



Kirby Road Widening Environmental Assessment Study

Jane Street to Dufferin Street

City of Vaughan

Environmental Study Report

June 2022

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Executive Summary

Introduction

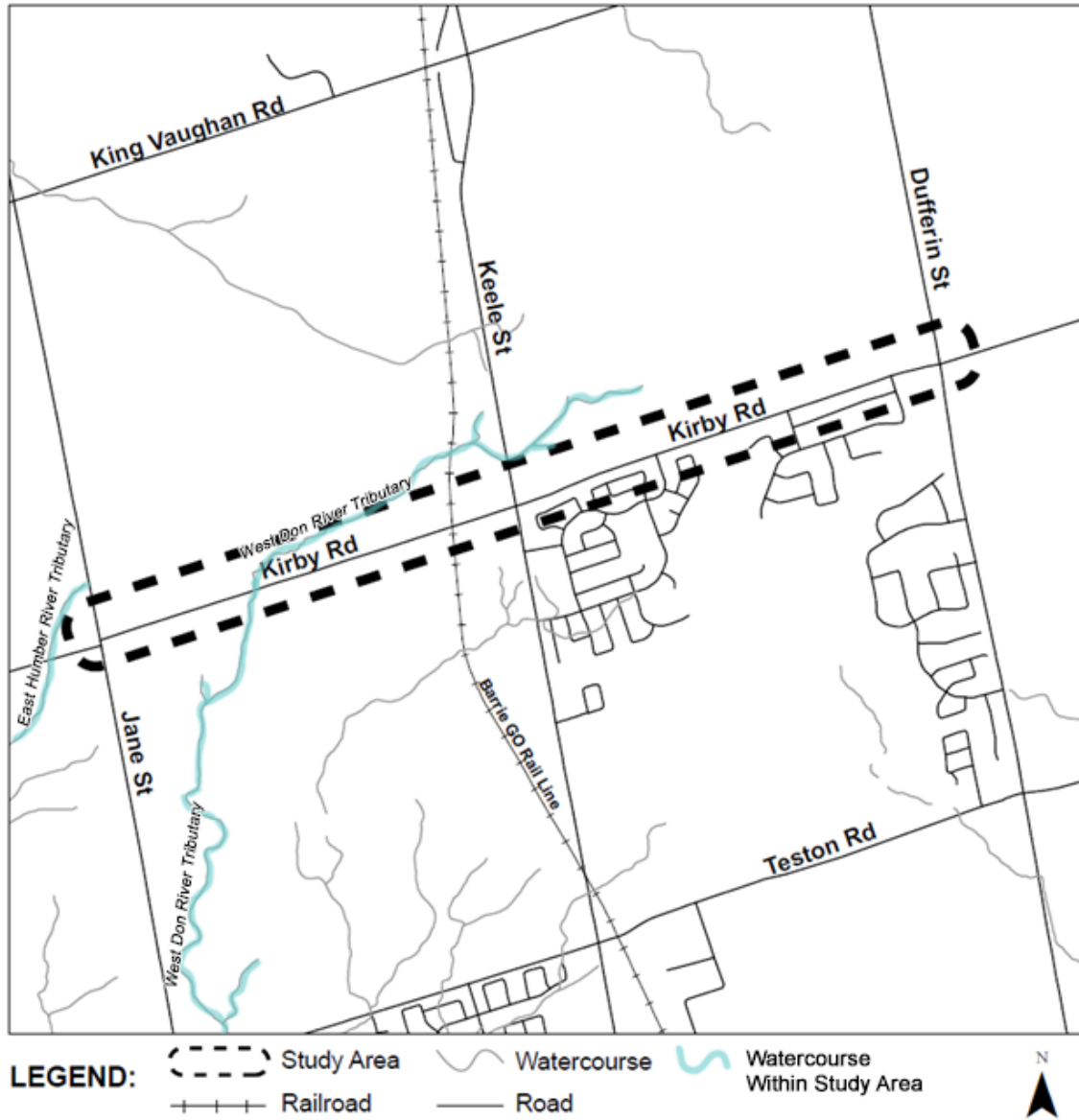
The City of Vaughan has completed a Schedule 'C' Municipal Class Environmental Assessment (EA) study for Kirby Road between Jane Street and Dufferin Street. The EA study is referred to as the Kirby Road Widening EA (Jane to Dufferin). The study reconfirmed the recommendations for the corridor as identified in the City of Vaughan's Transportation Master Plan (2012), York Region's Transportation Master Plan (2016), City's North Vaughan and New Communities Transportation Master Plan (NVNCTMP, 2019), City's Pedestrian and Cyclist Master Plan, and has completed Phases 3 and 4 of the Municipal Class EA process for Schedule 'C' projects as outlined in the Municipal Engineers Association (MEA) Municipal Class EA guidelines (October 2000, as amended in 2007, 2011 and 2015).

The purpose of the Kirby Road Widening Municipal Class EA study was to determine specific improvements to accommodate the current and future transportation needs of pedestrians, cyclists, transit users and motorists along Kirby Road from Jane Street to Dufferin Street.

Study Area

The Kirby Road Widening EA study corridor is between Jane Street and Dufferin Street in the City of Vaughan. Kirby Road is a two-lane rural, east-west arterial road. The Kirby Road Widening EA study area spans approximately 4.2 kilometers, as shown in **ES- 1** and includes a crossing of the West Don Tributary east of Jane Street, and a crossing of the Barrie GO Rail line west of Keele Street. The East Humber River Tributary is located just west of the study limits.

ES- 1: Study Area



Public, Agency, and Indigenous Consultation

Public input is an important part of the Kirby Road Widening EA. The project team engaged the general public, agencies, stakeholders and Indigenous Communities, through mail and email notifications as well as an online PIC to ensure opportunities to provide input and voice concerns. Key consultation events undertaken throughout the EA study are listed in **ES- 2**.

ES- 2: Summary of Consultation Events

Consultation Event	Date
Notice of Study Commencement	January 2020
Notice of Online Survey	July 28, 2020
Online Survey	July 28, 2020 to Aug. 21, 2020
Notice of Public Information Centre	June 7, 2021
Public Information Centre	June 7, 2021 to June 30, 2021
Notice of Study Completion	June 16, 2022

A variety of methods were used to update and inform the public, agencies, stakeholders, and Indigenous Communities about the study progress, including:

- Letters
- Emails
- Post cards
- Meetings
- Phone calls
- Notices
- Newspaper advertisements
- Project website (www.vaughan.ca/KirbyWidening)
- City of Vaughan Social Media (Facebook, Twitter, Instagram, and LinkedIn)
- City’s Website
- Online survey
- Public Information Centre (PIC)

Residents living along the study corridor were in receipt of mailed notices, post cards and letters. Following the study commencement, any individual who expressed interest in the project and requested, was added to the project mailing list (mail or email) to receive regular updates on the study progress.

To maximize public awareness, efforts such as social media posts (Facebook, Instagram, LinkedIn and Twitter), and regular updates to the project website provided information to the “silent majority” – the members of the public interested in the project, but opt for a more passive role.

A Technical Advisory Committee (TAC) consisting of key technical agencies was formed for the study. In addition, a Stakeholder Group (SHG), consisting of public representatives who expressed interest in the study, was formed to gather feedback at key milestones in the process.

Indigenous Communities who may have an interest in the study area were identified through correspondence from Ministry of the Environment, Conservation and Parks (MECP)’s response letter to the Notice of Commencement. These communities were included in the mailing list and received study notices through email. They were invited to participate in the study by providing input via direct correspondence with the project team, completion of the Online Survey and also

participation in the online Public Information Centre via the project website. The Indigenous Communities contacted are:

- Mississaugas of the Credit First Nation
- Hiawatha First Nation
- Curve Lake First Nation
- Alderville First Nation
- Mississauga's of Scugog Island First Nation
- Huron-Wendat Nation

An online survey was announced in August 2020 through a mailed postcard distribution. The online survey was available on the study website from July 28, 2020 to August 21, 2020 and requested feedback on how the public uses the corridor today, input on identified improvements and preliminary thoughts on initial alternative design concepts and the evaluation criteria. Three hundred and seventy-nine (379) members of the public responded to the online survey.

An online Public Information Centre (PIC) was posted on the City's project website between June 7, 2021 and June 30, 2021. The materials included a PIC presentation with transcript, comment form and PDFs of the recommended typical cross-sections, and plan and profile design plans. Individuals could visit the City website anytime during this period to view the material at their leisure and learn about and share their input on the study findings and recommendations. An online commenting form was available and additional comments could be e-mailed to the City. Two hundred and seven (207) users visited the online PIC. Thirty-four (34) members of the public submitted comment forms, three (3) provided comments via email, one via phone call and additional comments were posted on the City's Instagram post.

Problem and Opportunity Statement

The need for Kirby Road improvements was identified in the North Vaughan and New Communities Transportation Master Plan 2019, York Region Transportation Master Plan Update 2016, Vaughan Transportation Master Plan 2013 and the City's Pedestrian and Bicycle Master Plan Update. These studies incorporated feedback from technical agencies, stakeholders, and the public throughout the decision-making process. The NVNCTMP and YRTMP fulfilled the requirements of Phases 1 and 2 of the Municipal Class EA process. The EA's Transportation and Traffic Study supplemented the recommendations from the TMPs and confirmed the need for capacity improvements between Jane Street and Dufferin Street, the jog elimination at Jane Street intersection, and grade separation at the Barrie GO Rail crossing of the Kirby Road corridor.

The needs and justification for the Kirby Road Widening corridor as documented in the various TMPs are summarized as:

Needs:

- Capacity improvements to address existing congestion and future travel demands
- Corridor improvements to support walking and cycling
- Corridor improvements to support transit

Justification:

- NVNCTMP 2019 outlines existing and future traffic capacity deficiencies
- Kirby Road at Jane Street experiences congestion during peak periods
- Existing deficiencies with active transportation and transit network
- Traffic and train volumes are expected to exceed exposure warrant for grade separation. Grade separation improves pedestrian and cyclist safety and reduces delays to transit and traffic along the corridor and is needed to support planned Regional Express Rail (RER)

Based on the findings of the TMPs, Kirby Road widening between Jane Street and Dufferin Street is recommended to improve capacity, address existing congestion and future travel demands, and support walking, cycling and transit.

The following problem and opportunity statement is identified for the Kirby Road corridor between Jane Street and Dufferin Street:

- Provide opportunities to maximize the person-carrying capacity of the Kirby Road corridor between Jane Street and Dufferin Street to accommodate the expansion of the Designated Urban Area and projected travel demands
- Improve pedestrian and cycling facilities and overall active transportation network
- Improve the efficiency and reliability of transit

Alternative Solutions

Alternative Solutions are functionally different solutions for approaching and dealing with a problem or opportunity. The Class EA process requires documentation and examination of all reasonable alternatives to address the problem, referred to as Alternative Solutions.

The YRTMP and NVNCTMP analyzed various alternatives which considered the improvements needed along Kirby Road. The alternative solutions considered are:

YRTMP Alternative Solutions (Kirby Road corridor – Project ID 2034):

- Do Nothing
- Optimize existing facility with intersection improvements only
- Urbanize corridor but maintain 2-lane cross-section
- Widen corridor to 4 lanes and construct to urban arterial standard
- Widen parallel/adjacent corridor

YRTMP Alternative Solutions (Barrie GO Grade Separation at Kirby Road - Project ID: 2147):

- Do Nothing
- Improve grade crossing safety
- Transportation improvements to adjacent / parallel corridor
- Construct rail grade separation structure

NVNCTMP Alternative Solutions:

- Do Nothing
- Improvements to other roadways but not Kirby Road
- Widen and Improvements to Kirby Road

The Preferred Solution for Kirby Road between Jane Street and Dufferin Street was identified as:

- **Widen Kirby Road from two to four lanes and construct to urban arterial standard within a 36m right-of-way**
- **Grade separate the Barrie GO railway crossing at Kirby Road**
- **Eliminate the jogged intersection at Jane Street to improve traffic flow**
- **Improve walking and cycling facilities (active transportation)**

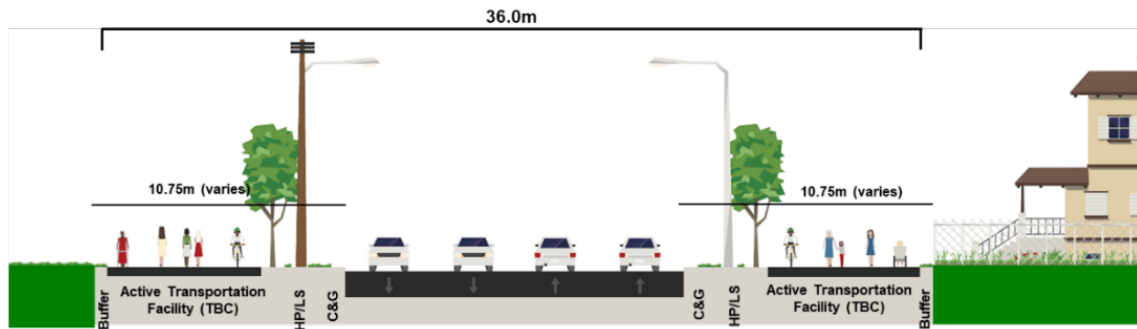
The EA’s Transportation and Traffic study assessed and reviewed the recommendations from the TMPs. It considered the existing traffic conditions at the key intersections along Kirby Road corridor, estimated and examined traffic growth and expected future traffic volumes, analyzed traffic impacts from the future traffic volumes, and identified infrastructure improvements to address the deficiencies and accommodate the future traffic growth for the horizon year of 2031. It confirmed the Preferred Solution recommended by YRTMP and NVNCTMP for the Kirby Road corridor between Jane Street and Dufferin Street.

The Preferred Solution was then reviewed against the Problem and Opportunity Statement to ensure that the Preferred Solution aligned with the study opportunities. The Preferred Solution was confirmed to align with the identified opportunities for the Kirby Road Widening EA study as documented in **ES- 3** and **ES- 4**

ES- 3: Preferred Solution’s Alignment with Study Opportunities

Opportunity	Preferred Solution’s Alignment with Study Opportunities
Provide opportunities to maximize the person-carrying capacity of the Kirby Road corridor between Jane Street and Dufferin Street to accommodate the expansion of the Designated Urban Area and projected travel demands	Provides improved multi-modal transportation link to increase the person-carrying capacity of the corridor via additional vehicular lanes, pedestrian and cycling facilities and opportunities for transit.
Improve pedestrian and cycling facilities and overall active transportation network	Completes gaps in the existing active transportation network by providing dedicated and continuous facilities for pedestrians and cyclists to improve safety, encourage active travel and reduce vehicular congestion.
Improve the efficiency and reliability of transit	Supports the development of the frequent transit network.

ES- 4: Preferred Solution



Alternative Designs

Alternative designs are different concepts developed to implement the preferred solution. This Class EA process examined all reasonable design options; referred to as Alternative Designs.

Active Transportation Facilities

The recommended active transportation (AT) solution is to provide continuous cycling and pedestrian facilities along Kirby Road. Four alternative design concepts were developed to address the need for improved pedestrian and cyclist facilities and are:

- Alternative 1: Boulevard Cycle Tracks and Sidewalks, both sides
- Alternative 2: Multi-use Path (two-way shared facility), both sides
- Alternative 3: Multi-use Path One Side, Sidewalk One Side
- Alternative 4: On-road Bike Lane and Sidewalks

Based on the findings of the Active Transportation Alternatives Evaluation, **Alternative 1- Boulevard Cycle Tracks and Sidewalks, both sides** is recommended as the preferred active transportation alternative because it:

- Separates pedestrians and cyclists from vehicles
- Eliminates conflicts between pedestrians and cyclists with dedicated and separate facilities
- Provides pedestrians and cyclists with direct access to adjacent lands / destinations in both boulevards
- Minimizes potential conflicts at driveways and intersections with one-way cyclist travel

Roadway Widening

To widen and urbanize Kirby Road to four lanes, three widening alternatives were considered:

- Alternative 1: Widening about the Centreline
- Alternative 2: Widen to the North
- Alternative 3: Widen to the south

Based on the findings of the Roadway Widening Evaluation, **Alternative 1- Widening About the Centreline** is the recommended widening alternative because it:

- Maximizes the existing right-of-way and balances property impacts where additional property is required
- Provides opportunities to mitigate impacts following the best fit approach (varying boulevard widths and localized shifts in the road centreline) to minimize impacts to the natural environment and avoid residential displacement

Jog Elimination at Jane Street Intersection

To address the significant delay for drivers and safely accommodate other users (pedestrians and cyclists), three alternatives for the jog elimination of Kirby Road at its intersection with Jane Street were considered and are:

- Alternative 1: Northern Alignment
- Alternative 2: Central Alignment
- Alternative 3: Southern Alignment

Based on the findings of the Jog Elimination Evaluation, **Alternative 2 – Central Alignment** is recommended jog elimination alternative because it:

- Provides a new intersection that improves intersection operations and accommodates all users
- Is not anticipated to impact aquatic habitat or provincially significant wetland
- Minimizes impacts to archaeological sites
- Minimizes property impacts to residential properties and active agricultural operations

Barrie GO Rail Corridor Crossing

To address the recommendation to grade separate the Barrie GO railway crossing at Kirby Road the following alternatives were considered:

- Alternative 1 – At-Grade Crossing (maintain the at-grade rail crossing with widened Kirby Road)
- Alternative 2 – Underpass (Rail over Road)
- Alternative 3 – Overpass (Road over Rail)
- Alternative 4 – Hybrid (Hybrid Underpass: Raised rail with lowered road / Hybrid Overpass: Lowered rail with raised road)

Based on the findings of the Barrie GO Rail Crossing evaluation, **Alternative 2 - Underpass (Rail over Road)** is the recommended rail crossing alternative because it:

- Removes rail conflicts with pedestrians and cyclists, and minimizes pedestrian and cyclist travel distance with elevated pedestrian and cyclist platform
- Mitigates vehicle queuing caused by increased GO Train service
- Although the underpass is more costly it allows access to be maintained to adjacent land uses

The recommended typical cross-sections for the corridor were based on a context sensitive approach to balance the needs of the improvements and minimize adverse impacts. In some locations the width of the boulevards and area for street trees / landscaping were reduced to minimize impacts to properties and sensitive natural features. The recommended typical sections were further refined when incorporated into the recommended design.

Recommended Design

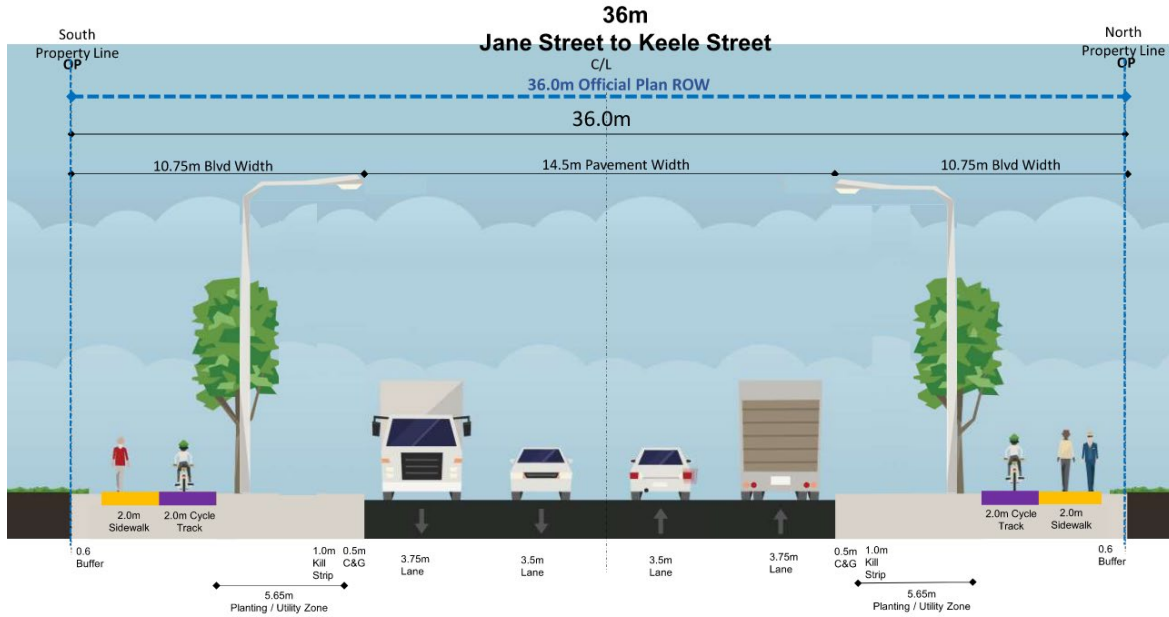
The recommended design of Kirby Road between Jane Street and Dufferin Street was chosen with consideration of transportation service for all road users (pedestrians, cyclists, transit riders, and motorists) and potential impacts to the natural environment, community, cultural heritage, operations, aesthetics, driveway access, property requirements, and capital construction and maintenance costs. It best meets the goals of the project with regards to transportation service improvements, while also considering the overall impact of the project and mitigation measures.

