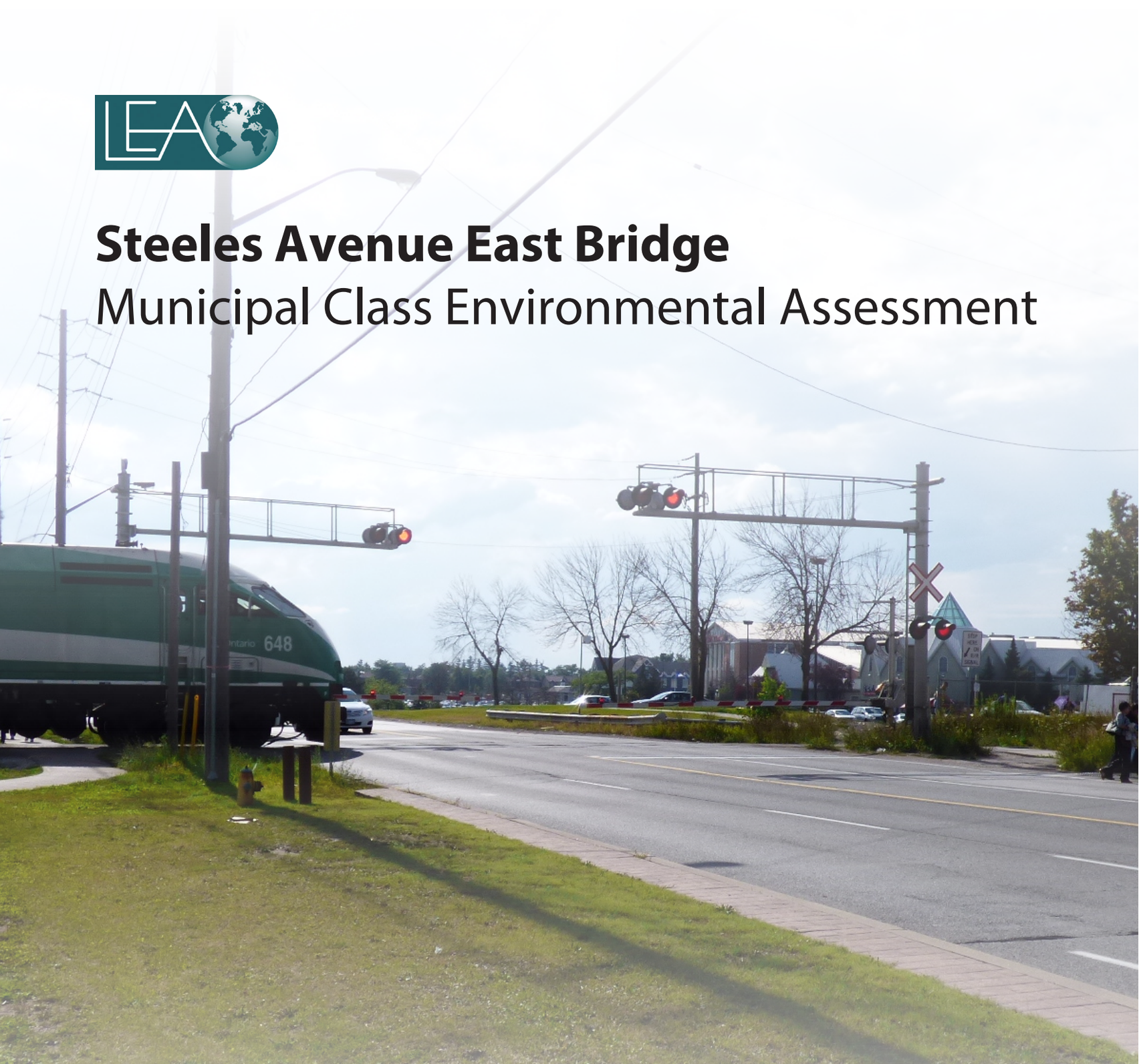
Steeles Avenue East Bridge

Municipal Class Environmental Assessment



March 2017

TORONTO

EXECUTIVE SUMMARY

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The Steeles Avenue East Bridge Municipal Class Environmental Assessment has been conducted to evaluate and recommend a design for the crossing of Steeles Avenue East at the Stouffville GO Rail Corridor and options for improving the consistency and connectivity of the Steeles Avenue corridor. Two previous studies have been conducted for the grade separation of the Stouffville GO Rail Corridor at Steeles Avenue East. The first study, the Steeles Avenue East Grade Separation Environmental Study Report was completed in 1994 and adopted by the former Metro Toronto recommending an overpass. The second study, an EA Study Addendum, was completed in 2004 and re-evaluated the underpass and overpass options recommending an underpass.

This study, which was undertaken by City of Toronto in combination with the Regional Municipality of York and Metrolinx, initiated undertaking background studies of the area in September of 2015, with the formal Notice of Commencement being issued in March of 2016. In accordance with the Municipal Class Environmental Assessment Planning Process, the study followed a process of developing and evaluating alternative solutions and recommending a preferred design.

<u>Alternative Solutions and Recommended Design</u>

Two types of grade separation options were considered in the development of the alternative solution; an underpass (road under rail) and an overpass (road over rail). Both options aim to:

- Remove train and vehicle conflicts
- Improve roadway inconsistency and lack of active transportation facilities
- Reduce delay for all road users
- Support transit expansions and Regional Express Rail
- Accommodate east-west and north-south flows for all street users
- Improve safety for all modes of transportation

In addition to overpass and underpass, the study considered maintaining the existing 4-lane cross-section along Steeles Avenue East and widening to a 6-lane cross-section.

Based on the evaluation and public consultations, the preferred alternative included an underpass (road under rail) with a 6-lane cross-section and includes the following elements:

- Provision of a 5.3m vertical clearance for Steeles Avenue East below the new rail bridge
- Widening of the existing right-of-way to protect for a rapid transit corridor along Steeles Avenue East and a rapid transit station at the Stouffville GO Rail Corridor

- A minimum 2.0m median along Steeles Avenue East between Redlea Avenue and Silver Star Boulevard
- Increasing the width of the sidewalk to 2.1m on both sides of the street
- Introducing a 1.8m raised cycle track on both sides of the street including a 0.8m buffer between sidewalk and cycle track and a 0.5m buffer between the cycle track and roadway
- Provision of enclosed pedestrian bridges east and west of the proposed rail bridge
- Provision of elevator/stair enclosures connecting the terminuses of the pedestrian bridges to the street level
- Landscaping to be provided within the buffer provided between the cycle track and roadway and street trees to be provided within the buffer between the cycle track and sidewalk between Redlea Avenue and Silver Star Boulevard
- A pumping station and stormwater management facility located at the northeast corner of the Stouffville GO Rail Corridor and Steeles Avenue East
- Relocation of utilities and municipal servicing infrastructure

Public and Stakeholder Consultation

Throughout the study, the public and various interest groups have had opportunities to make comments, identify issues and provide additional information. At the conclusion of Phase 3, the project mailing list included 317 contacts from 12 community associations, 126 businesses, and 165 members of the public. Opportunities to provide feedback included two public information centres, two group stakeholder meetings, 14 property owner meetings, and correspondence with several agencies. The comments provided by the public and interest groups have broadened the information base for the project and facilitated decision making in the process.

Anticipated Impact, Mitigation, and Monitoring

Table E-1 summarizes the anticipated impacts of the recommended alternative design and proposed mitigation measures.

Anticipated Impact	Response Mitigation Measure and Commitment to Future Work
Traffic ▪ Re-routing of traffic patterns during construction and along Steeles Avenue East due to access closures ▪ Increase in traffic volumes beyond anticipated forecasts. ▪ Traffic infiltration to surrounding neighbourhoods	▪ A traffic management plan will be developed to maintain 2 lanes of traffic in either directions at all times and to maintain access to adjacent businesses during construction. ▪ City of Toronto Traffic Operations will monitor the operations of the study intersections and make the necessary changes to the signal timings to optimize traffic movements in the area. ▪ Transportation Services will monitor the level of traffic in the area through a monitoring program including traffic counts, surveys and evaluation of development applications. ▪ Transportation Services will undertake a traffic infiltration study to consider the surrounding developments and the Redlea Avenue Extension to evaluate the potential for traffic infiltration and requirement for any mitigation measures, including restricting movements at intersections along Steeles Avenue East.
Socio-Economic Environment ▪ Nearby properties and business affected by construction activities	▪ Metrolinx will engage the nearby businesses in the development of a reasonable construction plan and endeavor to reduce the duration and impact of construction activities. ▪ Compensation to private property owners will be provided as part of property acquisition process.
Natural Environment ▪ Loss of vegetation and trees with the widening of the existing right-of-way ▪ Creation of dust during construction ▪ Creation of noise during construction	▪ An arborist report has been completed as part of this study. Trees will be planted, where feasible as determined in detailed design, through consultation with the City Urban Forestry department. ▪ The controlling of dust/debris from unpaved areas will be done through the application of water, calcium chloride or other means as recommended by the contractor and accepted by Metrolinx. ▪ Construction activities will comply with the City of Toronto noise control by-law. Should exemptions to the noise by-law be required, the appropriate application should be made to City Council.

Stormwater Management ▪ Increase in run-off volume, peak flow rates, need for water quality control and need for stormwater storage and pumping station	▪ Implementing stormwater retention and pumping infrastructure within the permanent easement areas and the use of permeable surfaces wherever possible to increase infiltration. ▪ Consideration of low impact development techniques such as source and conveyance controls and end of pipe treatments (e.g. Oil-Grit Separator) to improve the quality of, and discharge flow rate for stormwater entering downstream conveyance systems such as the adjacent main trunk sewers.
Utilities and Infrastructure ▪ Update utilities and legal land surveys	▪ In preparation of the detailed design stage, updated utilities and legal land surveys within the expected construction limits will be required. ▪ A separation study is required to determine the detailed design and construction details of the relocation plan.
Archaeology ▪ Unanticipated discovery of archaeological and or human remains	▪ If there is an unanticipated discovery of archaeological and or human remains, the City will immediately contact the Ontario Ministry of Tourism, Culture and Sport (MTCS) and the Registrar or Deputy Registrar of the Cemeteries Regulation Unit of the Ontario Ministry of Government Services.

Cost and Implementation

The recommended design construction cost is approximately $68.85 million based on preliminary estimates, exclusive of property acquisition. The study recommends the acquisition of parts from thirteen (13) properties, or approximately 0.42 hectares of private property, and acquiring permanent easements from eight (8) properties, or approximately 0.33 hectares. The permanent easements are intended to be subsurface to accommodate the placement of utility and municipal service plants, as well as structural elements from the retaining walls or bridge abutments.

In terms of implementation, this project is intended to be incorporated into a design, build, finance (DBF) project that will be tendered and managed by Metrolinx and Infrastructure Ontario (IO). The award of the contract is expected to be announced in Fall of 2017, upon which detailed will commence immediately and construction is anticipated to start in Spring/Summer 2018.

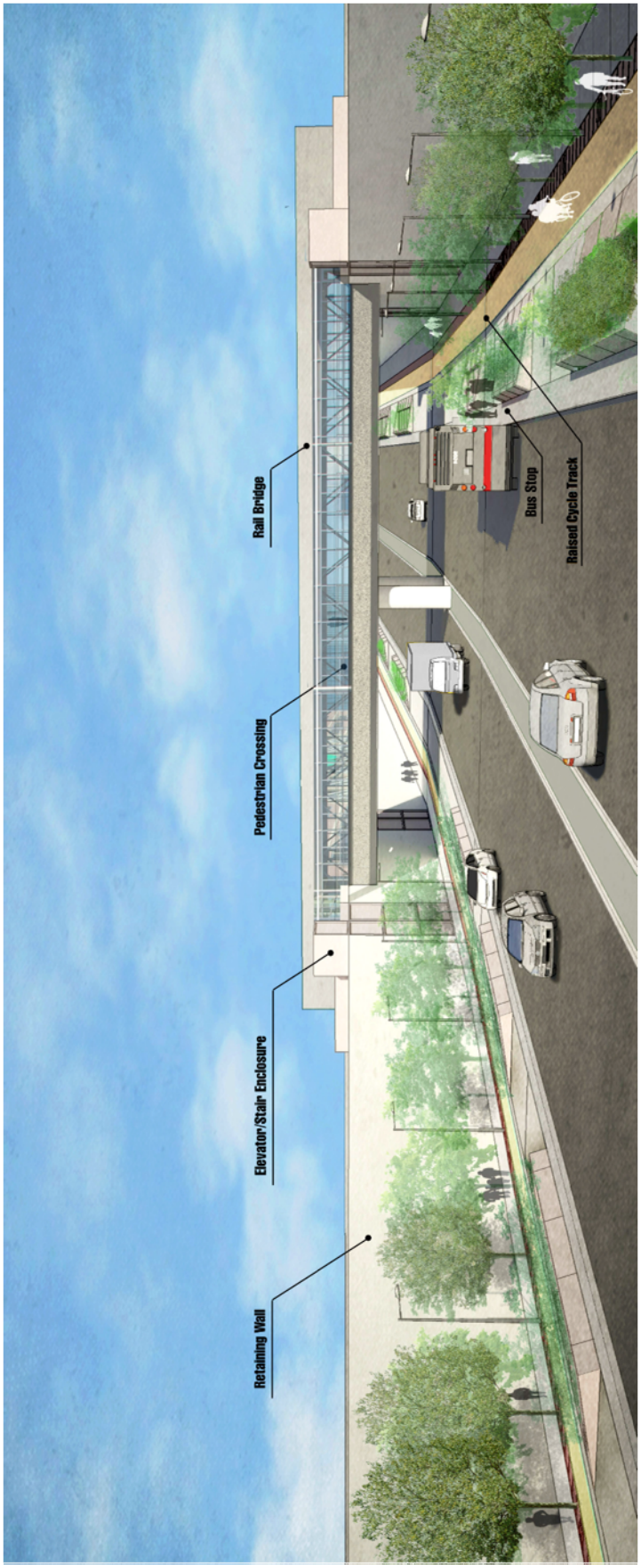

Figure E-1: Recommended Design for the Steeles Avenue East Grade Separation

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1.0 INTRODUCTION AND BACKGROUND

The Steeles Avenue East Bridge Municipal Class Environmental Assessment has been conducted to evaluate and recommend a design for the crossing of Steeles Avenue East and the Stouffville GO Rail Corridor. This study, which was undertaken by City of Toronto in combination with the Regional Municipality of York and Metrolinx, has also identified, and evaluated alternative options for improving the consistency and connectivity of the Steeles Avenue East corridor between Kennedy Road and Midland Avenue. The purpose of this Environmental Study Report (ESR) is to document the results of Phases 1 to 3 of the Schedule 'C' Municipal Class Environmental Assessment. This report documents the need and justification for studying rail crossing and road alignment options for Steeles Avenue East, the process used to select a preferred alternative solution, and the process used to select a preferred alternative design.

1.1 Municipal Class Environmental Assessment Process

The study was carried out in accordance with the requirements of the Municipal Class Environmental Assessment (EA) published by the Municipal Engineers Association (October 2000, as amended in 2007, 2011, and 2015). The Municipal Class Environmental Assessment (MCEA) Planning and Design process is an approved five-phase planning procedure, under the Ontario Environmental Assessment Act, that applies to municipal infrastructure projects. Projects undertaken through this planning process are classified by municipalities into one of four schedule types, Schedule 'A', 'A+', 'B' or 'C', in accordance with their degree of anticipated environmental impact. Schedule 'C' projects have the highest potential for environmental impacts and must proceed under the full planning and documentation procedures specified under the Municipal Class Environmental Assessment Guidelines. Since the current undertaking involves the construction of a rail crossing that is expected to have a construction cost that is greater than $9.5 million in costs, it has been classified as a Schedule 'C' project.

The flow chart outlining the Municipal Class EA Planning and Design Process is provided in **Figure 1-1.** The five phases of the Class EA planning and design process are summarized as follows:

Phase 1 Identify the problem (deficiency) or opportunity

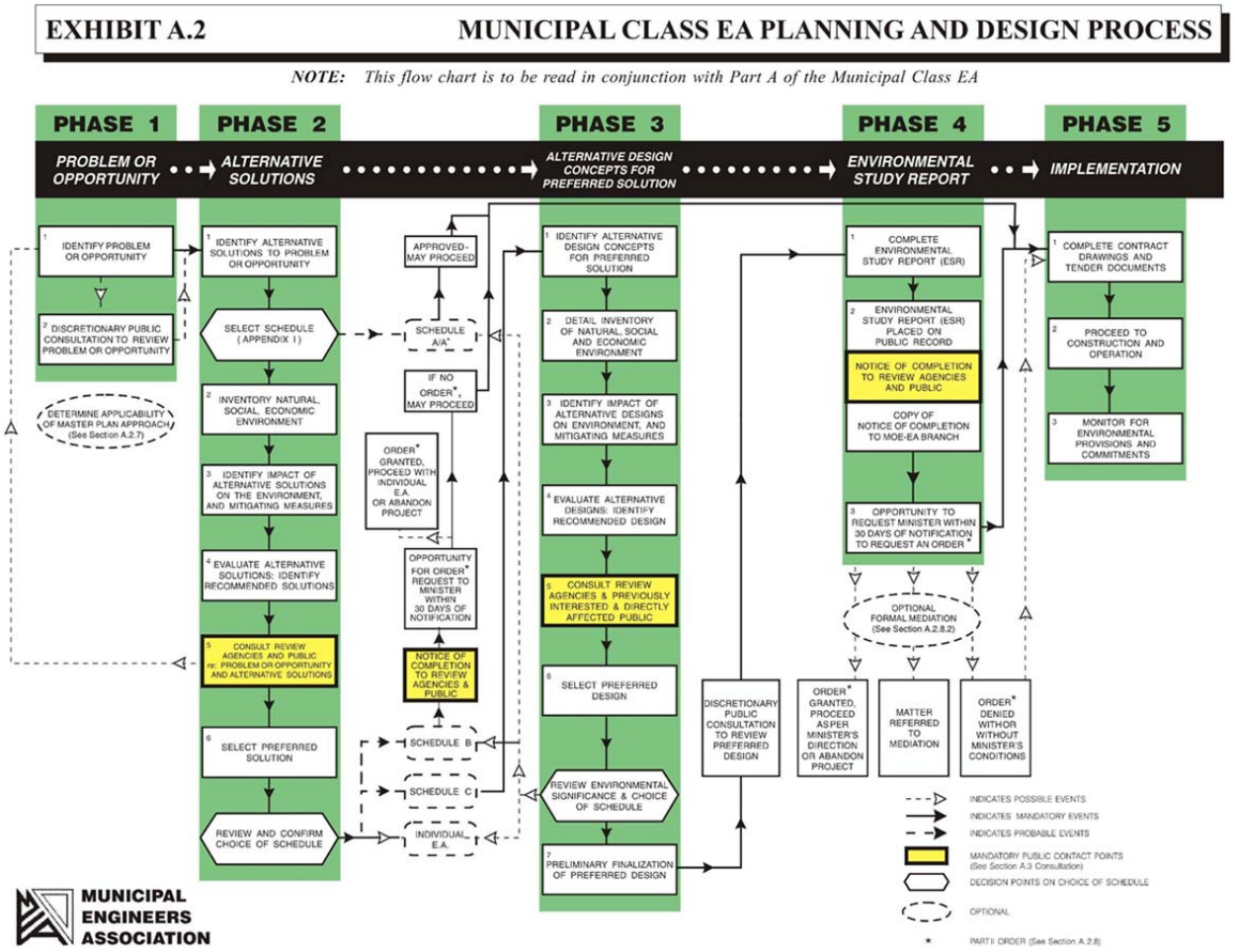
Phase 2 Identify alternative solutions to address the problem or opportunity, taking into consideration the existing environment, and select a preferred solution based on a thorough evaluation process and consultation with public, agencies and other stakeholders.

Phase 3 Examine a range of alternative design concepts for implementing the preferred solution, based on existing constraints, public and review agency input, potential environmental impacts, and methods of mitigating potential environmental effects.

Phase 4 Document, in an Environmental Study Report (ESR) the rationale for the recommended preferred design concept, based on the planning, design and consultation process established through Phases 1 to 3. The ESR must be made available for public and agency review and comment, for a specified period of time.

Phase 5 Complete contract drawings and documents, and proceed to construction of the recommended design concept, once all EA approvals are in place. Monitoring of construction activities and operations is warranted to ensure adherence to environmental provisions and mitigation measures noted in the ESR.

Figure 1-1: Municipal Class EA Planning and Design Process



1.2 Background

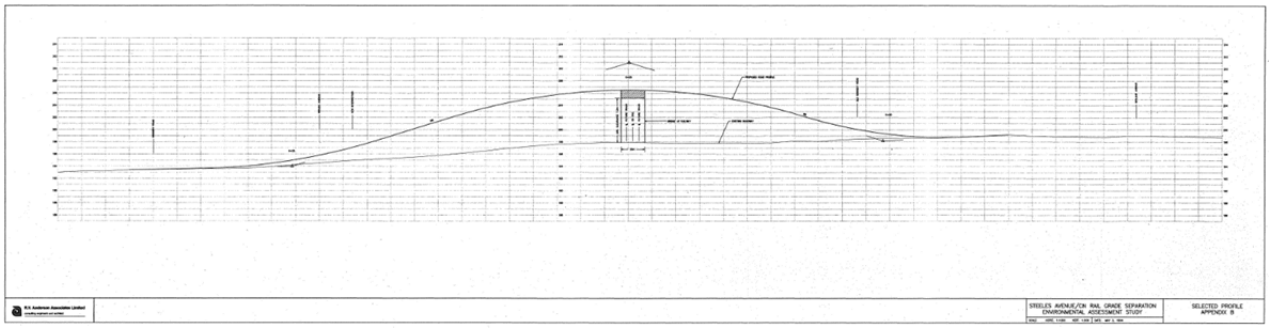
Two previous studies have been conducted for the grade separation of the Stouffville GO Rail Corridor at Steeles Avenue East. The first study, the Steeles Avenue East Grade Separation Environmental Study Report was completed in 1994 and was adopted by the former Metro Toronto. The second study, an EA Study Addendum, was completed in 2004 and re-evaluated the underpass and overpass options. Key findings of both reports are provided below.

1.2.1 1994 Steeles Avenue East Grade Separation Environmental Study Report

The 1994 Environmental Study Report was initiated because the grade separation was identified as a high priority by Metropolitan Toronto, after the surrounding area underwent significant redevelopment and traffic volumes nearly doubled between 1985 and 1994. Safety concerns and lengthy delays at the level crossing were identified to require a solution. They examined 7 options i) Do Nothing, ii) Diversion of existing traffic, iii) Improvement of existing traffic signals, iv) Improvement of transit services, v) Widen Steeles Avenue – from existing 4 lanes to 6 lanes, vi) Construct road over or under railway; and vii) Construct railway over or under Steeles Avenue. Based on the analysis and evaluation, the following conclusions were made:

- Recommended grade separation – overpass (road over rail)
- Final Design
    - Profile of Steeles Avenue East be raised by 7.2 metres at the rail track
    - Widen Steeles Avenue East to 6 lanes
    - Streetscape improvements and bicycle lanes
    - Profile incorporating 6% slopes along the Steeles Avenue approaches as shown in **Figure 1-2**
- Once EA Approval was obtained, work was scheduled to start in late 1994 with construction occurring in spring 1997

Figure 1-2: 1994 EA Overpass Profile



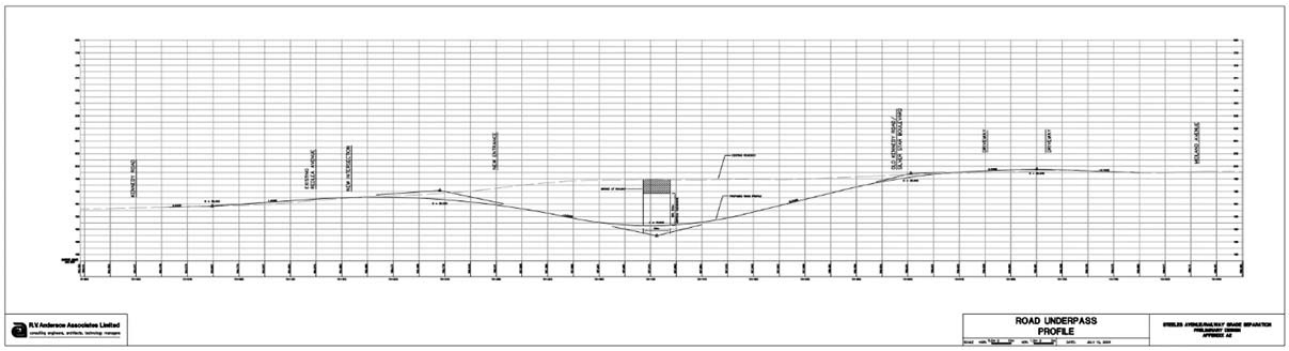
1.2.2 2004 EA Study Addendum

In August 1996 Metro Council put the construction of the bridge crossing on hold due to the costs for property acquisition, potential reduction in usage of the rail line, and questions from adjacent property owners regarding the design.

The 2004 EA Study Addendum was initiated to revisit the preliminary design for an underpass alternative, along with a more detailed comparison of the underpass and overpass options. The following summarizes the conclusions of the report:

- Between 1993 and 2004, additional GO Transit services have been added each way to increase the number of trains to 6 GO Transit trains per day plus an average of one freight train per day
- Grade separation is still warranted - underpass (road under rail)
- Installation of pumping station would be required
- Turff Avenue would be reconstructed as a cul-de-sac
- Municipal services and utilities within the Steeles Avenue right-of-way would need to be relocated
- Final Design
    - Underpass (road under rail)
    - Widen Steeles Avenue East to 6 lanes with streetscape improvement and bicycle lanes
    - Profile incorporating slopes between 4.25% and 5% along Steeles Avenue as shown in **Figure 1-3**.

Figure 1-3: 2004 EA Addendum Underpass Profile



As a result of budgetary constraints and uncertainty related to adjacent development plans, the bridge crossing of the rail corridor was not constructed. Given the period of time that has elapsed since the completion of the two former studies, the City of Toronto initiated the Steeles

Avenue Bridge EA to revisit and revaluate alternatives for a bridge crossing the rail corridor and the need to widen the existing roadway.

1.3 Study Area

The project is primarily focused along Steeles Avenue East from Kennedy Road to Midland Avenue. The Project Study Areas are shown in **Figure 1-4**. The EA Project Focus Area is the area around the rail crossing that is expected to be affected by the construction of the bridge, any road widenings and streetscaping. The larger EA Study Area is the area taken into consideration for impacts of the project. Since Steeles Avenue East is the border between the City of Toronto to the south, and York Region and the City of Markham to the north, the study area is located in both municipalities. In the City of Toronto, the study area is located in Ward 39 (Scarborough-Agincourt), and Ward 41 (Scarborough-Rouge River), while in the City of Markham the study area is located in Ward 8. The City of Toronto Ward 39 and Ward 41 boundaries can be seen in **Figure 1-5**, while the City of Markham Ward 8 boundaries can be seen in **Figure 1-6.**

Figure 1-4: Environmental Assessment Study Area

Figure 1-5: City of Toronto Ward 39, Ward 41 Boundaries

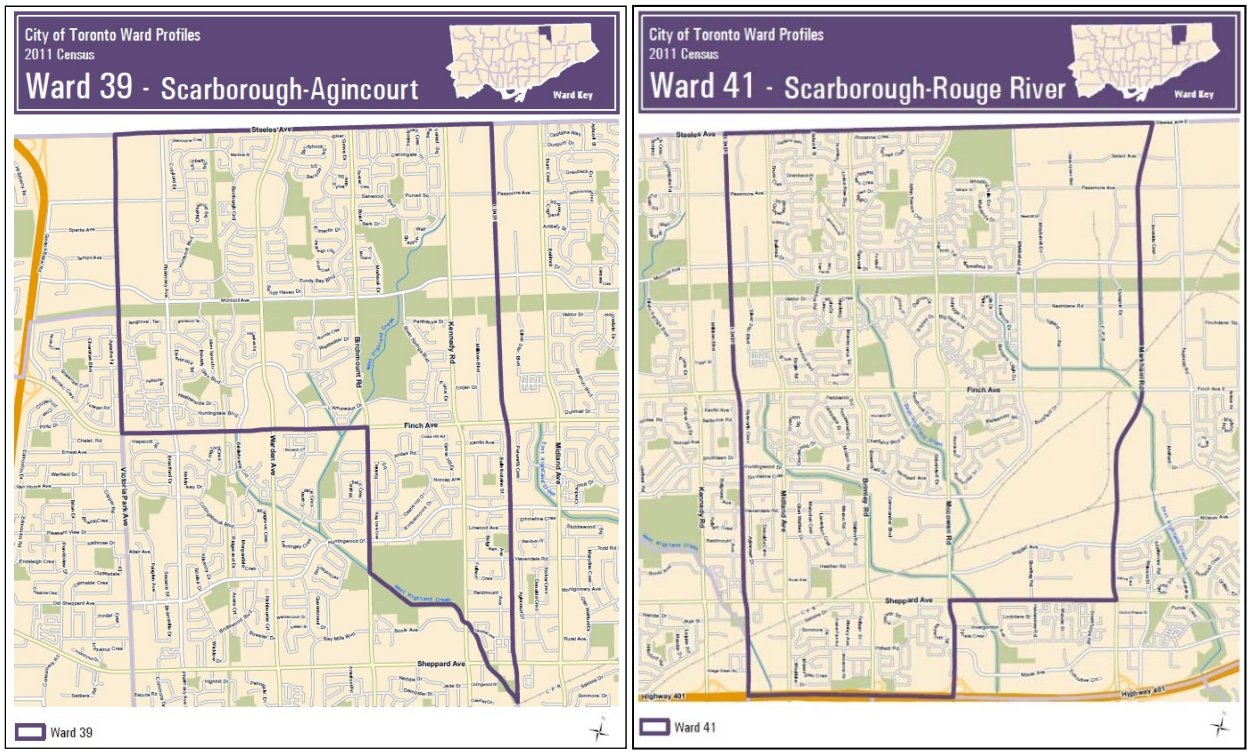
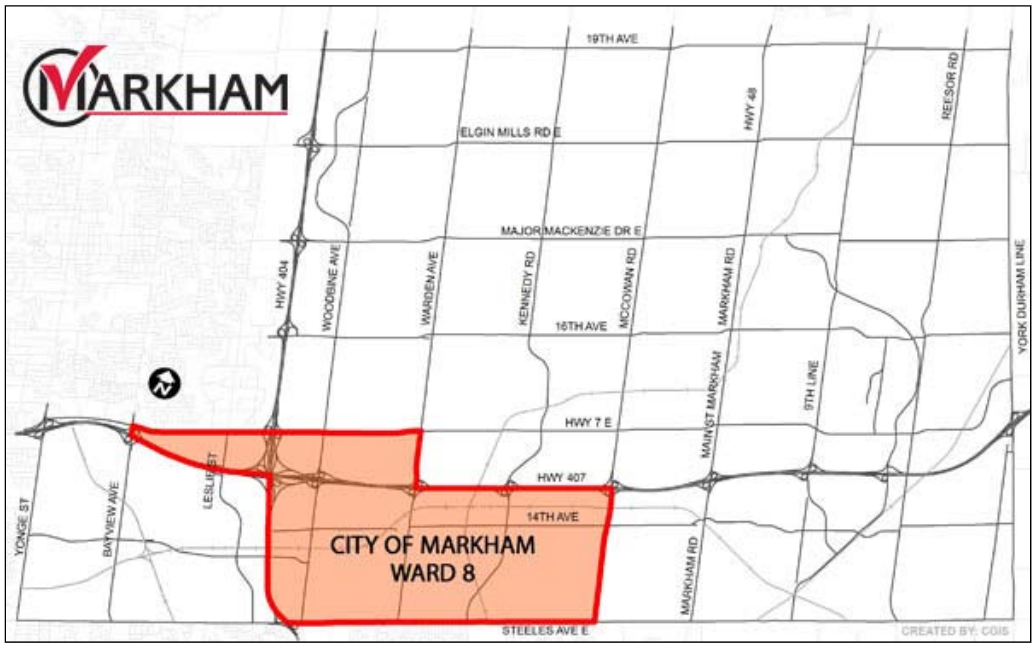


Figure 1-6: City of Markham Ward 8 Boundary



2 STUDY APPROACH

2.0 STUDY APPROACH

2.1 Project Tasks

To ensure that the purpose and objectives of this project are met and that the conclusions and recommendations resulting from the study reflect the requirements and requests of the City, local stakeholders, public and affected agencies, the study was conducted in accordance with the MCEA process. As a result the following tasks were carried out:

- Conducted background investigations including but not limited to natural environment, archaeological, cultural heritage, geotechnical, traffic, and air and noise.
- Identified the structural requirements/railway constraints;
- Identified the alternative planning solutions;
- Engaged with the public regarding the existing conditions review, problem statement and alternative solution proposals;
- Reviewed and evaluated the alternative solutions with regards to the identified constraints and requirements;
- Selected a preferred alternative solution;
- Identified the alternative designs;
- Reviewed and evaluated the alternative designs with regards to the identified constraints and requirements;
- Engaged with the public regarding the selection of a preferred alternative design;
- Selected a preferred alternative design; and
- Identified potential measures required to mitigate the anticipated impact of the preferred design.

