Appendix E.2 – Transportation Technical Report #1

Kennedy Road Environmental Assessment between Steeles Avenue and Major Mackenzie Drive

Transportation Technical Report #1

Class Environmental Assessment for Kennedy Road from Steeles Avenue to Major Mackenzie Drive

Regional Municipality of York

May 29, 2018

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Appendix B – MMLOS Analysis

1. Introduction

The Regional Municipality of York (York Region) is responsible for monitoring its transportation network and implementing required improvements in a timely manner. As such, York Region's transportation and roadway management strategies under the 2016 Transportation Master Plan (YR-TMP) have identified future road network needs for Kennedy Road (Y.R. 3) from Steeles Avenue to Major Mackenzie Drive within the City of Markham. Improvements to the segment of Kennedy Road between Steeles Avenue and Highway 7 are planned in years 2023 – 2024 as identified in York Region's 2017 approved 10-Year Roads and Transit Capital Construction Program. The segment of Kennedy Road between Highway 7 and Major Mackenzie Drive are not identified for improvements in the 10-Year Roads and Transit Capital Construction Program but may be scheduled for improvements in the forthcoming years as the Program is revised each year.

To further assess the transportation needs, York Region has retained HDR to undertake the Kennedy Road Municipal Class Environmental Assessment (Class EA) study. The study is being completed in accordance with the planning and design process for Schedule 'C' projects as outlined in the Municipal Engineers Association (MEA), Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011, and 2015) as described in **Section 1.3.1**.

This report documents the transportation analysis supporting Needs Assessment and Justification for the proposed improvements for the corridor per Phase 1 of the Municipal Class EA process.

1.1 Study Purpose

The purpose of the Kennedy Road Class EA study is to determine specific improvements to accommodate the current and future transportation needs of pedestrians, cyclists, transit users and motorists along the Kennedy Road corridor from Steeles Avenue to Major Mackenzie Drive.

Specifically, the purpose of the Needs Assessment is to identify, define, and evaluate:

- Existing and future network capacity, traffic safety, design, and operational needs of the transportation network along Kennedy Road between Steeles Avenue and Major Mackenzie Drive
- Physical and environmental constraints of the corridor
- A problem and opportunity statement

The YR-TMP establishes the needs and justification, and alternative solutions considered for the study corridor from a Region-wide Master Plan level (see **Section 1.3.1**).

1.2 Study Area

Kennedy Road between Steeles Avenue and Major Mackenzie Drive is a four-lane, north-south Regional arterial road located in the City of Markham. It continues as Kennedy Road in the City of Toronto south of Steeles Avenue. The Kennedy Road Class EA corridor spans approximately 8 kilometres of this regional road, as shown in **Exhibit 1-1.**

Exhibit 1-1: Kennedy Road Study Area and Corridor

1.3 Environmental Assessment Process

An overview of the Environmental Assessment Act of Ontario (EAA), the Municipal Class Environmental Assessment (MCEA) process, and the Canadian Environmental Assessment Act, 2012 (CEAA 2012) is provided in this section as they relate to the Kennedy Road Class EA.

1.3.1 Municipal Class Environmental Assessment Process

The Environmental Assessment Act of Ontario (EAA) provides for the protection, conservation, and management of the environment in Ontario. The EAA applies to municipalities and to activities including municipal road projects. Activities with common characteristics and common potential effects may be assessed as part of a "class", and are therefore approved subject to compliance with the pre-approved Class EA process.

The Municipal Class Environmental Assessment (MCEA) process is an approved Class EA process that applies to municipal infrastructure projects including roads, water, and wastewater. This process provides a comprehensive planning approach to consider alternative solutions and

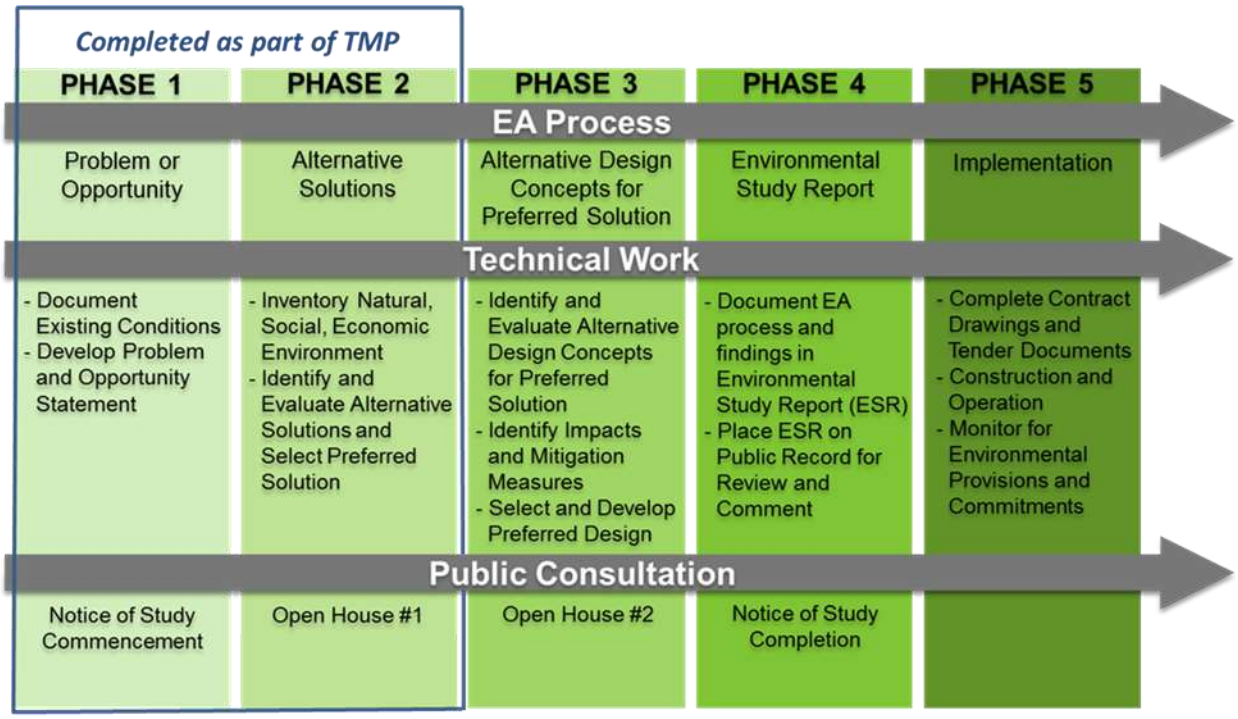
evaluate their impacts on a set of criteria (e.g. transportation, environmental, social, engineering considerations) and determine mitigating measures to arrive at a preferred alternative for addressing the problem (or opportunity). The Class EA process involves a rigorous public consultation component that includes various provincial and municipal agencies, Aboriginal communities, and the public, at each of the project stages.

The Kennedy Road Class EA study is being undertaken in accordance with the guidelines of the Municipal Engineers Association (MEA) Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011 and 2015). Due to the type of project, anticipation for potential effects, and estimated capital costs, the Kennedy Road Class EA is defined as a Schedule 'C' project. A Schedule 'C' project involves either the construction of new facilities or major modifications to existing facilities. Modifications to existing facilities could include road widening, intersection improvements, and/or other operational improvements.

Exhibit 1-2 illustrates the sequence of activities within the approved Class EA process leading to project implementation. The phases for this study are described below:

- Phase 1 (Problem and Opportunity) – Identify the problem (deficiency) or opportunity.
- Phase 2 (Alternative Solutions) – Identify alternative solutions to address the problem or opportunity considering the existing environment, and establish the preferred solution considering public and agency input.
- Phase 3 (Alternative Design Concepts for Preferred Solution) – Examine alternative methods of implementing the preferred solution, based on the existing environment, public and agency input, anticipated environmental effects, and methods of minimizing negative effects and maximizing positive effects.
- Phase 4 (Environmental Study Report) – Document in an Environmental Study Report (ESR) a summary of the study background, problem statement, alternative solutions, alternative designs, and the public consultation process. Place the ESR on public record for a minimum 30 calendar days for review, and notify completion of the ESR and opportunity for Part II Order requests.
- Phase 5 (Implementation) – This phase involves detailed design and the preparation of contract/tender documents followed by construction, operation, and monitoring. This phase is not within the scope of the Kennedy Road EA study.

A Transportation Master Plan (TMP) is conducted to examine the overall transportation system in order to outline a framework for planning for subsequent projects. The YR-TMP fulfilled the requirements of Phases 1 and 2 of the Municipal Class EA process. This study will build on the recommendations from the YR-TMP to form the basis of Phases 1 and 2 of this Class EA. Undertaking of the Class EA Process using TMP recommendations provides an enhanced understanding of the transportation needs of the corridor in line with those of the overall regional transportation system. The Class EA process as outlined by MEA as compared to the process being implemented for the Kennedy Road Class EA is illustrated in **Exhibit 1-3**. This study builds on the findings from the YR-TMP and reconfirms the needs and justification at the corridor-level in terms of corridor-specific constraints and issues.



The needs assessment and alternative evaluation supporting Phase 1 and Phase 2 of the Class EA for Kennedy Road has been completed as Part of York Region's 2016 TMP

Exhibit 1-2: Municipal Class Environmental Assessment Process

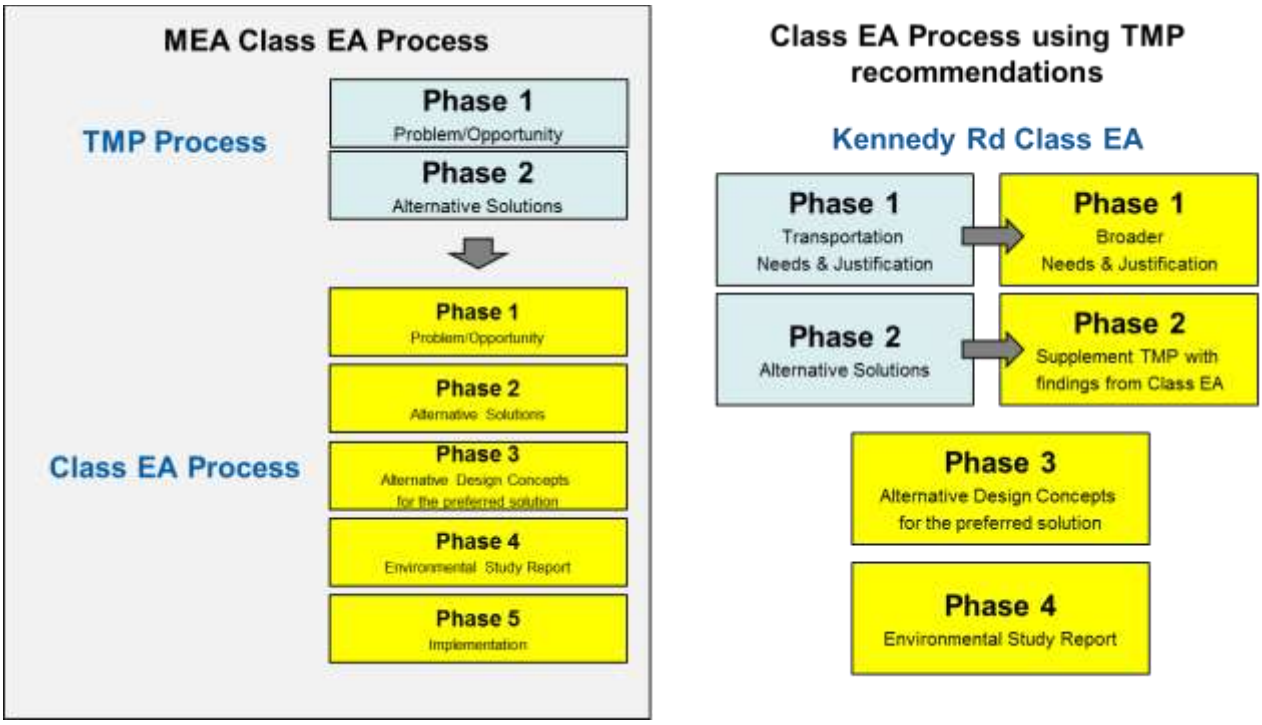


Exhibit 1-3: Traditional MEA Class EA Process and Class EA Process using TMP Recommendations

After the ESR is finalized, it will be filed and placed on public record for a minimum of 30 calendar days for review by the public and review agencies. At the time the report is filed, a Notice of Completion of the ESR will be advertised, to advise the public and other stakeholders where the ESR may be seen and reviewed, and how to submit public comments. The Notice will also advise the public and other stakeholders of their right to request a Part II Order, and how and when such a request should be submitted.

Under the Environmental Assessment Act, members of the public, interest groups, agencies, and other stakeholders may submit a written request to the Minister of the Environment and Climate Change to require the proponent (York Region) to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order) before proceeding with the proposed undertaking. Part II of the Act addresses Individual Environmental Assessments.

The request for a Part II Order must also be copied to the proponent at the same time it is submitted to the Minister. Written requests for a Part II Order should be submitted to the Minister within the identified (minimum 30 calendar day) review period. The Minister or delegate then reviews the ESR to ensure that the Class EA process has been followed. The proponent and the requestor have an opportunity to discuss and resolve the issues. Once the proponent has satisfied the requestor's concerns a requestor should promptly withdraw a Part II Order request.
If the proponent and requestor are unable to resolve the concerns, the Minister or delegate will decide on a Part II Order:

1. Refer the matter to mediation before making a decision under the provisions of subsection 16(6) of the Environmental Assessment Act.
2. Deny the request for an order and inform the proponent and requestor of the decision and rationale.
3. Deny the request for an order but impose conditions.
4. Require the proponent to comply with Part II of the Environmental Assessment Act which requires the preparation of a term of reference and an individual environmental assessment.

The Minister's decision on a Part II Order request is final.

1.3.2 Canadian Environmental Assessment Act

Under the Canadian Environmental Assessment Act, 2012 (CEAA, 2012), a federal environmental assessment study may be required to comply with the physical activities that constitute a "designated project", under the project list identified in the Regulations Amending the Regulations Designating Physical Activities, 2013. This project list ensures that federal environmental assessments are focused on the major projects with the greatest potential for significant adverse environmental impacts to matters of federal jurisdiction.

The Kennedy Road EA study does not constitute a "designated project" and therefore does not require an environmental assessment under the CEAA, 2012. However, the Minister of the

Environment and Climate Change may order an assessment for any project not included in the project list, where there may be adverse environmental effects related to federal jurisdiction.

2. Planning and Policy Context

A summary of the Provincial, Regional, and Municipal planning and policy context is provided in this section as they are related to the Kennedy Road Class EA.

2.1 Provincial Planning Context

Provincial planning policies were reviewed to identify their relevance to the Kennedy Road Class EA. Provincial plans are identified and summarized in **Table 2-1**.

Table 2-1: Provincial Planning Context

Provincial Planning Document	Description/Relevance
Provincial Policy Statement (2014)	Provides direction on land use planning and development as well as the transportation system, including: • Providing appropriate development while protecting resources, public health and safety, and the natural and built environments • Building strong, healthy communities by supporting density and land uses which support active transportation, are transit-supportive, and are freight-supportive • Safe, energy efficient, transportation systems that move people and goods • Integrated transportation and land use considerations at all stages of the planning process • Use of travel demand management (TDM) strategies to maximize efficiency • Land use pattern, density, and mix of uses to minimize length and number of vehicle trips, support current and future use of transit and active transportation
Oak Ridges Moraine Conservation Plan (2017)	Originally published in 2002, the 2017 update provides direction on how to protect the Moraine's ecological and hydrogeological features. No section of the study corridor falls within boundary of the Oak Ridges Moraine.
Greenbelt Plan (2017)	Updated in 2017 as a result of the Co-ordinated Land Use Planning Review, the Greenbelt Plan identifies environmentally and agriculturally protected lands within the Greater Golden Horseshoe, where urbanization should not occur, in order to protect ecological features. No section of the study corridor falls within the boundaries of the Greenbelt Plan.

Provincial Planning Document	Description/Relevance
Places to Grow Plan / Growth Plan for the Greater Golden Horseshoe (2006, 2017)	Originally adopted in 2006, the 2017 update sets forth a framework for implementing the Government of Ontario's 2041 vision for building stronger, prosperous communities by better managing growth in the region. Within York Region, four Regional Centres (Markham, Richmond Hill/Langstaff Gateway, Vaughan Metropolitan, and Newmarket) are designated as Urban Growth Centres. The land around the Kennedy Road corridor is classified as a 'built-up' area in the plan.
The Big Move (2008, Approved Changes 2013)	Identifies a 25-year plan for the Regional Rapid Transit and Highway Network and sets forth a vision for Regional Express Rail (RER). Within the study area, the plan identifies several improvements to Regional Rapid Transit and Highway Network including rapid transit on Highway 7 throughout York Region, regional rail with all-day two-way service along the Stouffville GO Line (every 15 minutes between Union Station and Unionville Station), and rapid transit along 407ETR. There are no plans from Metrolinx in the 10 year RER program to double track the Stouffville GO Rail Line past Unionville Station.
Provincial Co-ordinated Plan Review (2015)	The Province completed a simultaneous review of the Niagara Escarpment Plan, the Oak Ridges Moraine Conservation Plan, the Greenbelt Plan and the Greater Golden Horseshoe Growth Plan. This Coordinated Review of the four plans recognizes their common geography and the interconnected nature of their policies and provides an opportunity to assess progress to date, address challenges and make improvements to strengthen the plans and ensure a vibrant, healthy region for current and future generations. The Plan Review's role is to develop consensus-based recommendations to the Ministers of Municipal Affairs and Housing, and Natural Resources and Forestry on ways to amend and improve the plans. The review recommends increased efforts to curb sprawl, build complete communities, grow the Greenbelt, support agriculture and address traffic congestion. The proposed revisions released in May 2017 do not affect the study corridor.
#CycleON: Ontario's Cycling Strategy (2013)	Provides a strategy to support and encourage growth in cycling to 2033 and beyond. The Kennedy Road EA study will explore options that are cyclist-friendly in accordance with the recommendations of Ontario's Cycling Strategy.

2.2 Regional Planning Context

Regional planning policies were reviewed to identify their relevance to the Kennedy Road Class EA. Regional plans are identified and summarized in **Table 2-2**.

Table 2-2: Regional Planning Context

Regional Planning Document	Description/Relevance
York Region Official Plan (YR-OP) (2010, amended 2013)	Provides direction to guide economic, environmental, and community-building decisions to manage growth. YR-OP incorporates the *Planning for Tomorrow* study, undertaken to identify how York Region will accommodate the several provincial planning initiatives. The main theme of the YR-OP is to move York Region towards sustainability, completed through policies that emphasize a reduction in automobile reliance and an increase in active transportation facilities. The YR-OP transportation road network (Map 12 Street Network) designates a right-of-way (ROW) width of: • up to 43.0 m between Steeles Avenue and YMCA Boulevard, and Highway 7 to Major Mackenzie Drive • up to 45.0 m between YMCA Boulevard and Highway 7
York Region Strategic Plan (Vision 2051) (2011)	Vision 2051 is York Region's long-term strategy. It identifies eight goal areas that will guide policies to create strong, caring, and safe communities designed with sustainability in mind. The Vision identifies actions to help achieve these goals, several pertaining to the design of future transportation facilities and the importance of their positive contribution to vibrant communities.
York Region Transportation Master Plan (YR-TMP) (2016)	Provides infrastructure and policy requirements for a 25-year outlook that allows York Region to achieve its strategic vision of an advanced, interconnected system of mobility within the Region. Further information pertaining to transportation infrastructure improvements as documented in the Region's YR-TMP is described within **Section 2.2.1** of this report.
York Region's Sustainability Strategy (2007)	York Region's sustainability strategy is a guide to provide local municipal governments with long-term frameworks to balance economic growth with the natural environment and healthy communities. The thrust of the Sustainability Strategy as it pertains to transportation is to ensure that there is integration between land use planning, growth and transportation; promoting public transit and active modes of transportation; and, ensuring that the system is integrated with the local, intra and inter-regional transportation systems.
York Region Transit 2016 Annual Service Plan	The purpose of the York Region Transit (YRT) 2016 Annual Service Plan is to advance the goals and objectives of the 2016 to 2020 4-year service plan. It provides an overview of the main service initiatives for 2016 and the proposed rapid transit network plan up to 2020.
York Region Towards Great Regional Streets (2008)	Provides guidelines to improve Regional streets based on a thorough examination of the various needs and objectives within right-of-ways and road design standards.

Regional Planning Document	Description/Relevance
York Region 10-Year Roads and Transit Capital Construction Program (2017)	Approved in 2017, this program outlines the planned road and transit improvements required to accommodate growth in population and employment within York Region in the next ten years. Plans within this program include upgrading existing transportation infrastructure to meet current Regional design standards, and are updated on an annual basis. The current plan provides estimated construction timelines for the various planned improvements, including multiple segments of the Kennedy Road study corridor. Capital improvements are programmed for 2024 for the section of Kennedy Road between Steeles Avenue and 14th Avenue, and between 407ETR and Highway 7. The segment of Kennedy Road between 14th Avenue and 407ETR is documented for improvements in 2023.

2.2.1 York Region Transportation Master Plan 2016

The purpose of the York Region Transportation Master Plan (YR-TMP) Update (2016) is to support growth in York Region to the year 2041 by defining a long-term transportation vision based on integrated road and transit network planning. The plan aims for "more livable communities" and "safe, efficient and effective transportation" for people and goods.

The YR-TMP has five objectives that apply to the Kennedy Road study corridor:

- Create a world class transit system
- Develop a road network fit for the future
- Integrate active transportation in Urban Areas
- Maximize the potential of Employment Areas
- Make the last mile work

These five objectives are streamlined into five main policy areas that will affect the development of preliminary design alternatives for the Kennedy Road corridor. These policy areas include developing a finer grid network, corridor evolution, commuter parking management, goods movement network, and boulevard jurisdiction. The Kennedy Road EA will consider key aspects of these policy areas including the utilization of regional roads to maximize capacity to move people, and providing multi-modal transportation options at the fringes of urban areas.

The YR-TMP's proposed improvements for Kennedy Road between Steeles Avenue and Major Mackenzie Drive for 2041 are as follows:

- Widening to 6 lanes as shown in **Exhibit 5-3**
- Frequent transit network (mode undefined) and rapid transit segment in one section as shown in **Exhibit 5-4**
- Separated cycling facility (shown in **Exhibit 5-5**) – defined by the YR-TMP as facilities that provide a physically separate space for cyclists, including: cycle tracks, raised bike lanes, or multi-use paths as opposed to dedicated facilities like bike lanes and buffered bike lanes

2.2.1.1 A ROAD NETWORK FIT FOR THE FUTURE

The *2016 York Region Transportation Master Plan* (YR-TMP) established that the vehicular road network alone cannot accommodate future travel needs; therefore, the plan aims to manage the growth in travel demand and to use the road and transit networks as efficiently as possible. The YR-TMP also includes a strategy for improving transit services and guidelines to facilitate transit-supportive development.

The YR-TMP supports the Regional Official Plan (YR-OP) goal of strengthening the connections between the natural and built environment, economic vitality, and healthy communities through developing holistic mobility systems for the corridors of York Region. In addition, the plan elaborates on the YR-OP policies' integrated approach to transit, land use/transportation integration, parking, walking and cycling.

The YR-TMP expands on the 2010 YR-OP's policy direction to promote transit and reduce automobile dependence. The direction is based on several key policies including:

- Reducing auto dependence by planning communities with enhanced active transportation opportunities;
- Creating an active transportation system that encourages walking, cycling and transit use;
- Designing streets to support all modes of transportation.

These policies are summarized in a Transportation Demand Management program that is focused on making use of existing and future transportation infrastructure with an emphasis on active transportation options while reducing reliance on single-occupant automobiles.

Another aspect of the multi-modal strategy is the introduction of Transit/High Occupancy Vehicle (HOV) Lanes. The Region's *Towards Great Regional Streets – a Path to Improvement* also outlines transit supportive strategies. The report states that once no other viable options exist except to widen Regional streets to six/seven lanes, consideration should be given to allocating the additional lanes to HOV and/or transit lanes in order to help encourage ridesharing and be supportive of transit initiatives. The six-lane cross-section identified in the *Towards Great Regional Streets* report recommends using the two curb lanes as Transit/HOV lanes.

2.3 Municipal Planning Context

Municipal planning policies were reviewed to identify their relevance to the Kennedy Road Class EA. Municipal plans are identified and summarized in **Table 2-3**.

Table 2-3: Municipal Planning Context

Municipal Planning Document	Description/Relevance
City of Markham Official Plan Update (2014)	Provides guidance on responsible future development in the City of Markham through several guiding principles, including: growth management, environmental stewardship, economic prosperity, and transportation/transit development. It provides a framework for decision-making regarding land-use planning, and the requirement of municipal services to support growth.
City of Markham Transportation Planning Study (2002)	This study identifies and addresses several key constraints facing the City's future, including: the need to reduce congestion to maintain a high quality of life for residents through addressing changing travel patterns, and the continuing development of Markham's business community to maintain economic prosperity. It addresses these issues through its development of a multi-modal transportation solution up to 2021.
City of Markham Cycling Master Plan (2010)	Provides direction towards a growing need for a city-wide cycling network. Recognition of a growing popularity for cycling both as a recreational activity and a mode of transportation for short distance trips has spurred a plan to develop a connected cycling network.

3. Regional and Local Context and Growth

3.1 Population and Employment Growth

York Region is one of the fastest growing municipalities in the GTA. Since 1971, York Region's population has increased nearly seven-fold. Population and employment growth are expected to continue across the Region. As such, the transportation system and other infrastructure must be prepared to accommodate future growth. As illustrated in **Exhibit 3-1**, by 2041 the regional population will approach 1.79 million, while employment will approach 900,000.

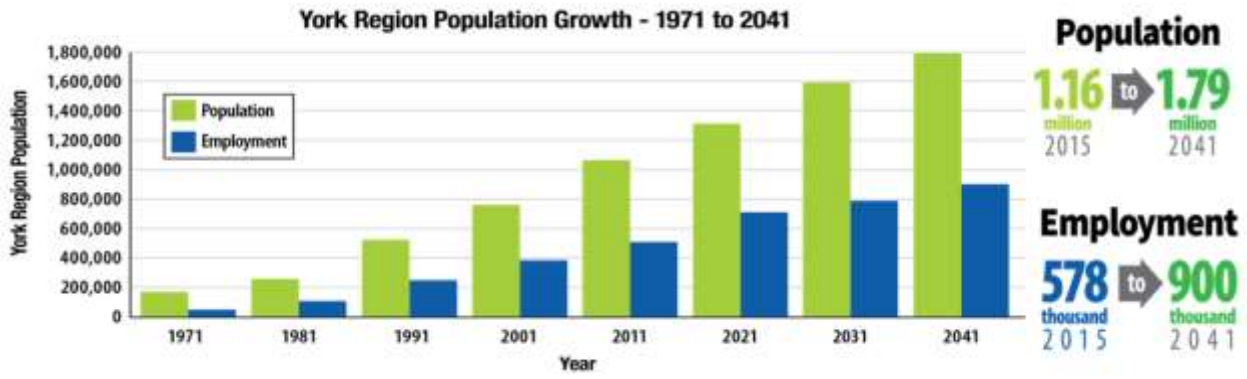


Exhibit 3-1: York Region Population and Employment Growth between 1971 and 2041

The City of Markham is itself experiencing tremendous growth. According to York Region's forecasts (November 2015), Markham's population is expected to grow by 184,100 people, reaching 535,100 in 2041. Meanwhile, employment is projected to increase from 170,000 in 2014 to approximately 275,000 in 2041. Growth in Markham is anticipated to account for 30% of York Region's overall employment and population growth according to York Region 2041 draft growth scenarios.

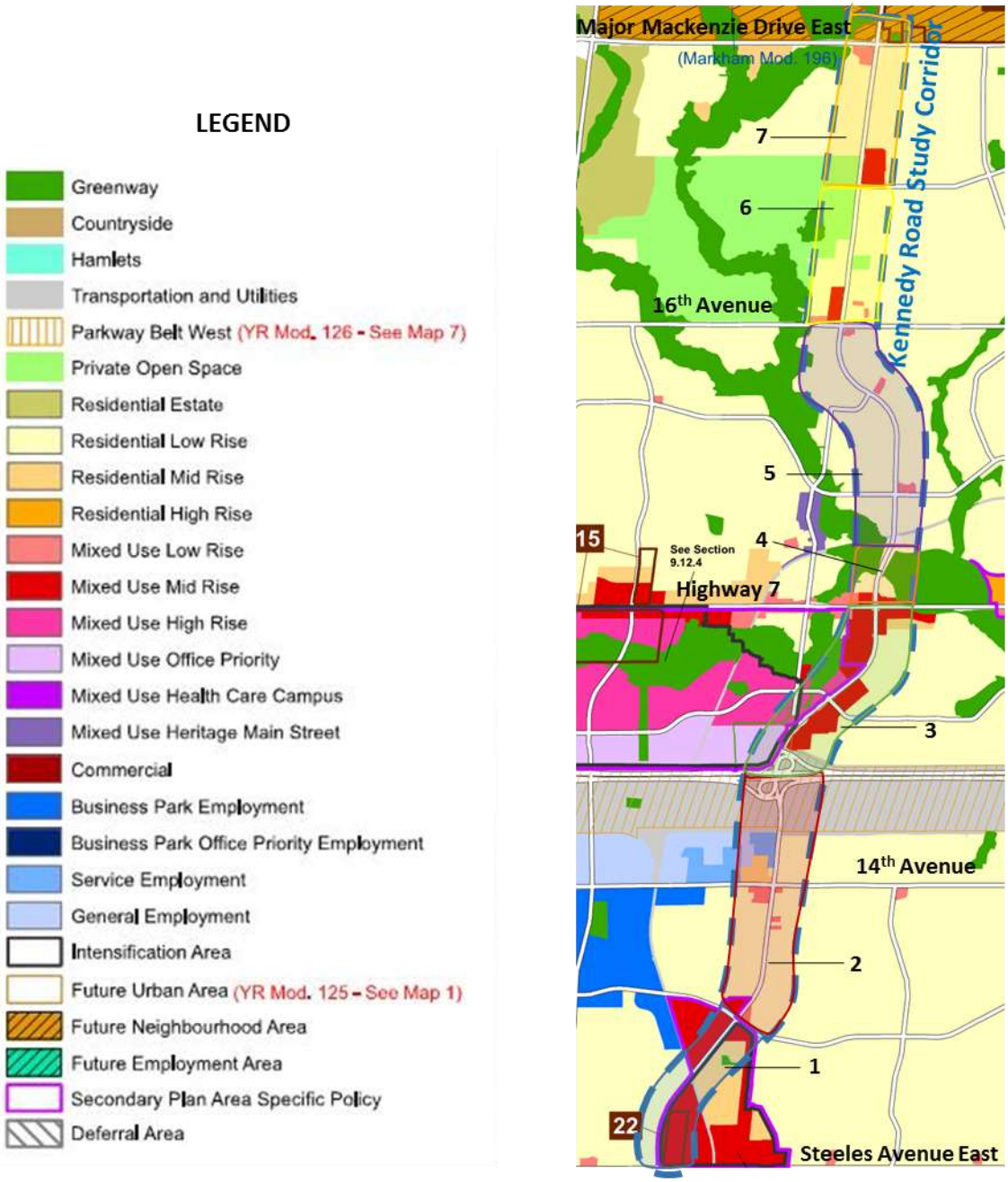
3.2 Land Use and Future Development Context

Land uses adjacent to Kennedy Road through the study limits are generally a mix of residential, industrial, or commercial, as follows:

- Steeles Avenue to Denison Street (1): Primarily residential low-rise, with planned mixed-use mid-rise at major intersections including Steeles Avenue and Denison Street.
- Denison Street to 407ETR (2): Primarily residential low rise with commercial plazas fronting onto Kennedy Road, lands south of 407ETR to north of 14th Avenue set aside for utilities and future transportation development.

- 407ETR to Denby Court (3): Lands surrounding Kennedy Road are predominantly mixed-use mid-rise, with the west side of Kennedy Road adjacent to the Markham Centre Secondary Plan boundary.
- Denby Court to Austin Drive (4): Greenway on both sides of Kennedy Road, the Rouge River intersects this segment of the study corridor.
- Austin Drive to 16th Avenue (5): Predominantly low-rise residential land use surrounding the Kennedy Road study corridor with exception at major intersections such as 16th Avenue where mixed-use mid-rise commercial plazas are present.
- 16th Avenue to Bur Oak Avenue (6): Primarily residential low-rise, with a mixed-use mid-rise commercial plaza fronting onto Kennedy Road at Bur Oak Avenue. On the west side of Kennedy Road in this segment, is the York Downs Re-development.
- Bur Oak Avenue to Major Mackenzie Drive (7): Primarily low-rise residential with a mixed-use low rise commercial plaza fronting onto Kennedy Road at Major Mackenzie Drive.

Exhibit 3-2 shows the land use designations along the corridor and surrounding area, as well as proposed development locations within and near the study area as listed in the Markham Official Plan.



Last modified and approved by York Region on June 12, 2014.

Exhibit 3-2: City of Markham Official Plan Map 3: Land Use

3.2.1 Milliken Secondary Plan Area

The Milliken Secondary Plan Area (Milliken Centre) is composed of the lands between Kennedy Road and Stouffville GO Rail Line on the west, Denison Street to the north, Old Kennedy Road and the existing subdivision to the east, and Steeles Avenue to the south.

Secondary Plans form part of Markham's 2014 Official Plan, providing further direction on specific land use policies to be undertaken in areas to which significant re-development is expected. The land use objectives of the Milliken Centre Secondary Plan is to provide a focal point for the larger Milliken community and balance a mixed-used use of lands including residential, commercial, and public uses, to be completed through pedestrian and transit supportive development options.

The City is currently preparing an update to the Milliken Centre Secondary Plan. This includes additional studies to identify Greenway and Natural Heritage Network components for protection and possible compensation. These lands are adjacent to the east and west sides of the study corridor where Kennedy Road intersects the Stouffville GO Rail Line crossing. The results of this study will inform the Milliken Secondary Plan with further policy direction on development options with respect to the protection of key natural heritage features.

3.2.2 Markham Centre Secondary Plan

The Markham Centre Secondary Plan Area encompasses the lands east of Rodick Road, west of Kennedy Road, north of 407ETR, and south of Highway 7. The Secondary Plan Area boundary is adjacent to the study corridor between north of Unionville Gate/South Unionville Avenue, and 407ETR.

The land use objectives for the Markham Centre Secondary Plan is to provide a mixed-use Regional Centre that functions as an urban growth centre for intensification while supporting a diverse mix of residential, commercial, and office uses within a Regional Rapid Transit corridor. In conjunction with Metrolinx, the City of Markham has undertaken a Joint Mobility Hub Study in 2016 to develop a transit plan for all transit aspects in the area, including the VIVA alignment study for the Markham Centre Secondary Plan Area. Ongoing consultation with the City of Markham as part of the Kennedy Road Class EA will inform on the findings of this Joint Mobility Hub Study.

3.2.3 Angus Glen and Robinson Glen Secondary Plans

The Angus Glen lands are bounded by Major Mackenzie Drive to the south, Warden Avenue to the west, Elgin Mills Road to the north, and Kennedy Road to the east. These lands include Greenway System lands as determined by Bruce Creek and Bruce Creek Tributary, a designation by the City of Markham's Official Plan and the Provincial Greenbelt Plan for the Bruce Creek portion.

The Robinson Glen lands are bounded by Major Mackenzie Drive to the south, Kennedy Road to the west, Elgin Mills Road to the north, and the Greenway System to the east as designated by the City of Markham's Official Plan and the Provincial Greenbelt Plan.

New residential developments are being planned for both of these lands and will accommodate an increase in the number of people and units within the area. These developments will achieve densities that are driven by Provincial policy in contrast to Markham's traditional suburban

communities south of Major Mackenzie Drive that were planned at 40-50 residents and jobs per hectare.

The new developments in both these communities are planned to be transit-supportive which, together with a comprehensive active transportation system, will increase the number of transit, pedestrian and cycle trips while reducing the number of travelled auto-trips. Additionally, residential areas will accommodate a broad range of housing types and provide a complete complement of community uses and retail services to ensure residents have full access to facilities to meet their daily needs.

3.2.4 York Downs Proposed Redevelopment

The York Downs Golf and Country Club is located on 168.6 hectares of land in the southern portion of the City of Markham concession block, bound by Warden Avenue, Major Mackenzie Drive East, Kennedy Road, and 16th Avenue. There are existing historic estate large-lot residential developments in the Glenburn Park and Cachet Parkway areas. The surrounding area at this location consists of low density residential developments, with the Berczy Glen and Upper Unionville neighbourhoods to the east, historic Unionville to the south, Cachet to the west, and Angus Glen Village and the southern portion of the Angus Glen Golf Course to the north.

On October 5, 2016, an application was submitted to the City of Markham to amend the City's Official Plan to allow for redevelopment of the York Downs Golf Course Lands. The proposed redevelopment plan for the York Downs lands consists of a predominantly low density residential neighbourhood on the developable portions of the property. This includes single detached and townhouse residential units, some with direct vehicular frontage on a road, and some with vehicular access from a lane. Several residential mid-rise blocks and one mixed use, residential / commercial, mid-rise block are proposed for areas of the property adjacent to the surrounding regional arterial roads (Kennedy Road and 16th Avenue). These blocks are planned at higher density than the surrounding low density areas in order to take advantage of the proximity to the arterial road network and associated transit opportunities.

Since the application submission, five (5) Community Information Meetings have been held in April, May, June, and September of 2017, and April 2018. The third submission of documents, reports, and proposed plans was submitted on April 12, 2018. It is currently being reviewed by The City of Markham, external agencies, and senior levels of government. Although the City of Markham does not yet have a position regarding the proposal, York Region and the Study Team will continue discussions with the City on the status of the development application and its implications related to the Kennedy Road EA.

3.2.5 Active Developments

York Region's record of active developments along the study corridor is shown in

Table 3-1.

Table 3-1: Active Developments along the Kennedy Road Study Corridor (N-S)

Development/Proponent Name	Description	Status	Location
JCY Development Corp.	• Proposed development of 34 semi-detached homes and restoration of an existing single family dwelling	Under Review	9721 Kennedy Road, east of Kennedy Road, north of 16th Avenue
Sixteenth Land Holdings Inc.	• Official Plan Amendment	Under Review	4134 16th Avenue, east of Warden Avenue
Kylemore Communities (Yorkton) Ltd.	• Proposed draft plan of subdivision	Under Review	9350-9392 Kennedy Road, south of Major Mackenzie Drive
Jade-Kennedy Development Corp.	• Draft Plan of Condominium	Under Review	8321,8333, 8339 Kennedy Road; 38, 30, 32 South Unionville Avenue
Del Ridge (Mid-town) Inc. Greenlife Markham	• Proposed development of a six storey residential condominium	Under Review	7768 Kennedy Road, north-west quadrant of Kennedy Road and 14th Avenue
Goldbright Plaza	• Proposed commercial building	Under Review	7750 Kennedy Road, south-west quadrant of Kennedy Road and 14th Avenue
1297482 Ontario Ltd. – Alai Gardens Condominium	• Proposed development of a 4-storey residential condominium	Under Review	7713 Kennedy Road, south-east quadrant of Kennedy Road and 14th Avenue
Neamsby Investments Inc.	• Proposed development of a seniors complex	Under Review	77 Amarillo Avenue, north-west quadrant of Kennedy Road and Denison Street
Chris and Louis Balkos	• Proposed draft plan of subdivision	Under Review	North-east quadrant of Kennedy Road and Steeles Avenue

4. Existing Transportation Conditions

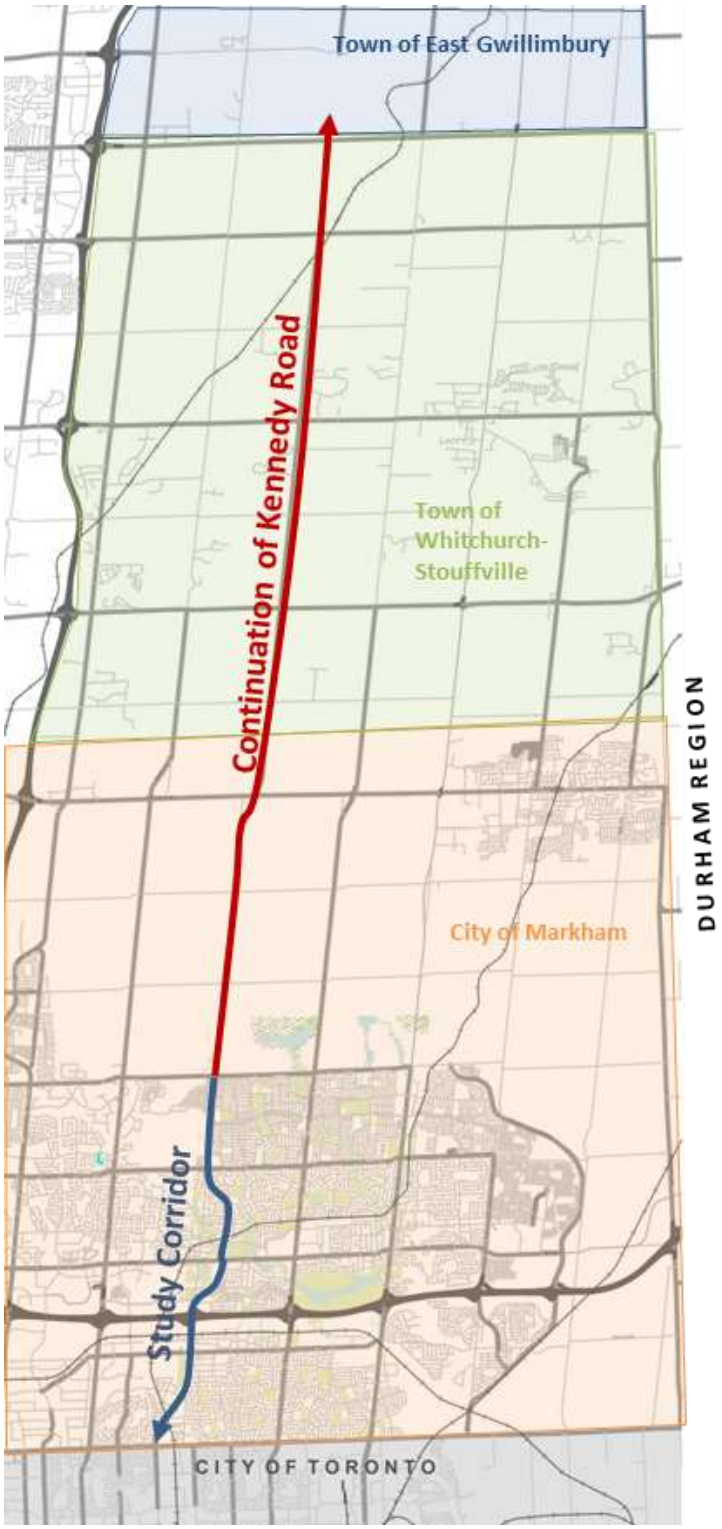
The following section documents current conditions with respect to transportation infrastructure and multi-modal level quality of service.