The recommended design includes the following elements:

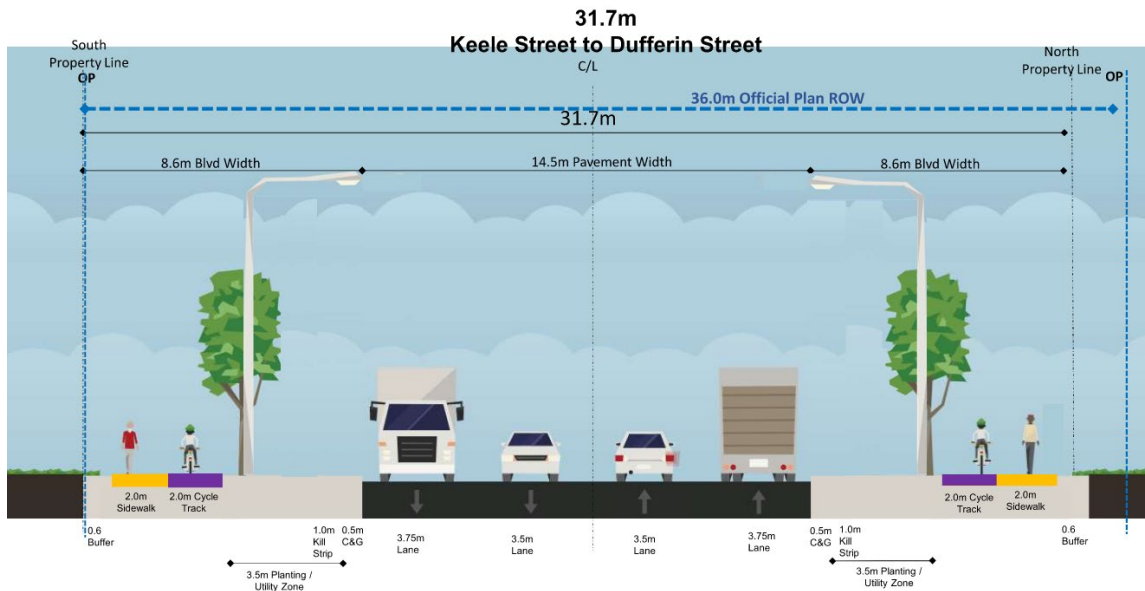
- Four general purpose lanes (two in each direction). Through lanes will be 3.5m and curb lanes will be 3.75m through a fully urbanized corridor
- 5.0m left turn lane (3.3m left turn lane with 1.7m island)
- Separated 2.0m boulevard cycle tracks (traveling in the same direction as the road) and 2.0m sidewalks on both sides of the road
- 0.5m curb and gutter with 0.6m rounding buffer
- Accessibility for Ontarians with Disabilities (AODA) compliant intersections with crossrides at intersections
- Re-aligned Kirby Road at a central new signalized intersection at Jane Street
- Culvert replacement at the Tributary to West Don River
- Underpass structure at Barrie GO Rail Crossing
- Extension of private driveway access to Keele Street
- Illumination along the corridor
- Utility relocations
- Opportunities for streetscaping in the boulevard
- Property requirements with temporary and permanent easements for construction, maintenance, and grading purposes

The typical cross-sections for Kirby Road between Jane Street and Keele Street and between Keele Street and Dufferin Street are illustrated in **ES- 5** and **ES- 6**.

ES- 5: Typical Cross-Section - Kirby Road (Jane Street to Keele Street)



ES- 6: Typical Cross-Section - Kirby Road (Keele Street to Dufferin Street)



Preliminary Cost Estimate

Based on preliminary cost estimates, the cost of the recommended improvements is estimated at **\$108M**. This preliminary cost estimate includes costs for road work, bridge and retaining wall construction, underpass, utility relocation, addition of streetlights, storm sewers and traffic signals, culvert replacement, landscaping, traffic control, and engineering services; however, property acquisition costs are not included in the estimate.

From the total project costs listed above, implementation of the Underpass will result in costs of approximately **\$74M**. This includes the structural (structure of underpass and rail bridge), design and construction administration, and contingency identified costs of the underpass, and retaining walls.

The extent of cost sharing with developers (including stormwater management facilities within the development and storm sewer systems) and with Metrolinx for the underpass design will be confirmed during Detailed Design.

The estimated costs are preliminary only and would be reviewed and confirmed during Detailed Design.

Potential Environmental Impacts and Mitigation

Anticipated impacts to the natural, socio-economic, and cultural environments, together with proposed mitigation measures, were identified to address the implementation of the preferred design. Anticipated impacts and proposed mitigation is provided for the following factors:

- Land Use and Socio-Economic Impacts
- Archaeology
- Built Heritage Resources and Cultural Heritage Landscapes
- Noise
- Property Requirements
- Climate Change
- Air Quality
- Source Water Protection
- Streetscaping / Urban Design
- Utilities
- Construction Detours/ Temporary Lane Restrictions
- Vegetation and Vegetation Communities
- Fisheries and Aquatic Habitat
- Wildlife and Wildlife Habitat
- Groundwater / Hydrogeology
- Surface Water
- Soil Removal and Contaminants
- Agricultural

Commitment of Future Work

This Environmental Study Report (ESR) identifies specific items to be reviewed and confirmed during the Detailed Design phase. Some of these commitments will address specific concerns raised by property owners and review agencies during the EA process. Items to be addressed during Detailed Design phase, include but are not limited to, resolution of outstanding concerns and any permits and approvals.

Timing of Improvements

Timing of improvements is to be confirmed during Detailed Design. Construction timing is anticipated to follow the timing outlined in the City's current (2022) Capital Plan. This plan is reviewed and approved by Council annually and is subject to change.

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1 Introduction and Background

The City of Vaughan has completed a Schedule 'C' Municipal Class Environmental Assessment (EA) study for Kirby Road between Jane Street and Dufferin Street. The EA study is referred to as the Kirby Road Widening EA (Jane to Dufferin). The study reconfirmed the recommendations for the corridor as identified in the City of Vaughan's Transportation Master Plan (2012), York Region's Transportation Master Plan (2016), City's North Vaughan and New Communities Transportation Master Plan (NVNCTMP, 2019), City's Pedestrian and Cyclist Master Plan, and has completed Phases 3 and 4 of the Municipal Class EA process for Schedule 'C' projects as outlined in the Municipal Engineers Association (MEA) Municipal Class EA guidelines (October 2000, as amended in 2007, 2011 and 2015).

1.1 Study Purpose

The purpose of the Kirby Road Widening Municipal Class EA study is to determine specific improvements to accommodate the current and future transportation needs of pedestrians, cyclists, transit users and motorists along Kirby Road from Jane Street to Dufferin Street.

1.2 Study Background

The City of Vaughan's Transportation Master Plan (2012) and the York Region Transportation Master Plan (2016) identified the need for Kirby Road improvements. Following completion of those studies the City's North Vaughan and New Communities Transportation Master Plan (NVNCTMP, 2019) undertook additional transportation planning analysis to support the development of two new community areas in the northern part of Vaughan and the proposed Kirby GO Station. The NVNCTMP study followed Approach #1 of the MEA Municipal Class EA guidelines (October 2000, as amended in 2007, 2011 and 2015) and identified the need for construction of the missing link between Dufferin Street and Bathurst Street, widening Kirby Road from Jane Street to Dufferin Street, jog elimination of the Kirby Road intersection at Jane Street, and grade separation of Kirby Road at the Barrie GO rail line. The completion of the NVNCTMP study in 2019 satisfied Phases 1 and 2 of the EA process and established the need and justification for Kirby Road improvements.

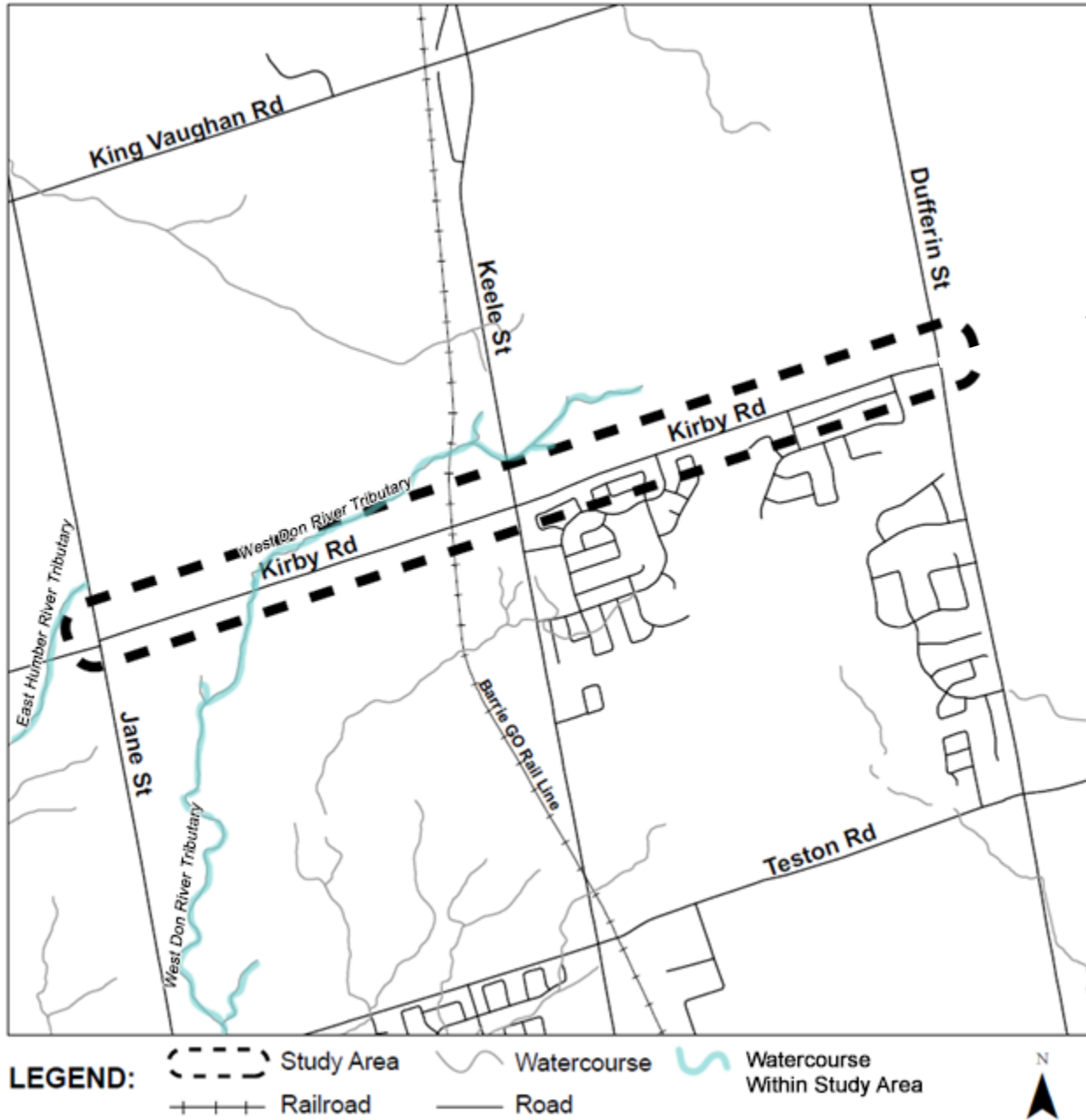
In 2019 the City of Vaughan completed a Schedule 'C' EA Study, referred to as the Kirby Road Extension EA to address the NVNCTMP's recommendation to construct the missing link along Kirby Road between Dufferin Street and Bathurst Street. The Kirby Road Extension EA study recommended to extend Kirby Road from Bathurst Street to Dufferin Street as four lanes (two in each direction) and to provide dedicated facilities for pedestrians and cyclists.

This Kirby Road Widening EA (Jane to Dufferin) study was undertaken to complete Phases 3 and 4 of the Municipal Class EA process for Schedule 'C' projects for the corridor. Specifically, it reviewed the recommendations to widen Kirby Road from two to four lanes between Jane Street and Dufferin Street, grade separate the Barrie Go Rail line at Kirby Road and eliminate the jog at the intersection of Kirby Road and Jane Street as identified in the preceding TMP studies.

1.3 Study Area

The Kirby Road Widening EA study corridor is between Jane Street and Dufferin Street in the City of Vaughan. Kirby Road is a two-lane rural, east-west arterial road. The Kirby Road Widening EA study area spans approximately 4.2 kilometers, as shown in **Figure 1-1**, and includes a crossing of the West Don Tributary east of Jane Street, and a crossing of the Barrie GO Rail line west of Keele Street. The East Humber River Tributary is located just west of the study limits.

Figure 1-1 Study Area



1.4 Environmental Assessment Process

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

1.4.1 Municipal Class Environmental Assessment Process

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

The MCEA process is an approved Class EA process that applies to municipal infrastructure projects including roads, water, and wastewater. This process provides a comprehensive planning approach to consider alternative solutions and evaluate their impacts on a set of criteria (e.g. transportation, environmental, social, engineering consideration) and determine mitigating measures to arrive at a preferred alternative for addressing the problem (or opportunity). The Class EA process involves a rigorous public consultation component that includes various provincial and municipal agencies, Indigenous communities, and the public, at each of the project stages.

The Kirby Road Widening EA study was undertaken in accordance with the MEA Class EA guidelines. Due to the type of project, anticipation for potential effects, and estimated capital costs, the Kirby Road Widening EA is defined as a Schedule ‘C’ project. A Schedule ‘C’ project involves either the construction of new facilities or major modifications to existing facilities. Modifications to existing facilities could include a road widening, intersection improvements, and/or other operational improvements.

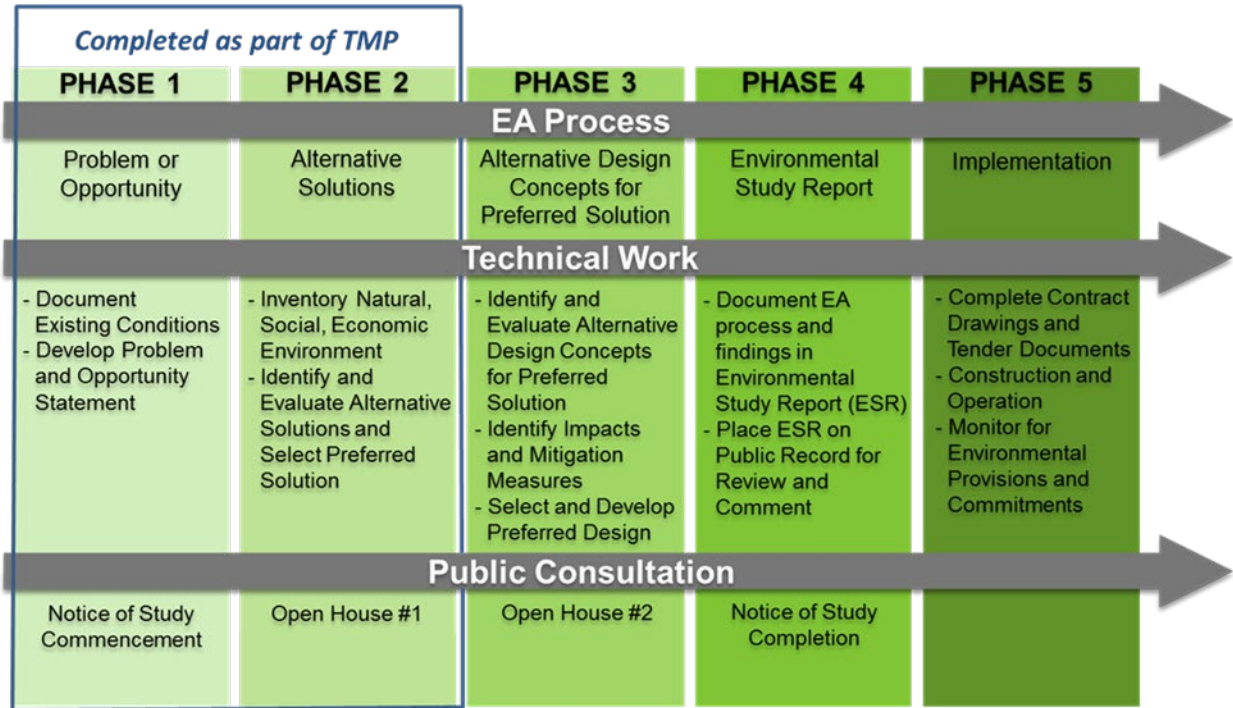
Figure 1-2 illustrates the sequence of activities within the approved Class EA process leading to project implementation. The phases for this study are described below:

- **Phase 1** (Problem and Opportunity) – Identify the problem (deficiency) or opportunity.
- **Phase 2** (Alternative Solutions) – Identify alternative solutions to address the problem or opportunity considering the existing environment, and establish the preferred solution considering public and agency input.
- **Phase 3** (Alternative Design Concepts for Preferred Solution) – Examine alternative methods of implementing the preferred solution, based on the existing environment, public and agency input, anticipated environmental effects, and methods of minimizing negative effects and maximizing positive effects.
- **Phase 4** (Environmental Study Report) – Document in an Environmental Study Report (ESR) a summary of the study background, problem statement, alternative solutions, alternative designs, and the public consultation process. Place the ESR on

public record for a minimum 30 calendar days for review, and notify completion of the ESR and opportunity for Section 16 Order requests.

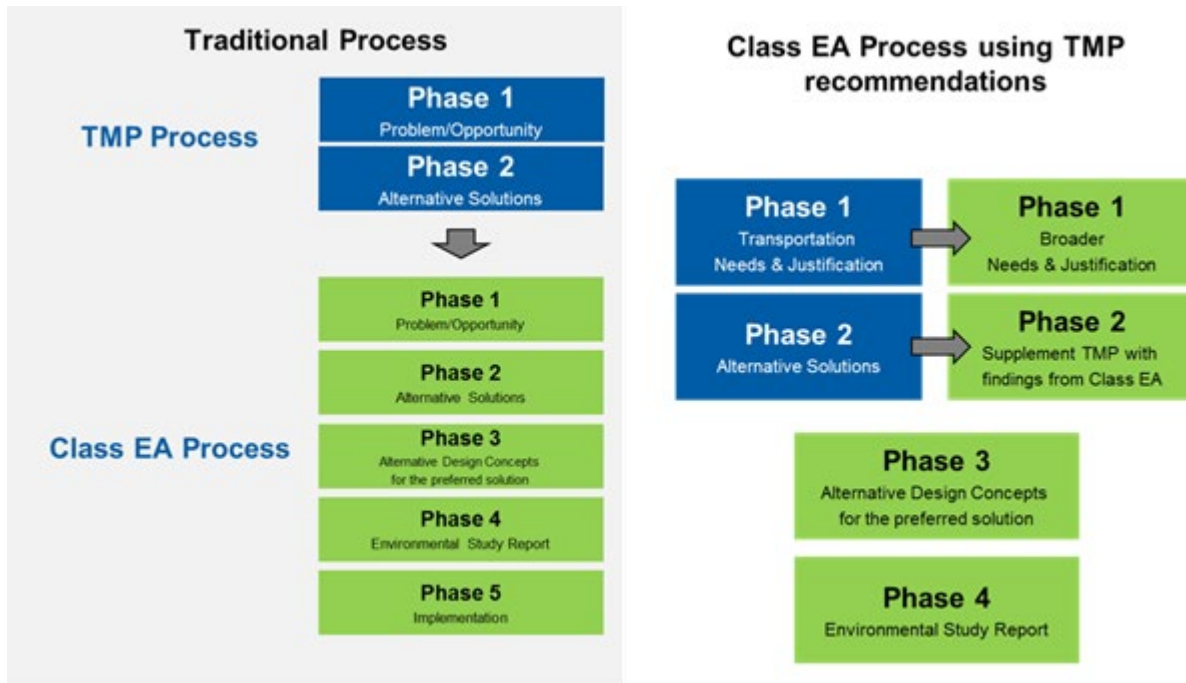
- **Phase 5** (Implementation) – This phase involves detailed design and the preparation of contract/tender documents followed by construction, operation, and monitoring.

Figure 1-2 The Class EA Process



A Transportation Master Plan (TMP) is conducted to examine the overall transportation system in order to outline a framework for planning for subsequent projects. The City’s TMP, York Region TMP, City’s Pedestrian and Cyclist Master Plan, and the City’s North Vaughan North Communities Transportation Master Plan (NVNCTMP) addressed Phases 1 and 2 of the Municipal Class EA process. Traditionally, specific projects within a TMP would fulfill all appropriate Class EA requirements by addressing Phases 1 through 4; however, this study built off the recommendations from the aforementioned TMPs including the NVNCTMP to form the basis of Phases 1 and 2 of this Class EA. It reconfirmed the needs and justification more closely at the corridor-level in terms of corridor-specific constraints and issues. Undertaking the Class EA Process using TMP recommendations provided an enhanced understanding of the transportation needs of the corridor in line with those of the overall regional transportation system. The traditional process compared to the process being implemented for this Class EA is illustrated in **Figure 1-3**.