2.2 Project Team

The Project Manager for the City of Toronto in this study was Anson Yuen, Project Manager, Infrastructure Planning, Transportation Services Division. LEA Consulting Ltd. (LEA) was the lead consultant undertaking this study. Terry Wallace and Christopher Sidlar, the Project and Deputy Project Managers, respectively, from LEA managed a multi-disciplinary team that consisted of both LEA and sub-consultants:

- LEA – EA Process Specialization, Transportation Engineering and Planning, Municipal Engineering, Utilities and Structural Engineering
- LGL Ltd. – Natural Environment;

- Archeoworks Inc. – Archaeology;
- Unterman McPhail Associates – Built and Cultural Heritage;
- Thurber Engineering Ltd. – Geotechnical Engineering;
- Brown + Storey Architects Ltd – Streetscape Design; and
- RWDI Consulting Engineers – Noise and Air Quality.

To supplement the guidance and direction provided by the project team, details of the study were be presented to and reviewed by a technical advisory committee (TAC). The technical advisory committee consisted of representation from the following agencies and departments who were involved throughout the project:

- ***City of Toronto***
  - Transportation Services – Traffic Operations
  - Transportation Services – Right of Way Management
  - Transportation Services – Cycling Infrastructure and Programs
  - Transportation Services – Public Realm (Pedestrian Projects, Beautiful Streets, and Street Furniture)
  - City Planning – Community Planning
  - City Planning – Transportation Planning
  - City Planning – Urban Design
  - City Planning – Heritage Preservation Services
  - Toronto Water – Water Infrastructure Management
  - Parks, Forestry & Recreation – Tree Protection and Plan Review
  - Policy, Planning, Finance & Administration - Public Consultation Unit
  - Engineering and Construction Services
  - Toronto Police
  - Toronto Transit Commission (TTC)
  - Toronto Paramedic Services (Operations)
  - Toronto Fire
- ***York Region***
  - Infrastructure Management and Project Management Office
  - McPhail Transportation Planning (Contract to York Region)
  - York Region Transit (YRT)
  - York Region Paramedic Operations

- ***Metrolinx***
  - Environmental Assessment: Capital Infrastructure
  - Stouffville Corridor Team, Capital Projects Group
  - Environmental Programs and Assessment, Capital Projects Group
  - Hubs and Station Planning, Service Planning
- ***City of Markham***
  - Engineering Development Services Commission
  - Fire and Emergency Services
  - Central District, Planning & Urban Design Department

2.3 Agency Involvement

Local institutions, utilities, and municipal, provincial and federal government agencies, who were determined to have a potential interest in the study, were contacted at the project initiation stage through correspondence notifying them of the project commencement with a Feedback Form including a cover letter, the notice of commencement, and standard form requesting contact details, and level of interest. A summary of agency comments and relevant correspondence is included **Appendix A**.

2.4 Public Involvement

Throughout the study, the public and various interest groups have had opportunities to make comments, identify issues and provide additional information. A stakeholder database was formulated for this project from these involved members of the public and interest groups, as well as property owners. At the conclusion of Phase 3, the project mailing list included 317 contacts from 12 community associations, 126 businesses, and 165 members of the public. The comments provided by the public and interest groups have broadened the information base and facilitated decision making in the process. A summary of the public correspondence and input received during the course of the Study is provided in **Appendix A**. The consultation program summarized in the following sections has been designed to comply with the requirements of the Municipal Class Environmental Assessment for a Schedule "C" project.

2.4.1 Notice of Study Commencement and Public Information Centre #1 (PIC #1)

The first step in the public and agency consultation process was the publication and circulation of the *Notice of Study Commencement*, a copy of which is provided in **Appendix A**. This was combined with the notice of the first public information centre. The notices were advertised in the following locations, in both English and Traditional Chinese:

- Scarborough Mirror North (March 10th, 2016)
- Markham Economist & Sun (March 10th. 2016)
- Sing Tao Daily (March 14th, 2016)
- Ming Pao Daily (March 14th, 2016)
- City's "Get Involved" Website – (http://www.toronto.ca/steelesbridge) on March 8th, 2016
- 16,200 flyers delivered by Canada Post – March 9, 2016
- Email invitations to various stakeholder associations including – Heathwood Ratepayers Association, Aldergrove Ratepayers Association, Milliken Mills East Ratepayers Association, Cycle Toronto and Toronto Centre for Active Transportation's Scarborough Cycles.

The first public information centre was held on Wednesday, March 28, 2016 at the L'Amoreaux Community Recreation Centre, 2000 McNicoll Avenue between 6:00 PM and 8:30 PM. The purpose of the first public meeting was to present the identified problem and opportunities, possible solutions and list of assessment criteria. A presentation was given by Anson Yuen from the City of Toronto and Christopher Sidlar from LEA Consulting Ltd. The remainder of the public information centre was operated as a 'drop-in' format with members from the project team and TAC available to answer questions on a one-to-one basis. Cantonese and Mandarin interpreters were also made available to help support one-to-one questions from the local community as needed.

The display boards at the first public meeting provided an overview of the project background, the study purpose, existing conditions and constraints, proposed alternative solutions, and preliminary preferred alternative solution. In particular, four alternative solutions were identified:

- Build the road over the rail corridor and maintain a four lane cross-section,
- Build the road over the rail corridor and widen to a six lane cross-section,
- Build the road under the rail corridor and maintain a four lane cross-section, and
- Build the road under the rail corridor and widen to a six lane cross-section.

For each alternative solution the evaluation was presented.

All attendees were invited to view display panels and to provide comments to the Project Team members on any issues of interest or concern. Meeting attendees included 52 members of the public.

The Public Information Session Summary Report, which includes a copy of the completed comment sheets, as well as the display panels, presentation and the notice of project commencement are included in **Appendix A**. The materials displayed and provided at the public information centre were also made available online at the Steeles Avenue East EA PIC 1 display boards page (www1.toronto.ca/City Of Toronto/Policy, Planning, Finance & Administration/Public Consultation Unit/Studies/Transportation/Steeles Grade Separation/PIC 1/PIC1 Display Boards_FINAL.pdf).

Discussion of the feedback received at the open house for the preferred alternative design can be found in **Section 5.8.**

2.4.2 Public Information Centre #2

The second public information centre was held on Wednesday, January 4, 2017 at the L'Amoreaux Community Recreation Centre, 2000 McNicoll Avenue between 6:00 PM and 8:30 PM. The purpose of this public meeting was to present to the progress made since the first public meeting, the preferred design options for the key considerations of the preferred alternative solution. A presentation was given by Anson Yuen from the City of Toronto and Christopher Sidlar from LEA Consulting Ltd. The remainder of the public information centre was operated as a 'drop-in' format with members from the project team and TAC available to answer questions on a one-to-one basis.

The display boards provided an overview of the project background, the study process, the preferred alternative solution and key design considerations and evaluation and the preferred overall design. In particular, these key design considerations of the preferred alternative solution were shown:

- Cycling Facilities
- Local Transit Stop Options
- Bridge Design
- Vertical Connections (between the road and rail bridge)
- Urban Design
- Pumping Station

The preferred options for each design consideration were combined to form the overall design, which was also presented in plan, profile and cross-section views.

All attendees were invited to view display panels and to provide comments to the Project Team members on any issues of interest or concern. Meeting attendees included 37 members of the public.

The Public Information Session Summary Report, which includes a copy of the completed comment sheets, as well as the display panels and the notice of project commencement are included in **Appendix A**. The materials displayed and provided at the public information centre were also made available online at the Steeles Avenue East EA PIC 2 display boards page (www1.toronto.ca/City Of Toronto/Policy, Planning, Finance & Administration/Public Consultation Unit/Studies/Transportation/Steeles Grade Separation/PIC 2/PIC2 Display Boards_FINAL.pdf).

Discussion of the feedback received at the open house for the preferred alternative design can be found in **Section 6.10.**

2.4.3 Private Property Owners

There were several additional opportunities for the private property owners to become involved and provide feedback during the project. Meetings during Phase 1 and 2 of the project were used to introduce the project and gather a deeper understanding of the local issues. Meetings with individual property owners to discuss the proposed designs and address site specific issues were held throughout Phase 3 of the project. Through these meetings the preferred design was refined and potential mitigation of impacts to adjacent property owners, including property requirements and access, were discussed. Overall, throughout the study the project team met with the representatives for the following properties throughout the project:

- 4300 Steeles Avenue East
- 4390-4394 Steeles Avenue East
- 4458 Steeles Avenue East
- 4577 Steeles Avenue East
- 4631 Steeles Avenue East
- 4665 Steeles Avenue East
- 4675 Steeles Avenue East
- 4711/4723/4733/4751 Steeles Avenue East

Meetings with property owners are planned to continue through detailed design and construction to address specific issues regarding property acquisition, site access, and construction staging.

2.5 First Nations Consultation

First Nations communities were contacted in accordance with the City's First Nations Consultation Protocol for Environmental Assessments, which was developed in consultation with the Ministry of Environment and Climate Change (MOECC), the Ministry of Aboriginal Affairs (MAA), and Aboriginal Affairs and Northern Development Canada. Specifically, the project team contacted the First Nations at key points in the study process, including the Notice of Commencement and Public Information Centre #1, completion of the Stage 1 Archaeological Assessment, and Design Recommendation and Public Information Centre #2. The communities contacted included:

- Mississaugas of New Credit First Nation
- Mississaugas of Scugog Island First Nation
- Alderville First Nation
- Hiawatha First Nation
- Kawartha Nishnawbe First Nation
- Curve Lake First Nation

Details of the letters of notification, comment tracking, and responses provided are detailed in **Appendix A**. Specific responses provided by the First Nations communities included the Mississauga of New Credit who indicated that the project was determined to have a low level of concern, and the Hiawatha First Nation who determined the project to have little, if any, impact on their community. Both First Nations also requested their continued inclusion in the process and to be made aware should any archaeological artifacts be discovered.

2.6 MCEA Consultation Requirements

As mentioned above, the Steeles Avenue East Bridge Environmental Assessment was carried out in accordance with the Municipal Class Environmental Assessment, October 2000 (as amended in 2007, 2011, and 2015).

The filing of the ESR completes the planning stage of the project. The ESR is filed in the public record and made available for review for a thirty (30) calendar day review period. A public notice is published at commencement of the 30-day review period. Copies of the report are available for review and comment during normal business hours at the following locations:

Steeles Public Library
Bamburgh Gardens Shopping Plaza
375 Bamburgh Circle
416-396-8975

Goldhawk Park Library
295 Alton Towers Circle
416-396-8964

The ESR is also available in a PDF format on the Steeles Avenue East Bridge EA project website (http://www.toronto.ca/steelesbridge). If no outstanding concerns are brought forward during the review period, the City may proceed to the detail design/construction stage (implementation).

If concerns regarding the project cannot be resolved in discussion with the City of Toronto, a person or party may request that the Minister of the Environment and Climate Change make an order for the project to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order), which addresses Individual Environmental Assessments.

Anyone wishing to request a 'Part II Order' of the Steeles Avenue East Bridge Class Environmental Assessment Study must submit a written request detailing their comments and/or concerns within the thirty (30) calendar day review period to the following contacts:

The Honourable Glen Murray
Minister of the Environment & Climate Change
77 Wellesley St. W., Ferguson Block, 11th Fl., Toronto, ON M7A 2T5

And

Ministry of the Environment & Climate Change
Environmental Approvals Branch
135 St. Clair Ave. W., 1st Fl., Toronto, ON M4V 1P5

Copy to:

City of Toronto (Proponent): Maogosha Pyjor
Senior Public Consultation Coordinator
City Hall, 22nd Floor
100 Queen Street West, Toronto, ON M5H 2N2

3 EXISTING CONDITIONS

3.0 EXISTING CONDITIONS

The MCEA process requires that existing natural, cultural, economic and social environments be examined so that any potential impacts from the proposed design solution can be evaluated. The background studies included socio-economic profile, transportation, archaeological, heritage, natural environment, geotechnical, noise and air quality investigations, as well as municipal servicing study for the area. The context and key findings have been described for each background study conducted.

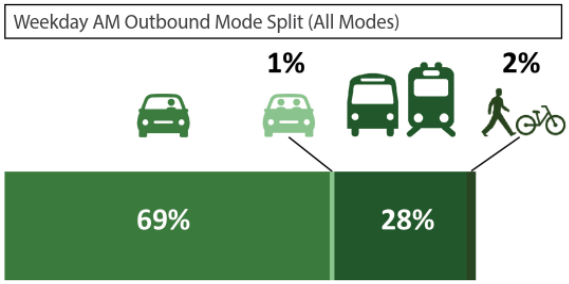
3.1 Socio-Economic Profile

A review of the study area planning context, census data and socio-economic environment as well as the current travel behaviour was conducted to establish the context in which the environmental assessment was being undertaken. The report is included in **Appendix B**; this section summarizes the key findings of that report. It has been identified that most land uses in the area are commercial, surrounded by low-rise residential and employment. It has also been identified that the population that resides in the area is dominantly Chinese, which is reflective of the culturally tailored land uses in the area, such as Pacific Mall, Kennedy Corners, and Market Village. Based on data extracted by the 2011 Census and 2014 City of Toronto Employment Survey, the population in the study area can be characterized as being:

- Of a young adult or middle age;
- Living in privately owned households with between three (3) and four (4) inhabitants;
- Earning a lower than average income ($18,122);
- A first generation immigrant, speaking dominantly languages of Chinese origin at home; and,
- Working in office, service, and retail.

The existing transportation modal split for the area is shown in **Figure 3-1**. The majority of residents (69%) drive to work, with a significant number of residents using public transit (28%) and the remaining using active transportation (walking and cycling).

Figure 3-1: Transportation Modal Split



As for travel behaviour of residents and those who work in the study area, it has been discovered that:

- Most residents are found to work in the City of Toronto downtown area (19%), or in the City of Markham (20%) and Scarborough north of Highway 401 (16%);
- 79% of transit users from the study area rely on either Toronto Transit Commission (TTC) or York Region Transit (YRT) services;
- GO Transit users represent a considerable portion of the transit (21%) and overall (13%) commuting population; and,
- Commuting times (approximately 30 minutes) are comparable to average commute times in the Toronto Census Metropolitan Area.

3.1.1 Government Initiatives

Establishing the planning context for the Environmental Assessment there are several government initiatives are currently in development and will be included in the study. They are as follows:

Metrolinx: Regional Express Rail Service Plan

Under the Regional Express Rail (RER), the Stouffville GO Rail Corridor has been identified by Metrolinx to receive service improvements that will allow two-way all day service 7 days a week, as well as electrification of the lines. The number of trains is expected to increase from the current 15 per day, serving only the peak hour direction in the AM and PM peak, to up to potentially 86 trains by 2031, serving both directions all day.

Metrolinx: Milliken Station Upgrade

Proposed station upgrades at Milliken Station include: installation of an east platform, integrated canopies, tunnels, elevators/accessible ramps, shelters, and pedestrian walkways. The grade separation project will review potential multi-modal connections from Steeles Avenue East to the platform at the rail crossing. In addition the track diversions during the

construction of the grade separation may require property acquired by Metrolinx for the station upgrades.

Metrolinx: Double Track Phase 1

Construction is underway from north to south and is expected to be completed by summer of 2018; the Double Track Phase 1 includes the addition of a second rail track to the Stouffville GO Rail Corridor from Marilyn Avenue (north of Agincourt GO station) to Kennedy Road South (north of Milliken GO Station). This will include construction of a second track through the current at-grade Steeles Avenue East crossing. The double tracking is part of the Metrolinx initiative to introduce two-way, all day service along the Stouffville GO line. The resulting additional trains crossing Steeles Avenue East in the future create part of the need for a grade separation.

Metrolinx: Stouffville Grade Separation Program

Metrolinx has also initiated the Stouffville Rail Corridor Grade Separation Program to study the feasibility of grade separating eleven at-grade crossing locations along the corridor. Up to six preferred locations for grade separations may be identified along the corridor.

Steeles Rapid Transit

Rapid Transit on Steeles Avenue East has been identified in Metrolinx's Regional Transportation Plan (RTP): The Big Move, The City of Toronto Official Plan, and York Region's Transportation Master Plan. While the timing of RT is unknown, the study will review the requirements for protecting rapid transit vehicles in the bridge design.

Midland Extension EA

Midland Avenue currently terminates at Steeles Avenue East in the City of Toronto. The City of Markham's EA recommends a preliminary design for an extension north of Steeles Avenue East to curve and connect to Old Kennedy Road. Construction is expected to commence in the summer of 2017. This EA is considering the impacts of the future traffic assumptions made by the study.

Redlea/Silver Star Boulevard EA

The City of Toronto is carrying out the construction phases for the following streets:

- Milliken Boulevard from Finch Avenue East to McNicoll Avenue
  - Construction is completed.

- Work Type: Road Reconstruction, Watermain Replacement, Sewer Replacement, Intersection Modifications

- Redlea Avenue from McNicoll Avenue to Passmore Avenue
  - Construction is ongoing to be completed by early 2017.
  - Proposed Work Type: Road Reconstruction and extension, Watermain Replacement, Sewer Replacement, Intersection Modifications

Both of these extensions are being considered in the traffic assessments for the area.

TTC McNicoll Bus Garage

The study includes the design of an indoor storage facility that can accommodate 250 conventional buses, a maintenance shop, a transportation office, and a bus services area. The study included a traffic impact study which took into account the completed City of Toronto Redlea Avenue /Silver Star Boulevard Class EA. This EA is considering the transportation recommendations and impacts to traffic movements.

Markham: Milliken Secondary Plan Update

The City of Markham's Milliken Secondary Plan Update is currently proceeding ahead and has provided the preliminary population and employment figures and City's corresponding traffic zones. The data will be incorporated to the municipal analysis of this EA.

Toronto: Steeles-Redlea Regeneration Area Study

Since the commencement of this EA study, the City of Toronto has completed the Steeles-Redlea Regeneration Area Study, which recommends an official plan amendment and urban design guidelines for the area. The final report was presented to and approved by the City Council in September 2016.

3.2 Transportation

To better describe the transportation conditions within the study area, the operational considerations have been broken down by mode. Specifically, the following sections will describe the conditions with respect to vehicles, transit, and active transportation.

3.2.1 Vehicles

The existing vehicle traffic conditions for Steeles Avenue East between Kennedy Road and Midland Avenue were analyzed. The detailed transportation study is found in **Appendix C**. The

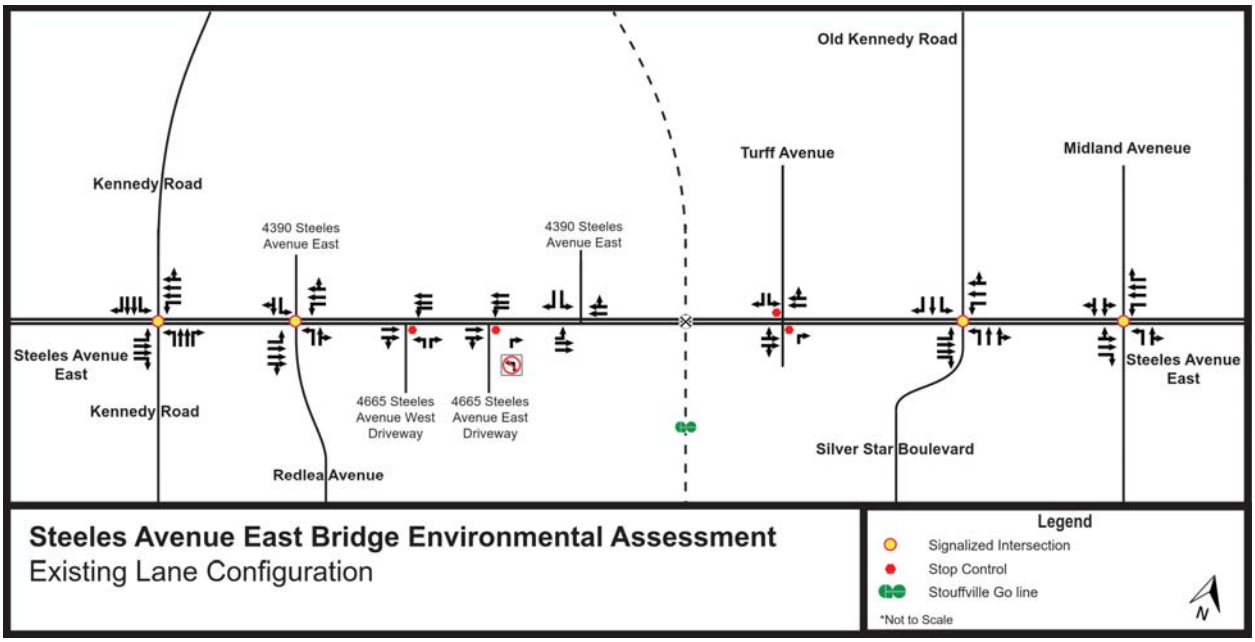
analysis includes all public road intersections along Steeles Avenue East between Kennedy Road to the west and Midland Avenue to the east, in addition to the Stouffville GO Rail Corridor.

The major intersections and driveways included in this study area are as follows:

- Kennedy Road & Steeles Avenue East (signalized intersection)
- Redlea Avenue/4390 Steeles Avenue East Access & Steeles Avenue East (signalized intersection)
- 4665 Steeles Avenue East West Access & Steeles Avenue East (unsignalized driveway)
- 4665 Steeles Avenue East East Access & Steeles Avenue East (unsignalized driveway)
- 4390 Steeles Avenue East Access & Steeles Avenue East (unsignalized driveway)
- Turff Avenue/Plaza Access & Steeles Avenue East (unsignalized intersection and driveway)
- Old Kennedy Road/Silver Star Boulevard & Steeles Avenue East (signalized intersection)
- Midland Avenue & Steeles Avenue East (signalized intersection)

The intersections are shown in **Figure 3-2**.

Figure 3-2: Existing Lane Configurations



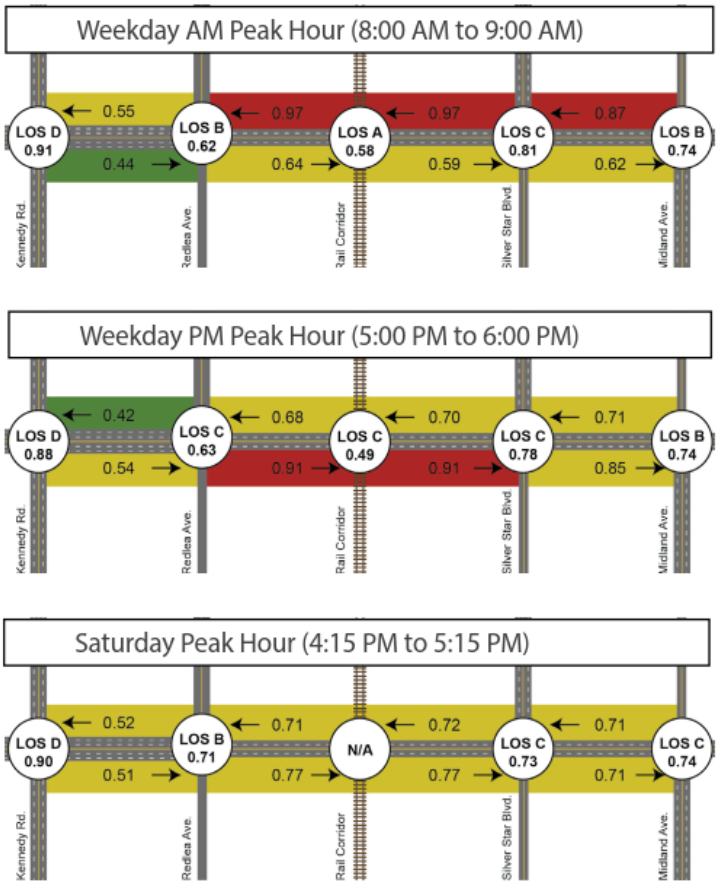
The existing condition levels of service and volume to capacity ratios along the corridor are shown in **Appendix C.**

Overall, the westbound traffic was identified to be constrained along Steeles Avenue East east of Redlea Avenue during the weekday morning peak hour and in the eastbound direction between Redlea Avenue and Silver Star Boulevard during the weekday afternoon peak hours. The higher volume to capacity ratios exhibited in these sections can be attributed to Steeles Avenue East being limited to two lanes of traffic in either direction, before it widens to three lanes in either direction east of Kennedy Road.

All movements at signalized intersections operate with acceptable levels of service and residual capacity during the peak hours with the exception of the eastbound left turn movement at the Old Kennedy/Silver Star and Steeles intersection, which exhibits a higher level of delay.

Based on the traffic analysis, no queuing issues were identified at the driveways and unsignalized intersections. However, the southbound left movement at the 4390 Steeles Avenue East access and the northbound left turn movement at the 4665 Steeles Avenue East west access are experiencing high levels of delays during the peak hours. The southbound movements at the Steeles Avenue East/Turff Avenue intersection are also experiencing delays during the weekday afternoon peak hour.

Figure 3-3: Traffic Existing Condition Levels of Service



Level of Service LOS	Conditions
A - B	Good operations, minimal delay
C - D	Fair operations, some delay
E - F	Poor operations, intersection is congested, long delay

The analysis also indicates that overall across the peak hour, the level rail crossing operates with acceptable delay during the weekday morning/afternoon peak hour. That being said, during the weekday morning peak hour, it was found that there was one train crossing for 91 seconds every half an hour. In the weekday afternoon peak hour the train crosses every half hour and has two gate cycles. When the train approaches from the south the gates close for 99 seconds until the train comes to a full stop at the station. Once the train was fully stopped, the gates open for traffic for 80 seconds while the train passengers board and alight. The gates then close again for 113 seconds while the train exits the station and continues north. With only two (2) through lanes in either direction at the rail corridor, as the trains blocked traffic, significant queues are created, which often interact with the adjacent intersections of Redlea Avenue and Silver Star Boulevard.

While overall the intersections along the Steeles Avenue corridor were operating at acceptable levels of service under existing conditions, there are some mid-block capacity and isolated queuing issues that are problematic to the flow of traffic through the study area corridor.

3.2.2 Collision History

The number of collisions by impact type in the area for the period beginning in January 2009 to November 2013 (3 years and 10 months) is shown in **Figure 3-4**. The collisions occurring at the crossing are shown in **Figure 3-5**.

Figure 3-4: Collisions along Steeles Avenue East

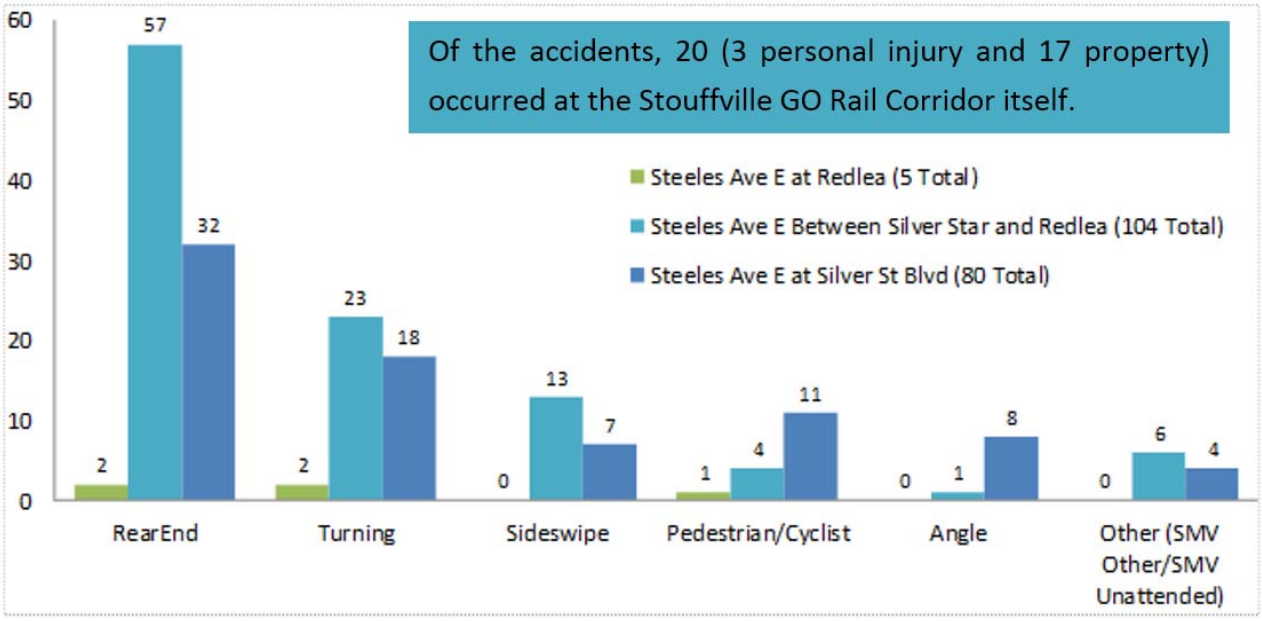
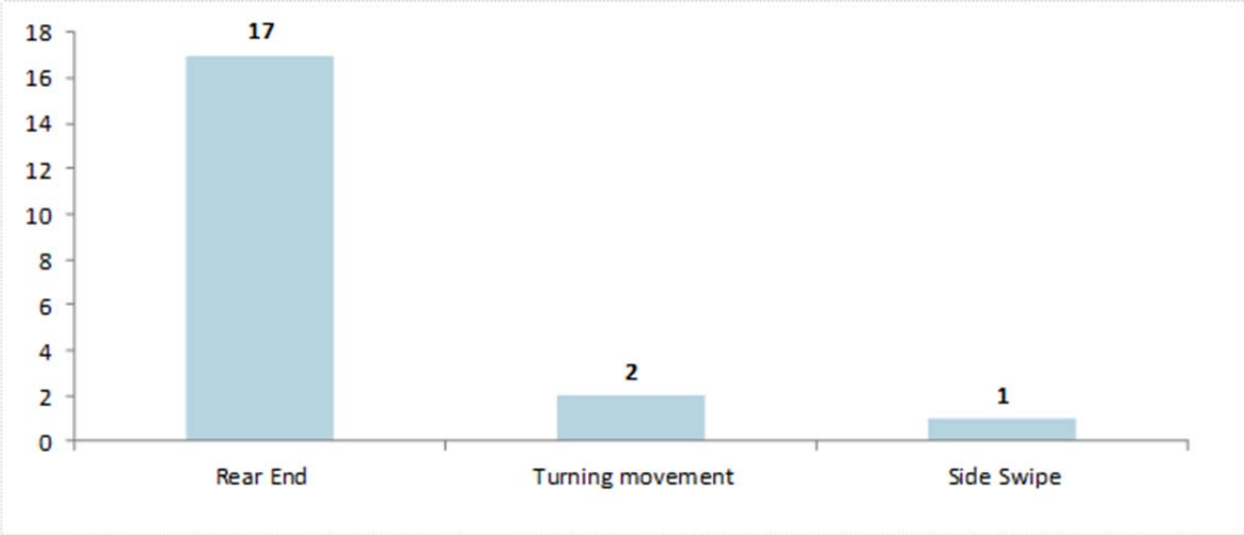


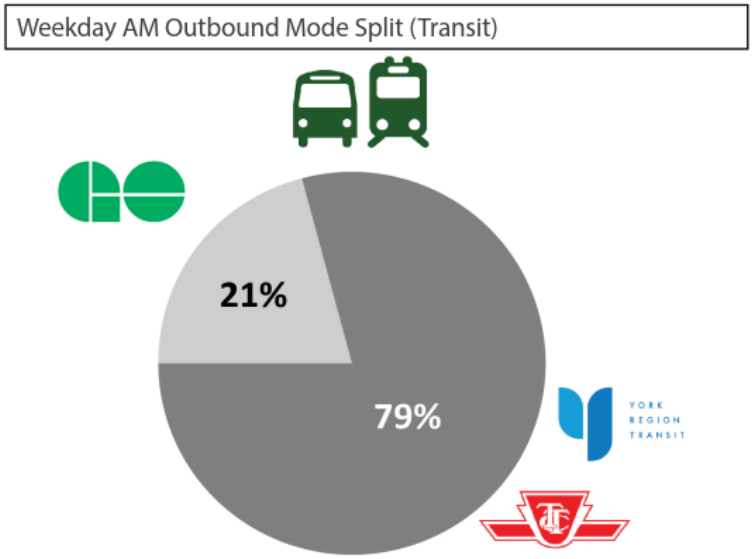
Figure 3-5: Collisions at the Rail Crossing



3.2.3 Transit

The study area is served by public transit via GO Transit, Toronto Transit Commission (TTC) and York Region Transit (YRT). The majority of local transit users in the area use TTC, while a large proportion also use GO Transit. The weekday morning transit mode split is shown in **Figure 3-6.**

Figure 3-6: Weekday Morning Transit Mode Split



The following describes the routes that service the study area:

- **Stouffville GO Train** operates along a Stouffville GO Rail Corridor. This service operates during the weekday peak periods in the peak direction, with seven southbound trains occurring approximately every 30 minutes between 6:00 a.m. and 9:00 a.m., two afternoon northbound trains between 2:30 p.m. and 5:00 p.m. and six northbound trains occurring approximately every 30 minutes between 5:00 p.m. and 7:45 p.m. There is currently no service at this station during weekends or holidays.
- **TTC Route 53 Steeles East** has four branches and one overnight branch that run along Steeles Avenue East in both the eastbound and westbound directions. Headways between buses range, with frequent service (three to five minute headways) occurring during the weekday morning and afternoon peak hours, ten-minute or better during off-peak hours and every 30 minutes overnight.
    - 53A (Finch Station – Staines) – midday and late evening weekdays and all times weekends and holidays;
    - 53B (Finch Station – Markham Road) – all times of the week;
    - 53E (Express Finch Station - Markham Road) – peak periods on weekdays;
    - 53F (Express Finch Station - Staines) – peak periods on weekdays; and
    - 353 Blue Night (York University – Staines) – operates overnight, every night.
- **TTC Route 43** runs along Kennedy Road, where the northern limit of the route travels clockwise along Kennedy Road (northbound), Steeles Avenue East (eastbound), Midland Avenue (southbound) and Passmore Avenue (westbound). The route operates from early mornings (about 8:30 a.m. on Sundays, about 6:00 a.m. otherwise) until late evenings (about 2:45 a.m.) with 8 to 15-minute headways during peak periods.
- **YRT Route 8** travels along Kennedy Road (southbound), Steeles Avenue East (westbound), Putnam Gate (northbound), Harvest Moon Drive (eastbound/northbound) and Clayton Drive (eastbound). Headways range and are typically between 15 minutes during weekday peak periods, and 60 minutes during weekends and holidays. Service operates from 5:30 a.m. until 10:30 p.m. during weekdays, 7:30 a.m. until 11:00 p.m. on Saturdays, and 7:30 a.m. until 10:00 p.m. on Sundays.
- **YRT Route 203** is a Milliken GO shuttle which operates primarily in an east/west direction from Box Glove By-pass & 14th Avenue to Old Kennedy Road & Steeles Avenue along Denison Street. The route turns southbound along Old Kennedy and unloads

passengers at the intersection of Old Kennedy Road at Steeles Avenue East. This service operates only during the weekday peak hours and is timed to pick-up and drop off passengers based on the Milliken GO train schedule.

