	WBL	149	26	B
	2041 Alt 1A	TWSC	2197	75	106	20	3	WBL	505	97	-
	2041 Alt 1B	Sig.	2238	9	61	12	9	WBL	89	22	B
	2041 Alt 1C	Sig.	2363	5	78	8	3	WBL	107	9	A
	2041 Alt 1D	Sig.	2343	49	148	39	31	NBT	179	30	D
	Casablanca Blvd & South Ramp Terminal										
	2041 Do Nothing	TWSC	2206	20	49	19	11	SBL	201	0	-
	2041 Base	Sig.	2812	6	57	8	4	EBR	91	33	A
	2041 Alt 1A	TWSC	2772	3	15	5	1	EBR	102	28	-
	2041 Alt 1B	Sig.	2756	6	59	5	3	EBR	91	13	A
	2041 Alt 1C	Sig.	2921	19	125	18	11	NBT	181	22	B
	2041 Alt 1D	Sig.	2913	23	152	20	12	NBR	176	15	B
PM Peak Hour	Casablanca Blvd & North Ramp Terminal										
	2041 Do Nothing	TWSC	1893	84	138	57	42	WBL	505	241	-
	2041 Base	Sig.	2653	6	59	9	6	WBL	145	25	A
	2041 Alt 1A	TWSC	2530	60	107	17	2	WBL	505	89	-
	2041 Alt 1B	Sig.	2668	4	54	8	6	NBL	113	3	A
	2041 Alt 1C	Sig.	2655	3	76	6	2	WBL	110	7	A
	2041 Alt 1D	Sig.	2535	54	141	35	25	NBT	181	36	D
	Casablanca Blvd & South Ramp Terminal										
	2041 Do Nothing	TWSC	2276	50	59	36	27	EBR	242	161	-
	2041 Base	Sig.	3025	76	146	30	15	EBR	505	135	C
	2041 Alt 1A	TWSC	2959	43	46	16	1	EBR	252	89	-
	2041 Alt 1B	Sig.	3190	26	105	25	15	EBR	246	77	C
	2041 Alt 1C	Sig.	3183	57	218	35	23	EBR	395	63	C
	2041 Alt 1D	Sig.	3010	105	246	51	34	EBR	441	78	D

**The maximum queue listed in the table may be related to a blocked condition at an adjacent movement*

6.5.4 Casablanca Boulevard & South Service Road Analysis

Table 22 summarizes the results of the analysis. The "2041 Base" geometry is the same as the "2021 Recommended" geometry, but with 2041 traffic demands. The analysis shows that there will be queues and delays without additional improvement.

All 2041 Alternatives include a dedicated eastbound right turn lane (instead of a shared through/right) and the widening of the South Service Road to two lanes in both directions between Casablanca Boulevard and Industrial Drive. The additional westbound through lane on South Service Road allows the southbound right turn movement to operate more freely than if it conflicted with the westbound through and northbound left turn movements. The additional eastbound through lane on South Service Road improves queuing operations for the eastbound approach which improves overall intersection performance.

Aside from the widening of South Service Road, no additional improvement is required. The 2041 Recommended geometry is the widening of South Service Road between Casablanca Boulevard and Industrial Drive.

Note that Alternative 1A appears to operate better than other alternatives because traffic is being metered by the stop control on the QEW ramp terminals.

Table 22: 2041 Casablanca Boulevard & South Service Road Analysis Results

	Alt	Control Type	# Veh. Entering Int.	Int. Avg. (Weighted by Mvmt. and Vol.)				Critical Movement			Overall Int. LOS
				Avg. Queue (m)	Max Queue (m)	Total Delay (sec)	Stopping Delay (sec)	Mvmt	Max Queue (m)	Avg. Delay (s)	
AM Peak Hour	2041 Do Nothing	Sig.	2724	104	144	66	48	NBR	267	50	E
	2041 Base	Sig.	3369	67	153	55	43	NBT	267	82	E
	2041 Alt 1A	Sig.	3498	22	104	27	21	NBT	147	41	C
	2041 Alt 1B	Sig.	3385	28	113	28	22	NBT	147	43	C
	2041 Alt 1C	Sig.	3631	24	106	29	22	EBR	148	6	C
	2041 Alt 1D	Sig.	3623	25	108	30	23	EBT	139	25	C
PM Peak Hour	2041 Do Nothing	Sig.	2724	104	144	66	48	NBR	267	50	E
	2041 Base	Sig.	3369	67	153	55	43	NBT	267	82	E
	2041 Alt 1A	Sig.	3498	22	104	27	21	NBT	147	41	C
	2041 Alt 1B	Sig.	3385	28	113	28	22	NBT	147	43	C
	2041 Alt 1C	Sig.	3631	24	106	29	22	EBR	148	6	C
	2041 Alt 1D	Sig.	3623	25	108	30	23	EBT	139	25	C