4.1 Transportation System Inventory

4.1.1 Road Network

Kennedy Road is a north-south arterial road in the eastern part of York Region that connects the Town of Whitchurch-Stouffville and the City of Markham within York Region and the City of Toronto. Kennedy Road is a continuous roadway north of Major Mackenzie Drive up to north of

Davis Drive, where it ends at the Bendor and Graves Tract. South of Steeles Avenue, Kennedy



Kennedy Road is illustrated in **Exhibit** 4-1.

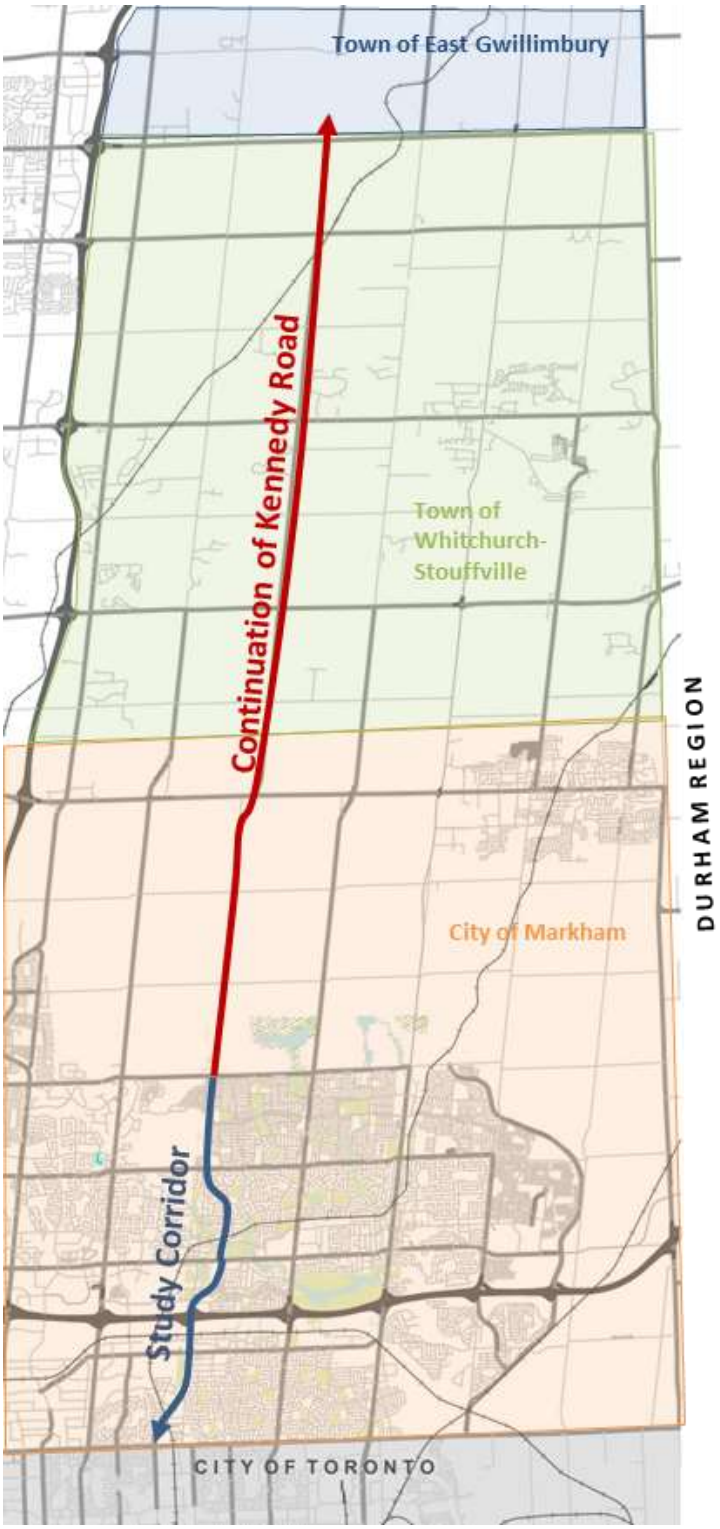


Exhibit 4-1: Kennedy Road Regional Context

A description of the north-south arterial road network within the study area is summarized in **Table 4-1**, and **Exhibit 4-2**, **Exhibit 4-3**, and **Exhibit 4-4** illustrate the roadway configuration within the study corridor.

Table 4-1: Road Characteristics of North-South Arterials in the Study Area

Name	Jurisdiction	Classification	Number of Through Lanes	Posted Speed Limit
McCowan Road	York Region	Regional Arterial Road	Two lanes in each direction from Steeles Avenue to Major Mackenzie Drive	60 km/h (Steeles Avenue to Major Mackenzie Drive)
Kennedy Road	York Region	Regional Arterial Road	Two lanes in each direction from Steeles Avenue to Major Mackenzie Drive	60 km/h (Steeles Avenue to Major Mackenzie Drive)
Warden Avenue	York Region	Regional Arterial Road	Two lanes in each direction between Highway 7 and Major Mackenzie Drive, and between Steeles Avenue to McNabb Street Three lanes in each direction between McNabb Street and Highway 7	60 km/h (Steeles Avenue to Major Mackenzie Drive)

Exhibit 4-2: Road Network Jurisdiction between Steeles Avenue and Major Mackenzie Drive

Exhibit 4-3: Posted Speed Limits and Intersection Control Type on Kennedy Road between Steeles Avenue and Major Mackenzie Drive

Exhibit 4-4: Vehicle Lane Configuration on Kennedy Road between Steeles Avenue and Major Mackenzie Drive

4.1.2 Existing Truck Restrictions

There are currently no truck restrictions on Kennedy Road between Steeles Avenue and Major Mackenzie Drive.

4.1.3 Right-of-Way Characteristics

The existing Kennedy Road right-of-way (ROW) varies along the corridor's length between 20 m and 104 m. A more detailed summary of the existing right-of-way characteristics is provided in **Table 4-2** and planned roadway widths according to the YR-TMP are shown in **Exhibit 4-5**.

Table 4-2: Kennedy Road Existing Right-of-Way Characteristics

Road Link	ROW Width	Roadway Type
Steeles Avenue to 14th Avenue (2.3 km)	28 m to 58 m • ROW generally consistent within this segment between 30 – 40 m • ROW reduced to 28 m in several locations due to commercial properties fronting onto Kennedy Road	Urban
14th Avenue to Highway 7 (2.1 km)	20 m to 68 m • ROW varies substantially within this segment due to 407ETR crossing and CN grade separation north of 14th Avenue • ROW widest south of 407ETR crossing (68 m) • ROW tapers to 20 m south of 407ETR crossing at the CN Rail Crossing • ROW is reduced to approximately 25 – 26 m south of the CN Rail crossing with Hagerman East and West cemeteries on both sides of Kennedy Road	Urban
Highway 7 to 16th Avenue (2 km)	34 m to 98 m • ROW is generally consistent in this segment between 35 to 40 m • Greatest variation and widest section of ROW is at the Stouffville GO Rail Line Crossing at approximately 98 m	Urban
16th Avenue to Major Mackenzie Drive (2 km)	25 m to 55 m • ROW is generally consistent in this segment between 35 m to 40 m • ROW is reduced to approximately 25 m approaching St. Philips-on-the-Hill Cemetery and Bethesda Lutheran Cemetery	Urban

4.1.4 Existing Accesses

The number of existing accesses along Kennedy Road varies throughout the corridor due to changing land uses between arterial roads. Access management procedures limit the number of access points along regional road to optimize the transportation network. The number of access points along the study corridor is generally well-distributed between each major intersection except between 16th Avenue and Highway 7 where the land use is predominantly low-rise residential with commercial units at major intersections. The access points for each section of the corridor separated by major intersection are summarized in **Table 4-3** and illustrated in **Exhibit 4-6**.

Between Steeles Avenue and Major Mackenzie Drive, there are 28 streets that intersect Kennedy Road (including main arterials). Some of these roads are major arterials while others are collectors and local roads.

Table 4-3: Intersections and Driveways on Kennedy Road

Road Link	Intersecting Roads (excluding main arterials)	Commercial Parking Lots/Driveways	Residential Driveways	TOTAL
Steeles Avenue to 14th Avenue	6	17	8	30
14th Avenue to Highway 7	6	11	3	20
Highway 7 to 16th Avenue	5	2	1	8
16th Avenue to Major Mackenzie Drive	7	13	8	28

Exhibit 4-5: Planned Road ROW Width along the Study Corridor

Exhibit 4-6: Existing Accesses along the Study Corridor

4.2 Travel Demand

The following section outlines the distribution of existing population and employment within the study area, the existing travel patterns that these generate, and the resulting modal split for travellers utilizing Kennedy Road.

4.2.1 Population and Employment Context

The existing AM peak hour EMME model (2011) was provided by the Region. Land use assumptions for all the GTA municipalities are listed in **Table 4-4**.

Table 4-4: 2011 Population and Employment Data for Various Regions

Municipality	2011 POP	2011 EMP
Toronto	2,726,763	1,616,228
Durham	636,915	225,530
York	1,075,210	509,858
Peel	1,334,604	685,639
Halton	493,045	250,932
Hamilton	517,509	231,764
GTA+H	6,784,045	3,519,951

In the 2011 horizon year, population and employment in the Kennedy Road study area (bordered by Warden Avenue, McCowan Road, Major Mackenzie Drive, and Steeles Avenue) was over 69,000 and 31,000 respectively.

The population and employment distributions at traffic zone level from the York Region EMME model are shown in **Exhibit 4-7**. The relatively populated areas are found immediately west and east of the study corridor, particularly north of Steeles Avenue and 16th Avenue, whereas high employment nodes are located in the commercial and industry areas approaching west at Warden Avenue.

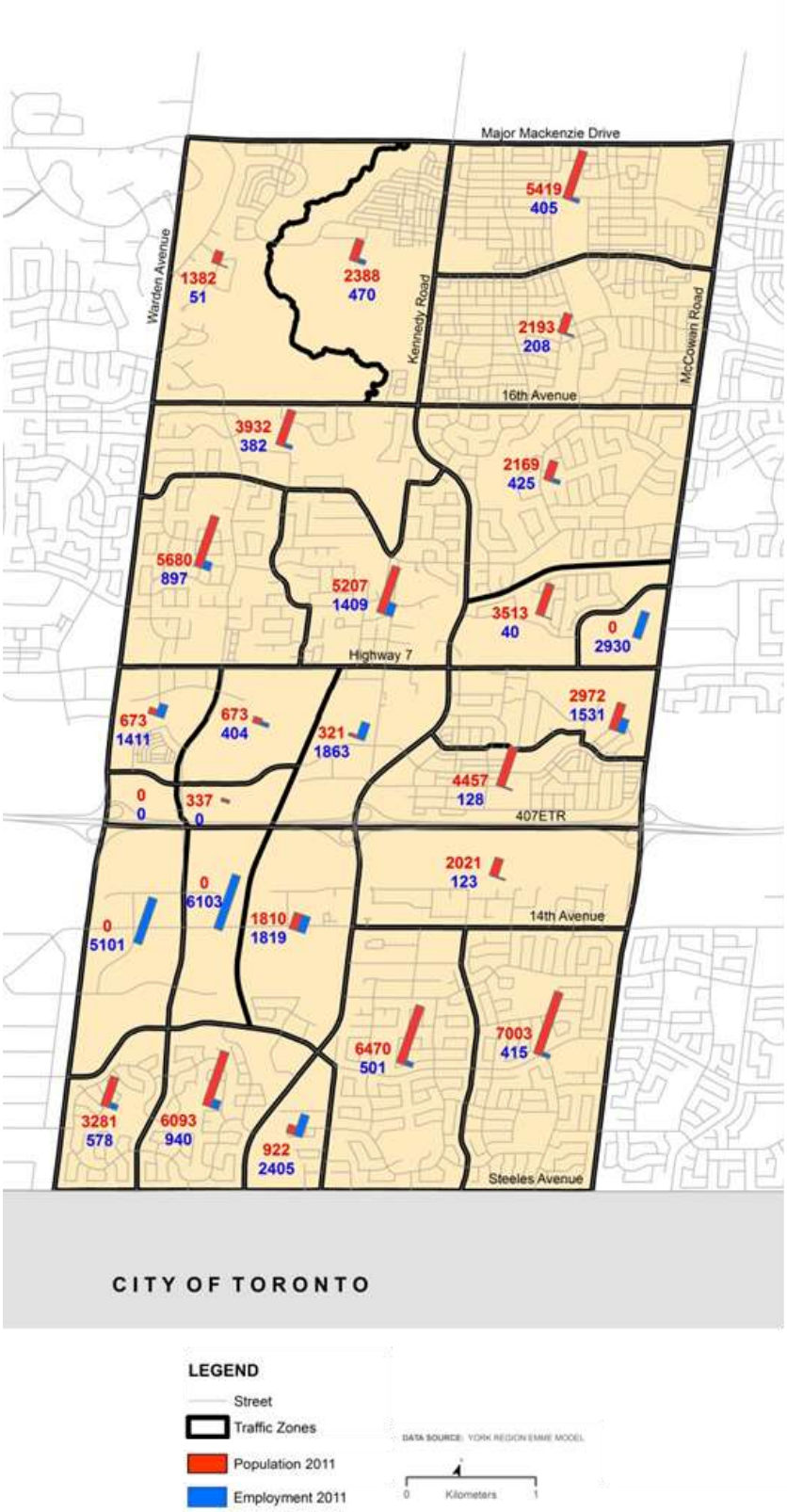


Exhibit 4-7: Traffic Zone Population/Employment

The concentration of industrial areas in the study area west of Kennedy Road, near Birchmount Road serve as a significant generator/attractor of trips during peak hours, many of which utilize Kennedy Road for north-south connectivity from residential areas north and south of Highway 7. These travel patterns are summarized in **Section 4.2.2**.

4.2.2 Existing Travel Patterns

Select link analysis (SLA) is a typical way of capturing origins and destinations of trips utilizing certain links in a network model. SLA was used along the corridor near the 407ETR to identify major travel patterns on Kennedy Road and to capture trips originating from or destined to the study area during AM peak hour. Results from the SLA are shown in **Exhibit 4-8** through **Exhibit 4-11**. Green bars depict the trip productions; red bars depict trip attractions. Link bars (pink) show relative auto volumes (at a 100 to 1 scale).

North of the 407ETR ramp terminals, as shown in **Exhibit 4-8**, the majority of southbound trips are generated in residential areas and are destined to industrial areas west of the study corridor at 14th Avenue and to commercial areas (e.g. Pacific Mall) north of Steeles Avenue. Northbound trips are generated from various residential neighbourhoods along Kennedy Road south of the 407ETR and are primarily destined to the Unionville GO Station, commercial uses located at the south-west corner of Highway 7 and Kennedy Road, and other residential areas by Kennedy Road between 16th Avenue and 14th Avenue.

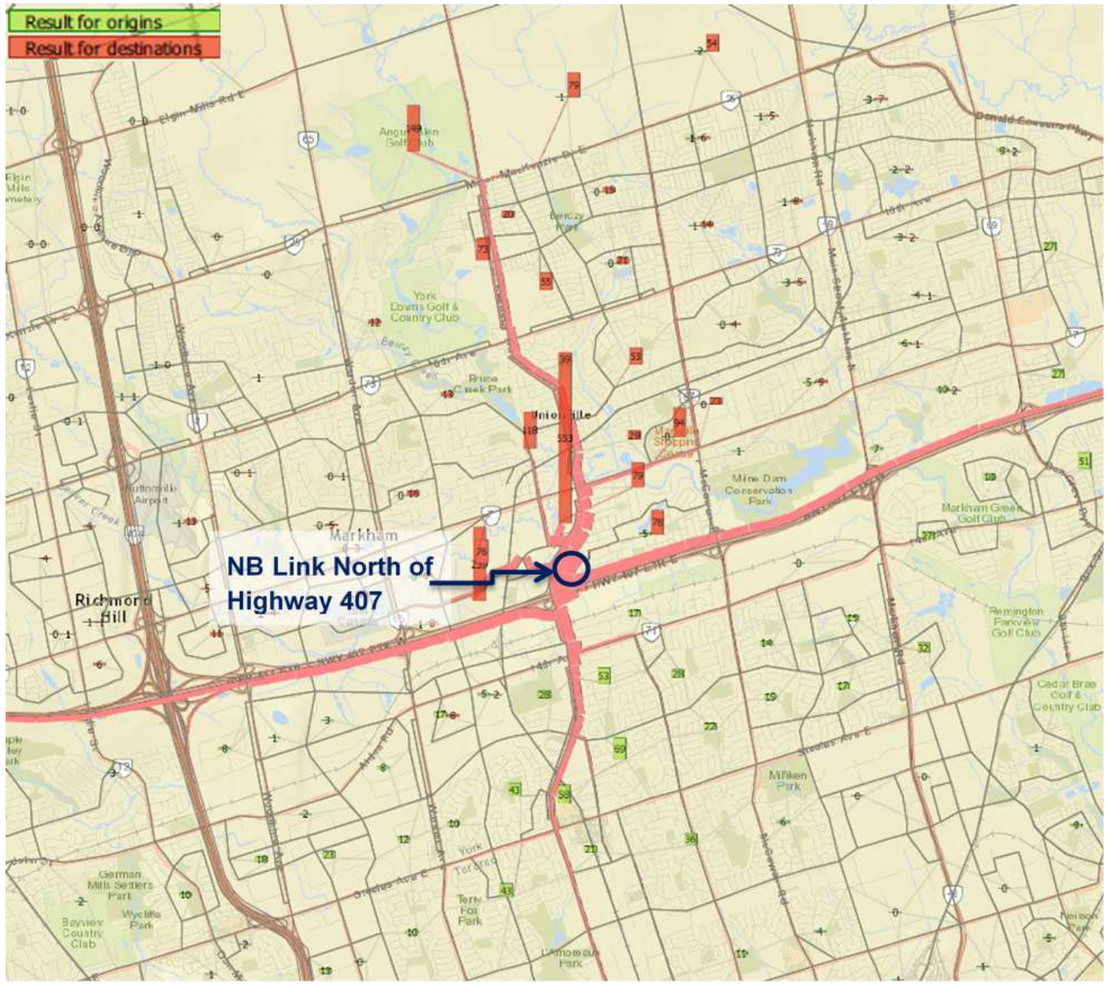


Exhibit 4-8: Select Link Analysis on NB Link North of 407ETR

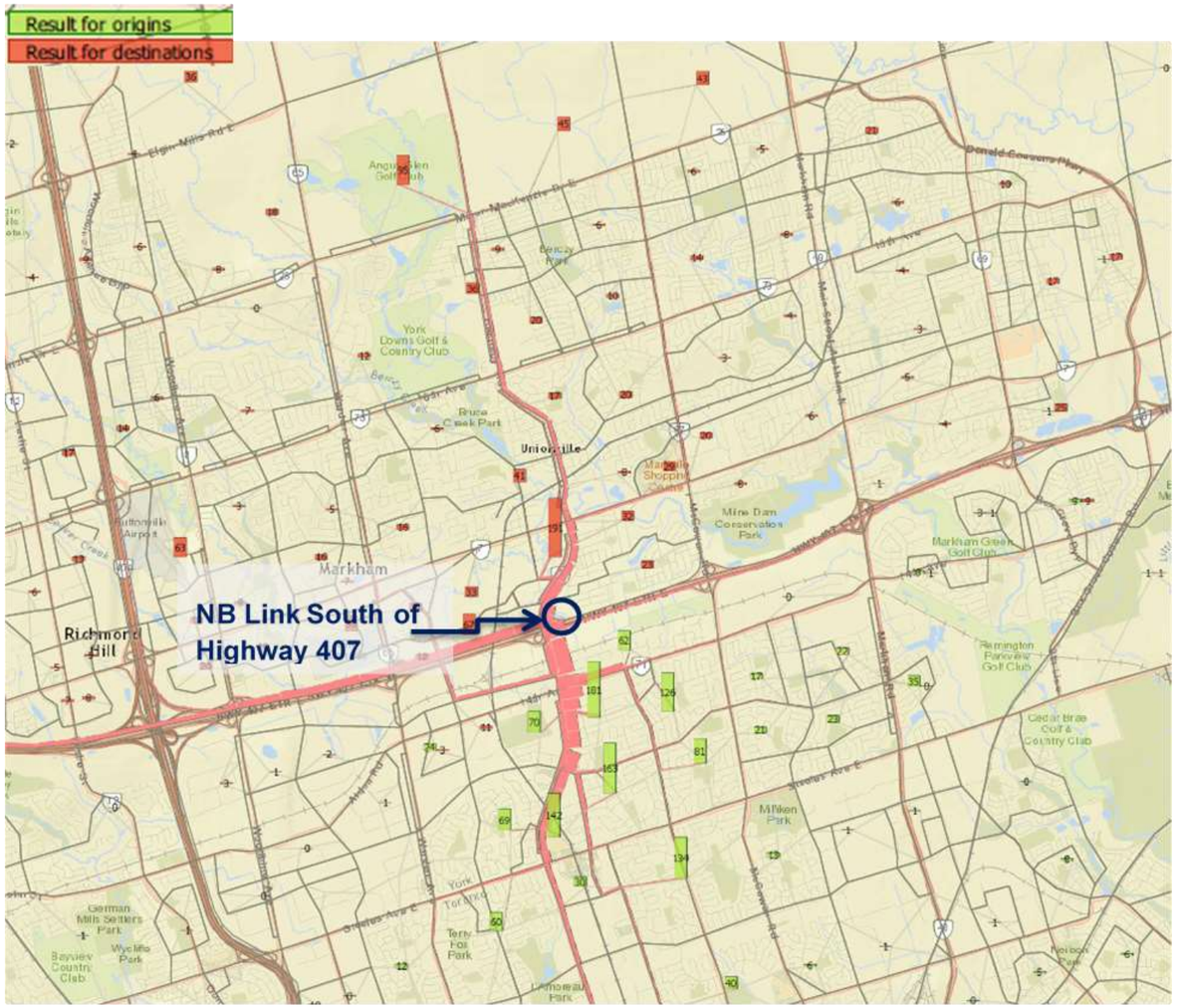


Exhibit 4-9: Select Link Analysis on NB Link South of 407ETR

South of the 407ETR ramp terminals, as shown in **Exhibit 4-10,** the majority of southbound trips originate from various residential neighborhoods north of the 407ETR and are primarily destined to the commercial areas and high schools along Kennedy Road, as well as industrial areas west of 14th Avenue. Northbound trips are largely generated in residential areas along Kennedy Road south-east of the 407ETR and the majority are destined to the plaza at Highway 7 and Kennedy Road, as shown in **Exhibit 4-9.**

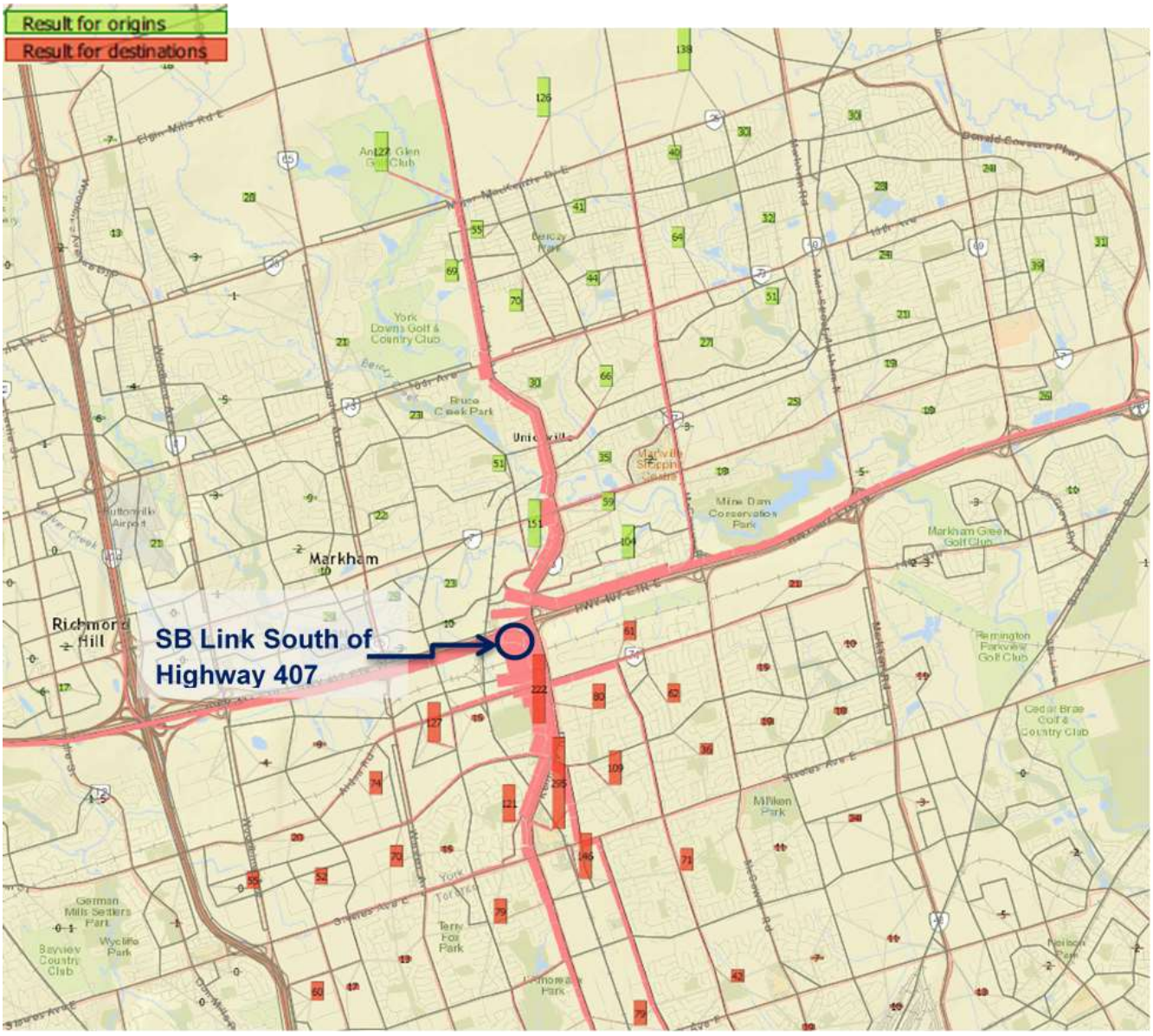


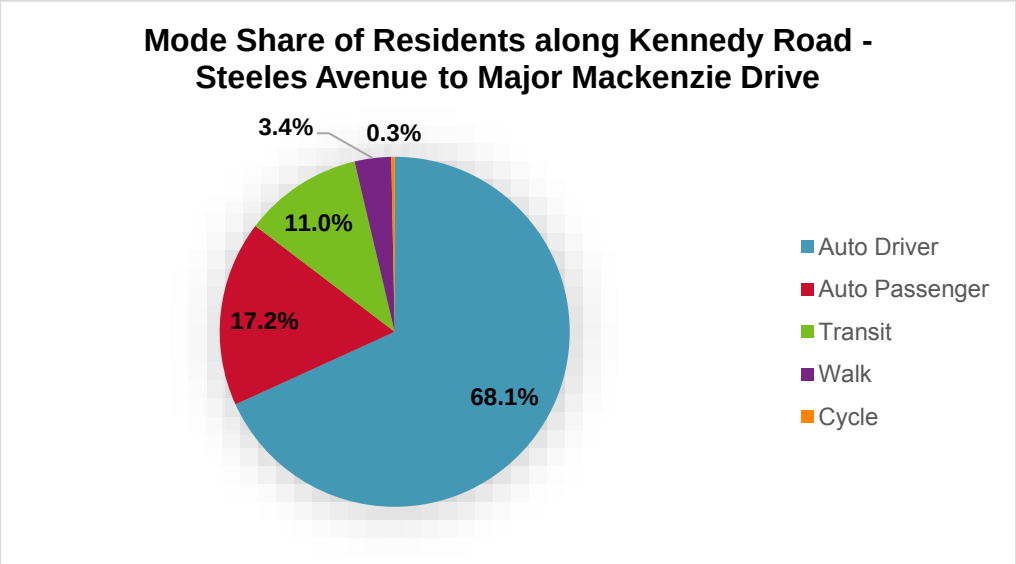
Exhibit 4-10: Select Link Analysis on SB Link South of 407ETR

4.2.3 Average Trip Length and Mode Share

To better identify the opportunities for a modal shift, mode share data from the 2011 Transportation Tomorrow Survey (TTS) was extracted for trips made by residents along Kennedy

Road and for commuting trips destined to the Study Area. In order to create an accurate representation of the mode share for intra-regional trips along the corridor (i.e. local trips by residents along Kennedy Road), versus inter-regional trips (i.e. commuting trips outside the region), all trips on Kennedy Road between Steeles Avenue and Major Mackenzie Drive were considered in this analysis.

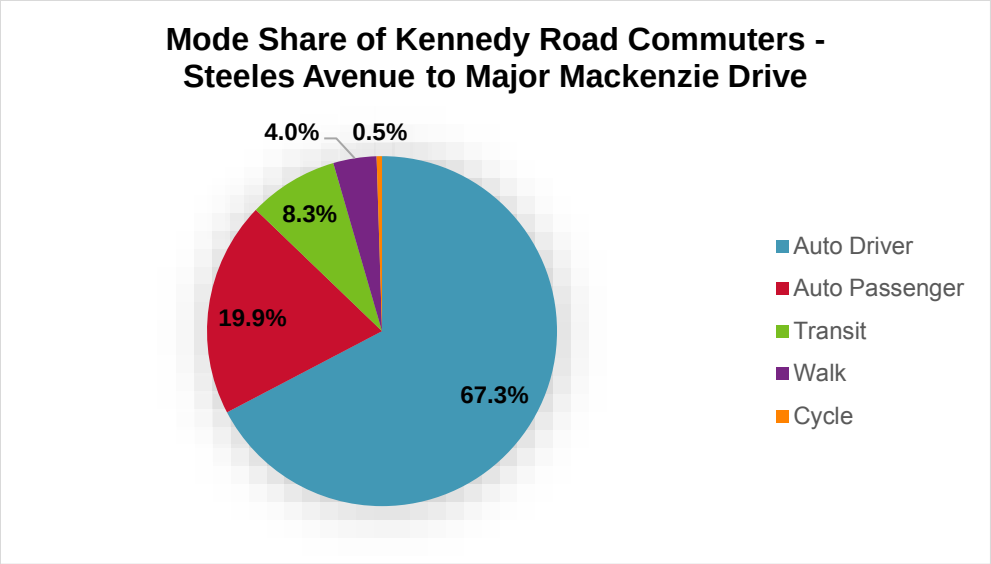
During a typical day, approximately 117,000 trips were completed by people residing along Kennedy Road. Of the total trips, approximately 85% were made by car (driver or passenger), 11% by transit, and 3% by active modes such as walking or cycling, as illustrated in **Exhibit 4-11**.



Source: TTS 2011

Exhibit 4-11: Mode share of residents along Kennedy Road between Steeles Avenue and Major Mackenzie Drive

Over 100,000 trips during a typical day are destined to zones adjacent to Kennedy Road. Car-based trips accounted for a majority share of trips. In fact, approximately 67% of automobile trips were comprised of drivers operating their own vehicle while the remaining 20% were composed of passengers. Only about 8% of total trips to Kennedy Road were made by transit, whereas active modes of transportation were able to reach approximately 4% mode share. The results are summarized in **Exhibit 4-12**.



Source: TTS 2011

Exhibit 4-12: Mode share of commuters destined to Kennedy Road

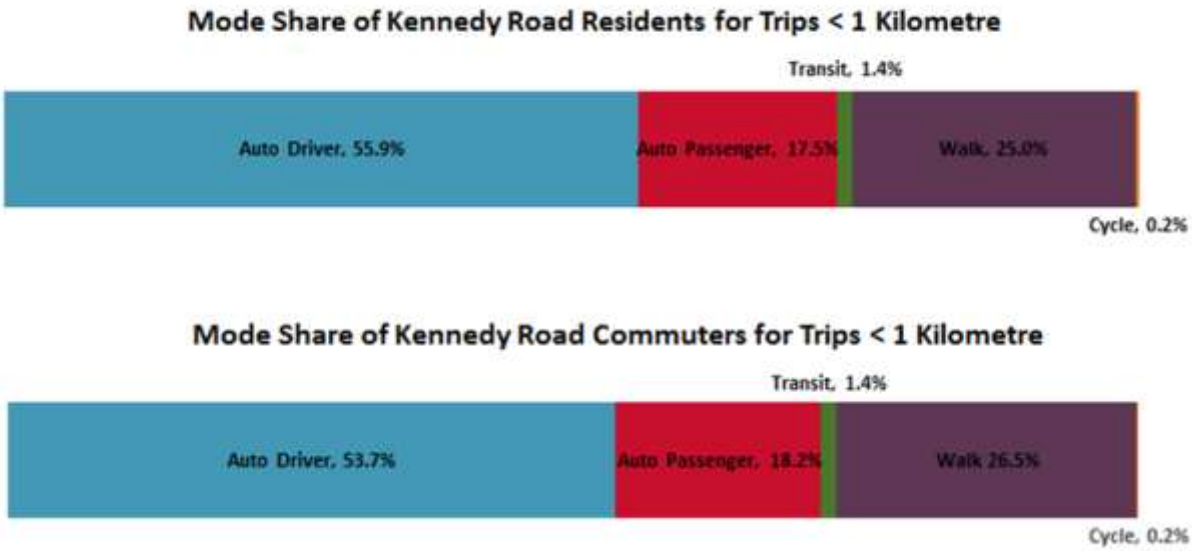
Exhibit 4-11 and **Exhibit 4-12** shows that there is a high propensity to travel by car for both residents and travelers, which is typical of a primarily auto-oriented, low-density area. The presence of the 407ETR and availability of free surface parking at major commercial and retail locations within the study area also likely encourages travel by autos.

There is a 3% difference in transit usage between **Exhibit 4-11** and **Exhibit 4-12**. This indicates that residents of the study corridor are more likely to travel by transit than Kennedy Road commuters.

4.2.3.1 TRIPS OF 1 KM AND SHORTER

There are approximately 9,000 trips of 1 kilometre and shorter in length that are made each day by residents of the Study Area between Steeles Avenue and Major Mackenzie Drive. Of these trips, approximately 73% were completed by car, less than 2% by transit, less than 1% by cycling, and 25% by walking, as illustrated in **Exhibit 4-13**.

The high proportion made by those driving alone indicates that walking and cycling are not attractive alternative modes to driving for short trips (i.e. ≤ 1 km).



Source: TTS 2011

Exhibit 4-13: Mode share of trips by Kennedy Road less than 1 km

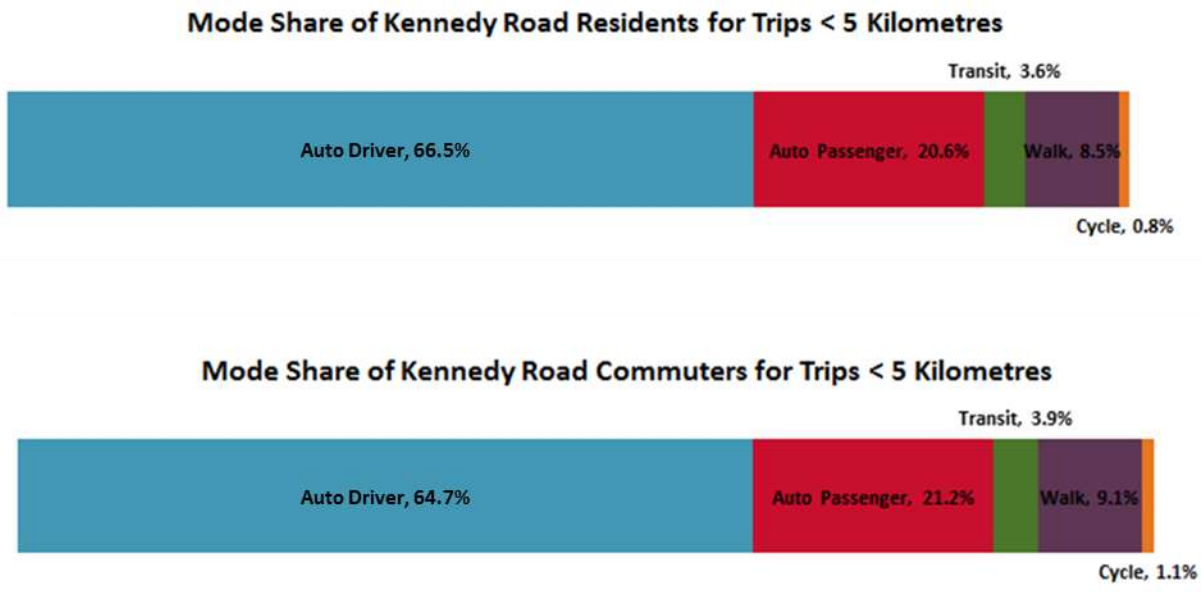
Furthermore, on a typical day, 9,000 commuter trips destined to Kennedy Road were one kilometre or shorter in length. Of these trips, approximately 72% were made by car, less than 2% by transit, less than 1% by cycling, and approximately 27% by walking, as can be seen in **Exhibit 4-13**. As expected for short trips, commuter mode share is similar to that of residents along Kennedy Road. In addition, a slightly lower proportion of trips made by solo drivers suggest a higher carpooling rate. The high instance of car usage still indicates that walking and cycling are not attractive modes compared to driving for these short trips, thus indicating an opportunity to improve the pedestrian and cyclist environment to reduce the auto mode share for short trips.

In both cases, the high driving rates for short trips can be attributed to factors including land use, pedestrian environment, cycling environment, shorter travel times compared to other modes, plentiful free parking, and existing transit service quality. Infrequent buses, many of which have headways of 20 to 30 minutes along the study corridor, as summarized in **Section 4.3.1**, may encourage people to opt for their cars, while a single cash fare compared to pay by distance or timed transfers may also inhibit short trips by transit. The fact that cycling is so uncommon along the corridor for short trips is indicative of the current inhospitable environment resulting from the absence of cycling infrastructure.

4.2.3.2 TRIPS OF 5 KM AND SHORTER

There are approximately 96,000 trips shorter than or equal to 5 kilometres in length that are made each day by residents of the Study Area. Of these trips, approximately 87% were completed by car, almost 4% by transit, and approximately 9% by active modes such as walking or cycling, as illustrated in **Exhibit 4-14**.

The high proportion made by those driving alone indicates that walking and cycling are not attractive alternative modes to driving for short trips (i.e. ≤ 5 km).



Source: TTS 2011

Exhibit 4-14: Mode share of Kennedy Road residents for trips 5 km and shorter

On a typical day, 50,000 commuter trips destined to Kennedy Road were 5 kilometres or shorter in length. Of these trips, approximately 86% were made by car, 4% by transit, and 10% by active modes such as walking or cycling, as can be seen in **Exhibit 4-14**.

A 1% drop in automobile trips hints that commuters to Kennedy Road drive just as often compared to the area's residents. Active modes of transportation are just as popular for commuter trips. The low cycling mode share for trips 5 km and shorter indicates an opportunity for improvements to the cycling infrastructure to reduce auto-dependence.

4.3 Transit

The following section describes the existing transit services on Kennedy Road and transit connectivity to the local and regional transit network. Transit ridership demand along Kennedy Road is also summarized below.