Figure 1-3 Comparison of EA Processes



1.4.2 Section 16 Orders

The ESR is finalized, filed, and placed on public record for a minimum of 30 calendar days for review by the public and review agencies. At the time the report is filed, a Notice of Study Completion is advertised, to advise the public and other stakeholders where the ESR may be seen and reviewed, and how to submit public comments. The Notice also advises the public and other stakeholders of their right to request a Section 16 Order, and how and when such a request should be submitted.

On July 21, 2020, the Ontario province passed the *COVID-19 Economic Recovery Act*, which included important amendments to the Environmental Assessment (EA) Act. The amendments to the EA Act included, changes to the Section 16 Order Request process and sets up the authority of the Ministry of Environment Conservation and Parks (MECP) to create new regulations that would replace all Class EAs, including the Municipal Class Environmental Assessment (MCEA) process.

1.4.2.1 NEW APPEAL PROCESS

As part of the new appeal process, implemented by the amendments to the EA, proponents will continue to issue a Notice of Study Completion and place the EA documentation/ Environmental Study Report (ESR) on the public record for 30-days; however, instead of concerns being filed with the Ministry, concerns will be addressed to the proponent. The Section 16 Order process will only apply if the objective deals with aboriginal or treaty rights. All other concerns, the Section 16 Order process has been replaced with an additional 30-day window for the Ministry to decide if the Minister should take any action. Regional coordinators from the Ministry of

Environment, Conservation and Parks (MECP) will continue their role of monitoring MCEA projects. During the additional 30 days the Minister will decide if the project will be elevated (Section 16 Order granted) or if it will be approved with conditions. If the Minister advises the proponent that the project will be approved but with conditions, the Minister has more time to draft these conditions. If there is no response from the Minister within the additional 30-days, the proponent may proceed with the project.

1.4.3 Canadian Environmental Assessment Act

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

The Kirby Road Widening EA study does not constitute a “designated project” and therefore does not require an environmental assessment under the CEAA, 2012. However, the Minister of the Environment may order an assessment for any project not included in the project list, where there may be adverse environmental effects related to federal jurisdiction.

2 Consultation

Public input is an important part of the Class EA and the public was presented opportunities to participate in the planning process through a number of public and stakeholder consultation activities. The consultation requirement ensures that interested persons have an opportunity to voice their concerns on projects that may impact them or their environment.

The consultation undertaken for the Class EA Study is outlined herein and supporting materials for consultation with the public, agencies and Indigenous Communities are provided in **Appendix A, Appendix B** and **Appendix C** respectively.

2.1 Consultation Approach

Key consultation events undertaken throughout the EA study are listed in **Table 2-1** and are further elucidated in the following sections.

Table 2-1 List of Consultation Events

Consultation Event	Date
Notice of Study Commencement	January 2020
Notice of Online Survey	July 28, 2020
Online Survey	July 28, 2020 to Aug. 21, 2020
Notice of Public Information Centre	June 7, 2021
Public Information Centre	June 7, 2021 to June 30, 2021
Notice of Study Completion	June 23, 2022

A variety of methods were used to update and inform the public, agencies, stakeholders, and Indigenous Communities about the study progress, including:

- Letters
- Emails
- Post cards
- Meetings
- Phone calls
- Notices
- Newspaper advertisements
- Project website (www.vaughan.ca/KirbyWidening)
- City of Vaughan Social Media (Facebook, Twitter, Instagram, and LinkedIn)
- City's Website
- Online survey
- Public Information Centre (PIC)

The communication and consultation were conducted in compliance with the Accessibility for Ontarians with Disabilities Act (AODA).

Residents living along the study corridor were in receipt of mailed notices, post cards and letters. Following the study commencement, any individual who expressed interest in the project and requested, was added to the project mailing list (mail or email) to receive regular updates on the study progress.

To maximize public awareness, efforts such as social media posts (Facebook, Instagram, LinkedIn and Twitter), and regular updates to the project website provided information to the

“silent majority” – the members of the public interested in the project, but opt for a more passive role.

A Technical Advisory Committee (TAC) consisting of key technical agencies was formed for the study. In addition, a Stakeholder Group (SHG), consisting of public representatives who expressed interest in the study, was formed to gather feedback at key milestones in the process. Further details are provided in **Section 2.3** and **Section 2.4**.

2.1.1 Project Website

A project website (www.vaughan.ca/kirbywidening) was created for the study and launched in January 2020, to coincide with the issuance of the Notice of Study Commencement. The project website was updated as needed and provided information on the study background, study notifications, links to related studies, frequently asked questions (FAQ), ways to get involved, link to the online survey, virtual Public Information Centre and contact information to allow those interested in the study an opportunity to contact the project team.

2.2 Consultation Events

2.2.1 Notice of Study Commencement – January 2020

The Notice of Study Commencement with an accompanying letter invitation to join the Stakeholder Group was mailed to all identified stakeholders and property owners / residents living within 200m of the study corridor in January 2020. The Notice of Study Commencement was also mailed to all identified agencies with an accompanying letter invitation to join the Technical Advisory Committee in January 2020. The public was notified via the City’s project website (www.vaughan.ca/KirbyWidening) and newspaper advertisements.

Newspaper advertisements were published in newspapers with local circulation in the study area and are the King Connection Newspaper and the Vaughan Citizen Newspaper on the dates listed in **Table 2-2**.

Table 2-2 Notice of Commencement Newspaper Advertisements

Newspaper	Date
King Connection	January 16, 2020
	January 30 th , 2020
Vaughan Citizen Newspaper	January 16, 2020
	January 30 th , 2020

The Notice of Commencement was circulated to Indigenous communities based on direction of the Ministry of the Environment, Conservation and Parks (MECP) response to the Notice of Study Commencement.

2.2.2 Postcard and Online Survey #1

Postcards were distributed in August 2020 via mail to residents, property owners, stakeholders, agencies and Indigenous communities on the study mailing list and emailed to those on the email mailing list. The postcard contained a reference to the study website and announced the

details to access and participate in the online survey for the project to provide feedback. Notification of the online survey was also made through the City's social media updates (Facebook, Twitter, Instagram and LinkedIn), online advertisements on YorkRegion.com and City Media Release posted to the City's main website (www.vaughan.ca). The online survey was available on the study website from July 28, 2020 to August 21, 2020 and requested feedback on how the public uses the corridor today, input on identified improvements and preliminary thoughts on initial alternative design concepts and the evaluation criteria. Three hundred and seventy-nine (379) members of the public responded to the online survey.

Key public feedback received from the online survey is summarized as follows. These comments were considered in assessing and understanding the existing conditions, needs and opportunities for improvements in the corridor, and used in the development of options, evaluation criteria and evaluations:

- General support for separated cycling and pedestrian facilities
- Concerns that road widening will increase congestion
- Requests to introduce traffic signals to replace stop signs
- Request for transit service and better access to transit, by driving, walking and cycling
- Request for sidewalk and cycling facilities with mixed feedback regarding preference for cycling. Support for separated cycling from pedestrians and support for on-road cycling with increased separation to vehicles. General consensus on need for safe and dedicated cycling facilities due to the demand in the area.
- Improvements that support reduction in traffic congestion
- Concerns regarding road widening related to increased noise levels, air quality, residential property impacts and impacts to the natural environment
- Support for the project and identified improvements
- Consideration of roundabouts to improve traffic flow at Jane Street intersection
- Consideration of auxiliary turn lanes at intersections to improve traffic flow
- Request to increase the speed limit, and requests to decrease the speed limit
- Concerns with speeding and aggressive driving, and a need for enforcement

A summary report of the Online Survey including the communication materials, detailed comments and project team responses is provided in **Appendix A**.

2.2.3 Public Information Centre

The City held a virtual Public Information Centre (PIC) in place of an in-person event to keep the community safe by complying with regional and provincial guidelines and supporting physical distancing. Engagement for essential and priority projects continued online, paired with universally accessible methods. Community members and those interested in the project participated by viewing PIC materials posted on the City's project website

The following was used to notify the public and stakeholders of the virtual Public Information Centre (PIC):

- Direct mail of the Notice of PIC to 1,551 members of the public, including property owners and residents along the study corridor

- Direct mail of Notice of PIC and email to 47 agency representatives and 74 stakeholder group representatives
- Direct email of Notice of PIC and letter to 17 Indigenous Community representatives from 5 different communities
- Email notification with Notice of PIC to 236 individuals on the project email list – developed through previous responses to project notifications and requests to join the study mailing list
- Updates to project website, including the link to the online PIC on the project website: <http://www.vaughan.ca/kirbywidening> on June 7, 2021
- Public Service Announcement on June 7, 2021 and June 29, 2021
- Online advertisements as follows:
 - YorkRegion.com – “Have your say on ‘alternative designs’ to widen Kirby Road in Vaughan” on June 12, 2021
- Social media updates: City of Vaughan Facebook, Twitter, Instagram, and LinkedIn posts on June 7, 2021, June 14, 2021, June 21, 2021 and June 25, 2021
- Newspaper Postings (Vaughan Citizen and Thornhill Liberal) on June 3, 2021 and June 17, 2021

The PIC was posted on the City’s website between June 7, 2021 and June 30, 2021. The materials included a PIC presentation with transcript, comment form and PDFs of the recommended typical cross-sections, and plan and profile design plans. Individuals could visit the City website anytime 24/7 during this period to view the material at their leisure, learn about and share their input on the study findings and recommendations. An online commenting form was available for completion, and additional comments could be e-mailed to the City. The purpose of PIC was to:

- Share key feedback received on the project.
- Present the design approach, alternative design concepts considered, evaluations and preliminary recommendations for Kirby Road Improvements.
- Present the Preferred Preliminary Design.
- Receive input regarding the project and recommendations.
- Discuss next steps

There were two hundred and seven (207) users that visited the online PIC. Thirty-four (34) members of the public submitted comment forms, three (3) provided comments via email, one via phone call and additional comments were posted on the City’s Instagram post. Key public feedback received through PIC #2 is summarized as follows:

- Generally supportive of the recommended active transportation facilities of cycle tracks and sidewalks on both sides of Kirby Road.
- General support for widening Kirby Road about the centreline following a best-fit approach to minimize impacts.
- General support for the recommended re-alignment of Kirby Road about a central alignment to eliminate the jogged intersection at Jane Street.
- General support for the recommended underpass (rail over road) at the Barrie GO Rail Crossing at Kirby Road to grade separate the crossing.
- Inquiries regarding the need for improvements on the Kirby Road Widening corridor in advance of improvements on other corridors.

- Consideration of intersection operations and recommendations for improvements
- Safe and efficient facilities for pedestrians and cyclists
- Concerns for impacts to noise
- Concerns with preserving the natural environment
- Concerns for speeding

Key responses to comments received at the PIC include:

- The Kirby Widening EA study plans for a longer-term horizon year (2031) and not just the needs of today. The need for Kirby Road improvements, including widening to four lanes, was identified in the City's Transportation Master Plan (TMP), City's North Vaughan and New Communities (NVNC) TMP and York Region's TMP. These recommendations were reconfirmed in the Transportation and Traffic Study completed as part of this EA study.
- In addition to the Kirby Road Widening EA there are other planning studies in the surrounding area, either on-going or completed, that identify improvements to other corridors.
- A Transportation and Traffic study was undertaken as part of the EA study. The analysis was used to inform the recommendations at the intersections and identify and protect future needs required in the corridor to the year 2031, including the need to widen Kirby Road to 4 lanes.
- The proposed improvements recommend separated cycle track adjacent to a sidewalk in each boulevard. Pedestrian and cyclist crossings at driveways, entrances, and signalized and unsignalized intersections are being planned in accordance with applicable design standards.
- A Noise Impact Assessment Study is completed as part of the EA study and will identify mitigation measures where technically and economically feasible as a result of impacts from the proposed improvements.
- A Natural Heritage Impact Assessment is completed as part of the EA study and will identify mitigation measures. The proposed design is developed to minimize adverse impacts. Mitigation measures will be identified in the EA study in consultation with the conservation authority.
- The posted speed is not proposed to change. The proposed design introduces urbanization (curb and gutter) of the corridor, grade separation at the rail crossing, street trees, illumination, facilities for pedestrians and cyclists and pavement markings. Speed enforcement is required.

A summary report of the PIC including the communication materials, detailed comments and project team responses is provided in **Appendix A**.

2.2.4 Notice of Completion – June 2022

The Notice of Completion was mailed and emailed to all identified stakeholders, agencies, indigenous communities and property owners / residents on the study mailing lists. The public was also notified via the City's project website (www.vaughan.ca/KirbyWidening) and newspaper advertisements in the King Connection Newspaper and the Vaughan Citizen Newspaper on the dates listed in **Table 2-2**.

Table 2-3 Notice of Commencement Newspaper Advertisements

Newspaper	Date
King Connection	June 23, 2022
	June 30, 2022
Vaughan Citizen Newspaper	June 23, 2022
	June 30, 2022

2.3 Agency Consultation

In addition to City of Vaughan technical staff the following agencies, including federal departments, provincial ministries, municipalities, and utilities were contacted for information, comments, and input to the study. The list of agencies contacted includes:

Federal Agencies and Stakeholders

- Health Canada
- Fisheries and Oceans Canada
- Environment Canada
- Canadian Pacific Rail
- Canadian National Rail

- Infrastructure Ontario
- Ontario Provincial Police
- Metrolinx/GO Transit

Local and Regional Municipalities and Stakeholders

- City of Vaughan
- Regional Municipality of York
- York Region Transit (YRT)
- Toronto and Region Conservation Authority (TRCA)
- York Regional Police

Provincial Agencies and Stakeholders

- Ministry of Transportation (MTO)
- Ministry of Health and Long Term Care
- Ministry of Municipal Affairs
- Ministry of Housing
- Ministry of Natural Resources and Forestry (MNR)
- Ministry of Infrastructure
- Ministry of the Environment, Conservation and Parks (MECP)
- Ministry of Heritage, Sport, Tourism, and Culture Industries (MHSTCI)

Utilities and Services

- Hydro One Networks Inc.
- Alectra Utilities
- C/O Lehman & Associates
- TC Energy

MECP and MHSTCI were also key stakeholders that were circulated on technical reports and / or submissions as required to obtain input and technical review.

2.3.1 Technical Advisory Committee Meetings

In response to the Notice of Commencement, a Technical Advisory Committee (TAC) was formed comprising representatives from the City of Vaughan, York Region, Toronto and Region Conservation Authority (TRCA) and Metrolinx. TAC meetings, individual agency meetings and review package circulations were held / issued as required to discuss input, concerns, and technical details at various decision-making points throughout the study. The TAC was also invited to participate in the PICs.

The first Technical Advisory Committee (TAC) meetings were held on May 7, 2020. The TAC meetings consisted of a separate meeting with TRCA, and another meeting with City of Vaughan and York Region. The purpose of the meeting was to introduce the Kirby Road Widening EA project, provide an update, and obtain feedback on the study including existing conditions review (key features and challenges, and TMP recommendations), key design parameters, alternative design concepts, draft evaluation criteria, study schedule and next steps.

The second TAC meetings consisted of a separate meeting with City of Vaughan held on November 24, 2021, and another meeting with City of Vaughan, TRCA, and York Region on December 2, 2021. The purpose of the meeting was to provide an update on the Kirby Road Widening EA, with a focus on the Phase 3 Evaluation and Design package (provided prior to the meeting). The package included alternative design concepts, draft evaluations and the preliminary technical recommendations. The feedback from the meeting was considered along with feedback from internal City staff and the stakeholder groups to update and finalize the evaluations and recommendations, and to inform the development of the preferred design.

Members of the TAC were also circulated the Recommended Design package in April 2021 for review and input in advance of the PIC.

Key agency feedback received and meeting minutes are summarized in **Appendix B**.

2.4 Stakeholder Consultation

Stakeholders including adjacent landowners, residents, ratepayer groups, business associations, developers, and political representatives were identified through the Stakeholder Sensitivity Analysis and/or by requests submitted to the Project Team. The contact list was updated as the study progressed, and as additional stakeholders expressed their interest in the project. The list of stakeholders contacted by the team included:

Property Stakeholders

- Residents adjacent to the study corridor
- Property Owners adjacent to the study corridor

Ratepayer and Community Associations

- Mackenzie Ridge Ratepayers' Association

Interest Groups

- Smart Commute North Toronto, Vaughan
- York-Simcoe Naturalists
- Canadian Automobile Association (CAA)
- York Region Cycling Coalition

- Cycling and Pedestrian Advisory Council
- Cycling and Pedestrian Advisory Task Force
- Vaughan Bicycle User Group
- First Student Inc.

Local Business Associations

- Vaughan Chamber of Commerce
- Markham, Richmond Hill and Vaughan Chinese Business Association

Housing / Developer Groups

- Arista Homes Limited
- Armour Heights Developments Inc.

- Brattys LLP
- Canvas Developments
- Cortel Group
- Downing Street Property Management Inc.
- Emc Group Limited
- Heritage Hill
- History Hill Group
- Marquis Property Management Inc.
- Maple Downs Golf & Country Club
- Metrus Properties Limited
- My Design Studio Inc.
- P2 Realty Inc.
- PACE Developments
- Revive Condominium Management Services Inc.
- SmartCentres – Thornhill
- SmartCentres – Vaughan
- Trans Power Utility Contractors Inc.
- Ware Malcomb
- Block 27 Land Owners Group

- Tim Hortons
- Time 2 Time Convenience
- The Mortgage Centre
- Vista Day Care
- Vista Convenience
- Walkington Insurance

Educational Institutions

- St. Raphael the Archangel Catholic Elementary School
- Shining Light Montessori School
- St. Peter ACHS College School
- York Region District School Board
- York Catholic District School Board

Businesses adjacent to the study corridor include but are not limited to

- A&W Canada
- Bodylife Fitness
- Belle NY Nails
- Bliss Nail & Spa
- Carrick Macross Golf
- DanceWearChampions
- Express Cleaners
- Galina's BBQ Churrasqueira
- iLoveKickboxing.com
- Mid Ontario Truck Centre
- North Maple Dental
- Nova Era Bakery Pastry
- Petro-Canada
- Pizza Village
- Point Blank Martial Arts and Fitness
- Relax Tanning Inc
- Rizmi Stone & Aggregates
- Sherwood Court Long Term Care

A Stakeholder Group (SHG) was formed consisting of members of the public who expressed an interest in actively participating in the study. The SHG could include residents, representatives of resident associations, property owners, and commuters along the corridor. Meetings and circulations of materials for review with the SHG and the project team were held to provide a forum for focused discussion and to obtain feedback at key points during the study.

2.4.1 Stakeholder Group Meetings

The first Stakeholder Group (SHG) meeting was held virtually on May 14, 2020. The SHG meeting was held between 6:00PM and 8:00PM on WebEx Online Platform. The purpose of the first SHG meeting was to introduce and provide an update on the project, with a focus on existing conditions review (including key features and challenges and TMP Recommendations), initial alternative design concepts, draft evaluation criteria, study schedule and next steps to obtain input. A question-and-answer period was held at the conclusion of the presentation with members of the project team available to address questions.

An invitation to participate in SHG Meeting#1 was sent on March 10, 2020 via email. Forty-four (44) stakeholders were invited to participate. SHG members were circulated the draft presentation slides and a detailed comment form in advance of the meeting to facilitate providing input on the materials presented. Approximately 24 stakeholders participated at the SHG meeting and 7 comment forms / emails were submitted by April 30, 2020.

The second SHG meeting was held on December 14, 2020. The SHG meeting was held between 6:00PM and 7:30PM on the Microsoft Teams Online Platform. The purpose of the meeting was to provide an update on the Kirby Road Widening EA, with a focus on Phase 3 of the Environmental Assessment process to obtain the Stakeholder's group comments. The presentation includes alternatives design concepts, draft evaluations, and the preliminary technical recommendations. The feedback from this meeting was considered along with feedback from external review agencies to update and finalize the evaluations and recommendations, and to inform the development of the preferred design.

An invitation to participate in SHG Meeting#2 was first sent on November 18, 2020 by email. Fifty (50) stakeholders were invited to participate. SHG members were circulated the draft presentation slides in advance of the meeting to facilitate providing input on the materials presented. Approximately 14 stakeholders participated at the second SHG meeting.

Members of the SHG were also circulated the Recommended Design package in May 2021 for review and input as a preview in advance of the PIC.

The discussions from the meeting question and answer period, and summary of feedback received from the comment forms for both SHG meetings are summarized in **Appendix A**.

2.5 Indigenous Communities Consultation

Indigenous Communities who may have an interest in the study area were identified through correspondence from Ministry of the Environment, Conservation and Parks (MECP)'s response letter to the Notice of Commencement. Through this letter MECP delegated the procedural aspects of right-based consultation to the City. These communities were included in the mailing

list and received study notices through email. They were invited to participate in the study by providing input via direct correspondence with the project team, completion of the Online Survey and also participation in the online Public Information Centre via the project website. A summary of correspondence with Indigenous Communities is provided in **Appendix C**. The Indigenous Communities that were contacted are:

- Mississaugas of the Credit First Nation
- Hiawatha First Nation
- Curve Lake First Nation
- Alderville First Nation
- Mississauga's of Scugog Island First Nation
- Huron-Wendat Nation

Six Nations and Chippewas of Rama First Nation were circulated on the broad circulation for the online survey for the project but not on project notifications as they were not identified in MECP's Delegation letter. Six Nations of the Grand River requested additional project information (EA) and noted additional consultation may be required. The City clarified Six Nations were not included in the list of Indigenous Communities to consult for the study as they were not identified in MECP's Delegation Letter. The City provided a link to the project website which contained additional project information on the study and will the Notice of Completion for the ESR to Six Nations at the study completion. Chippewas of Rama First Nation acknowledged receipt of the correspondence.