All transit routes within the study area are summarized in **Figure 3-7** and **Figure 3-8** for YRT and TTC, respectively. The YRT Route 203 is not shown in either figure.

Figure 3-7: York Region Transit Network

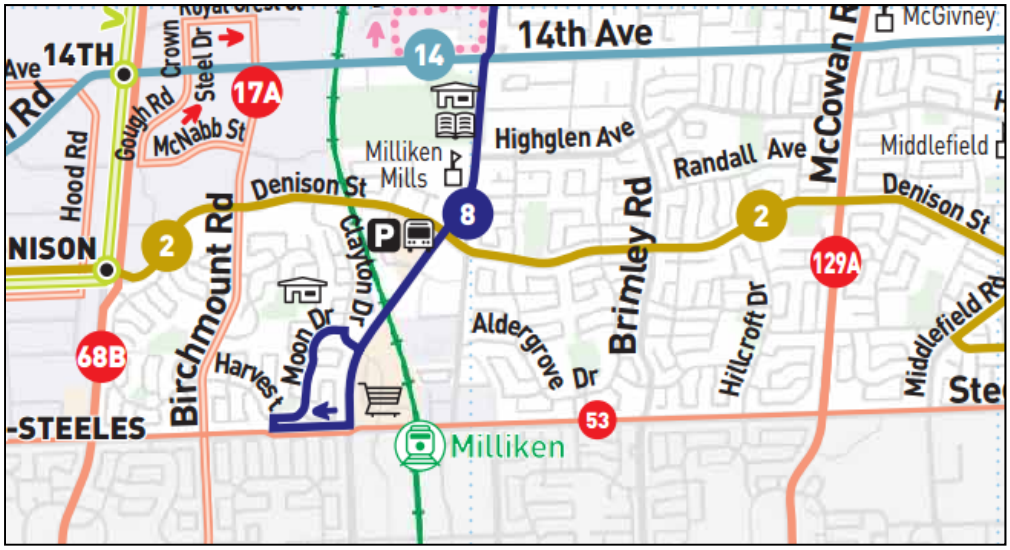
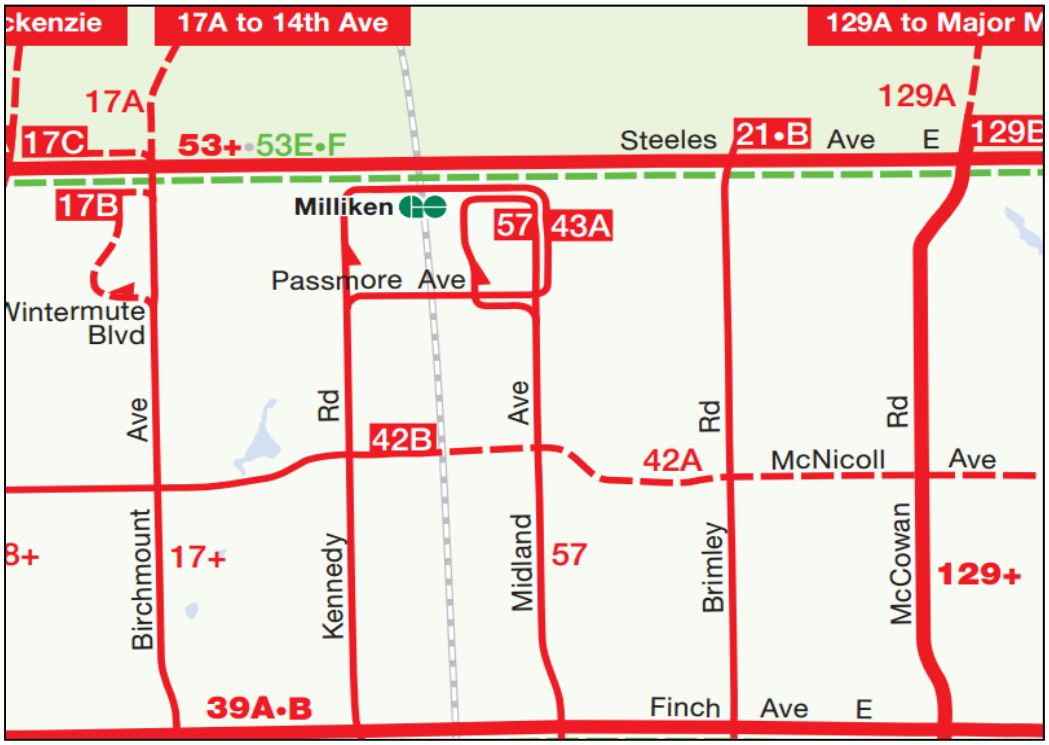


Figure 3-8: Toronto Transit Commission Transit Network



Currently all transit vehicles must stop at the rail corridor at all times. This causes delays for transit vehicles and other road users, which also causes congestion for traffic in the lane behind the bus. Currently this affects approximately 591 buses in both directions on weekdays, 352 on Saturdays and 306 on Sundays.

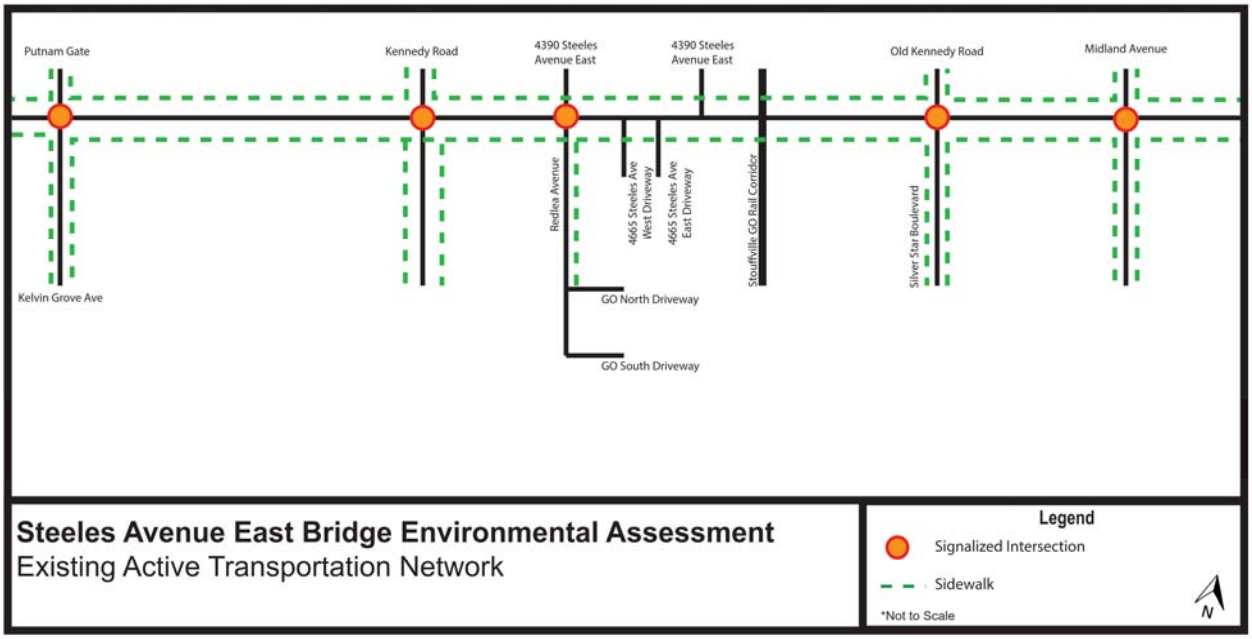
Additionally, the future transit network works being considered in this study are:

- Double-tracking of the Stouffville GO Rail corridor
- The Milliken GO station modifications, which include platforms on both the east and west side
- Connections between the TTC/YRT routes with the Milliken GO Station
- The TTC Steeles Bus Route 53 is expected to continue to have a bus stop near the rail corridor;
- YRT/VIVA service is considering a new east-west bus route to run along Steeles Avenue East and West, with frequencies of 15 minutes during peak morning and afternoon hours and 20 minutes off peak
- Future plans for YRT/VIVA include converting select TTC services north of Steeles Avenue to YRT/Viva operated services and extended to Milliken GO Station, namely 17A Birchmount and 68B Warden North
- Transit growth projections for the area due to the Regional Express Rail expansion

3.2.4 Active Transportation

There is a significant amount of active transportation along the Steeles Avenue East corridor. The presence of large retail destinations, along with the presence of several transit routes present high volumes of pedestrian and cyclists. Currently, sidewalks are provided on both sides of Steeles Avenue East and no dedicated cyclist facilities are provided. The existing active transportation network is shown in **Figure 3-9**.

Figure 3-9: Existing Active Transportation Network



Currently, cyclists are to share the road with vehicles as per the *Ontario Highway Traffic Act*. Despite this, the majority of cyclists in the area were observed to ride in both directions on both the north and south side Steeles Avenue East sidewalks. This is likely due to cyclists feeling unsafe next to vehicles. **Figure 3-10** illustrates a cyclist riding on the sidewalk on the south side of Steeles Avenue East at the rail corridor. The existing sidewalks vary in width throughout the corridor but are not wide enough to be considered a shared pathway and cyclists and pedestrians sharing the roadway creates potential conflicts and safety concerns.

Figure 3-10: Cyclist Riding along Sidewalk on Steeles Avenue East

Pedestrians were also observed to be making unprotected crossings in the north-south direction at the rail tracks as well as at midblock between the tracks and Redlea Avenue, as shown in **Figure 3-11**. Currently, there are no protected crossings along the 400m between Redlea Avenue and Silver Star Boulevard.

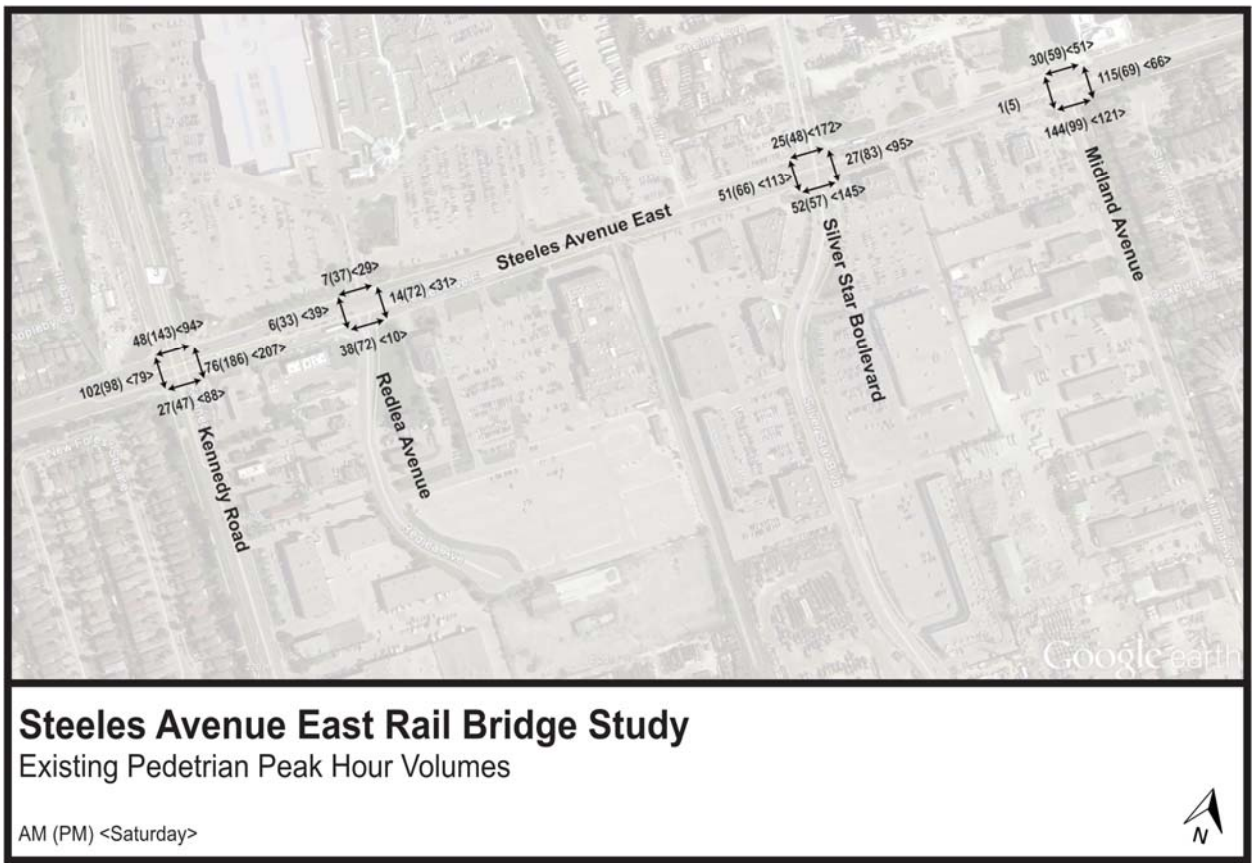
Figure 3-11: Pedestrians Crossing Steeles Avenue East

Pedestrian and cyclist observation counts at the rail crossing are shown in **Table 3-1**, while existing pedestrian volumes at adjacent intersections is presented in **Figure 3-12**.

Table 3-1: Midblock Pedestrian Crossings and Sidewalk Cyclists along Steeles Avenue East

Peak Period	Midblock Pedestrian Crossings		Cyclists on Sidewalk	
	Weekday	Saturday	Weekday	Saturday
AM (7:30-9:30)	8	7	69	64
Midday (11:00-13:00)	21	10	134	139
PM (16:00-18:00)	40	6	101	73

Figure 3-12: Existing Pedestrian Peak Hour Volumes



3.3 Archaeological Assessment

Stage 1 Archaeological Assessment of Steeles Avenue East and the area surrounding the Stouffville GO Rail Corridor was completed as part of this study. This study, attached in **Appendix D,** was prepared in accordance with the Part VI of the Ontario Heritage Act, R.S.O. 1990, c0.18, and found the following.

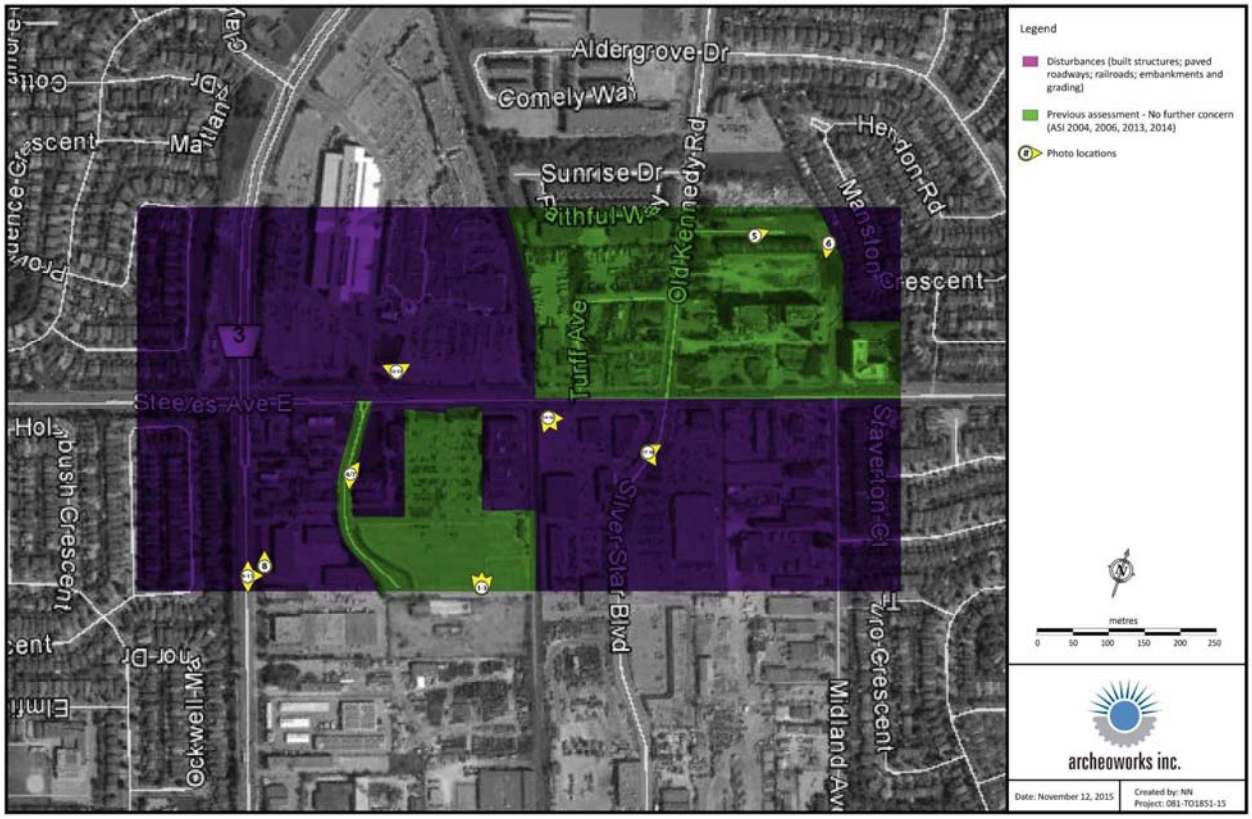
An 1860 Map of the County of York reveals that the study area was primarily located within the agricultural lands of several land owners. One historic structure, two inns and the developed area of the hamlet of Milliken, were depicted within the study area in the 1860 Map. The 1878 Atlas Illustrated Historical Atlas of the County of York revealed the study area continued to be located within cultivated lands of several landowners. Three historic homesteads, a post office, and the Toronto and Nipissing Railway are depicted within the study area in the 1878 Atlas. One additional historic homestead and a church are depicted within 300 metres of the study area.

Steeles Avenue East, Kennedy Road, Old Kennedy Road, and Midland Avenue were originally laid out during the survey of the Township of Scarborough, and the Township of Markham. Based on the close proximity of several historic structures and several historic transportation routes, there is elevated archaeological potential for the location of Euro-Canadian archaeological resources (pre-1900) within portions of the study area.

To provide a summary of registered or known archaeological sites within a minimum one kilometre distance from the study area limits, the Ontario Archaeological Sites Database (OASD) maintained by the Ontario Ministry of Tourism, Culture and Sport (MTCS) was consulted. According to the MTCS (2015), two archaeological sites have been registered within one kilometre of the study area. None of these sites fall within close proximity of the study area limits.

Portions of the study area were identified in background research as undergoing previous Stage 1 Archaeological Assessment (Stage 1 AA) as shown in **Figure 3-13,** which determined the respective areas to be entirely disturbed lands and thus, are of no further archaeological concern. Disturbances were documented throughout the entirety of the study area, and include the paved roadways, driveways and parking areas, railways, existing residential, commercial, and industrial development, utilities, grading and infilling activities, and extensive landscaping.

Figure 3-13: Results of Stage 1 Archaeological Assessment



On-site property inspection was conducted to systematically review the archaeological potential. Based on the field inspection, as well as the historical aerial photographs and satellite imagery, it is apparent that the entirety of the study area has undergone deep and extensive disturbances that have removed its archaeological potential. Furthermore, portions of the study area were identified in background research as undergoing previous Stage 1 Archaeological Assessment in 2004, 2006, 2013 and 2014, which determined the respective areas to be entirely disturbed and are of no further archaeological concern. Areas that exhibit disturbed conditions are recommended to be exempt from a Stage 2 Archaeological Assessment. Therefore, no further archaeological concerns exist within the study area and all alternative options are considered to have minimal impacts on archaeological potential in the study area.

3.4 Cultural Heritage

A cultural heritage study and survey of the area surrounding the Stouffville GO Rail Corridor crossing at Steeles Avenue East was completed. This study, attached in **Appendix E**, is summarized below.

Two (2) principal landscapes with cultural heritage potential were identified within the project focus area in the City of Markham, namely, the GO Transit Rail Corridor and the historical crossroad hamlet of Milliken. Additionally, a number of heritage properties have been identified within the City of Markham just outside of the immediate area. Specifically the listed properties identified include:

- 30 Old Kennedy Road;
- 51 Old Kennedy Road;
- 58 Old Kennedy Road;
- 59 Old Kennedy Road;
- 64 Old Kennedy Road; and,
- 93 Old Kennedy Road.

While two designated properties were identified to be adjacent to the project focus area, specifically, 73 Old Kennedy Road (James Rattle House) and 4600 Steeles Avenue East (Milliken Public School), neither is expected to be impacted by the proposed project.

3.5 Natural Heritage

A review of the natural heritage system in the study area surrounding the Stouffville GO Rail Corridor was completed to identify areas of environmental sensitivity and/or significance. The review presented in **Appendix F**, included a consideration of the existing conditions with regards to the area's aquatic ecosystem, vegetation, and wildlife. The study area is under the jurisdiction of the Toronto Region Conservation Authority (TRCA).

The Steeles Avenue East Corridor study area is located within the South Slope physiographic region with underlying soils comprised of Milliken Loam which slope gently in a southeasterly direction towards Lake Ontario. There are no watercourses located within the study area. The majority of vegetation throughout the study area exists as manicured lands, with a large portion of the species non-native in origin. The two vegetation communities identified and both are considered to be widespread in Ontario and are adapted to persist in regularly disturbed areas. Previous correspondence between LGL and the Ministry of Natural Resources and Forestry (MNRF) has revealed that although Kentucky Coffee Trees are considered a "species at risk", non-native planted Kentucky Coffee Trees are not considered within the context of the *Endangered Species Act, 2007*.

Wildlife habitat was found to be typical of an urbanized area. It was limited to scattered trees, manicured grass, and ornamental vegetation and for the more highly adaptable species,

buildings and other anthropogenic features. These intensely urbanized areas provide low quality wildlife habitat in the study area, with only a few bird and mammal species being documented within these lands. Given the urban nature of the study area, any natural heritage features found within the study area are highly fragmented from surrounding natural areas by an intensive road network. Only wildlife species generally considered urban or tolerant of human activity were documented within the study area. No significant wildlife habitat or passage corridors were identified within the lands examined. Previous records indicate three Species at Risk were identified in the study area, however no habitat considered suitable for each species were identified and therefore no further surveys are required.

3.5.1 Arborist Report

LGL Limited also prepared an arborist report to document the results of the tree inventory conducted on October 16th, 2015. The arborist report and aerial photos showing the location of all trees identified are included in **Appendix G**. All trees within the existing Steeles Avenue East right-of-way and private trees with canopies overhanging the Steeles Avenue right-of-way were surveyed and cataloged. Surveyed trees were screened for rare species as referenced by the Ministry of Natural Resources and Forestry and Natural Heritage Information Centre (NHIC) for trees classified as Endangered, Threatened, and Special Concern species. The only species at risk identified was a singular Kentucky Coffee Tree located on Kennedy Road south of Steeles Avenue East, which is regulated as Threatened under the *Ontario Endangered Species Act*. However, this tree had been planted for amenity purposes, which is not considered within the context of the Endangered Species Act, and is not expected to be impacted by any of the alternatives. All alternative solutions are expected to have similar impacts to the tree resources.

3.6 Geotechnical Investigation

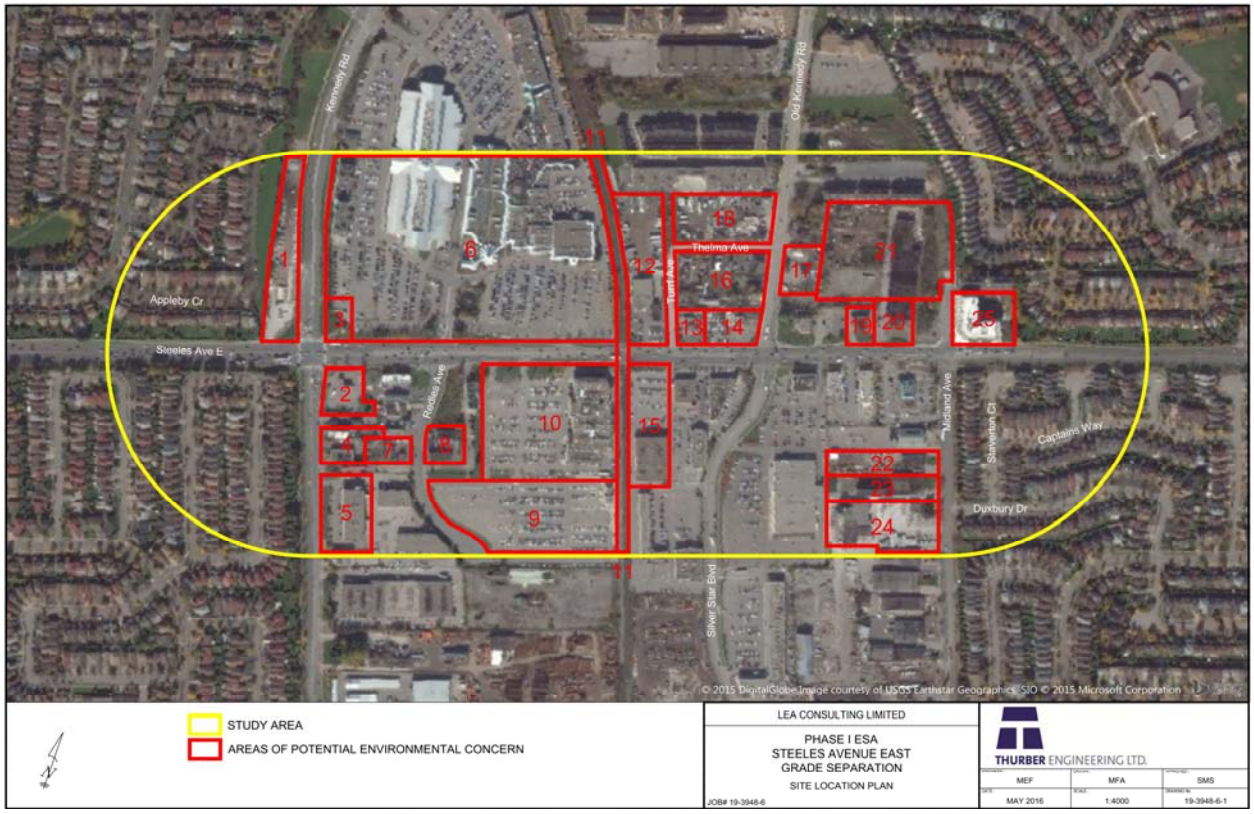
A Phase I Environmental Site Assessment (ESA) and a Geotechnical Investigation Report (GIR) for the proposed grade separation along Steeles Avenue East were completed to determine the subsurface conditions, including identifying any potential sites of contaminated soils or groundwater.

3.6.1 Phase I Environmental Site Assessment (ESA)

The Phase I ESA assesses actual, or potential, sources of site contamination within the project focus area, and is included in **Appendix H.** The Phase I ESA work was carried out in accordance with CSA Standard Z768-01, with a city directory search conducted in lieu of a legal title search. **Figure 3-14** shows Areas of Potential Environmental Concern (APEC) identified due to historical

or current land use, in addition to records of spills or incidents that may have caused soil contamination.

Figure 3-14: Phase I ESA Areas of Potential Environmental Concern



A complete list of the APEC properties is available in the Phase I ESA report in **Appendix H**. Further study during the detail design and property acquisition phase is recommended in the form of a Phase II ESA for any APEC properties that may be acquired for the grade separation construction. Soil and groundwater testing is also recommended along the Steeles Avenue East right-of-way for any excavation works within 50m of the APEC properties. The Phase II ESA and soil/groundwater water testing required would be expected to be conducted in the detail design phase and property acquisition phase.

3.6.2 Preliminary Geotechnical Investigation Report

A preliminary geotechnical investigation report, which presents the factual data collected from the investigation carried out in the site area and is included in **Appendix I**. The geotechnical investigation report summarizes the subsurface conditions along Steeles Avenue East, through the description of the borehole locations, soil strata drawings, laboratory test results, and a description of the subsurface conditions.

Field investigations were conducted between January 6th and 27th, 2016, during which eight boreholes (numbered 15-01 to 15-08) were drilled along Steeles Avenue East between Kennedy Road and Midland Avenue to depths between 5.0m and 15.9m. Soil samples from all boreholes were subjected to visual identification and natural moisture content determination. Selected samples were also subjected to grain size distribution analysis (hydrometer and/or sieve) and Atterberg Limits testing.

The following are the general soil conditions for the subject area, with detailed factual data of the soil conditions are provided in the report and appendices in **Appendix I**.

- Asphalt pavement was encountered at a boreholes, with thicknesses ranging from 100mm to 150mm
- The subsurface stratigraphy consists generally of sandy till. Fill below the asphalt ranged from sand to gravel with trace silt and occasional cobbles to silt with some sand, clay and occasional wood fragments. The fill thickness ranged from 0.6m to 1.3m.
- Standard penetration test (SPT) "N" values recorded in the fill ranges from 10 to 44 blows per 0.3m of penetration, indicating a compact to dense relative density. Moisture contents varied between 2 and 16 percent.
- Boreholes 15-03, 15-06 and 15-07 found a layer of silty clay with trace sand to sandy below the fill. The thickness ranged from 0.5m to 1.6m and extended to depths between 1.2m and 2.2m. SPT "N" values ranged from 12 to 15 blows per 0.3m of penetration indicating a stiff consistency. Moisture contents varied between 19 and 23 percent.
- All boreholes encountered a till deposit of sandy silt with some clay, trace gravel and occasional oxide staining beneath the fill or silty clay. All boreholes were terminated in the sandy silt till at depths from 5.0m to 15.9m. SPT "N" values ranged from 11 to 112 blows per 0.3 m of penetration up to 100 blows per 0.100m of penetration, indicating a compact to very dense relative density. Moisture contents within the sandy silt till varied between 5 and 22 percent.
- Soil samples were tested to standards set in Table 1 of the Ontario Ministry of the Environment and Climate Change, Ground Water and Sediment Standards for use under Part XV.1 of the Environmental Protection Act (2011).
    - The concentration of metal parameters meets the Table 1 standard, with the exception of chromium in sample BH2-SS1.
    - Five samples exceeded the Table 1 standard for electrical conductivity and seven samples exceeded the sodium adsorption ratio. These are expected to be related to road salting.

- Concentrations of volatile organic carbons, polycyclic aromatic hydrocarbons and polychlorinated biphenyls met the standards.
- Concentrations of petroleum hydrocarbons met the standards with the exception of fraction F4 in sample BH1-SS2.
- The concentration of samples submitted for toxic characteristic leaching procedure for metal and organics met the standards.
- Amounts of asbestos detected in sample C-02 met the regulatory threshold for Ontario. No other samples detected asbestos.

Groundwater conditions were also observed during the drilling operations and measured upon completion of the drilling. A standpipe piezometer was installed at two borehole locations to monitor groundwater levels along Steeles Avenue East. The groundwater levels were observed to vary between 3.0m and 12.5m below the surface at elevations of between +194.8 and +185.2. During the testing period in January 2016, several locations exhibited dry conditions. Seasonal fluctuations are expected and groundwater levels may be at a higher elevation after periods of significant precipitation. The standpipe piezometer that was installed at the rail corridor was reviewed at subsequent occasions on April 6, 2016 and April 21, 2016. At both instances it revealed a water level depth of 10.1m (elevation of +187.8). Comparatively the standpipe piezometer located within the Steeles Avenue East roadway south of Turff Avenue revealed a water depth of 3.0m (+194.8), when reviewed on April 6, 2016 and April 21, 2016.

3.7 Air and Noise Quality

An air and noise quality assessment was completed to assess the existing conditions. The air and noise quality report for both the existing conditions and the future assessment can be found in **Appendix J**. Information on background air quality and noise conditions in the study area was derived from data presented in air quality and noise assessments undertaken by RWDI as part of the Environmental Assessment for Stouffville Corridor Rail Service Expansion. These assessments were completed in 2014.

A comparison of the existing air contaminants to the air quality thresholds set by the Ontario Ministry of Environment and Climate Change shows that the background values for PM2.5, NO2, and acrolein are less than their relevant thresholds. The background values for benzene (annual average) on the other hand exceed their thresholds, indicating that current levels of these contaminants in the study area are above the desired levels. It should be stated that, reviewing the general background concentrations based on historical data in the study area does not account for possible future changes in background levels in the airshed. Specifically,

the relevant contaminants have generally continued to exhibit declining trends over the past ten years in Southern Ontario, mainly due to declining tailpipe emissions from motor vehicles. The declining trends in these emissions are expected to continue as older vehicles are replaced with vehicles with lower tailpipe emissions.