4.3.1 Existing Transit Network

Transit service on Kennedy Road provides connectivity for local residents and businesses to other routes and areas around York Region and the City of Toronto. The existing GO Transit, VIVA, YRT, and TTC network within the study area are described in the following subsections and illustrated in **Exhibit 4-15**. Further analysis on transit demand can be found in **Section 4.3.2**.

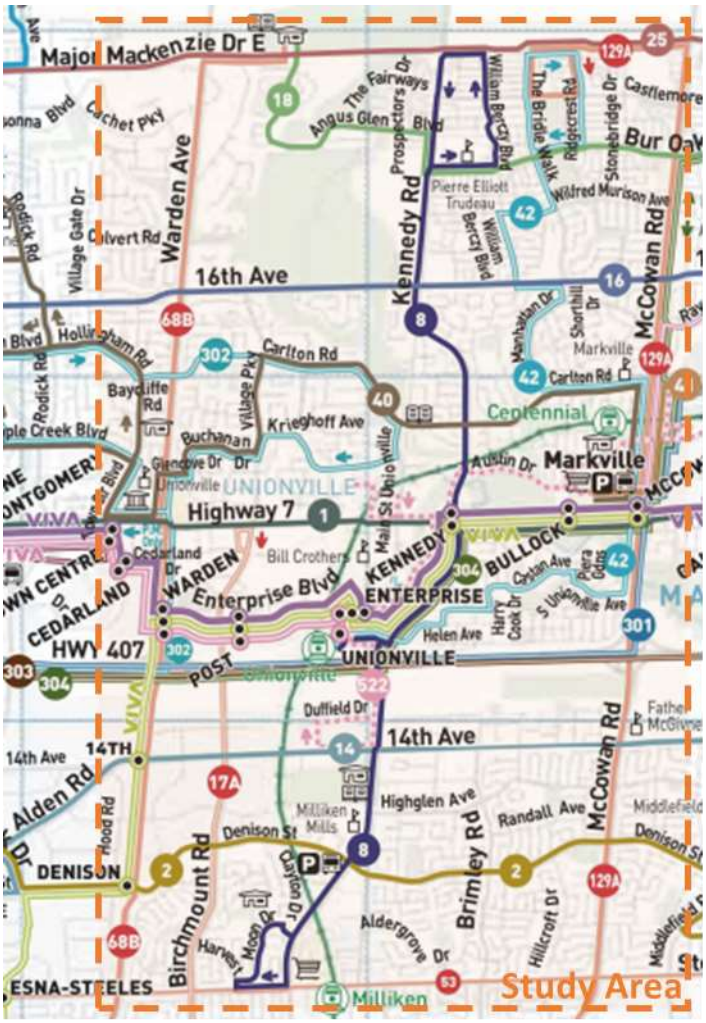


Exhibit 4-15: GO Transit/VIVA/YRT/TTC Service within Study Area

4.3.1.1 GO TRANSIT AND UNIONVILLE GO STATION

Unionville GO Station is located within the study corridor, west of Kennedy Road on YMCA Boulevard, approximately 500 m from Kennedy Road. This station is served by the Stouffville GO Rail Line. There are currently ten southbound GO Trains that stop at this station in the morning and fifteen northbound GO trains that stop at this station in the afternoon/evening. These trains run between the Lincolnville GO Station in Whitchurch-Stouffville and Union Station in Toronto, with multiple stops including Unionville GO Station, from Monday to Friday, and do not run on weekends or holidays. The number of trains arriving and departing at Unionville GO Station increased to one train per hour during non-peak periods on June 26, 2017 as part of Metrolinx's plan to support GO Regional Express Rail. The current train departure schedule from Unionville GO Station for peak hours is shown in **Table 4-5**.

Table 4-5: Weekday GO Train Departure Times, Unionville GO Station

AM Trains Southbound	PM trains Northbound
5:47 AM	12:54 PM
6:27 AM	1:54 PM
7:07 AM	2:54 PM
7:14 AM	3:50 PM
7:46 AM	5:03 PM
8:14 AM	5:33 PM
8:44 AM	6:02 PM
9:49 AM	6:27 PM
10:46 AM	6:55 PM
11:46 AM	7:13 PM
	7:56 PM
	8:39 PM
	9:09 PM
	10:19 PM
	11:09 PM

Source: Information confirmed from YRT.ca on July 14, 2017

GO Buses (Route 70/71 and 51/52/54) also serve Unionville GO Station when trains are not running. Route 70/71 heads southbound towards Union Station during the morning and heads northbound from Union Station in the afternoon. The northern terminus of the northbound buses is Lincolnville GO Station. Route 51/52/54 heads east and west along the 407ETR between York University and Oshawa GO Station. The GO Bus schedule for peak hours is shown in **Table 4-6** and **Table 4-7**.

Table 4-6: Weekday GO Bus Departure Times, Route 70/71 Unionville GO Station

Southbound Buses – Morning Peak Period	Northbound Buses –Evening Peak Period
5:20 AM	3:02 PM
11:31 AM	8:47 PM

Source: Information confirmed from GOTransit.com on July 14, 2017

Table 4-7: Weekday GO Bus Departure Times, Route 51/52/54 Unionville GO Station

Eastbound Buses – Morning Peak Period	Westbound Buses – Morning Peak Period	Eastbound Buses – Evening Peak Period	Westbound Buses – Evening Peak Period
6:40 AM	6:40 AM	4:15 PM	4:10 PM
7:15 AM	6:55 AM	4:31 PM	4:25 PM
7:25 AM	7:10 AM	4:50 PM	4:40 PM
7:45 AM	7:25 AM	5:03 PM	4:55 PM
7:55 AM	7:35 AM	5:20 PM	5:10 PM
8:15 AM	7:50 AM	5:35 PM	5:25 PM
8:25 AM	8:05 AM	5:50 PM	5:40 PM
9:15 AM	8:20 AM	6:05 PM	5:55 PM
9:25 AM	8:35 AM	6:20 PM	6:10 PM
10:15 AM	8:50 AM	6:33 PM	6:25 PM
10:25 AM	9:05 AM	7:01 PM	6:55 PM
11:15 AM	9:20 AM	7:15 PM	7:10 PM
	9:55 AM	7:28 PM	7:25 PM
	10:10 AM		
	10:55 AM		
	11:10 AM		

Source: Information confirmed from GOTransit.com on July 14, 2017

Unionville GO Station includes:

- 1620 parking spaces (985 main lot, 635 east lot)
- Enclosed bus shelters
- Kiss-and-Ride drop-off area
- Bicycle Racks

Unionville GO Station is served by several connecting YRT Routes: 8, 42, 202, VIVA Pink, VIVA Purple, and VIVA Green. Passengers transferring between YRT and GO Transit alight at YRT stations on the north side of YMCA Boulevard at Unionville GO Station.

4.3.1.2 VIVA SERVICE

The following VIVA bus services currently operate near the Kennedy Road corridor with additional details provided in **Table 4-8**.

- VIVA Pink has its eastern terminus at Unionville GO Station and operates along Highway 7 between Town Centre Boulevard and Yonge Street and on Yonge Street between Highway 7 and Finch Station.
- VIVA Purple runs along Highway 7 and Centre Street between Markham-Stouffville Hospital and York University
- VIVA Green has its eastern terminus at McCowan Road and Highway 7 and operates towards the TTC Don Mills subway station at Sheppard Avenue and Don Mills Road

Table 4-8: Existing VIVA Services within the Study Area

Route	Service corridor	Service Direction	From	To	Service type	Peak / Off-Peak Period Frequency
VIVA Pink	Enterprise Boulevard Highway 7	East-west	Unionville GO Station	Finch subway station	Bus Rapid Transit	Unionville GO Station to Finch subway station: 15/15
VIVA Purple	Highway 7	East-West	Markham-Stouffville Hospital	York University	Bus Rapid Transit	Markham-Stouffville Hospital to York University: 15/15 minutes
VIVA Green	Highway 7 Warden Avenue Don Mills Road	East-West North-South (past Warden Avenue)	McCowan and Highway 7	Don Mills subway station	Bus Rapid Transit	Highway 7/McCowan Road to Don Mills subway station: 15/15 minutes

Source: Information confirmed from YRT.ca on July 14, 2017

4.3.1.3 YORK REGION TRANSIT (YRT) SERVICE

The following YRT services operate on or near Kennedy Road and are shown in **Table 4-9** and described below.

- Route 25: service runs between Mackenzie Richmond Hill Hospital and Markham-Stouffville Hospital and intersects the study corridor at Major Mackenzie Drive

- Route 18: service runs between Angus Glen Community Centre and Markham-Stouffville Hospital and intersects the study corridor at Bur Oak Avenue
- Route 16: service runs between Rutherford Road at Ilan Ramon Boulevard to Markham-Stouffville Hospital and intersects the study corridor at 16th Avenue
- Route 8: service runs between Kennedy Road at Major Mackenzie Drive to Kennedy Road at Steeles Avenue, servicing the entire study corridor
- Route 40: service runs between Markville Mall and Woodbine Avenue at Rodick Road, running through the study corridor between Carlton Road and Highway 7
- Route 522: service runs between Hagerman's Corners and 122 Cornell Park Avenue, intersecting the study corridor at YMCA Boulevard
- Route 304: service runs between Mount Joy GO Station and Finch GO Bus Terminal, intersecting the study corridor at YMCA Boulevard
- Route 1: service runs between SmartCentres Markham Boxgrove and Woodbine Avenue at Denison Street, intersecting the study corridor at 14th Avenue
- Route 42: service runs between Unionville GO Station and Major Mackenzie Drive at Ridgecrest Road, running through the study corridor between Carlton Road and South Unionville Avenue
- Route 14: service runs between Denison Street at Woodbine Avenue and SmartCentres Markham Boxgrove, intersecting the study corridor at 14th Avenue
- Route 2: service runs between Finch GO Bus Terminal and Highway 48 at Denison Street, intersecting the study corridor at Denison Street

Table 4-9: Existing YRT Services within Kennedy Road Study Corridor

Route	Service corridor	Service Direction	From	To	Service type	Peak / Off-Peak Period Frequency
YRT 25	Major Mackenzie Drive	East-West	Mackenzie Richmond Hill Hospital	Markham-Stouffville Hospital	Arterial Route	30 minutes/1 hour
YRT 18	Bur Oak Avenue	East-West	Angus Glen Community Centre	Markham-Stouffville Hospital	Arterial Route	30 minutes/1 hour
YRT 16	16th Avenue	East-West	Rutherford Road at Illan Ramon Boulevard	Markham-Stouffville Hospital	Arterial Route	5 minutes/30 minutes
YRT 8	Kennedy Road	North-South	Kennedy Road at Major Mackenzie Drive	Kennedy Road at Steeles Avenue	Arterial Route	5 minutes/36 minutes

Route	Service corridor	Service Direction	From	To	Service type	Peak / Off-Peak Period Frequency
YRT 40	Unionville Local	East-West North-South	Markville Mall	Woodbine Avenue at Rodick Road	Local Service	30 minutes/30 minutes
YRT 522	Markham	East-West North-South	Hagerman's Corners	122 Cornell Park Avenue	Local Service	15 minutes/15 minutes
YRT 304	Mount Joy Express	North-South	Mount Joy GO Station	Finch GO Bus Terminal	Peak Hour Service	5 minutes/20 minutes
YRT 1	Highway 7	East-West	Richmond Hill Centre Terminal	SmartCentres Markham Boxgrove	Arterial Route	5 minutes/5 minutes
YRT 14	14th Avenue	East-West	Smart Centres Markham Boxgrove	Woodbine Avenue at Denison Street	Arterial Route	30 minutes/30 minutes
YRT 42	Berczy Local	North-South	Unionville GO Station	Major Mackenzie Drive at Ridgecrest Road	Peak Hour Service	20 minutes
YRT 2	Denison Street	East-West	Finch GO Bus Terminal	Highway 48 at Denison Street	Arterial Route	20 minutes/30 minutes

Source: Information confirmed from YRT.ca on July 14, 2017

4.3.1.4 TORONTO TRANSIT COMMISSION (TTC) SERVICE

The following TTC bus services operate within vicinity or along the Kennedy Road study corridor and are shown in **Table 4-10** and described below.

- Route 68B: service runs between Angus Glen Community Centre Loop and Warden Avenue at Eglinton Avenue in the City of Toronto
- Route 17A: service runs between Rougeside Promenade at Birchmount Road to Birchmount Road at Eglinton Avenue in the City of Toronto
- Route 129A: service runs between Major Mackenzie Drive at Ridgecrest Road to Scarborough Town Centre in the City of Toronto
- Route 53: service runs between Finch Station and Staines Road at Mantis Road, intersecting the study corridor at Steeles Avenue

Table 4-10: Existing TTC Services within or near Kennedy Road Study Corridor

Route	Service corridor	Service Direction	From	To	Service type	Peak / Off-Peak Period Frequency
TTC 68B	Warden Avenue	North-South	Angus Glen Community Centre	Warden Avenue at Eglinton Avenue	Arterial Route	10 minutes/20 minutes
TTC 17A	Birchmount Road	North-South	Rougeside Promenade	Birchmount Road at Eglinton Avenue	Arterial Route	10 minutes/30 minutes
TTC 129A	McCowan Road	North-South	Major Mackenzie Drive and Ridgecrest Road	Scarborough Town Centre	Arterial Route	10 minutes/30 minutes
TTC 53	Steeles Avenue	East-West	Finch Station	Staines Road at Mantis Road	Arterial Route	3 minutes/10 minutes

Source: Information confirmed from TTC.ca on July 14, 2017

4.3.2 Transit Ridership Demand

As described in **Section 4.3.1**, the study area between Steeles Avenue and Major Mackenzie Drive is served by one primary arterial bus route – YRT Route 8 – which has headway of approximately 15 minutes during peak periods.

As expected, the majority of existing ridership is concentrated at key transit connections such as the Unionville GO station and major arterials with connecting transit services such as Steeles Avenue and Highway 7 in both directions. In the northbound direction, Highway 7 has approximately 150 daily boardings and alightings, with Steeles Avenue and Unionville GO station seeing approximately 130 each. In the southbound direction, Highway 7 still observed highest boarding/alighting with approximately 160 daily commuters. Steeles Avenue, Unionville GO Station, and Bur Oak Avenue have approximately 120 each. Detailed transit ridership, boarding and alighting information for daily, AM peak period and PM peak period for northbound and southbound travel, are shown in **Exhibit 4-16** through **Exhibit 4-21**.

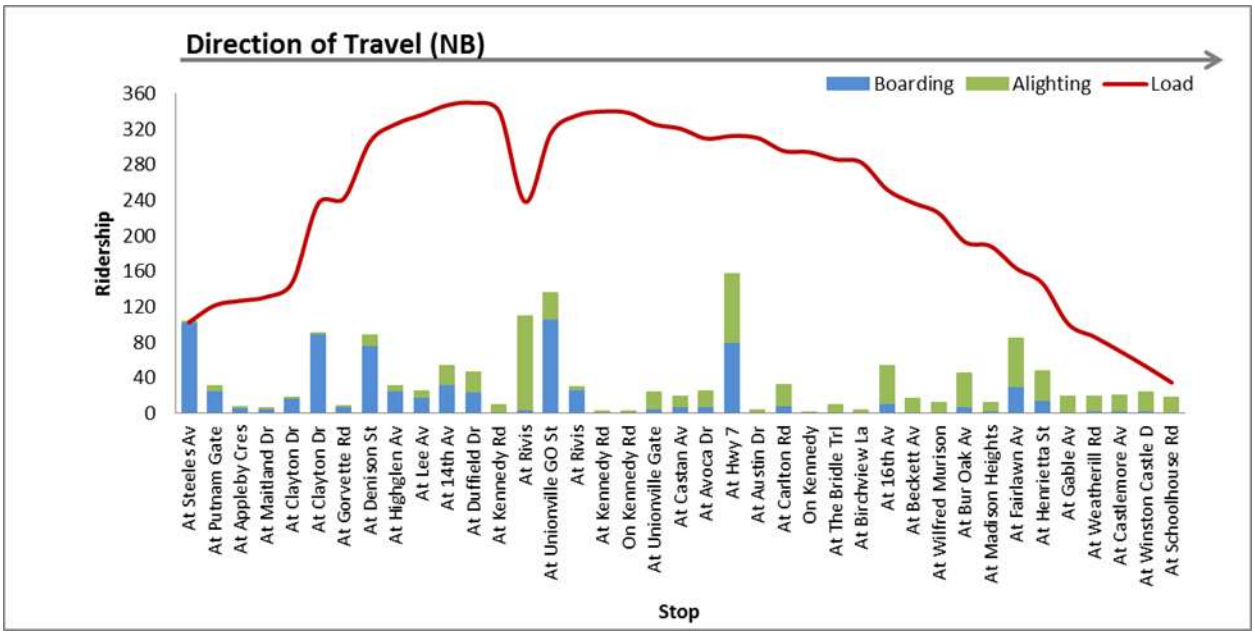


Exhibit 4-16: Northbound (NB) Total Daily Ridership (Route 8)

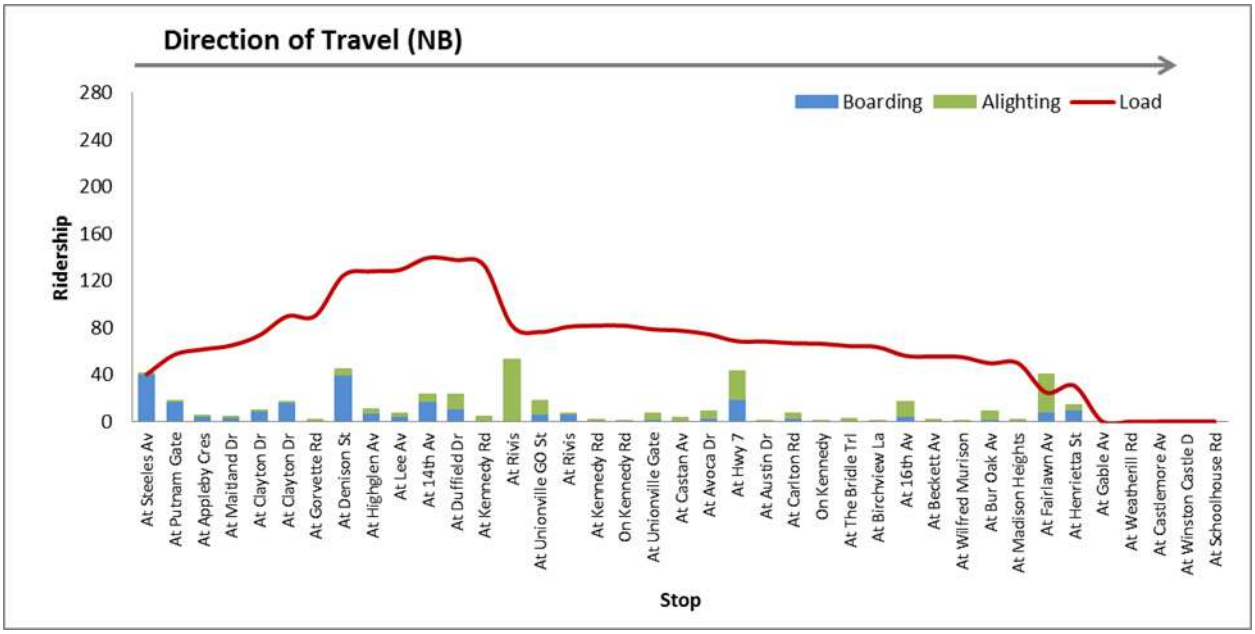


Exhibit 4-17: Northbound (NB) AM Peak Period Ridership (Route 8)

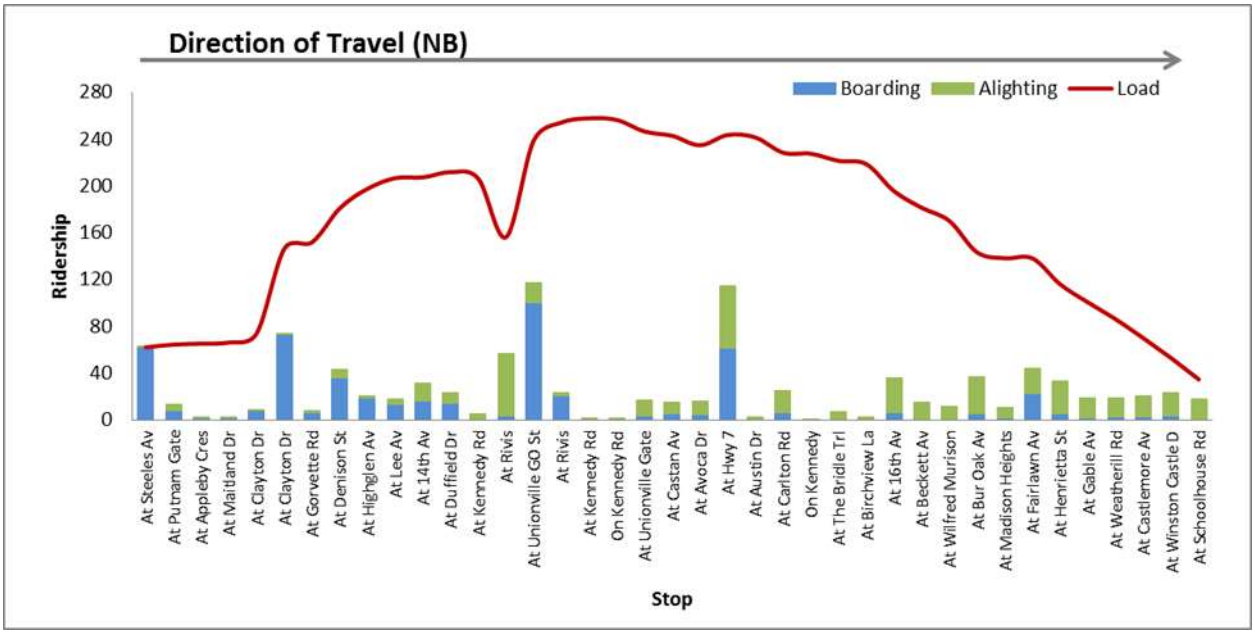


Exhibit 4-18: Northbound (NB) PM Peak Period Ridership (Route 8)

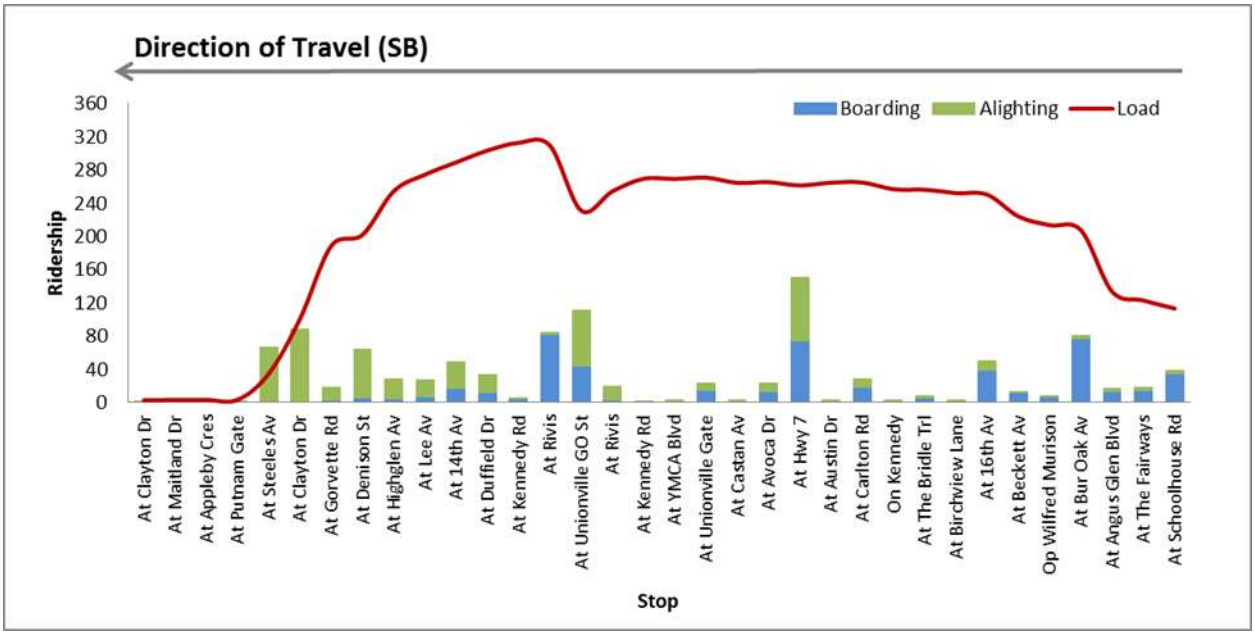


Exhibit 4-19: Southbound (SB) Total Daily Period Ridership (Route 8)

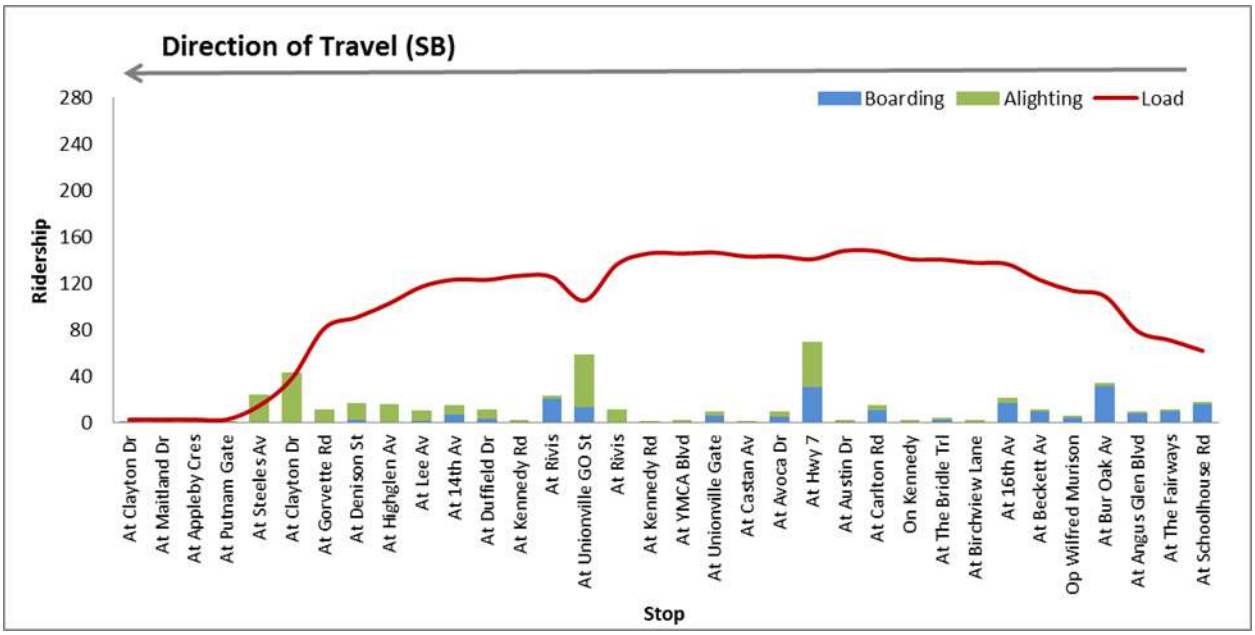


Exhibit 4-20: Southbound (SB) AM Peak Period Ridership (Routes 8)

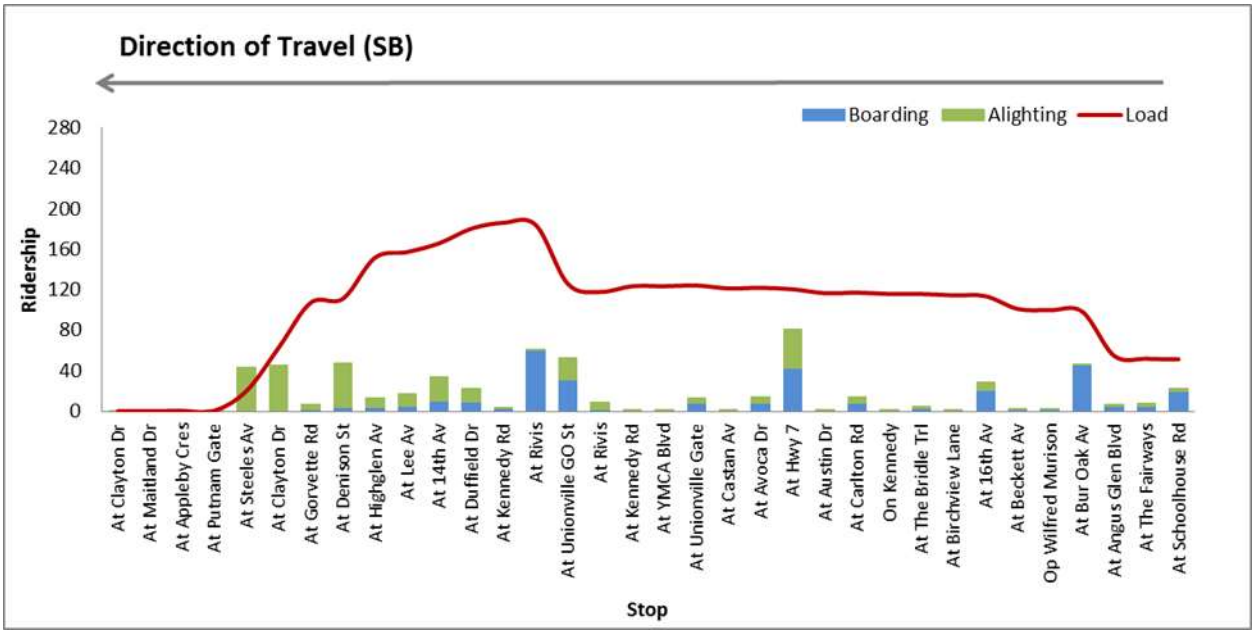


Exhibit 4-21: Southbound (SB) PM Peak Period Ridership (Routes 8)

For all directions and peak periods, the majority of boardings and alightings occurs at major intersections where transfers are made between connecting bus routes, such as Highway 7, Steeles Avenue, and Unionville GO Station. A high number of alightings are also observed between Steeles Avenue and Denison St, where the primary commercial (Pacific Mall) and industrial areas of the corridor are located, and at Rivis Road, which is situated across from the Markham YMCA Centre.

4.4 Pedestrians

4.4.1 Pedestrian Network

There are continuous sidewalks on the east and west side of Kennedy Road between Steeles Avenue and Major Mackenzie Drive. Sidewalks are at least 1.5 metres wide along the study corridor.

There is one major trail (Rouge Valley Trail) connection that provides an underpass at Kennedy Road approximately 270 metres north of Highway 7 in proximity to Austin Drive. The Rouge Valley Trail will connect to Toogood Pond and Bob Hunter Memorial Park in the future.

Pedestrians are able to cross Kennedy Road using crosswalks located at all signalized intersections. The average signalized intersection spacing is approximately 375 metres and the maximum distance between signalized intersections is 780 meters (i.e. between the Bridle Trail and Carlton Road). There are 24 signalized intersections along the study corridor distributed as follows:

- Steeles Avenue to 14th Avenue: 7 signalized intersections (321 m average spacing)
- 14th Avenue to Highway 7: 7 signalized intersections + 1 pedestrian signal (323 m average spacing)
- Highway 7 to 16th Avenue: 5 signalized intersections (430 m average spacing)
- 16th Avenue to Major Mackenzie Drive: 5 signalized intersections (502 m average spacing)

The existing pedestrian network is shown in **Exhibit 4-23**.

4.4.2 Pedestrian Demand

Pedestrian volumes were estimated from intersection 8-hour turning movement counts. **Exhibit 4-24** illustrates the combined AM and PM peak pedestrian volumes at all intersections along the corridor. Pedestrian activity with combined peak hour volumes greater than 100 persons was noted at the following locations along the corridor:

1. Steeles Avenue
2. Clayton Drive
3. Denison Street
4. Highglen Avenue
5. Highway 7

The amount of pedestrian activity generally increases from the north end to the south end of the study corridor, which generally correlates to the change in land use and urban density along Kennedy Road. Toward the south of the corridor, there is generally a higher density of mixed use development, including various built up residential, commercial, and industrial neighborhoods, which facilitate high pedestrian volumes. It is noted that pedestrian volumes peak at Steeles Avenue, which serves 700 persons over AM and PM peak hours.

4.4.3 Pedestrian Quality of Service

A multi-modal level of service (MMLOS) analysis was used to better understand the existing pedestrian conditions along the corridor. The methodology employed for this study is based on the City of Ottawa MMLOS Guidelines, September 2015. These guidelines were preferred over other similar approaches for their intuitiveness, accommodation of contemporary facility designs, and explicit recognition that pedestrian level of service (PLOS) should be based on user comfort, safety, and convenience and are subjective in nature. The results of the PLOS evaluation are graphically summarized in **Exhibit 4-25**.

As shown in **Exhibit 4-22**, the PLOS methodology is based upon cross-section and roadway characteristics such as sidewalk and boulevard width, traffic volumes, presence of on-street parking, and vehicle speed limits. Scoring ranges as follows:

- **PLOS 'A' to 'B'** – Attractive to most pedestrians including locations where lower vehicle speeds and volumes, wider sidewalks, and larger boulevards with ample separation from moving traffic are present.
- **PLOS 'C' to 'D'** – Elements may not appeal including narrow sidewalks, lack of separation from traffic, longer crossing distances, etc.
- **PLOS 'E' to 'F'** – Facilities under this rating are not adequate, this includes locations without any facility or where no buffer is provided adjacent to high speed high volume traffic. At the intersection level, no cross-walks are provided.

Exhibit 4-22: Pedestrian Level of Service (PLOS) Rankings

PLOS is calculated at the intersection and mid-block segment in recognition that, unlike vehicular LOS, a pedestrian's experience is determined by the conditions both between crossings and at the crossing itself (e.g., a high quality pedestrian crossing may or may not connect to a sidewalk facility at either end). The methodology generally follows a weakest link approach. This means that the segment is scored at its weakest portion to account for the fact that the pedestrian experience is best defined by the most dangerous and/or stressful segment. An example of how the weakest link approach is applied along the corridor is at Kennedy Road over the 407ETR, as illustrated in **Exhibit 4-26**, where the absence of a boulevard and high traffic volumes and operating speeds at this location contribute to undesirable pedestrian level of service for this segment.

Exhibit 4-23: Existing Pedestrian Network along the Study Corridor

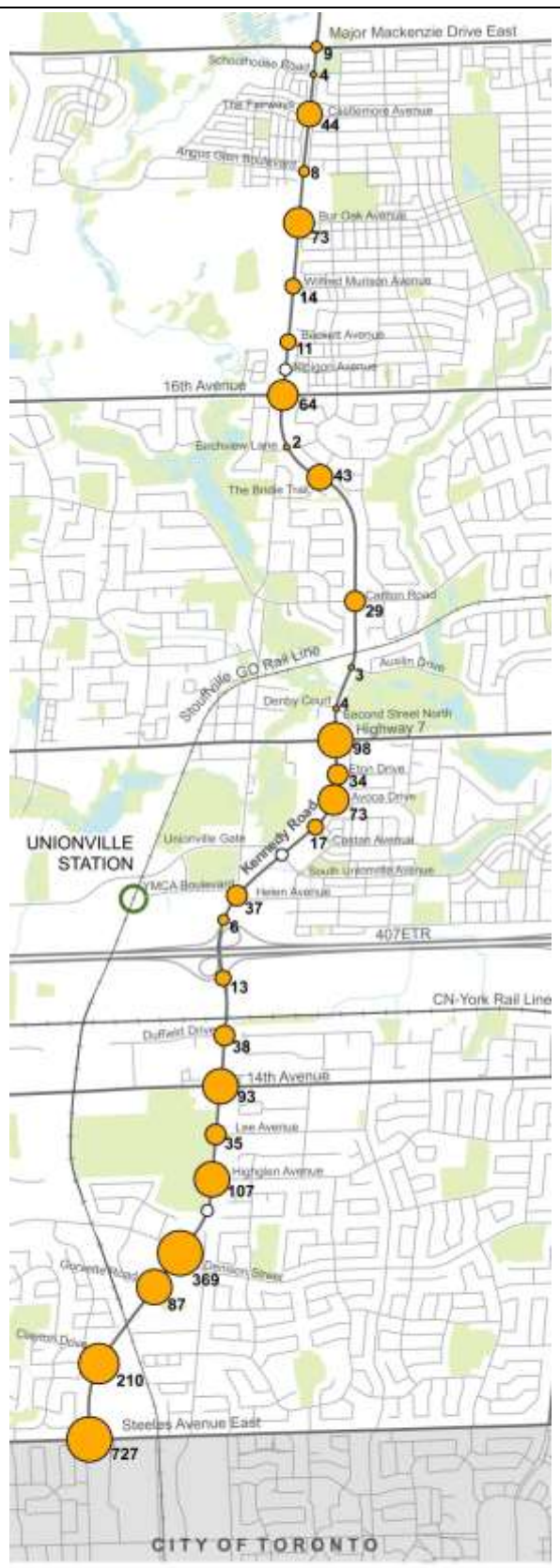


Exhibit 4-24: Existing Pedestrian Volumes at Intersections along the Study Corridor

Exhibit 4-25: Pedestrian Level of Service along the Study Corridor

Exhibit 4-26: Example of Less Desirable Pedestrian Environment (Kennedy Road over 407ETR), Segment PLOS 'F'

The methodology for the evaluation of *segment* PLOS uses a look-up table approach based on cross-section and roadway characteristics (e.g., sidewalk and boulevard width, traffic volumes, presence of on-street parking, and operating speed). Intersection PLOS uses the Pedestrian Exposure to Traffic at Signalized Intersections (PETSI) and assigns points based on a number of crossing characteristics (e.g., crossing distance, presence of a median, presence of a crossing refuge, turning restrictions, right hand turn characteristics, curb radii, etc.). This is calculated for each crossing (e.g., north, south, east, west) and their averages are computed to derive an overall intersection PLOS; however, each crossing's score should be considered individually when recommending improvements.

The look, feel, and function of the study corridor changes along its length as does the level of comfort experienced by pedestrians. The segment PLOS scores range between D and F for the study corridor. The low scores can be attributed to high operating speeds along Kennedy Road (i.e. greater than 60 km/hr), high traffic volumes (i.e. greater than 3000 AADT), and 1.5 metre sidewalks (minimum width to meet provincially accessible standards). The lowest scores occur where there is no buffer between the roadway and the sidewalk (i.e. segment PLOS F).

Similarly, intersection PLOS varies along the study corridor with the majority of intersections between PLOS 'D' and 'F'. Intersection PLOS scores of 'D' are indicative of somewhat shorter crossing distances (3-4 lanes), relatively small corner radii, and zebra crosswalk treatments. Scores of 'F' tend to apply to intersections with longer crossing distances, standard transverse markings and large corner radii. For example, the intersection of Kennedy Road and 14th Avenue as shown in **Exhibit 4-27** has an intersection PLOS of 'F' since pedestrians must cross a total of 6-7 lanes, limited traverse markings, and high turn speeds allowed by the large turning radii.

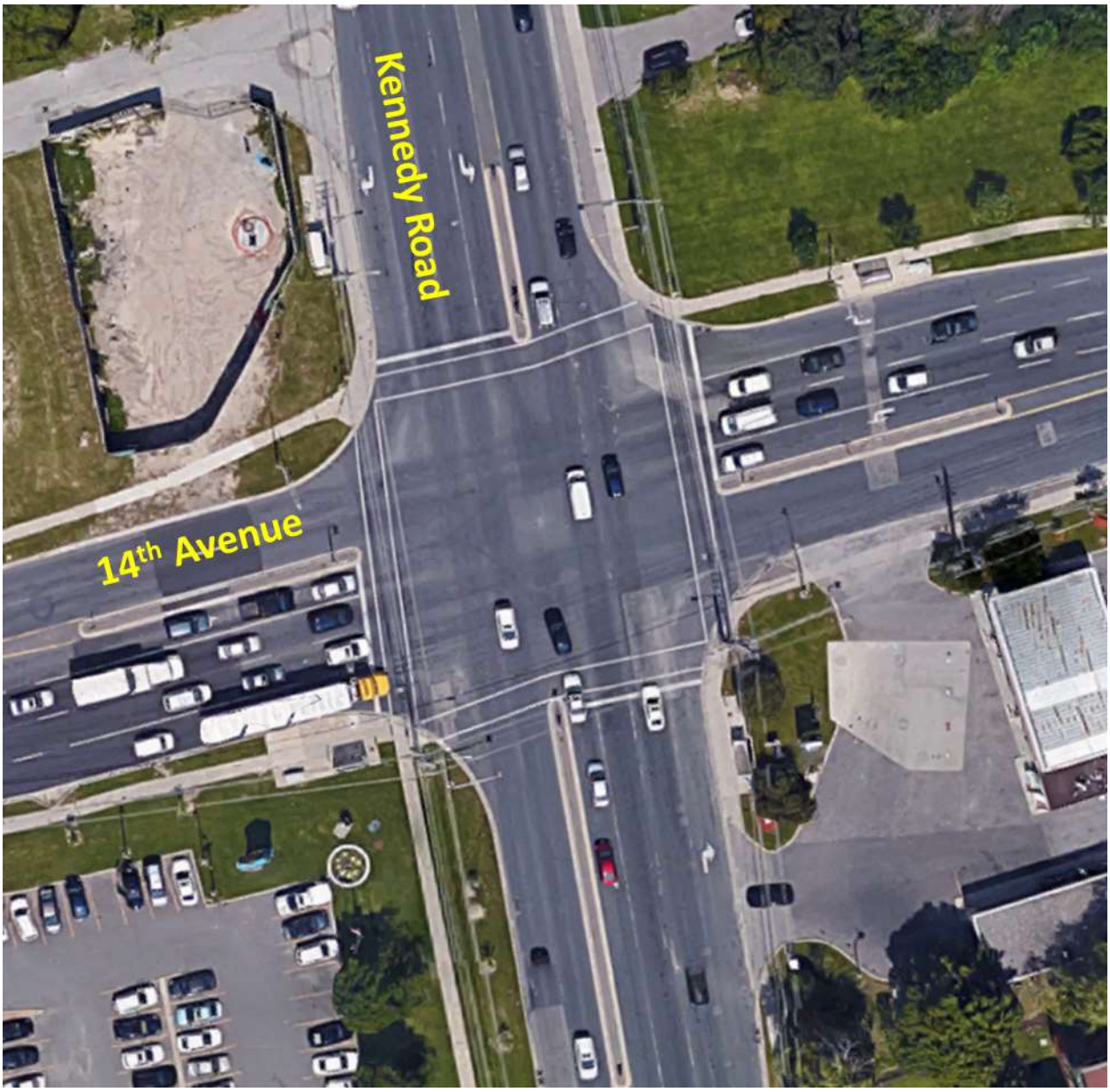


Exhibit 4-27: Kennedy Road and 14th Avenue, Intersection PLOS 'F'

4.5 Cycling

4.5.1 Cycling Network

In the study corridor, cyclists are required to share the roadway with motorists. At present, there are no designated cycling facilities on Kennedy Road. The YR-TMP notes that separated cycling facilities are planned for Kennedy Road; however the individual configurations will depend on the future typical cross-sections identified through the Class EA process. **Exhibit 4-29** shows the location of the existing and planned bicycle network, per the Region's Pedestrian and Cycling Master Plan. Planned facilities on Kennedy Road will form a connected network of safe cycling infrastructure in York Region and will make connections to other regional and local routes on 16th Avenue, Highway 7, and 14th Avenue as well as the existing and potential trail connections.