Alderville First Nation responded to the project communications in July 2020. In follow-up correspondence to the City they indicated they had no interest in the project.

Hiawatha First Nation did not respond to any notices and updates regarding the EA Study.

Mississauga's of Scugog Island First Nation requested a copy of the Stage 1 Archaeological Assessment but did not provide any comments.

Huron-Wendat Nation responded to the Notice of Request to Consult requesting a copy of the Stage 1 Archaeological Assessment. The Stage 1 Archaeological Assessment was sent to Huron Wendat Nation. They noted they did not have specific comments on the Stage 1 AA report but requested involvement in the future stages of Archaeological Assessments. The City noted that future Stage 2 and 3 AA would be conducted during the Detailed Design stage of the project and Huron-Wendat will be consulted at that time when the work is being planned.

Curve Lake First Nation (CLFN) responded to the project notifications and initially noted the project did not fall within the Treaty Territory (Williams Treaty). The City responded that there was a boundary discrepancy and while it was being resolved the City would continue to keep CLFN engaged for the study. CLFN later noted the boundary encompassed the southeast corner of the City of Vaughan and requested the Stage 1 AA Report. The City shared the Stage 1 AA and clarified the project study corridor falls within north-east Vaughan. CLFN later issued a letter to request to participate in future archaeological assessment studies associated with the project to ensure that Indigenous Knowledge is included in the analysis and recommendations

and to ensure their Treaty rights are protected. The letter indicated the study corridor is situated within the Traditional Territory of Curve Lake First Nation, and requested that should excavation unearth bones, remains, or other such evidence of a native burial site or any other archaeological findings, Curve Lake First Nation be contacted immediately. A meeting took place with CLFN in October 2021 to discuss ongoing projects in the City of Vaughan. After the meeting the City provided follow-up correspondence to clarify that a formal request for review fee was not submitted to the City at the time the Stage 1 AA was circulated. The City also noted that future Stage 2 and 3 AA would be conducted during the Detailed Design stage of the project and CLFN will be consulted at that time when the work is being planned.

3 Planning Policy Context

A summary of the Provincial, Regional, and Municipal planning and policy context is provided in this section as they related to the Kirby Road Widening EA. Refer to **Appendix D** for additional details.

3.1 Provincial Planning Context

Provincial planning policies, summarized in **Table 3-1**, were reviewed to identify their relevance to the Kirby Road Widening EA.

Table 3-1 Summary of Provincial Planning Policies

Provincial Planning Document	Directions	Impact to Kirby Road Widening EA
Provincial Policy Statement, Ontario, 2020	<p><u>Description:</u> Provides direction on land use planning and development, and the transportation system.</p> <p><u>Directions:</u> The most relevant land use and transportation policies) include:</p> <ul style="list-style-type: none"> • 1.6.7.1 Transportation systems should be provided which are safe, energy efficient, facilitate the movement of people and goods, and are appropriate to address projected needs. • 1.6.7.2 Efficient use should be made of existing and planned infrastructure, including through the use of transportation demand management strategies, where feasible. • 1.6.7.3 As part of a multimodal transportation system, connectivity within and among transportation systems and modes should be maintained and, where possible, improved including connections which cross jurisdictional boundaries. • 1.6.7.4 A land use pattern, density and mix of uses should be promoted that minimize the length and number of vehicle trips and support current and future use of transit and active transportation. • 1.6.8.2 Major goods movement facilities and corridors shall be protected for the long term. • 1.6.8.3 New development should be compatible with the long-term purposes of the corridor. 	<p>The Kirby Road Widening EA will consider projected needs for both people and goods, encourage travel demand management, and consider all travel modes.</p>

Provincial Planning Document	Directions	Impact to Kirby Road Widening EA
<p>Growth Plan for the Greater Golden Horseshoe (GGH), Ministry of Municipal Affairs, 2006, 2013, 2017 Update</p>	<p><u>Description:</u> The Growth Plan for the GGH was released on June 16, 2006, and is a long-term plan that aims to:</p> <ul style="list-style-type: none"> • Revitalize downtowns • Create complete communities • Provide housing options to meet the needs of people at any age • Curb urban sprawl and protect farmland and green spaces • Reduce traffic gridlock by improving access to a greater range of transportation options <p>The June 2013 amendment extended the growth planning horizon to 2041 while the 2016 update identified new intensification targets.</p> <p><u>Directions:</u> The Growth Plan defines specific policies for where and how to grow, including the identification of defined urbanized areas versus a protected Greenbelt Area. The plan also identifies Urban Growth Centres across the Greater Toronto Area (GTA), Major Transit Station Areas and Intensification Corridors.</p> <p>There has been a 2017 update and a 2020 consolidation to the Growth Plan. The updates revised growth targets but does not change the mandate to intensify Urban Growth Centres, Major Transit Station Areas, and Intensification Corridors.</p>	<p>The study area is at the northern boundary of the urbanized area. The Vaughan Metropolitan Centre, a designated Urban Growth Centre south of the study area, and the future Kirby GO station through which transit connections to the greater regional rapid transit network can be made will be considered in the study.</p>

Provincial Planning Document	Directions	Impact to Kirby Road Widening EA
<p>2041 Regional Transportation Plan updated in 2018 from The Big Move, Metrolinx, 2008</p>	<p><u>Description:</u> The Big Move is the Greater Toronto and Hamilton Area's (GTHA's) multi-modal long-range regional transportation plan. Since 2008 this plan has been providing strategic direction for planning, designing and building a regional transportation network that enhances quality of life, environment, and prosperity.</p> <p><u>Directions:</u> The Big Move sets the context for the GO Expansion project [formerly known as Regional Express Rail (RER)], a frequent all-day, two-way express rail service on existing GO Rail lines with 15 minute frequencies using future electrification infrastructure.</p> <p>In order to support the expanded services, improvement to infrastructure is needed:</p> <ul style="list-style-type: none"> • Track expansion, including upgrade of existing structures within corridor such as culverts, bridges • Grade separations • Maintenance and storage facilities • Electrification infrastructure • Station Expansion (parking, building, pedestrian access, etc) • New station(s) along corridor that will optimize ridership and minimize delay <p>As of 2018, the 2008 Big Move has been updated to the 2041 Regional Transportation Plan (RTP)</p>	<p>The Kirby GO Station is included as a new station along the Barrie GO Corridor as part of the GO Expansion project with direct access to Kirby Road within the Kirby Road Widening EA study limits (in the vicinity of Kirby Road and Keele Street intersection). The City will work with Metrolinx to implement transit supportive planning around the station, develop sustainable station access solutions, and support the works required for GO Expansion, including planning for grade separation of rail crossings.</p>

Provincial Planning Document	Directions	Impact to Kirby Road Widening EA
<p>Transit-Supportive Guidelines, Ministry of Transportation, 2012</p>	<p><u>Description:</u> Identifies best practices in Ontario, North America and abroad for transit-friendly land-use planning, urban design, and operations.</p> <p><u>Directions:</u> Key directions relevant to the Kirby Road Widening EA include layout and spacing of arterial and collector streets:</p> <ul style="list-style-type: none"> • Street networks are fine-grained and interconnected to provide efficient transit services and connections to transit stops • Eliminate unnecessary jogs or breaks in the network • Spacing of arterial and collector roads should support a maximum 400 m walk from the interior of a block to a transit stop, and facilitate higher levels of walking and cycling • Access routes to transit stops, such as pedestrian pathways or local roads, should be spaced no greater than 200 m apart. <p>Key directions for planning around major transit station areas include:</p> <ul style="list-style-type: none"> • A rational progression of facilities from passenger pick up and drop off / bus transfer / parking areas to ticketing and wayfinding, safe and comfortable waiting areas, and finally to transit loading areas • Organize surface parking areas into smaller modules to facilitate defined walking and cycling paths to the stations and also establish future development parcels over time • Prioritize pedestrian access • Limit free surface parking where frequent feeder transit service is available 	<p>The Kirby Road widening shall be planned in consideration of the Transit Supportive Guidelines.</p>
<p>#CycleON: Ontario's Cycling Strategy, Ministry of Transportation, 2013</p>	<p><u>Description:</u> Identifies a vision for cycling in the province over the next 20 years where cycling is valued as a core mode of transportation.</p> <p><u>Directions:</u> Key directions relevant to the Kirby Road Widening EA include:</p> <ul style="list-style-type: none"> • Partner with municipalities to implement Complete Streets policies and develop active transportation plans • Partner with municipalities / transit agencies to integrate cycling and transit • Develop a funding partnership to build provincial and municipal cycling routes, including pilot program funding to gather data and test new ideas • Create communities that have a built form that supports and promotes cycling for all trips under 5 km 	<p>The Kirby Road Widening EA strives to plan for cycling infrastructure and complete communities in accordance with this plan.</p>

Provincial Planning Document	Directions	Impact to Kirby Road Widening EA
Ontario's Climate Change Action Plan	<p><u>Description:</u> Identifies a five-year plan to fight climate change, reduce greenhouse gas pollution, and transition to a low-carbon economy.</p> <p><u>Directions:</u> Specific action areas are identified to meet specific greenhouse gas emission reduction targets:</p> <ul style="list-style-type: none"> • Transportation: Becoming a North American leader in low-carbon and zero-emission transportation <ul style="list-style-type: none"> ○ Increase the use of electric vehicles ○ Support cycling and walking ○ Support the accelerated construction of GO Expansion project (formerly known as Regional Express Rail) • Land use planning: Support low-carbon communities <ul style="list-style-type: none"> ○ Strengthen climate change policies in the municipal land use planning process ○ Eliminate minimum parking requirements 	The implementation of Active Transportation and Travel Demand Management (TDM) to promote sustainable mode of transportation to increase the number of active transportation trips and reduce the number of single-occupancy vehicles will be considered during the alternative analysis.
Greenbelt Plan (2017)	<p><u>Description:</u> In concert with the Growth Plan, Niagara Escarpment Plan (NEP) and Oak Ridges Moraine Conservation Plan (ORCMP), and further to the PPS, the Greenbelt Plan establishes land use planning framework for the GGH to support a clean and healthy environment, a thriving economy and social equity.</p> <p><u>Directions:</u> Identifies areas where urbanization should not occur in order to protect the ecological, agricultural, and hydrological land use. Lands identified in the NEP and ORCMP are also included in the Greenbelt Plan.</p>	Kirby Road Widening EA strives to support the achievement of complete communities and community hubs that are conveniently accessible by active transportation and transit. Infrastructure will integrate with land use planning while minimizing environmental impacts in the Protected Countryside of the Greenbelt Area.
Oak Ridges Moraine Conservation Plan (2002), Updated in May 2017	<p><u>Description:</u> Identifies policy and plans to provide land use and resource management direction for the 190,000 hectares of land and water within the Moraine. The subject area is also accounted for in the Greenbelt Plan.</p> <p><u>Directions:</u> Protect the ecological and hydrological integrity of the Oak Ridges Moraine Area and provide land and resource uses and development that are compatible with other objectives of the Plan. Transportation infrastructure development is permitted in key natural heritage features and hydrological sensitive features if it will not adversely affect these features.</p>	The Oak Ridges Moraine Area is part of the lands designated under the Greenbelt Plan and is a significant portion of the study area between east of Keele Street and Dufferin Street. Similar to the Greenbelt Plan, the Kirby Road Widening EA will strive to minimize disturbance and respect the land and its key natural heritage features.

3.2 Regional Planning Context

The Regional Municipality of York Official Plan (ROP) and York Region Transportation Master Plan build upon provincial planning guidance and provide more specific direction on the need for transportation improvements to support growth in the Region, and these documents are summarized in the following sections.

3.2.1 Regional Official Plan (April 2019)

The ROP represents the Region's vision and plan for the way communities are designed, serviced, and supported. The objectives of the Plan include: Sustainable Natural Environment, Healthy Communities, and Economic vitality.

The plan emphasizes interconnected and accessible mobility systems, with a priority on pedestrian movement, and on transit use and access. Some of objectives related to the widening of Kirby Road include: create an active transportation system and programs that encourage walking, cycling and the use of public transit, provide transit service that is convenient and accessible to all residents and workers of York Region, ensure streets support all modes of transportation including walking, cycling, transit, automobile use, and the efficient movement of goods, plan and protect future urban and rural streets to accommodate transportation demands, and promote a linked and efficient network for goods movement that supports economic vitality and minimizes conflicts with sensitive land uses.

3.2.2 Regional Transportation Master Plan (November 2016)

York Region's Transportation Master Plan (TMP) Update, 2016 addresses the Region's mobility needs to 2041. It provides a 25 year outlook to:

Create an advanced interconnected system of mobility in the Greater Toronto and Hamilton Area (GTHA) in order to give York Region residents and businesses a competitive advantage, making York Region the best place to live, work and play in the GTHA.

The Region's TMP has five objectives:

1. Create a world class transit system
2. Develop a road network fit for the future
3. Integrate active transportation in Urban Areas
4. Maximize the potential of employment areas
5. Make the last mile work

Kirby Road, while currently a City Road, forms part of the Regional concession road grid network. The Region's TMP identifies Kirby Road from Highway 27 to Bathurst Street as a candidate to be added to the Regional Road network. In addition, the Region's TMP makes specific recommendations for Kirby Road (which extends from Albion Vaughan Road to Dufferin Street in the City of Vaughan) to provide regional east-west connectivity and transportation capacity through or adjacent to the study area including:

- Widening of Kirby Road plus the completion of the Kirby Road missing link
- Designation as a Frequent Transit Network corridor

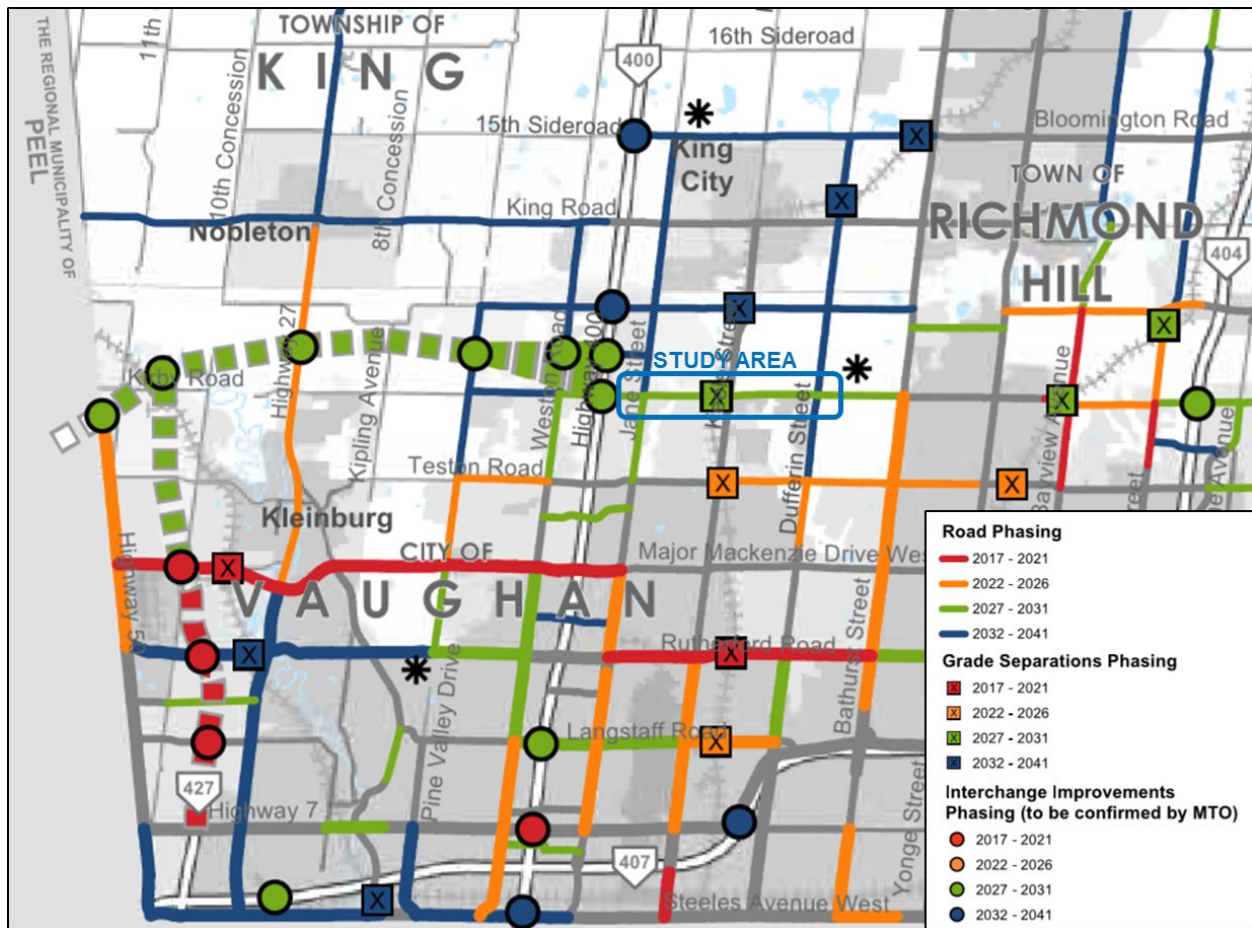
- Cycling Facilities as a local cycling route of regional significance
- Designation as a strategic goods movement corridor
- Construction of an interchange at Highway 400 and Kirby Road
- Grade Separation at the Barrie GO rail line at Kirby Road

Additional mode-specific details on Region’s TMP recommendations are provided in the following sections.

3.2.2.1 ROAD NETWORK RECOMMENDATIONS

The 2016 York Region TMP update identified the Regional significance of Kirby Road (currently under jurisdiction of the City of Vaughan) as a frequent transit, vehicular traffic, pedestrian/ cycling, and strategic goods movement corridor. The road phasing and grade separation phasing are scheduled for 2027-2031 as shown in **Figure 3-1**.

Figure 3-1: 2031 Region’s TMP Road Network (Source: York Region Transportation Master Plan)

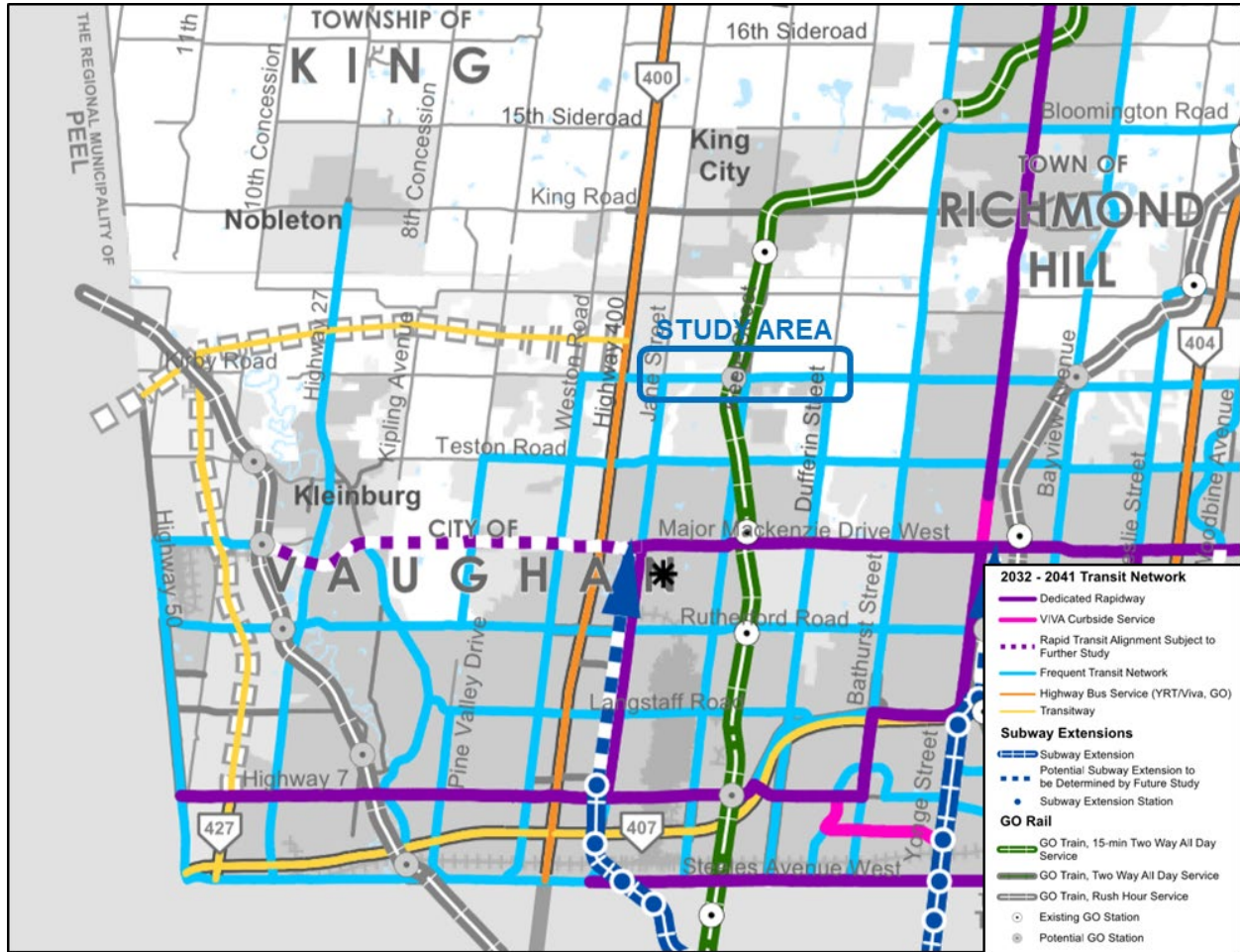


3.2.2.2 TRANSIT NETWORK RECOMMENDATIONS

As identified in **Figure 3-2**, York Region is planning for frequent transit service on Kirby Road east of Weston Road within the Kirby Road Widening EA study area. This frequent transit service will connect the development of the New Communities and Highway 400 Employment

lanes to the proposed Kirby GO Station, Vaughan Metropolitan Centre, the rest of Vaughan and the City of Toronto. Frequent Transit Network service is defined as bus service every 15 minutes or less between 6AM and 10PM, seven days a week.