Existing background levels of noise in the study area are anticipated to be typical of urban areas with daytime ambient sound levels around the 60 dBA range and greater, depending on traffic. Since the rail corridor is on the order of 200m to 400m away from the nearest residences in the area, the ambient noise levels at the residences are dominated by noise from road traffic on the major roads. The sensitive receptors are shown in blue in **Figure 3-15** and consisted of the residential areas located within the study area.

Figure 3-15: Proximity of Sensitive Receptors

3.8 Municipal Servicing

The following municipal servicing infrastructure were identified in the study area and assessed for existing performance. The existing servicing report can be found in **Appendix K**.

Based on the information provided by both the City of Toronto and the City of Markham, the following existing municipal services on Steeles Avenue are identified near the grade separation area:

- A 600mm/675mm sanitary sewer line (City of Markham);
- A 300mm distribution watermain (City of Markham);
- A 1350mm transmission watermain (City of Toronto); and
- A 300mm distribution watermain (City of Toronto).

There is also a City of Toronto storm sewer along the north side of Steeles Avenue East through this area. Through the course of the study additional surveys were undertaken to confirm the location and direction of flow of this storm sewer, but the results were inconclusive. Based on the information obtained it is understood to flow from the east to west, outletting to the Redlea Avenue trunk storm sewer. It is also understood to vary in size between 450mm and 600mm.

In addition to the municipally-owned utilities, there are a number of other utilities along the Steeles Avenue East right-of-way including:

- Bell buried telephone cables and conduits
- Rogers buried fiber TV plants
- Enbridge Distribution Gas Line
- Toronto Hydro encased duct bank and lighting poles

3.8.1 Sanitary Servicing

Within the City of Markham, the existing municipal sanitary sewer system drains wastewater from the residential, institutional, industrial, and commercial areas south of 14th Avenue, between Brimley Road and Kennedy Road, through their respective service connections.

Figure 3-16: City of Markham Sanitary Sewer Network

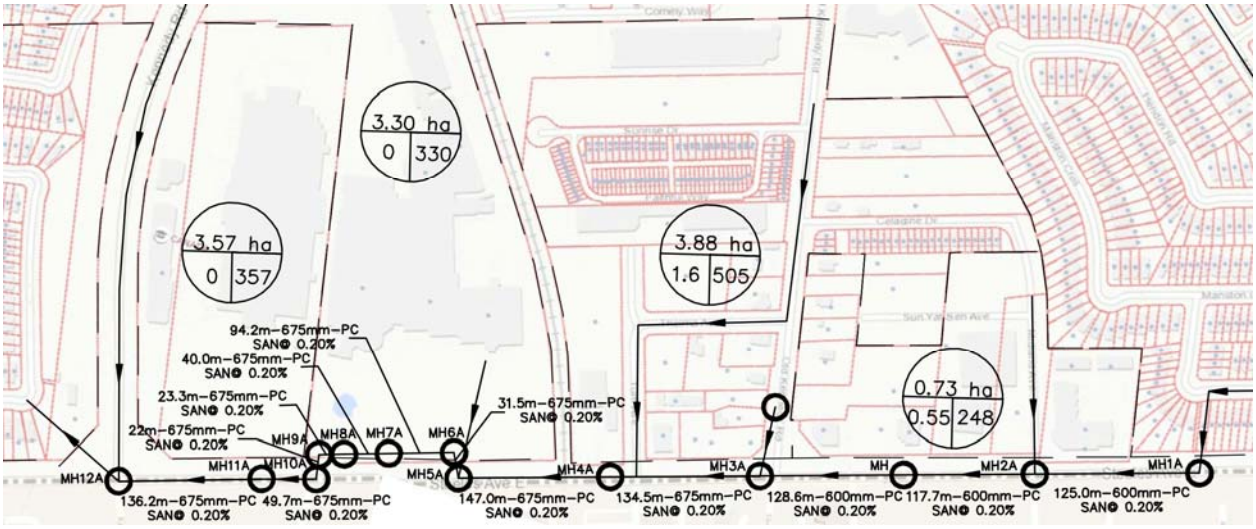


Figure 3-16 illustrates the City of Markham sanitary sewer network that feeds into the sanitary trunk sewer along Steeles Avenue East. Based on the City of Markham's record drawings, the existing 600mm and 675mm concrete sanitary sewers have a cover of approximately 7.0m under Steeles Avenue from Old Kennedy Road, Stouffville GO Rail Corridor, to approximately 55m west of the Stouffville GO Rail Corridor where the sanitary sewer turns northerly outside of Steeles Avenue East right-of-way entering into the Market Village/Pacific Mall property. The sanitary sewer re-enters the Steeles Avenue East right-of-way at the Steeles Avenue East and Redlea Avenue intersection.

The slope of the existing 600mm/675mm concrete sanitary sewers on Steeles Avenue East is approximately 0.20%.

The City of Markham has developed and calibrated a sanitary sewer system model with flow monitoring data. According to the calibrated sanitary sewer system model, most of the City of Markham local trunk sewers along Steeles Avenue East, within the Study Area, have sufficient capacity to serve the existing drainage area. The one exception is a section of 675mm sewer south of Pacific Mall, which was identified to be surcharged. The trunk sewer along Steeles Avenue East from approximately Turff Avenue to Kennedy Road would be expected to be surcharged and not able to accommodate the future growth within the study area, unless the pipe size is increased. Further discussions are necessary with the City of Markham during the detailed design stage

Figure 3-17: City of Toronto Sanitary Sewer Network

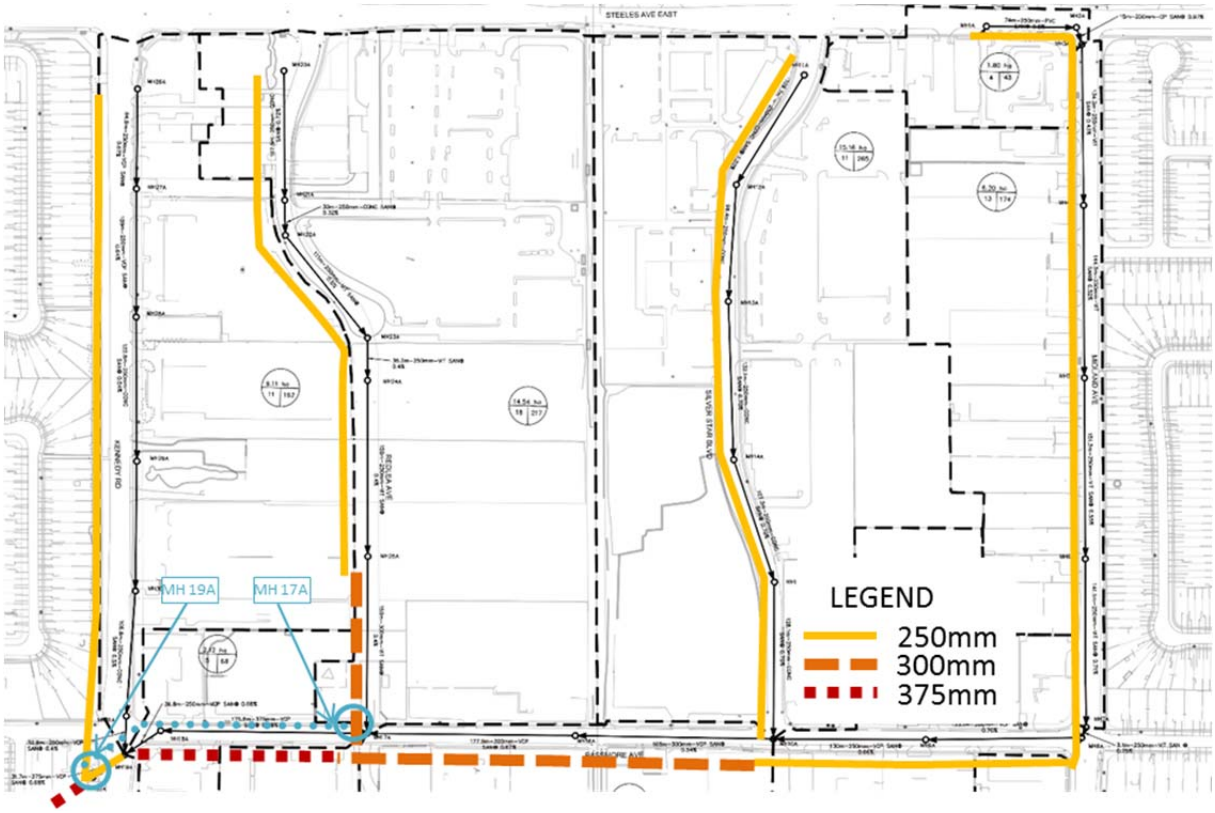
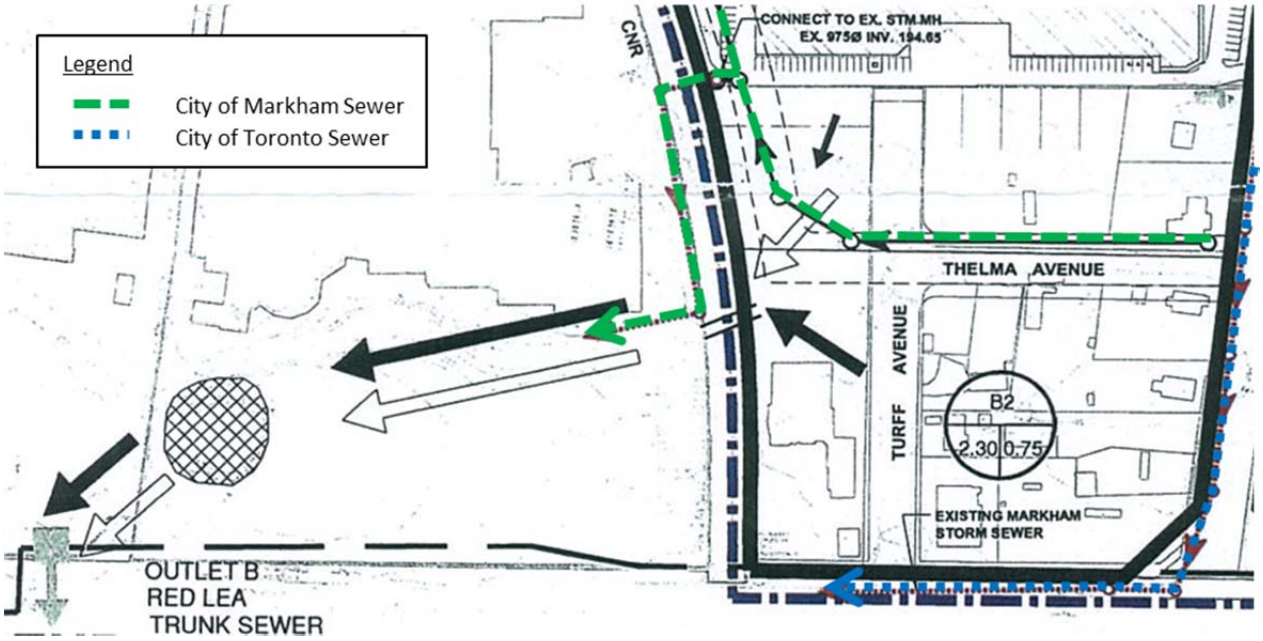


Figure 3-17 illustrates the existing sanitary sewer system within the City of Toronto, generally ranging in size from 250mm diameter to 375mm diameter**.** Based on the review of the existing network, it has been determined that most the sanitary sewers within the study area have spare capacity beyond existing dry weather flow conditions except the last section of pipe along Passmore Avenue, from Manhole 17A (MH17A) to MH19A, which is surcharged under existing conditions. This pipe is located along Passmore Avenue between Kennedy and Redlea Avenue and is shown as the red dashed line indicating the only section of 375mm pipe on **Figure 3-17**.

3.8.2 Stormwater Servicing

Figure 3-18 illustrates the drainage pattern within the City of Markham north of Steeles Avenue East. Based on the drainage area maps, it was identified that there is a storm sewer on the north side of Steeles Avenue East that runs west from Old Kennedy Road, in addition to the stormwater management pond within the Market Village parking lot which outlets into the Redlea Avenue trunk sewer.

Figure 3-18: City of Markham Storm Sewer Network



Since the stormwater from the site of Market Village is discharged into the stormwater management pond onsite and is then drained to Redlea Avenue in the City of Toronto, the effect on the stormwater management system due to a redevelopment of Market Village is expected to be positive because the new development will be required to provide a storm water management system to current City of Markham standards.

Based on the design sheets provided, it is understood that the drainage area for Old Kennedy Road outlets onto Steeles Avenue East. As a result, the drainage area for Old Kennedy Road was approached as an external area contributing to the storm sewer demands within the study area. Since the rail corridor is currently a highpoint along Steeles Avenue East in this area, the major overland flows from Old Kennedy Road is currently directed southerly along Silver Star Boulevard, while minor overland flows from Old Kennedy Road.

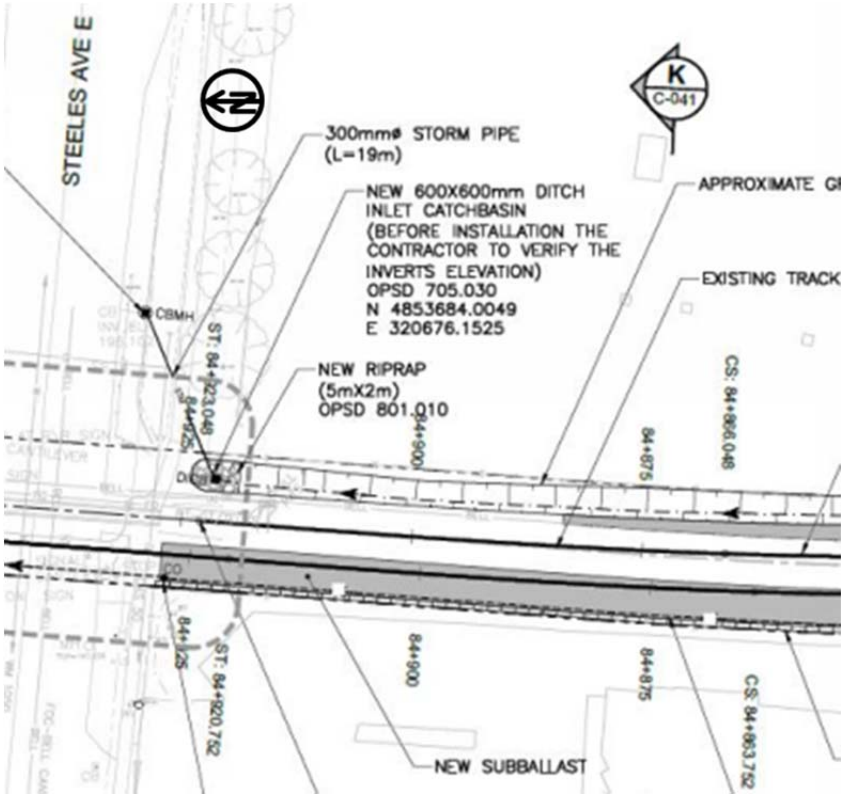
Figure 3-19: City of Toronto Storm Sewer Network

For the City of Toronto, the existing stormwater pipes range in size from 450mm diameter to 1950mm diameter and they drain south to Passmore Avenue then west to Kennedy Road. As illustrated in **Figure 3-19**, Steeles Avenue East drains away from the Stouffville GO Rail Corridor to either Redlea Avenue or Silver Star Boulevard. These sewers then drain south to the sub-trunk sewer along Passmore Avenue before outletting south of Shepton Way.

The estimated runoff draining into the storm sewer system was calculated based on the City of Toronto 2-year design storm event, the runoff coefficient related to the type of land use, and the estimated drainage area. The remaining capacity of the existing storm sewer system was determined by comparing the full flow capacity and the peak flow rate of the storm sewer pipes. Based on the existing conditions review, two storm sewer sections were identified to be surcharged (MH10 to MH11 and from MH11 to MH12).

Currently, the Stouffville GO Rail Corridor utilizes the rail side ditches to convey storm water flow to the City of Toronto's storm water management system on Steeles Avenue East. Based on the Storm Water Management – Stouffville Corridor Rail Service Expansion report conducted by Metrolinx in 2015, the 2-year flow is 64 L/s, the 2-year intensity is 13.1 mm/hour, and the time of concentration is 1.72 hours. According to Metrolinx's findings, the existing runoff coefficient is 0.32 and the contributing drainage area is 5.53 hectares (ha). Along the Stouffville GO Rail Corridor itself, Metrolinx will be installing a ditch along the west side of the tracks including control dams at defined intervals with the intent to provide quality control for the flow before it is discharged into the City of Toronto's stormwater sewer system, as shown in **Figure 3-20.**

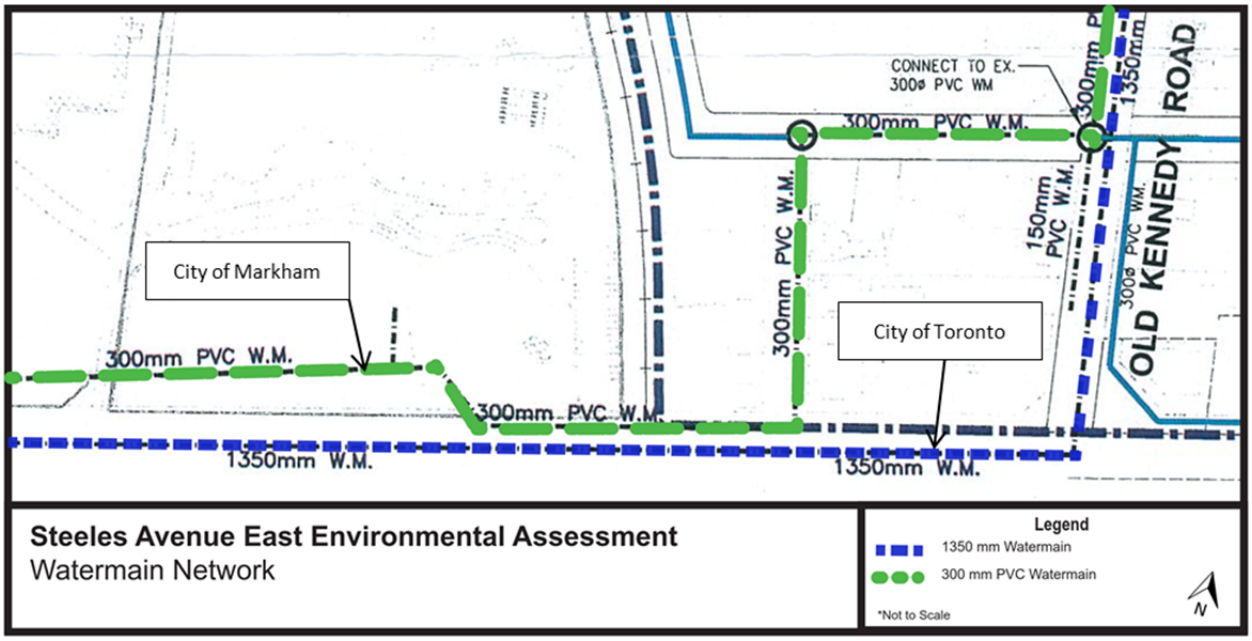
Figure 3-20: Proposed Stormwater Management for the Rail Corridor at Steeles Avenue



3.8.3 Watermain Servicing

As is illustrated by **Figure 3-21**, Steeles Avenue accommodates a 300mm PVC watermain which services the properties within the City of Markham. In consultation with the City of Markham it is understood that they are currently undertaking a Master Servicing Report, which is intended for completion by the end of 2016. This Master Servicing Report will review the need to up-size the existing 300mm distribution City of Markham main, but based on conversations with the City of Markham it was expressed that the EA study should assume the upsizing of this pipe to a 400mm distribution main. Confirmation for upsizing will be needed with City of Markham during the detail design phase.

Figure 3-21: City of Markham Watermain Network



For the City of Toronto, there is a 1350mm diameter trunk watermain located within the centre of the Steeles Avenue East right-of-way that services the Milliken Reservoir and a 300mm distribution main located on the south side of Steeles Avenue East. Currently, the Watermain Asset Planning group for Toronto Water has indicated that there are no plans to up-size either of the watermain assets within the study area. It is understood that the 1350mm watermain cannot be taken out of service for an extended period of time, and that any relocations will need to be constructed, commissioned and available for service before taking the existing main out of service. Further, in consultation with Toronto Water, they have identified that any period of deactivation must only occur during low demand periods.

4 PROBLEM/OPPORTUNITY STATEMENT

4.0 PROBLEM/OPPORTUNITY STATEMENT

The existing level crossing of the Stouffville GO Rail Corridor at Steeles Avenue East has long been identified in previous Environmental Assessments as a priority for grade separation (i.e. bridge). It is typical practice for municipalities and road authorities in Canada to determine the priority for a grade separation by calculating an exposure index.

The exposure index is a cross product of the number of vehicle crossings and rail crossings with a threshold value of 200,000 warranting a grade separation. **Table 4-1** presents the calculation of the exposure index under existing and future conditions, once planned Metrolinx initiatives, including the Regional Express Rail Service Expansion and Double Tracking are implemented. Based on these calculations, the exposure index for the Steeles Avenue East crossing of the Stouffville GO Rail Corridor exceeds the minimum threshold value both under existing and future conditions.

Table 4-1: Exposure Index at Stouffville GO Rail Corridor crossing of Steeles Avenue East

		2014	2025
Annual Road Traffic Growth			1%
Daily Crossings	Vehicular	45,811	50,850
	Transit	591	885
	Rail	15	78
Exposure Index		696,030	3,966,300

Based on this exposure index and site observations, the problems for this study are as follows:

- Given the traffic volume along Steeles Avenue East, the existing rail activity and the planned Regional Express Rail Expansion along the Stouffville GO Rail Corridor, there is a need to evaluate a grade separation (i.e. bridge) to remove train conflicts with all road users caused by the level crossing.
- There is a need to assess improving the consistency and continuity provided for the road and sidewalk, and lack of bike facilities on either side, along Steeles Avenue East at the Stouffville GO Rail Corridor.
- With the significant current transit use, and its expected growth, there is a need to consider improving the transit service and connections provided.

- There is a notable existing and future volume of pedestrians and cyclists along and across Steeles Avenue between Kennedy Road and Midland Avenue and therefore there is a need to improve the connectivity and safety of the active transportation facilities in the area.

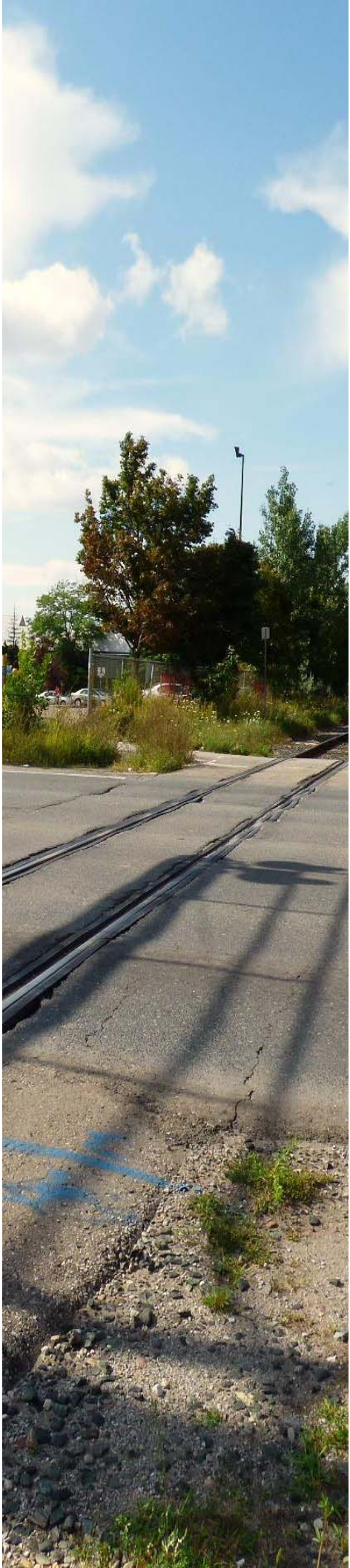
While reviewing the potential for a grade separation, there are several opportunities to be considered for the Steeles Avenue East corridor between Kennedy Road and Midland Avenue, such as:

- Reducing delay for all road users during train crossings and buses stopping at the Stouffville GO Rail Corridor.
- Supporting Regional Express Rail and connectivity between transit agencies
- Improving GO Train service and accommodate planned improvements for the Stouffville GO Rail Corridor, including electrification, double tracking, and increased frequency of trains.
- Accommodating both east-west and north-south flows along and across Steeles Avenue East for transit users, pedestrians and cyclists to improve safety, accessibility, and connectivity.
- Improving the streetscape by considering the urban design principles set forth in the study area.
- Improving the safety for all modes of transportation.

Therefore the Problem/Opportunity Statement is as follows:

> The Stouffville GO Rail Corridor and the existing conditions along Steeles Avenue East between Kennedy Road and Midland Avenue limit the movement of pedestrians, cyclists, transit and vehicles. This results in poor connectivity and congestion along and across Steeles Avenue East. This Environmental Assessment Study will evaluate alternatives to improve movement, connections and safety using the existing network and potential new infrastructure for the benefit of all modes of travel.

5 ALTERNATIVE SOLUTIONS



5.0 ALTERNATIVE SOLUTIONS

Phase 2 of the Municipal Class Environmental Assessment process focuses on the identification and evaluation of planning solutions that address the problem and opportunity statement for the project. Alternative solutions are assessed for their advantages and disadvantages to the environment, as broadly defined by the Environmental Assessment Act. For this project, two alternatives were developed to address the need for grade separation, overpass and underpass, and two sub-options to address the need for a consistent and connected corridor, 4 lanes and 6 lanes. Combined, these alternatives make four alternative solutions plus a "Do Nothing" scenario.

5.1 Development of Alternatives

Two sets of alternatives were developed concurrently for the grade separation and the widening options. Two types of grade separation were considered in the development of the alternative solution; an underpass (road under rail) and an overpass (road over rail). Both options aim to:

- Remove train and vehicle conflicts
- Improve roadway inconsistency and lack of active transportation facilities
- Reduce delay for all road users
- Support transit expansions and Regional Express Rail
- Accommodate east-west and north-south flows for all street users
- Improve safety for all modes of transportation

After consultation with the project team, TAC members and key stakeholders, the following alternative solutions were determined to be feasible options for this EA Study:

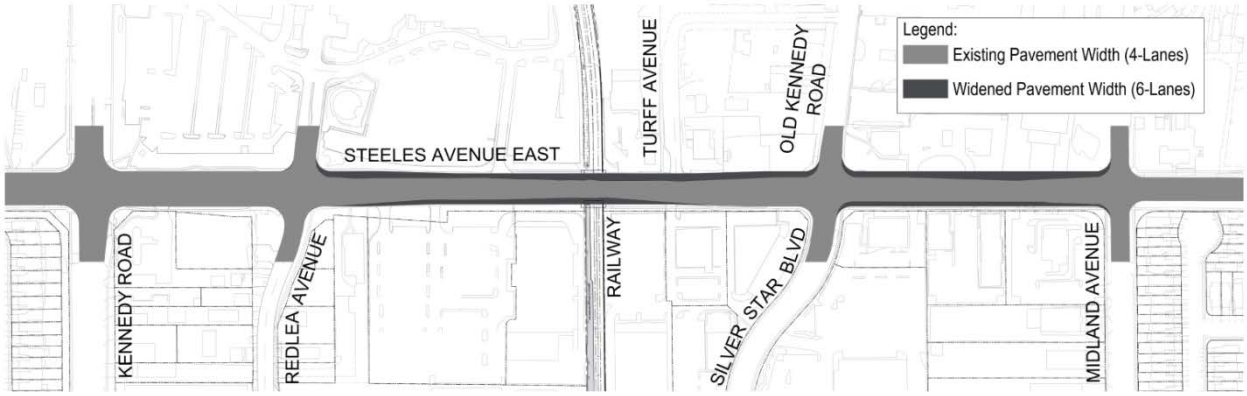
- Option 1: Do Nothing
- Option 2: Overpass (road over rail)
- Option 3: Underpass (road under rail)

The option of depressing the rail corridor and maintaining the road at or near the existing grade was considered in consultation with Metrolinx but was not determined to be feasible. Depressing the rail profile for this segment corridor would result in significant property impacts and present challenges to coordinate existing on-going improvement plans to support Metrolinx's Regional Express Rail Initiative.

Both Options 2 and 3 have subset options, as shown in **Figure 5-1**:

- Sub-option A: 4 lanes between Redlea Avenue and Midland Avenue
- Sub-option B: 6 lanes between Redlea Avenue and Midland Avenue

Figure 5-1: Road Widening Options



Therefore the alternative solution options considered in this EA are as follows.

- Option 1: Do Nothing
- Option 2a: Overpass with 4 lanes
- Option 2b: Overpass with 6 lanes
- Option 3a: Underpass with 4 lanes
- Option 3b: Underpass with 6 lanes

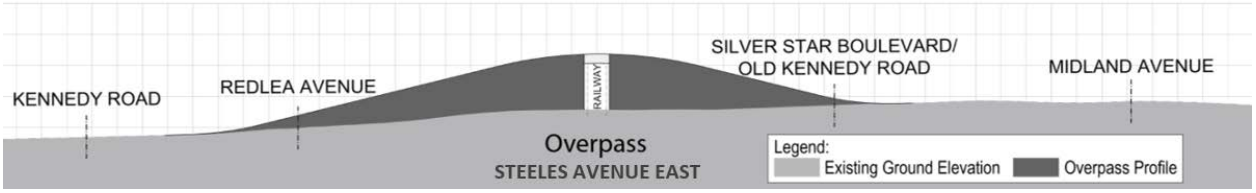
5.2 Option 1: Do Nothing

The "Do Nothing" option assumes that no physical improvements will be made along Steeles Avenue East other than the approved infrastructure projects, such as Redlea Avenue, Silver Star Boulevard, and Midland Avenue extensions. This option represents the future base-case scenario.

5.3 Option 2: Overpass

This option involves constructing a road bridge over the existing at grade Stouffville GO Rail Corridor. The rail guidelines from Metrolinx indicate that electrified rail corridors require a clearance of 7400mm from the top of rail to the bottom of the bridge. The length of the bridge would accommodate two rail tracks as well as a north-south at grade active transportation connection. The road approaches will have a maximum slope of 5%. The preliminary profile is shown in **Figure 5-2**.

Figure 5-2: Overpass Profile



As shown in **Figure 5-2**, the overpass profile raises the road from the current elevation from west of Redlea Avenue to east of Silver Star Boulevard. The raised elevation at both Redlea Avenue and Silver

Star Boulevard (2.02m and 1.03m higher at centreline, respectively) would have impacts that would require regrading north and south of the intersections to accommodate the change in elevation. Depending on the width of the road, the raised profile will require additional soil fill of approximately 100,000 cubic metres for **Option 2a** and 120,000 cubic metres for **Option 2b**. Both **Options 2a** and **2b** will see an increase in elevation at all eight driveways between Redlea Avenue and Silver Star Boulevard, and will require either closure or significant regrading of all accesses. Turff Avenue will be closed and converted to a cul-de-sac and access to properties on Turff Avenue will be available via Old Kennedy Road and Thelma Avenue.

The overpass would require that all municipal servicing located underneath the rail corridor would be relocated to maintain feasible access for maintenance. This would require relocating all existing watermains, sanitary sewers and stormwater pipes, as well as all privately owned utilities. In order to maintain access, additional permanent easements may be required.

The raised roadway will improve traffic flow by removing conflicts at the corridor. Traffic will no longer be stopped with the crossing of each train passes, which will be significant in the future with Metrolinx's planned Regional Express Rail program. Transit buses will also no longer be required to stop at the corridor. Traffic flow for **Option 2a** is expected to continue to be congested between Redlea Avenue and Midland Avenue, while the widening to six lanes in **Option 2b** will see significant improvements and reduced congestion. **Option 2b** could also allow for the protection of right-of-way for the potential rapid transit along Steeles. However, widening the roadway to six lanes does increase crossing distance for pedestrians and cyclists and would leave less room for streetscaping applications.

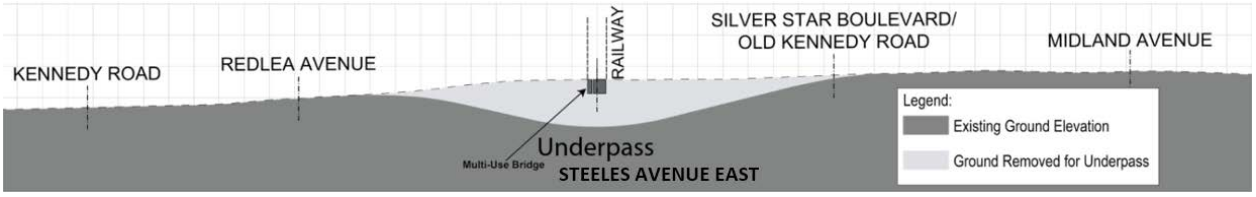
As noted, in addition to the rail corridor, the length of the bridge would accommodate a potential active transportation facility, to provide an at-grade north-south connection for pedestrians and cyclists. All overpass options could allow for wider than existing sidewalks and a separated cycling lane along the roadway on Steeles Avenue East.