4.5.2 Cycling Demand

Cycling demand along the corridor was estimated using geo-referenced activity data acquired by the Region from Strava, Inc. Strava is a free mobile application allowing members to record their physical activity and is popular with runners and cyclists in the Region. The Region's Strava dataset covers the period from November 2013 to December 2014, representing data from 4,577 active Strava members. A total of 51,381 activities were recorded during this time period resulting in approximately 2.3 million record data points—a data point is recorded for each instance a user passes a node (primarily intersections) on a logged trip.

While it is important to acknowledge the limitations of the data—primarily that the data is heavily skewed to recreational trip purposes as opposed to utilitarian purposes such as commuting—the dataset can still provide valuable insight into usage patterns in the area. For example, the data may indicate which routes are repelling cyclists and which are attracting, allowing for a more nuanced discussion when considering improvements.

Exhibit 4-30 represents the number of unique cycling trips per street segment (not representative of total cycling trips) giving an indication of a street's popularity amongst recreational cyclists in the area as well as the combined AM and PM peak hour cycling movements at study intersections. Cycling demand is modest and generally constant along the study corridor given that cyclists must travel in mixed traffic. Higher cycling volumes are observed (according to the Strava data) north of Highway 7 along Main Street Unionville and towards Unionville Gate, where there are separated cycling facilities.

4.5.3 Cycling Quality of Service

Similar to pedestrian level of service, MMLOS analysis was used to estimate the quality of the cycling environment along Kennedy Road. As noted previously, the methodology employed for this study is based on the City of Ottawa's MMLOS Guidelines. These guidelines were selected over other variations mainly for their intuitiveness, accommodation of contemporary facility designs, and explicit recognition that bicycle LOS should be based on user comfort, safety, and convenience and are thus subjective in nature.

As shown in **Exhibit 4-28**, bicycling level of service (BLOS) is calculated at the intersection and mid-block in recognition that, unlike vehicular LOS, a cyclist's experience is determined by the conditions both between crossings and at the crossing itself. Facility type is a key factor for segment BLOS scores as follows:

- **BLOS 'A' to 'B' –** Physically separated facilities such as cycle tracks, protected bike lanes, and multi-use paths (MUP) are attractive to most cyclists
- **BLOS 'C' to 'D' –** Designated bike lanes adjacent to high speed traffic lanes or shared facilities on low volume, low speed streets with wide curb lanes provide some comfort but the majority of cyclists typically will not cycle
- **BLOS 'E' to 'F'** – Non-separated, shared roadways with high volume traffic volume and speeds, and no accommodations at intersections

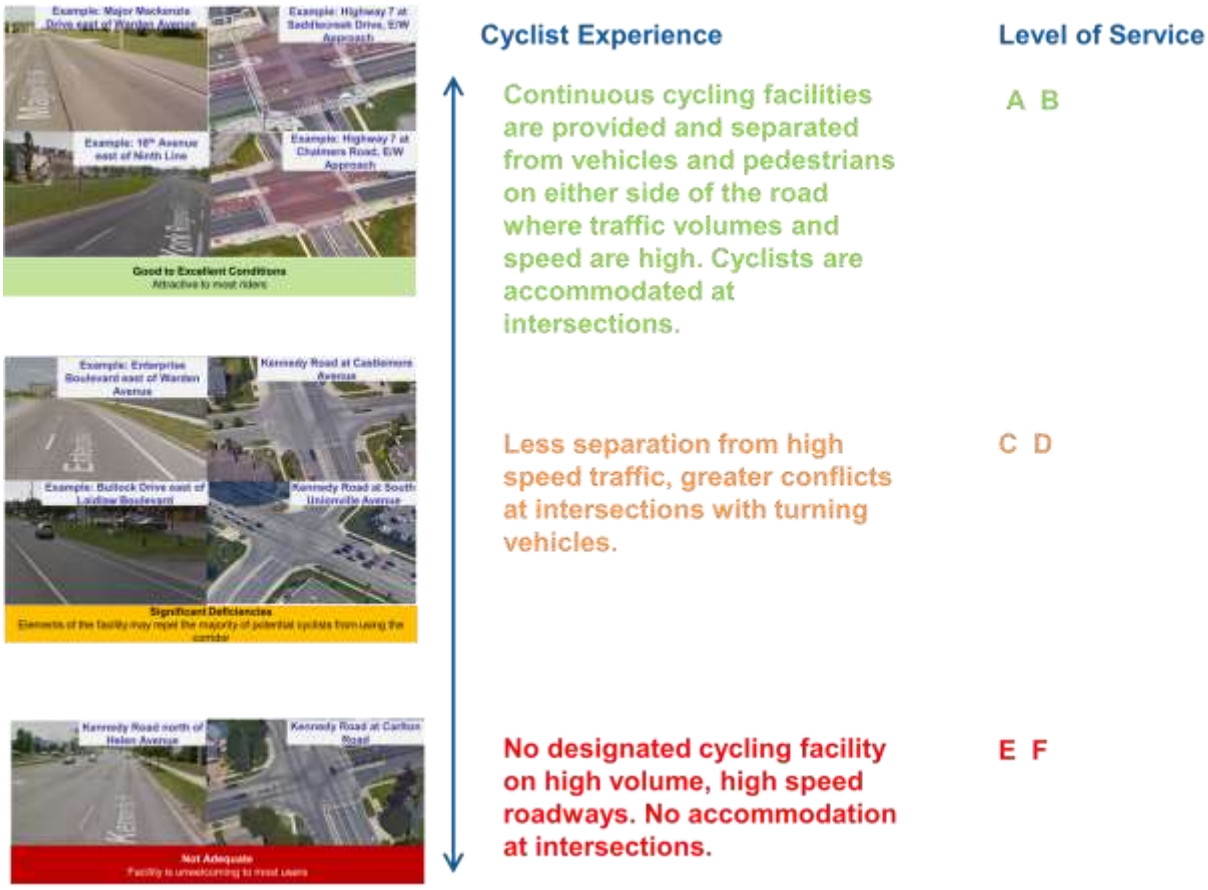


Exhibit 4-28: Bicyclist Level of Service (BLOS) Rankings

The BLOS methodology is similar to the PLOS method, and is based on roadway characteristics and facility type and quality. The methodology measures each segment's and intersection's level of traffic stress (LTS) experienced by the cyclist, established in the Mineta Transportation Institute report no. 11-19. Each LTS score is associated with a category of cyclist (e.g. "all ages" to "very

confident cyclists only") and to a letter score from A to F. Segment BLOS are calculated using a look-up table approach and considers facility type, street width, operating speed, and parking characteristics. As with segment PLOS, segment BLOS is calculated using a weakest link approach, meaning that the lowest scored portion of a segment is used to calculate its BLOS. This is in line with the methodology's user-centric focus which evaluates a user's perceived safety from a network perspective (in this case the segment). For example, there may be a high quality cycle track for 50 m between intersections but if this abruptly ends between intersections to become a mixed-traffic facility on a high speed roadway, it's the latter portion that would define the comfort level experienced by the cyclist. Intersection BLOS is calculated for each approach and for both left and right turning conditions. Scores are evaluated using a look-up table approach. For a typical 4-way intersection, eight scores are calculated—a left and right for each approach. The average of all eight scores is used to determine the intersection BLOS.

Segment BLOS is most sensitive to facility type, with physically separated bikeways such as cycle tracks, protected bike lanes and multi-use paths receiving a score of 'A'. Scores for mixed-traffic and on-street cycling lanes (without separation) are highly dependent on traffic volume and speed as well as facility width (if applicable). A quiet 2-lane residential street with vehicle speeds less than or equal to 40 km/h, for example, would score an 'A' while the same mixed-traffic facility would score an 'F' if the speeds were greater than 60 km/h. Mixed traffic conditions with varying operating speeds and street widths would generally score lower – 'D' to 'F'.

The study corridor between Steeles Avenue and Major Mackenzie Drive does not accommodate cyclists in a separate or designated facility and they ride in mixed traffic. The segment BLOS is 'F' for the entire study corridor, due to the four lane cross-section and 60 to 70 km/h operating speed.

Intersections do not accommodate cyclists making left or right turns in a controlled manner. Cyclists operate in mixed traffic and are subject to crossing several lanes to make left turns and traversing long right turn lanes. The majority of intersections receive an intersection BLOS between 'E' and 'F', as is the case at major intersections with Kennedy Road (i.e. Steeles Avenue, 14th Avenue, Highway 7, 16th Avenue, and Major Mackenzie Drive) . Intersections with side streets receive a score of 'D', such as at Unionville Gate, Beckett Avenue, and Avoca Drive.

The results of the BLOS evaluation are graphically summarized in **Exhibit 4-31**.

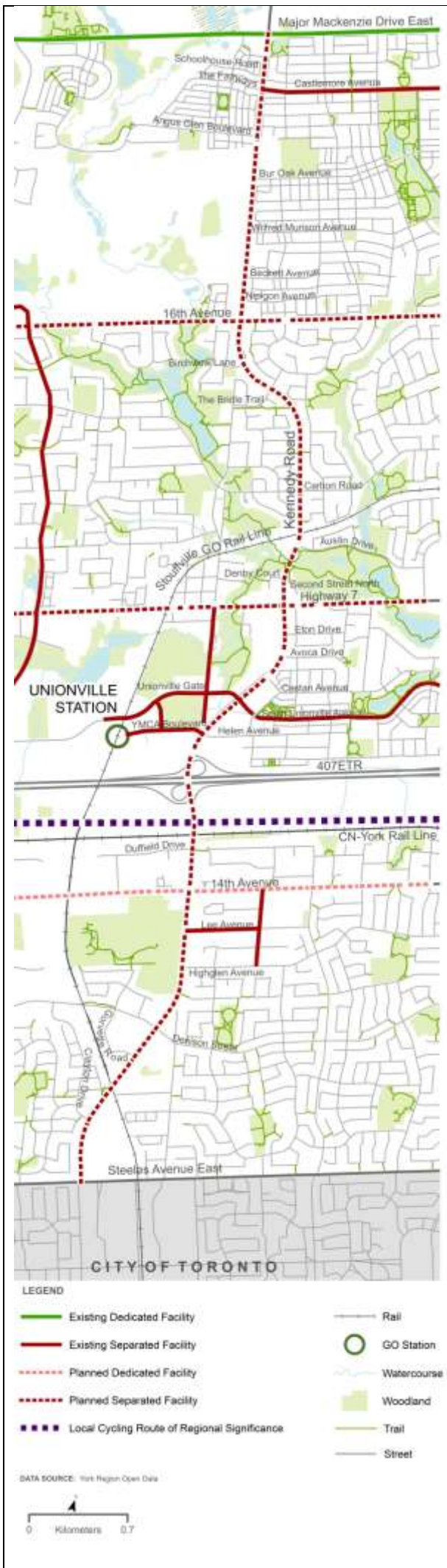


Exhibit 4-29: Cycling Network along the Study Corridor

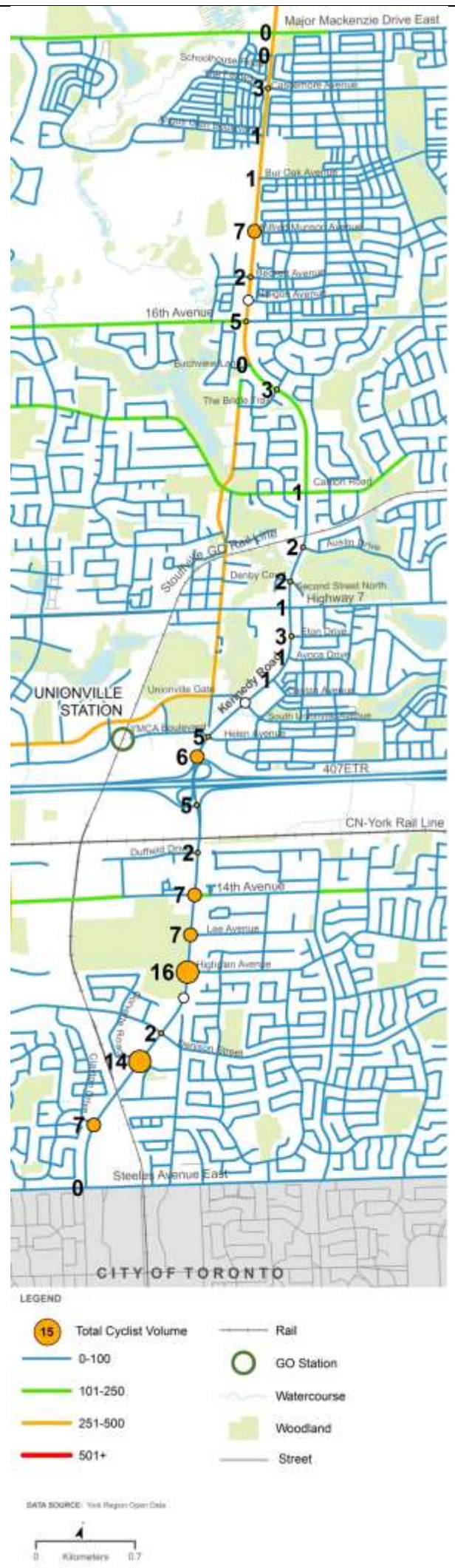


Exhibit 4-30: Existing Cyclist Volumes along the Study Corridor

Exhibit 4-31: Cycling Level of Service along the Study Corridor

4.6 Auto Traffic

4.6.1 Traffic Counts

This section describes the existing traffic operations at signalized intersections along the study corridor. Existing operations for 24 signalized intersections and 8 unsignalized intersections along Kennedy Road were analyzed to provide a complete understanding of the existing traffic operations along the study corridor.

Capacity analysis in the subsequent sections considers operations of signalized intersections along the study corridor; however, unsignalized intersections have also been assessed using Synchro for both the AM and PM peak hours. The existing traffic condition analysis was completed using volumes derived from the most recent turning movement counts available and provided by York Region. As shown in **Table 4-11** there is some variability in the turning movement counts in terms of count year and month. The majority of counts were collected in 2017, except for 4 intersections. As the count years range from 2015 to 2017, link volumes vary marginally from one intersection to the next. In order to compensate for lower volumes at intersections with older counts, volumes were balanced to the higher, more recent counts implicitly incorporating volume growth. For intersections without existing counts (Nipigon Avenue and Milliken Mills High School Driveway), volumes were estimated to be consistent with surrounding intersections.

Table 4-11: Existing Traffic Counts

Intersecting Roadway	Signalized?	Date of Count (DD/MM/YYYY)
Major Mackenzie Drive	Yes	22/03/2017
Schoolhouse	No	25/04/2017
The Fairways/Castlemore Avenue	Yes	22/03/2017
Angus Glen Boulevard	No	22/03/2017
Bur Oak Avenue	Yes	22/03/2017
Wilfred Murison Avenue	No	20/09/2016
Beckett Avenue	Yes	22/03/2017
16th Avenue	Yes	22/03/2017
Birchview Lane	Yes	22/03/2017
The Bridle Trail	Yes	22/03/2017
Carlton Road	Yes	22/03/2017
Austin Drive	Yes	22/03/2017
Denby Court/Second Street	No	22/03/2017
Highway 7	Yes	22/03/2017
Eton Street	No	22/03/2017
Avoca Drive	Yes	22/03/2017
Castan Avenue	No	22/03/2017
Unionville Gate/South Unionville Avenue	Yes	21/12/2016
YMCA Boulevard/Helen Avenue	Yes	22/03/2017

Intersecting Roadway	Signalized?	Date of Count (DD/MM/YYYY)
407ETR Westbound Off-Ramp	Yes	22/03/2017
407ETR Eastbound Off-Ramp	Yes	22/03/2017
Duffield Drive	Yes	22/03/2017
14th Avenue	Yes	22/03/2017
Lee Avenue	Yes	22/03/2017
Highglen Avenue	Yes	22/03/2017
Denison Street	Yes	11/06/2015
Gorvette Road	Yes	22/03/2017
Clayton Drive	Yes	11/06/2015
Steeles Avenue	Yes	22/05/2017

4.6.2 Peak Hour Traffic Volumes

Balanced peak hour volumes were compared to the theoretical road capacity to conservatively evaluate peak hour operations for existing conditions.

As illustrated in **Exhibit 4-32**, existing traffic on Kennedy Road between Major Mackenzie Drive and Steeles Avenue is highest in the southbound direction during the weekday AM peak hour. In the southbound direction, the traffic volumes increase continually from Major Mackenzie Drive to 16th Avenue and fluctuate within a range from 1,200 and 2,000 vehicles per hour between 16th Avenue and Steeles Avenue.

In the weekday PM peak hour, as shown in **Exhibit 4-33**, traffic is highest in the northbound direction. In the northbound direction, the traffic volumes fluctuated within a range from 1,400 and 1,900 vehicles per hour between 14th Avenue and 16th Avenue, and diminish from Steeles Avenue to 14th Avenue.

In both peaks, the off-peak direction traffic flow is much lower than the peak direction, indicating that Kennedy Road serves a commuter function. The relatively high volumes spread throughout the study corridor indicates that the intra-regional traffic role of Kennedy Road is more significant than its inter-regional role.

In both directions of travel, there is a dip in volumes approaching Steeles Avenue. The driving attractiveness of this section of the corridor is low compared to other sections of the corridor due to shorter lane widths/ right-of-way constraints and multiple accesses to the relatively large commercial developments surrounding Kennedy Road and Steeles Avenue, such as Pacific Mall.

Exhibit 4-32 and **Exhibit 4-33** illustrate the existing AM and PM peak hour balanced traffic volume-to-capacity ratios and intersection level of service across the study corridor. The relatively higher segment volume-to-capacity ratios and intersection level of service between Bullock Drive and 14th Avenue in the peak directions suggest there is a need for increased capacity along Kennedy Road.

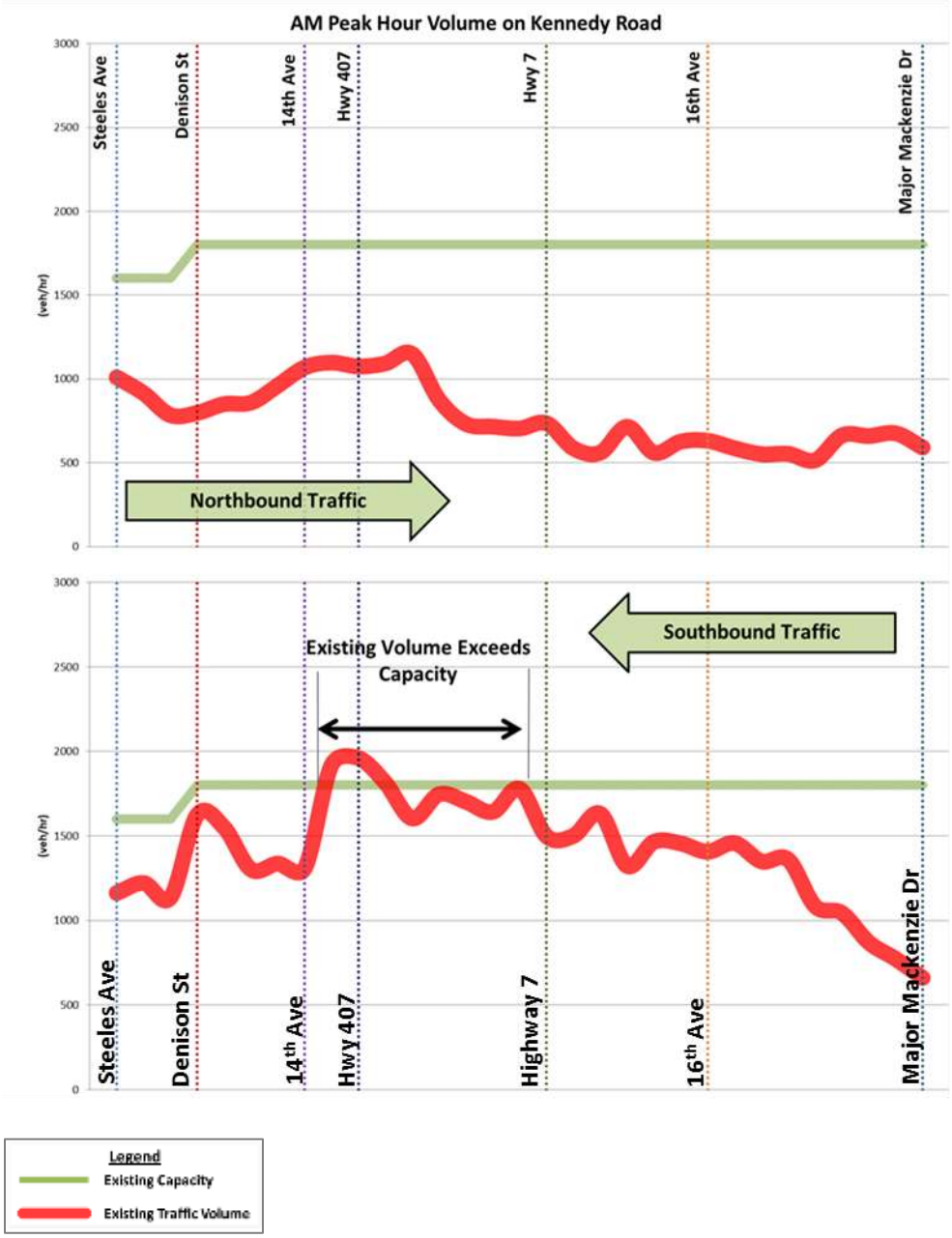


Exhibit 4-32: Existing AM Peak Hour Volumes

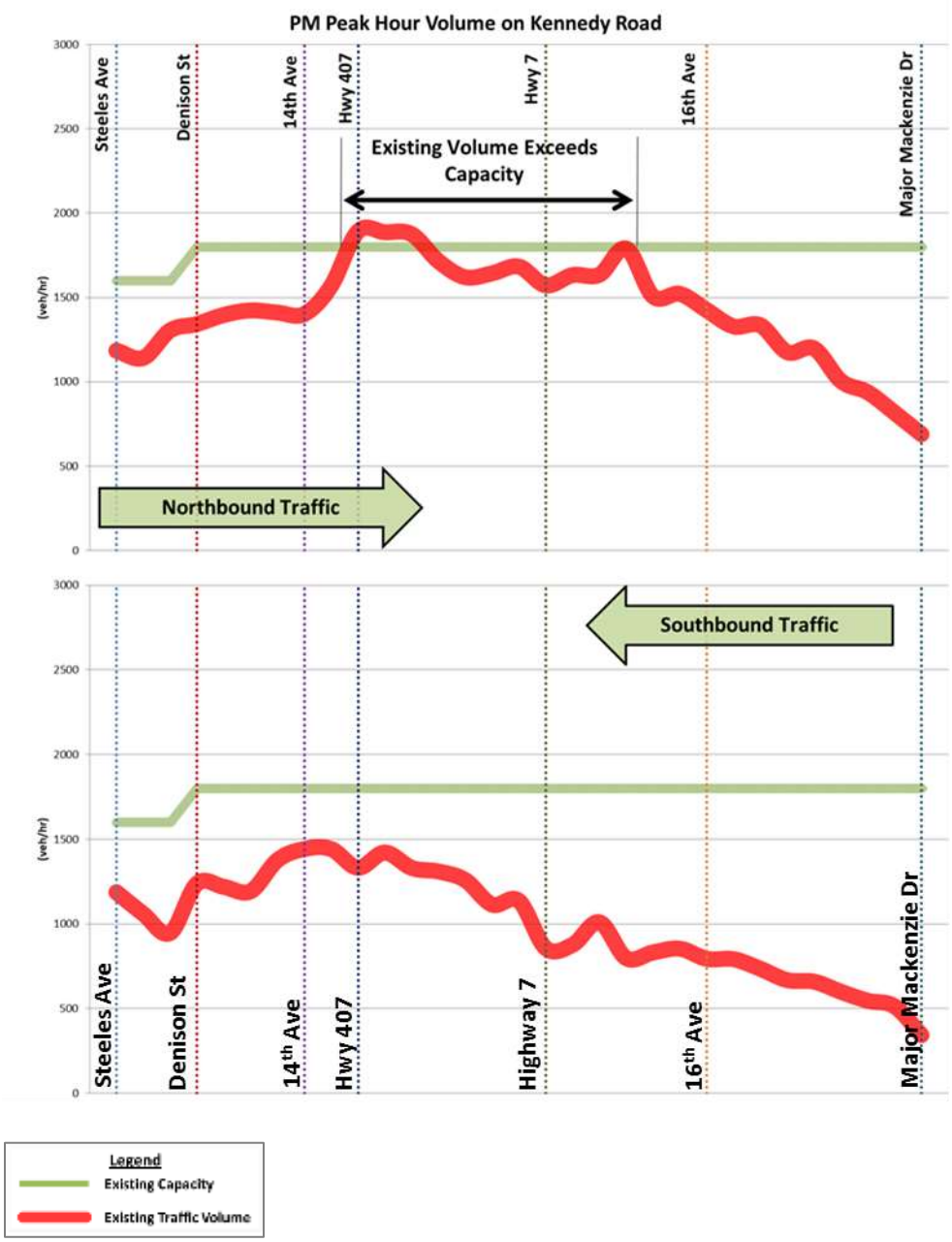


Exhibit 4-33: Existing PM Peak Hour Volume

Exhibit 4-34: Existing AM Vehicle Level of Service

Exhibit 4-35: Existing PM Vehicle Level of Service

4.6.3 Existing Screenline Analysis

A screenline capacity analysis was completed for Kennedy Road and three parallel arterial roads, Warden Avenue, Birchmount Road, and McCowan Road that also serve north-south traffic in the study area. **Table 4-12** and **Table 4-13** summarize the existing AM northbound and southbound peak hour volumes, respectively, on Warden Avenue, Birchmount Road, Kennedy Road, and McCowan Road between major arterial roads in the study area.

Table 4-12: Existing Northbound Peak Hour Screenline Analysis

Legend			
Approaching Capacity		At/Exceeding Capacity	

	Steeles Ave-Denison St			*Denison St-14th Ave*			*14th Ave-407ETR*		
AM Northbound	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*
Warden Avenue	1094	1600	0.68	500	1800	0.28	725	1800	0.40
Birchmount Road	333	1600	0.21	1257	1400	0.90	266	400	0.67
Kennedy Road	915	1600	0.57	719	1800	0.40	1173	1800	0.65
McCowan Road	932	2000	0.47	1184	1800	0.66	1462	1800	0.81
Total:	**3274**	**6800**	**0.48**	**3660**	**6800**	**0.54**	**3626**	**5800**	**0.63**
	407ETR-Highway 7			*Highway 7-16th Ave*			*16th Ave-Major Mackenzie Dr*		
AM Northbound	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*
Warden Avenue	1657	2700	0.61	1037	2400	0.43	491	1600	0.31
Birchmount Road	-	-	-	111	400	0.28	-	-	-
Kennedy Road	1067	1800	0.67	701	1800	0.39	635	1800	0.35
McCowan Road	1438	1800	0.80	970	1600	0.61	667	1400	0.48
Total:	**4162**	**6300**	**0.66**	**2819**	**6200**	**0.45**	**1793**	**4800**	**0.37**

Table 4-13: Existing Southbound Peak Hour Screenline Analysis

Legend			
Approaching Capacity		At/Exceeding Capacity	

	Steeles Ave-Denison St			*Denison St-14th Ave*			*14th Ave-407ETR*		
AM Southbound	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*
Warden Avenue	1036	1600	0.65	1172	1800	0.65	2719	1800	1.51
Birchmount Road	152	1600	0.10	342	1400	0.24	180	400	0.45
Kennedy Road	1626	1600	1.02	1309	1800	0.73	1815	1800	1.01
McCowan Road	1442	2000	0.72	1551	1800	0.86	1772	1800	0.98
Total:	**4256**	**6800**	**0.63**	**4374**	**6800**	**0.64**	**6486**	**5800**	**1.12**
	407ETR-Highway 7			*Highway 7-16th Ave*			*16th Ave-Major Mackenzie Dr*		
AM Southbound	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*
Warden Avenue	2990	2700	1.11	2192	2400	0.91	1704	1600	1.07
Birchmount Road	-	-	-	384	400	0.96	-	-	-
Kennedy Road	1499	1800	0.83	1407	1800	0.78	773	1800	0.43
McCowan Road	1666	1800	0.93	1515	1600	0.95	1280	1800	0.71
Total:	**6155**	**6300**	**0.98**	**5498**	**6200**	**0.89**	**3757**	**5200**	**0.72**

Northbound traffic volumes do not exceed or approach capacity during the AM peak hour. However, in the southbound direction, existing AM peak hour traffic exceeds capacity between 14th Avenue and 407ETR, and approaches capacity north of 407ETR.

4.6.4 Existing Traffic Operations

4.6.4.1 SYNCHRO MODEL DEVELOPMENT

A Synchro model was developed for the entire corridor based on existing volumes and field observations.

The analysis was conducted using the software program *Synchro Rev. 9.1.911.1, Traffic Signal Coordination Software Version 9*. Synchro can analyze both signalized and unsignalized intersections in a road corridor or network taking into account the spacing, interaction, queues and operations between intersections.

Detailed summaries of the intersection operations, queues, supporting reports, and signal timings from Synchro can also be found in **Appendix A**.

4.6.4.2 INTERSECTION CAPACITY

The existing traffic operations for weekday AM and PM peak hours were assessed for all signalized intersections along the study corridor.

The signalized intersection analysis considers two separate measures of performance:

- The capacity of all intersection movements, which is based on a volume to capacity ratio (v/c); and
- The level of service (LOS) for all intersection movements, which is based on the average control delay per vehicle for each of various movements through the intersection, and for the overall intersection.

Level of service is based on the average control delay per vehicle for a given movement. Delay is an indicator of how long a vehicle must wait to complete a movement and is represented by a letter between 'A' and 'F', with 'F' being the longest delay. Level of service is based on the scale shown in **Table 4-14**. The volume to capacity (v/c) ratio is a measure of the degree of capacity utilized at an intersection. A legend for the lane configuration schematic is shown in **Table 4-15**.

Table 4-14: Level of Service Criteria

Level of Service (LOS)	Control Delay per Vehicle (s)
A	≤ 10
B	> 10 and ≤ 20
C	> 20 and ≤ 35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80

Note: Generally LOS A, B, C, and D are considered acceptable. LOS E and F indicate notable delays but may be acceptable in urban contexts.

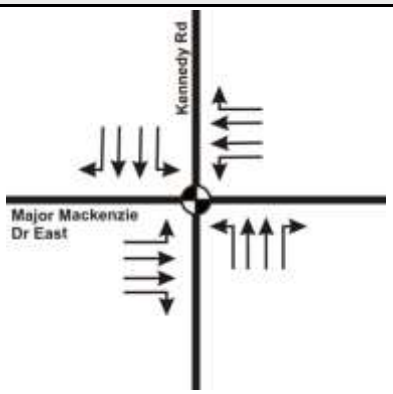
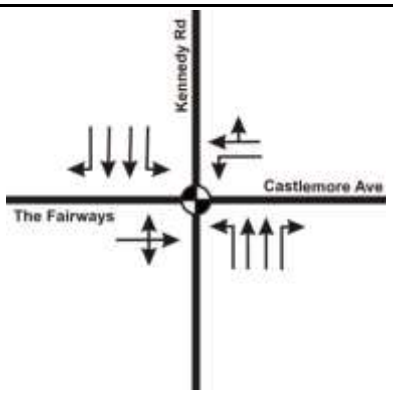
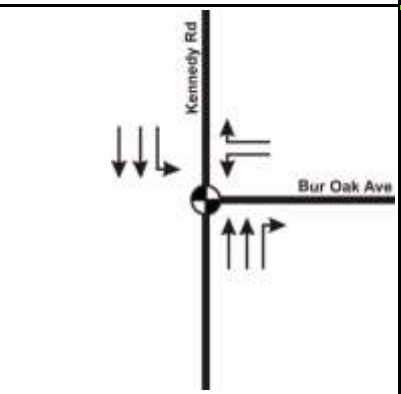
Table 4-15: Lane Configuration Schematic

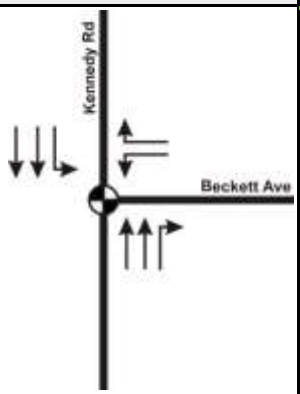
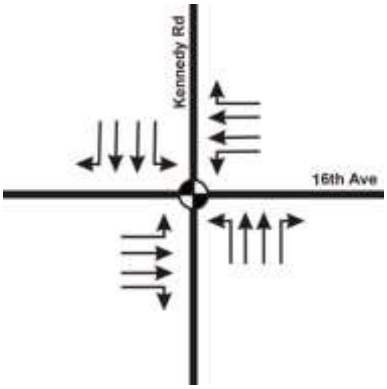
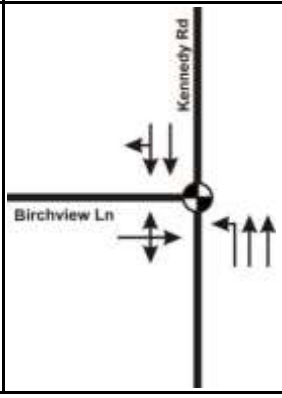
Movement	Symbol
Traffic Signal	
Left-Turn Lane	
Share Through-Left Lane	
Through Lane	
Shared Through-Right Lane	
Shared Left-Through-Right Lane	
Right-Turn Lane	
All schematics oriented with north aligned with the top of page	

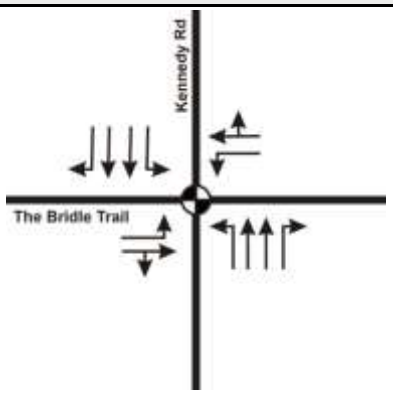
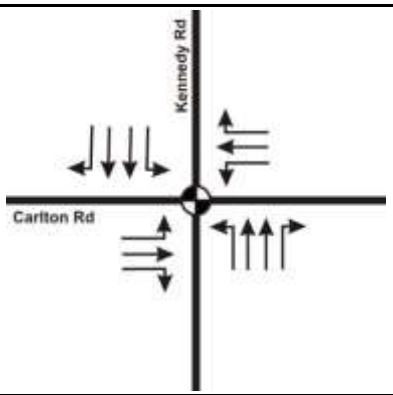
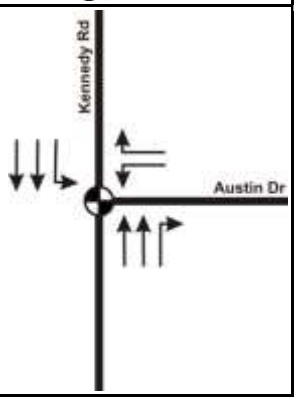
The existing traffic operations for weekday AM and PM peak hours were assessed for all signalized intersections along the study corridor and are summarized in **Table 4-16**.

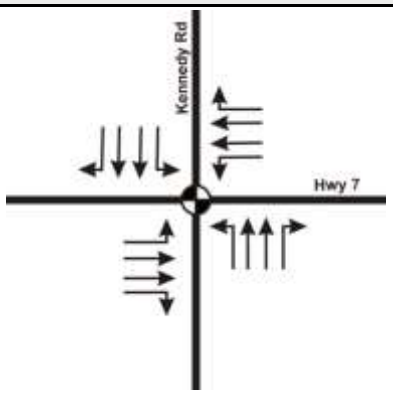
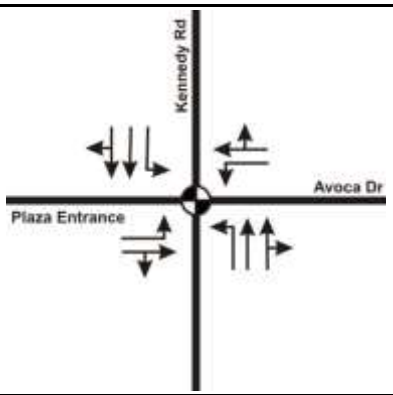
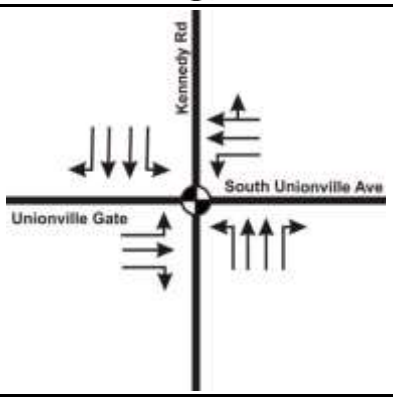
The existing lane configuration and overall intersection level of service are provided. Through or shared-through movements with v/c of 0.85 or above and exclusive turning movements with v/c of 1.0 or above are summarized. In addition, movements with LOS 'E' or worse, and the corresponding delay are summarized.