**The maximum queue listed in the table may be related to a blocked condition at an adjacent movement*

6.5.5 Casablanca Boulevard / Main Street Intersection Analysis

Table 20 summarizes the results at the intersection of Casablanca Boulevard with Main Street.

Table 23 – Casablanca and Main Street West Analysis Results

Peak	Alt	Control Type	# Veh. Entering Int.	Int. Avg. (Weighted by Mvmt. and Vol.)				Critical Movement			Overall Int. LOS
				Avg. Queue (m)	Max Queue (m)	Total Delay (sec)	Stopping Delay (sec)	Mvmt	Max Queue (m)	Avg. Delay (s)	
AM Peak Hour	Casablanca Blvd & Main St W										
	2018 Existing	TWSC	756	0	11	2	0	SBR	38	10	-
	2021 Do Nothing	TWSC	711	1	12	3	0	SBR	41	9	-
	2021 Base	TWSC	707	0	9	2	0	SBR	27	7	-
	2041 Do Nothing	TWSC	990	1	20	4	1	SBR	53	14	-
	2041 Base	TWSC	997	1	17	3	0	SBR	33	9	-
	2041 Alt 1A	TWSC	958	0	13	3	0	SBR	29	8	-
	2041 Alt 1B	TWSC	930	0	12	3	0	EBL	35	8	-
	2041 Alt 1C	TWSC	958	0	18	3	1	EBL	37	8	-
	2041 Alt 1D	TWSC	958	0	15	3	1	EBL	39	8	-
PM Peak Hour	Casablanca Blvd & Main St W										
	2018 Existing	TWSC	732	0	12	2	0	SBR	26	7	-
	2021 Do Nothing	TWSC	751	0	15	2	0	SBR	30	8	-
	2021 Base	TWSC	756	0	14	2	0	EBL	29	2	-
	2041 Do Nothing	TWSC	944	1	30	3	1	EBL	54	4	-
	2041 Base	TWSC	1021	1	27	3	1	EBL	50	4	-
	2041 Alt 1A	TWSC	943	1	25	3	1	EBL	49	4	-
	2041 Alt 1B	TWSC	948	1	25	3	1	EBL	50	4	-
	2041 Alt 1C	TWSC	948	1	25	3	1	EBL	49	4	-
	2041 Alt 1D	TWSC	944	1	25	3	1	EBL	49	4	-

Analysis of the intersection of Casablanca Boulevard with Main Street shows that the intersection works well in all tested alternatives. Delays and queuing are well controlled in both peak hours.

However, there is potential for travel patterns to shift at this location in the future dependent on the operation of adjacent intersections, primarily that of Casablanca Boulevard and Livingston Avenue. If future operations here change, there could be a desire for vehicles making southbound left turns at the Casablanca Boulevard / Livingston Avenue intersection to move to the intersection of Casablanca Boulevard / Main Street West, as they serve complementary travel markets looking to travel east.

Additionally, increasing pedestrian and cyclist volumes in the area due to improved active transportation infrastructure will increase the number of pedestrians and cyclists at this intersection that may benefit from improved controls at this location.

There is no indication of the need for signalisation in the current analysis, but this location should be monitored in future years to assess whether signalisation is warranted for operational and/or safety purposes.

6.5.6 South Service Road & GO North Parking Lot Access Analysis

Table 24 summarizes the results of the analysis. The GO North Parking Lot Access on the South Service Road is assumed to be signalized with a westbound left turn lane into the site with approximately 50 metres of storage. The westbound left turn lane will be back-to-back with the dual eastbound left turn lanes at Casablanca Boulevard and South Service Road, which will also have approximately 50 metres of storage for the median lane.