5.4 Option 3: Underpass

This option involves constructing a rail bridge and an active transportation facility over a depressed Steeles Avenue East. The clearance requirements for the underpass are informed by both the Ministry of Transportation clearance requirements for active transportation and TTC rapid transit vehicle clearance requirements. As a result, the minimum clearance between the top of the road and the bottom of the bridge is 5300mm. The length of the bridge is set to accommodate three general purpose lanes, with a centre pier. Retaining walls would be constructed along the length of the road

depression to minimize elevation impacts to the neighbouring properties. As with the overpass, the road slopes will have a maximum slope of 5%. The profile of the underpass is shown in **Figure 5-3**.

Figure 5-3: Underpass Profile



As shown in the above figure, the underpass profile depresses the road from the current elevation from east of Redlea Avenue to just east of Silver Star Boulevard. The lowered elevation at Silver Star (0.47m lower at centreline) would require minimal regrading at the intersection to accommodate the change in elevation. Depending on the locations of the retaining walls, width of the road and boulevard, the depressed road profile will require removal of approximately 40,000 cubic metres of soil fill for **Option 3a** and 50,000 cubic metres for **Option 3b**. Both **Options 3a** and **3b** will see a lowering in elevation at seven driveways between Redlea Avenue and Silver Star Boulevard, and will require either closure or significant regrading of all but one access. As with the overpass option, Turff Avenue will be closed and converted to a cul-de-sac.

The underpass would require that most municipal services located underneath the rail corridor would be relocated as they would not be able to accommodate the lower elevation. The watermains may potentially remain under the road and follow the lowering of the roadway as they are pressurized. All other existing sanitary and storm sewer pipes, as well as all privately owned utilities will also require relocation. A storm sewer pumping station would be required to address the new low point being constructed along Steeles Avenue East. Additional permanent easements will be required for maintenance purposes.

As with the overpass options, the benefits to traffic travel times are primarily due to the removal of conflicts at the Stouffville GO Rail Corridor as traffic will no longer be stopped every time a train passes. Traffic flow with the four lane option, **Option 3a,** is expected to continue to be congested between Redlea Avenue and Midland Avenue, while the widening to six lanes in **Option 3b** will see significant improvements and reduced congestion. **Option 3b** could also allow for the protection of right of way for the potential rapid transit along Steeles Avenue East. However, the widened roadway in this option would increase crossing distance for pedestrians and cyclists and would leave less room for streetscaping applications.

A north-south active transportation facility at the rail corridor would provide an at-grade north-south connection for pedestrians and cyclists. All underpass options could also allow for wider than existing

sidewalks and a separated cycling lane along the roadway on Steeles Avenue East. The clearance requirement for pedestrians and cyclists is less of that than the roadway, allowing for the sidewalk and potentially the cycling facility to be raised above the roadway. This could potentially provide separation of the uses and a gentler sidewalk slope to be maintained under the bridge.

5.5 Evaluation

The alternative solutions were evaluated using the following criteria and sub-criteria, which were developed through consideration of the problem and opportunity statement, consultation with the public and stakeholders, and the background review:

- Land Use and Socio-Economic Impact
  - Property required
  - Impacts to existing and planned land uses
  - Property impacts
- Archaeology / Built and Cultural Heritage
  - Impact on known features
  - Impact on areas/resources of potential
- Natural Environment
  - Impact to area ecology
  - Effect on designated natural areas
  - Impact on the tree inventory
  - Change in vehicle emission levels
  - Change in noise levels
  - Impacts to Climate Change
- Traffic Congestion
  - Impact on intersection levels of service (delay, queuing, LOS, etc.)
  - Impact on convenience and connectivity
  - Impact on safety and comfort
- Transit
  - Impact on convenience and connectivity
  - Impact on safety and comfort
- Active Transportation
  - Accommodation of travel desire lines
  - Impact on convenience and connectivity
  - Impact on safety and comfort for all modes
- Streetscape/Public Realm

- Accommodation of streetscaping/public realm improvements
- Consistency with Complete Streets Principles

- Structural Engineering
  - Constructability / Staging
  - Soil Excavation / Fill
  - Maintenance requirements
  - Appearance
- Municipal Servicing
  - Potential for Utility Relocations
  - Accommodation of storm events
  - Accommodation of future sanitary needs
- Cost
  - Potential construction costs
  - Potential operating / maintenance costs
  - Life-cycle

The background existing conditions summarized in **Section 3.0** provided the basis for evaluating the alternative solutions. Each alternative solution was assessed for its advantages/disadvantages to identify its suitability to meet the evaluation criteria, based on the scale of perceived preference for each of the evaluation criteria.

5.5.1 Land Use and Socio-Economic Impact

Impacts to the land use and socio-economic profile of the area were considered to be negative if the alternatives require changes to the surrounding properties and driveways, as well as removing potential for planned land uses. It was determined that none of the alternatives would have impacts to the current or planned land uses. That being said, both the overpass and underpass options would affect area driveways. As the underpass option has fewer impacts to the property accesses between Redlea Avenue and Silver Star Boulevard than the overpass, it gained a slight preference in the rating.

5.5.2 Archaeology/Built and Cultural Heritage

This criteria was included to determine if the alternatives would have negative impacts to either known archaeological or built heritage features, or areas with archaeological or heritage potential. As no impacts were identified to listed or designated heritage features within the study focus area, the rating for each alternative was the same.

5.5.3 Natural Environment

As the study area is mostly a built urban environment, the focus of this criteria was to determine if there was impacts to any of the local wildlife or fauna found in the study area. Similarly to the archaeological and heritage evaluation, there was no difference between the overpass and underpass alternatives in impacts to the local wildlife or fauna. None of the alternatives are expected to increase the noise levels to the sensitive residential areas. However, from a qualitative analysis, it was determined that due to a reduction in the idling time for vehicles the overpass and underpass options would have an improvement in air quality over the existing conditions. Idling time is expected to be further enhanced with the widening from 4-lane to 6-lanes along Steeles Avenue East.

5.5.4 Traffic Congestion

The transportation criteria used for the examination included performance, convenience, connectivity and safety impacts to traffic, transit and active transportation. The traffic performance of each of the options in the horizon year of 2025 was evaluated and details can be found in **Appendix C**. The future conditions were assumed to incorporate the approved development plans and changes to the existing road network, including Redlea Avenue, Silver Star Boulevard, and Midland Avenue extensions.

Considering the analysis, it was determined that the do nothing alternative did not address any of the identified issues, and resultantly it was given the lowest ranking for all criteria. The 6-lane alternative for both the overpass and underpass has the greatest improvements in traffic flows and the elimination of the rail crossing reduces congestion and conflicts. The overpass has more impacts to the property accesses, reducing the connectivity of the corridor for vehicles and therefore the 6-lane underpass was the preferred alternative for this criterion.

5.5.5 Transit

As the transit service along the Stouffville GO Rail Corridor is planned to increase as a result of Metrolinx initiatives, namely the Regional Express Rail program, direct connections to the local transit facilities will be important. Given the expected grade differential, the underpass offers more opportunities to incorporate direct connections at the rail corridor. Besides the connectivity, both the overpass and underpass options were found to equally improve the safety and reliability for the local transit services by removing the level crossing.

5.5.6 Active Transportation

Active transportation facilities along Steeles Avenue East were incorporated into each alternative solution, providing improvements over the existing (do-nothing) option. Specifically, both the overpass

and underpass alternatives provide a north-south crossing at the rail corridor. However, the underpass option provides greater opportunities to connect to adjacent properties, and allows for the cycling facilities and sidewalk to potentially be at a higher elevation than the road under the bridge, giving less of a grade change and providing greater separation and comfort. Therefore the underpass options were preferred to the overpass options. The 6-lane option creates a longer crossing distance for pedestrians, making the 6-lane options less attractive.

5.5.7 Streetscape/Public Realm

As most of the streetscaping and public realm aspects of the project will be determined through the alternative design phase of the EA, this criteria evaluation focused on the overall potential for accommodation of streetscaping and public realm improvements, as well as adherence to complete streets principles. As the overpass will effectively create a wall along Steeles Avenue East, there is significant visual impacts to the surrounding area and reduced potential for streetscaping. Therefore the overpass is considered less desirable than the underpass. The 6-lane options will leave less space for streetscaping opportunities and are considered less desirable for the public realm.

5.5.8 Structural Engineering

This criterion was included to evaluate the constructability and the maintenance requirements of the structure, as well as the aesthetic appeal, taking into account the rail structure, pedestrian structure(s) and retaining walls. Although the construction staging plan will be completed during the detailed design phase after the completion of this EA, during Phase 2 it was determined that all alternatives will have similar construction impacts to the area and may require detours for the road and rail traffic. Regarding the structure itself, the overpass was determined to have severe visual impacts and requires significant retaining walls and volume of soil fill. Therefore, the overpass is the less preferred alternative.

It was determined that based on the soil conditions; a number of foundation options would be viable. If it were to be designed with a conventional spread footing founded at or below 3m depth, it would be expected to have a factored geotechnical resistance at Ultimate Limit Stat (ULS) of 600 kilopascals (kPa) and a geotechnical resistance at Serviceability Limit State (SLS) of 400 kilopascals (kPa). Additional details are provided in the Geotechnical Investigation Notice of Refusal included as part of **Appendix I**.

As an alternative to the conventional spread footing, the density of the soil may pose challenges for using pile foundations and that augered caissons would be recommended. Based on the above information, the soil condition encountered is suitable for the purpose of designing either the

underpass or overpass bridges and the details of the foundation type will be determined as part of a subsequent phase in the EA and refined as part of detailed design.

5.5.9 Municipal Servicing

The consideration of impacts on the municipal infrastructure examines the potential need to relocate the utilities as well as the accommodation of future storm events and sanitary needs. Within the Steeles Avenue East right-of-way utilities including storm sewers, sanitary sewers, watermains, telecommunication, gas, and hydro-electric were identified to require relocation as part of the grade separation with either the overpass or underpass options.

Regarding the stormwater servicing, while it was determined that the parts of the system were surcharged, the proposed undertaking would not worsen the identified conditions. That said, it is recognized that either the overpass or underpass would result in changes to the overland storm water flows, creating new high and low points, which will change how and where the water enters the sewer system. The underpass especially will create elevations below existing levels and will require a pumping station to capture and maintain flows in the storm water system under Steeles Avenue East. With an underpass, the change in the drainage pattern along Steeles Avenue East would need to be examined as part of a subsequent phase of the EA. Therefore the overpass option was considered to be preferred for this criterion. Furthermore, the 4-lane option was given a slight preference due to the increased run-off surface of the 6-lane option. With a widening, the added run-off along Steeles Avenue East would need to be examined as part of a subsequent phase of the EA.

Regarding the sanitary sewer servicing, it was identified that, while sections of the sanitary trunk sewer along Steeles Avenue East are surcharged, the proposed undertaking was determined not to create an increased adverse impact. Rather, the undertaking, presents an opportunity to improve the existing system, by upsizing the sanitary sewer owned by the City of Markham along Steeles Avenue East. Consultations regarding the upsizing of this sewer will occur with the City of Markham in a subsequent phase of the EA.

In reviewing the watermain system, no impacts or requirements to upgrade the existing system were identified.

5.5.10 Cost

The cost estimates for each alternative included the structure and related infrastructure costs, roadworks cost and estimated maintenance and operating costs. It should be noted that during the Phase 2 work, these cost estimates did not include costs associated with property acquisition, active

transportation, streetscaping elements and utility relocations and therefore costs may vary between the Phase 2 and Phase 3 work.

The ratings were assigned in inversely to the costs, with do nothing alternative has no costs associated and therefore were giving the best rating, and the six lane overpass having the highest costs and receiving the lowest rating. Further, the overpass options were noted to be more expensive than the underpass options due to the extra soil fill and retaining walls required.

5.6 Evaluation Matrix

Each alternative was assigned a preference using a 5-level scale, with the following measures:

- ● Rating of 5 best addresses problem/opportunity statement, may or may not have impacts
- ◕ Rating of 4 best addresses problem/opportunity statement, may have some impacts
- ◐ Rating of 3 somewhat address problem/opportunity statement OR has no impacts and does not address the problem/opportunity statement
- ◔ Rating of 2 does not address problem/opportunity statement and has significant impacts
- ○ Rating of 1 does not address problem/opportunity statement and has most impacts

Key highlights of the evaluation matrix are shown in , with the full matrix found in **Appendix L**.

Figure 5-4: Alternative Solutions Evaluation Matrix

	Do Nothing	Road Over Rail [Overpass]		Road Under Rail [Underpass]	
	Option 1: 4-lane	Option 2a: 4-lane	Option 2b: 6-lane	Option 3a: 4-lane	Option 3b: 6-lane
Land Use and Socio-Economic Impact	◐	○	○	◔	◔
Archaeology / Built and Cultural Heritage	◐	◐	◐	◐	◐
Natural Environment	◐	◕	●	◕	●
Traffic Congestion	○	◔	◕	◐	●
Transit	○	◐	●	◐	●
Active Transportation	○	◕	◕	●	●
Streetscape/Public Realm	◐	◔	○	●	◕
Structural Engineering	◐	○	○	◔	◔
Municipal Servicing	◐	◕	◐	◔	○
Cost	●	◔	○	◕	◐
Overall Rating	○	◔	◐	◕	●

5.7 Preferred Alternative Solution

Based on the evaluation summarized above, **Option 3b**, the 6-lane underpass option was recommended as the preliminary preferred solution and was presented to the public on March 23rd, 2016.

The 6-lane option provides the best benefit for the increased traffic and train activity and development expected for the area in the future, as well as ensuring no future rapid transit plans are precluded. The provision of pedestrian and cyclist connections will provide connectivity and improved safety for the active transportation users.

The underpass will have less functional impacts to the driveways and nearest intersections and less visual impacts to the community than the overpass. The cost of the underpass is expected to be lower than that of the overpass and the benefits of a 6-lane cross-section on the continuity and connectivity of the Steeles Avenue East corridor are greater than the additional costs over the 4-lane options.

Ultimately this 6-lane underpass option would remove the train and traffic conflicts, create connectivity of the Steeles Avenue East corridor for transit users, pedestrians and cyclists and improve the consistency of the roadway along the corridor between Kennedy Road and Midland Avenue.

5.8 Feedback from Public Information Centre #1

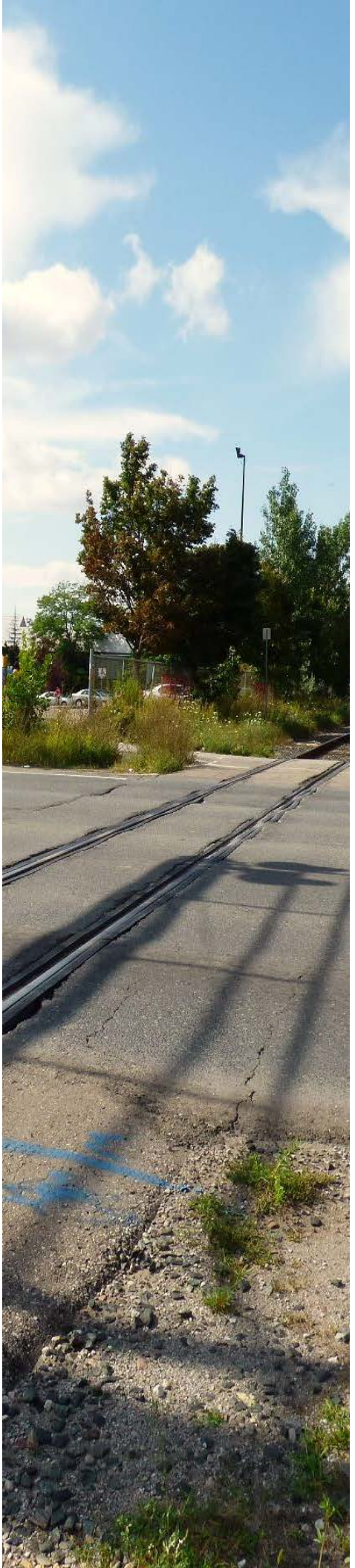
As summarized in **Section 2.4.1**, on March 23, 2016 the City of Toronto hosted a Public Information Centre to introduce the project and gather feedback about the study. The feedback received was greatly in support of the underpass (road under rail) option. The majority of the meeting attendees also showed support for widening to a 6-lane option, with approximately half of the feedback indicating preference of using the additional lane in either direction as a transit priority lane and the other half emphasizing the need for all three lanes to be utilized by traffic given the likely increase in traffic in the area. There were also several responses requesting further consideration of improvements in facilities for pedestrians and cyclists in the area.

Based on the feedback from the PIC, local stakeholders and affected landowners, the following were identified as key elements to further consider during the Phase 3 design work.

- ***Cycling Facilities:*** The public expressed support for active transportation being included as a point of further consideration for the design, as many voiced safety concerns with cycling along Steeles Avenue East. Several feedback responses indicated a preference for a dedicated and separate cycling facility to reduce conflicts between cyclists, pedestrians and vehicles. Recognizing this, the evaluation of cycling facilities in the design phase incorporated a preference for dedicated and protected cycling facilities.

- ***Number of Lanes:*** The potential for Steeles Avenue East as a rapid transit route was expressed as an important point. While some expressed concerns that two lanes would be insufficient for future traffic volumes, others preferred to maintain two general purpose lanes and utilizing the third lane as a dedicated transit, carpool or high-occupancy vehicle lane. Given that a dedicated HOV or transit lane would require implementation along the entire corridor of Steeles Avenue East, this study will maintain all three lanes as general purpose lanes. However, all options indicated support for three lanes and protection for rapid transit along Steeles Avenue East, which will be carried into the design phase.
- ***North-South Connections:*** There were many requests to consider a north-south pedestrian and cycling crossing of Steeles Avenue East given the existing lack of crossings between Redlea Avenue and Silver Star Boulevard. It was suggested that the active transportation facility (i.e. bridge) shown on the west side of the rail bridge in the underpass option be further explored to connect to both the east and west sides of the rail corridor. The provision of active transportation facilities next to the rail corridor will require consideration of the modal use (i.e. pedestrian bridge or a multi-use path) and the connection between the facilities and the lowered roadway.
- ***Lane Configurations:*** Due to the elevation differences between the roadway and adjacent properties, some of the existing accesses and road connections may need to be closed. Feedback obtained during the open house and from private land owners indicated that the configuration of the intersections and private driveways are of great interest to the community.
- ***Design Considerations:*** It was noted that as part of the design, attention should be paid to reconsider accesses to the proposed developments in the area, as well as to consider urban design and streetscaping opportunities. The underpass design will also require the design of a pumping station facility and relocation of the underground utilities. Many attendees were also concerned about the construction impacts, timing and potential funding of the project

6 ALTERNATIVE DESIGN CONCEPTS



6.0 ALTERNATIVE DESIGN CONCEPTS

Phase 3 of the Municipal Class Environmental Assessment (MCEA) process focuses on the identification and evaluation of alternative design concepts for the recommended alternative solution. Based on the findings of Phase 2 and the feedback from PIC #1, the 6-lane underpass option was recommended, with the following elements identified as individual components of the overall design to be further considered:

- Cycling Facilities
- Transit
- Alternative Rail and Pedestrian Bridge Options
- Vertical Connections (connections between roadway and bridge for people walking and cycling)
- Urban Design / Streetscaping
- Pumping Station
- Utility Relocations
- Lane Configurations and Local Accesses

For the selection of the preferred components, each option was considered in how it relates to existing and future requirements, as well as the overall goals of improving the safety, accessibility, and connectivity for all users. The following sections outline the evaluations undertaken for each component.

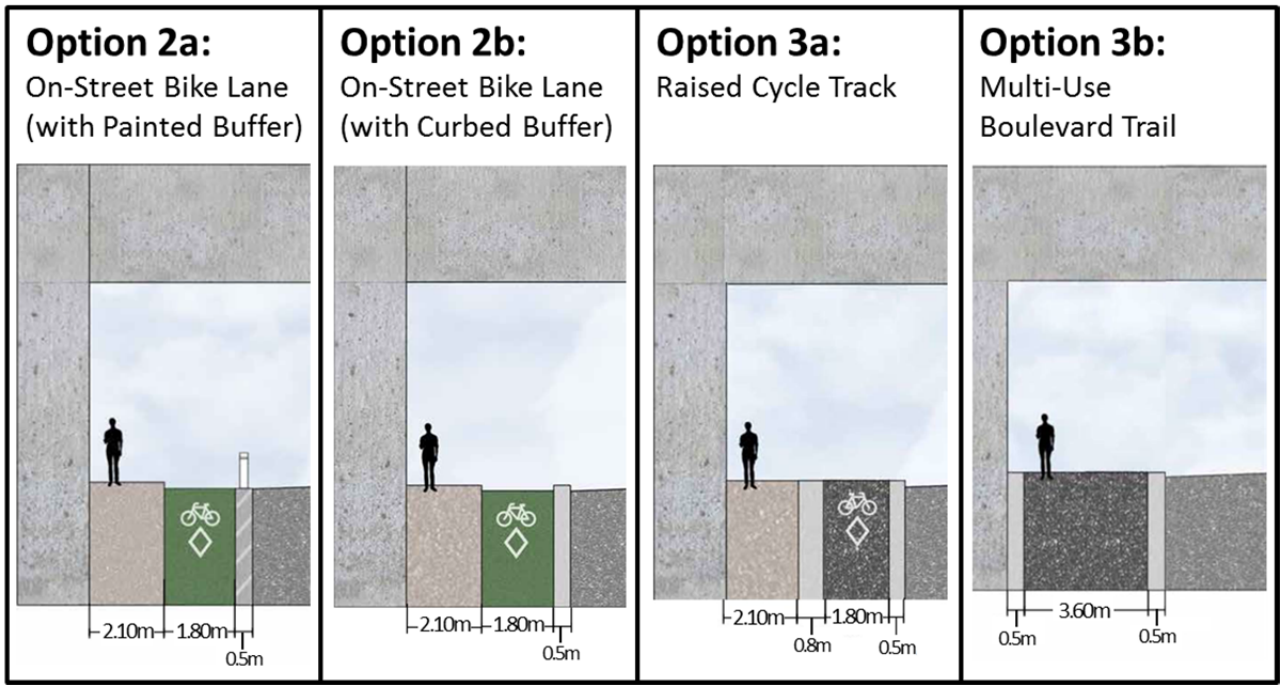
6.1 Cycling Facilities

Given the high volumes of people cycling along Steeles Avenue East, three cycling facility options were considered to properly accommodate the east-west cyclist volumes:

- Option 1: no facilities
- Option 2: on-street bike lanes, including options for the on-street bike lane to be constructed with a painted buffer (Option 2a) or a curbed buffer (Option 2b)
- Option 3: separated facility, including options for the separated facility to be a raised cycle track (Option 3a) or a bi-directional multi-use shared path (Option 3b).

The cross-sections are illustrated in **Figure 6-1.**

Figure 6-1: Cycling Facility Options Cross Sections



Each option was scored based on the same 5-level scale as the alternative solutions, from most preferred to least preferred. The options were evaluated based on the following criteria:

- Property Requirements
- Social Impacts
- Natural Environment (Impact on the tree inventory and change in noise levels)
- Consistency with Complete Street Principles
- Safety
- Maintenance Requirements (Summer, Winter and Overall)
- Construction, Maintenance and Life Cycle Costs (Over 50 years)
- Consistency with Long Range Plans
- Land use
- Integration with Transit

The overall evaluation matrix for the cycling facilities is shown in **Figure 6-2.** As part of the alternative solution development and subsequent feedback from the public, it was evident that safety was the largest concern for the community and that physically separated bicycle facilities would be preferred. The four options considered all had various degrees of separation from traffic, with the raised cycle track and multi-use trail providing both a horizontal and physical separation from traffic. With the exception of the multi-use trail, all options were separated from pedestrians as well. The cycle track provides the highest degree of protection and separation.

The introduction of cycling facilities in the right-of-way will require additional boulevard width. Given the limited right-of-way space available, additional property would need to be acquired from the neighbouring properties. The cycle track requires the most space due to the 0.8m tactile delineation buffer required between the sidewalk and cycle track as both are at the same grade. Given that, the additional buffer space required would present an opportunity for potential streetscaping which is not available in the other options.

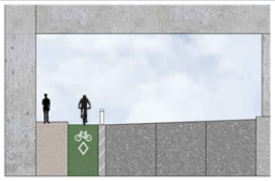
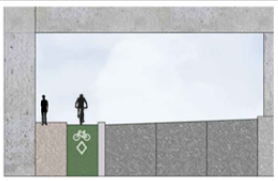
The costs vary between options. The on-street bike lane with a painted buffer requires the lowest capital cost and maintenance costs, as it can be maintained with the roadway. The physically separated on street bike lane and raised cycle track have higher capital costs and maintenance requirements, as they must be constructed and cleaned separately from the roadway and sidewalk, requiring specialized equipment.

There were minimal differences noted in social impacts, impacts to the surrounding land use, natural environment or integration with transit between the options.

Option 3a, the raised cycle track, has the highest costs but provides the greatest degree of separation and is consistent with complete street and the city's long range plans for a dedicated facility on Steeles Avenue East. Given the community's preference for a separated cycling facility, Option 3a for a raised cycle track was the preferred option.

Figure 6-2: Cycling Facility Evaluation Matrix

Evaluation Matrix of Cycling Facilities for the Steeles Avenue East Bridge Environmental Assessment

	Do Nothing	On-street Bike Lane		Elevated Cycle Track	
	Option 1: No Cycling	**Option 2a: On-Street Bike**	**Option 2b: On-Street Bike**	**Option 3a: Raised Cycle**	**Option 3b: Multi-Use Path**
5-LEVEL SCALE Best addresses problem and opportunity statement, may or may not have impacts ● ◕ ◑ ◔ ○ Does not address problem and opportunity statement and results in net negative impacts					
Property Impacts					
Impacts to private property	● No impact	◕ Requires 2.3m on either side of the roadway	◕ Requires 2.3m on either side of the roadway	◔ Requires 3.1m on either side of the roadway	○ Requires an additional 3.6m on either side of roadway (includes width required for a sidewalk)
Social Impacts					
Consistency with municipal plans and policies	○ Is not consistent with the 10 Year Cycling Plans	● Is consistent with Long Range Cycling Plans for Steeles Avenue East - would connect to future planned bike network	● Same as Option 2a	● Same as Option 2a	◔ This type is not a dedicated facility and therefore is not consistent with the 10 year Cycling Network Plan
Natural Environment					
Impact to flora (e.g. Trees)	● No impacts	◑ May impact 18 existing trees	◑ Same as Option 2a	◑ Same as Option 2a	◑ Same as Option 2a
Change in noise levels	No impacts	Same as Option 1	Same as Option 1	Same as Option 1	Same as Option 1
Consistency with Complete Street Principles					
Consistency with Complete Streets Principles	○ Not consistent with principles of designing streets to be safe for all users	◕ On-Street Cycle track provides a lower level of protection for cyclists when compared to Option 3a.	◕ Same as Option 2a	● Separated cycle track is ideal for cyclists and pedestrians given that the proper separation is provided	● Same as Option 3a
Safety					
Impact on safety and comfort	○ No improvements to safety or comfort for cyclists	◔ Provides facilities but no physical separation from traffic	◑ Provides horizontal separation from traffic	● Provides complete horizontal and physical separation from traffic	◑ Provides complete horizontal and physical separation from traffic but leaves additional potential conflict points with pedestrians
Maintenance Requirements					
Summer, Winter and Overall Maintenance Requirements	● No impact	◕ Requires regular street cleaning and snow ploughing.. Minor maintenance required every 25 years.	◑ Requires regular street cleaning and specialized snow ploughing.. Requires minor maintenance at year 5 and 10, and moderate maintenance at year 25 and 50.	○ Requires regular street cleaning and specialized snow ploughing.. Requires minor maintenance at year 5 and 10, and moderate maintenance at year 25 and 50.	◔ Requires debris removal but may require specific snow removal in winter. Requires minor maintenance at year 5 and 10, and moderate maintenance at year 25 and 50
Costs					
Construction costs Not including property acquisition costs or retaining walls	● No direct costs	◕ Approximate cost for corridor - Kennedy to Midland = $1,700,000.00	◑ Approximate cost for corridor - Kennedy to Midland = $1,750,000.00	◔ Approximate cost for corridor - Kennedy to Midland = $2,100,000.00	◔ Approximate cost for corridor - Kennedy to Midland = $2,000,000.00
Operating / maintenance costs (Over 50 years)	No direct costs	Estimated Total for maintenance: $30,000.00	Estimated Total for maintenance: $1,948,000.00	Estimated Total for maintenance: $1,948,000.00	Estimated Total for maintenance: $1,930,000.00
Land use					
Impacts to property access	◑ No impact	◑ Same as Option 1	◑ Same as Option 1	◑ Same as Option 1	● Will retain access to properties and cyclists cyclists can travel both directions to their destination
Transit Integration					
Transit Integration	◑ No impacts	◔ Cycling lanes may be interrupted by bus loading activities	◔ Same as Option 2a	◔ Same as Option 2a	◔ Same as Option 2a
Overall					
Rating	○	◑	◕	● The raised cycle track will provide a dedicated cycling facility and the highest level of comfort for cyclists.	◔



6.2 Transit

One of the main opportunities of this Environmental Assessment is to improve and support connections between transit agencies along Steeles Avenue East and to Milliken GO station. Long term transit plans from Metrolinx, the City of Toronto and the York Region all identified protection for rapid transit on Steeles Avenue East.

Before rapid transit on Steeles Avenue East is realized, local bus (TTC and YRT) stops are frequent and well utilized on Steeles Avenue East. Existing local bus stop locations were proposed to be maintained or relocated wherever possible. Specifically, existing eastbound stop at Midland Avenue were also relocated to a far-side location to accommodate bus shelters while minimizing impacts to adjacent properties. Between Redlea Avenue and Silver Star Boulevard, the location of bus stops needed to be considered in relation to the proposed road profile. Bus stops are required to be placed on slopes of 2% or less. Since segments with slopes of up to 5% will be introduced to the profile of Steeles Avenue East between Redlea Avenue and Silver Star Boulevard, some existing bus stops will need to be relocated or modified. Existing stops at Redlea Avenue will be maintained on the west side of the intersection and stops at Silver Star Boulevard will be relocated to the east side of the intersection. Additional consideration was given to the bus stops located at the rail corridor, to determine which lane configuration would be preferable.

The following three options were considered at the rail corridor:

- A local bus stop for both directions, with lay-by lanes on both sides of the road. This option would allow traffic to continue to flow while passengers are boarding and alighting at the stop. However, in heavy traffic bus drivers often have difficulty in merging back into traffic, which would increase delay for transit vehicles. Midblock lay-by lanes are not considered desirable.
- A local bus stop for both directions, with curb lanes on both sides of the road. This option presents delay to vehicles that must stop while passengers are boarding and alighting, however transit vehicles do not have to merge back into traffic, reducing delay and increasing safety for merging vehicles.
- No bus stops located at the rail corridor. This option would remove the delay for buses and vehicles. However the elimination of these stops would reduce the connectivity between the local stops and the Stouffville Rail Corridor. The nearest stops to the GO station would be Silver Star and Redlea and would increase transfer times for passengers of both transit routes.

Given the importance of providing a direct connection between the local bus facilities and Milliken GO station, eliminating the bus stops at the rail corridor is not preferred. The curb lane stop presents the option with the least amount of delay to transit vehicles. In the future, a total of 100 buses, 50 in

either direction (42 TTC and 8 YRT buses) are expected to use the rail bridge bus stop during the AM and PM peak hours. The proposed midblock condition is similar to curb-lane bus stops at the nearby signalized intersections. The delay experienced by buses and vehicles is considered acceptable at the intersection locations and as there are fewer conflicts at a midblock location the delay is expected to be less.

6.3 Alternative Rail and Pedestrian Bridge Options

The rail bridge and pedestrian bridge options were both key design components of the underpass design. While the rail bridge options will be further explored and refined during the post-EA detailed design, it was important to understand the feasibility and impacts of constructing a rail bridge based on the requirements of the other design criteria. The pedestrian bridge options were identified early on in the environmental assessment as requiring further consideration to the number required, placement and type of facility to be provided.

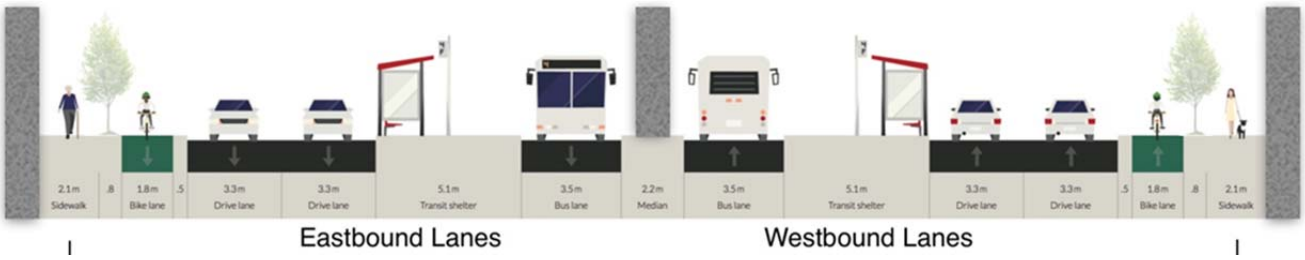
6.3.1 Rail Bridge Options

Several factors of the rail bridge design that were important to consider include the constructability, cost and span configuration. The typical bridge types considered for feasibility were steel plate girders and precast box girders, 1-span and 2-span. The type of girders would impact the cost and constructability of the rail bridge. The required span configuration was dependent on the number of lanes, cycling and pedestrian facility widths and the rail corridor transit stop configuration.

The required span configuration was also dependent on protection for a rapid transit corridor. Several types of rapid transit protection were considered, including protection for curb lane, centre lane and a rapid transit station at the rail corridor. The station located at the centre of the roadway would require the most space of the options and is used to determine the required span of the bridge.