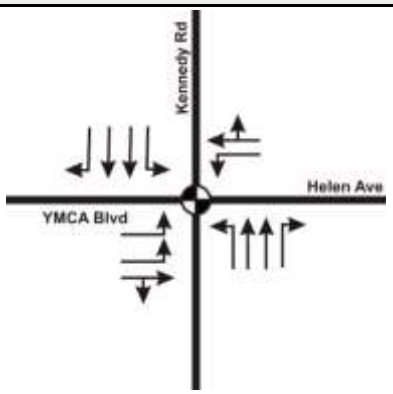
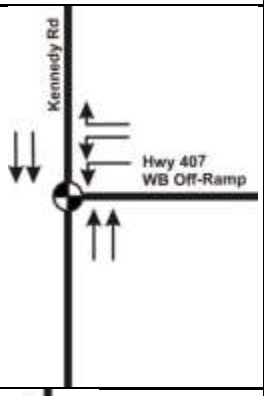
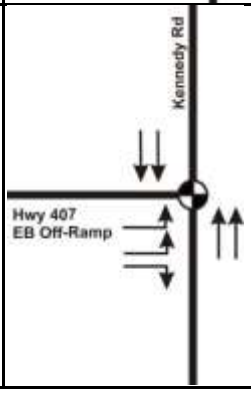
Table 4-16: Existing Signalized Intersection Lane Configurations and Level of Service

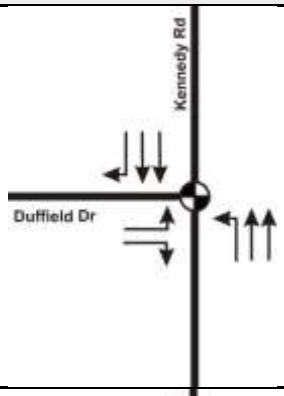
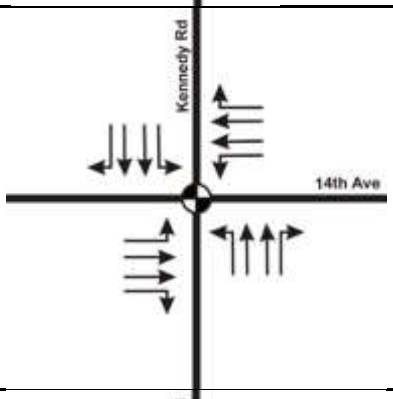
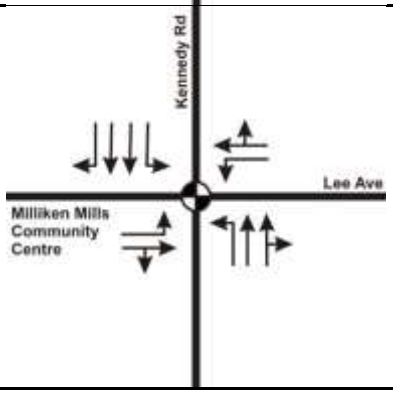
Intersection	Lane Configuration Schematic	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Major Mackenzie Drive		E	WBT v/c = 1.14; F (100.2s) NBL v/c = 1.04; F (118.5s)	C	EBT v/c = 0.88; C (31.8s) SBL v/c = 0.54; E (58.9s)
The Fairways		B	WBL v/c = 0.7; E (58.2s)	A	
Bur Oak Avenue		C	WBL v/c = 0.88; D (52.5s)	A	WBL v/c = 0.66; E (58.7s)

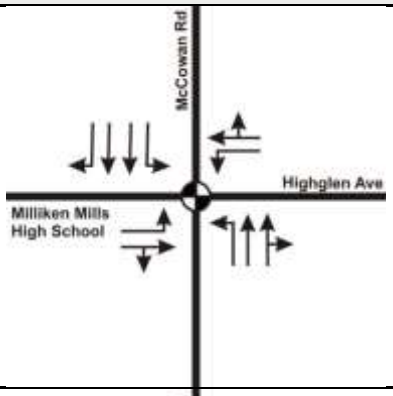
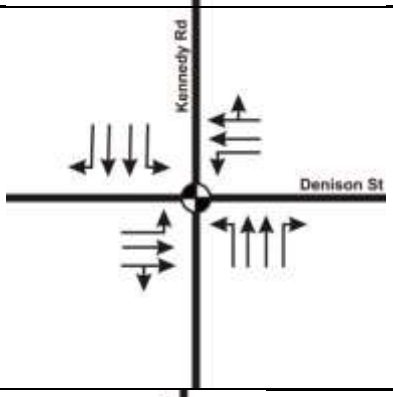
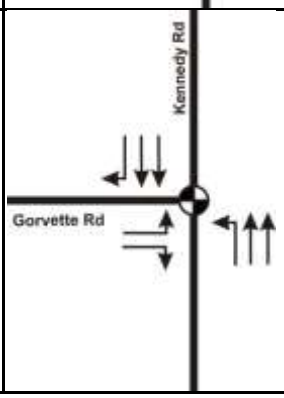
Intersection	Lane Configuration Schematic	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Beckett Avenue		B	WBL v/c = 0.78; E (73.6s)	A	WBL v/c = 0.24; E (59.1s)
16th Avenue		D	EBL v/c = 0.89; E (74s) WBT v/c = 0.97; D (54.8s) NBL v/c = 0.99; F (128s) SBT v/c = 1.01; F (81.1s)	E	EBL v/c = 0.95; E (57.5s) EBT v/c = 0.93; D (47.1s) WBL v/c = 1.19; F (162.7s) NBL v/c = 0.77; E (69.6s) NBT v/c = 1.03; F (101s) SBL v/c = 0.82; E (68.8s)
Birchview Lane		A		B	

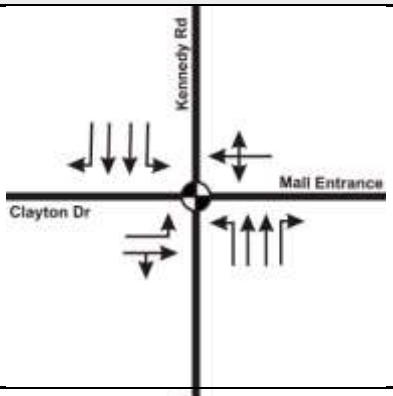
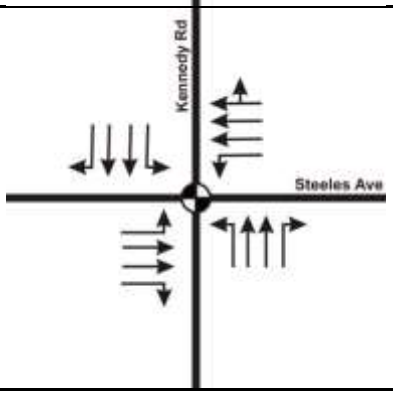
Intersection	Lane Configuration Schematic	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
The Bridle Trail		B		F	NBT v/c = 1.25; F (170.5s) SBL v/c = 0.7; F (126.1s) SBT v/c = 0.67; E (62.4s)
Carlton Road		C	WBT v/c = 0.97; E (77s)	C	EBT v/c = 0.87; E (71.1s)
Austin Drive		B	WBL v/c = 0.39; E (63.2s)	B	WBL v/c = 0.25; E (55.5s)

Intersection	Lane Configuration Schematic	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Highway 7		E	WBL v/c = 0.9; E (55.1s) WBT v/c = 1.12; F (106.2s) NBL v/c = 0.74; E (59.3s) SBT v/c = 0.95; E (59.8s)	D	EBT v/c = 1; E (72.6s) WBL v/c = 0.94; F (80.6s) NBT v/c = 0.95; D (53.5s) SBL v/c = 0.78; E (55.1s)
Avoca Drive		A	EBL v/c = 0.27; E (59.6s) WBL v/c = 0.26; E (58.9s)	B	EBL v/c = 0.8; E (79.7s)
Unionville Gate		C	EBL v/c = 0.62; E (76s) EBT v/c = 0.32; E (56.2s)	D	EBL v/c = 1.09; F (125.8s) SBL v/c = 0.8; F (100.7s) SBT v/c = 0.89; D (40.2s)

Intersection	Lane Configuration Schematic	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
YMCA Boulevard		C	**WBL v/c = 1.18; F (162s) WBT v/c = 0.42; E (57.4s)**	D	**EBT v/c = 0.91; E (69.1s)**
407ETR Westbound Off-ramp		D	**WBL v/c = 0.72; E (59.2s) SBT v/c = 0.85; D (53.3s)**	A	
407ETR Eastbound Off-ramp		B	**EBR v/c = 0.79; E (64.1s)**	C	**EBR v/c = 0.86; E (59.1s)**

Intersection	Lane Configuration Schematic	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Duffield Drive		B	EBL v/c = 0.48; E (59.9s)	C	EBL v/c = 0.87; E (67.2s)
14th Avenue		D	WBT v/c = 1; E (68.9s) NBL v/c = 1.28; F (192.5s) SBL v/c = 0.92; E (70.2s) SBT v/c = 0.85; D (49.3s)	D	EBT v/c = 0.94; E (57.4s) NBL v/c = 0.82; E (63.2s) NBT v/c = 0.98; E (67.1s) SBL v/c = 1.14; F (134.3s) SBT v/c = 0.86; D (49.6s)
Lee Avenue		A	EBL v/c = 0.44; E (61.2s) WBT v/c = 0.4; E (58.3s)	A	EBL v/c = 0.51; E (63.9s)

Intersection	Lane Configuration Schematic	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Highglen Avenue		C	EBL v/c = 0.49; E (63.4s) WBL v/c = 0.8; E (58.8s) WBT v/c = 0.86; E (58.3s)	B	
Denison Street		E	EBL v/c = 0.86; E (69.7s) WBT v/c = 1.18; F (135.8s) SBL v/c = 1; E (79.1s)	D	EBL v/c = 0.9; E (72s) EBT v/c = 0.97; E (71s) SBL v/c = 0.95; E (78.9s)
Gorvette Road		B		B	EBL v/c = 0.62; E (62.5s)

Intersection	Lane Configuration Schematic	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Clayton Drive		B	WBL v/c = 0.48; E (59.5s)	C	WBL v/c = 1.09; F (141.5s)
Steeles Avenue		D	EBL v/c = 0.89; E (72.8s) NBL v/c = 1.22; F (163.1s)	D	EBT v/c = 0.95; D (54.9s) WBL v/c = 0.96; F (87.4s) NBL v/c = 0.96; F (84.3s) SBL v/c = 1.04; F (107.3s)

The intersections with Denison Street, Highway 7, and Major Mackenzie Drive operate at or near capacity during AM peak hours only, while the intersections with 16th Avenue and The Bridle Trail operate at or near capacity during PM peak hours only, with delays equivalent to LOS 'E' or 'F'.

4.6.4.3 STORAGE LENGTHS AND QUEUING

Table 4-17 summarizes the Synchro 95th percentile queues and storage lengths between Steeles Avenue and Major Mackenzie Drive for all intersection movements.

Table 4-17: AM and PM Peak Hour 95th Percentile Queues

95th Percentile Queues (m)

Existing AM Peak Hour

Intersection	EBL		EBR		WBL		WBR		NBL		NBR		SBL		SBR	
	Storage	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*
Kennedy Rd & Steeles Ave E	92	57.6	-	-	56	26	-	-	43	99.2	25	5.8	166	48.5	88	18.4
Kennedy Rd & Clayton Dr	57	42.7	-	-	-	-	-	-	127	25	70	3.6	90	26.2	42	13.8
Kennedy Rd & Corvette Rd	-	-	-	-	-	-	-	-	71	13.9	-	-	-	-	41	9
Kennedy Rd & Denison St	60	46.1	-	-	48	39.1	-	-	150	36.3	39	10.3	80	116.3	44	90.9
Kennedy Rd & Highglen Ave	32	19.9	-	-	53	56.4	-	-	75	24.5	-	-	90	2.8	63	0.2
Kennedy Rd & Lee Ave	-	-	-	-	-	-	37	40.6	90	2.7	-	-	72	4.5	54	5.8
Kennedy Rd & 14th Ave	64	30.3	58	12.8	50	31.6	45	53.5	65	104.6	60	8.6	50	74.2	44	20.2
Kennedy Rd & Duffield Dr	65	36.5	-	-	-	-	-	-	63	52.8	-	-	-	-	52	87.1
Kennedy Rd & 407 EB Off-Ramp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	300	1.4
Kennedy Rd & 407 WB Off-Ramp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kennedy Rd & Helen Ave/YMCA Blvd	135	12.2	-	-	132	100.7	-	-	77	67.2	100	7.5	96	1.6	83	0.1
Kennedy Rd & Unionville Gate	57	34.6	-	-	83	49.6	-	-	193	70.7	98	5.8	35	3.3	85	22.5
Kennedy Rd & Avoca Dr	-	-	-	-	20	17.6	-	-	100	13.3	-	-	60	1.5	-	-
Kennedy Rd & Highway 7	78	19.9	95	0	43	123.4	87	0	111	46.3	126	20.1	100	22.7	46	28.1
Kennedy Rd & Austin Dr	-	-	-	-	41	30.9	-	-	-	-	37	11.9	57	20.8	-	-
Kennedy Rd & Carlton Rd	48	17.1	61	3.1	73	130.2	-	-	138	41.2	44	11.8	140	5.8	52	28.7
Kennedy Rd & The Bridle Trail	23	26.5	-	-	27	39.8	-	-	90	10.8	41	8.5	120	2.6	40	22.2
Kennedy Rd & Birchview Ln	-	-	-	-	-	-	-	-	105	0.4	-	-	-	-	-	-
Kennedy Rd & 16th Ave	92	74.7	93	12.4	70	73.1	72	0	145	73.6	70	7.5	70	0	63	121.4
Kennedy Rd & Beckett Ave	-	-	-	-	-	-	20	11.2	-	-	55	6.1	54	2.7	-	-
Kennedy Rd & Bur Oak Ave	-	-	-	-	-	-	-	-	-	-	52	6.1	55	65.9	-	-
Kennedy Rd & The Fairways/Castlemore Ave	-	-	-	-	-	-	-	-	57	6.4	56	16.7	50	2.9	46	0
Kennedy Rd & Major Mackenzie Dr	50	7.6	92	14.1	50	34.2	160	11.3	140	114.6	80	22.9	50	27.3	92	13.4

LEGEND
XX = 95th percentile queues exceed availble storage

Existing PM Peak Hour

Intersection	EBL		EBR		WBL		WBR		NBL		NBR		SBL		SBR	
	Storage	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*
Kennedy Rd & Steeles Ave E	92	62.1	-	-	56	65	-	-	43	66.7	25	19.9	166	76.4	88	17.3
Kennedy Rd & Clayton Dr	57	55	-	-	-	-	-	-	127	20.7	70	7.8	90	39.1	42	4.8
Kennedy Rd & Corvette Rd	-	-	-	-	-	-	-	-	71	14.6	-	-	-	-	41	0.3
Kennedy Rd & Denison St	60	77.9	-	-	48	41.4	-	-	150	11.5	39	47.6	80	106.7	44	35.7
Kennedy Rd & Highglen Ave	32	11	-	-	53	18.4	-	-	75	4.4	-	-	90	13.5	63	0
Kennedy Rd & Lee Ave	-	-	-	-	-	-	37	12	90	3.3	-	-	72	70.2	54	5.8
Kennedy Rd & 14th Ave	64	32.7	58	34.4	50	24.7	45	48.2	65	56.8	60	18.7	50	120.8	44	12.2
Kennedy Rd & Duffield Dr	65	128.9	-	-	-	-	-	-	63	37.6	-	-	-	-	52	20
Kennedy Rd & 407 EB Off-Ramp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	300	0.7
Kennedy Rd & 407 WB Off-Ramp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kennedy Rd & Helen Ave/YMCA Blvd	135	35.8	-	-	132	33.1	-	-	77	41.6	100	13.5	96	15.6	83	14.5
Kennedy Rd & Unionville Gate	57	158.9	-	-	83	46.7	-	-	193	66	98	0.8	35	41.7	85	26.9
Kennedy Rd & Avoca Dr	-	-	-	-	20	17.3	-	-	100	9.8	-	-	60	11.5	-	-
Kennedy Rd & Highway 7	78	63.3	95	22.9	43	100.4	87	13.5	111	30.5	126	43.3	100	45.9	46	10.3
Kennedy Rd & Austin Dr	-	-	-	-	41	25.5	-	-	-	-	37	6.2	57	39.1	-	-
Kennedy Rd & Carlton Rd	48	47.5	61	24.2	73	42	-	-	138	28	44	48	140	1.5	52	0
Kennedy Rd & The Bridle Trail	23	26.6	-	-	27	10.7	-	-	90	4.4	41	45.6	120	30.9	40	27.9
Kennedy Rd & Birchview Ln	-	-	-	-	-	-	-	-	105	5.3	-	-	-	-	-	-
Kennedy Rd & 16th Ave	92	101.2	93	17.8	70	95.7	72	3.8	145	94.8	70	98.5	70	51.8	63	7.2
Kennedy Rd & Beckett Ave	-	-	-	-	-	-	20	6.2	-	-	55	0.2	54	5	-	-
Kennedy Rd & Bur Oak Ave	-	-	-	-	-	-	-	-	-	-	52	9.2	55	18.3	-	-
Kennedy Rd & The Fairways/Castlemore Ave	-	-	-	-	-	-	-	-	57	4	56	3.8	50	13.8	46	1
Kennedy Rd & Major Mackenzie Dr	50	8.5	92	25.7	50	20.2	160	0	140	47.3	80	10.2	50	29.7	92	0

LEGEND
XX = 95th percentile queues exceed availble storage

Critical locations, where 95th percentile queues exceed available storage, are highlighted in red in the table above. There is generally sufficient storage along the corridor, although there are localized congestion points that experience queuing issues during peak hours.

4.7 Traffic Safety

York Region provided both segment and intersection-related collision records for the most recent 5 years between January 1, 2011 and December 31, 2015 along the study corridor. Collisions reported with classification of 'Non-reportable' are assumed to be 'Property Damage Only' (PDO), as more severe collisions resulting in injury would be classified as such. A total of 1,430 collisions occurred in the study area during the five-year review period. Of these 1,430 collisions, 1,240 collisions were intersection-related while 190 occurred along segments, as summarized in **Table 4-18**.

Table 4-18: Collisions based on Location Types

Location Type	PD only	Non-fatal	Fatal	Total
Intersection	923	316	1	1240
Segment	156	33	1	190
Total	**1079**	**349**	**2**	**1430**

Collisions were analyzed by year, weekday and month of occurrence, severity, initial impact type, environmental condition, and light condition to identify trends and patterns in the collisions.

4.7.1 Collision Rate

Collision rates per million vehicle-kilometres travelled (MVK) are calculated separately for intersections and segments using the following formulas:

$$Segment\ Collision\ Rate = \frac{Number\ of\ Collisions \times 1{,}000{,}000}{AADT \times 365 \times Length \times Years}$$

$$Intersection\ Collision\ Rate = \frac{Number\ of\ Collisions\ \times 1{,}000{,}000}{AADT\ \times 365\ \times Years}$$

Annual Average Daily Traffic (AADT) was estimated to be ten times the average of the AM and PM peak hour volumes. The segment collision rates are provided in **Table 4-19** and the intersection collision rates are provided in **Table 4-20**.

The Regional Safety Study, *Development of Safety Performance Functions and Network Screening Final Report (April 4, 2013)*, assessed 1,224 intersections and 1,920 segments (non-intersection) in the Region based on historical collision and traffic data from 2006 to 2010. The results from the Regional study show how collision rates at intersections and segments within this corridor rank compared to other intersections and segments within the region from a safety

perspective. The two parameters extracted from the Regional study are Potential for Safety Improvement (PSI) and PSI Ranking. A higher PSI Ranking indicates a high potential for safety improvement.

The PSI is the outcome from a network screening analysis which is a process for reviewing a roadway network (intersections, segments, ramps) in order to prioritize sites for improvement from highest to lowest. A network screening process involves several analytical steps utilizing historical data of the network's collision history. For instance, the intersection at Kennedy Road and 407ETR Eastbound Off-ramp Terminal (Exit 88) has the highest PSI within the study corridor at 179 and ranks 8th in York Region (highest ranked intersection within the study corridor). From a network screening analysis perspective, this site has the highest potential for safety improvement.

Other segments that have high PSI rankings (top 100) in the Region are between the 407ETR Eastbound Off-Ramp and Duffield Drive and between Bur Oak Avenue and 16th Avenue (ranked 76 and 90 respectively) with the highest collision rate (2.39) is between Eton Street and Highway 7. This segment had 22 collisions recorded over the 5-year period with a short segment length of 200 m. This segment is also being recognized as one of the locations with high potential for improvement with its high PSI ranking of #11 in the Region. The location with the second highest collision rate is between YMCA Boulevard/Helen Avenue and 407ETR Westbound Off-Ramp. There were 35 collisions recorded in this 0.5 km long segment within the analysis period. It is ranked #282 in the Region with high potential for improvement. As such, the segments between Highway 7 and Eton Street and between YMCA Boulevard/Helen Avenue and 407ETR Westbound Off-Ramp warrant further consideration for road safety improvement.

Table 4-19: Segment Collision Analysis

Kennedy Road Segment	2016 AADT	Number of Collisions	Segment Length (km)	Segment Collision Rate (per MVK)	Network Screening	
					PSI[1]	Rank[1]
Schoolhouse Road to The Fairways/Castlemore Avenue	14,395	1	0.23	0.17	0.7	703
The Fairways/Castlemore Avenue to Angus Glen Boulevard	16,055	1	0.34	0.10	0.0	1343
Angus Glen Boulevard to Bur Oak Avenue	17,610	1	0.30	0.10	1.5	569
Bur Oak Avenue to 16th Avenue	18,685	14	1.02	0.40	20.4	90
16th Avenue to Birchview Lane	21,580	3	0.31	0.25	1.1	640
Birchview Lane to The Bridle Trail	22,570	1	0.26	0.09	0.0	1151
The Bridle Trail to Carlton Road	21,005	7	0.81	0.23	0.0	1169
Carlton Road to Austin Drive	25,495	6	0.40	0.32	0.0	973
Austin Drive to Denby Court/Second Street	23,015	1	0.26	0.09	0.0	1203

Kennedy Road Segment	2016 AADT	Number of Collisions	Segment Length (km)	Segment Collision Rate (per MVK)	Network Screening	
					PSI[1]	Rank[1]
Denby Court/Second Street to Highway 7	23,125	7	0.19	0.87	15.4	121
Highway 7 to Eton Street	25,265	22	0.20	2.39	56.6	11
Eton Street to Avoca Drive	25,540	1	0.15	0.14	0.0	1378
Avoca Drive to Castan Avenue	26,260	1	0.19	0.11	0.0	1168
Castan Avenue to Unionville Gate/South Unionville Avenue	26,035	10	0.26	0.81	0.0	1128
Unionville Gate/South Unionville Avenue to YMCA Boulevard/Helen Avenue	29,055	9	0.36	0.47	0.0	966
YMCA Boulevard/Helen Avenue to 407ETR Westbound Off-Ramp	31,945	12	0.16	1.29	6.0	282
407ETR Westbound Off-Ramp to 407ETR Eastbound Off-Ramp	32,945	19	0.35	0.90	12.5	151
407ETR Eastbound Off-Ramp to Duffield Drive	31,940	14	0.34	0.71	22.7	76
Duffield Drive to 14th Avenue	27,555	4	0.29	0.27	2.3	470
14th Avenue to Lee Avenue	25,270	10	0.29	0.75	5.7	301
Lee Avenue to Highglen Avenue	24,350	5	0.27	0.42	0.0	1147
Highglen Avenue to Denison Street	24,655	8	0.48	0.37	2.5	461
Denison Street to Gorvette Road	21,800	8	0.24	0.84	9.5	201
Gorvette Road to Clayton Drive	21,145	9	0.56	0.42	2.2	502
Clayton Drive to Steeles Avenue	21,825	16	0.46	0.87	14.6	131

[1]*Data referenced from Regional Safety Study, 2013*

Table 4-20: Intersection Collision Analysis

Intersection	2016 AADT	Number of Collisions	Intersection Collision Rate (per MVK)	Network Screening	
				PSI[1]	Rank[1]
Major Mackenzie Drive	39,085	55	0.77	30.1	111
The Fairways/Castlemore Avenue	17,550	9	0.28	N/A	N/A
Angus Glen Boulevard	17,735	3	0.09	0.0	1020
Bur Oak Avenue	21,805	17	0.43	12.0	206
16th Avenue	48,870	115	1.29	14.8	187
Birchview Lane	22,720	5	0.12	2.9	387
The Bridle Trail	25,595	23	0.49	0.0	741
Carlton Road	34,225	33	0.53	0.0	659

Intersection	2016 AADT	Number of Collisions	Intersection Collision Rate (per MVK)	Network Screening	
				PSI[1]	Rank[1]
Austin Drive	26,795	18	0.37	0.0	760
Denby Court/Second Street	23,200	1	0.02	0.0	1170
Highway 7	48,905	185	2.07	154.8	11
Eton Street	27,210	7	0.14	0.0	929
Avoca Drive	28,580	27	0.52	0.0	818
Castan Avenue	27,495	18	0.36	5.8	295
Unionville Gate/South Unionville Avenue	38,880	65	0.92	5.9	292
YMCA Boulevard/Helen Avenue	36,380	148	2.23	94.7	25
407ETR Off-ramp Terminal	34,205	126	2.02	179.1	8
Duffield Drive	33,495	0	0.00	10.7	219
14th Avenue	49,940	35	0.38	53.0	54
Lee Avenue	28,690	140	2.67	0.0	797
Highglen Avenue	28,930	26	0.49	0.0	678
Denison Street	41,415	18	0.24	20.5	150
Gorvette Road	22,540	81	1.97	0.0	764
Clayton Drive	27,800	23	0.45	7.9	259
Steeles Avenue	49,080	43	0.48	N/A	N/A

[1]*Data referenced from Regional Safety Study, 2013*

Collisions are highly concentrated at three major locations along the study corridor. Out of 1221 intersection-related collisions, 58% (714 collisions) occurred at the following five locations with the highest collision rates within the study corridor: the 407ETR Off-ramp Terminals, Highway 7, YMCA Boulevard/Helen Avenue, Lee Avenue, and 16th Avenue. These intersections generally also have high PSI scores and rankings amongst all other intersections in the Region (the top three being ranked 8th, 11th, and 25th respectively).

Based on available data in the Regional study, the 407ETR Off-ramp Terminals and YMCA Boulevard/Helen Avenue have an overrepresentation of rear-end collisions, while other collision prone intersections may have experienced notable patterns related to an influence of environmental factors (rain and wet road surface). The results from the collision rate analysis and comparison with Regional averages confirm the opportunity to enhance safety within the study corridor.

4.7.2 Collisions by Year, Day of the Week, and Month

The number of collisions by severity and year is shown in

Table 4-21 with the distribution shown in **Exhibit 4-36**. Two fatal collisions occurred – one in 2011 and the other in 2013. Overall, the total number of collisions have decreased from year to year during the five-year period. The number of “Property Damage Only” collisions has decreased

moderately in 2014 and 2015. The number of "Non-fatal Injury" collisions decreased in 2015 and exhibited a relatively steady pattern from 2012 to 2015.

Table 4-21: Collisions by Severity and Year (January 2011 to December 2015)

Severity	2011	2012	2013	2014	2015	Total	Percentage
Property Damage Only	258	210	253	187	171	1079	**75%**
Non-fatal Injury	78	72	69	69	61	349	**24%**
Fatal Injury	1	0	1	0	0	2	**1%**
Total	**337**	**282**	**323**	**256**	**232**	**1430**	**100%**
%	**24%**	**20%**	**23%**	**18%**	**16%**	**100%**	

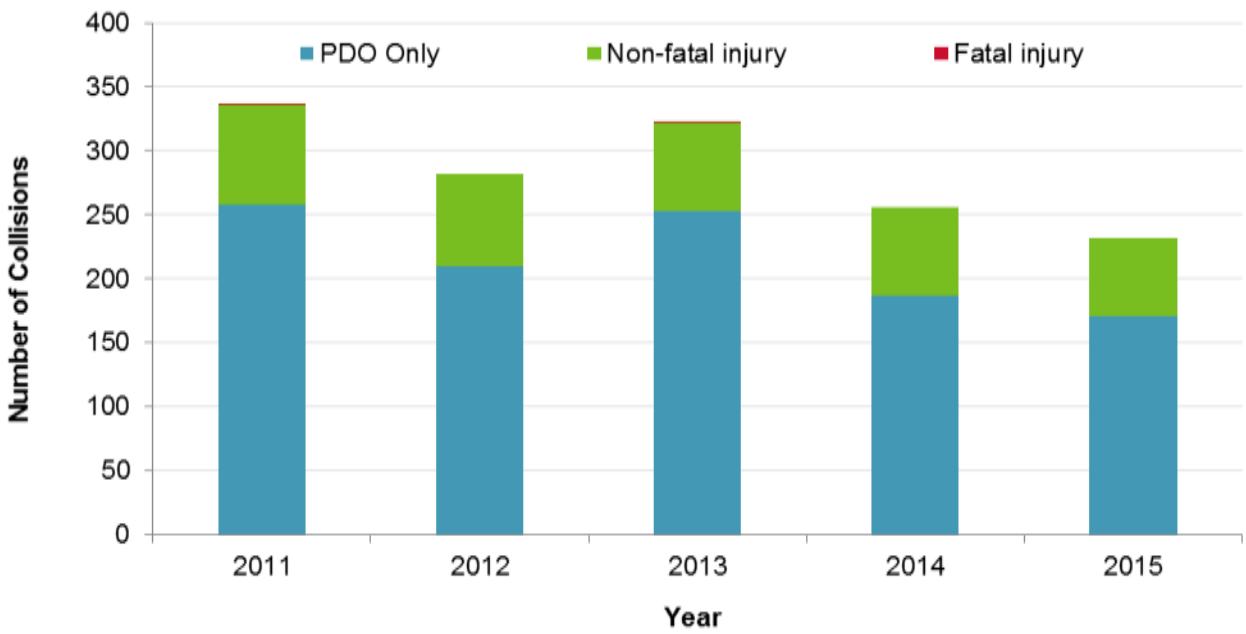


Exhibit 4-36: Collisions by Severity and Year (January 2011 to December 2015)

The number of collisions by severity and day of the week is provided in

Severity	Mon	Tues	Wed	Thu	Fri	Sat	Sun	Total	Percentage
Property Damage Only	116	159	175	167	180	162	120	1079	75%
Non-fatal Injury	41	47	65	55	57	51	33	349	24%
Fatal Injury	1	0	0	0	0	1	0	2	1%
Total	**158**	**206**	**240**	**222**	**237**	**214**	**153**	**1430**	**100%**
%	**11%**	**14%**	**17%**	**16%**	**17%**	**15%**	**11%**	**100%**	

Table 4-22 and **Exhibit 4-37**. Overall, the number of collisions by day of week generally peaks with respect to peak traffic periods (e.g. mid-week weekdays and Saturdays). It appears that the

highest number of collisions mainly occured between Wednesday and Friday with the lowest collisions records on Monday and Sunday.

Table 4-22: Collisions by Severity and Day of the Week (January 2011 to December 2015)

Severity	Mon	Tues	Wed	Thu	Fri	Sat	Sun	Total	Percentage
Property Damage Only	116	159	175	167	180	162	120	1079	75%
Non-fatal Injury	41	47	65	55	57	51	33	349	24%
Fatal Injury	1	0	0	0	0	1	0	2	1%
Total	**158**	**206**	**240**	**222**	**237**	**214**	**153**	**1430**	**100%**
%	**11%**	**14%**	**17%**	**16%**	**17%**	**15%**	**11%**	**100%**	

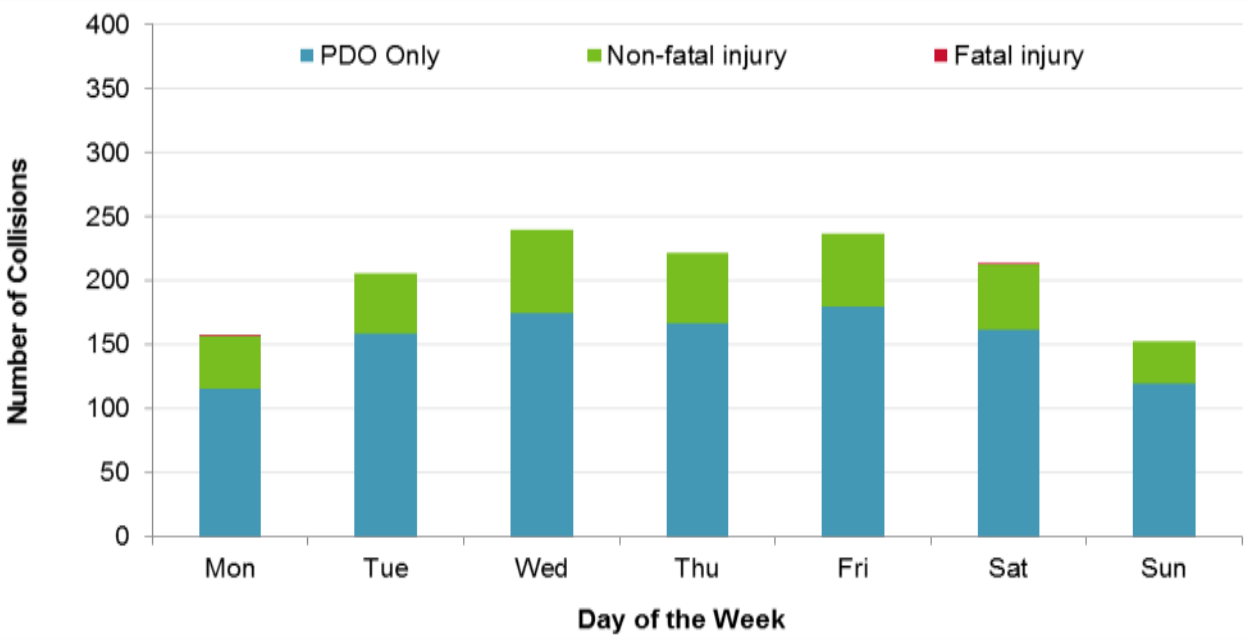


Exhibit 4-37: Collisions by Severity and Day of the Week (January 2011 to December 2015)

The number of collisions by severity and month is provided in **Table 4-23** and **Exhibit 4-38**. Over 60% of the collisions occurred between June and December with the least number of collision records in February and April.

Table 4-23: Collisions by Severity and Month (January 2011 to December 2010)

Severity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
PDO only	101	71	77	60	85	113	94	62	114	133	85	84	1079	75%
Non-fatal Injury	30	15	19	26	33	28	37	41	35	36	23	26	349	24%
Fatal Injury	1	0	0	0	0	0	0	0	0	1	0	0	2	1%
Total	**132**	**86**	**96**	**86**	**118**	**141**	**131**	**103**	**149**	**170**	**108**	**110**	**1430**	**100%**
Percentage	**9%**	**6%**	**7%**	**6%**	**8%**	**10%**	**9%**	**7%**	**10%**	**12%**	**8%**	**8%**	**100%**	

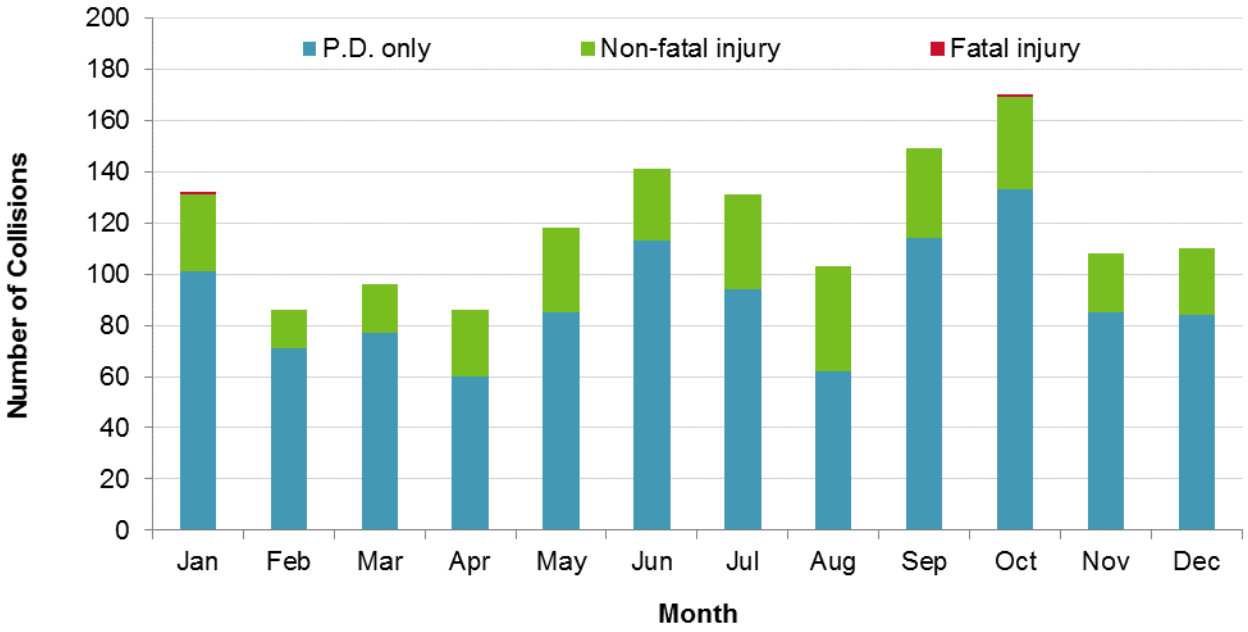


Exhibit 4-38: Collisions by Severity and Month (January 2011 to December 2010)

4.7.3 Collisions by Severity

The distribution of collisions by severity along the study corridor is summarized in **Table 4-24**. As mentioned, two fatal collisions were recorded in the five year time period. Majority of collisions within the study area are “Property Damage Only” (75%), and the remainder are primarily “Non-Fatal Injury” collisions (24%). The majority of collisions occurred at intersections (1240, 88%), whereas only 190 (12%) of collisions occurred at midblock segments. Collisions are primarily concentrated at the major arterial intersections, namely at Highway 7 (13%), 16th Avenue (8%), and 14th Avenue (10%). Intersection-related countermeasures and treatments, particularly at major arterial intersections, have a high potential to improve the safety performance of the study corridor.

Table 4-24: Collisions by Severity and Location within Study Area (January 2011 to December 2015)

Location	Property Damage Only	Non-Fatal Injury	Fatal	Total	% of all Collisions
Major Mackenzie Drive	37	18	0	55	4%
Schoolhouse Road to The Fairways/Castlemore Avenue	1	0	0	1	0%
The Fairways/Castlemore Avenue	4	5	0	9	1%
The Fairways/Castlemore Avenue to Angus Glen Boulevard	1	0	0	1	0%
Angus Glen Boulevard	2	1	0	3	0%
Angus Glen Boulevard to Bur Oak Avenue	1	0	0	1	0%

Location	Property Damage Only	Non-Fatal Injury	Fatal	Total	% of all Collisions
Bur Oak Avenue	11	6	0	17	1%
Bur Oak Avenue to 16th Avenue	13	1	0	14	1%
16th Avenue	92	23	0	115	8%
16th Avenue to Birchview Lane	3	0	0	3	0%
Birchview Lane	2	3	0	5	0%
Birchview Lane to The Bridle Trail	1	0	0	1	0%
The Bridle Trail	16	7	0	23	2%
The Bridle Trail to Carlton Road	6	1	0	7	0%
Carlton Road	20	13	0	33	2%
Carlton Road to Austin Drive	6	0	0	6	0%
Austin Drive	14	4	0	18	1%
Austin Drive to Denby Court/Second Street	0	1	0	1	0%
Denby Court/Second Street	0	1	0	1	0%
Denby Court/Second Street to Highway 7	6	1	0	7	0%
Highway 7	155	29	1	185	13%
Highway 7 to Eton Street	20	2	0	22	2%
Eton Street	5	2	0	7	0%
Eton Street to Avoca Drive	1	0	0	1	0%
Avoca Drive	19	8	0	27	2%
Avoca Drive to Castan Avenue	1	0	0	1	0%
Castan Avenue	13	5	0	18	1%
Castan Avenue to Unionville Gate/South Unionville Avenue	6	4	0	10	1%
Unionville Gate/South Unionville Avenue	47	18	0	65	5%
Unionville Gate/South Unionville Avenue to YMCA Boulevard/Helen Avenue	8	1	0	9	1%
YMCA Boulevard/Helen Avenue	108	40	0	148	10%
YMCA Boulevard/Helen Avenue to 407ETR Westbound Off-Ramp	10	2	0	12	1%
407ETR Off-ramp Terminal	93	33	0	126	9%
407ETR Westbound Off-Ramp to 407ETR Eastbound Off-Ramp	16	3	0	19	1%
407ETR Eastbound Off-Ramp to Duffield Drive	10	4	0	14	1%

Location	Property Damage Only	Non-Fatal Injury	Fatal	Total	% of all Collisions
Duffield Drive	26	9	0	35	2%
Duffield Drive to 14th Avenue	3	1	0	4	0%
14th Avenue	109	31	0	140	10%
14th Avenue to Lee Avenue	7	3	0	10	1%
Lee Avenue	18	8	0	26	2%
Lee Avenue to Highglen Avenue	4	1	0	5	0%
Highglen Avenue	11	7	0	18	1%
Highglen Avenue to Denison Street	4	4	0	8	1%
Denison Street	60	21	0	81	6%
Denison Street to Gorvette Road	7	0	1	8	1%
Gorvette Road	17	6	0	23	2%
Gorvette Road to Clayton Drive	7	2	0	9	1%
Clayton Drive	30	13	0	43	3%
Clayton Drive to Steeles Avenue	14	2	0	16	1%
Steeles Avenue	14	5	0	19	1%
Total	**1079**	**349**	**2**	**1430**	**100%**
Percentage	**75%**	**24%**	**1%**	**100%**	

4.7.4 Collisions by Initial Impact Type

The distribution of collisions by initial impact type and location is listed in **Table 4-25**. Rear-end collisions (51%) is the predominant impact type, followed by angle collisions (17%). The remaining 32% of collisions involved a combination of turning movement (10%), sideswipe (10%), Single Motor Vehicle or SMV (6%), approaching (2%), and unclassified (2%).