The GO North Parking Lot access is anticipated to operate adequately under this configuration. Westbound queues will occasionally extend back to Casablanca Boulevard and eastbound queues will occasionally extend back to Industrial Drive. This queuing has the potential to result in short weaving distance for GO station bound traffic turning right from southbound Casablanca Boulevard. However, these extended queues will be short in duration and they will not significantly impact the adjacent Industrial Drive intersection or the QEW interchange. The road network is expected to operate acceptably with the recommended improvements.

The eastbound queues are caused by the relatively short eastbound left turn lane at the Casablanca Boulevard intersection. Extending the eastbound left turn lane at Casablanca Boulevard would require shortening the westbound left turn lane at the GO North Parking lot access, which was assumed to be 40 metres. However, shortening the westbound left turn lane is not recommended so it is instead recommended to use the bus loop opposite the GO North Parking lot access as a right turn loop. This would address the westbound queuing and weaving distance. With this change, the eastbound left turn lane at Casablanca Boulevard could nearly be doubled in length, from 50 metres to 95 metres, which is shorter than the calculated 95th percentile queue (105 metres) and the max queue (130 metres), but it would still operate acceptably and improve traffic operations.

Table 24: 2041 Casablanca Boulevard & GO North Parking Lot Analysis Results

	Alt	Control Type	# Veh. Entering Int.	Int. Avg. (Weighted by Mvmt. and Vol.)				Critical Movement			Overall Int. LOS
				Avg. Queue (m)	Max Queue (m)	Total Delay (sec)	Stopping Delay (sec)	Mvmt	Max Queue (m)	Avg. Delay (s)	
AM Peak Hour	2041 Do Nothing	Sig.	1792	22	106	17	12	EBT	119	29	B
	2041 Base	Sig.	2173	36	129	18	11	WBT	149	13	B
	2041 Alt 1A	Sig.	2281	11	71	12	7	EBT	75	17	B
	2041 Alt 1B	Sig.	2233	15	88	13	8	WBT	92	9	B
	2041 Alt 1C	Sig.	2365	12	87	13	7	WBT	101	9	B
	2041 Alt 1D	Sig.	2362	13	90	13	8	EBT	100	19	B
PM Peak Hour	2041 Do Nothing	Sig.	1789	33	90	21	14	EBT	119	30	C
	2041 Base	Sig.	2069	35	114	20	13	WBT	132	11	B
	2041 Alt 1A	Sig.	2125	43	84	32	22	EBT	118	61	C
	2041 Alt 1B	Sig.	2170	42	88	32	22	EBT	118	63	C
	2041 Alt 1C	Sig.	2187	41	92	32	22	EBT	118	60	C
	2041 Alt 1D	Sig.	2030	42	92	35	24	EBT	118	70	D

**The maximum queue listed in the table may be related to a blocked condition at an adjacent movement*

6.5.7 Active Transportation Assessment

As identified in **Section 1.4**, the QEW interchange has several high-speed, free-flowing or yield-controlled ramps which are intimidating for pedestrians and cyclists. The Town of Grimsby has expressed a desire to improve active transportation connections at these locations. This is exemplified in the Grimsby Go Transit Station Secondary Plan, which indicates in Policy 4.3.4, Item 4 and Policy 4.3.8 the recommendation that Niagara Region, The Town, Metrolinx, and the Ministry of Transportation (MTO) work jointly to consider the feasibility of improving the pedestrian and cycling facilities on the interchange to address potential conflicts between vehicles and active transportation users[7]. This would also serve to connect the growing residential population to the north of the QEW to the station area, as well as improve connections between the waterfront and the station area.

[7] Dillon Consulting Limited, Grimsby GO Transit Station Secondary Plan, October 2017, p.45 and p. 49

Figures 11 and **12** present the forecasted pedestrian and cyclist activity relative to areas with high auto activity. Via these forecasts a basic understanding of the potential for active transportation demand can be examined. Of particular concern at the functional planning level, prior to obtaining the design details that will drive the true street-level experience for pedestrians and cyclists, is the layout and functional design of the QEW interchange ramp termini and any incidence of channelized turn lanes for vehicles that cross bicycle facilities or increase the exposure for pedestrians to fast-moving vehicles.