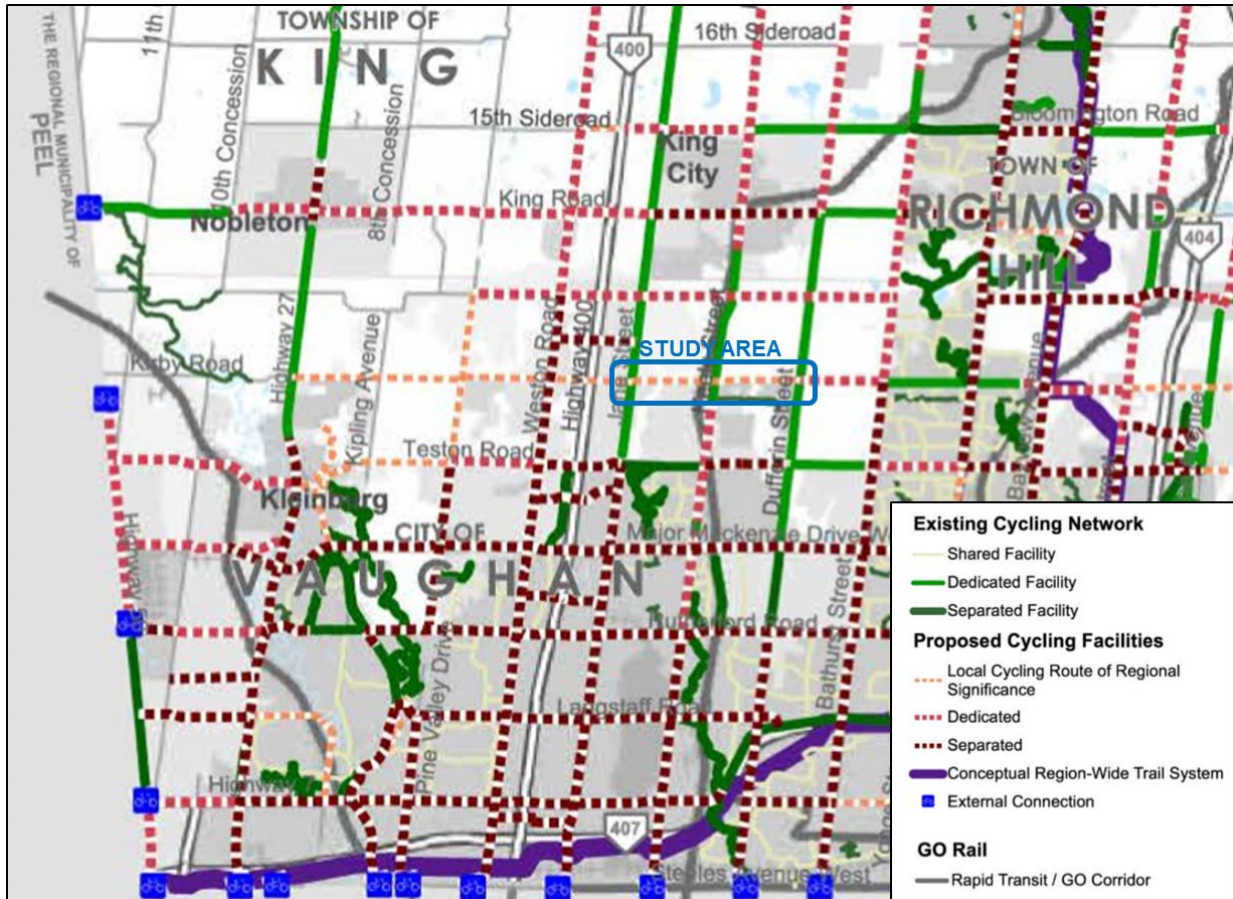
Figure 3-2: 2041 Region's TMP Transit Network



3.2.2.3 CYCLING NETWORK RECOMMENDATIONS

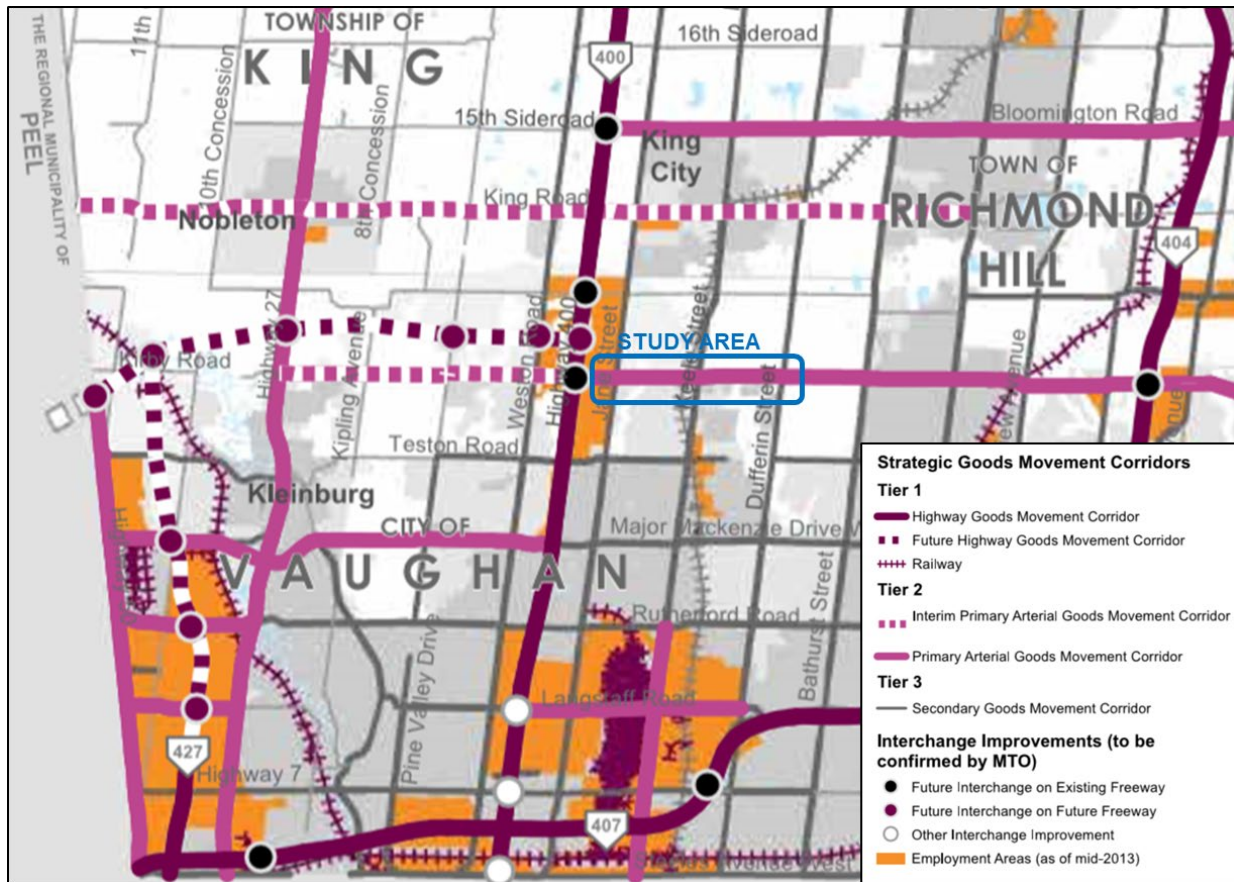
The York Region TMP 2016 recommends cycling infrastructure for a 10-year horizon and for a 25-year horizon. Within the study area and for the 10-year horizon the TMP recommends a Local Cycling Route of Regional Significance (shown in **Figure 3-3**).

Figure 3-3: Proposed 2041 Region’s TMP Cycling Network



3.2.2.4 GOODS MOVEMENT NETWORK RECOMMENDATIONS

York Region’s Strategic Goods Movement Network provides a framework for future goods movement within the Study Area. It consists of a hierarchy of corridors, identifying all freeways as Tier 1 (Highway Good Movement Corridors), strategic arterial roads as Tier 2 (Primary Arterial Goods Movement Corridor), such as Kirby Road through the Study Area, and all other roadways as Tier 3 (Secondary Goods Movement Corridors). The Region’s Proposed Strategic Goods Movement Network is illustrated for the Study Area in **Figure 3-4**.

Figure 3-4: Region's TMP Strategic Goods Movement Network


3.2.3 Kirby Road Widening Project Sheet

Further to the York Region TMP's mode specific recommendations for Kirby Road, a project sheet from the York Region TMP outlines the problem and opportunity, alternatives considered, and recommendations as follows:

Problem and Opportunity:

- Transportation network improvements are needed to accommodate expansion of the Designated Urban Area.
- Capacity improvements needed to accommodate future travel demands.
- Corridor improvements needed to support walking and cycling.

Alternatives Considered:

1. Do Nothing - Does not address Problem or Opportunity Statement.
2. Optimize existing facility with intersection improvements only - Minor improvement for corridor traffic flow. Does not address overall traffic congestion.
3. Urbanize corridor but maintain 2-lane cross-section - Does not address traffic congestion. Opportunity to improve walking and cycling facilities.
4. Widen corridor to 4 lanes and construct to urban arterial standard - Addresses traffic capacity. Opportunity to improve walking and cycling facilities.

5. Widen parallel/adjacent corridor - Potential to divert some traffic to other corridors. Does not address corridor congestion and provides no improvements to walking and cycling facilities.

Recommended Improvement and Justification:

- Widen corridor to 4 lanes and construct to urban arterial standard and realign jogged intersection. 2027 to 2031 timing to Weston Road to Dufferin Street and 2032 to 2041 timing to widen Pine Valley Drive to Weston Road.
- Serves growth in designated built up areas in North Vaughan. Corridor is an Interim Primary Arterial for Goods Movement. Widening provides for continuous 4-lane east-west corridor tying into 19th Avenue to the east with the planned connection of the missing link east of Dufferin Street. Elimination of jogged intersection at Jane Street to improved traffic flow. Opportunity to improve walking and cycling facilities.

3.3 Municipal Planning Context

3.3.1 City of Vaughan Official Plan

The City of Vaughan Official Plan 2010 (VOP 2010) was approved by Council on September 7, 2010. The VOP 2010 was endorsed by Regional Council on June 28, 2012. VOP 2010 is part of a Growth Management Strategy “that will shape the future of the City and guide its continued transformation into a vibrant, beautiful and sustainable City.”

The following policies, with VOP 2010 references in brackets, are of relevance to the study area:

- To establish a comprehensive transportation network that allows a full range of mobility options, including walking, cycling and transit (4.1.1.1).
- That the street network will be the basis for enhanced transportation opportunities, including transit, walking, cycling, and place making initiatives. Existing rights-of way should be designed to optimize the efficient movement for a variety of modes, potentially resulting in reduced capacity for cars where overall capacity increases can be achieved (4.1.1.5).
- To support the development of a comprehensive network of on-street and off-street pedestrian and bicycle routes, through the implementation of the City’s Pedestrian and Cycling Master Plan and York Region’s Pedestrian and Cycling Master Plan; and to facilitate walking and cycling and to promote convenience and connectivity (4.1.1.6).
- To plan for a street network that prioritizes safe and efficient pedestrian travel while effectively accommodating cyclists, transit and other vehicles, and to create more pedestrian and transit-friendly street cross-sections (4.2.1.2).
- To provide a minimum of 2 north / south and 2 east / west collector streets in new development where feasible, including grade-separated crossings of 400-series highways and rail corridors. The purpose of these streets will be to provide for local travel between and within concession blocks without the necessity of traveling on arterial streets and to provide effective routing for transit vehicles. (4.2.1.23).

Schedule 9 and Schedule 10 in the VOP 2010 identify the City's Future Transportation Network and Major Transportation Network, respectively. It is noted that these schedules were developed prior to the completion of the 2016 York Region TMP, and as such, incorporate Regional plans based upon the previous version of the York Region TMP. Kirby Road is under the jurisdiction of the City and is identified as a 36 m wide minor arterial road, as shown on Schedule 9 "Future Transportation Network" of VOP 2010. Some of the key transportation improvements related to the study area or adjacent to it include:

- Completion of the Kirby Road missing link between Dufferin Street and Bathurst Street.
- Jog elimination at Jane Street and Kirby Road
- Grade separation along the GO Rail Barrie Corridor at Kirby Road subject to coordinated studies by Metrolinx, York Region and the City
- Kirby GO Station

3.3.2 Green Directions Vaughan

Green Directions Vaughan 2019 is the City's sustainability plan. It identifies actions to ensure the health, well-being and vitality of the community. In relation to the Kirby Road Widening EA, this plan provides direction to ensure that getting around Vaughan is easy and has a low environmental impact. The Kirby Road Widening EA will look to promote sustainable and active transportation in accordance with Green Directions Vaughan.

3.3.3 City of Vaughan Transportation Master Plan 2013: A New Path

The Vaughan Transportation Master Plan (VTMP) identifies City-wide transportation needs to the year 2031, including local improvements, strong Regional investments in transit service, and arterial road improvements, sidewalks, on-street and off-street bicycle facilities, and a mix of land uses. Within the study area the timing of recommended improvements identified in the VTMP varies from the YRTMP recommendations given more up-to-date information on timing of development. As an example, the timing for the Kirby Road widening (from 2 to 4 lanes) and the missing link between Keele Street and Bathurst Street is 2021 as per the VTMP versus 2031 as per the YRTMP. It should be noted that the VTMP is currently being updated.

3.3.4 City of Vaughan Pedestrian and Bicycle Master Plan

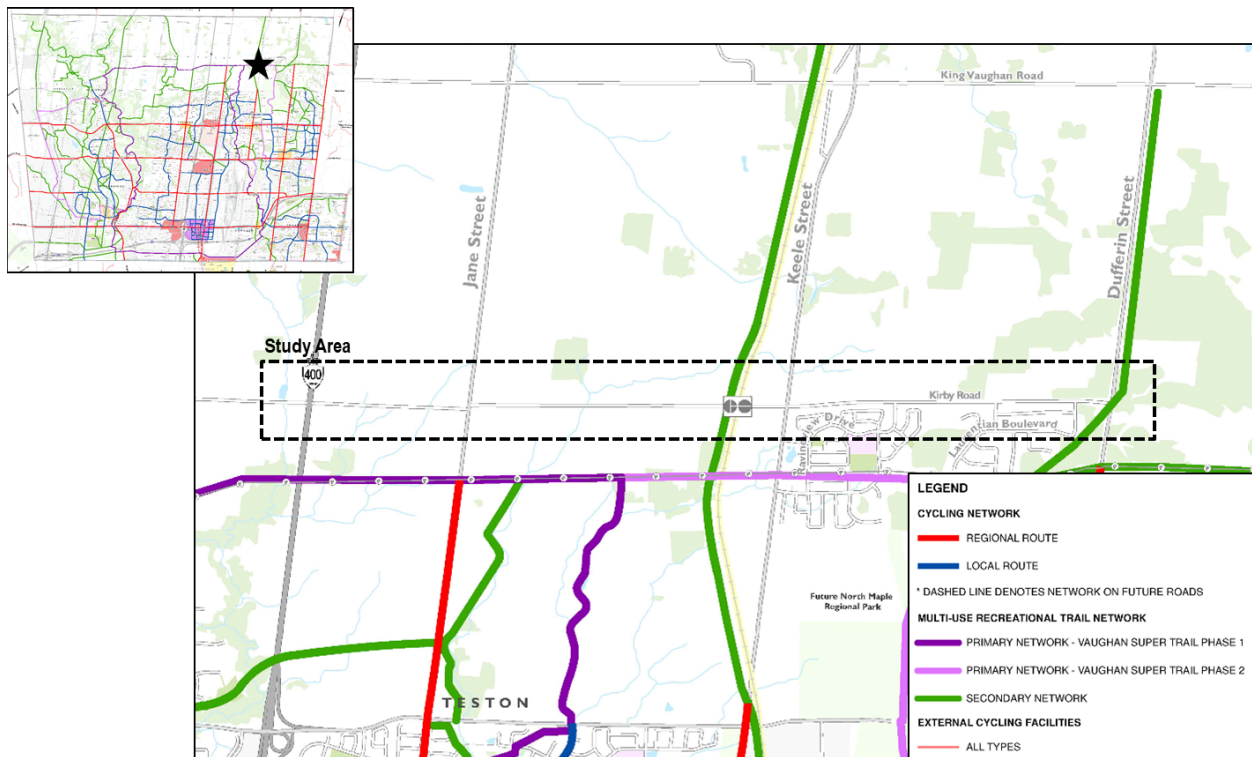
The City of Vaughan adopted the Pedestrian and Bicycle Master Plan in January 2007 and is currently being updated. The Plan has a 20-year horizon. The central intent is to guide improvements to existing and proposed pedestrian and cycling infrastructure in order to create a friendlier environment for residents. The two central goals of the plan are:

- To create new environments and enhance existing ones for both pedestrians and cyclists in the City of Vaughan. These environments should be supported by developing a visible and connected pedestrian and cycling network in Vaughan that integrates, enhances and expands the existing on- and off-road pedestrian and cycling facilities.
- To facilitate an increase in walking and cycling for leisure and utilitarian purposes.

Cycling facilities in the study area were initially identified in the City's Pedestrian and Bicycle Master Plan and more recently updated for the City-wide TMP.

The Pedestrian and Bicycle Master Plan update endorses the Vaughan Super Trail, a signature active transportation facility that links communities to one another, and increases accessibility for residents and visitors alike to important cultural, natural, heritage, and public space destinations. The Vaughan Super Trail is proposed to run east-west direction located south of the Kirby Road Widening EA corridor. No cycling facilities are, however, identified on Kirby Road Widening EA corridor as shown in **Figure 3-5**. However, the City of Vaughan policy is to explore active transportation facilities on all arterial roads and this study will explore the need for cycling facilities on Kirby Road.

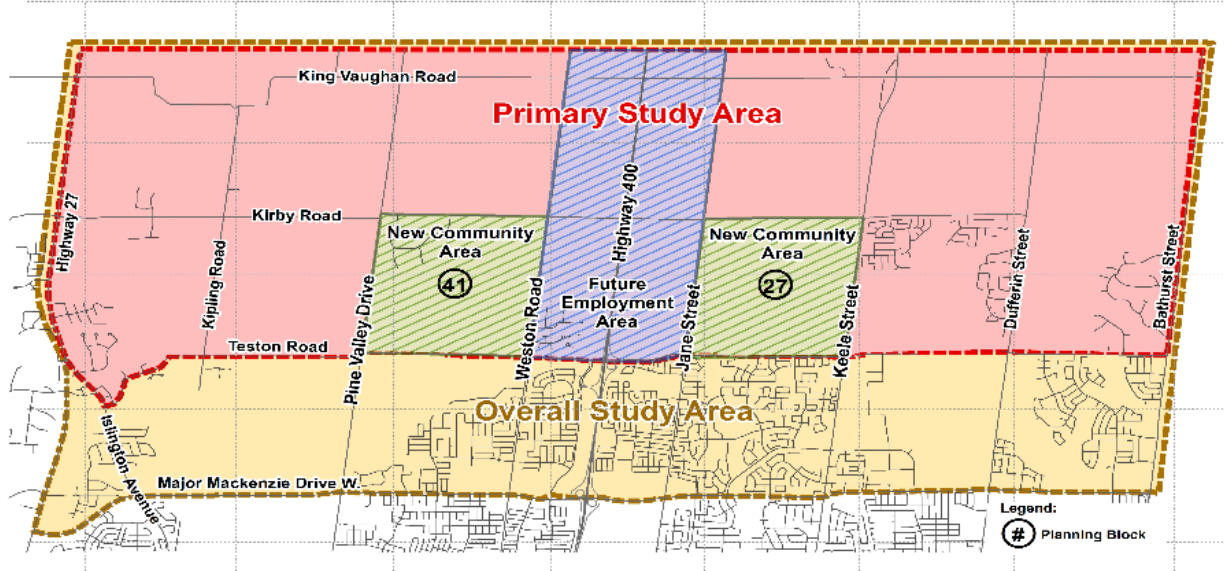
Figure 3-5: Pedestrian and Cycling Master Plan Update



3.3.5 North Vaughan and New Communities Transportation Master Plan (NVNCTMP)

The North Vaughan and New Communities Transportation Master Plan (NVNCTMP) is a long-range plan that supports policies, programs and infrastructure required to meet existing and future mobility needs and provide context for transportation decisions within North Vaughan. The primary and overall study areas are shown in **Figure 3-6**.