Table 4-25: Collisions by Initial Impact Type and Location (January 2011 to December 2015)

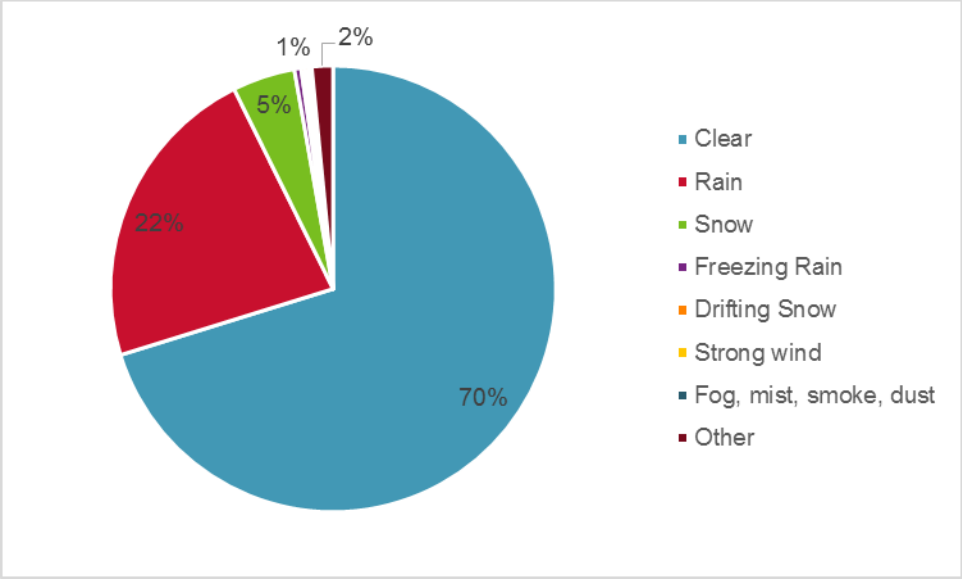
Location	Approaching	Angle	Rear End	Side-swipe	Turning	SMV	Total	% of all Collisions
Steeles Avenue	0	2	10	2	5	0	19	1%
Clayton Drive to Steeles Avenue	0	2	6	5	2	1	16	1%
Clayton Drive	0	11	19	4	6	2	42	3%
Gorvette Road to Clayton Drive	0	0	8	1	0	0	9	1%
Gorvette Road	0	1	13	1	4	3	22	2%
Denison Street to Gorvette Road	0	0	3	3	1	1	8	1%
Denison Street	0	16	32	18	10	4	80	6%
Highglen Avenue to Denison Street	1	1	2	2	0	2	8	1%
Highglen Avenue	1	3	9	1	1	3	18	1%
Lee Avenue to Highglen Avenue	0	0	4	1	0	0	5	0%
Lee Avenue	3	5	11	3	2	2	26	2%
14th Avenue to Lee Avenue	0	2	1	3	4	0	10	1%
14th Avenue	4	30	68	16	13	5	136	10%
Duffield Drive to 14th Avenue	0	1	2	0	1	0	4	0%
Duffield Drive	1	5	18	5	5	1	35	2%
407ETR Eastbound Off-Ramp to Duffield Drive	0	0	9	3	0	2	14	1%
407ETR Westbound Off-Ramp to 407ETR Eastbound Off-Ramp	1	0	14	2	1	1	19	1%
407ETR Off-ramp Terminal	1	7	107	2	1	7	125	9%

Location	Approaching	Angle	Rear End	Side-swipe	Turning	SMV	Total	% of all Collisions
YMCA Boulevard/Helen Avenue to 407ETR Westbound Off-Ramp	0	2	8	1	0	0	11	1%
YMCA Boulevard/Helen Avenue	2	12	106	12	11	5	148	11%
Unionville Gate/South Unionville Avenue to YMCA Boulevard/Helen Avenue	0	2	5	1	0	1	9	1%
Unionville Gate/South Unionville Avenue	2	20	29	7	5	1	64	5%
Castan Avenue to Unionville Gate/South Unionville Avenue	2	1	2	2	1	2	10	1%
Castan Avenue	0	5	6	1	3	2	17	1%
Avoca Drive to Castan Avenue	0	0	0	1	0	0	1	0%
Avoca Drive	0	5	12	4	1	3	25	2%
Eton Street to Avoca Drive	0	0	0	1	0	0	1	0%
Eton Street	0	3	2	1	0	1	7	0%
Highway 7 to Eton Street	2	12	1	0	5	2	22	2%
Highway 7	10	40	69	22	33	4	178	13%
Denby Court/Second Street to Highway 7	1	1	3	0	1	0	6	0%
Denby Court/Second Street	0	0	1	0	0	0	1	0%
Austin Drive to Denby Court/Second Street	0	0	0	0	0	1	1	0%
Austin Drive	1	2	10	0	1	3	17	1%
Carlton Road to Austin Drive	0	0	4	1	0	1	6	0%

Location	Approaching	Angle	Rear End	Side-swipe	Turning	SMV	Total	% of all Collisions
Carlton Road	1	6	11	1	8	5	32	2%
The Bridle Trail to Carlton Road	0	1	4	1	0	1	7	0%
The Bridle Trail	2	6	9	4	1	1	23	2%
Birchview Lane to The Bridle Trail	0	0	1	0	0	0	1	0%
Birchview Lane	0	0	3	2	0	0	5	0%
16th Avenue to Birchview Lane	0	0	1	1	1	0	3	0%
16th Avenue	1	15	67	14	10	6	113	8%
Bur Oak Avenue to 16th Avenue	0	4	4	1	1	3	13	1%
Bur Oak Avenue	1	3	9	0	1	3	17	1%
Angus Glen Boulevard to Bur Oak Avenue	0	0	0	0	1	0	1	0%
Angus Glen Boulevard	0	0	1	0	0	2	3	0%
The Fairways/Castlemore Avenue to Angus Glen Boulevard	0	0	0	1	0	0	1	0%
The Fairways/Castlemore Avenue	0	1	5	0	2	1	9	1%
Schoolhouse Road to The Fairways/Castlemore Avenue	0	0	1	0	0	0	1	0%
Major Mackenzie Drive	2	15	23	2	10	3	55	4%
Total	**39**	**242**	**733**	**153**	**152**	**85**	**1404**	**100%**
Percentage	**3%**	**17%**	**52%**	**11%**	**11%**	**6%**	**100%**	

4.7.5 Collisions by Environmental Conditions

The distribution of collision by environmental condition and location is provided in **Exhibit 4-39**. The majority of collisions have occurred under clear conditions (70%), followed by rain (22%), and snow (5%). Very few collisions occurred in other conditions (freezing rain, drifting, fog, mist, smoke, and dust), possibly due to a rare chance of such weather conditions. No pattern can be observed related to environmental conditions.

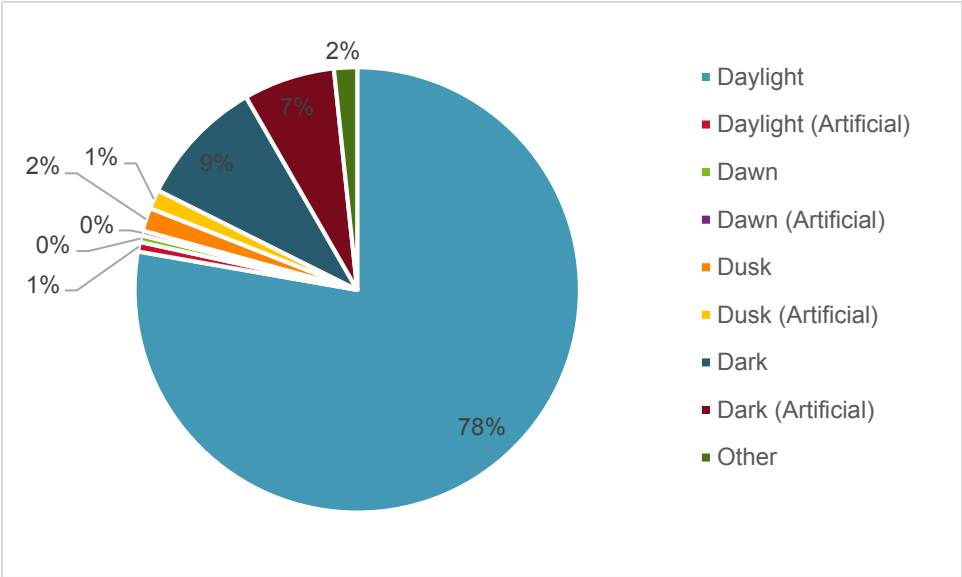


Note: Categories with less than 1.0% were omitted in this graph

Exhibit 4-39: Collisions by Environmental Conditions (January 2011 to December 2015)

4.7.6 Collisions by Light Conditions

The distribution of collisions by light condition is provided in **Exhibit 4-40**. The majority of collisions occurred in daylight conditions (78%), followed by dark (9%), dark artificial (7%), dusk (2%), dusk artificial (1%), daylight artificial (1%), and other (2%). The study corridor is located in an urban setting where the roads are illuminated. No pattern can be observed related to light conditions.



Note: Categories with less than 1.0% were omitted in this graph

Exhibit 4-40: Collisions by Light Conditions (January 2011 to December 2015)

4.7.7 Safety for Vulnerable Users

York Region provided 10 year pedestrian and cyclist data between 2006 and 2016. To be consistent with collision analysis conducted for traffic, pedestrian and cyclist collisions between January 1, 2011 and December 31, 2015 along the study corridor are summarized below. A total of 58 collisions involving pedestrians or cyclists occurred in the study area during the five-year review period. Of these 44 collisions, 15 collisions (34%) were pedestrian-related while 29 collisions (66%) were cyclist-related.

Collisions for vulnerable users were assessed by year, severity, location, and impact type to identify trends and patterns in the collisions.

4.7.7.1 COLLISIONS BY YEAR FOR VULNERABLE USERS

Collisions for pedestrians and cyclists were reviewed between 2011 and 2015, as illustrated in **Exhibit 4-41** and **Exhibit 4-42**. Both pedestrian and cyclist collisions are fairly constant over this time period, with cyclist collisions generally ranging between 5 and 6 collisions per year (reaching a maximum of 8 collisions in 2015). Pedestrian collisions, on the other hand, exhibits more sporadic patterns, growing from 3 to 6 collisions per year between 2012 and 2014, followed by a significant decrease to only 1 collision in 2015. This historical data suggests that collision rates for pedestrians and cyclists are not expected to increase along the corridor despite increase in traffic; this is likely due to the fact that pedestrian and cyclist volumes are low relative to auto volumes, which dominates mode choice for the corridor's users.

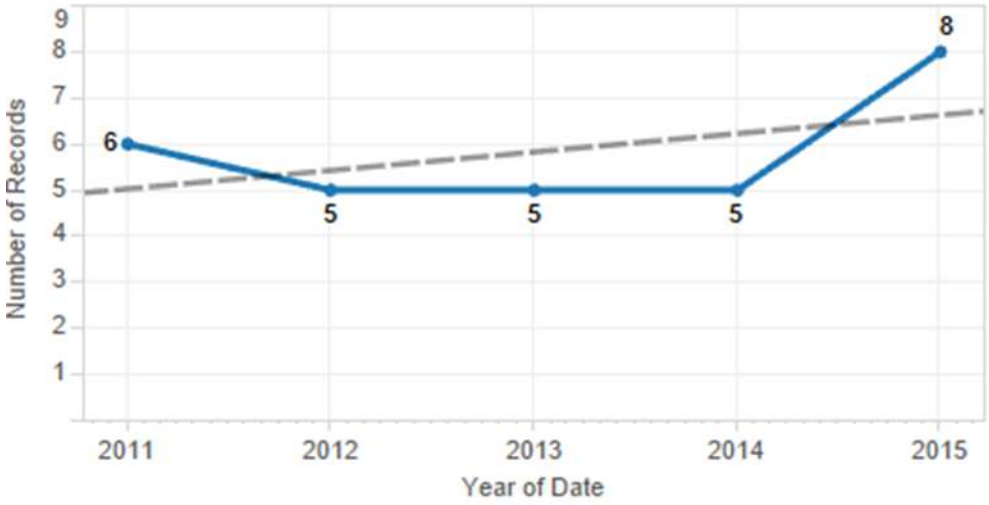


Exhibit 4-41: Cyclist Collisions by Year (January 2011 to December 2015)

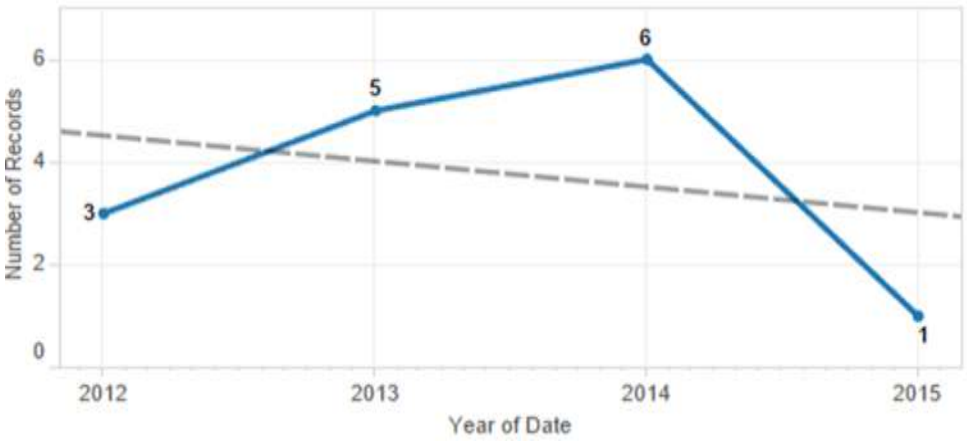


Exhibit 4-42: Pedestrian Collisions by Year (January 2011 to December 2015)

4.7.7.2 COLLISIONS BY SEVERITY FOR VULNERABLE USERS

As shown in **Table 4-26**, the following intersections have relatively high numbers of collisions that involved vulnerable users: Kennedy Road at 14th Avenue (14%), Denison Street (16%), and 407ETR Off-Ramp Terminal (9%). These intersections are situated near key pedestrian and cyclist generators such as Unionville GO Station, Milliken Mills Community Center, Milliken Mills High School, and various commercial plazas between 14th Avenue and Denison Road.

Kennedy Road / Denison Street and Kennedy Road / 14th Avenue are near various commercial plazas and recreational land use areas, such as Milliken Mills Park. It is likely that these intersections exhibited a higher pedestrian demand as a result of the neighbouring hand uses, increasing the likelihood of pedestrian-related collisions.

Table 4-26: Pedestrian and Cyclist Collisions by Location (January 2011 to December 2015)

Location	Pedestrian	Cyclist	Total	% of all Collisions
Clayton Drive to Steeles Avenue	1	0	1	2%
Clayton Drive	0	2	2	5%
Gorvette Road	1	0	1	2%
Denison Street to Gorvette Road	1	0	1	2%
Denison Street	2	5	7	16%
Highglen Avenue to Denison Street	0	1	1	2%
Highglen Avenue	0	2	2	5%
Lee Avenue	0	3	3	7%
14th Avenue	3	3	6	14%
Duffield Drive	0	1	1	2%
407ETR Off-ramp Terminal	0	4	4	9%
Unionville Gate/South Unionville Avenue	0	2	2	5%
Avoca Drive	3	0	3	7%
Highway 7	0	2	2	5%
Carlton Road	0	3	3	7%
16th Avenue	2	1	3	7%
Bur Oak Avenue	1	0	1	2%
The Fairways/Castlemore Avenue	1	0	1	2%
Total	**15**	**29**	**44**	**100%**
Percentage	**34%**	**66%**	**100%**	

Out of 29 cyclist collisions, 25 (86%) collisions were non-fatal, 4 (14%) collisions involved property damage only, and no collisions were fatal.

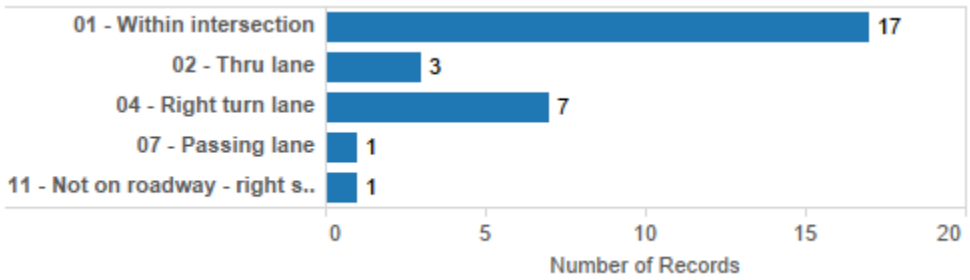


Exhibit 4-43: Impact Locations for Cyclist Related Collisions between 2011 and 2015

Exhibit 4-43 illustrates the various impact locations for the 29 cyclist collisions along the corridor. 17 out of 29 (59%) cyclist collisions occurred within an intersection, the predominant impact location type along the study corridor. Notably, 7 out of 29 (24%) cyclist collisions occurred in the right turn lane approaching an intersection, where generally and historically, auto-cyclist collisions have been observed to have a high probability of occurrence relative to other intersection impact locations.

Out of 15 pedestrian collisions, 13 (86%) collisions were non-fatal, while 1 (7%) collision involved property damage only and 1 (7%) collision was fatal. The fatal incident was recorded in 2013 on Kennedy Road between Gorvette Road and Denison Street, whereby a pedestrian crossed Kennedy Road illegally and was struck by a vehicle exceeding the posted speed limit. **Exhibit 4-44** illustrates the various impact locations for the 15 pedestrian collisions along the corridor. 10 out of 15 (66%) of pedestrian collisions occurred within an intersection, the predominant impact location type involving pedestrians along the corridor.

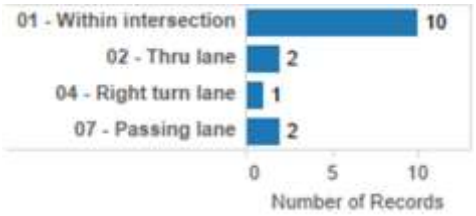


Exhibit 4-44: Impact Locations for Pedestrian Related Collisions between 2011 and 2015

4.7.7.3 COLLISIONS BY INITIAL IMPACT TYPE FOR VULNERABLE USERS

Impact types for pedestrians and cyclists were investigated between 2011 and 2015 to identify historical trends in driver activity and pedestrian/cyclist activity during the initial impact of collisions along the corridor.

For collisions involving pedestrians, the majority of collisions involved pedestrians crossing with the right-of-way and with drivers failing to obey the right of way, which comprises nearly 7 (50%) pedestrian related collisions. Only 4 (27%) pedestrian related collisions involved a driver driving properly. **Exhibit 4-45** illustrates the various pedestrian and driver actions observed for pedestrian related collisions along the corridor.

Exhibit 4-45: Impact Types Involving Pedestrian and Driver Actions

For collisions involving cyclists, the majority of collisions involved a driver making an improper turn or failing to provide right-of-way to a cyclist, comprising 17 (59%) cyclist related collisions. Only 7 (24%) cyclist related collisions involved a driver driving properly. **Exhibit 4-46** illustrates the various driver actions observed for cyclist related collisions along the corridor.

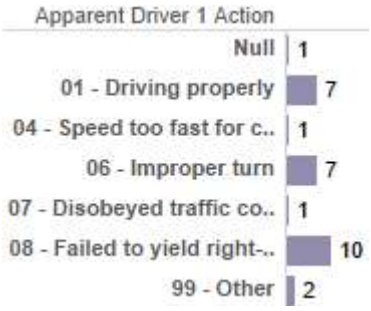


Exhibit 4-46: Driver Action Involving Cyclist Collisions

5. Future Transportation Conditions

The following section documents 2041 transportation demand and network along Kennedy Road, including a summary of regional transportation trends and recommendations from the *York Region's 2016 Transportation Master Plan* (YR-TMP), future corridor travel demand patterns, traffic operations, and preliminary needs analysis for various corridor improvements. The future transportation conditions analysis and findings presented in this section reflected a 6-lane (4 GPL + 2 HOV lane) widening scenario between Steeles Avenue and Major Mackenzie Drive, as per the recommendations in the YR-TMP and as assumed in the 2041 York Region Model.

5.1 Findings of Analysis from York Region Transportation Master Plan

The rapidly evolving nature of York Region affects the transportation choices of the people who live and work within. Origin and destination patterns, mode choice preferences, and magnitude of trips are changing as York Region becomes more urbanized. The following section summarizes the results of the transportation analysis with respect to future travel patterns, modal share, and transit ridership, conducted as part of the YR-TMP, as well as planned improvements identified as a part of the study.

5.1.1 2041 Future Travel Patterns

Future travel demand was estimated for the 2041 horizon year using the York Region EMME Model. The future travel demand documented in this report is based on the land use projections provided by the Region and a 2041 base network which includes improvements from the Region's 10-year capital program, funded rapid transit services and funded highway improvements.

Over the next 30 years, travel demand is expected to grow about 2% per year, equating to a growth of 61% across York Region. As York Region becomes progressively urbanized, it has also become more self-contained. **Exhibit 5-1** presents AM peak period trips originating from York Region. Internal York Region to York Region trips will continue to be the most significant growth segment as intra-regional trips are predicted to grow by over 200,000 trips. This growth alone accounts for 28% of all future trips in York Region, and accounts for 75% of future growth in trips originating from York Region.

Origin Destination	Trips			Growth			
	1986	2011	2041	1986 2011		2011 2041	
York-York	63,400	293,000	517,300	229,600	362%	224,300	77%
York-Downtown Toronto	16,000	49,600	68,600	33,600	210%	19,000	38%
York-Rest of Toronto	55,300	111,700	155,000	56,400	102%	43,300	39%
York-Durham	2,000	6,200	12,600	4,200	210%	6,400	103%
York-Peel	5,900	23,100	27,800	17,200	292%	4,700	20%
York-Other	2,200	8,700	9,600	6,600	295%	900	10%
Total from York	**144,900**	**492,300**	**791,000**	**347,600**	**240%**	**298,600**	**61%**

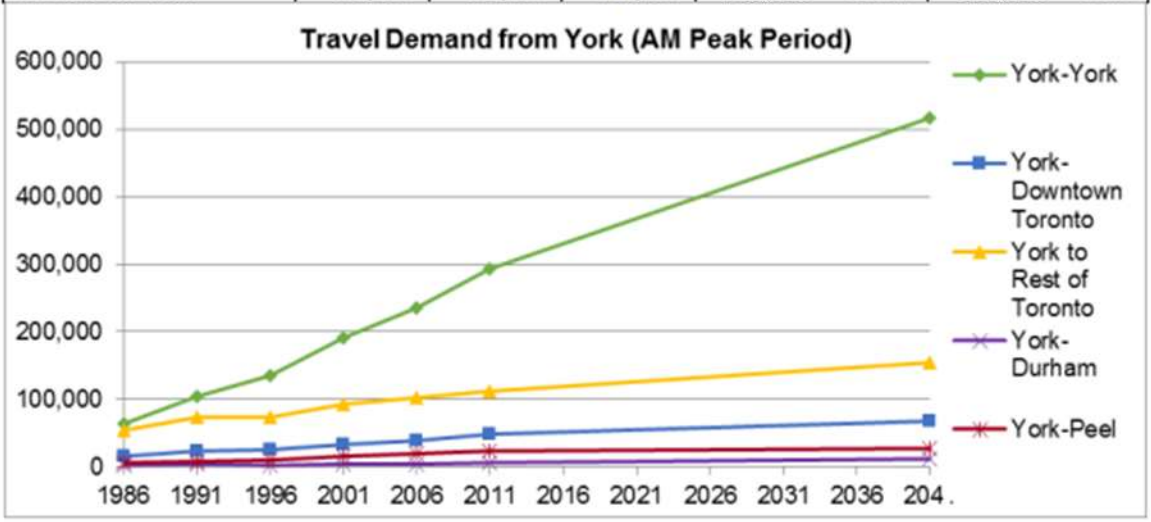


Exhibit 5-1: AM Peak Hour Trips Originating from York Region

In 2041, York Region will continue to be a net exporter of trips in the AM peak period. That is, there remains a component of York Region that remains a commuter suburb to Toronto. However, looking forward, the growth in new trips destined to York Region exceeds that of new trips originating in York Region. In the last 25 years, more trips stay within York Region (the proportion of which grows from 44% to 60% of total trips destined to York Region). This significant change can be attributed to those formerly commuting to York Region relocating to also live in York Region. **Exhibit 5-2** illustrates AM peak period trips destined to York Region.

Origin Destination	Trips			Growth			
	1986	2011	2041	1986 2011		2011 2041	
York-York	63,400	293,000	517,300	229,600	362%	224,300	77%
Downtown Toronto-York	1,700	3,200	4,700	1,500	88%	1,500	47%
Rest of Toronto-York	50,400	74,500	99,100	24,100	48%	24,600	33%
Durham-York	4,100	17,500	35,000	13,400	327%	17,500	100%
Peel-York	6,800	20,600	35,900	13,800	203%	15,300	74%
Other-York	1,100	18,500	29,000	17,400	1582%	10,500	57%
Total to York	**127,600**	**427,200**	**721,000**	**299,800**	**235%**	**293,700**	**69%**

* Other trip origins are under-represented in the 1986 TTS due to the smaller geographic survey area.

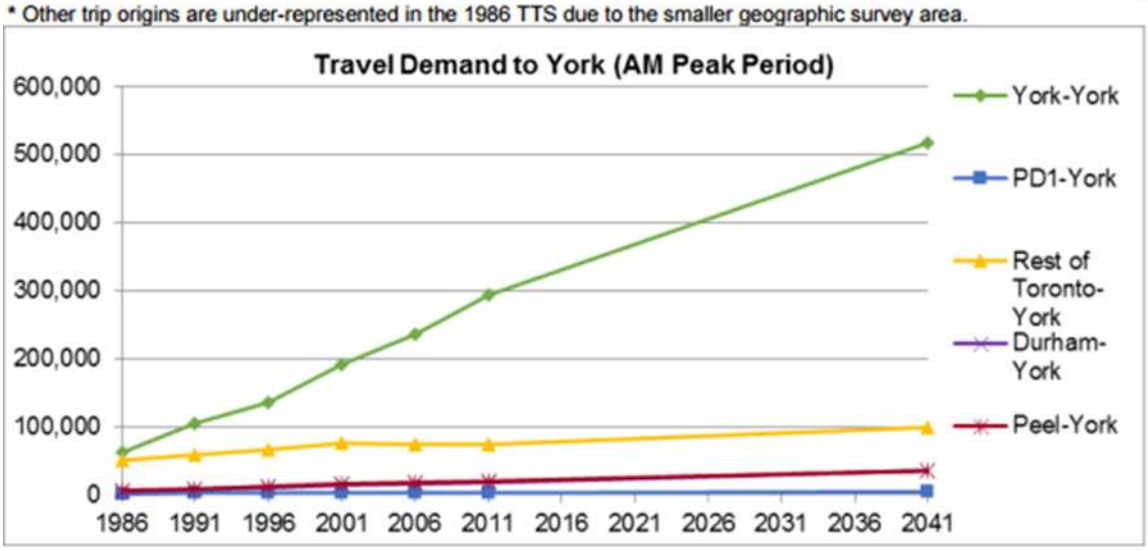


Exhibit 5-2: AM Peak Hour Trips Destined to York Region

The origin-destination trends for the AM peak hour indicate that York Region is developing into a more established urban area where more residents can choose to live, work and play. This suggests Kennedy Road will continue to serve its primary role as intra-regional north-south corridor, with similar travel patterns as that of its existing role as illustrated in **Section 4.2.2**.

5.1.2 2041 Modal Share

A comparison of the percent of trips from, to, and within York Region by the various modes of transportation between 2011 and 2041 were analyzed in the YR-TMP and supplemented by the findings in the *Background Report D - Pedestrian and Cycling Plan Development Report*.

The auto mode is expected to be the Region's most popular method of transportation by far, whereas transit mode share will continue to grow for trips within and outside of York Region.

The combined mode share between auto and transit greatly outweighs other modes such as pedestrians and cyclists. For example, historically, cycling trips have increased substantially in the last decade, but their overall share remains less than 1% of the AM peak period total.

Therefore, future auto and transit mode shares are the primary focus of the analysis conducted in the YR-TMP. These future patterns are summarized as follows.

The majority of trips in York will be made by automobiles in 2041. Mode share is strongly related to travel distribution patterns and the availability of transit connecting a specific origin-destination pair.

Internal York Region trips are the largest component of travel in York Region, representing over 517,000 total trips in the AM peak period. The YR-TMP predicts that the 2041 transit share for internal York Region trips will increase slightly, but will continue to remain low, at about 5%. In comparison, the YR-TMP predicts a significant shift in travel by transit from York Region to other municipalities. For example, transit share for trips to downtown Toronto is anticipated to increase from 74% in 2011 to 82% in 2041. The increased transit share supports increased capacity that will be provided by the Toronto-York Spadina Subway Extension and the planned Yonge North Subway Extension and Regional Express Rail. The growth in transit mode share between 2011 and 2041 for trips originating from and destined to York Region is summarized in **Table 5-1**.

Table 5-1: York Region Transit Mode Share

Origin Destination	Transit Share		
	1986	2011	2041
Trips Originating in York Region			
York-York	4.1%	3.4%	4.5%
York-Downtown Toronto	54.0%	73.5%	81.6%
York-Rest of Toronto	9.5%	12.5%	15.6%
York-Durham	0.0%	4.8%	2.5%
York-Peel	0.8%	1.4%	7.4%
York-Other	3.2%	2.1%	1.7%
Total from York	**11.4%**	**12.5%**	**13.4%**
Trips Destined within York Region			
York-York	4.1%	3.4%	4.5%
Downtown Toronto-York	25.4%	21.1%	26.4%
Rest of Toronto-York	11.2%	9.0%	12.6%
Durham-York	0.7%	0.2%	5.0%
Peel-York	2.2%	2.6%	4.2%
Other-York	4.0%	0.8%	1.2%
Total to York	**6.9%**	**4.2%**	**5.6%**

As shown in **Table 5-1**, although transit mode share for trips to and from downtown Toronto is significant, growth for transit trips in the study corridor, utilizing Kennedy Road between Steeles Avenue and Major Mackenzie Drive, is marginal. Kennedy Road between Steeles Avenue and Major Mackenzie Drive primarily serves and will continue to serve as a major intra-regional corridor, with a small proportion of trips originating from or destined to Toronto, immediately south of the study area. Overall, transit mode share is expected to increase marginally between 2011

and 2041 by roughly 1% for intra-regional trips, and up to 4% for trips originating from or destined to Toronto.

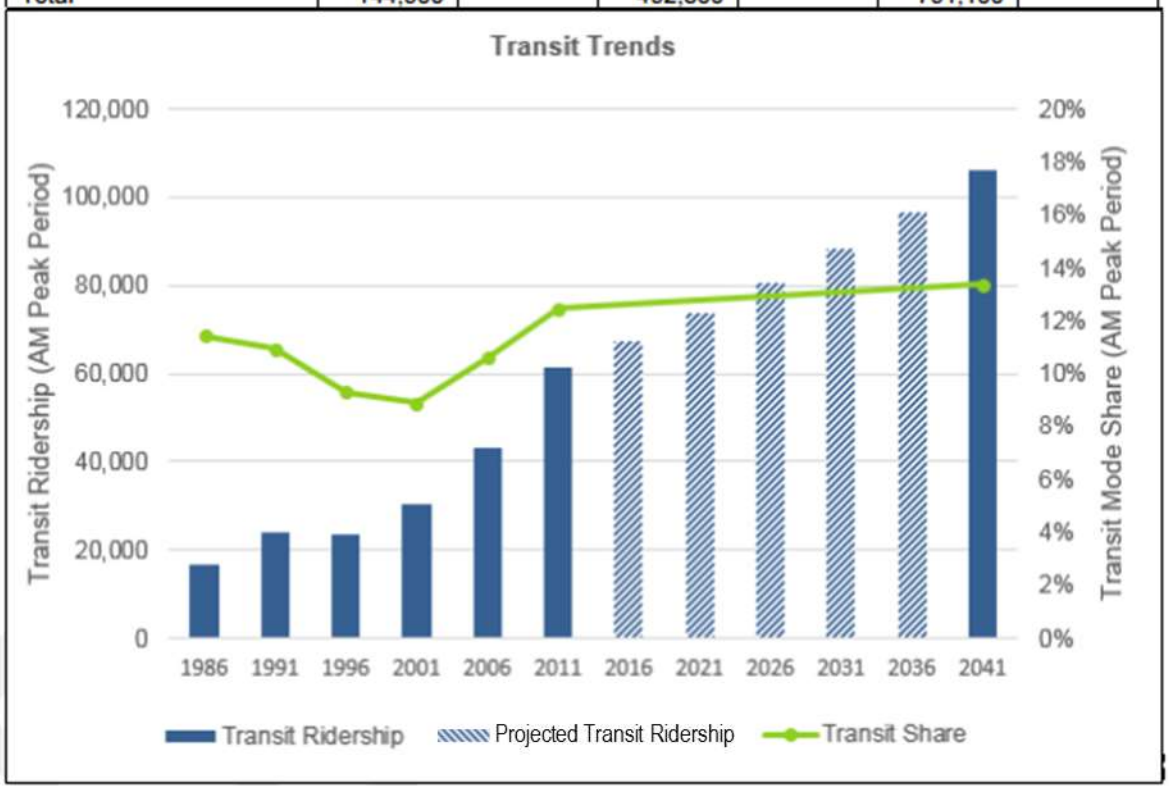
5.1.3 2041 Transit Ridership

York Region Transit has made significant progress in expanding its transit networks and service hours. Overall, transit service hours increased by 12% over the five year period from 2009 to 2014. Service levels on the GO Train have even more rapid increases with a 33% increase in seats provided. Looking forward, the predicted change in transit share over the next 30 years is expected to be similar to past growth as projected in the York Region Model's base case estimation and existing trends and travel characteristics upon which the model was calibrated.

Existing and future transit ridership levels across York Region are summarized in **Table 5-2**. Transit trips across York Region, including both local and GO transit trips, are expected to increase from 61,300 to 106,000 trips between 2011 and 2041.

Table 5-2: 2041 Transit Ridership in York Region

Mode	1986		2011		2041 Base Case	
	Trips	Mode Share %	Trips	Mode Share %	Trips	Mode Share %
Transit (Local, GO)	16,600	11.4%	61,300	12.5%	106,000	13.4%
Auto (Driver+Passenger)	128,300	88.6%	430,900	87.5%	685,100	86.6%
Total	144,900		492,300		791,100	



Given the model outputs ridership forecasts for the AM peak period only, only AM peak hour transit trips are provided for the 2041 ridership forecasts below. Existing peak period and peak hour ridership data for Route 8, the primary transit route along the study corridor, was used to develop a transit peak hour factor to adjust EMME model outputs and reflect future AM peak hour conditions. The resulting 2041 transit ridership projection along Kennedy Road between major arterials, by direction and for the AM peak hour is summarized in **Table 5-3** through **Table 5-4**.

Table 5-3: AM Northbound 2041 Transit Ridership on Kennedy Road

2041 AM NB Kennedy Road Transit Ridership				
From	**To**	**2041 Transit Trips - Modelled (AM Peak Period)**	**Transit Peak Hour Factor (based on existing ridership data for Route 8)**	**2041 Transit Trips - Factored (AM Peak Hour)**
14th Avenue	Steeles Avenue	99	0.62	62
407ETR	14th Avenue	201	0.67	135
Highway 7	407ETR	203	0.71	144
16th Avenue	Highway 7	106	0.77	81
Major Mackenzie Drive	16th Avenue	53	0.82	43

Table 5-4: AM Southbound 2041 Transit Ridership on Kennedy Road

2041 AM SB Kennedy Road Transit Ridership				
From	**To**	**2041 Transit Trips - Modelled (AM Peak Period)**	**Transit Peak Hour Factor (based on existing ridership data for Route8)**	**2041 Transit Trips - Factored (AM Peak Hour)**
14th Avenue	Steeles Avenue	333	0.51	169
407ETR	14th Avenue	388	0.58	225
Highway 7	407ETR	756	0.56	427
16th Avenue	Highway 7	732	0.58	427
Major Mackenzie Drive	16th Avenue	599	0.59	352

5.1.4 Network Recommendations

The TMP documents an assessment of existing trends and anticipated future conditions in York Region. This assessment not only identifies problems and opportunities for improvements to the transportation network, but also summarizes strategies, guidelines, and recommendations to the Region's 2041 road and transit network. A summary of the TMP findings is provided below:

- Transportation demand is increasing faster than road network capacity. The future road network will be congested, have major capacity constraints, and the level of service will worsen for road users, especially motorists, under existing roadway capacities.

- Connectivity between modes and the ease of access to transit are major factors to transit demand. The availability of sidewalks and path connections to transit stops, as well as park-and-ride lots at major transit stations are needed to provide mode choice options and accommodate multi-modal trips for the "first and last mile"

- The assessment of the future base and future 'build-out' networks indicate that continuing to widen Regional roads alone will not address the needs of York Region as demand will continue to exceed capacity. Applying alternative solutions through Transportation System Management measures that make better use of the existing infrastructure to improve flow and reduce delay could provide relief in a more cost-effective manner. Measures could include traffic signal coordination, signal priority for transit vehicles, queue jump lanes, or operational improvements at specific locations to address the local capacity constraint

- The development of the proposed transit network was based on designating transit/HOV lanes where peak passenger demand, including transit, exceeds 1,000 passengers per hour in the peak direction

- The focus of the proposed road network is to make strategic road improvements that add capacity, address traffic bottlenecks, complete missing links and optimize system performance. Widening to six lanes with transit/HOV lanes was recommended where peak volume-to-capacity ratios exceeded 1.2

In accordance with the network improvement strategies and guidelines identified above, the YR-TMP recommends widening on Kennedy Road between Steeles Avenue and Major Mackenzie Drive to six lanes to accommodate transit/HOV lane. In addition, Kennedy Road is also recommended in the YR-TMP to be part of the Region's Frequent Transit Network.

5.1.5 Planned Improvements

Planned improvements to 2041 were identified in the YR-TMP including road capacity improvements, frequent transit service, and separated cycling facilities. YR-TMP recommendations for the study corridor are summarized in **Exhibit 5-3**, **Exhibit 5-4**, and **Exhibit 5-5**.