The required span to accommodate a rapid transit scenario is shown in **Figure 6-3**.

Figure 6-3: Rapid Transit Minimum Bridge Span Requirements



Given the required width for a rapid transit station, the bridge will be required to have two spans with a centre pier on a 2.2m median. The preliminary preferred design that is able to accommodate this span and would provide an easier constructability and lower cost is the precast box girder bridge type.

6.3.2 Active Transportation Bridge Options

In the existing conditions, the rail corridor served as a north-south pedestrian crossing. A pedestrian bridge placed next to the rail bridge would provide that connection and would facilitate a connection between the Milliken GO Transit station and the local transit stops on the north side. During the evaluation of alternative solutions, a multi-use facility was considered west of the rail corridor. However, feedback provided during Phase 2 of the MCEA process indicated there may be a need for bridges on both the east and west side of the bridge, to allow for connection to the southbound and northbound directions of the GO train without having to cross at the platform. To determine the benefit of the bridges, two factors were examined, the potential volumes of the bridge and the direction of travel. The flow/volume of pedestrians in that area was based on forecasted demands by both Metrolinx (Stouffville GO Rail Corridor Improvements) and the City of Toronto (SmartTrack). The forecasts are for Milliken GO Station and include local transit, existing neighborhoods and businesses, proposed developments, and frequency of service along the Stouffville Rail Corridor. Between 350 and 1,000 pedestrians are expected to cross Steeles Avenue East at the rail corridor during the weekday AM peak hour if a pedestrian facility and improved transit service is provided. The direction of travel is illustrated in **Figure 6.2**.

Figure 6-4: Direction of Travel on the Pedestrian Bridge

Based on these two factors, approximately 120-350 pedestrians will be utilizing the west pedestrian bridge and 230-650 pedestrians will be utilizing the east pedestrian bridge during the AM peak hour. These volumes are considered significant and justify the installation of a bridge on both sides of the rail corridor.

These bridge paths will connect directly into the Milliken GO Station platform areas. Given the Metrolinx requires cyclists to dismount while on the platform, the potential conflicts between cyclists and pedestrians and the plans to enclose the bridges on either side of the rail corridor, the bridges were decided to be pedestrians only, and cyclists will be required to dismount upon entering onto the bridge. Therefore, the bridges will be considered pedestrian bridges. The design of the pedestrian bridges should include an enclosure to be coordinated with Metrolinx plans for the Milliken station and the electrification of the Stouffville corridor. Details of the bridge design are to be finalized in the detailed design phase.

It is understood that the City of Markham, as part of the Milliken Secondary Plan, is considering an active transportation corridor east of the rail corridor extending from Steeles Avenue East north towards Kennedy Road. As part of this EA, these plans were considered and the proposed pedestrian bridges were determined not to preclude the future implementation of the active transportation corridor being considered by the City of Markham.

6.4 Vertical Connections

In order to connect the local transit stops at the rail corridor and potential future rapid transit to the Milliken GO Station, vertical connections are required that will provide a link between the road and the pedestrian bridges. Three options were considered for feasibility, Options 1a and 1b consider walkways and Option 2 considers elevators and stairs. Considering the link will be made between Steeles Avenue and a pedestrian bridge, for all options, cyclists have been assumed to dismount and walk their bicycles. **Figure 6-5** shows examples of the three options.

Figure 6-5: Vertical Connection Options

Option 1a: Straight Walkways

Option 1b: Switchback Walkways

Option 2: Elevator and Stairs

Each option was marked based on the 5-level scale, with respect to how well each option addresses the evaluation criteria. These options were evaluated based on the following criteria:

- Consistency with Complete Street Principles
- Impacts to Property
- Construction, Maintenance and Life Cycle Costs (Over 50 years)
- Integration with Transit

The full evaluation matrix is shown in **Figure 6-6.**

The straight walkways would provide the connection between local transit and the pedestrian bridges; however the base of the walkway would not be located at the base of the underpass. This option was determined to have the lowest cost but would have the longest walk time between the rail corridor transit stops and Milliken GO Station. The switchback walkway would connect from the pedestrian bridge and would turn around halfway down to connect directly at the rail corridor. This option would reduce the walking time between the transit stops but would require more property. The elevator and stairs combination would provide the quickest and most convenient connection between the base of the underpass and the pedestrian bridges and would require the least amount of property but would have the highest construction and maintenance costs.

Despite the costs, the comfort and convenience provided by the elevator and stair combination was determined to be the best option for a vertical connection between the pedestrian bridges and the lowered Steeles Avenue East and local transit stops.

Figure 6-6: Vertical Connection Evaluation Matrix

Evaluation Matrix of Vertical Connections for the Steeles Avenue East Bridge Environmental Assessment

Alternatives	Future Base with No Vertical Connections	Option 1a: Straight Walkways	Option 1b: Switchback Walkways	Option 2: Elevators and Stairs
5-LEVEL SCALE: ● ◕ ◑ ◔ ○		 Image is for illustration purposes only.	 Image is for illustration purposes only.	 Image is for illustration purposes only.
Complete Streets				
Comfort and Safety	○ No improvement in comfort or safety	◔ Straight walkways would not connect directly at bridge and has a longer path from the transit stop location to the top of the walkways.	◑ Switchback walkways would connect directly from under the bridge to the top of the ramp.	◕ Elevators and stairs provide the most comfortable and direct connection from the transit stop to the pedestrian bridge.
Consistency with Complete Streets Principles	○ Does not provide connections or promote mobility	◔ Provides a connection between the transit stop and pedestrian bridge, but requires walking back up to base of ramp.	◑ Provides direct connection from the transit stop at the base of the underpass to the pedestrian bridge at grade.	◕ Provides direct connection from the transit stop at the base of the underpass to the pedestrian bridge at grade.
Property Impacts				
Impacts to Private Property	● No additional property requirements	◔ Approximately 1,350 sq metres of property acquisition	◔ Approximately 1,350 sq metres of property acquisition	◕ Approximately 40 sq metres of property acquisition
Costs				
Construction costs	No Cost	$4,750,000 for four walkways	$4,750,000 for four walkways	$6,500,000 for four elevators and stairs
Operating and maintenance costs (over 50 years)	● No Cost	◑ $1,500,000.00 for ramp maintenance	◑ $1,500,000.00 for ramp maintenance	○ $2,000,000.00 for elevator maintenance
Transit Integration				
Protection for Future Rapid Transit	○ A centre platform rapid transit station is precluded at the rail corridor as no connections to the GO station will be available without major reconstruction	Protects for access to a rapid transit station underneath rail bridge	Same as Option 1a	Same as Option 1a
Fastest Travel Times to Milliken Station from transit stop	○ For eastbound transit users: Approximately 9 minutes via Rodlea Avenue Avenue stop and along Rodlea Avenue to GO parking lot For westbound transit users: Approximately 18 minutes from Silver Star Boulevard stop, along Steeles Avenue East and along Rodlea Avenue to GO parking lot	◑ For eastbound transit users: Approximately 7 minutes via the Rodlea Avenue stop and southwest ramp. For westbound transit users: Approximately 7 minutes via the Silver Star Boulevard stop and northeast ramp and east ped bridge	◕ For eastbound transit users: Approximately 5 minutes via rail corridor stop and southwest or southeast ramp For Westbound transit users: Approximately 6 minutes via rail corridor stop and northwest or northeast ramp	● For Eastbound transit users: Approximately 2 minutes via Rail corridor stop and stairs or elevator on northeast or northwest side. For Westbound transit users: Approximately 3 minutes via Rail corridor stop and stairs or elevator on northeast or northwest side.
Access to Milliken GO Station	Requires local transit users to access station from Rodlea Avenue or Silver Star Boulevard	Provides a connection between the transit stop and pedestrian bridge, but requires rerouting back to base of ramp	Provides a direct connection between the base of the bridge and the pedestrian bridges connecting to GO Transit	Provides a direct connection between the base of the bridge and the pedestrian bridges connecting to GO Transit
Overall				
Rating	○	◔	◑	● The elevators and stairs provide the most direct and comfortable transfer between the road underneath the bridge and the pedestrian bridge that will connect to the Milliken GO Station and surrounding properties.



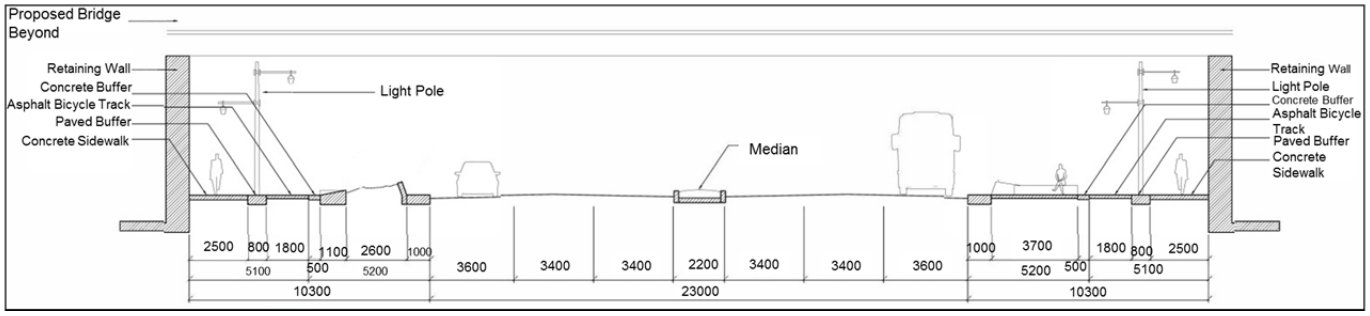
6.5 Urban Design / Streetscaping

As part of the Phase 2 public consultation, it was noted that improvements to the streetscape of the area should be included in the final design. Although the final streetscaping options will be refined in the detail design, various options have been reviewed during Phase 3 to determine the impacts and space requirements.

Earlier in Phase 3, it was determined that a raised cycle track will be incorporated, and that the right-of-way will be sufficient to accommodate a rapid transit corridor with a station at the bridge. There will be a 0.8m tactile delineation buffer available between the sidewalk and the cycle track and a 4.8m boulevard zone between the cycle track and the roadway. Both of these areas will provide opportunities for streetscaping.

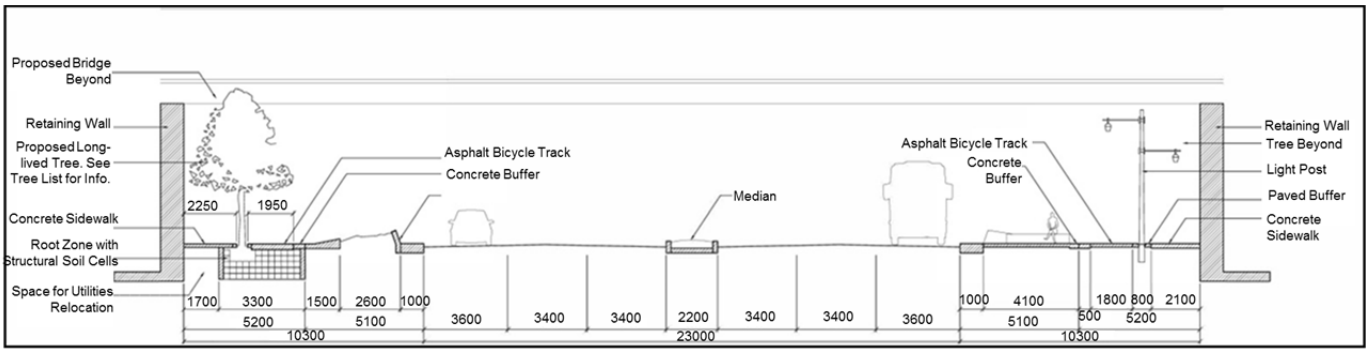
Four streetscaping options were prepared, as shown in **Figure 6-7** to **Figure 6-10**. Options 1-3 provide additional streetscaping within the expanded right-of-way, while Option 4 requires an additional 3.2m on both the north and south sides of the proposed right-of-way.

Figure 6-7: Urban Design Option 1: Streetscaping in Boulevard



Option 1 is the lowest cost option. It provides streetscaping and reserves space for potential street furniture in the 5.2m boulevard zone.

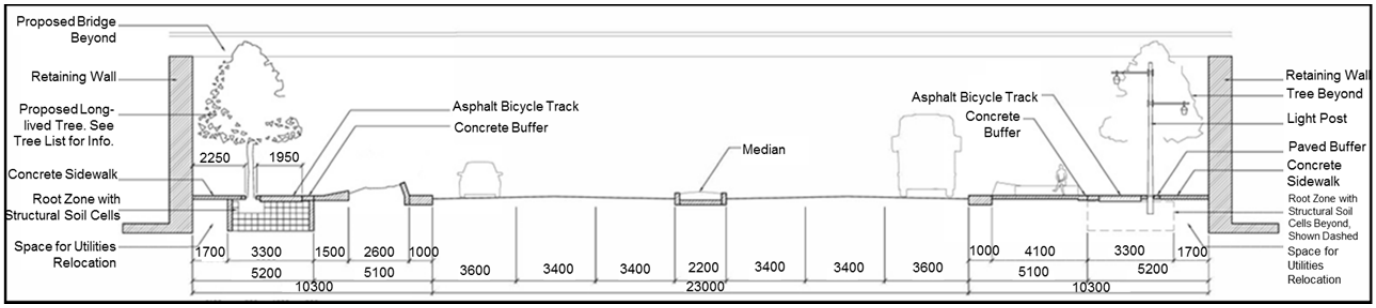
Figure 6-8: Urban Design Option 2: Street Trees on North Side



Option 2 provides street trees on the north side of the road. In order to reduce the space requirements, the trees would be installed in structural soil cells, which would retain the root growth.

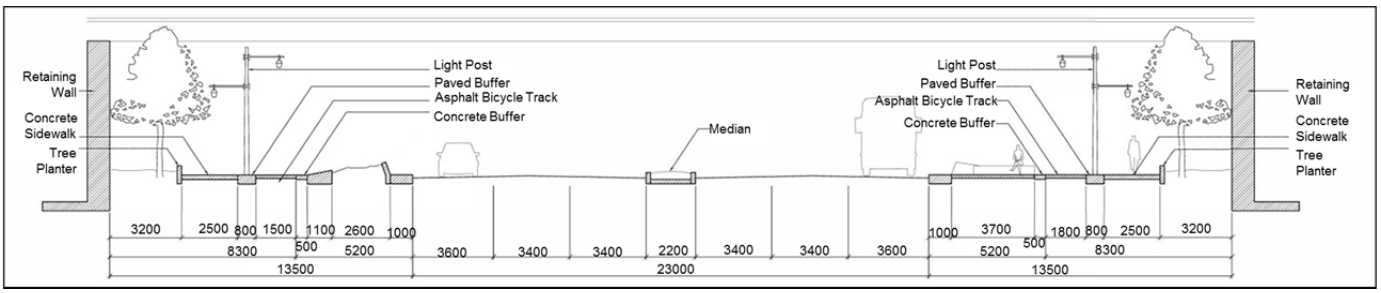
These cells require 1m of protection underground, which will require consideration in the relocation of utilities. The soil cell would require an 800x1200mm tree plate and the root system would be underneath the 0.8m buffer and the cycle track. This option would provide approximately 30 trees.

Figure 6-9: Urban Design Option 3: Street Trees on Both Sides



Option 3 provides the most opportunities for street trees, with soil cells on both the north and south side of Steeles Avenue East. This option would provide approximately 60 to 70 trees.

Figure 6-10: Urban Design Option 4: Widen ROW to Accommodate Street Trees in Sod



Option 4 would place the street trees in sod outside of the expanded right-of-way. Placing the trees in sod reduces the cost of implementation of the trees, but requires an additional 3.2m of property on either side of the road.

Figure 6-11 shows the evaluation matrix for the four options. These options were evaluated based on the following criteria:

- Streetscaping (Addition of trees)
- Utility, Maintenance and Private Property Impact Costs
- Integration with Transit

Option 3 is preferred as it will provide the most street trees between Redlea Avenue and Silver Star Boulevard without requiring additional property. West of Redlea Avenue and east of Silver Star Boulevard, street trees will be considered where they can be added in streetscape without requiring additional property takings.

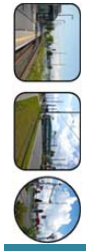
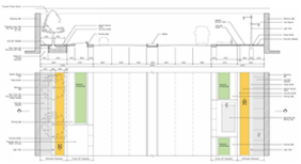
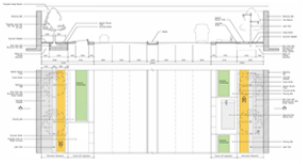


Figure 6-11: Streetscaping Evaluation Matrix

Evaluation Matrix of Streetscaping Elements for the Steeles Avenue East Bridge Environmental Assessment

Options	Option 1: Streetscaping in Boulevard	Option 2: Street Trees on North Side	Option 3: Street Trees on Both Sides	Option 4: Widen Right-of-Way to Accommodate Street Trees in Sod
5-LEVEL SCALE Best addresses problem and opportunity statement, may or may not have impacts ● ◕ ◑ ◔ ○ Does not address problem and opportunity statement and has most negative impacts	 Image is for illustration purposes only.	 Image is for illustration purposes only.	 Image is for illustration purposes only.	 Image is for illustration purposes only.
Urban Design				
Number of Trees	○ No trees added	◑ An estimated 30 trees added to Steeles Avenue East	● An estimated 70 trees addedd to Steeles Avenue East	● An estimated 70 trees addedd to Steeles Avenue East
Ensures Healthy Tree Growth	No space provided for street trees	Protects space for trees to grow	Protects space for trees to grow	Protects space for trees to grow
Transit integration				
Compatibility with Future Rapid Transit	● Yes	● Yes	● Yes	● Yes
Costs				
Utility Conflicts	No utility conflicts	No utility conflicts on south side, requires 1m of protected space beneath soil cells on north side	Requires 1m of protected space beneath soil cells on both sides	Requires 1m of protected space beneath sod on both sides
Private Property Impact	● No additional property required	◕ No additional property required	◑ No additional property required	◔ Requres an additional 3.2m on either side of property
Maintenance	Minimal maintenance requirements	Maintenance required for street trees on North Side	Maintenance required for street trees on both sides	Maintenance required for street trees on both sides
Cost	$300,000	$750,000	$1,350,000	$350,000
Overall				
Rating	◔	◕	● The preliminary preferred option 3 will provide space for a streetscape area and space for street trees between Redlea Avenue and Silver Star Boulevard. The use of soil cells will reduce property impacts. West of Redlea Avenue and east of Silver Star Boulevard, street trees will be considered where they can be accommodated in streetscape without requiring additional property.	◑

6.6 Private Property Accesses

The proposed changes to the Steeles Avenue East profile will affect the ability to maintain existing private driveways along Steeles Avenue East between Redlea Avenue and Silver Star Boulevard. The impact, and resulting proposals, have been developed in consultation with adjacent property owners. The property owners were invited to attend both public open houses, and were met with as a group on November 30th, 2015 and February 23rd, 2016. During Phase 3 several property owners were met with in individual meetings to discuss impacts. Consultation will be further continued during detailed design to discuss the particulars regarding the maintenance, relocation or closure of the accesses. Records of the consultation throughout the MCEA process can be found in **Appendix A**.

The accesses affected due to elevation changes were located on Steeles Avenue East between Redlea Avenue and Silver Star Boulevard and are discussed below:

Access to 4631 Steeles Avenue East

The elevation at this access is expected to be lowered by 0.3m. Through discussions with the property owner, it was expressed that the site is anticipated to be redeveloped and the driveway may not be required. Additional consultation with the property owner will be undertaken at the detailed design phase to determine the future existence of this driveway access. For the purposes of this study it has been assumed that the access will be retained and 4631 Steeles Avenue East property will be regraded.

West access to 4665 Steeles Avenue East

The elevation at the existing east access is expected to be lowered by 1.41m. Through discussions with the property owner, it was expressed to be consistent with future redevelopment plans, this driveway could be relocated further west from its current location. For the purposes of this study, the proposed undertaking does not preclude maintaining, or relocating, the existing driveway location. In either instance the driveway would require regrading on private property to connect the driveway with the new elevation of Steeles Avenue East. Additional consultation with the property owner will be undertaken at the detailed design phase to determine the future location of this driveway access, its configuration, and resulting impacts on the parking lot.

East access to 4665 Steeles Avenue East

The elevation at this access is expected to be lowered by 3.59m. Through discussions with the property owner, it was noted that this driveway would not be maintained with the future redevelopment. While the access could be maintained and graded through the site, it was understood to have significant impacts to the configuration of the existing parking lot. Additional consultation with

the property owner will be undertaken post-EA at the detailed design phase to confirm the closure of this driveway.

East access to 4390 Steeles Avenue East

The elevation at this access is expected to be lowered by 5.92m. Through discussions with the property owner it was expressed that the project team felt there was an opportunity to maintain the access if it was relocated to the west of its existing location. While this was a potential solution for maintaining the access point, the property owner expressed a desire for the driveway relocation to be integrated into the future redevelopment plans. Additional consultation with the property owner will be undertaken at the detailed design phase to determine the appropriate location and design of the driveway access, as well as appropriate fire routes for the existing site and future plans.

Access to 4440 Steeles Avenue East

The elevation at this access is expected to be lowered by 7.05m. The access is to be closed and site access will be available from the Turff Avenue cul-de-sac.

Access to 4711, 4723 and 4733 Steeles Avenue East

The elevation at this access is expected to be lowered by 5.93m. The access is to be closed and site access will be available from an existing access on Silver Star Boulevard via existing reciprocal easements. Closure of this access will change the available fire route for the property, which will now route via Silver Star Boulevard and the internal drive lane on the south side of 4733 and 4723 Steeles Avenue East. Additional consultation with the property owner will be undertaken at the detailed design phase to confirm the closure of this driveway access and appropriate fire routes for the site.

Access to 4458 Steeles Avenue East

The elevation at this access is expected to be lowered by 3.65m. The access is to be closed as the property will be acquired to accommodate the Turff Avenue cul-de-sac.

Access to 4468 Steeles Avenue East

The elevation at this access is expected to be lowered by 3.14m. The access to this property is expected to be closed and site access will be available from the Turff Avenue cul-de-sac.

6.7 Intersection Configurations

As part of design considerations the lane configurations at each intersection were evaluated to determine the optimal intersection layout. The following sections examine each signalized intersection against the below criteria to determine if exclusive turn lanes would be required:

- Improvement in delay
- Improvement in the queue length

- Volume of vehicles making the turn
- Impact of queue lengths on adjacent accesses
- Property impacts
- Impacts of increasing the pedestrian crossing distance

For each intersection the analysis to determine the improvement in delay and queue lengths was done for the Saturday Peak Hour, which was generally found to experience the most congested conditions. The full analysis can be found in the Transportation Report included in **Appendix C**.

6.7.1 Kennedy Road and Steeles Avenue East

The existing lane configurations of Kennedy Road and Steeles Avenue East are as follows:

- Northbound Approach: Dedicated left lane, two through lanes and a dedicated right lane
- Southbound Approach: Dedicated left lane, two through lanes and a dedicated right lane
- Eastbound Approach: Dedicated left lane, two through lanes and a dedicated right lane
- Westbound Approach: Dedicated left lane, two through lanes and a shared through-right lane

As the northbound and southbound approaches are not planned to be reconstructed, the lane configurations will remain as existing. The existing eastbound right and left turn lanes will be maintained in the future. The only change considered was to add a dedicated westbound right turn lane. The comparison in delay and queue lengths for the shared through-right and dedicated right turn lane is shown in **Table 6-1** below. Although the dedicated right-turn lane shows better traffic conditions, the impacts to the property and pedestrian crossing distance would be significant, considering the existing cross-section of Steeles Avenue East is 7 lanes. The queues associated with a shared through-right lane are not expected to impact any accesses between Kennedy Road and Redlea Avenue.

Table 6-1: Comparison of Steeles and Kennedy Lane Changes

	Through Volume	Right Turn Volume	Delay (s)	95th Queue (m)
Shared Through-right Lane (Before)	1406	266	101.3	#186.2
Dedicated Right Turn Lane (After)	1406	266	25.0	56.5
Improvement			76.3	129.7

Therefore the lane configurations at Steeles Avenue and Kennedy Road remain as per the existing conditions.

6.7.2 Redlea Avenue/4390 Steeles Avenue East Entrance and Steeles Avenue East

The existing lane configurations of the Redlea Avenue/4390 Steeles Avenue East Entrance and Steeles Avenue East intersection are as follows:

- Northbound Approach: Dedicated left lane and a shared through-right lane
- Southbound Approach: Dedicated left lane and a shared through-right lane
- Eastbound Approach: Dedicated left lane, two through lanes and a shared through-right lane
- Westbound Approach: Dedicated left lane, one through lane and a shared through-right lane

The eastbound and westbound approaches are to be widened to three lanes and additional westbound and eastbound right turns were considered instead of shared through-right turn lanes. The comparison in delay and queue lengths for the shared through-right and dedicated right turn lane is shown in **Table 6-2** below. For the eastbound right turn movement, the significant volume forecasted for the movement was determined to require a dedicated right turn lane. Further it was noted that in the eastbound direction there was the potential for the eastbound traffic along Steeles Avenue East to queue back to Kennedy Road; a situation that would be mitigated by the introduction of the eastbound right turn lane. Comparatively, while the westbound right turn movement had similar volumes forecasted it was determined that there would be only a minor impact of not providing the exclusive right turn lane. Specifically, it was noted the curb lane would operate as a defacto right-turn lane, and this may cause a block of the entrance to 4390 Steeles Avenue East, which would serve as an intervening turn opportunity for any queue created. In comparison, the anticipated impacts of further widening Steeles Avenue East to accommodate a westbound right turn lane, such as a longer pedestrian crossing distance, were determined to be significant and a designated westbound right-turn lane is considered unnecessary.

Table 6-2: Comparison of Steeles and Redlea through and right turn lanes

Steeles And Redlea/4390 Steeles Entrance Right Turn Analysis	Through Volume	Right Turn Volume	Delay (s)	95th Queue (m)
Eastbound Approach				
Shared Through-right Lane (Before)	789	427	77.8	148.2
Dedicated Right Turn Lane (After)	789	427	38.7	112.2
Improvement			39.1	36
Westbound Approach				
Shared Through-right Lane (Before)	586	481	39.5	88.6
Dedicated Right Turn Lane (After)	586	481	12.2	48.6
Improvement			27.3	40

In the Steeles-Redlea Regeneration Area Study, a double northbound left turn was identified as necessary to accommodate the anticipated movement volumes in the PM and Saturday peak hours. Although undesirable from a pedestrian crossing perspective, the impacts on the east and west traffic

conditions of only providing one left turn lane are significant and the resulting northbound left queues would impact many of the accesses to the south. Therefore, the northbound double left is considered necessary. Considering this requirement, a southbound left-turn can be accommodated without any further impact to the pedestrian crossing perspective. As a result, to provide further improvement to the operations of this intersection it is recommended that a double southbound left turn also be implemented. Lastly, a number of members of the community have raised the potential concern of traffic infiltration to/from Pacific Mall and Market Village once the Redlea Avenue extension is completed. Recognizing this, it is suggested that, as part of the detailed design and implementation of the Redlea Avenue extension, a traffic infiltration study be undertaken by the City of Toronto and any required potential mitigation be identified for implementation at that time.

The proposed lane configurations of the Redlea Avenue/4390 Steeles Entrance and Steeles Avenue East intersection are as follows:

- Northbound Approach: Two dedicated left lanes and a shared through-right lane
- Southbound Approach: Dedicated left lane and a shared through-right lane
- Eastbound Approach: Dedicated left lane, three through lanes and a dedicated right lane
- Westbound Approach: Dedicated left lane, two through lanes and a shared through-right lane

It is recognized that the realigned northbound and southbound approaches will require further consultation with the TTC during the detailed design process. It is anticipated that the key issues to be refined during detailed design include lane designations, lane width and taper requirements.

6.7.3 Silver Star Boulevard/Old Kennedy Road and Steeles Avenue East

The existing lane configurations of the Silver Star Boulevard/Old Kennedy Road and Steeles Avenue East intersection are as follows:

- Northbound Approach: Dedicated left lane, one through lane and a shared through-right lane
- Southbound Approach: Dedicated left lane, one through lane and a dedicated right lane
- Eastbound Approach: Dedicated left lane, two through lanes and a dedicated right lane
- Westbound Approach: Dedicated left lane, one through lane and a shared through-right lane

The northbound and southbound lane configurations will remain as existing and the eastbound and westbound approaches will be widened to provide two through lanes and a shared through-right lane. The delay for the shared right-through movements in both directions is less than 30 seconds, as shown in **Table 6-3** below. As these are acceptable conditions, dedicated right-turn lanes were not considered for either approach.

Table 6-3: Comparison of Steeles and Silver Star/Old Kennedy through and right turn lanes

Steeles And Silver Star/Old Kennedy Right Turn Analysis	Through Volume	Right Turn Volume	Delay (s)	95th Queue (m)
Eastbound Approach				
Shared Through-right Lane	1444	237	27.7	138.2
Westbound Approach				
Shared Through-right Lane	1403	101	21.6	75.5

The proposed lane configurations of the Silver Star Boulevard/Old Kennedy Road and Steeles Avenue East intersection are as follows:

- Northbound Approach: Dedicated left lane, one through lane and a shared through-right lane
- Southbound Approach: Dedicated left lane, one through lane and a dedicated right lane
- Eastbound Approach: Dedicated left lane, two through lanes and a shared through-right lane
- Westbound Approach: Dedicated left lane, two through lanes and a shared through-right lane

6.7.4 Midland Avenue and Steeles Avenue East

The existing lane configurations of the Midland Avenue and Steeles Avenue East intersection are as follows:

- Northbound Approach: Dedicated left lane and a shared through-right lane
- Southbound Approach: Dedicated left lane and a shared through-right lane
- Eastbound Approach: Shared through-left lane, one through lane and a dedicated right lane
- Westbound Approach: Dedicated left lane, two through lanes and a dedicated right lane

However, the Midland EA indicated a different configuration for the intersection, as follows:

- Northbound Approach: Dedicated left lane, one through lane and a dedicated right lane
- Southbound Approach: Dedicated left lane and a shared through-right lane
- Eastbound Approach: Dedicated left lane, two through lanes and a shared through-right lane
- Westbound Approach: Dedicated left lane, two through lanes and a dedicated right lane

At the time of this ESR, the southbound approach of the intersection has been reconstructed to the configuration as per the Midland EA. This study considered variations that were consistent with the southbound approach already constructed.

Given that east of the intersection Steeles Avenue East narrows to two lanes, an eastbound configuration of two through lanes and a dedicated right turn lane was reviewed. **Table 6-3** below shows the delay and queue lengths for the proposed configuration and shows acceptable conditions for both directions.

Table 6-4: Comparison of Steeles and Midland eastbound and westbound right turn lanes

Steeles And Midland Right Turn Analysis	Through Volume	Right Turn Volume	Delay (s)	95th Queue (m)
Eastbound Approach				
Two Through Lanes	1136	240	36.9	133.9
Dedicated Right Turn Lane	1136	240	19.0	15.8
Westbound Approach				
Two Through Lanes	1132	109	48.7	147.3
Dedicated Right Turn Lane	1132	109	16.6	9.8

The configuration of the northbound approach in the Midland EA shows three lanes for the northbound movements and one receiving lane for the southbound movements. However, this configuration would not be able to accommodate eastbound right-turning trucks without a wide corner radius, or a further widening of Midland Avenue, which is undesirable from a pedestrian crossing point of view. To provide sufficient width for truck making the eastbound right turn, two southbound receiving lanes would be preferable. Therefore the proposed northbound approach configuration is a dedicated left lane and a shared through-right lane, with two southbound receiving lanes. The southbound approach configuration is a dedicated left lane, one through lane and a shared through-right lane. **Table 6-5** shows the comparison of the two northbound approach configurations.

Table 6-5: Comparison of Steeles and Midland northbound lane configurations

Steeles And Midland Right Turn Analysis	Through Volume	Right Turn Volume	Delay (s)	95th Queue (m)
Midland EA Northbound Approach Configuration				
Dedicated Through Lane	216	105	16.9	39.9
Dedicated Right Turn Lane	216	105	16.8	26.5
Proposed Northbound Approach Configuration				
Shared Through-right Lane	216	105	24.4	87.8

The traffic conditions for both configurations are considered acceptable, while the Midland EA configuration shows less delay than the proposed. However the proposed configuration provides a better functional design of the intersection for all approaches. Therefore the proposed configuration of the intersection is as follows:

- Northbound Approach: Dedicated left lane and a shared through-right lane
- Southbound Approach: Dedicated left lane, one through lane and a shared through-right lane
- Eastbound Approach: Dedicated left lane, two through lanes and a dedicated right lane
- Westbound Approach: Dedicated left lane, two through lanes and a dedicated right lane

It is recognized that the realigned northbound approach will require further consultation with the City of Markham during the detailed design process. It is anticipated that the key issues to be refined during detailed design include curb radii, lane width, taper requirements and interface of the Steeles Avenue East and Midland Avenue cycling facilities.

6.8 Alternative Pumping Station Options

The lowered profile of Steeles Avenue East will change the stormwater flow patterns. As the stormwater pipes are gravity fed and proposed road elevation is below the existing sewers, a stormwater storage facility and a pumping station are required. Since the lowered profile will establish a new low point along Steeles Avenue East, the stormwater storage facility size is required to be able to accommodate a 100 year storm, and discharge at a rate that can be accommodated by the existing storm sewer system.