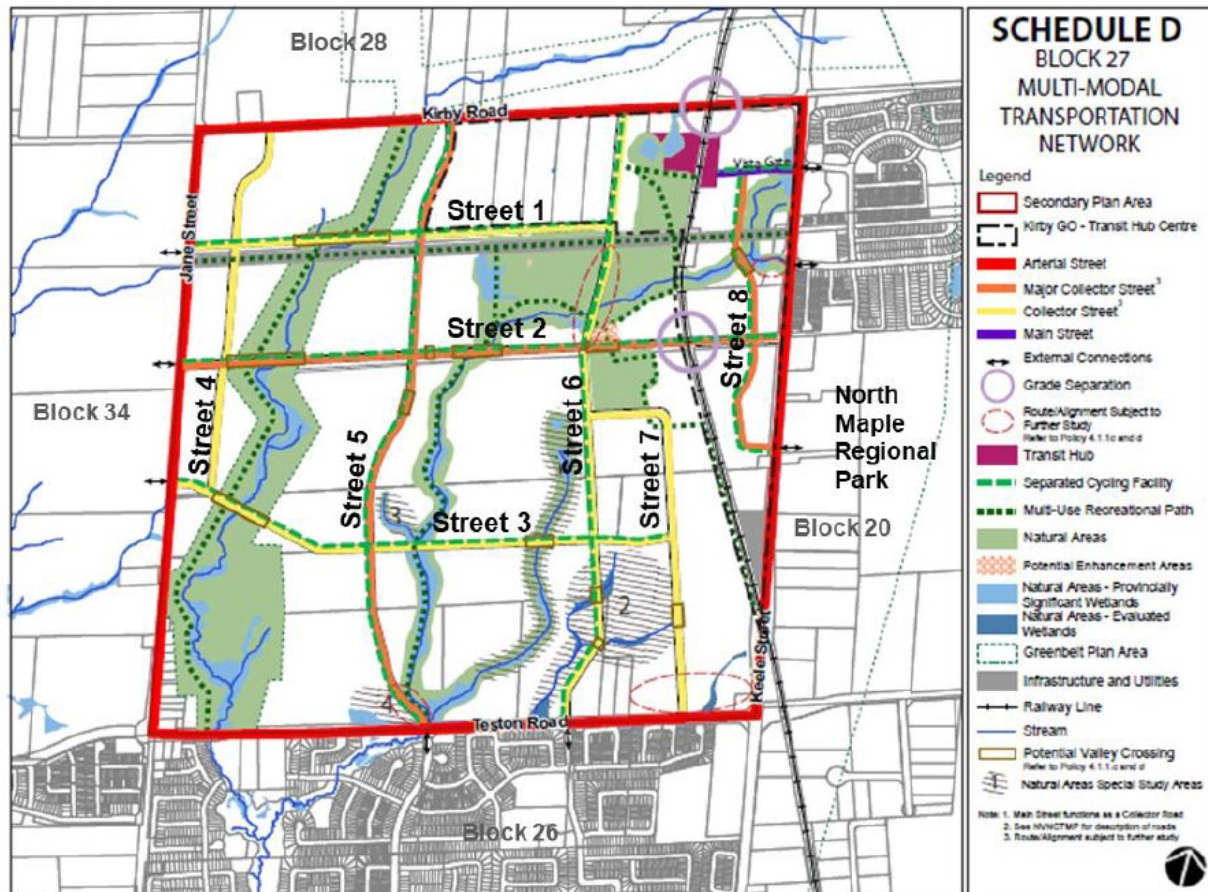
Figure 3-6: NVNCTMP Primary and Overall Study Area



The objective of the plan is to look at both internal and external factors that contribute to achieving sustainable transportation for residents and businesses while ensuring recommendations of the plan address the transportation network needs from immediate to future growth. The NVNCTMP has satisfied the Phases 1 and 2 of the Municipal Class EA process and recommended completion of an Environmental Assessment Study for Kirby Road from Jane Street to Dufferin Street to satisfy Phase 3 and 4 of the Class EA to address the NVNCTMP recommendations for grade separation at Barrie GO railway, jog elimination at Kirby Road intersection at Jane Street, active transportation improvements, and widening Kirby Road from two to four lanes within a 36m right-of-way to support Block 27 development and the future Kirby GO station.

3.3.6 Block 27 Secondary Plan

The NVNCTMP was conducted in parallel and in close coordination with the secondary plan study for the New Community Area of Block 27, bound by Teston Road to the south, Keele Street to the east, Kirby Road to the north and Jane Street to the west. The Secondary plan was adopted by City Council in September 2018. At the time of writing of this report this secondary plan study is still subject to review and approval by York Region.

Figure 3-7: Block 27 Study Area


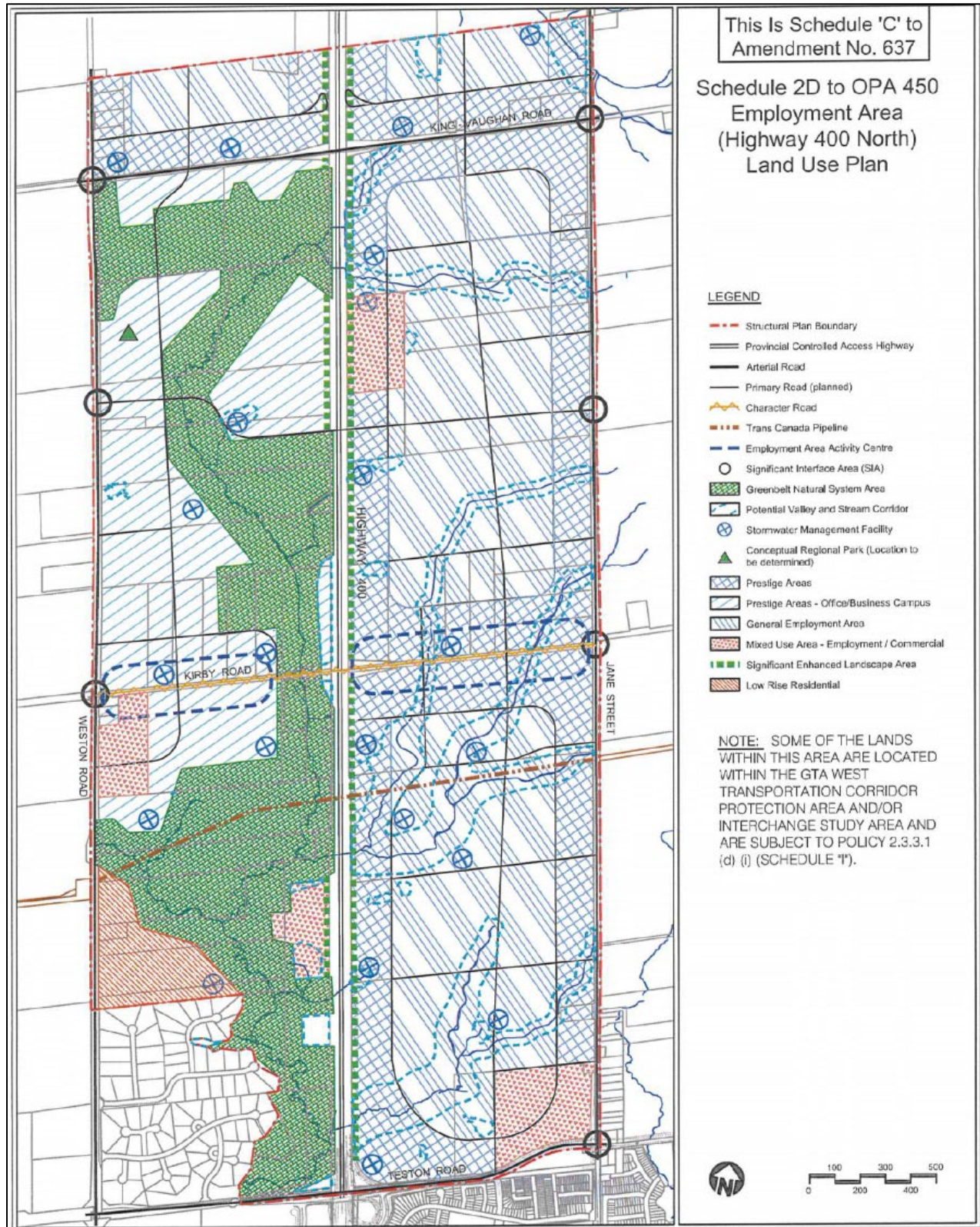
Block 27 is planned to have a mix of low and mid-rise buildings with a blend of residential, commercial and institutional uses. It will be anchored by a transit hub centre that has schools, community facilities, and a transit hub with the future Kirby GO station in the north-east quadrant, as proposed by Metrolinx’s GO Expansion project (formerly known as Regional Express Rail) 2025 and as planned through the Block 27 Secondary Plan by the City.

In addition to the projected growth from the Secondary Plan and the demand generated by the GO Station, this Kirby Road Widening EA study will also need to consider the proposed street connections identified in **Figure 3-7**, including Street 4, Street 5, Street 6, and a potential access for the Kirby GO Station between the Barrie GO Line and Keele Street.

3.3.7 Highway 400 North Employment Lands Secondary Plan

The Highway 400 North Employment Lands Secondary Plan area (**Figure 3-8**) is bound by Teston Road on the south, Weston Road on the west, King-Vaughan Road on the north and Jane Street on the east. It is just west of the study limits of Kirby Road Widening EA.

Figure 3-8: Block 34 and 35 Plan (Schedule 2D to OPA 450)



The Secondary Plan area has many environmental features and shows future employment areas, mid-block linkages, the Region’s widening of Weston Road and Jane Street for transit and active transportation facilities, interchanges at Kirby/Hwy 400 and King- Vaughan/Hwy 400 and potential GTA West Highway Corridor. The plan identifies lands primarily for prestige areas, prestige office and business campuses and general employment areas, with some lands designated as low rise residential and Employment / Commercial mixed use areas.

3.3.8 Kirby Road Extension Municipal Class Environmental Assessment

The City of Vaughan completed a Schedule ‘C’ Municipal Class EA study for the extension of Kirby Road between Dufferin Street to Bathurst Street. The study is referred to as the Kirby Road Extension EA and the Environmental Study Report (September 2019) prepared for the project documents the analyses of the various alignments for the extension. The new roadway (**Figure 3-9**) is recommended to include a four-lane roadway, a crossing over the significant environmental features within the Oak Ridges Moraine Conservation Plan area and active transportation facilities.

Figure 3-9: Kirby Road Extension EA - Refined Preferred Alternative

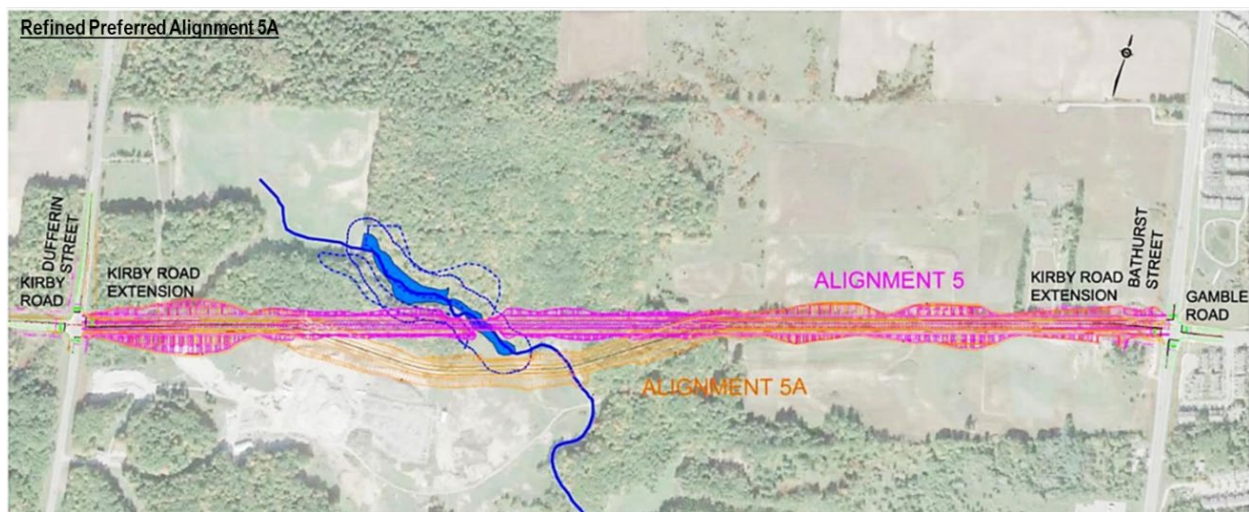
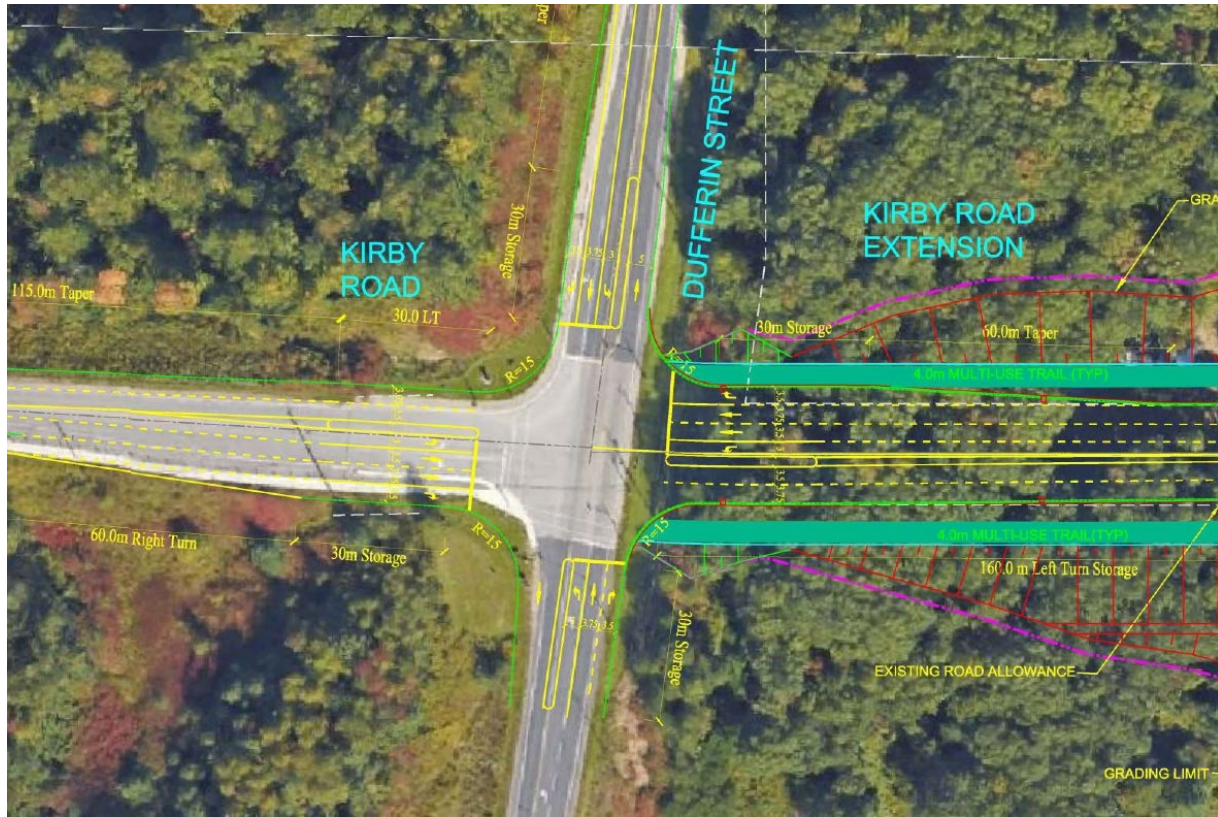


Figure 3-10 illustrates the lane configuration for the preferred alternative for the intersection of Kirby Road at Dufferin Street (the eastern study limits of this Kirby Road Widening EA) which will inform the baseline future conditions to be assessed in this Kirby Road Widening EA study.

Figure 3-10: Kirby Road at Dufferin Street Lane Configuration



3.3.9 Kirby GO Transit Hub Sub-Study

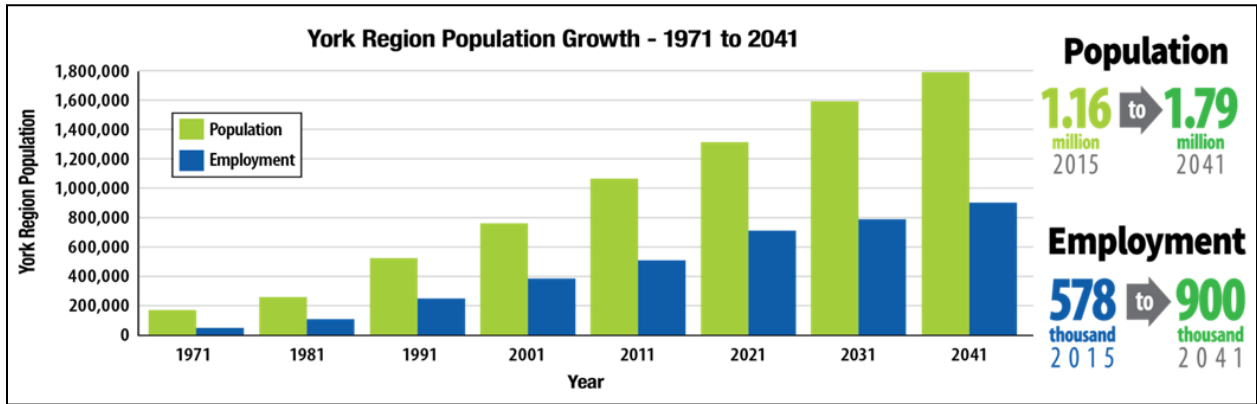
In early 2016, the City initiated the Kirby GO Transit Hub Sub-Study as an extension of NVNCTMP and the Block 27 Secondary Plan. The purpose of the Kirby GO Transit Hub Sub-Study was to develop a vision, based on a robust planning rationale, which will direct future development of the transit hub and integration with the rest of Block 27 and surrounding areas. Key findings from this study were carried forward to the recommendations for the Kirby GO Station documented in NVNCTMP. This includes the grade separation of Kirby Road at the Barrie GO Rail line and preliminary recommendations to accommodate a GO Station access at Kirby Road.

3.4 Regional and Local Context Growth

3.4.1 Population and Employment Growth

York Region is one of the fastest growing municipalities in the GTA. Since 1971, York Region's population has increased nearly seven-fold. Population and employment growth are expected to continue across the Region. As such, the transportation system and other infrastructure must be prepared to accommodate future growth. As illustrated in **Figure 3-11**, by 2041 the regional population will approach 1.79 million, while employment will approach 900,000.

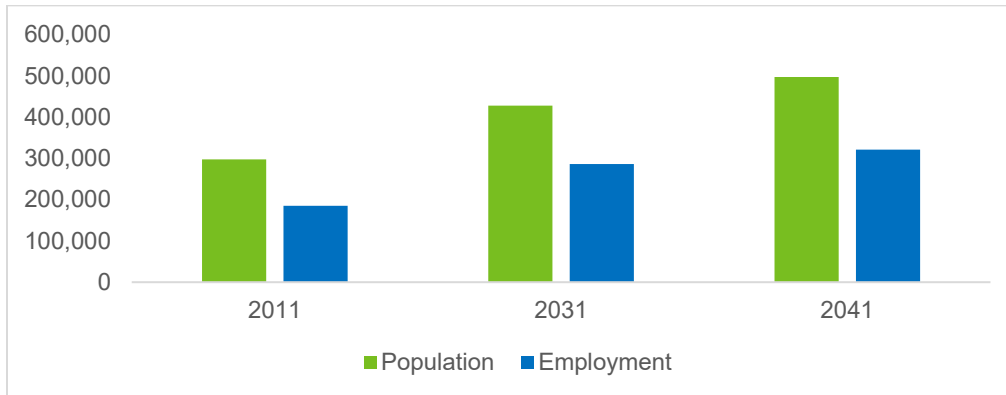
Figure 3-11: York Region Population and Employment Growth – 1971 to 2041



Source: Regional Municipality of York (2041 Preferred Growth Scenario)

City of Vaughan and City of Markham are forecasted to accommodate nearly 60% of the Region’s population growth. Vaughan’s population is expected to reach 497,400 in 2041. Meanwhile, employment is projected to increase to approximately 321,500 in 2041¹ (shown in **Figure 3-12**).