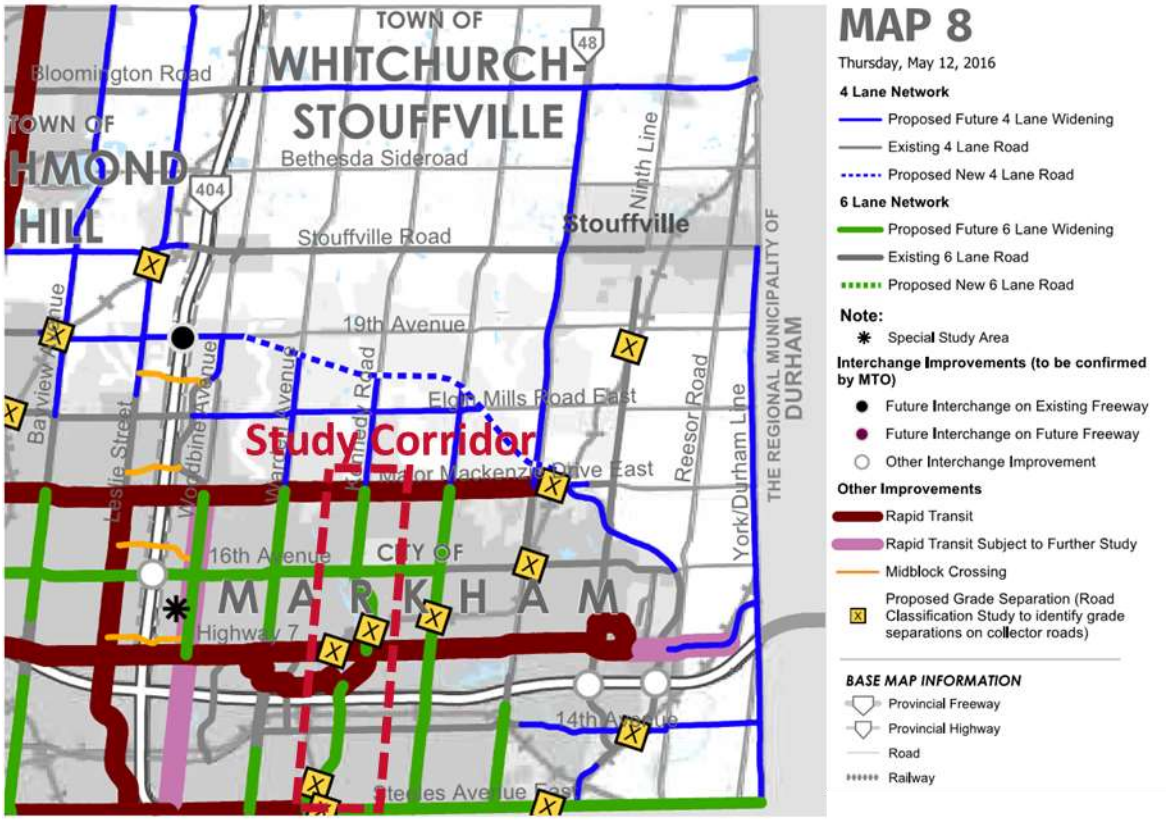


Exhibit 5-3: YR-TMP 2041 Road Network

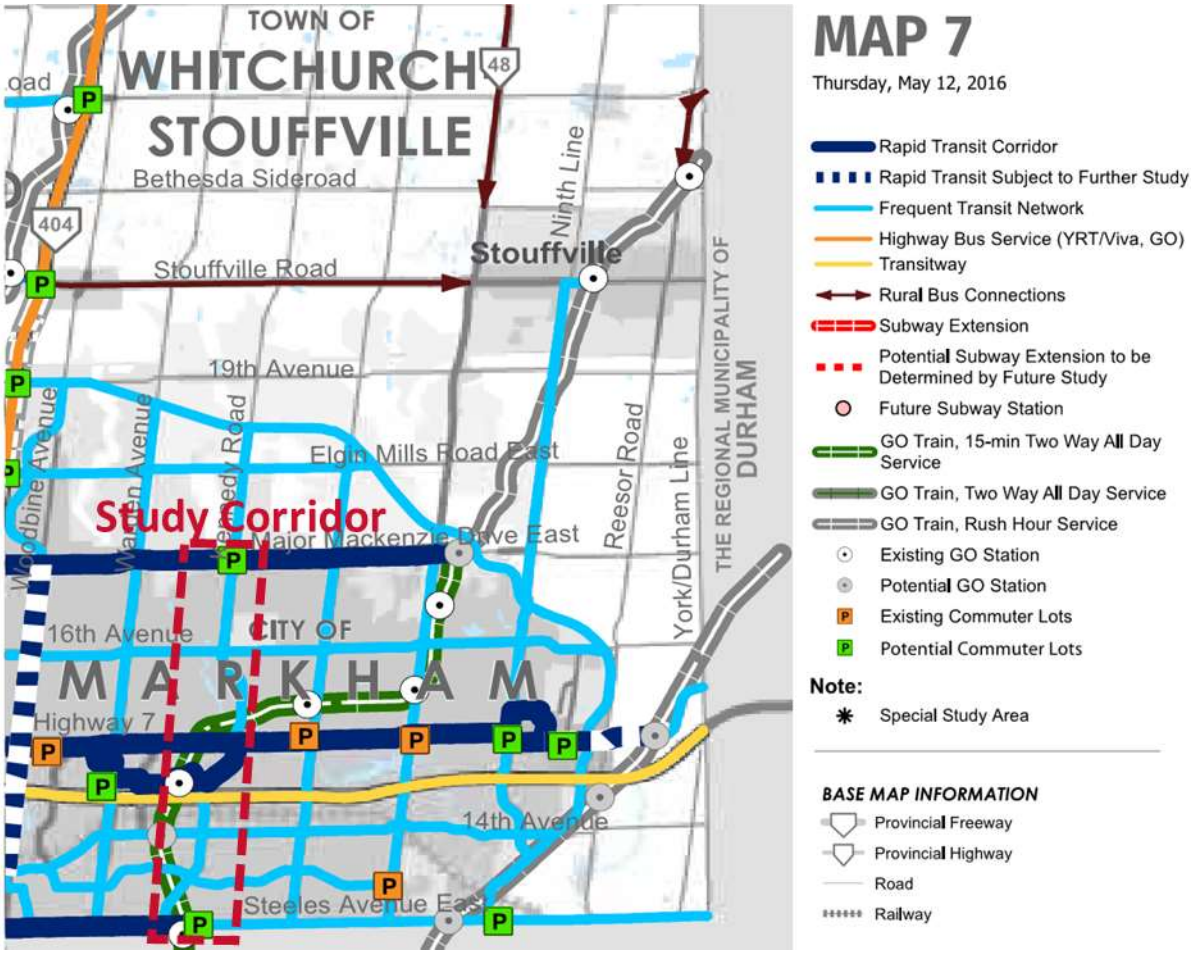


Exhibit 5-4: YR-TMP 2041 Transit Network

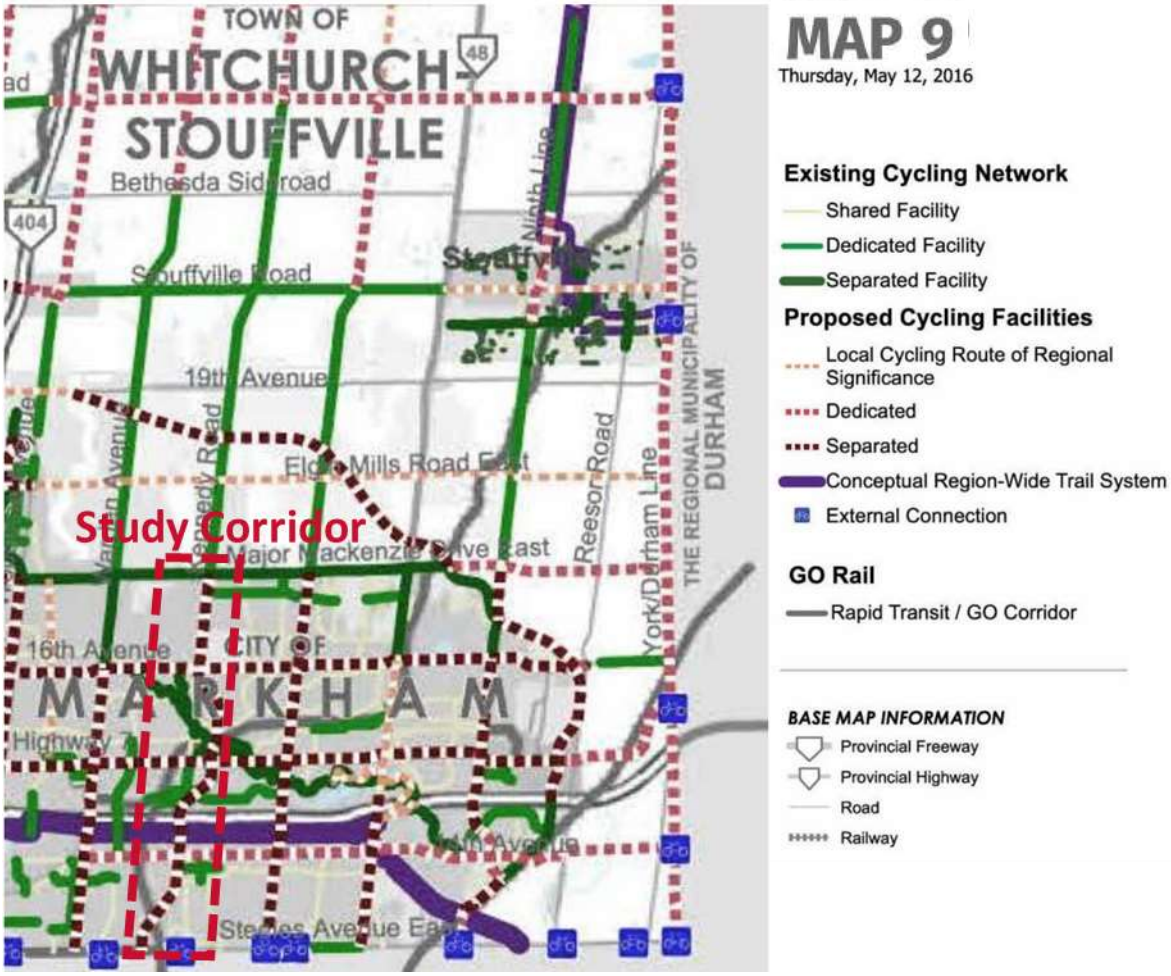


Exhibit 5-5: YR-TMP 2041 Cycling Network

5.2 Future Travel Demand

The key tool to assess future conditions and the development of the proposed transportation network is the York Region Travel Demand Forecasting Model. The York Region Model is a conventional four-step multi-modal transportation forecasting model that was last updated by York Region in 2014 and validated to 2011 Transportation Tomorrow Survey (TTS) data and cordon counts. The York Region Model is described at length in York Region Travel Demand Forecasting Model Update Report dated June 30, 2014 and a subsequent memorandum on the 2011 York Region Model Validation dated August 8, 2014. These documents were used for background information on the application of the Model for the YR-TMP.

The Model predicts AM weekday peak period travel demands for motorized modes – transit, automobile driver and automobile passenger. The Model includes the Greater Toronto and Hamilton Area (GTHA) as well as external areas including the Counties of Peterborough, Simcoe, Dufferin, and Wellington and the Regional Municipalities of Waterloo, Niagara Falls, and Brant/Brantford.

The model zone system is based on the 2006 GTA traffic zone system, and further refined with an additional 41 disaggregated zones in York Region for a total of 519 zones for York Region. The modified zone system is referenced as the 2011 zone system.

5.2.1 Volume Adjustments for Model Calibration

The existing EMME model is based on a 2011 horizon year. 2011 traffic volumes were estimated from existing traffic turning movement counts and historical growth rates based on Annual Average Daily Traffic (AADT) counts between 2011 and 2017. The 2011 volumes were then used to validate the 2011 EMME base model. Count locations and their corresponding dates are listed in **Table 4-11**.

North-south volumes on Kennedy Road were observed to match well to the observed volumes at most locations, with minor discrepancies across the study corridor. Minor location specific adjustments as well as re-routing of traffic based on intersection and segment capacities were applied to the 2011 volumes to calibrate the model to the observed volume. These adjustments were carried forward and applied to 2041 modelled volumes on Kennedy Road to estimate the expected 2041 traffic conditions along Kennedy Road.

As illustrated in **Exhibit 5-6** and **Exhibit 5-7**, the blue line shows the 2011 factored volumes which were factored from 2015/2016 balanced volumes. The difference between the 2011 factored and 2011 calibrated EMME models were applied to adjust the EMME volumes.

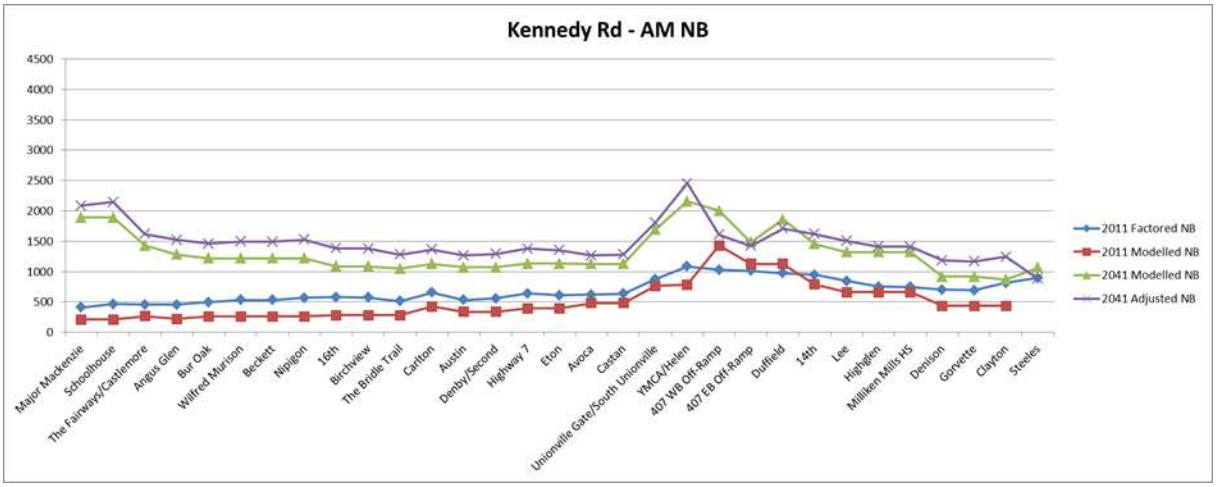


Exhibit 5-6: AM NB – Link Volumes Comparison

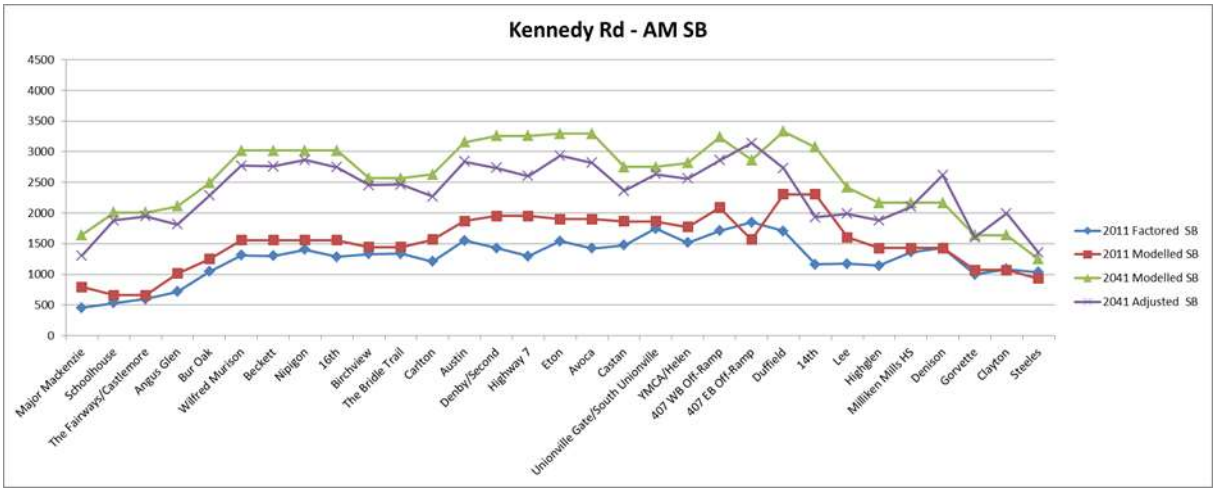


Exhibit 5-7: AM SB – Link Volumes Comparison

5.2.2 2041 Base Case Land Use Assumptions and Growth

The 2041 land use assumptions for all GTA municipalities are listed in **Table 5-5**. In the 2011 horizon year, a total population of 69,000 and employment total of 31,000 was recorded for the entire Kennedy Road Study Area between Steeles Avenue and Major Mackenzie Drive. By 2041, population and employment is expected to grow to 117,000 and 55,000 respectively, which assumes the Region's 45% intensification target is met in future conditions.

Table 5-5: 2041 Land Use Assumptions

Municipality	2011POP	2041POP	2011EMP	2041EMP
Toronto	2,726,763	3,082,670	1,616,228	1,902,072
Durham	636,915	1,190,000	225,530	430,000
York	1,075,210	1,790,000	509,858	900,000
Peel	1,334,604	1,970,000	685,639	970,000
Halton	493,045	917,729	250,932	470,000
Hamilton	517,509	741,068	231,764	337,279
GTHA	**6,784,045**	**9,691,465**	**3,519,951**	**5,009,351**

The population and employment distribution in the study area at traffic zone level is shown in **Exhibit 5-8**. The land use in the study area is predominantly residential and there is little opportunity for employment growth.

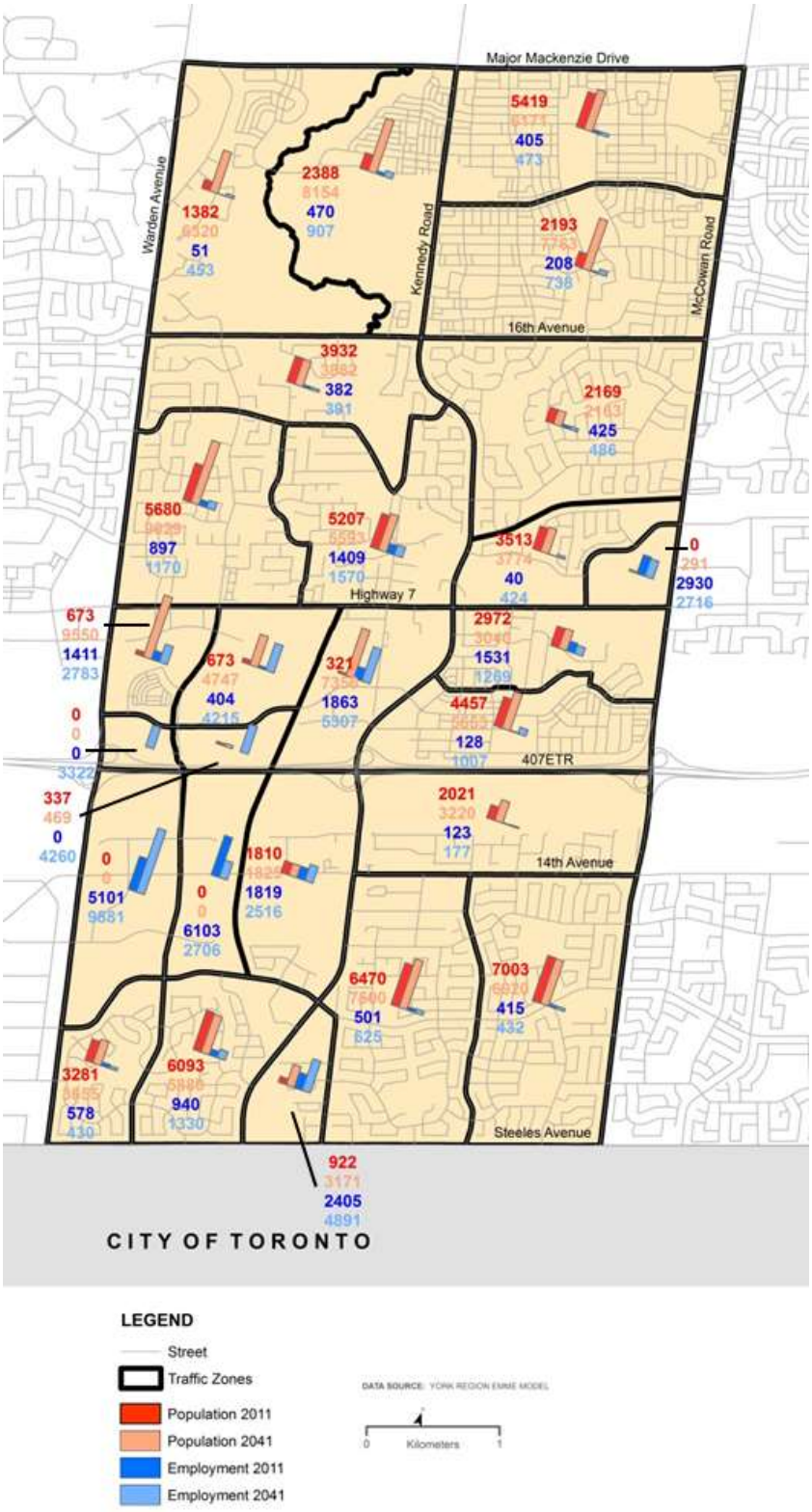


Exhibit 5-8: 2011 and 2041 Population and Employment by Traffic Zone

5.2.3 2041 Peak Hour Traffic Volume Forecasting Approach

The following subsection details the methodology and results in developing 2041 peak hour traffic turning movement volumes along the corridor. Compound annual growth rates (CAGRs) were calculated on an intersection approach level, and applied to existing turning movement volumes to generate the 2041 turning movement volumes.

By applying individual growth factors on an approach-by-approach level for each intersection along the study corridor, this methodology minimizes over-conservative estimates on turning movements (compared to growth methodologies using a screenline approach), as turning movements are directly proportional to link-level volume growth forecasted through the Region's EMME model, which varies on an intersection by intersection basis.

CAGRs are developed using different methodologies for north-south traffic, major east-west traffic (including ramps), and minor east-west traffic. For north-south traffic along the corridor, 2041 EMME adjusted volumes were directly used as future target volumes in balancing intersection volumes. 2016 – 2041 CAGRs were calculated for the sole purpose of forecasting PM peak hour volumes (as the 2041 EMME model is available for the AM peak period only). For east-west traffic crossing the corridor, 2011 – 2041 CAGRs (model to model growth) were used to forecast future AM and PM peak hour volumes based on existing intersection turning movement distributions. 2041 EMME outputs for side streets were not directly used as future target volumes because the EMME model network does not capture the same level of granularity compared to observed data, particularly with respect to analyzing traffic infiltration at major-minor intersections. These methodologies are explained in greater detail in the following sub-sections.

5.2.3.1 2041 NORTH-SOUTH CAGR ON KENNEDY ROAD

North and south approach CAGRs were calculated using 2041 adjusted northbound and southbound link volumes and balanced existing volumes. North-south (N-S) CAGRs for the AM peak hour can be found in **Table 5-6**. These CAGRs were applied to the existing AM Peak hour NB and SB turning movement counts in order to grow existing volumes. High N-S CAGR's located at intersections adjacent to future development area are expected. For instance, the high growth rates at intersections between 16th Avenue and Major Mackenzie Drive are anticipated to York Downs Re-development and North Markham Future Urban Area development.

Table 5-6: 2016-2041 N-S Approach CAGRs

ID	Intersection	2041 AM EMME – Adjusted (6-lane) Volume		2017 AM Balanced Volume		2017 - 2041 CAGR	
		NB	*SB*	*NB*	*SB*	*NB*	*SB*
1	Steeles Avenue	1009	1351	1009	1163	0.00%	0.63%
2	Clayton Drive	1245	1991	915	1222	1.29%	2.05%
3	Gorvette Road	1170	1601	784	1136	1.68%	1.44%
4	Denison Street	1182	2618	798	1626	1.65%	2.00%

ID	Intersection	2041 AM EMME – Adjusted (6-lane) Volume		2017 AM Balanced Volume		2017 - 2041 CAGR	
		NB	*SB*	*NB*	*SB*	*NB*	*SB*
5	Milliken Mills HS	1406	2099	850	1550	2.12%	1.27%
6	Highglen Avenue	1414	1881	859	1302	2.10%	1.54%
7	Lee Avenue	1504	1988	961	1337	1.88%	1.67%
8	14th Avenue	1616	1930	1068	1309	1.74%	1.63%
9	Duffield Drive	1710	2731	1097	1921	1.87%	1.48%
10	407ETR EB Off-Ramp	1424	3143	1074	1961	1.18%	1.98%
11	407ETR WB Off-Ramp	1608	2859	1092	1815	1.63%	1.91%
12	YMCA Blvd/Helen Avenue	2456	2560	1148	1604	3.22%	1.97%
13	Unionville Gate/South Unionville Avenue	1810	2633	875	1747	3.07%	1.72%
14	Castan Avenue	1280	2360	732	1703	2.36%	1.37%
15	Avoca Drive	1266	2818	716	1643	2.40%	2.27%
16	Eton Street	1350	2936	705	1779	2.74%	2.11%
17	Highway 7	1377	2604	736	1499	2.64%	2.33%
18	Denby Court/Second Street	1292	2734	587	1501	3.34%	2.53%
19	Austin Drive	1267	2837	561	1632	3.45%	2.33%
20	Carlton Road	1360	2269	715	1323	2.72%	2.27%
21	The Bridle Trail	1280	2463	560	1466	3.50%	2.19%
22	Birchview Lane	1378	2454	627	1456	3.34%	2.20%
23	16th Avenue	1382	2611	632	1407	3.31%	2.61%
24	Nipigon Avenue	1526	2706	587	1458	4.06%	2.61%
25	Beckett Avenue	1492	2762	552	1350	4.23%	3.03%
26	Wilfred Murison Avenue	1494	2771	554	1360	4.22%	3.01%
27	Bur Oak Avenue	1458	2285	516	1085	4.42%	3.15%
28	Angus Glen Blvd	1519	1815	664	1044	3.51%	2.33%
29	The Fairways/Castlemore Avenue	1621	1948	660	870	3.81%	3.42%
30	Schoolhouse Road	2145	1881	676	773	4.93%	3.77%
31	Major Mackenzie Drive	2087	1305	592	661	5.39%	2.87%

5.2.3.2 2041 E/W CAGR AT MAJOR INTERSECTIONS

At certain major intersections, east-west (E-W) volumes in the 2011 EMME model were significantly lower when compared to 2017 observed volumes; so when applying the CAGRs to 2017 volumes, the resultant 2041 forecasted volumes were much higher than expected given the future roadway capacity. Therefore, the 2041 forecasted volumes for E-W approaches were re-calculated by adding the interpolated absolute difference between 2011 and 2041 to existing 2017 volumes to achieve more reasonable volume estimates. East-west CAGRs for the AM peak hour can be found in **Table 5-7**.

Table 5-7: E-W CAGRs at Major Intersections

ID	Intersection	2041 AM Forecasted (6-lane) Volume		2017 AM Balanced Volume		2017 - 2041 CAGR	
		EB	*WB*	*EB*	*WB*	*EB*	*WB*
1	Steeles Avenue	1095	2242	1095	1495	0.00%	1.70%
4	Denison Street	584	1125	505	985	0.61%	0.56%
8	14th Avenue	822	1708	702	1545	0.66%	0.42%
10	407ETR EB Off-Ramp	433	-	328	-	1.16%	-
11	407ETR WB Off-Ramp	-	1454	-	539	-	4.22%
17	Highway 7	960	2201	584	1793	2.09%	0.86%
23	16th Avenue	1208	2476	839	1822	1.53%	1.29%
31	Major Mackenzie Drive	1286	2185	753	1995	2.26%	0.38%

5.2.3.3 2041 E-W CAGR AT MINOR INTERSECTIONS

Estimating E-W CAGRs at minor intersections are not straightforward, as the EMME network does not include every single minor intersection. Additionally, some minor intersections' E-W legs are represented by centroid connectors, which potentially can skew volumes depending on how the centroid is coded. In order to estimate E-W CAGRs for minor intersections, a centroid-level growth factor was calculated and apportioned to all minor intersections it represented according to the existing traffic distribution. East-west (E-W) CAGRs for minor intersections for the AM peak hour can be found in **Table 5-8.**

Table 5-8 E-W CAGRs for Minor Intersections

ID	Intersection	2041 AM Forecasted (6-lane) Volume		2017 AM Balanced Volume		2017 - 2041 CAGR	
		EB	*WB*	*EB*	*WB*	*EB*	*WB*
2	Clayton Drive	351	134	351	83	0.00%	2.00%
3	Gorvette Road	79	-	79	-	0.00%	-
5	Milliken Mills HS	20	-	20	-	0.00%	-
6	Highglen Avenue	194	528	194	528	0.00%	0.00%
7	Lee Avenue	142	280	142	280	0.00%	0.00%
9	Duffield Drive	153	-	153	-	0.00%	-
12	YMCA Blvd/Helen Avenue	467	354	213	349	3.32%	0.05%
13	Unionville Gate/South Unionville Avenue	638	573	304	537	3.14%	0.27%
14	Castan Avenue	-	48	-	48	-	0.00%
15	Avoca Drive	70	107	70	107	0.00%	0.00%
16	Eton Street	10	31	10	31	0.00%	0.00%
18	Denby Court/Second Street	27	4	25	3	0.28%	1.42%

ID	Intersection	2041 AM Forecasted (6-lane) Volume		2017 AM Balanced Volume		2017 - 2041 CAGR	
		EB	*WB*	*EB*	*WB*	*EB*	*WB*
19	Austin Drive	-	279	-	206	-	1.27%
20	Carlton Road	219	1363	214	1016	0.10%	1.23%
21	The Bridle Trail	121	310	118	310	0.10%	0.00%
22	Birchview Lane	59	-	57	-	0.16%	-
24	Nipigon Avenue	-	30	-	20	-	1.67%
25	Beckett Avenue	284	331	-	228	-	1.57%
26	Wilfred Murison Avenue	311	83	-	57	-	1.57%
27	Bur Oak Avenue	-	942	-	648	-	1.57%
28	Angus Glen Blvd	196	-	151	-	1.09%	-
29	The Fairways/Castlemore Avenue	71	519	55	291	1.10%	2.44%
30	Schoolhouse Road	56	-	43	-	1.12%	-

5.3 Future Auto Traffic

5.3.1 2041 Peak Hour Traffic Volumes

Future peak hour operations were assessed based on the 2041 traffic volume forecast. These updated peak hour volumes were compared to the existing road capacity to identify potential capacity issues.

2041 link and turning movement volumes were derived from existing volumes and the 2041 traffic volume forecast. Compound annual growth rates were calculated on an intersection approach level, balanced using the Fratar/Furness method and applied to existing turning movement volumes to generate the 2041 turning movement volumes. This methodology and its results are documented in detail in **Section 5.2.3**.

As illustrated in **Exhibit 5-9**, 2041traffic on Kennedy Road is highest in the southbound direction during the weekday AM peak hour, peaking at approximately 3,000 vehicles per hour near 407ETR. The projected volume in the southbound direction is expected to exceed existing capacity throughout almost the entire study corridor. In the northbound direction during the weekday AM peak hour, 2041 traffic exceeds capacity on small segments at south of Major Mackenzie Drive.

During the weekday PM peak hour, as shown in **Exhibit 5-10**, 2041 traffic is highest in the northbound direction and peaking at over 3,000 vehicles per hour near 407ETR. The projected volume in the northbound direction is expected to exceed existing capacity throughout entire study corridor. In the southbound direction during the weekday PM peak hour, 2041 traffic exceeds

capacity from south of Major Mackenzie Drive to north of Denison Street. In summary, 2041 peak hour traffic exceeds capacity throughout entire study corridor.

In accordance with the network improvement strategies and guidelines identified in the 2041 YR-TMP, the Region recommends widening on Kennedy Road between Steeles Avenue and Major Mackenzie Drive to six lanes to accommodate transit/HOV lane.

For the purpose of evaluating future capacity constraints along Kennedy Road, a capacity of 500 vehicles per hour per lane (vphpl) was assumed for the HOV lane, consistent with the HOV lane capacities assumed in the York Region model. These capacity improvements are reflected in **Exhibit 5-9** and **Exhibit 5-10** which illustrate the future AM and PM peak hour balanced traffic volume-to-capacity ratios and intersection level of service across the study corridor, assuming the widening of Kennedy Road to six lanes between Steeles Avenue and Major Mackenzie Drive.

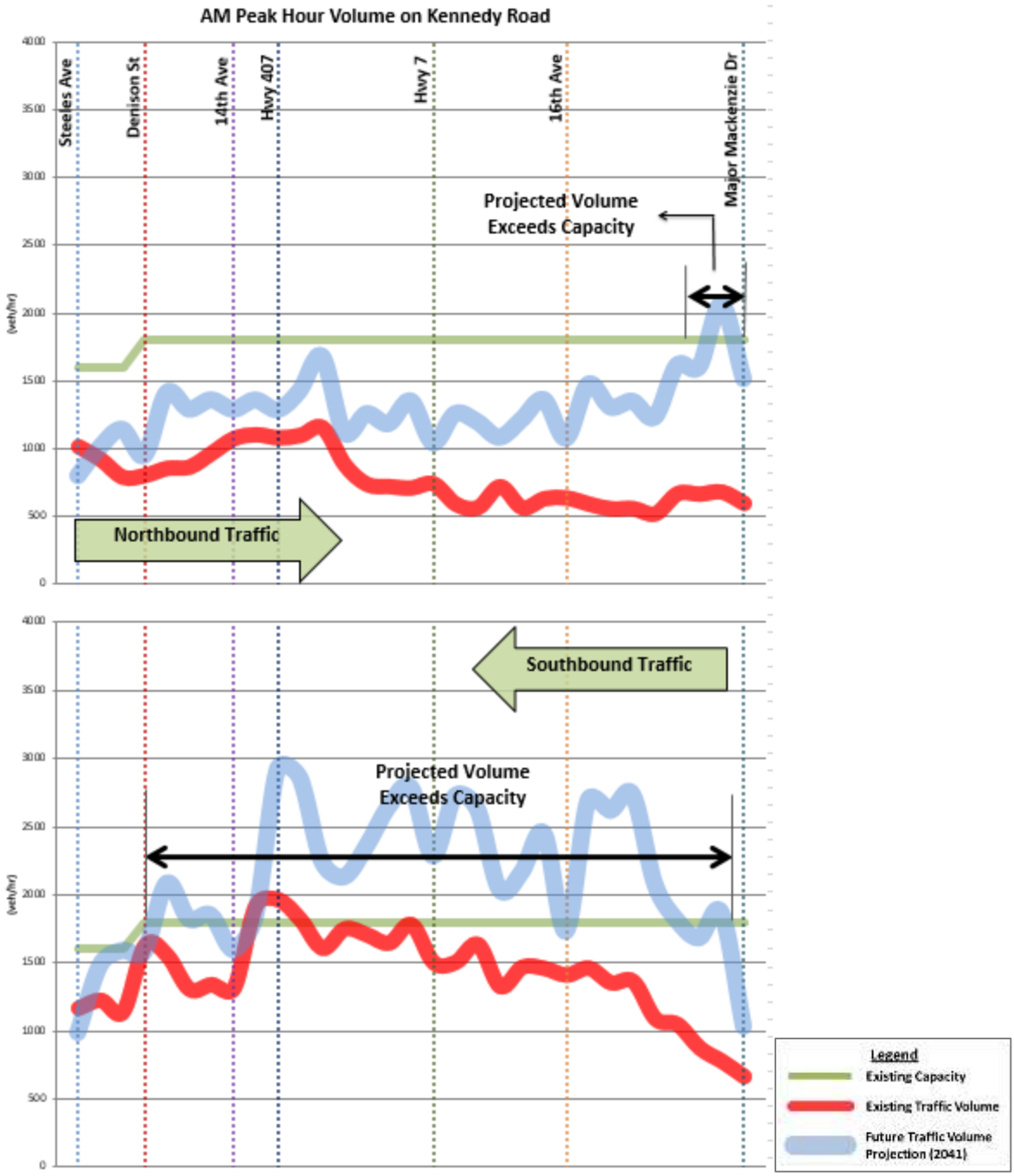


Exhibit 5-9: Future AM Peak Hour Volumes

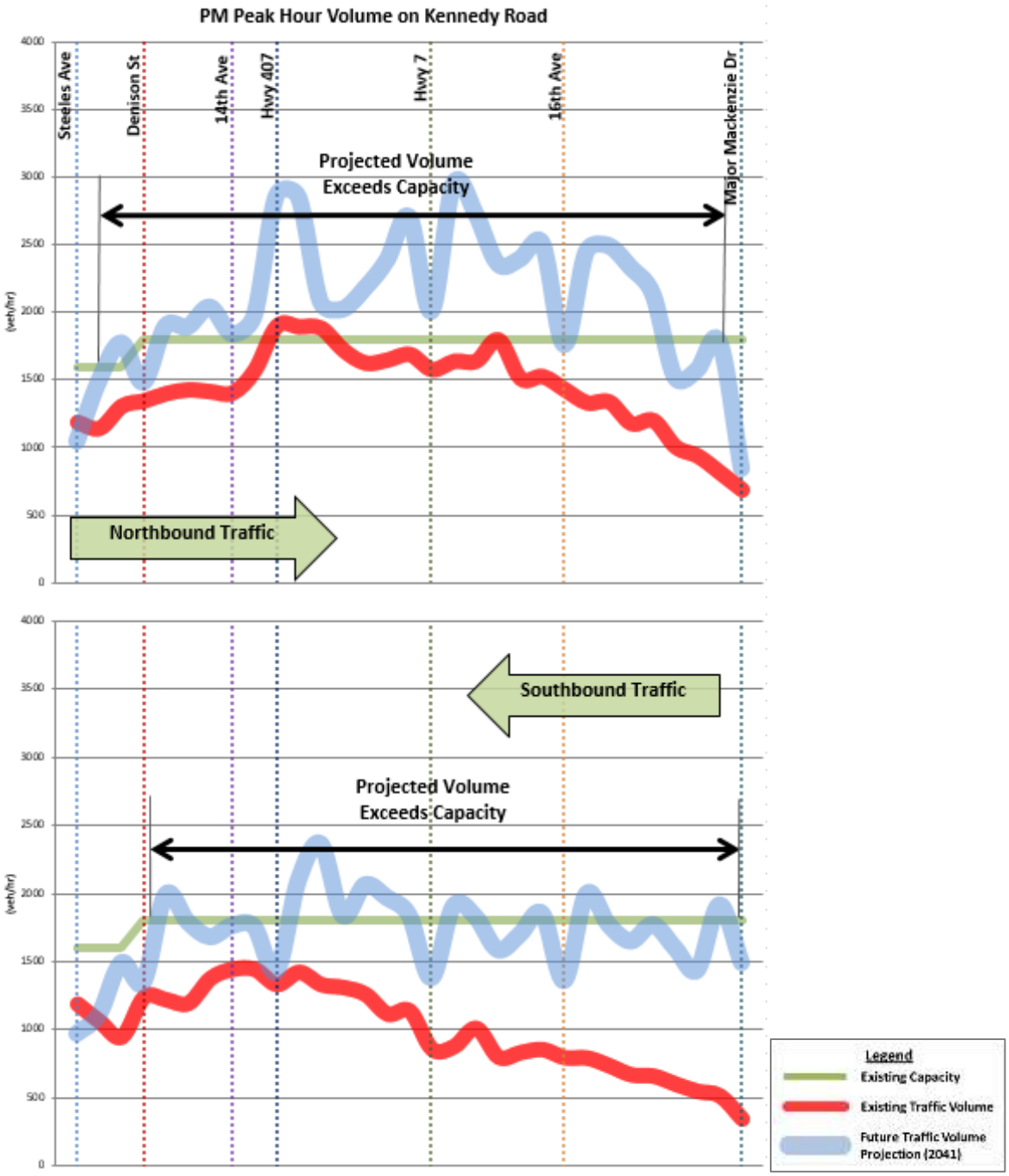


Exhibit 5-10: Future PM Peak Hour Volumes

Exhibit 5-11: 2041 AM Intersection LOS and Segment Volume to Capacity Ratios

Exhibit 5-12: 2041 PM Intersection LOS and Segment Volume to Capacity Ratios

5.3.2 2041 Screenline Analysis

A 2041 screenline capacity analysis was completed for the study area including Warden Avenue, Birchmount Road, Kennedy Road, and McCowan Road. **Table 5-9** and **Table 5-10** summarize the 2041 AM northbound and southbound peak hour volumes, respectively, on Warden Avenue, Birchmount Road, Kennedy Road, and McCowan Road between major arterial roads in the study corridor. It is noted that the 2041 screenline analysis focuses only on the AM peak hour as EMME only provides AM forecast volumes.

Table 5-9: 2041 AM Peak Hour Screenline Analysis

Legend			
Approaching Capacity		At/Exceeding Capacity	

	Steeles Ave-Denison St			*Denison St-14th Ave*			*14th Ave-407ETR*		
AM Northbound	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*
Warden Avenue	1897	2400	0.79	990	2300	0.43	1579	2700	0.58
Birchmount Road	654	1600	0.41	1445	1400	1.03	760	1400	0.54
Kennedy Road	1073	2400	0.45	1407	2300	0.61	1710	2700	0.63
McCowan Road	1096	2400	0.46	1383	2100	0.66	1925	2400	0.80
Total:	**4720**	**8800**	**0.54**	**5225**	**8100**	**0.65**	**5974**	**9200**	**0.65**
	407ETR-Highway 7			*Highway 7-16th Ave*			*16th Ave-Major Mackenzie Dr*		
AM Northbound	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*
Warden Avenue	2047	2700	0.76	1482	2400	0.62	1207	2400	0.50
Birchmount Road	977	1400	0.70	233	400	0.58	-	-	-
Kennedy Road	1608	2700	0.60	1292	2700	0.48	1526	2700	0.57
McCowan Road	1918	2400	0.80	1462	2400	0.61	1016	2700	0.38
Total:	**6550**	**9200**	**0.71**	**4469**	**7900**	**0.57**	**3749**	**7800**	**0.48**

Table 5-10: 2041 PM Peak Hour Screenline Analysis

Legend			
Approaching Capacity		At/Exceeding Capacity	

	Steeles Ave-Denison St			*Denison St-14th Ave*			*14th Ave-407ETR*		
AM Southbound	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*
Warden Avenue	1336	2400	0.56	1952	2300	0.85	3227	2700	1.20
Birchmount Road	761	1600	0.48	1043	1400	0.75	1094	1400	0.78
Kennedy Road	2569	2400	1.07	1931	2300	0.84	2859	2700	1.06
McCowan Road	1442	2400	0.60	1551	2100	0.74	1772	2400	0.74
Total:	**6108**	**8800**	**0.69**	**6477**	**8100**	**0.80**	**8952**	**9200**	**0.97**
	407ETR-Highway 7			*Highway 7-16th Ave*			*16th Ave-Major Mackenzie Dr*		
AM Southbound	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*	*Volume*	*Capacity*	*v/c Ratio*
Warden Avenue	2862	2700	1.06	3046	2400	1.27	2903	2400	1.21
Birchmount Road	1605	1400	1.15	484	400	1.21	-	-	-
Kennedy Road	2608	2700	0.97	2531	2700	0.94	1881	2700	0.70
McCowan Road	1666	2400	0.69	1515	2400	0.63	1280	2700	0.47
Total:	**8741**	**9200**	**0.95**	**7576**	**7900**	**0.96**	**6064**	**7800**	**0.78**

In the peak AM northbound direction, 2041 traffic can be accommodated within capacity, except Birchmount Road between Denison Street and 14th Avenue. However, in the southbound direction, 2041 traffic approaches capacity between 14th Avenue and 16th Avenue as a whole.

5.3.3 2041 Traffic Operations

In order to test future network capacity against future demand and identify potential problem areas, a 2041 Synchro model was developed, assuming the widening of Kennedy Road to 6 lanes to accommodate transit/HOV lanes in both directions as recommended in the YR-TMP. In order to model the HOV lane capacities in Synchro, a lane utilization factor of 0.85 was calculated based on lane capacities assumed in the York Region model, and applied to the relevant lane groups in the future Synchro model. The York Region model accounts for potential future developments along Kennedy Road that will contribute to future trip generation such as the York Downs Redevelopment and the Market Village Redevelopment. For the purposes of assessing the need and justification for potential corridor improvements, cycle lengths and existing phases were maintained at all intersections, and splits were optimized according to the future demand. Cycle lengths and phases may be optimized in the subsequent phases of this study.

The analysis was conducted using the software program *Synchro Rev. 9.1.911.1, Traffic Signal Coordination Software Version 9*. Synchro can analyze both signalized and unsignalized intersections in a road corridor or network taking into account the spacing, interaction, queues and operations between intersections.