Five locations were identified as potential locations for the pumping station, as shown in **Figure 6-12**:

- Option 1: Northwest corner of the Rail Corridor
- Option 2: Northeast corner of the Rail Corridor
- Option 3: Northeast corner of Steeles and Turff
- Option 4: Southeast corner of the Rail Corridor
- Option 5: Northwest corner of Steeles Avenue East and Old Kennedy Road

Figure 6-12: Potential Pumping Station Locations

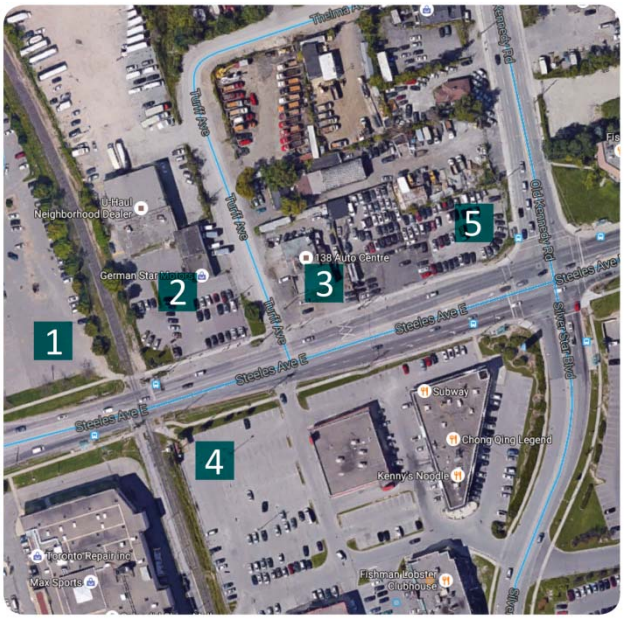


Figure 6-13 shows the evaluation matrix of the options. These options were evaluated based on the following criteria.

- Impact of Property Required
- Impact of Development Potential
- Connection to the Storm Sewer System
- Access to the Pumping Station
- Coordination with Other Elements of the Design
- Construction Cost
- Net Property Cost (for pumping station and cul-de-sac)

After careful evaluation of the options and their impacts on the development potential and property requirements, Option 2 at the northeast corner of the Rail corridor and Steeles Avenue East- was decided as the most appropriate location. This location can be accessed from the Turff Avenue cul-de-sac and reduce property requirements by coordinating the design with the elevator and stair enclosure at the northeast corner. The connection to the storm sewer will be made via Silver Star Boulevard, which will reduce the impacts to the currently overcharged Redlea Avenue Storm Sewer.

As part of the EA, through consultation with the consultation with the City of Markham, it was identified that an active transportation corridor is identified north of Steeles Avenue East. The location of this pumping station at the northeast corner of the rail corridor does not preclude the ability of a connection to be made, as currently contemplated as part of the on-going Milliken Secondary Plan Update Study.

Figure 6-13: Pumping Station Evaluation Matrix

Evaluation Matrix of the Pumping Station Location for the Steeles Avenue East Bridge Environmental Assessment

5-LEVEL SCALE

Best addresses problem and opportunity statement, may or may not have impacts ● ◕ ◑ ◔ ○ *Does not address problem and opportunity statement and has most negative impacts*

Options	Option 1: Northwest Corner of Rail Corridor	Option 2: Northeast Corner of Rail Corridor	Option 3: Northeast Corner of Steeles and Turff	Option 4: Southeast Corner of Rail Corridor	Option 5: Northwest Corner of Steeles and Old Kennedy
Property Impacts					
Private Property Required	60 sq m	60 sq m	60 sq m	60 sq m	60 sq m
Impact on Development Potential	● Located within the setback requirement from the rail corridor where development is typically restricted	● Located within the setback requirement from the rail corridor where development is typically restricted.	◔ Could impact future block and development size.	● Located within the setback requirement from the rail corridor where development is typically restricted.	◔ Could impact future block and development size.
Access and Connection					
Connection to the Storm Sewer System	Via Silver Star Boulevard	Via Silver Star Boulevard	Via Silver Star Boulevard	Via Silver Star Boulevard	Via Silver Star Boulevard
Access to the Pumping Station	◔ Requires access from 4394 Steeles Avenue East	◕ Requires access from proposed Turff Avenue cul-de-sac and easement through northern properties	● Requires access from proposed Turff Avenue Cul-de-Sac	◔ Requires access from Silver Star and easements through 4711 and 4723 Steeles Avenue East	◕ Requires access from Old Kennedy Road
Coordination					
Coordination with Rail Bridge and Road Widening	◑ None	◑ None	◕ Potential to use property to be acquired for the Turff Avenue cul de sac for the pumping station and access requirements	◑ None	◑ None
Costs					
Cost	◑ $4,150,000	◕ $3,430,000	● $3,250,000	○ $4,450,000	● $3,835,000
Overall					
Rating	◔	● Pumping station would be located within the rail corridor buffer and the design can be coordinated with the elevator / stair enclosure. Access would be via Turff Avenue cul-de-sac and the connection will be made to storm sewer via Silver Star Boulevard, offloading the Redlea Avenue storm sewer	◕	◑	◑

6.9 Cycling Facility Connection between Kelvin Grove Avenue and Kennedy Road

The City of Toronto Ten Year Cycle Plan, endorsed by City Council in May 2016, identifies a consistent cycling facility between Kelvin Grove Avenue and McCowan Road, with a connection to other cycling facilities at either end. To provide a connection at the western edge of the project, the recommended raised cycle track is to be continued from Kennedy Road to Kelvin Grove Avenue. This will be undertaken as part of a Schedule A+ environmental assessment project.

6.10 Feedback from Public Information Centre #2

On February 4, 2017 the City of Toronto hosted the second Public Information Centre to provide details of the recommended solution for the project and to gather feedback regarding the design evaluations and chosen options. The feedback received was generally in support of the raised cycle track, the proposed pedestrian connections on either side of the rail bridge. Several attendees mentioned concerns regarding the traffic impacts during construction. Numerous attendees were pleased with the proposed streetscaping measures and expressed interest in the possible community mural artwork on the retaining walls, while others preferred a texture wall material. The following items are the main feedback that was provided from attendees at the PIC, local stakeholders and affected landowners.

- ***Pedestrian and Cycling Facilities:*** The public expressed approval for the inclusion of raised cycle tracks. Several attendees inquired as to whether the pedestrian bridges will connect to facilities at grade level on the north side in addition to the GO Station connection. Any connections to private properties will need to be considered in detailed design and negotiated with private property owners.
- ***Transit:*** Some attendees expressed concern about the traffic impacts of a curb-lane bus stop at the base of the bridge and indicated preference for a lay-by. During the design phase, both a lay-by option and the curb-lane bus stop were considered for the rail corridor bus stop. Generally lay-bys are not desirable stop locations when placed midblock, as they can create delays to both buses and vehicles when the bus attempts to merge back into traffic. Therefore the curb lane was considered the best option for the midblock stop.
- ***Vertical Connections:*** Some attendees appeared to not understand that both an elevator and stairs will be provided at all four corners of the rail corridor and Steeles Avenue East, therefore providing the most convenient and fastest service for all users of the system. Some expressed preference for walkways so that cyclists could utilize the connection into the GO station. However, cyclists would not be allowed to cycle on the walkways themselves due to high pedestrian volumes and the connections to the bridge and GO station platforms. As cyclists

could dismount and use the elevators to access the bridge and platform areas, they are just as useful as walkways. Others expressed concerns with the flooding potential of an elevator at the base of the underpass. The stormwater infrastructure for the underpass has been designed to accommodate a 100 year storm and is expected to prevent any damage to the infrastructure underneath the rail bridge.

- ***Private Property Accesses:*** Via the Public Information Centre forum, feedback was received by a few property owners regarding the potential closure and/or relocation of their existing accesses. Due to elevation differences, the existing private property accesses have been considered throughout the design phase of the EA. Negotiations regarding the final location and configuration of these accesses will continue post EA and into the detailed design phase.
- ***Construction Impacts:*** Attendees expressed frustration with the current traffic situation along Steeles Avenue East and the impacts on the neighbouring community. Many expressed concerns that two lanes of traffic would not be maintained during construction, and that traffic infiltration will continue to get worse on the local roads. Many expressed that a minimum of two lanes must be maintained during construction, and that impacts to GO Train service along the Stouffville line should be minimized.
- ***Construction Staging:*** Feedback was received requesting information regarding the construction staging. The construction staging will be conducted as part of the detailed design of the project, as it will need to be considered with other construction projects in the area, such as the reconstruction of the Milliken GO Station.
- ***Lane Configurations:*** Feedback was received requesting that northbound through and southbound through movements at the Steeles Avenue East and Redlea Avenue intersection be prohibited in the recommended design. This concern has been noted. Given that this study is focused on the grade separation along Steeles Avenue East, analysis needed to evaluate the impacts that this prohibition might have on the overall network has not been completed. Notwithstanding, future turn restrictions and prohibitions on through movements can be studied in a fulsome manner through the City's development review process, which forms part of the Redlea Avenue Extension implementation strategy. This EA study does not preclude the implementation of "no southbound thoroughfare" at this intersection in the future.
- ***Inclusion of Development Applications:*** Feedback received expressing concern regarding the study scope and inclusion of active development applications in the traffic generation assumptions. In considering future traffic, the EA study included approved development plans and active site plan applications. The study did not consider withdrawn site plan applications or proposals to amend municipal Official Plans or Zoning Bylaws.

Should any future development applications be submitted to either the City of Toronto or the City of Markham, it will be the developer's responsibility, under the *Planning Act*, to demonstrate the serviceability, from a transportation capacity perspective, of its proposal.

The City's EA will not preclude future development. The results of this EA study will be an input to any future subsequent planning studies or development applications by governmental agencies or area developers.

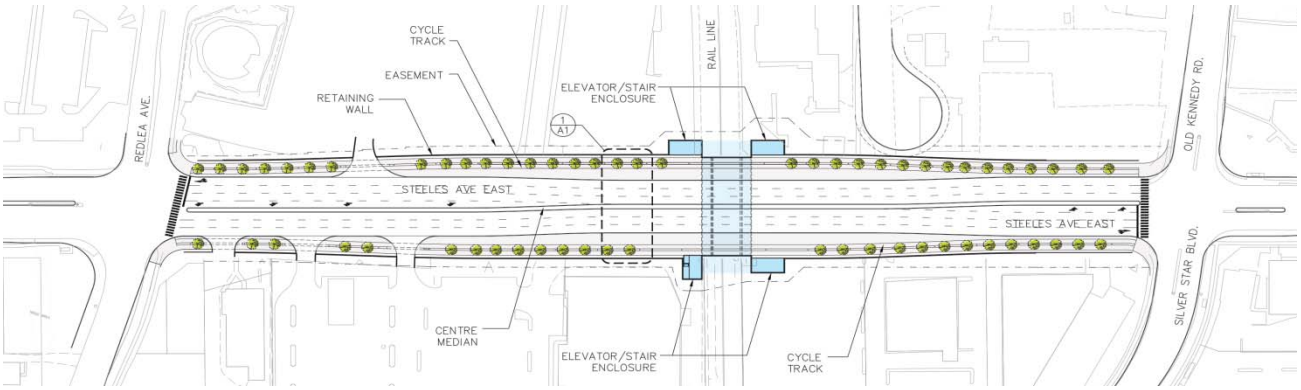
The City will work with property owners along Steeles Avenue East to determine how existing and proposed driveways can be accommodated within the road works being proposed as part of this EA.

- ***Related Projects:*** Several members of the public requested that lessons learned from the construction of the Agincourt and Sheppard Avenue underpasses be taking into consideration in the detailed design and construction staging plans.

7 RECOMMENDED DESIGN

7.0 RECOMMENDED DESIGN

Figure 7-1: Preferred Design for Steeles Avenue East Rail Bridge



The preferred design for Steeles Avenue East was developed through extensive evaluation and consultation with members of the project team, technical advisory committee, stakeholders, members of the public and private landowners. This section describes the features of the proposed design for the underpass and Steeles Avenue East corridor. The streetscaping plan is shown in **Figure 7-1**, a rendering of the proposed bridge and underpass is shown in **Figure 7-2**, the proposed typical cross section is shown in **Figure 7-3**. These figures are conceptual and are subject to change during detailed design. Accesses to the private property accesses are to be refined through further consultation post-EA and during detailed design. A detailed set of the plan and profile and cross-section drawings are found in **Appendix M**.

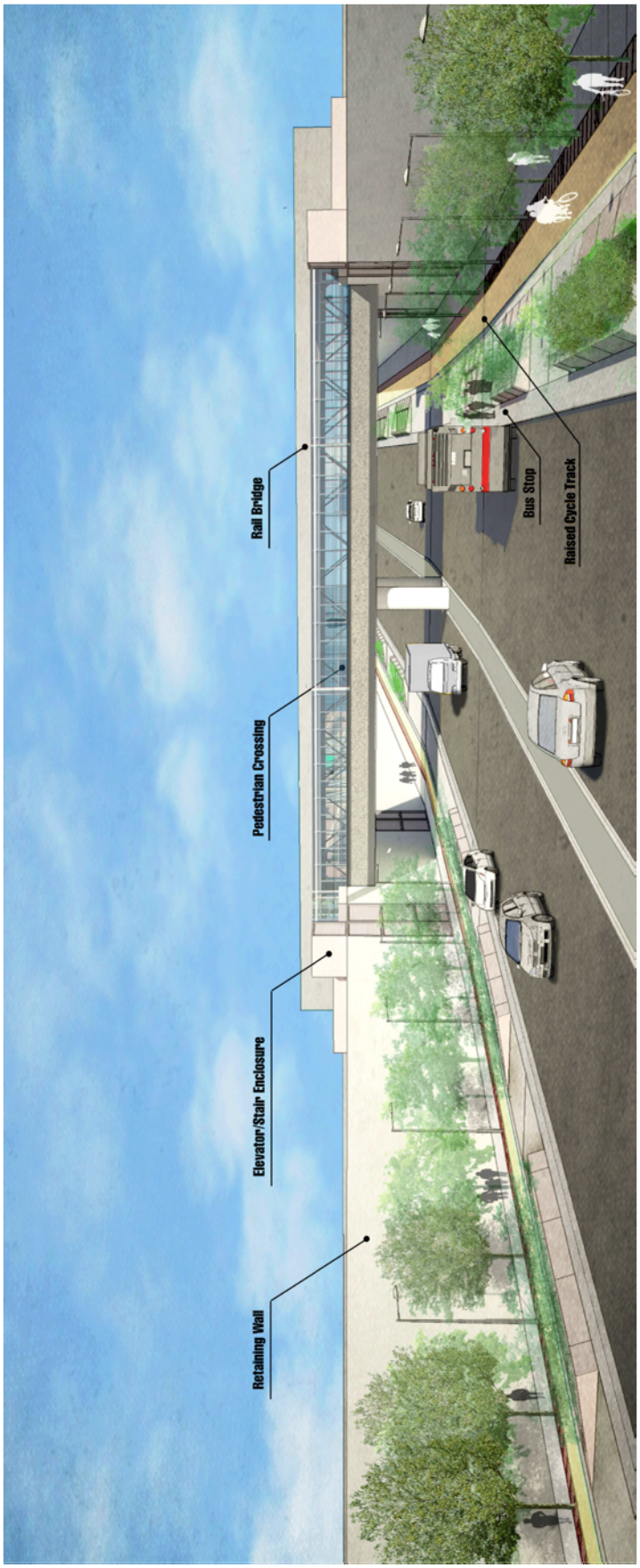


Figure 7-2: Rendering of Steeles Avenue East Rail Bridge

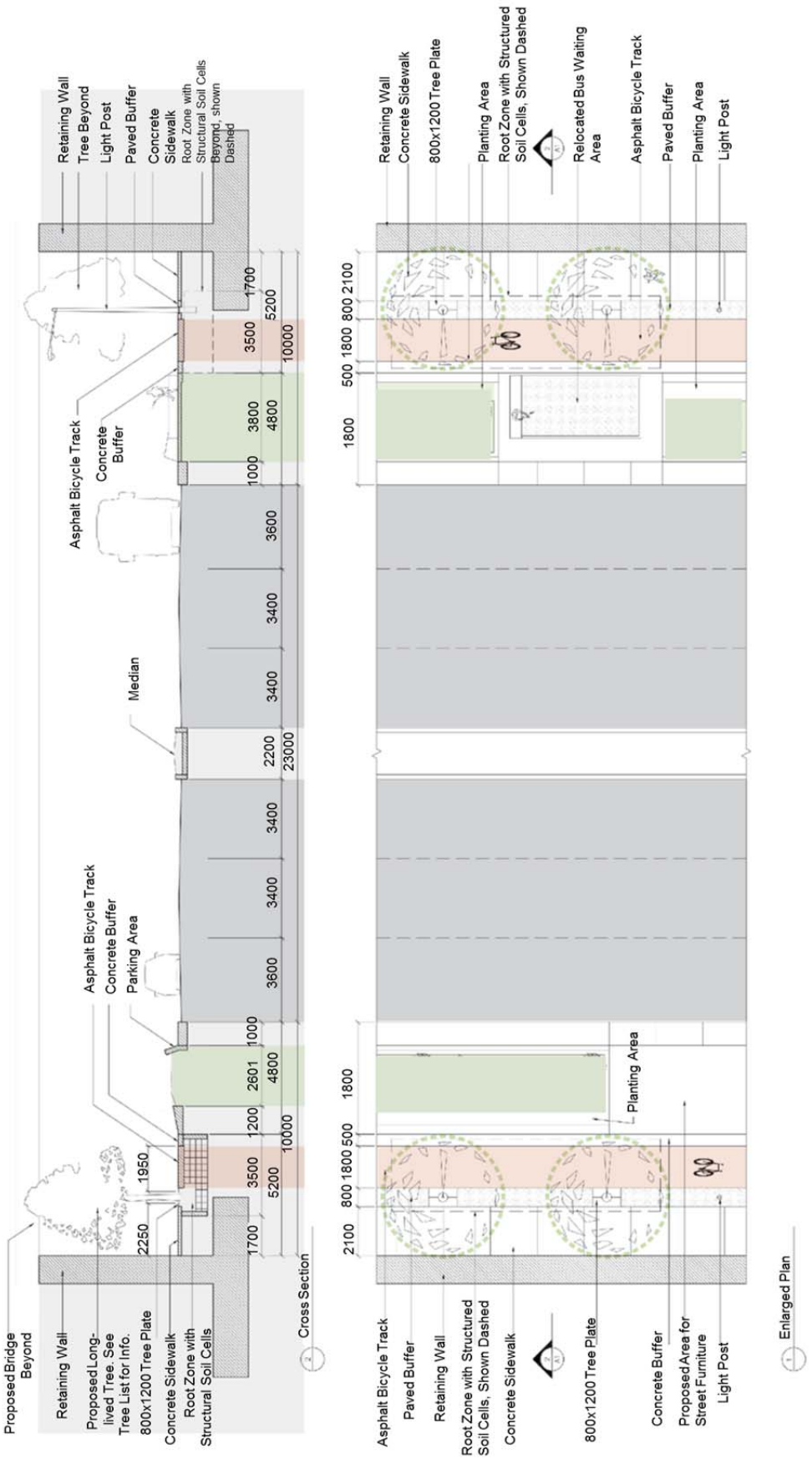


Figure 7-3: Streetscaping Cross-section and plan view

The recommended design for the underpass includes:

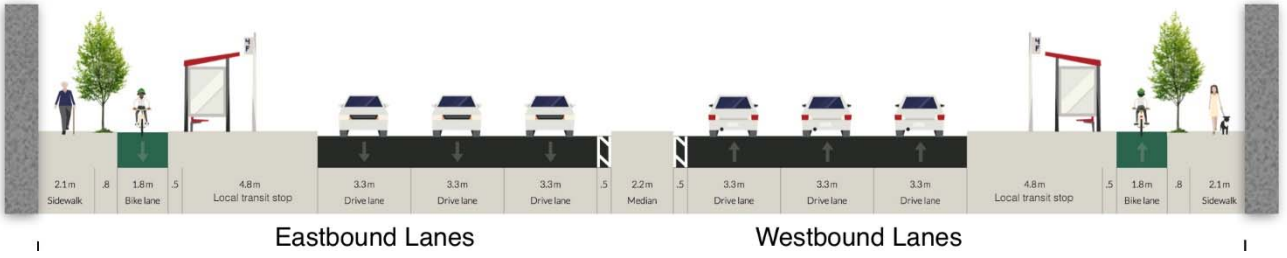
- The separation of the Stouffville GO Rail Corridor and Steeles Avenue East by an underpass of road under rail, with a rail bridge wide enough to accommodate two tracks;
- Provision of a 5.3m vertical clearance for Steeles Avenue East below the new rail bridge;
- The widening of Steeles Avenue East to create a consistent three lane corridor between Kennedy Road and Midland Avenue;
- Exclusive left turns at all signalized intersections;
- Exclusive eastbound right turn lanes at Kennedy Road, Redlea Avenue and Midland Avenue;
- Exclusive eastbound and westbound right turn lanes at Midland Avenue;
- Widening of the existing right-of-way from the existing 36m to protect for a rapid transit corridor along Steeles Avenue East and a rapid transit station at the corridor between Redlea Avenue and Silver Star Boulevard;
- A minimum 2.0m median along Steeles Avenue East between Redlea Avenue and Silver Star Boulevard, that widens to 2.2m around the centre pier of the new rail bridge;
- Re-grading of Redlea Avenue, Silver Star Boulevard, Old Kennedy Road and private accesses (where determined through consultation with landowners to remain open);
- Sidewalks increased to a width of 2.1m;
- A raised cycle track at sidewalk level of a width of 1.8m along the Steeles Avenue East corridor between Kennedy Road and Midland Avenue, to connect to proposed facilities from Kennedy Road to Kelvin Grove;
- Raised cycle track to be given a 0.8m buffer between the sidewalk and cycle track and a 0.5 m buffer between the cycle track and the roadway;
- Enclosed pedestrian bridges adjacent to the rail bridge on both the east and west side of the rail corridor;
- Enclosed elevators and stairs at each corner of the rail corridor and Steeles Avenue East;
- Streetscaping and street trees within the 0.8m pedestrian and cycle track buffer and the 4.8m streetscaping area between the roadway and the cycle track buffer;
- A pumping station located at the northeast corner of the rail corridor and Steeles Avenue East, with access from the Turff Avenue cul-de-sac;
- Relocation of utilities and municipal servicing infrastructure; and,
- Construction of a new stormwater management system, inclusive of a stormwater management facility to accommodate a 100-year storm.

The design is detailed in the following sections.

7.1 Typical Cross Sections

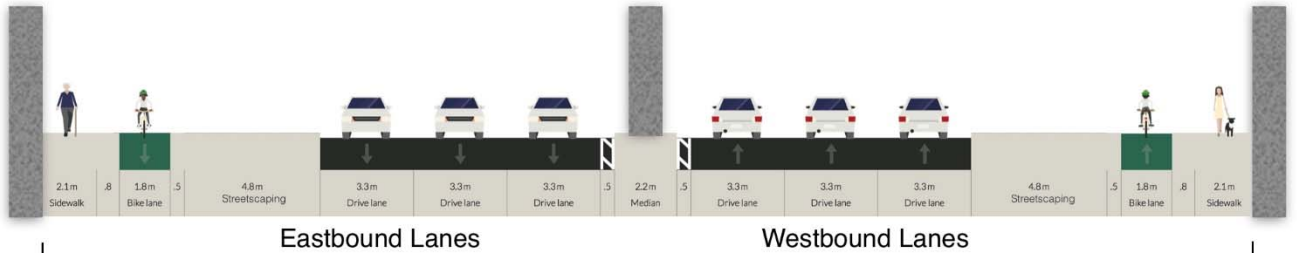
Three typical cross sections have been prepared for the Steeles Avenue East corridor, located west of the rail crossing (**Figure 7-4**), at the rail crossing (**Figure 7-5**) and east of the rail crossing (**Figure 7-6**). These cross-sections are prepared for a pre-rapid transit corridor. The provision of space protects for a rapid transit corridor on Steeles Avenue East and does not preclude any transit type. The cross sections illustrate the road configuration between retaining walls and do not illustrate the total property required to accommodate municipal services and utilities north and south of the retaining walls.

Figure 7-4: Cross-Section of Steeles Avenue East between Redlea Avenue and the Rail Corridor



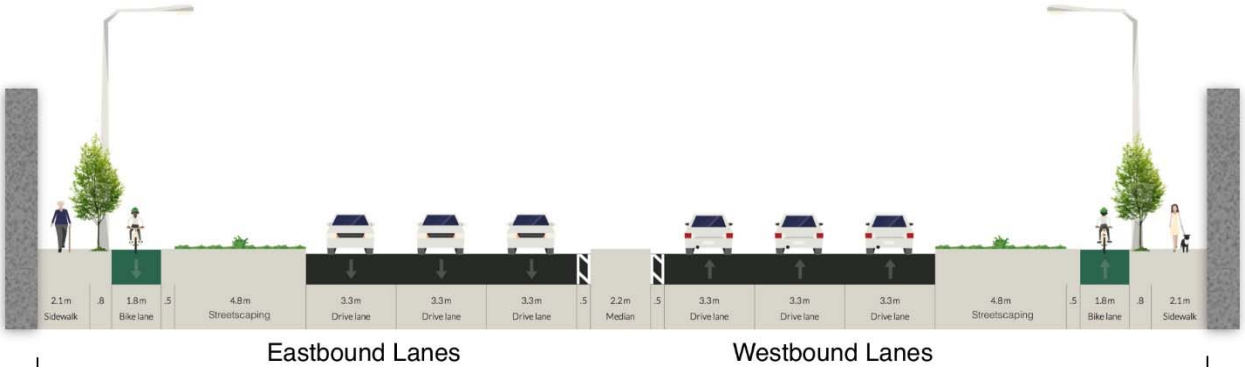
The proposed cross-section for Steeles Avenue East west of the rail corridor shows 2.1m for the sidewalk, a 0.80m buffer, a 1.8m raised cycle track, a 0.50m buffer, 4.80m of space reserved for streetscaping, street furniture and/or bus stop shelters, 10.40m reserved for three general purpose lanes and a buffer and a 2.2m median. The retaining walls will vary in height between Redlea Avenue and the rail corridor.

Figure 7-5: Cross-Section of Steeles Avenue East at the Rail Corridor



The cross-section at the rail corridor is similar to that west of the rail corridor, but incorporates a bridge structure and a centre pier at the median.

Figure 7-6: Cross-Section of Steeles Avenue East between the Rail Corridor and Silver Star Boulevard



The cross-section of Steeles Avenue East east of the rail corridor has the same width as the cross-section west of the rail corridor, with retaining walls on both sides of the street.

7.2 Proposed Intersection Configurations

The final lane configurations for Steeles Avenue East between Kennedy Road and Midland Avenue are shown in **Figure 7-7**. The final configurations were based on the traffic analysis conducted and described in **Section 6.7**, with detailed analysis included in the Transportation Report in **Appendix C**. The lane configurations are shown in more detail on the plans included in **Appendix M**. The proposed queue lane storage and taper lengths are shown in **Table 7-1**.

Figure 7-7: Proposed Lane Configurations

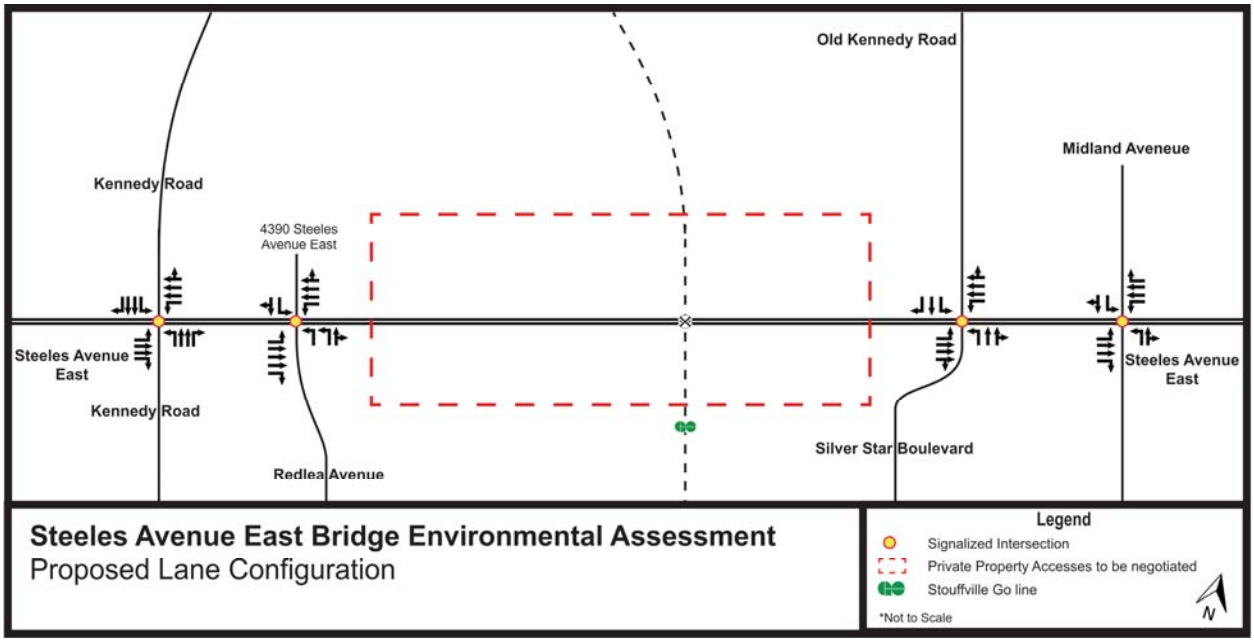


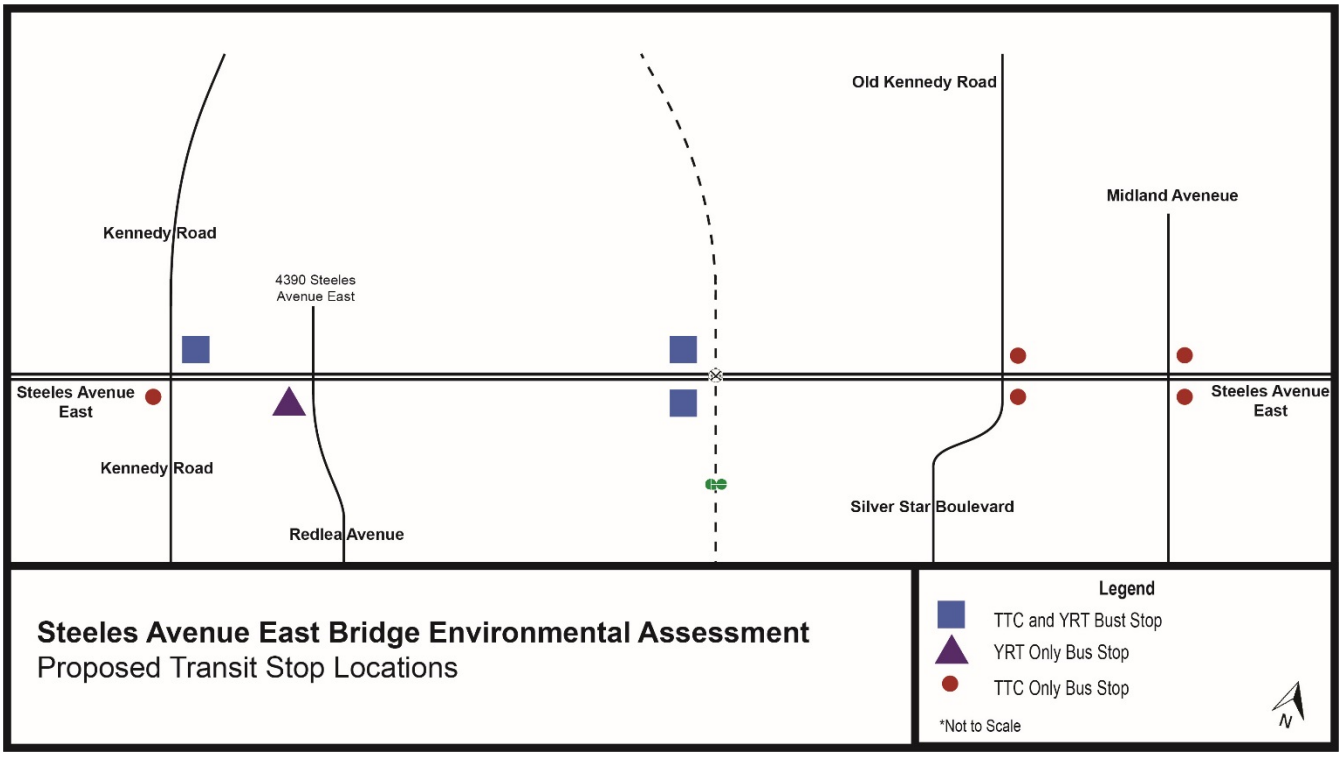
Table 7-1: Proposed Queue Lane Storage and Taper Lengths

Intersection	Movement	Queue Length (m) - Storage	Queue Length (m) - Taper
Steeles Avenue East and Kennedy Road	EBL	55.5	70.0
	WBL	32.0	57.0
Steeles Avenue East and Redlea Avenue/4390 Steeles Entrance	NBL	45.0	
	SBL	45.0	
	EBL	32.0	57.0
	EBR	45.0	50.0
	WBL	115.0	60.0
Steeles Avenue East and Silver Star Boulevard/Old Kennedy Road	NBL	15.0	50.0
	SBL	15.0	45.0
	EBL	90.0	42.0
	WBL	25.0	45.0
Steeles Avenue East and Midland Avenue	SBL	15.0	40.0
	EBL	30.0	55.0
	WBL	30.0	45.0
	WBR	30.0	57.9
	NBR Receiving Lane		50.0

7.3 Proposed Transit Stop Locations

The proposed transit stop locations for Steeles Avenue East between Kennedy Road and Midland Avenue are shown in **Figure 7-8**. The final stop locations were determined through consultation with TTC and YRT and the discussion regarding the rail corridor transit stop is located in **Section 6.2**. The local transit stops are shown in more detail on the plans included in **Appendix M**.