Figure 3-12: City of Vaughan Population/ Employment Forecast



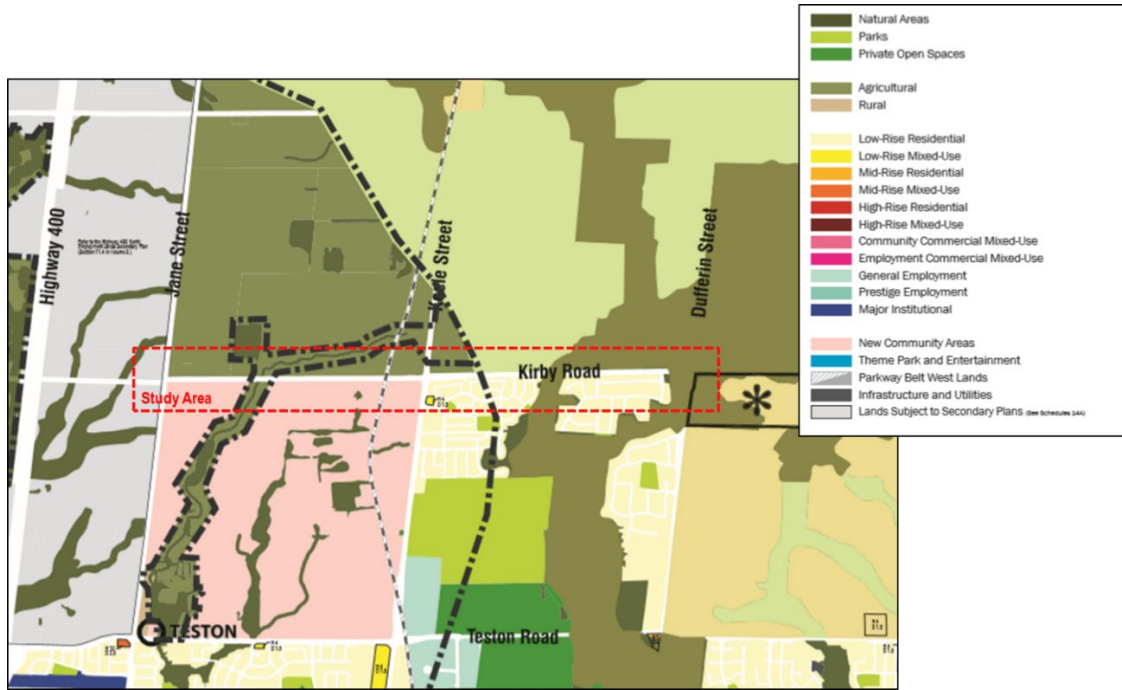
Source: Regional Municipality of York (2041 Preferred Growth Scenario)

3.4.2 Existing Land Use Context

Land uses adjacent to Kirby Road through the study limits are currently rural with residential houses located south of Kirby Road between Keele Street and Dufferin Street. **Figure 3-13** shows the land use designation along the corridor and surrounding area as listed in Vaughan Official Plan.

¹ <https://www.york.ca/wps/wcm/connect/yorkpublic/77c5e970-8020-4b89-a3d0-ff62c60403f1/nov+5+preferred+att+2.pdf?MOD=AJPERES>

Figure 3-13: Land Use – Schedule 13 Official Plan (2019)

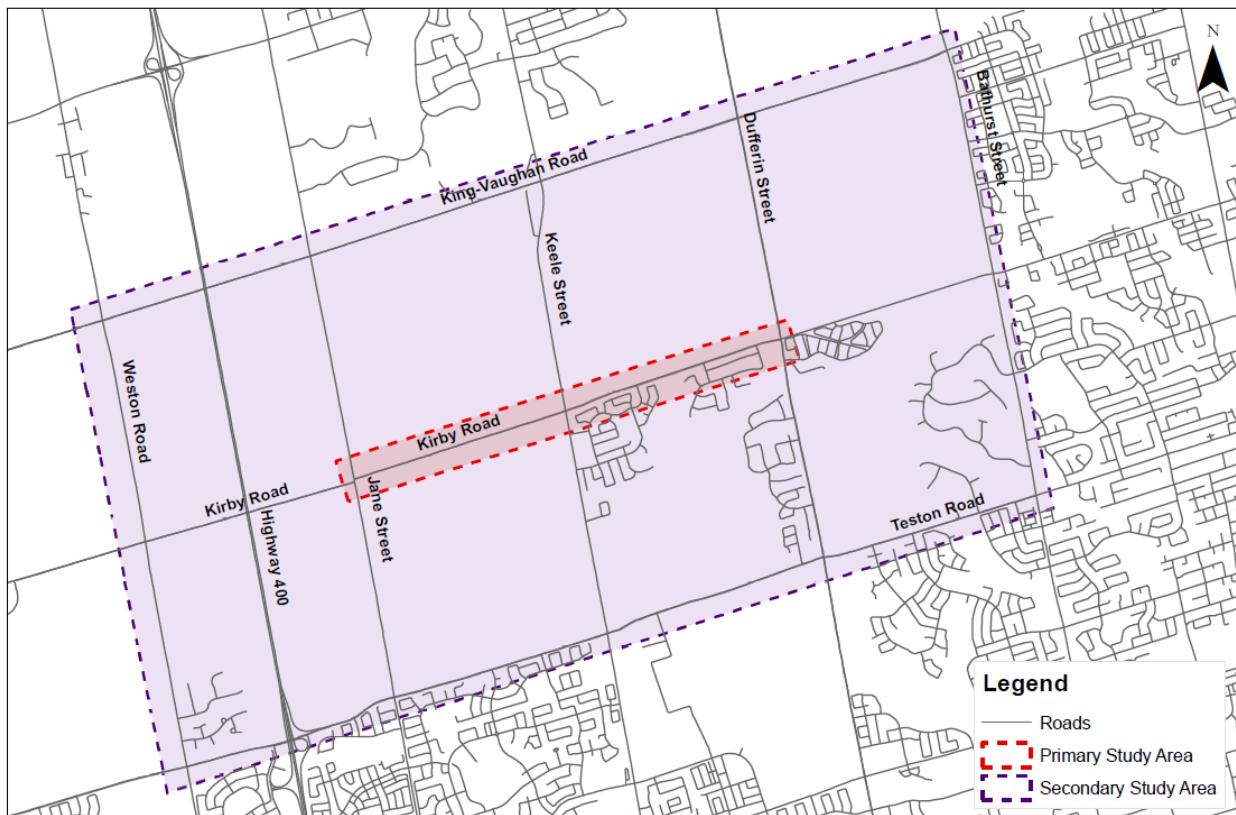


4 Transportation Conditions

The existing and future conditions with respect to transportation infrastructure and multi-modal level of service, including vehicular traffic, transit, cycling, and pedestrian facilities were assessed for the study corridor. A traffic safety review and grade separation assessment at the Kirby Road crossing of the Barrie GO Rail tracks was also undertaken to inform the EA study. Detailed analysis is documented in the Transportation and Traffic Analysis Report under **Appendix D**.

A broader Study Area was identified for the transportation study and is generally bounded by Bathurst Street to east, Weston Road to west, King-Vaughan Road to the north and Teston Road to the south. The Kirby Road Widening EA study corridor and the broader transportation study area is shown in **Figure 4-1**.

Figure 4-1 Transportation Primary and Secondary Study Area



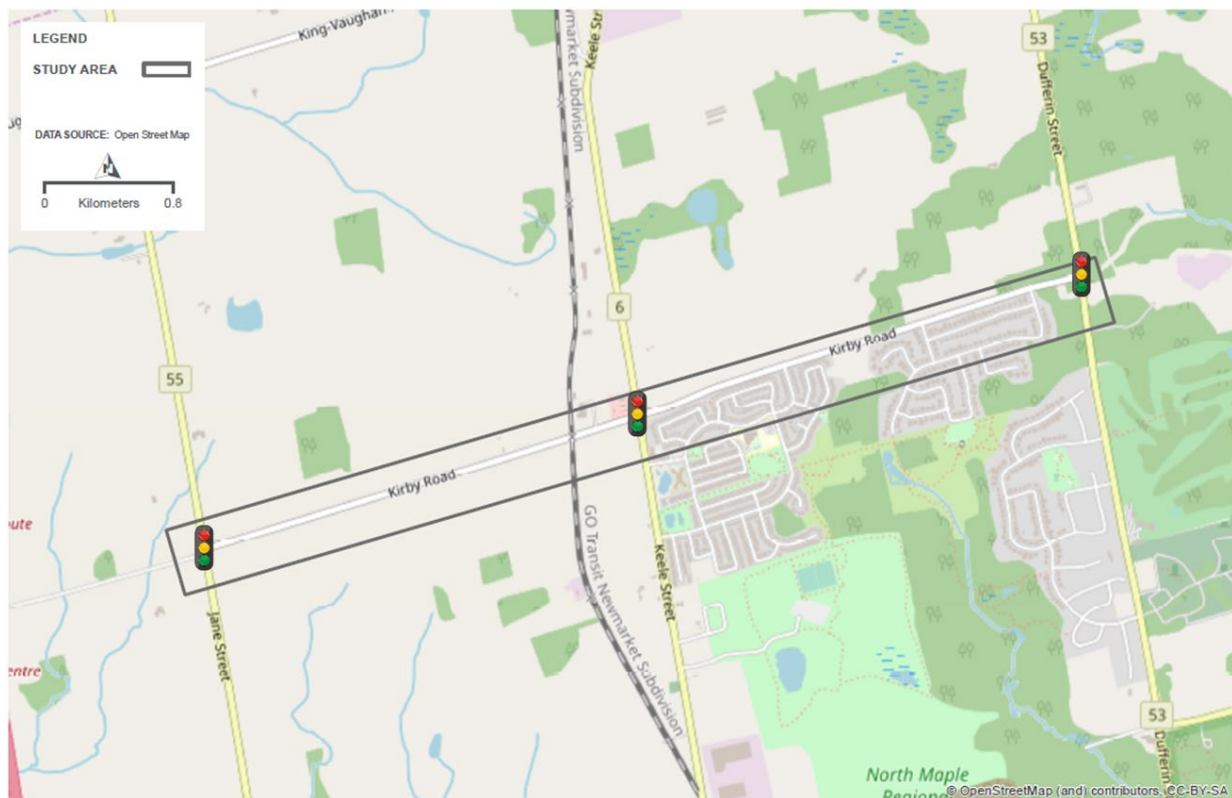
4.1 Existing Road Network

Kirby Road is designated as an east-west rural minor arterial road. It is under the jurisdiction of the City of Vaughan with plans to become a regional road, under the jurisdiction of Regional Municipality of York, to function as a strategic goods movement corridor. It has a posted speed limit of 60 km/h within the study area. Immediately east of the study area Kirby Road is planned for an extension from Dufferin Street to Bathurst Street as a four lane roadway, as determined through a separate EA study completed in 2019 (see **Section 3.3.8**).

According to City of Vaughan’s OP, arterials play an important role in moving large volumes of traffic and are the primary location for rapid transit service. Arterials form the basis for the location of nearly all the Intensification Areas. In addition to enhanced pedestrian, bicycle and transit capacity, arterials are the focus for streetscaping and other place-making initiatives to improve the quality of place.

The corridor within the study area has three (3) signalized intersections at Jane Street, Keele Street, and Dufferin Street. The signalized intersection at Jane Street includes the north and south jog at Kirby Road. There are five (5) unsignalized intersections at Mid Ontario Truck Center Access, Petro Canada Access, Ravineview Drive, Foot Hills Road, and Laurentian Boulevard. The study area and the signalized intersections are shown in **Figure 4-2**.

Figure 4-2 Signalized Intersections within the Study Area



The majority of side streets crossing Kirby Road within the study area are designated as local roads under the jurisdiction of City of Vaughan except for Jane Street (major arterial as Regional Road), Keele Street (major arterial as Regional Road), and Dufferin Street (major arterial as Regional Road).

4.2 Transportation Findings

4.2.1 Auto

Level of Service (LOS) describes the “driver experience” on a transportation facility, with each LOS associated with the average delay each driver would experience at an intersection.

The majority of signalized and unsignalized intersections within the study area are operating at overall LOS C or better with reserved capacity during both the AM and PM peak hours, except for the intersection of Kirby Road at Jane Street and Kirby Road at Keele Street. The following individual movements are operating at LOS E or worse:

AM Peak Hour

- Kirby Road at Jane Street – eastbound left/ through/ right, westbound left/ through/ right, southbound left/ through/ right
- Kirby Road at Keele Street – westbound left
- Kirby Road at Dufferin Street – eastbound left, eastbound right

PM Peak Hour

- Kirby Road at Jane Street – eastbound left/ through/ right, westbound left/ through/ right, northbound left/ through/ right
- Kirby Road at Keele Street – eastbound left/ through, westbound left
- Kirby Road at Dufferin Street – eastbound left

Signalized intersection of Kirby Road at Jane Street is operating at overall LOS F with a few individual movements operating at v/c ratio greater than 1.0 during the AM peak hour. The operational performance observed at this intersection is the result of the split signal timing plan as a result of the jog. At Kirby Road and Keele Street, there are currently 339 vehicles turning left during the AM peak hour for the WBL movement which results in high v/c ratios, observing the video taken at the site showed that the WBT vehicles bypass left-turning vehicles by using the right-turn lanes.

It should be noted that interim measures such as signal timing split optimization may benefit the intersection of Kirby Road at Keele Street, especially during the AM peak hour. It is also recommended that, due to the high number of westbound left turn vehicles, the westbound approach lane configuration be adjusted to allow for a shared through-right and left turn movement.

A screenline capacity analysis was completed for Kirby Road and the two parallel arterial roads, King-Vaughan Road and Teston Road Based on projected demand by 2031 with the Kirby GO station and with the development of Blocks 27, 34, 35, and 41 in North Vaughan, and without any significant improvements to Kirby Road through the study area, the projected travel demand exceeds capacity East of Jane Street and is approaching capacity at the other three screenlines where users are experiencing delays and queuing.

4.2.2 Walking

The pedestrian level of service (LOS) was analyzed based on the sidewalk width and buffer width. The pedestrian model level of service performance is calculated at the intersection and road segments as a pedestrian's experience is determined by both the conditions between intersections and at intersection crossings themselves.

Under existing conditions, Kirby Road within the study limits does not accommodate pedestrians adequately and the majority of road segments are operating at worst LOS (LOS F). There are

no sidewalks along the study corridor from Jane Street to Keele Street, thus pedestrians may walk on the paved shoulder next to the road. Sidewalk facilities are available from Keele Street to Dufferin Street on the south side of the road only and are at most 1.5m wide, with varying buffer widths. Pedestrian accessibility and visibility are a concern along Kirby Road; while intersections have pedestrian signal heads and clearly delineated cross-walks, they often lack curbs at their corners which exposes pedestrians to turning vehicles. Overall, the study corridor does not meet the requirements set for Accessibility for Ontarians with Disabilities Act. There is opportunity to consider sidewalks across the entire study corridor.

4.2.3 Cycling

There are no dedicated cycling facilities within the study limits. Cyclists must ride along the road shoulders or share the road with vehicles, which is less desirable due to existing traffic volumes and speed. The cycling experience has room for improvement; the City's Pedestrian and Bicycle Master Plan (PBMP) Update is developing a visible and connected pedestrian and cycling network in Vaughan that integrates, enhances and expands the existing on- and off-road pedestrian and cycling facilities. While the PBMP did not identify cycling facilities on Kirby Road and the proposed Vaughan Super Trail which runs parallel to Kirby Road about 400m to the south, the City of Vaughan policy is to explore active transportation facilities on all arterial roads. This approach is further supported by the Region's TMP which identifies Kirby Road as a local cycling route of regional significance (**Section 3.2.2**). There are opportunities to consider continuous cycling facilities and their treatment at signalized and unsignalized intersections.

4.2.4 Transit

City of Vaughan is serviced by York Region Transit (YRT). As of August 31, 2021 there are two local routes that travel within the study area, namely Route 107 and 96. Route 107 starts at Pioneer Village Station and runs along Keele Street in a north-south direction before looping along Teston Road and Drummond Drive. In addition, the local Route 96 connects Pioneer Village to Newmarket GO Bus Terminal and runs along Steeles Avenue, Keele Street, King Road, and Yonge Street and also crosses Kirby Road in a north-south direction. Many of the intersections within the study area currently do not have a transit stop location except for the Northbound/ Southbound transit route at Kirby Road and Keele Street intersection. With York Region's plans for Frequent Transit Network which envisions 15-minute service or better on Kirby Road, improvements are required to the roadway to support vehicular movements as well as active transportation access to potential stop locations in order to support this vision.

4.2.5 Collision History

Collision history over a five-year period (2014- 2018) was reviewed to identify the trends, patterns, hotspots, and opportunities to improve safety. Over the five-year period 86 collisions were recorded in the study area. The predominant initial impact type are rear-end and turning movements, comprising of more than two-thirds of all collisions. No collisions resulting in fatalities have been recorded for the study area. Other external factors such as environment conditions and light conditions show that most collisions (>75%) occur in normal conditions (clear ad in daylight, respectively). A decrease in collisions have been recorded yearly since 2015, with a sudden increase in 2018. This is inconsistent with the rest of City of Vaughan, where total collisions have been consistent since 2014. The number of collisions per month

varies throughout the year; with the most observed between September and October. Collisions are observed to be highest during the weekday, which is expected due the larger volume of vehicles on the road as opposed to the weekend.

The intersection of Keele Street and Kirby Road is within the top five intersections for the highest number of collisions north of Major Mackenzie Drive in the less urban areas of Vaughan. Improvements at this intersection should be made to mitigate factors causing this higher than average number of collisions.

4.2.6 Grade Separation

The study corridor includes an existing at-grade crossing of the Barrie Go Rail Corridor, located approximately 300m west of Keele Street. The level at-grade crossing is a single-track of the Barrie Go Rail Corridor, with crossing gates and signal lights. The crossing is located between the Maple Go Station and King City Go Station. Approximately 50m south of the crossing, the single-track splits into two tracks. Based on Metrolinx’s two way all-day planned schedule (including 15 minute service) at this crossing, the number of trains are proposed to increase from 12 today to 120 by 2031.

The City’s Kirby GO Transit Hub Sub-Study, 2016, identified a need for grade separation of the Barrie GO Rail Corridor crossing of Kirby Road and preliminary recommendations to accommodate a GO station access at Kirby Road. The recommendation was made to enhance safety, reduce traffic delay, and accommodate increased transit frequency of the GO line.

As part of the EA study’s Transportation and Traffic Assessment, the exposure index at the Barrie GO Rail crossing was computed. It followed the “Inventory Manual: Municipal Roads and Railway Level Crossings, Ontario Ministry of Transportation,” a document traditionally used in Ontario as a baseline for determining if a grade separated crossing is warranted. The calculated train exposure index, based on the daily AADT and trains at the crossing, is not met today for current volumes. However, by 2031 and 2041 the exposure index is more than ten times as large as the warranted value for a grade separation. As a result grade separation of the crossing is recommended. See **Table 4-1** for the Rail Exposure Indices.

Table 4-1: Kirby Rail Exposure Indices

Horizon Year	Trains per Day	AA DT	Train Exposure Index
Existing	12	4,600	55,200
2031	120 (RER)	27,900	3,348,000
2041	120 (RER)	31,800	3,816,000

4.2.7 Future Travel Demand Needs

The northern part of Vaughan bounded by Highway 27 to Bathurst and between King-Vaughan Road and Teston Road (NVNCTMP study area) is projected to experience significant growth by 203. Population is forecasted to increase by 510% and employment by 800%.

Based on projected demand by 2031 with the Kirby GO station and with the development of Blocks 27, 34, 35, and 41 in North Vaughan, and without any significant improvements to Kirby Road through the study area, the projected travel demand exceeds capacity East of Jane Street and is approaching capacity at other points along the study corridor where users are experiencing delays and queuing.