With respect to the design of the QEW interchange ramps, Alternative 1C (Diverging Diamond Interchange) replaces high-speed, low-angle ramp movements with lower-speed, high-angle movements which will provide an improvement in safety for pedestrian and cyclists by slowing down vehicles and providing drivers with more time and improved angles of view when crossing areas that could contain vulnerable pedestrians or cyclists. As discussed previously, the only other alternative with sufficient vehicle capacity for the interchange is Alternative 1B, which maintains the existing high-speed, low-angle ramp movements. These high-speed, low-angle ramps are intimidating, especially for children and those with mobility issues.

The signalisation of crossings in Alternatives 1B, 1C, and 1D will also provide a measure of improved safety at the ramp termini, as appropriate crossing times can be provided for pedestrians and drivers should be more aware of the potential for conflicts. Of the tested interchange alternatives, Alternative 1C (Diverging Diamond interchange) is preferred from the perspective of active transportation.

The Town has set policy goals for increasing the mode share for active transportation users as the area develops. To achieve these goals, it will be necessary that the Town, Niagara Region, Metrolinx, and MTO collaborate as necessary to provide a considered, safe, and efficient network of sidewalks, cycling infrastructure, and multi-use pathways integrated with the station and the community to enable an increase in active transportation mode share. The Grimsby GO Transit Station Secondary Plan presents a network of on-road cycling infrastructure and multi-use pathways that can be used to accomplish this goal and provide significant improvements to the overall comfort, safety, and continuity of active transportation infrastructure in the station area, as shown in **Figure 14**[8].

Improvements to active transportation in the area will be one portion of a travel demand management (TDM) plan for the station area, which should also include local transit improvements and other incentives to curb single-occupant automobile travel. TDM will be a significant factor in reducing the growth in automobile travel and assist in slowing the rate of investment in automobile infrastructure, which is costly both to build and maintain in the long term.

[8] Dillon Consulting Limited, Grimsby GO Station Secondary Plan, October 2017, p. 50

7.0 Conclusions and Recommendations

The Town of Grimsby is currently experiencing rapid population and employment growth and is forecast to continue to grow to 2041. This growth will be catalyzed by the expansion of GO train service east to Beamsville, Grimsby, St. Catherine's, and Niagara Falls which is scheduled to open in 2021.

Within the study area, the existing conditions strategic analysis and microsimulation analysis has identified a lack of capacity on Casablanca Boulevard between North Service Road and Livingston Avenue, and at the QEW / Casablanca Boulevard ramp terminals. Introduction of GO train service, with GO station accesses on South Service Road and Livingston Avenue, will only worsen existing capacity issues.

The microsimulation model has demonstrated that it is necessary to widen Casablanca Boulevard, implement improvements to the QEW interchange, widen South Service Road between Casablanca Boulevard and Industrial Drive, and improve the intersection of Casablanca Avenue & South Service Road. The analysis clearly shows that without these improvements there will be significant queuing on Casablanca Boulevard, South Service Road, and Industrial Drive.

By the 2021 horizon the following road works are recommended for consideration from a transportation perspective:

- Widen Casablanca Boulevard to a four-lane cross-section from NSR to SSR;
- Widen Casablanca Boulevard to a four-lane cross-section with two-way left-turn lane (TWLTL) from South Service Road to Livingston Avenue (the TWLTL will be a short segment between the southbound left turn lane to Livingston Avenue and the northbound left turn lane to South Service Road. This will provide safe access opportunities for the private driveways on the east side of Casablanca);
- Widen Casablanca Boulevard to include a two-way left-turn lane from Livingston Avenue and Main Street West. With the volume increase on Casablanca Boulevard, mid-block turning movement conflicts will increase (access to private driveways on the east side of the road and midblock movements at collector roads). A TWLTL will mitigate these conflicts;

- Reconstruct the QEW and Casablanca interchange to include traffic control signals and realignment of the ramp terminals or a diverging diamond interchange treatment;
- Install traffic control signals and remove the westbound right turn channelization at the intersection of Casablanca Boulevard and Livingston Avenue;
- Provide dual eastbound left turn lanes at the intersection of Casablanca Boulevard and South Service Road; and,
- At the GO Station north access / South Service Road, provide a traffic control signal and either a westbound left turn lane or a right turn loop. Under peak, peak conditions the right loop operation would be more effective at limiting the impacts of congestion on the operation of this short section of the South Service Road
- Monitor the Casablanca Boulevard/Main Street intersection for potential need for signal control (as and when vehicle or active mode demands warrant)

Figure 14 illustrates the 2021 recommended lane configuration and traffic control.