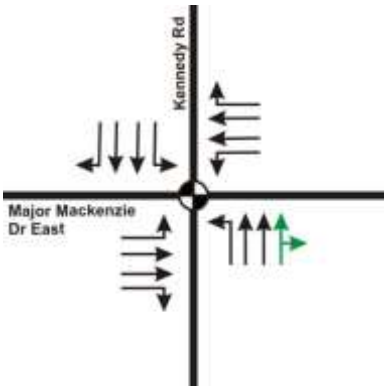
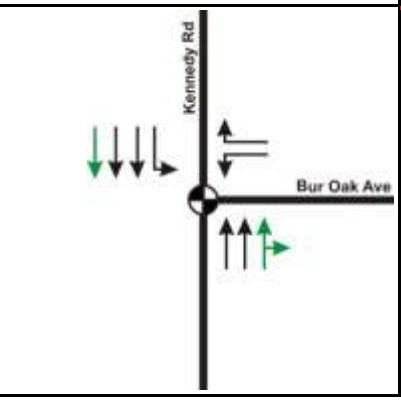
Detailed summaries of the intersection operations, queues, supporting reports, and signal timings from Synchro can also be found in **Appendix A**.

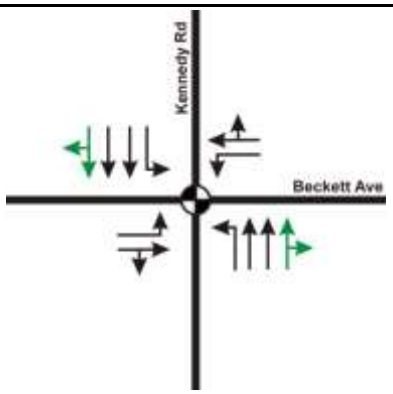
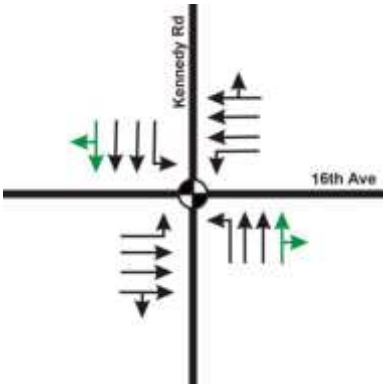
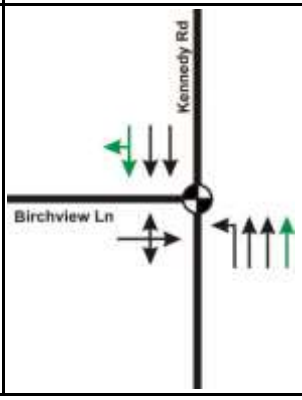
5.3.3.1 2041 INTERSECTION CAPACITY

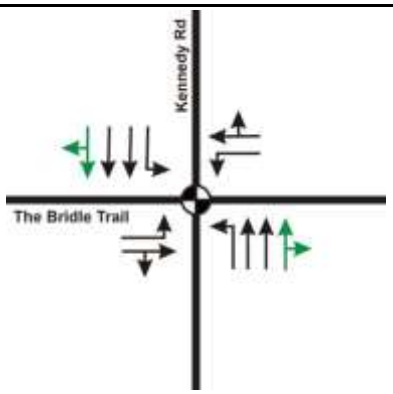
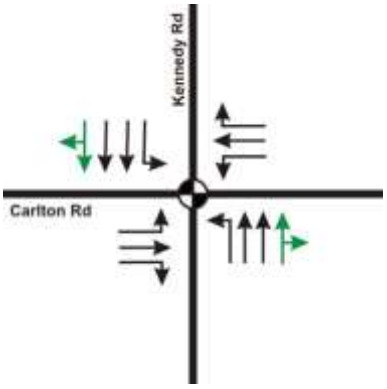
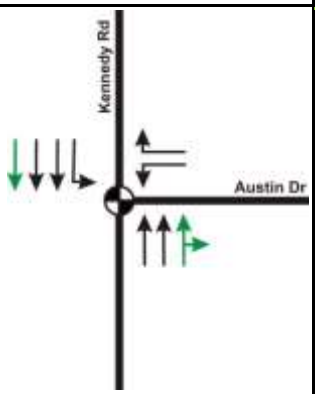
The future traffic operations for weekday AM and PM peak hours were assessed for all signalized intersections along the study corridor. The future traffic operations for weekday AM and PM peak hours were assessed for all signalized intersections along the study corridor and are summarized in **Table 5-11**. The lane configuration and overall intersection level of service are provided. Through or shared-through movements with v/c of 0.85 or above and exclusive turning movements with v/c of 1.0 or above are summarized. In addition, movements with LOS F and the corresponding delay are summarized. A summary of the methodology to assess intersection capacity and Level of Service can be found in **Section 4.6.4**.

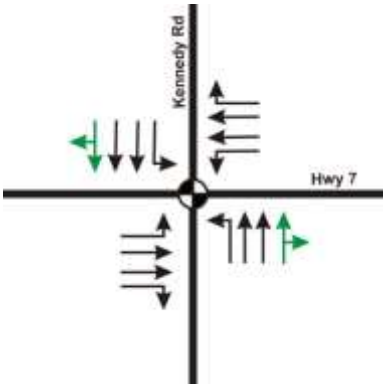
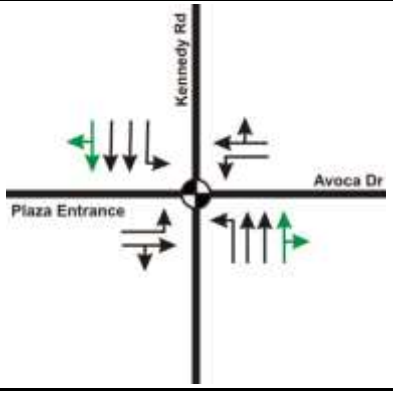
In 2041, signal timings will be optimized to serve future turning movement volumes to mitigate capacity issues, vehicular delays, and queue build-up along the corridor.

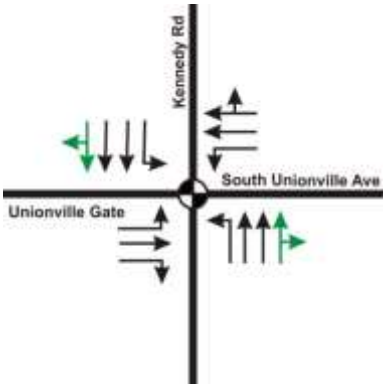
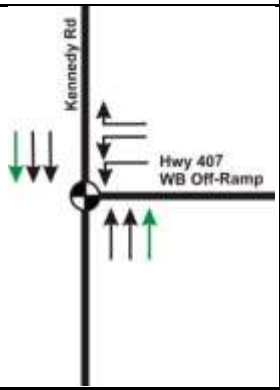
Table 5-11: Signalized Intersection Lane Configurations and Level of Service

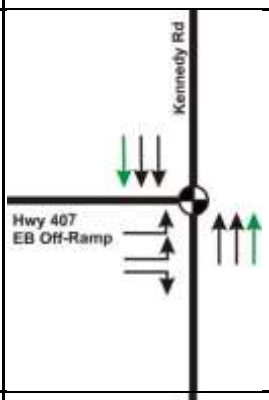
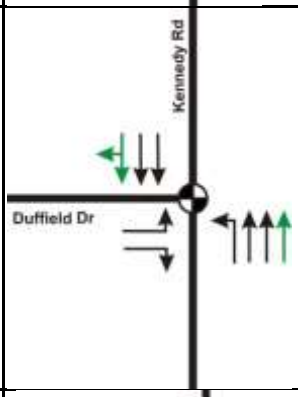
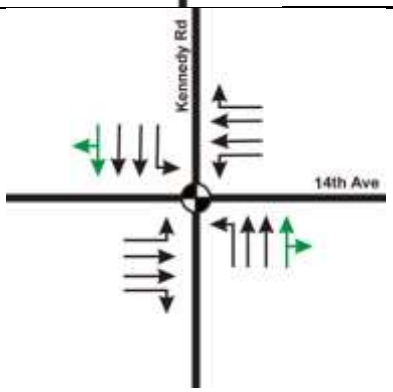
Intersection	Lane Configuration Schematic *Widening for HOV*	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Major Mackenzie Drive		F	EBL v/c = 1.03; F (169.3s) EBT v/c = 0.89; D (52.2s) EBR v/c = 0.95; D (51.8s) WBL v/c = 1.31; F (195.8s) WBT v/c = 1.43; F (226.3s) NBL v/c = 1.66; F (325.9s) NBT v/c = 1.47; F (240.1s) SBT v/c = 1.13; F (111.7s)	F	EBT v/c = 1.48; F (248.8s) WBL v/c = 1.48; F (266.6s) NBL v/c = 1.76; F (381s) SBT v/c = 1.38; F (210.7s)
The Fairways		D	EBT v/c = 1.62; F (379.4s) WBT v/c = 0.9; D (40.8s) NBT v/c = 0.96; D (54.5s) SBL v/c = 0.96; D (35.9s)	C	EBT v/c = 0.68; F (96.8s)
Bur Oak Avenue		F	WBL v/c = 1.23; F (149.8s) NBT v/c = 1.16; F (114.3s) SBL v/c = 1.23; F (169.7s) SBT v/c = 1.18; F (114.5s)	C	WBL v/c = 0.84; E (66s) NBT v/c = 1; D (44.4s) SBL v/c = 0.79; E (64.4s)

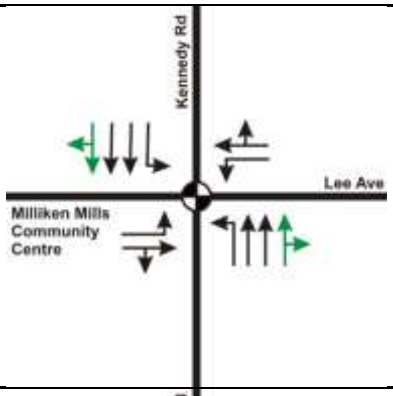
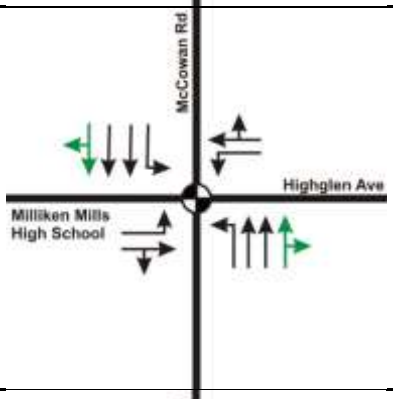
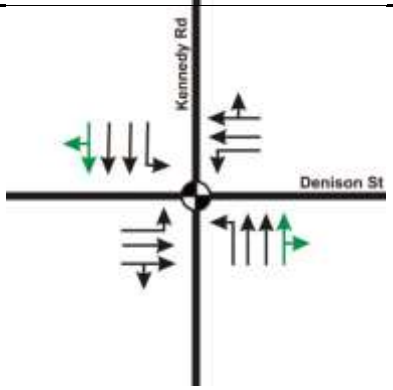
Intersection	Lane Configuration Schematic *Widening for HOV*	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Beckett Avenue		C	EBL v/c = 0.58; E (59.7s) WBL v/c = 0.91; F (91.1s) SBT v/c = 0.93; C (25.4s)	B	EBL v/c = 0.71; E (77.1s) NBL v/c = 0.91; D (39.9s) SBL v/c = 0.73; F (81.4s)
16th Avenue		F	EBL v/c = 1.62; F (328.3s) WBL v/c = 1.3; F (185.1s) WBT v/c = 1.28; F (171s) NBL v/c = 1.42; F (253.1s) SBL v/c = 0.82; E (63.1s) SBT v/c = 1.47; F (247.2s)	F	EBL v/c = 1.73; F (367.8s) EBT v/c = 1.17; F (122s) WBL v/c = 1.66; F (347.6s) NBL v/c = 1.55; F (296.5s) NBT v/c = 1.5; F (255.6s) SBL v/c = 1.8; F (407.2s) SBT v/c = 1.19; F (128s)
Birchview Lane		A	EBL v/c = 0.39; E (57.1s)	A	

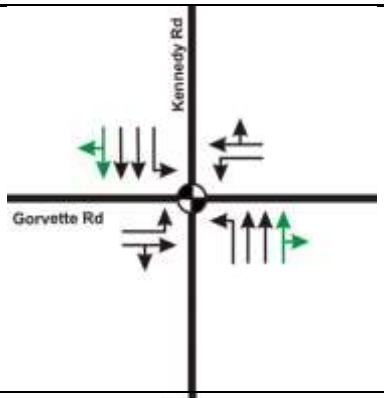
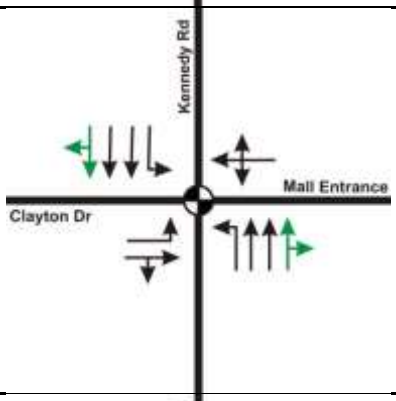
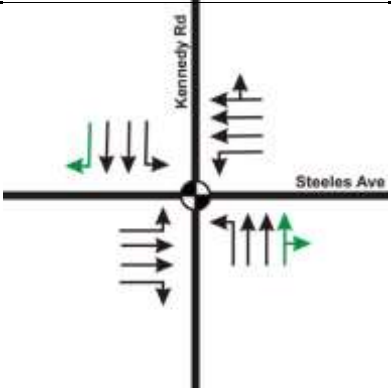
Intersection	Lane Configuration Schematic *Widening for HOV*	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
The Bridle Trail		B	EBL v/c = 0.58; E (67.5s) WBL v/c = 0.51; E (58.2s) WBT v/c = 0.69; E (57.9s)	C	NBT v/c = 0.91; B (12.7s) SBL v/c = 1.11; F (189.8s)
Carlton Road		F	WBL v/c = 1.26; F (161.5s) WBT v/c = 0.99; F (80.2s) NBL v/c = 0.84; E (68.2s) SBT v/c = 1.29; F (173.4s)	E	EBT v/c = 0.96; F (89.7s) WBL v/c = 1.1; F (140.5s) NBL v/c = 0.99; F (100.3s) NBT v/c = 1.07; E (73.3s) SBL v/c = 1.78; F (438.4s) SBT v/c = 0.7; E (61.4s)
Austin Drive		D	WBL v/c = 0.61; E (69.3s)	D	WBL v/c = 0.5; E (58.7s) WBR v/c = 0.89; E (58.6s) NBT v/c = 1.03; D (49.4s) SBL v/c = 0.84; E (66s)

Intersection	Lane Configuration Schematic *Widening for HOV*	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Highway 7		F	EBL v/c = 1.34; F (220.8s) WBL v/c = 1.51; F (269.2s) WBT v/c = 1.29; F (175.7s) NBL v/c = 1.25; F (183.9s) SBT v/c = 1.45; F (241s)	F	EBL v/c = 1.68; F (350.1s) EBT v/c = 1.22; F (145.6s) WBL v/c = 1.53; F (292.9s) WBT v/c = 1.02; E (79.6s) NBL v/c = 1.28; F (176.5s) NBT v/c = 1.43; F (228.2s) SBL v/c = 1.29; F (194.9s) SBT v/c = 1.06; E (76.1s)
Avoca Drive		B	EBL v/c = 0.47; E (66.3s)	D	EBL v/c = 0.95; F (91.6s) NBL v/c = 0.92; F (83.4s) SBL v/c = 0.91; F (112s)

Intersection	Lane Configuration Schematic *Widening for HOV*	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Unionville Gate		F	EBL v/c = 0.81; F (86.3s) NBL v/c = 1.39; F (231.2s) SBT v/c = 1.44; F (230.3s)	F	EBL v/c = 1.51; F (274.8s) EBT v/c = 0.72; E (55.9s) EBR v/c = 1.21; F (134.8s) WBL v/c = 0.85; E (70.4s) NBL v/c = 1.59; F (311.8s) NBT v/c = 0.93; D (40.2s) SBL v/c = 1.04; F (189.8s) SBT v/c = 1.6; F (306.8s)
YMCA Boulevard		F	EBT v/c = 0.81; F (96.7s) WBL v/c = 1.44; F (270.6s) WBT v/c = 0.5; E (61s) NBL v/c = 1.37; F (202.1s) SBT v/c = 1.56; F (273.9s)	F	EBT v/c = 1.64; F (319.9s) WBL v/c = 0.74; E (57.2s) NBL v/c = 1.55; F (293.5s) NBT v/c = 1.07; F (87.6s) SBL v/c = 0.78; F (115.5s) SBT v/c = 1.6; F (306.4s)
407ETR Westbound Off-ramp		F	WBR v/c = 1.7; F (350.4s) NBT v/c = 0.89; D (41.9s) SBT v/c = 1.58; F (295.7s)	A	

Intersection	Lane Configuration Schematic *Widening for HOV*	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
407ETR Eastbound Off-ramp		C	EBL v/c = 0.73; E (61.7s) SBT v/c = 0.97; C (26.5s)	C	EBR v/c = 0.92; E (74.8s) NBT v/c = 0.96; C (22.8s)
Duffield Drive		F	EBL v/c = 0.36; E (57s) SBT v/c = 1.24; F (141.8s)	D	EBL v/c = 0.98; E (71.4s) NBL v/c = 0.82; E (60.1s) SBT v/c = 0.95; D (42.4s)
14th Avenue		E	EBL v/c = 0.77; E (59.2s) WBT v/c = 1.09; F (97.7s) NBL v/c = 1.19; F (157.3s) NBT v/c = 0.93; D (54.5s) SBL v/c = 1.04; F (106.5s) SBT v/c = 1.08; F (89.3s)	F	EBT v/c = 1.14; F (117.8s) WBL v/c = 0.94; F (92s) NBL v/c = 0.99; F (95s) NBT v/c = 1.17; F (121.4s) SBL v/c = 1.29; F (191.1s) SBT v/c = 1; E (61.6s)

Intersection	Lane Configuration Schematic *Widening for HOV*	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Lee Avenue		B	WBR v/c = 0.79; E (57.6s) NBL v/c = 0.9; F (97s)	B	EBL v/c = 0.51; E (63.8s)
Highglen Avenue		C	EBL v/c = 0.48; E (63s) WBL v/c = 0.93; F (80.9s) WBT v/c = 0.85; E (56.1s) SBT v/c = 0.92; C (30.5s)	B	WBL v/c = 0.52; E (66s)
Denison Street		F	EBL v/c = 1.33; F (206s) WBT v/c = 1.22; F (148.6s) NBT v/c = 0.87; D (50.8s) SBL v/c = 1.59; F (299.9s) SBT v/c = 1.35; F (198.1s)	F	EBL v/c = 1.4; F (232.4s) EBT v/c = 0.9; E (57.9s) WBL v/c = 0.77; E (59s) WBT v/c = 0.89; D (49.8s) NBT v/c = 1.19; F (129.2s) SBL v/c = 1.47; F (255.7s)

Intersection	Lane Configuration Schematic *Widening for HOV*	AM Peak Hour		PM Peak Hour	
		Overall LOS	Critical movement v/c, LOS, and delay	Overall LOS	Critical movement v/c, LOS, and delay
Gorvette Road		D	EBL v/c = 0.03; E (65.3s) WBL v/c = 0.8; E (78.5s)	C	EBL v/c = 0.7; F (87.5s) WBL v/c = 0.43; F (81.3s) SBL v/c = 0.59; E (72.8s)
Clayton Drive		C		D	EBL v/c = 0.8; E (66.5s) WBL v/c = 1.08; F (133.3s) NBT v/c = 1.05; E (75.6s)
Steeles Avenue		F	EBL v/c = 1.39; F (242.2s) WBT v/c = 1.17; F (121.9s) NBL v/c = 1.05; F (125.2s) SBL v/c = 1.31; F (202.2s) SBT v/c = 1.03; F (85.4s)	F	EBT v/c = 1.29; F (172.6s) WBL v/c = 1.11; F (139.3s) NBL v/c = 0.78; E (58.6s) NBT v/c = 1.07; F (96s) SBL v/c = 1.76; F (386s) SBT v/c = 1.01; F (80.9s)

Under the 2041 conditions, all major intersections along the study corridor generally operate at capacity or near capacity during AM and PM peak hours, with delays equivalent to LOS 'E' or 'F' and multiple critical movements. Major traffic concerns lay at intersections between Highway 7 and 407ETR potentially due to its land-use. High traffic volumes are generated by GO station, Markham Centre developments, Downtown Markham developments and relatively large commercial/business area surrounding Kennedy between Highway 7 and Unionville Gate. High

traffic volumes resulting in poor intersection operations have also been noted at the intersections of 16th Avenue and Steeles Avenue, attributed to the York Downs Redevelopment, and the Market Village Redevelopment.

5.3.3.2 STORAGE LENGTHS AND QUEUING

Table 5-12 summarizes the 2041 95th percentile queues and storage lengths between Steeles Avenue and Major Mackenzie Drive for all intersection movements. Queuing generally exceeds capacity for most left turn and right-turn movements at major intersections across the corridor, during both AM and PM peak hours. In these cases, existing storage lengths will not be sufficient in containing 95th percentile queues without queue spillover hindering adjacent movements.

Table 5-12: 2041 AM and PM Peak Hour 95th percentile Queues

95th Percentile Queues (m)

2041 AM Peak Hour

Intersection	EBL		EBR		WBL		WBR		NBL		SBL	
	Storage	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*
Kennedy Rd & Steeles Ave E	92	108.8	-	-	56	44.3	-	-	43	71.9	166	117.8
Kennedy Rd & Clayton Dr	57	41.2	-	-	-	-	-	-	127	7.6	90	79.7
Kennedy Rd & Gorvette Rd	-	-	-	-	-	-	-	-	71	23.8	71	5
Kennedy Rd & Denison St	60	108.2	-	-	48	32.4	-	-	150	22.4	80	228.7
Kennedy Rd & Highglen Ave	32	19.9	-	-	53	62.8	-	-	75	25.2	90	3.1
Kennedy Rd & Lee Ave	-	-	-	-	-	-	37	64.4	90	39.7	72	5.6
Kennedy Rd & 14th Ave	64	44.9	58	21	50	59.1	45	79.1	65	118.7	50	110.6
Kennedy Rd & Duffield Dr	65	27.3	-	-	-	-	-	-	63	173	-	-
Kennedy Rd & 407 EB Off-Ramp	-	-	-	-	-	-	-	-	-	-	-	-
Kennedy Rd & 407 WB Off-Ramp	-	-	-	-	-	-	-	-	-	-	-	-
Kennedy Rd & Helen Ave/YMCA Blvd	135	19.6	-	-	132	106.6	-	-	77	264.8	96	0.4
Kennedy Rd & Unionville Gate	57	60.3	-	-	83	46	-	-	193	296.3	35	2.2
Kennedy Rd & Avoca Dr	-	-	-	-	20	1.7	-	-	100	4.1	60	11
Kennedy Rd & Highway 7	78	101.3	95	15.7	43	264.7	87	5.3	111	92.7	100	26.9
Kennedy Rd & Austin Dr	-	-	-	-	41	51.6	-	-	-	-	57	40.4
Kennedy Rd & Carlton Rd	48	23.1	61	7.4	73	344.6	-	-	138	53.5	140	11.8
Kennedy Rd & The Bridle Trail	23	33.4	-	-	27	42.2	-	-	90	1.9	120	4.9
Kennedy Rd & Birchview Ln	-	-	-	-	-	-	-	-	105	0.4	-	-
Kennedy Rd & 16th Ave	92	229.3	93	34.3	70	210.2	72	0.9	145	131.4	70	74.8
Kennedy Rd & Beckett Ave	30	61	-	-	30	103.8	-	-	54	9.4	54	1.7
Kennedy Rd & Bur Oak Ave	-	-	-	-	-	-	-	-	-	-	55	87.6
Kennedy Rd & The Fairways/Castlemore Ave	-	-	-	-	-	-	-	-	57	1.7	50	38.8
Kennedy Rd & Major Mackenzie Dr	50	42.3	92	155.2	50	123.1	160	25.5	140	162.2	50	32.6

2041 PM Peak Hour

Intersection	EBL		EBR		WBL		WBR		NBL		SBL	
	Storage	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*	*Storage*	*95th Queue*
Kennedy Rd & Steeles Ave E	92	61.7	-	-	56	81.5	-	-	43	72.3	166	273.9
Kennedy Rd & Clayton Dr	57	53.7	-	-	-	-	-	-	127	25.6	90	150.2
Kennedy Rd & Gorvette Rd	-	-	-	-	-	-	-	-	71	28.9	71	37.2
Kennedy Rd & Denison St	60	150.3	-	-	48	43.5	-	-	150	34.3	80	228.5
Kennedy Rd & Highglen Ave	32	11.9	-	-	53	27.3	-	-	75	2.1	90	35.5
Kennedy Rd & Lee Ave	-	-	-	-	-	-	37	11.6	90	9.1	72	48.6
Kennedy Rd & 14th Ave	64	37.5	58	47.4	50	63	45	70.7	65	92.2	50	165.6
Kennedy Rd & Duffield Dr	65	231.8	-	-	-	-	-	-	63	55.2	-	-
Kennedy Rd & 407 EB Off-Ramp	-	-	-	-	-	-	-	-	-	-	-	-
Kennedy Rd & 407 WB Off-Ramp	-	-	-	-	-	-	-	-	-	-	-	-
Kennedy Rd & Helen Ave/YMCA Blvd	135	63.2	-	-	132	35.8	-	-	77	221.6	96	34.8
Kennedy Rd & Unionville Gate	57	296.8	-	-	83	74.3	-	-	193	314.2	35	44.9
Kennedy Rd & Avoca Dr	-	-	-	-	20	17.1	-	-	100	75.2	60	17.3
Kennedy Rd & Highway 7	78	209.8	95	46.4	43	155.3	87	26.9	111	117.1	100	111.4
Kennedy Rd & Austin Dr	-	-	-	-	41	56.4	-	-	-	-	57	98.8
Kennedy Rd & Carlton Rd	48	59.3	61	40.5	73	80.1	-	-	138	72.2	140	71.8
Kennedy Rd & The Bridle Trail	23	59	-	-	27	24.6	-	-	90	0.7	120	49.8
Kennedy Rd & Birchview Ln	-	-	-	-	-	-	-	-	105	0.8	-	-
Kennedy Rd & 16th Ave	92	289.4	93	40.4	70	157.1	72	13.8	145	142.4	70	186.8
Kennedy Rd & Beckett Ave	30	54	-	-	30	20.6	-	-	54	2.2	54	19.5
Kennedy Rd & Bur Oak Ave	-	-	-	-	-	-	-	-	-	-	55	59.7
Kennedy Rd & The Fairways/Castlemore Ave	-	-	-	-	-	-	-	-	57	5.5	50	14.2
Kennedy Rd & Major Mackenzie Dr	50	24.9	92	59.7	50	115.6	160	1.7	140	163.4	50	37.9

LEGEND

XX = 95th percentile queues exceed availble storage

Locations where 95th percentile queues exceed available storage are highlighted in red in the table above. Queuing is particularly problematic near the major intersections, where queue spillover can occur, increasing delays and reducing level of service for through movements. In order to mitigate corridor operations and queue spill-overs, the possibility of providing additional storage for left-turn and right-turn lanes should be explored, particularly where queues exceed available storage.

5.4 HOV Warrant Analysis

5.4.1 Methodology

To determine if High Occupancy Vehicle (HOV) lanes are warranted for the study corridor, an HOV warrant analysis was undertaken based on warrant criteria developed by York Region for transportation master planning exercises. The warrant criteria were modified to reflect the higher level of detail available for this study. For example, while the warrant analysis typically assumes an average of 50 people per bus during the peak period and peak direction, for this study we have used York Region Transit ridership counts from 2013. Additionally, the project team included school buses and other buses in its analysis, as these vehicles would be able to use HOV lanes.

Based on the Region's current criteria, HOV lanes are warranted if there is a minimum of 900 Non-Single Occupancy Vehicle (Non-SOV) person trips, comprised of transit person trips and High Occupancy Vehicle person trips. When this warrant is met, the throughput of people in the HOV lane is equal to or greater than the throughput of a general purpose lane with 100% SOV. For this analysis, a threshold of 900 trips was applied throughout the study corridor.

The following data were used in the assessment:

- 2041 traffic volume forecasts to calculate 2041 Non-SOV auto person trips
  - Percentage of HOV vehicles, HOV occupancy also from 2014 cordon count data at Kennedy Road north of Steeles Avenue
- 2041 transit ridership forecasts, as detailed in **Section 5.1.3**:
  - 2015 ridership data for Route 8, the primary transit route along the study corridor
  - 2041 EMME transit ridership forecasts

The results of the HOV warrant analysis for the AM Peak Hour by direction are shown in **Table 5-13** and **Table 5-14**.

As indicated in the tables, under estimated 2041 conditions HOV lanes are warranted between Steeles Avenue and Major Mackenzie Drive in the southbound direction. The Kiss-and-Ride trip to Unionville GO Station is expected to be a major contributor to the high HOV lane utilization. Recommendations for HOV lanes in this section are subject to further analysis in Phase 2 of this EA study.

Table 5-13: HOV Warrant Analysis – 2041 AM Peak Hour Kennedy Road Northbound

Kennedy Road NORTHBOUND	(1)	(2)	(3)	(4)	(5)	(6)	
Segment	2041 Total Vehicle Trips	Existing % HOV 2+ Vehicles	Passengers / HOV Vehicle	Total 2041 Transit Person Trips	HOV 2+ Auto Person Trips	Total Non-SOV Person Trips	% Warrant Achieved
					(1) x (2) x (3)	(4) + (5)	(6) / 900
14th Avenue – Steeles Avenue	1,407	13.95%	2.13	62	418	480	53%
407ETR – 14th Avenue	1,710	13.95%	2.13	135	508	643	71%
Highway 7 – 407ETR	1,608	13.95%	2.13	144	478	622	69%
16th Avenue – Highway 7	1,292	13.95%	2.13	81	384	465	52%
Major Mackenzie Drive - 16th Avenue	1,526	13.95%	2.13	43	453	496	55%
LEGEND	HOV Warranted		HOV Warrant within 10%			HOV Not Warranted	

Table 5-14: HOV Warrant Analysis – 2041 AM Peak Hour Kennedy Road Southbound

Kennedy Road SOUTHBOUND	(1)	(2)	(3)	(4)	(5)	(6)	
Segment	2041 Total Vehicle Trips	Existing % HOV 2+ Vehicles	Passengers / HOV Vehicle	Total 2041 Transit Person Trips	HOV 2+ Auto Person Trips	Total Non-SOV Person Trips	% Warrant Achieved
					(1) x (2) x (3)	(4) + (5)	(6) / 900
14th Avenue – Steeles Avenue	2,569	19.02%	2.19	169	1072	1241	138%
407ETR – 14th Avenue	2,859	19.02%	2.19	225	1193	1418	158%
Highway 7 – 407ETR	2,608	19.02%	2.19	427	1088	1515	168%
16th Avenue – Highway 7	2,531	19.02%	2.19	427	1056	1483	165%
Major Mackenzie Drive - 16th Avenue	1,881	19.02%	2.19	352	785	1137	126%
LEGEND	HOV Warranted		HOV Warrant within 10%			HOV Not Warranted	

5.5 Signal Warrant Analysis

Signal warrant analyses were completed for unsignalized intersections along Kennedy Road between Steeles Avenue and Major Mackenzie Drive based on peak hour volumes for the 2041 horizon year. The signal warrants analysis in this section follows the methodology and warrants criteria outlined in the *Ontario Traffic Manual – Book 12 Traffic Signals, March 2012* (OTM Book 12).

Turning movement counts for AM, Mid-day, and PM peak period and historical collision data along Kennedy Road between Steeles Avenue and Major Mackenzie Drive, as detailed in **Section 4.6** and **Section 4.7**, were provided by York Region and used as inputs for signal warrants analysis of stop controlled intersections along the study corridor. Based on the criteria listed in OTM Book 12 and existing conditions, it was found that only the Kennedy Road and Wilfred Murison Avenue intersection satisfies OTM signal warrants criteria. The future signal warrants criteria for this intersection is provided in **Table 5-15**.

The Traffic Impact Assessment Study conducted by Poulos and Chung in October 2016 for York Downs Golf Course Redevelopment application have recommended an installation of traffic signal at the intersection of Kennedy Road and Wilfred Murison Avenue for the 2026 horizon year regardless of not meeting typical warrants due to low crossing traffic.

Table 5-15: OTM Signal Warrants Criteria at Kennedy Road & Wilfred Murison Avenue

Justification		Compliance	Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A Total Volume	100 %	☐	☑
	B Crossing Volume	84 %		
2. Delay to Cross Traffic	A Main Road	100 %	☑	☐
	B Crossing Road	100 %		
3. Combination	A Justificaton 1	84 %	☑	☐
	B Justification 2	100 %		
4. 4-Hr Volume		85 %	☐	☑
5. Collision Experience		13 %	☐	☑
6. Pedestrians	A Volume	Justification not met	☐	☑
	B Delay	Justification not met		

Delays to cross traffic at the Wilfred Murison intersection during both AM and PM peak hours are significant due to insufficient gap time for east-west turning movements at this stop controlled intersection resulting from heavy northbound and southbound through traffic along Kennedy Road. The results from Synchro indicate v/c greater than 1.00 and LOS 'F' for all east-west movements during future AM and PM peak hour conditions. Detailed Synchro reports can be found in **Appendix A**.

In this case, the signal warrant analysis supports the consideration for the installation of a traffic signal at this location due to high delays on the side street.

5.6 Grade Separation at Stouffville GO Crossings

To determine whether a grade separated crossing should be considered at this location, an exposure index was developed as follows:

$$Exposure\ Index\ =\ Total\ Number\ of\ Trains\ per\ Day\ \times\ Daily\ Traffic\ Crossing\ Railway$$

If the exposure index exceeds 200,000, then a grade separation will be considered as required. This exposure index is from the "*Inventory Manual: Municipal Roads and Railway Level Crossings, Ontario Ministry of Transportation*" and is traditionally used in Ontario as a baseline for determining if a grade separated crossing is warranted.

Total Number of Trains per Day: According to GO Transit train schedules, a total of thirty-four (34) trains cross Kennedy Road each weekday at the at-grade crossing north of Clayton Drive, and eighteen (18) trains cross Kennedy Road each weekday at the at-grade crossing south of Austin Drive. By 2041 with RER all-day 2-way service 120 trains per day, and 36 trains per day are expected at the at-grade crossings north of Clayton Drive, and north of Austin Drive, respectively.

Daily Traffic Crossing Railway: Based on AADT data identified previously, the AADT on Kennedy Road today is 28,600 north of Austin Drive and 31,350 north of Clayton Drive but will grow to 52,350 and 48,550, respectively, by 2041.

5.6.1 Daily Traffic on Kennedy Road Austin Drive Stouffville GO Rail Crossing

Traffic volumes near the Austin Drive Stouffville GO Rail Crossing were estimated using 2016 AADT midblock counts on Kennedy Road between Carlton Road and Austin Drive that were provided by York Region. The volumes are summarized in **Table 5-16**.

Table 5-16: Traffic Volumes on Kennedy Road at Austin Drive Stouffville GO Crossing

Year	AADT North of Austin Drive
2012	27,410
2013	28,038
2014	28,004
2015	27,969
2016	28,600

For planning purposes, the most current AADT volumes north of Austin Drive (collected in 2016) are approximately 28,600.

To estimate future 2041 AADT, a growth rate was calculated for each at-grade crossing based upon the York Region EMME AM Peak Hour Model (refined for the Kennedy EA). The growth rate was also calculated from existing intersection peak hour counts on Kennedy Road at Carlton Road (March 2017), Kennedy Road at Austin Drive (March 2017).This growth rate was then applied to the 2016 AADT resulting in a 2041 AADT estimate of 52,350 for north of Austin Drive. The existing and future AADT is summarized in **Table 5-17**.

Table 5-17: Existing and Future 2041 AADT North of Austin Drive

	North of Austin Drive		
	Northbound	Southbound	2-way
2017 AM Existing	680	1,605	2,285
2041 Adjusted Model	1,360	2,823	4,183
CAGR	n/a	n/a	2.55
2041 AADT	n/a	n/a	52,350

5.6.2 Daily Traffic on Kennedy Road at Clayton Drive Stouffville GO Rail Crossing

Traffic volumes near the Clayton Drive Stouffville GO Rail Crossing were estimated using 2016 AADT midblock counts on Kennedy Road between Gorvette Road and Clayton Drive that were provided by York Region. The volumes are summarized in **Table 5-18**.

Table 5-18: Traffic Volumes on Kennedy Road at Clayton Drive Stouffville GO Rail Crossing

Year	AADT North of Clayton Drive
2012	31,797
2013	34,615
2014	34,168
2015	33,721
2016	31,350

For planning purposes, the most current AADT volumes north of Clayton Drive (collected in 2016) is approximately 31,350 will be used.

To estimate future 2041 AADT, a growth rate was calculated for each at-grade crossing based upon the York Region EMME AM Peak Hour Model (refined for the Kennedy EA). The growth rate was also calculated from existing intersection peak hour counts on Kennedy Road at Carlton Road (March 2017), Kennedy Road at Austin Drive (March 2017), Kennedy Road at Gorvette Road (March 2017), and Kennedy Road at Clayton Drive (March 2017).This growth rate was then applied to the 2016 AADT resulting in a 2041 AADT estimate of 48,550 for north of Clayton Drive. The existing and estimated future AADT is summarized in **Table 5-19**.

Table 5-19: Existing and Future 2041 AADT South of Clayton Drive

	South of Clayton Drive		
	Northbound	**Southbound**	**2-way**
2017 AM Existing	835	1125	1,960
2041 Adjusted Model	1169	1868	3,037
CAGR	n/a	n/a	1.84
2041 AADT	n/a	n/a	48,550

A similar calculation was previously completed by York Region and documented in Attachment 2 of the September 10, 2015 report to the Committee of the Whole regarding York Region's Initial Response to the Regional Express Rail Service Concept. The comparable information from this document is provided in **Table 5-20**. The existing and estimated 2041 AADT's are consistent, noting that the Kennedy EA analysis assumed Kennedy Road to be six lanes wide (including HOV lanes).

Table 5-20: Stouffville GO Line AADT's at road crossing locations in York Region (Source: York Region's Initial Response to RER Service Concept)

Line	Crossing Location in York Region	Road Jurisdiction	Daily Trains (2-way)[1]			No. of Lanes (2-way)[2]		Speed (km/h)	AADT[3]				
			existing	2021	RER[4]	existing	2041		existing	2021	2025[4]	2031	2041
Stouffville Line													
	Union - Unionville		15	50	120								
1	Steeles Ave East	Regional				4	4	60	39,517	41,100	43,300	46,600	50,600
2	Kennedy Rd (south)	Regional				4	6	60	34,600	40,100	42,900	47,100	54,000
3	Denison St	Markham				4	4	50	17,580	21,100	22,500	24,610	28,130
	Unionville - Mount Joy		12	12	36								
4	Hwy 7	Regional				4	4	50	49,100	53,000	54,280	56,200	60,100
5	Eureka St	Markham				2	2	40	1,420	1,560	1,620	1,700	1,840
6	Main Unionville St	Markham				2	2	40	8,360	9,190	9,530	10,030	10,860
7	Kennedy Rd (north)	Regional				4	6	60	28,000	32,500	35,740	40,600	47,600
8	McCowan Rd	Regional				4	6	60	49,600	54,100	56,060	59,000	64,000
9	Snider Dr	Markham				2	2	40	7,140	7,860	8,140	8,570	9,290
10	Main Markham St	Markham				2	2	50	19,150	21,060	21,830	22,980	24,890
11	16th Ave	Regional				4	6	60	29,800	35,200	37,320	40,500	46,500
12	Bur Oak Ave	Markham				4	4	50	7,800	9,360	9,980	10,920	12,480
	Mount Joy - Lincolnville		12	12	16								
13	Castlemore Ave	Markham				2	2	40	2,000	2,400	2,560	2,800	3,200
14	Major Mackenzie Dr East	Regional				4	4	70	11,200	13,000	15,520	19,300	23,700
15	Elgin Mills Rd East	Regional				2	2	60	34,900	39,100	41,180	44,300	49,600
16	Ninth Line	Regional				2	4	70	8,000	10,600	11,880	13,800	17,000
17	19th Ave	Markham				2	2	60	3,400	5,200	13,000	24,700	32,900
18	Reeves Way Blvd	Whitchurch-Stouffville				2	2	40	4,240	5,080	5,420	5,930	6,780
19	Hoover Park Dr	Whitchurch-Stouffville				2	2	40	6,790	8,140	8,680	9,500	10,860
20	Main St	Whitchurch-Stouffville				2	2	40	13,890	15,280	15,830	16,670	18,060
21	Millard St	Whitchurch-Stouffville				2	2	50	5,670	6,800	7,260	7,940	9,070
22	Bethesda Rd	Whitchurch-Stouffville				2	2	60	860	1,030	1,100	1,200	1,370
23	Tenth Line	Whitchurch-Stouffville				2	2	60	2,730	3,270	3,490	3,820	4,360

[1] Daily Trains do not include freight trains -- information were not available

[2] Road improvements and phasing are based on 10-Year Capital Construction Program and DC Background Study

[3] Feb 2014 land use forecast is used for AADT estimation

[4] Daily Trains are based on the assumption that Metrolinx has planned to increase train trips in the next five years and full RER service to be implemented by 2025

[5] Transport Canada Exposure Index: A grade seperation is warranted when AADT x Daily Trains exceeds 200,000

[6] Daily transit vehicles estimated using York Region Forecasting model

[7] Assumed future regional roads

[8] RER service assumed to be extended to Bloomington Station by 2021