Figure 7-8: Proposed Transit Stop Locations



7.4 Municipal Infrastructure

The following sections outline the planned municipal infrastructure requirements for the proposed design. The full analysis and proposed composite utility plan can be found in **Appendix K**.

7.4.1 Sanitary Sewer

A 675mm gravity sanitary sewer owned by City of Markham is to be located in the Steeles Avenue East right-of-way permanent easement and potentially upgraded to an 825mm pipe. All service connections to the adjoining properties are to be reconnected adhering to the applicable municipal standards. Modifications to this municipal service are to be finalized during detailed design in consultation with the City of Markham.

7.4.2 Watermain

The 1350mm truck watermain is to be replaced within the Steeles Avenue East roadway. Two 300mm distribution watermains (one City of Toronto, one City of Markham) are to be relocated, with the City of Toronto distribution watermain placed within the Steeles Avenue East right-of-way and the City of Markham distribution watermain potentially upsized to 400mm. All service connections to the adjoining properties are to be reconnected adhering to the applicable municipal standards.

7.4.3 Stormwater

The City of Toronto storm sewers should be relocated within the Steeles Avenue East right-of-way or in the permanent easement adjacent to the Steeles Avenue East right-of-way. The pipes are to be modified as need be to account for all existing flow conveyance requirements and the proposed grade separation. All service connections to the adjoining properties are to be reconnected adhering to the applicable municipal standards. The stormwater flow over the rail corridor will continue as existing, which collects in the side ditches and conveyed to a separate City of Toronto storm sewer which will convey the stormwater to the Redlea Avenue pipe. The stormwater collected from the underpass will flow to Silver Star Boulevard.

To mitigate the impacts of the underpass on the environment, a storm water storage facility is required to store the storm flow in accordance with the City of Toronto Wet Weather Flow Management Guidelines. This storage facility should be located at the north-east corner of Steeles Avenue East and the Rail corridor and should be sized to control post-construction peak flows to 2-year pre-construction levels for all storms up to and including 100-year storm.

7.4.4 Pumping Station

The proposed design includes the installation of the following storm water infrastructure and associated power supply, to be located at the north east corner of Steeles Avenue East and the Rail Corridor:

- a stormwater storage tank and maintenance accesses;
- minor storm drainage system, including catchbasins, manholes, pipes;
- stormwater quality treatment facilities; and
- stormwater outfalls; and,
- oil-grit separators.

The flow captured by the stormwater facility should be conveyed to the existing storm sewer on Silver Star Boulevard, relieving the at-capacity sewer on Redlea Avenue.

7.4.5 Third Party Infrastructure

The relocation of existing utility infrastructure should be within the Steeles Avenue East right-of-way or in the permanent easement adjacent to the Steeles Avenue East right-of-way including but not limited to:

- Bell buried telephone cables and conduits
- Rogers buried fiber TV plants

- Enbridge Distribution Gas Line
- Toronto Hydro encased duct bank and lighting poles

7.5 Urban Design

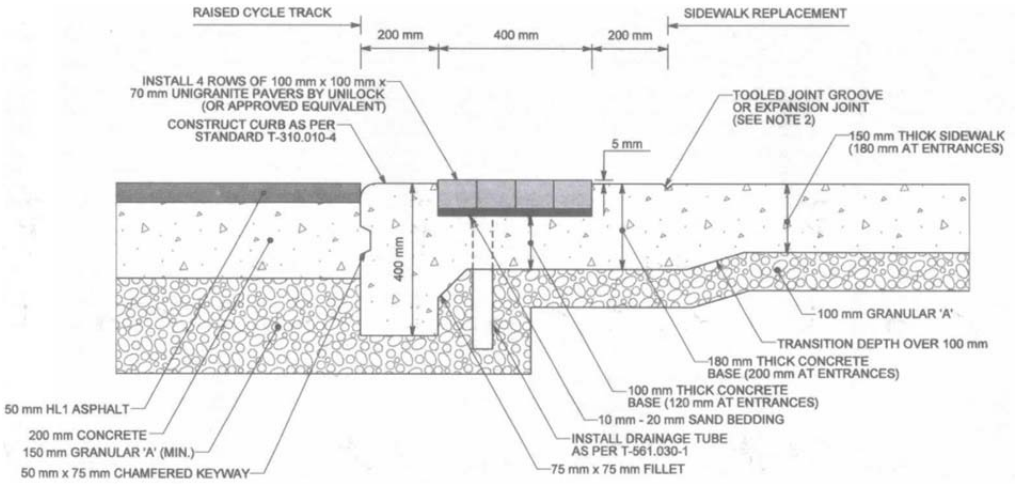
In keeping with the identified opportunities for the study, the proposed design has incorporated several design elements to improve the streetscape according to the study area's design principles. Specifically the design has incorporated active transportation and streetscaping. Space has been reserved for bus shelters, additional streetscaping and street furniture. Public art is contemplated as part of this process. These elements are subject to further refinement during detailed design.

7.5.1 Sidewalks

The sidewalks are to be widened to a minimum of 2.1m and constructed as per City standards. This will serve to accommodate the existing and future pedestrian volumes while enhancing the walking experience. Accordingly, necessary design considerations and elements include:

- The sidewalk is to be free of physical impediments to accommodate the greatest volumes of pedestrians and provide accessible pedestrian pathways;
- A 0.8m space will be maintained between the sidewalk and cycle track, which will provide a tactile delineation strip reinforced by continuous street trees and lighting; and,
- Concrete pavers used for the tactile delineation strip to enhance the quality of the pedestrian environment in accordance with **Figure 7-9**. The width of the pavers between the pedestrian clearway and the cycling facility should be 400mm.

Figure 7-9: Typical Concrete Curb and Boulevard Detail



7.5.2 Concrete Centre Median

A concrete centre median is proposed to define the opposing and safe flows of traffic through the underpass. Accordingly, necessary design considerations and elements include:

- A width no less than 2.0 metres between Redlea Avenue to Silver Star Boulevard and 2.2m underneath the rail bridge to accommodate the centre pier; and,
- Uninterrupted and continuous through the underpass between Redlea Avenue and Silver Star Boulevard.

7.5.3 Paving Materials

The paving materials are intended to provide an aesthetically pleasing, yet durable surface for the active transportation and streetscaping area. Accordingly, necessary design considerations and elements include:

- Concrete curbs;
- Concrete sidewalks and pedestrian areas, as per City Standards;
- 100mm by 100mm concrete pavers to be used for the tactile delineation strip, as specified in **Section 7.5.1**;
- Poured-in-place concrete for the centre median;
- Buffer between cycling facility and roadway to incorporate street trees and street lighting, as per approval from the City Urban Forestry, Transportation Services and Urban Design departments;
- Pavement designs according to City standards for the roadway; and,
- Pavement design for the cycling facility as per City Requirements.

7.5.4 Landscaping

Landscaping is intended to enhance the setting and quality of the user experience in all seasons while maintaining adequate pedestrian space. Accordingly, necessary design considerations and elements include:

- Trees planted along the north and south side of the street between Redlea Avenue and Silver Star Boulevard;
- The potential for additional trees in the soft boulevard east of Silver Star Boulevard on south side of Steeles Avenue East , where right-of-way is available.
- New trees are to be placed in structural soil cells to provide required soil volumes;
- Trees are to be planted in the spring;
- Adequate soil volumes as per Toronto Green Standards and grates to ensure the health and survival of the trees; and,

- Provisions of tree species which are tolerant to urban conditions, such as a mixture of American Elm (DED resistant cultivar), Honey Locust and Black Locust.

7.5.5 Lighting

Lighting is to be provided to serve both functional and aesthetic purposes and is subject to approval by Toronto Hydro. Necessary design considerations and elements include:

- Lighting and street poles along both sides of the street to provide lighting for roadway, pedestrian, and cyclist areas. Material and types should adhere to City of Toronto Streetscape Manual subject to approval by Toronto Hydro;
- Lighting at regular intervals and balanced to provide light at pedestrian scale with pedestrian fixtures; and,
- Wall mounted lighting along both sides of the street under the rail corridor to provide lighting for roadway, pedestrian and cyclist areas. Material and types should adhere to City of Toronto Streetscape Manual subject to approval by Toronto Hydro.

7.5.6 Street Furniture

Street furniture is to be of a coordinated palate with a contemporary and clean-lined design. To reduce clutter in the sidewalk and cycle track areas, furniture location will be determined at detailed design subject to consultation with the City of Toronto.

7.5.7 Public Art

The underpass provides an opportunity to incorporate a public art component and should be integrated early on in the detailed design. The chosen form should be context-sensitive, particularly considering aesthetics from a pedestrian perspective. The public art component is important to be differentiated as an enhancement to the overall grade separation rather than as a replacement for high-quality infrastructure and streetscape elements. While efforts should be made to integrate the public art offered along Steeles Avenue East with that being proposed for the Milliken GO Station, the public art must be a separate and distinct installation related to the grade separation.

7.5.8 Pedestrian Bridge and Elevator/Stair enclosure

The pedestrian bridge design should be coordinated with the design of the rail bridge, Milliken Station and the proposed elevator/stair enclosures during the detailed design phase. The design of the bridges and elevator/stair enclosures should have a high design quality, and be of a similar design vernacular as that of the Milliken GO Station and architectural lighting that enhances the structures, while meeting safety requirements.

7.6 Preliminary Cost Estimates

Preliminary cost estimates are presented in **Table 7-2**. The preliminary construction cost is $68,850,000 excluding costs for property acquisition. The cost estimate is for the works between Kennedy Road and Midland Avenue.

Table 7-2: Preliminary Construction Cost Estimate

Component	Cost
Rail Bridge	$7,000,000
Pedestrian Bridges (2 Bridges)	$4,000,000
Elevators/Stairs (4 Sets)	$8,000,000
Cycling Facilities	$2,100,000
Pumping Station	$1,900,000
Road Reconstruction	$22,000,000
Utility Relocation	$6,000,000
Sub-Total	**$51,000,000**
Contingency (15%)	$7,650,000
Engineering, approvals (20%)	$10,200,000
Total Cost	**$68,850,000**

Since most of the proposed right-of-way expansion requires the acquisition of private property, the City and Metrolinx will need to work closely with property owners to acquire the necessary property. In total, the City will need to acquire property and/or acquire permanent easements from 14 landowners, which include:

- 4300 Steeles Avenue East;
- 4350, 4370, 4372, 4390, 4392, 4394 Steeles Avenue East;
- 4440 Steeles Avenue East;
- 4631 Steeles Avenue East;
- 4665 Steeles Avenue East;
- 4675 Steeles Avenue East;
- 4711 Steeles Avenue East;
- 4723 Steeles Avenue East;
- 4733 Steeles Avenue East;
- 19 Turff Avenue;
- 4458 Steeles Avenue East;
- 4468 Steeles Avenue East;
- 4575 Steeles Avenue East; and,
- 4751 Steeles Avenue East.

The property requirements will be finalized during detailed design.

7.7 Implementation

At the time of preparing this report, this project has been incorporated into a design build and finance (DBF) package that will be tendered and managed by Metrolinx and Infrastructure Ontario (IO). The grade separation and associated works identified along Steeles Avenue East as part of this EA has been bundled with the design and construction of Milliken GO Station as well as Agincourt Station and Unionville Station. The award of the contract is expected to be announced in Fall 2017, upon which detailed design will commence immediately and construction is anticipated to start in Spring/Summer 2018. Considering the timing of the DBF announcement, it is recommended that immediately after approval of this project the recommendations be incorporated into the request for proposals.

The Environmental Study Report will be placed on the public record with the City of Toronto for a 30-day review period. Any outstanding issues with the project can be addressed with City staff. If concerns arise regarding this project which cannot be resolved in discussion with the City, a person or party may make a request to the Minister of the Environment and Climate Change for a “Part II Order” within this 30-day review period. Provided that no Part II Orders are received, the City of Toronto and Metrolinx may proceed to implement the undertaking.

The detailed design for the project will have to be coordinated with adjacent projects and will include other aspects, including but not limited to the determination of the bridge type, the type and location of street lighting, landscaping and storm water management facilities. In addition consultation with private property owners regarding the determination of the existence and final location of private property accesses, property requirements, and connection regarding vertical circulation will continue through the detailed design phase. These aspects are not expected to require an Environmental Study Report addendum to be filed.

8 ANTICIPATED IMPACTS AN MITAGATION MEASURES

8.0 ANTICIPATED IMPACTS AND MITIGATION MEASURES

Included in Phase 3 of the Class Environmental Assessment process is the identification of potential impacts and the determination of potential mitigation measures. **Table 8-1** summarizes the anticipated impacts of the preferred alternative design and proposed mitigation measures, while the following sections provide greater detail of the anticipated impacts and recommended future commitments and monitoring activities as part of the construction process.

Table 8-1: Anticipated Impacts and Proposed Mitigation Measures

Anticipated Impact	Response Mitigation Measure and Commitment to Future Work
Traffic ▪ Re-routing of traffic patterns during construction and along Steeles Avenue East due to access closures ▪ Increase in traffic volumes beyond anticipated forecasts. ▪ Traffic infiltration to surrounding neighbourhoods	▪ A traffic management plan will be developed to maintain 2 lanes of traffic in either directions at all times and to maintain access to adjacent businesses during construction. ▪ City of Toronto Traffic Operations will monitor the operations of the study intersections and make the necessary changes to the signal timings to optimize traffic movements in the area. ▪ Transportation Services will monitor the level of traffic in the area through a monitoring program including traffic counts, surveys and evaluation of development applications. ▪ Transportation Services will undertake a traffic infiltration study to consider the surrounding developments and the Redlea Avenue Extension to evaluate the potential for traffic infiltration and requirement for any mitigation measures, including restricting movements at intersections along Steeles Avenue East.
Socio-Economic Environment ▪ Nearby properties and business affected by construction activities	▪ Metrolinx will engage the nearby businesses in the development of a reasonable construction plan and endeavor to reduce the duration and impact of construction activities. ▪ Compensation to private property owners will be provided as part of property acquisition process.

Natural Environment ▪ Loss of vegetation and trees with the widening of the existing right-of-way ▪ Creation of dust during construction ▪ Creation of noise during construction	▪ An arborist report has been completed as part of this study. Trees will be planted, where feasible as determined in detailed design, through consultation with the City Urban Forestry department. ▪ The controlling of dust/debris from unpaved areas will be done through the application of water, calcium chloride or other means as recommended by the contractor and accepted by Metrolinx. ▪ Construction activities will comply with the City of Toronto noise control by-law. Should exemptions to the noise by-law be required, the appropriate application should be made to City Council.
Stormwater Management ▪ Increase in run-off volume, peak flow rates, need for water quality control and need for stormwater storage and pumping station	▪ Implementing stormwater retention and pumping infrastructure within the permanent easement areas and the use of permeable surfaces wherever possible to increase infiltration. ▪ Consideration of low impact development techniques such as source and conveyance controls and end of pipe treatments (e.g. Oil-Grit Separator) to improve the quality of, and discharge flow rate for stormwater entering downstream conveyance systems such as the adjacent main trunk sewers.
Utilities and Infrastructure ▪ Update utilities and legal land surveys	▪ In preparation of the detailed design stage, updated utilities and legal land surveys within the expected construction limits will be required. ▪ A separation study is required to determine the detailed design and construction details of the relocation plan.

Archaeology ▪ Unanticipated discovery of archaeological and or human remains	▪ If there is an unanticipated discovery of archaeological and or human remains, the City will immediately contact the Ontario Ministry of Tourism, Culture and Sport (MTCS) and the Registrar or Deputy Registrar of the Cemeteries Regulation Unit of the Ontario Ministry of Government Services.

8.1 Transportation Impacts

The preferred design incorporates three lanes and multiple lane configurations throughout the corridor. The final lane configurations are incorporated onto the preliminary design plan found in **Appendix M**. Conditions across the corridor are expected to improve between the existing conditions (shown in **Figure 8-1**) and the future conditions (shown in **Figure 8-2**). Specifically, the future traffic analysis has determined that this design can accommodate the future traffic volumes and the overall level of service is expected to be acceptable in the morning, afternoon and Saturday peak hours. The detailed analysis can be found in the transportation report included in **Appendix C.** It is recommended that as part of the change in lane configurations and the projected traffic volumes that the City reviews the signal timings in the area to optimize traffic flow.

At the intersection of Steeles Avenue East and Redlea Avenue, a northbound dual left has been proposed. Given the space and signal timing requirements for this movement and as per request from the property owner, a southbound dual left was also considered. This was not included in the proposed design but can be further considered during the detailed design phase. If able to occur during the same phase as the protected northbound left movement, a southbound dual left movement may provide additional benefits to the operation of the intersection.

The future traffic conditions include approved development proposals. It is understood that several of these proposals have revised development applications that are active and these proposals should be required to confirm their integration with the proposed design to the City, through transportation impact studies and other related studies.

A construction staging plan will be completed during detailed design to ensure access to adjacent properties are maintained through the construction process.

Figure 8-1: Existing Traffic Conditions

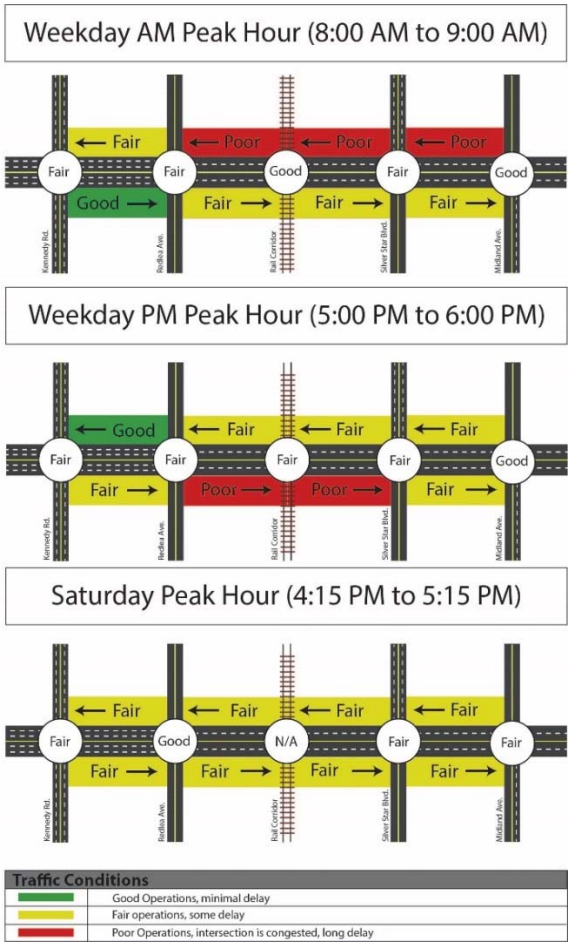
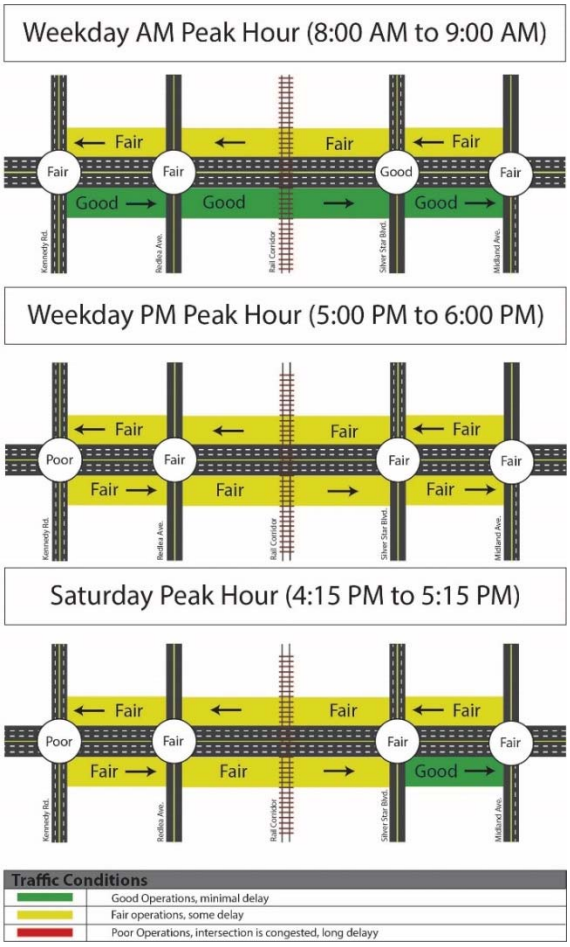


Figure 8-2: Future Traffic Conditions



8.2 Cultural Landscape and Heritage

The cultural heritage review identified two designated properties to be adjacent to the project focus area, specifically, 73 Old Kennedy Road (James Rattle House) and 4600 Steeles Avenue East. Neither of these is substantively affected by the proposed design and thus no mitigation measures are proposed.

8.3 Air Quality/ Noise

More detailed studies regarding the impacts of constructing a 6-lane underpass can be found in **Appendix J**. Construction phase impacts were not included in the dispersion modelling analysis, but were addressed qualitatively in the assessment. It is recommended that in order to minimize potential air quality impacts during construction, the construction tendering process should include requirements for implementation of an emissions management plan.

Overall, it is expected that the proposed project will not cause any air quality criteria thresholds to be exceeded, with the exception of benzene which exceeds the threshold values in the existing

conditions. As well, that the design will improve the air quality slightly at sensitive uses in the area due to reductions in traffic idling and general improvement in tailpipe emissions technologies.

The road traffic noise levels are anticipated to be typical of urban areas, and no change is expected in the sound levels from existing to the proposed design. The design area is located around 200m to 400m away from the nearest residential areas and sensitive receptors, and is expected to have daytime ambient levels of traffic around the 60 dBA range. That being said, all construction activities should utilize methods to minimize construction noise as included in the Construction Code of Practice.

8.4 Natural Environment

Since there are no natural vegetation communities in the study area, no removal or disturbance to vegetation communities will occur. The right-of-way expansion along Steeles Avenue East will require removal of some manicured boulevard trees. The arborist report located in **Appendix G** provides a catalogue of the trees in the area, the majority of which were planted for amenity/landscape purposes. Approximately 18 trees will be removed from the study area, and approximately 60 to 70 trees will be incorporated in the proposed design. These trees planted between Redlea Avenue and Silver Star Boulevard will be planted in structural soil cells to avoid encroachment into the relocated sewers and watermains.

The proposed design takes place in a highly urbanized area with minimal documented wildlife species and limited habitat potential. Consequently, the proposed works will have limited effects on wildlife and habitats utilized by wildlife.

8.5 Stormwater

The City of Toronto Wet Weather Flow Management Guidelines and the Toronto and Regional Conservation Authority (TRCA) established the criteria for governing storm water management impacts of the recommended design. The storm water management criteria consideration includes water balance, water quality and water quantity. Details of the proposed storm water management system are included in **Appendix K**.

The City of Toronto and TRCA require that post construction flows are controlled to existing levels for all storms up to and including the 100-year storm. The proposed design will create a new low point on Steeles Avenue East which will cause changes to the current overland flow route and volume, and will require more storage volume than in existing conditions. According to the TRCA's stormwater quantity control criteria (control post-development peak flows to 2-year pre-development levels for all storms up to and including 100-year storm), the allowable stormwater discharge rate is 156.90 L/s. The

required stormwater storage on Steeles Avenue East is 511.30 m^3. It is recommended that the sizing of storm water management controls, storm sewers and connections into the existing system be confirmed during the detailed design process. The storm sewer storage, pumping station and storm sewer pipes shall be sized to sufficiently accommodate the post-development peak flow conditions. Other storm water retention measures should also be considered, including the use of bioswales and super pipes or combinations thereof. Emphasis should be placed on investigating and maximizing the use of 'Green Street' infrastructure, such as bioswales, wherever possible and feasible, in order to reduce the cost of oil/grit separators, storm sewer pipes, super pipes, etc.

The water quality requirement includes the capture of 80% of Total Suspended Solids (TSS) within the study on an annual loading basis. In construction for the recommended design, the use of an oil/grit separator is recommended for Steeles Avenue East. The sizing of the quality control device shall be determined during the detailed design process.

8.6 Archaeological

There are no known areas of archaeological interest or archaeological features that would be affected by the recommended design. The proposed alignment of the recommended design mostly impacts already-disturbed areas. The City of Toronto does not consider any portion of this area as having archaeological potential. Details of the Stage 1AA completed and accepted by MTCS are included in the report in **Appendix D**.

8.7 Property Impacts

As part of the widening of Steeles Avenue East and the additional right-of-way required to protect for rapid transit, a number of properties will need to be acquired. The study recommends the acquisition of parts from thirteen properties, or approximately 0.42 hectares of private property, and acquiring permanent easements from eight properties, or approximately 0.33 hectares. The permanent easements are intended to be subsurface to accommodate the placement of utility and municipal service plants as well as structural elements from the retaining wall or bridge abutments. The permanent easements will also need to accommodate the maintenance of the elements located within. The proposed design and revised property lines can be seen on the plans included in **Appendix M**.

The affected property owners have been consulted throughout the project, and will continue to be consulted throughout the detailed design process. The proposed design includes property takings as summarized in **Table 8-2** and includes the city's best efforts to minimize impacts to existing infrastructure.

Table 8-2: Property Impact Summary

Address	Estimated Property Required to be Acquired (m^2)	Estimated Property Required for Permanent Easement (m^2)
4300 Steeles Avenue East	109.3	-
4350, 4370, 4372, 4390, 4392, 4394 Steeles Avenue East	1005.3	1177.8
4440 Steeles Avenue East	357.9	454.8
4631 Steeles Avenue East	-	10.7
4665 Steeles Avenue East	253.6	240.5
4675 Steeles Avenue East	345.2	262.2
4711 Steeles Avenue East	314.3	254.6
4723 Steeles Avenue East	171.4	196.9
4733 Steeles Avenue East	144.0	251.9
19 Turff Avenue	48.3	-
4458 Steeles Avenue East	1250.0	-
4468 Steeles Avenue East	153.3	460.0
4575 Steeles Avenue East	2.5	-
4751 Steeles Avenue East	19.5	-

** Further refinement through the detailed design process may alter these estimates*

8.8 Subsurface Soil Conditions

The recommended Phase II ESA and soil/groundwater water testing as per the geotechnical reports in Appendix H and Appendix I are expected to be completed during the detailed design phase post EA. As part of the Phase I ESA completed it was identified that given the surrounding historical uses, there was an expectation that contamination could be encountered on contaminated properties identified for acquisition, within the Steeles Avenue road right-of-way, or due to migration of contaminants from adjacent properties. In total 26 properties along the corridor were identified as Areas of Potential Environmental Concern and the adjacent right-of-way would be subject to Phase II ESA investigation. Should these test results show any contaminated soils or groundwater within the proposed alignment of the recommended design, a soil remediation and management plan will be developed.

9 REVISIONS AND ADDENDA TO THE ESR

9.0 REVISIONS AND ADDENDA TO THE ESR

This section will delineate minor adjustments that have been contemplated in the proposed design and major changes that would necessitate a formal addendum to the ESR. Any addenda required shall be led with the Environmental Study Report and the Notice of Filing of Addendum shall be given immediately to all potentially affected members of the public and review agencies, as well as those who were notified in the preparation of the original Environmental Study Report. The Environmental Study Report addendum will be placed on the public record with the City of Toronto for a 30-day review period. A person or party with concern regarding the addendum may make a written request to the Minister of the Environment for a "Part II Order" within this 30-day period. Provided that no Part II Orders are received, the City of Toronto may proceed to Phase 5 of the Class EA process, design and construction.

9.1 Lapse of Time

According to the MCEA process, "if the period of time from the filing of the Notice of Completion of Environmental Study Report in the public record or the MOE's denial of a Part II Order request(s), to the proposed commencement of construction for the project exceeds ten (10) years, the proponent shall review the planning and design process and the current environmental setting to ensure that the project and the mitigation measures are still valid given the current planning context. The review shall be recorded in an addendum to the Environmental Study Report which shall be placed on the public record."

9.2 Changes in Project or Planning Context

Subsequent to the filing of the Environmental Study Report, any modification to the project or change in the environmental setting for the project shall be reviewed by the proponent. Should the change be considered significant, it should be documented as an addendum to the Environmental Study Report detailing the circumstances necessitating the change, the environmental implications of the change, and the mitigating measures. A minor change to the undertaking can proceed without an addendum as long as there are in line with the intent of the EA.

9.3 Left Turning Lanes at Private Accesses on Driveways

As part of this proposed design, a median is proposed along Steeles Avenue East, prohibiting left turns at unsignalized intersections between Redlea Avenue and Silver Star Boulevard. However, breaks in the median may be incorporated into the detailed design through negotiations with private property owners at unsignalized accesses, if the movement can be incorporated safely and is justified by the

movement volumes. No addendum to the EA would be required to incorporate a break in the median in association with an adjacent redevelopment application.

9.4 Urban Design/Streetscape

As part of the detailed design, the urban design plans should be integrated with the proposed Metrolinx designs for Milliken Station, especially for elements such as the elevator and stairs structures. Initial community feedback has indicated support for both the mural and textured concrete retaining wall designs. The urban design and streetscape design should be evaluated in accordance with the key criteria set out in **Section 6.5** of this study. Minor changes to the urban design and streetscaping plan can proceed without an addendum.

9.5 Emerging City of Markham Planning Context

The City of Markham was consulted during the initiation, development and evaluation of the alternative solutions and designs. As part of the consultation, City of Markham advised that it is in the process of undertaking an update to Milliken Centre Secondary Plan. Associated with this update, it is understood that assumptions have been made regarding an increase in the forecasted population and employment levels within this Centre and that modifications will be made with respect to land use, development blocks, required servicing, and the transportation networks. Recognizing that the plan is ongoing, the Steeles Avenue Bridge EA has endeavoured to ensure that the recommended designs do not preclude the potential outcome of this Secondary Plan. Through the EA process the following has been given consideration:

Active Transportation Connections:

- It is understood that the Milliken Centre Secondary Plan will incorporate the development of an active transportation network to facilitate walking and cycling within and outside of the Secondary Plan area. An active transportation corridor is proposed by the City of Markham along the east side of the Stouffville GO Rail Corridor and pedestrian/cycling routes are proposed along Steeles Avenue East on both sides of the Stouffville GO Rail Corridor north of the proposed retaining wall from Redlea Avenue to Old Kennedy Road.
- As part of the easement negotiation with the property owners along the north side, the extent of the easement, the purpose of the easement (i.e. what the easement will accommodate), and residual rights that the property owner will have within the easements will be determined. The potential location of the pedestrian / cycling routes along the north side of Steeles Avenue East will be part of the negotiation with the preference that they be located within the easement.

- The active transportation corridor along the east side of the Stouffville GO Rail Corridor to the Steeles Avenue Bridge would include the establishment of a secondary gateway hub[1] located at the northeast quadrant of the Steeles Avenue Bridge at the northern terminus of the Pedestrian Bridge. This pedestrian bridge is included in the recommended design for the Steeles Bridge EA.
- The City of Markham previously requested that the gateway include a number of elements to support walking and cycling including: secure bicycle parking facilities, public plaza, landscaping, and street furniture. The drawings prepared for this study have noted a potential location for these elements. The final location of these elements will be informed by the detail design and construction stages of the Steeles Bridge Design Build Finance ("DBF") Project.

Turff Avenue and Pumping Station:

- As part of the recommended design, it was noted that a pumping station is required due to the new low point created by the Steeles Avenue Underpass. Several locations of the pumping station were considered within the City of Toronto and the City of Markham. The preferred location is identified within the City of Markham east of the railway corridor.
- The City of Markham advised that it did not support the pumping station location, given that as part of the Secondary Plan process Turff Avenue may be removed as a public right of way, which would affect primary access to the proposed pumping station. Through discussions with the City of Markham, it was determined that a viable alternative access to the pumping station should be considered via the pedestrian/cycling route along the north side of Steeles Avenue from Old Kennedy Road.
- City of Markham advised that as part of the Secondary Plan process, this area is anticipated to be redeveloped and that the existing block structure may substantially change and a secondary gateway hub will be established as noted above. Therefore, the City maintains that the pumping station should be located within the City of Toronto. If maintained within the City of Markham, it should be located underground at the preferred location in order to reduce the visual impacts to the surrounding environment of the secondary gateway hub.
- Considering that there is a reasonable access alternative within the pedestrian/cycle route north of Steeles Ave, without using Turff Avenue, the final location of the pumping station will

[1] City of Markham 2014 Official Plan, Map 2.

be reviewed and refined at the DBF detail design and construction stages based on the final agreed access route.

Intersection Designs:

- Through the review of the Draft Recommended Design, the City of Markham offered comments to the north leg of the proposed intersection that would minimize the construction cost of the intersection. The proposed north leg configuration would be an interim condition to the ultimate design as defined in the Midland Avenue Extension EA .
- The proposed design will address the particular concern of pedestrian crossing distance and integration of cycling facilities with those defined in the Secondary Plan and Midland Avenue Extension EA.
- Recognizing this, the north leg of the intersection was revised to the recommended interim design. A number of items will need to be coordinated through the DBF process including the integration of the cycling facilities along Midland Avenue and Steeles Avenue East. City of Markham will be engaged throughout the DBF detail design review and will be consulted through the DBF process.