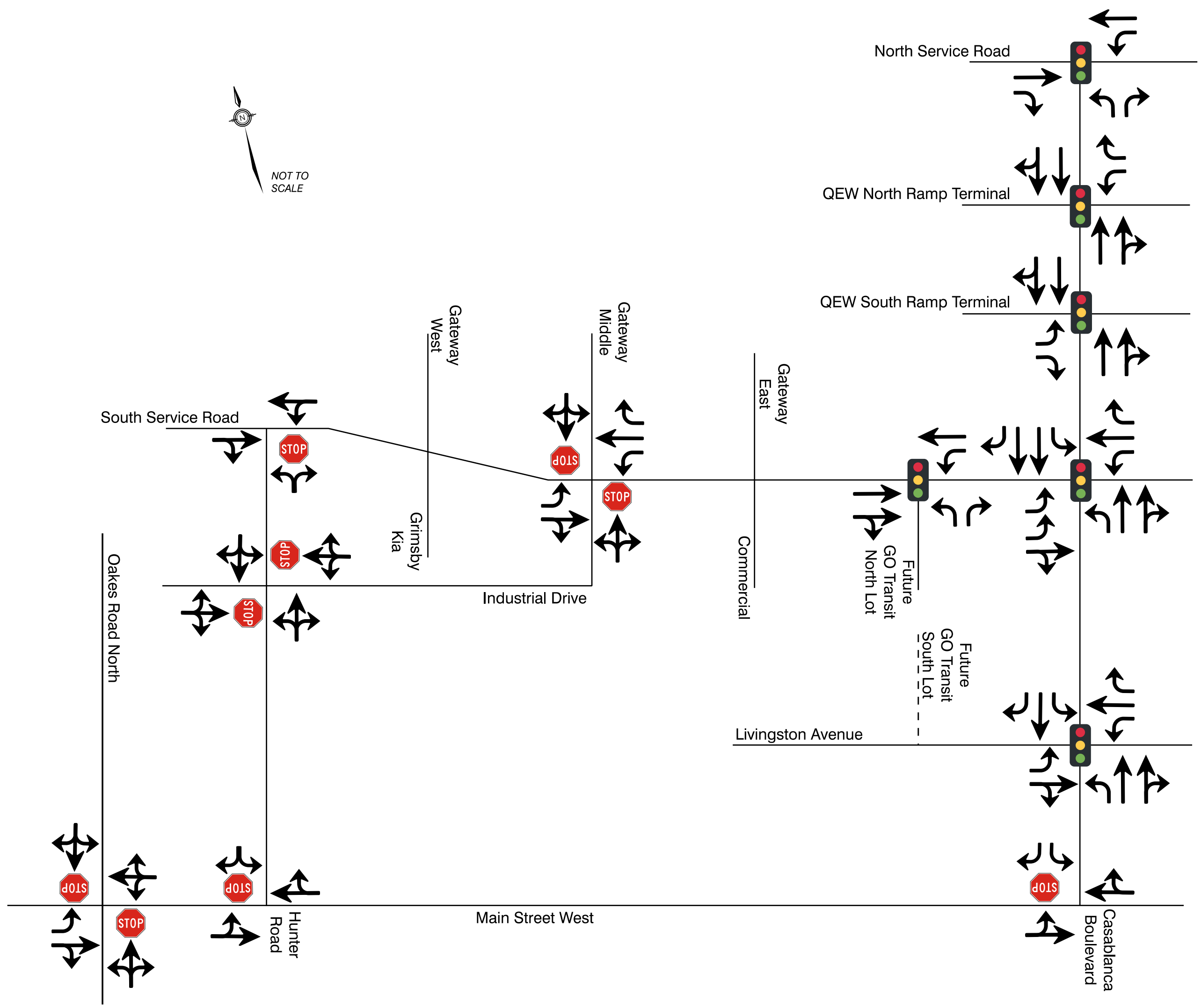

Figure 14: 2021 Recommended Lane Configuration and Traffic Control

By the 2041 horizon, in addition to the above recommendations, it is also recommended, from a transportation perspective, to:

- Widen South Service Road to a basic four-lane cross-section (plus required auxiliary lanes) between Casablanca Boulevard and Industrial Avenue;
- Implement a right turn loop from westbound South Service Road into the GO North Parking Lot; and,
- Provide a stop-controlled intersection on Livingston Avenue at the GO south parking lot access.

The above roadway recommendations consider future transportation needs only and the recommendations need to be confirmed through the completion of the Class EA study that will consider additional environmental, social, engineering, and cost considerations.

Figure 15 illustrates the 2041 recommended lane configuration and traffic control.

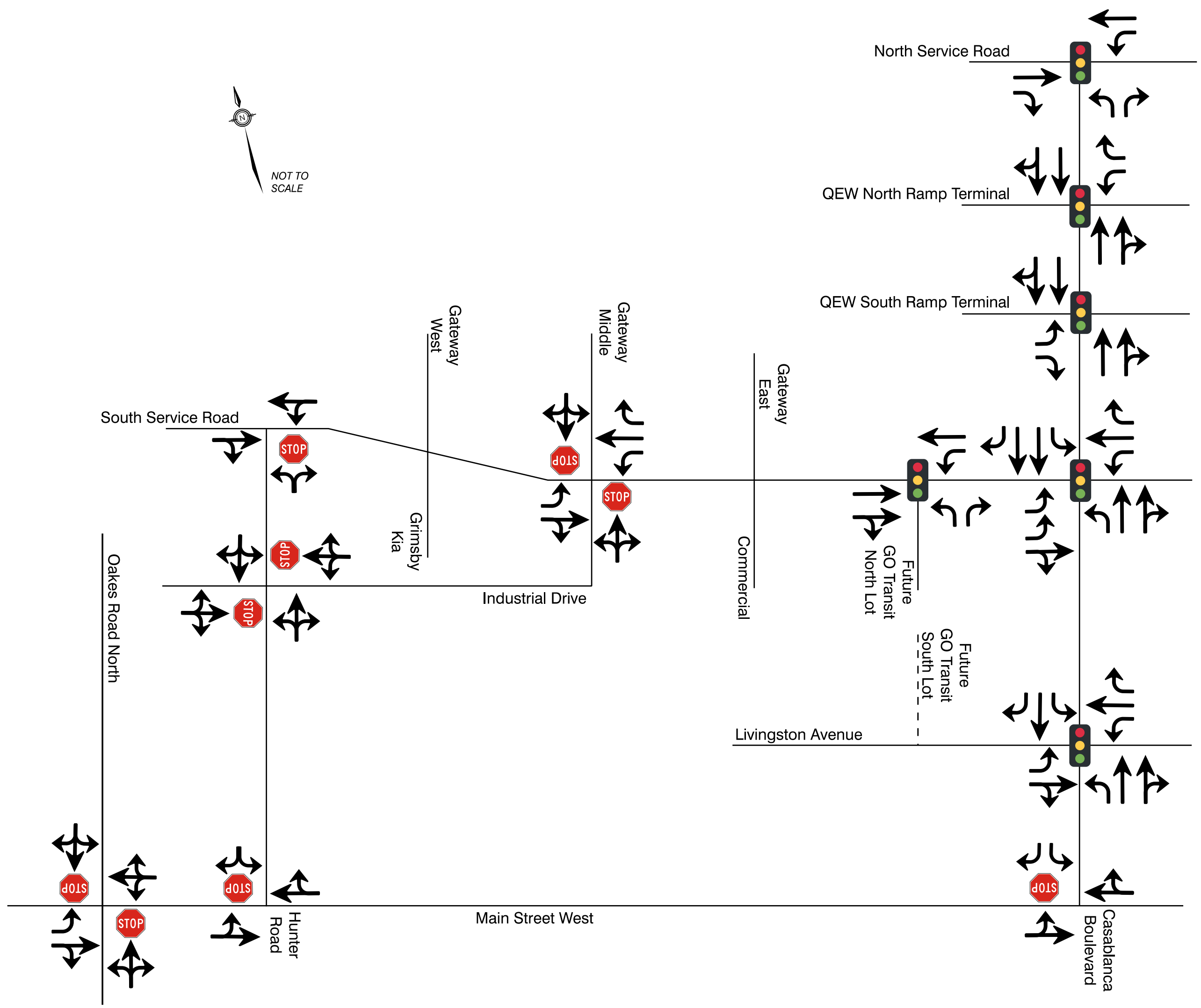

Figure 15: 2041 Recommended Lane Configuration and Traffic Control

Appendix A

Existing Traffic Counts

Appendix B

Screenline Assessment

Appendix C

Vissim Results