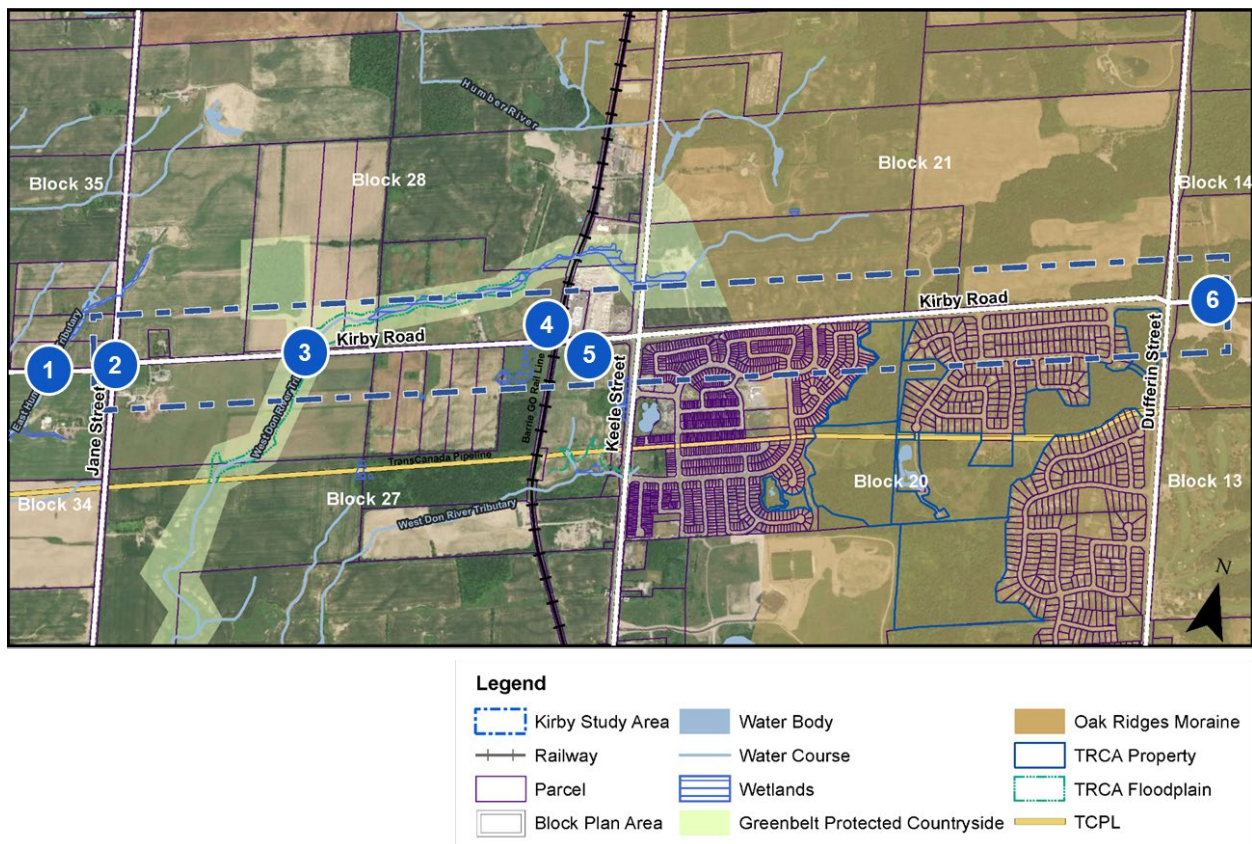
5 Physical and Environmental Constraints

5.1 Overview of Existing Features and Constraints

A list of existing features and constraints is provided below to correspond with **Figure 5-1**.

1. Crossing of the East Humber River Tributary
2. Existing Jog at Jane St. Intersection
3. Crossing of the West Don River Tributary
4. Barrie GO Rail Corridor At-Grade Crossing of Kirby Road
5. Future Kirby GO Station
6. Future Kirby Rd. Extension
 - (Dufferin St. to Bathurst St.) *separate study*

Figure 5-1 Existing Features and Constraints on Kirby Rd from Jane St. to Keele St.



5.2 Natural Environment

A Natural Environment Assessment (NEA) was conducted by Natural Resource Solutions Inc. (NRSI) to inform the Kirby Road EA and preliminary design. A tree inventory was also completed and documented in the study's Tree Protection Plan (TPP). Refer to **Appendix E** Natural Environment Assessment Report and **Appendix F** Tree Protection Plan (including tree inventory) for detailed descriptions of existing natural environmental conditions.

5.2.1 Vegetation

The following Ecological Land Classifications (ELC) ecosites were documented in the study area: Dry – Fresh Sugar Maple Deciduous Forest Ecosite, Dry - Fresh Red Oak Deciduous Forest Type, Deciduous Forest, Dry - Fresh White Pine - Maple - Oak Mixed Forest Ecosite, Maple Mineral Deciduous Swamp Ecosite, Thicket Swamp, Reed-canary Grass Mineral Meadow Marsh Type, Mineral Meadow Marsh Ecosite, Cultural Woodland, Plantation, Cultural Savannah, Cultural Meadow, Hedgerow, Agriculture and Residential.

A total of 130 species of vascular flora were inventoried within the study area. The majority of inventoried species reflect the intact to moderately disturbed natural features concentrated in the eastern extent of the study area. Most non-native invasive species are found in the cultural meadows and abandoned parcels in the western extent of the study area and along the road ROW. No federally and provincially significant flora species were observed. A number of aggressive non-native species were observed within the study area which generally occur along edges of natural features or in disturbed areas and can out-compete native vegetation and lead to a reduction in biodiversity.

The Tree Inventory documented 466 trees $\geq 10\text{cm}$ DBH within the study area, comprising 45 species. No Species At Risk (SAR) trees were observed within the study area. A high proportion of inventoried trees are native species (77%). Nearly all of the Ash trees inventoried displayed evidence of infestation by Emerald Ash Borer.

5.2.2 Wildlife

A total of 135 bird species are reported from data within a 10x10km range that overlaps the study corridor. This data includes the species observed in the 10x10km area, are known to nest in the area, and/or have exhibited some evidence of breeding in the area. A total of 46 of these species were documented within the study area during the field surveys, of which 42 species exhibited signs of breeding, such as males singing, females carrying food or nest materials, or the presence of fledged young. An additional 4 species were observed during other field investigations which did not exhibit signs of breeding evidence, such as species observed during migration periods.

There were three significant bird species identified within the study area and they are Barn Swallow, Bobolink, and Eastern Wood-Pewee. Barn Swallow is ranked as Threatened provincially; the species is noted to be common throughout Ontario, however, it has experienced widespread declines. Bobolink is ranked as Threatened provincially; the species is noted to be common throughout Ontario, however, it has experienced widespread declines. Finally Eastern Wood-Pewee is ranked as Special Concern provincially; the species is noted to be common throughout Ontario, however, it too has experienced widespread declines.

Twenty-three species and forms of herpetofauna are reported from the vicinity (approximately 10km) of the study area. During field investigations the presence of Spring Peeper and Gray Treefrog were confirmed. They are both common and secure in Ontario.

Fifty-two butterfly species are known to occur within the 10x10km atlas square that overlaps with the study area, one of which, Monarch is identified as significant. During field surveys

Cabbage White, Clouded Sulphur, Common Wood-Nymph, and Common Ringlet were observed. All butterfly species observed are species ranked as common and secure throughout the province. Although Monarch was not observed, it may be present, as its larval food source, Milkweed sp. was observed within the study area, albeit in low abundance.

Forty-two mammal species are reported from within 10km of the study area. Four mammal species were observed during field investigations. These include species commonly found within woodland and urban environments: Eastern Cottontail, Gray Squirrel, Eastern Chipmunk, and Northern Raccoon.

Bat roost habitat assessments were conducted and found 11 trees that have cavities, cracks or loose bark that may provide suitable maternal roosting habitat for Little Brown Myotis or Northern Myotis. Seven of these trees are part of woodlands adjacent to the study area, and the other 4 are either in a hedgerow or isolated along the Kirby Road ROW. Trees with features suitable for maternal roosting habitat for SAR bats are identified. The evaluation methods followed the MNRF Guelph District's guidance document, *Survey Protocol for Species at Risk Bats within Treed Habitats* (OMNRF 2017).

5.2.3 Eco-Passages and Linkage

At the existing crossing of the Tributary to the West Don River, a minor linkage for small wildlife may occur crossing under Kirby Road via the existing twin corrugated steel pipe culverts. This minor linkage corresponds with the Greenbelt Plan Natural Heritage System corridor that crosses Kirby Road in this location however, this corridor is tilled for agriculture within the immediate vicinity of Kirby Road and it is unlikely that wildlife would specifically use this as a movement path.

In addition another potential wildlife passage linkage is located where the Maple Spur Channel Environmental Significant Areas (ESA) and Maple Uplands and Kettles Life Science Area of Natural and Scientific Interest (ANSI) crosses Kirby Road between Keele Street and Foothills Road. There is no cross-road culvert that currently exists at this potential linkage. However, the presence of natural lands on either side of the road, which are narrowed between adjacent agricultural and urban land uses (on the north and south sides of Kirby Road, respectively) may have the effect of funneling and directing wildlife movements across the road in this location. This potential linkage may provide a crossing location for small-, medium-, and large-sized wildlife.

A third potential location for a crossing for up to large-sized wildlife location occurs to the immediate west of Dufferin Street, where Significant Woodland associated with the ESA and ANSI occurs on both sides of the road.

Wildlife road-crossing data for Kirby Road within the study area was not available for the completion of this study. It is recommended that the section of road that falls within the ESA/ANSI crossings (between west of Radha Road and Dufferin Street) be further investigated in consultation with the TRCA and City to determine if there is suitable rationale to incorporate measures that would mitigate wildlife road crossing impacts and/or reduce hazards of motorist-wildlife collisions.

5.2.4 Headwater Drainage Features

Six potential Headwater Drainage Features (HDFs) were identified within the study area. HDR1 is a roadside ditch within the northeast corner of the study area. HDR2 and HDR2-001 are an unconstrained feature leading to a roadside ditch located along the northern edge of the study area. HDR3 and HDR4 are undefined features that connect to the roadside ditches in the western extent of the study area. HDR5 is the wetland along the northern extent of the study area. Much of the study area has seen modification through agricultural and residential development.

It is recommended that HDF-001, HDF-003, and HDF-004 require no management. HDFs with this characterization typically have limited flow with no terrestrial habitat due to agricultural planting. HDF-002 and HDF-002-01 will require that their contributing hydrological functions be maintained or enhanced. HDF-005 requires protection due to its categorization as a perennial wetland which stipulates that the feature should be protected or enhanced where possible and its hydroperiod maintained.

5.2.5 Natural Feature Significance

Areas of Natural and Scientific Interests (ANSI) characterized as Core Features of the Natural Heritage Network, fall within the eastern portion of the study area and are: the 'Maple Uplands and Kettle' candidate Life Science ANSI (regionally significant), the 'Maple Spur Channel' Earth Science ANSI (regionally significant), and the 'Maple Spur' candidate Earth Science ANSI (regionally significant). The ESA, characterized as a Core Feature of the Natural Heritage Network in the VOP 2010, falls within the eastern portion of the study area and is the McGill Area ESA. Both ANSI and ESA are mapped in **Figure 5-2** and **Figure 5-3**.

The Don River West Branch Headwater Provincially Significant Wetland (PSW) Complex is located within the study area. Additional, unmapped and unevaluated wetlands were identified during field work. A small Mineral Meadow Marsh (MAM2) is located opposite Ravineview Drive, on the north side of Kirby Road. In addition, there is a Maple Mineral Deciduous Swamp (SWD3) at the eastern extent of Kirby Road. Based on complexing rules under the Ontario Wetland Evaluation System (MNRF 2014), it is anticipated that these wetlands would meet criteria for being complexed with the larger Don River West Branch Headwater PSW, as they are located 450m and 590m from evaluated PSW. As such, the wetlands should be treated as provincially significant.

One Significant Wildlife Habitat (SWH) type was confirmed for the study area: Special Concern and Rare Wildlife Species Habitat (Eastern Wood-Pewee). Eastern Wood-Pewee is listed as Special Concern both federally and provincially and was confirmed within the study area as a probable breeder. Eastern Wood-Pewee were observed from all the natural woodlands within the study area, including: Dry – Fresh Sugar Maple Deciduous Forest (FOD5), Dry – Fresh White Pine – Maple – Oak Mixed Forest (FOM2), Deciduous Forest (FOD), and Maple Mineral Deciduous Swamp (SWD3). An additional one SWH type was determined to be candidate: Bat Maternity Colony. Bat maternity colonies are typically found in cavity trees with a DBH of >25cm and older buildings within forested vegetation communities. Any ELC ecosite that is determined to contain a bat maternity colony is considered SWH. Given that the FOD, FOD1-1, FOD5,

FOM2, and SWD3 communities contain the most ideal habitat and largest number of potentially suitable trees for bat maternity colonies, these have been designated as candidate bat maternity colony SWH.

Two regulated SAR were documented within the subject property: Barn Swallow and Bobolink. Both Barn Swallow and Bobolink are listed as provincially and federally Threatened. As Kirby Road is sufficiently distant from the presumed nesting location of Barn Swallows within the active barn, and that the existing pasture lands where Bobolink and Barn Swallows were observed are largely outside of the developable lands associated with the Kirby Road widening, there are no negative impacts to either this species. There are no suitable culverts for Barn Swallow nesting underneath Kirby Road

The location of all regionally significant bird species was noted to be well outside of the Kirby Road ROW, however, the road design and construction practices should have consideration for the habitats these species are found in.

Of the 9 regionally significant vegetation species given consideration, only Poke Milkweed and Thin-leaved Sedge have a low 'R#' number, indicating their general scarceness within the region. Generally, all of the regionally significant vegetation species have a high Coefficient of Conservation rating, indicating that they generally require higher quality and intact habitats. The development of Kirby Road should have consideration to these species' locations and the impacts that the widening may have on them.

The natural environmental constraints are presented in **Figure 5-4** and **Figure 5-5**.

Figure 5-2: ANSI and ESA within the Study Corridor (Jane St to Keele St)

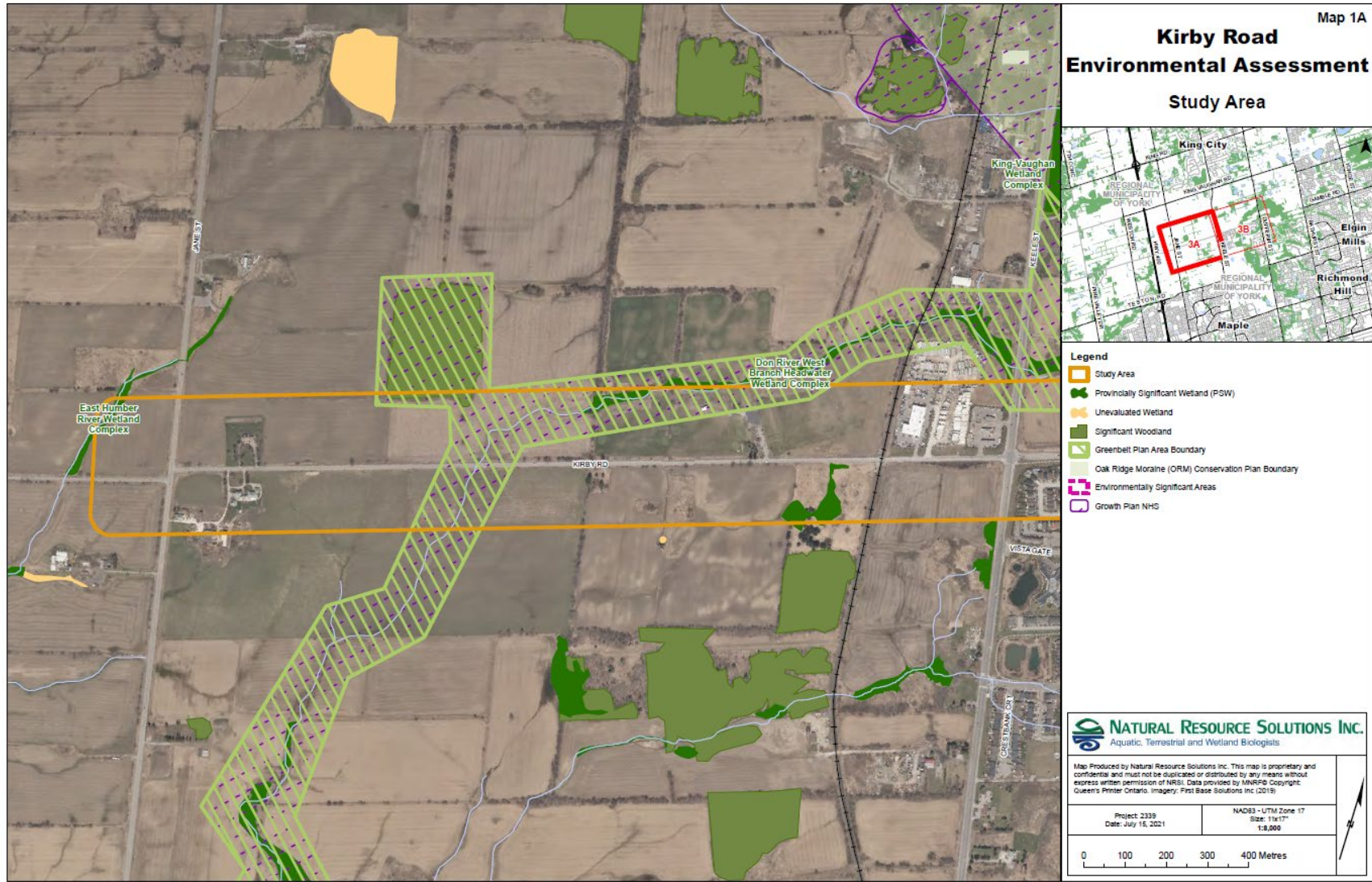


Figure 5-3: ANSI and ESA within the Study Corridor (Keele St to Dufferin St)

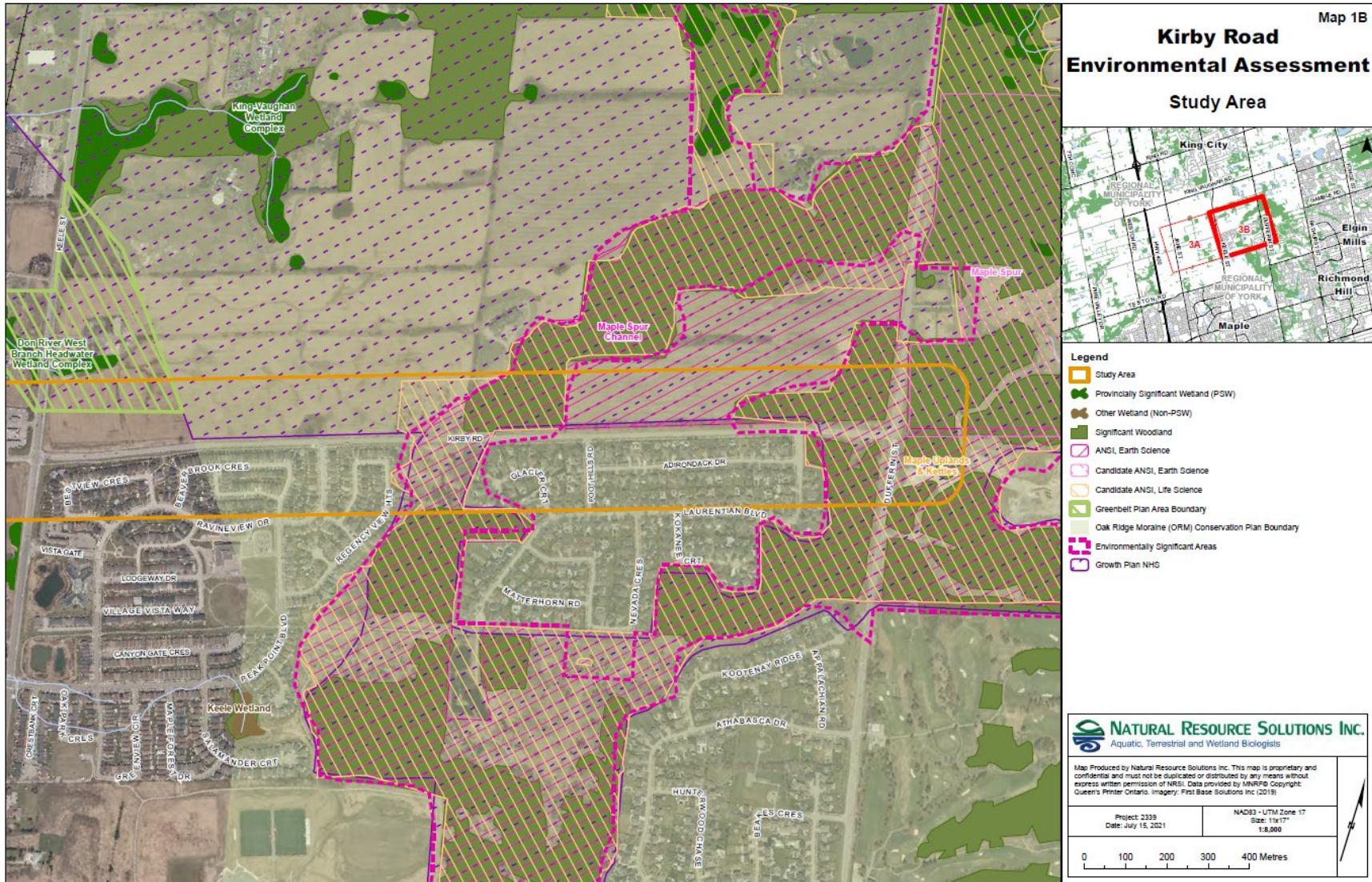


Figure 5-4: Natural Heritage Features from Jane St to Keele St

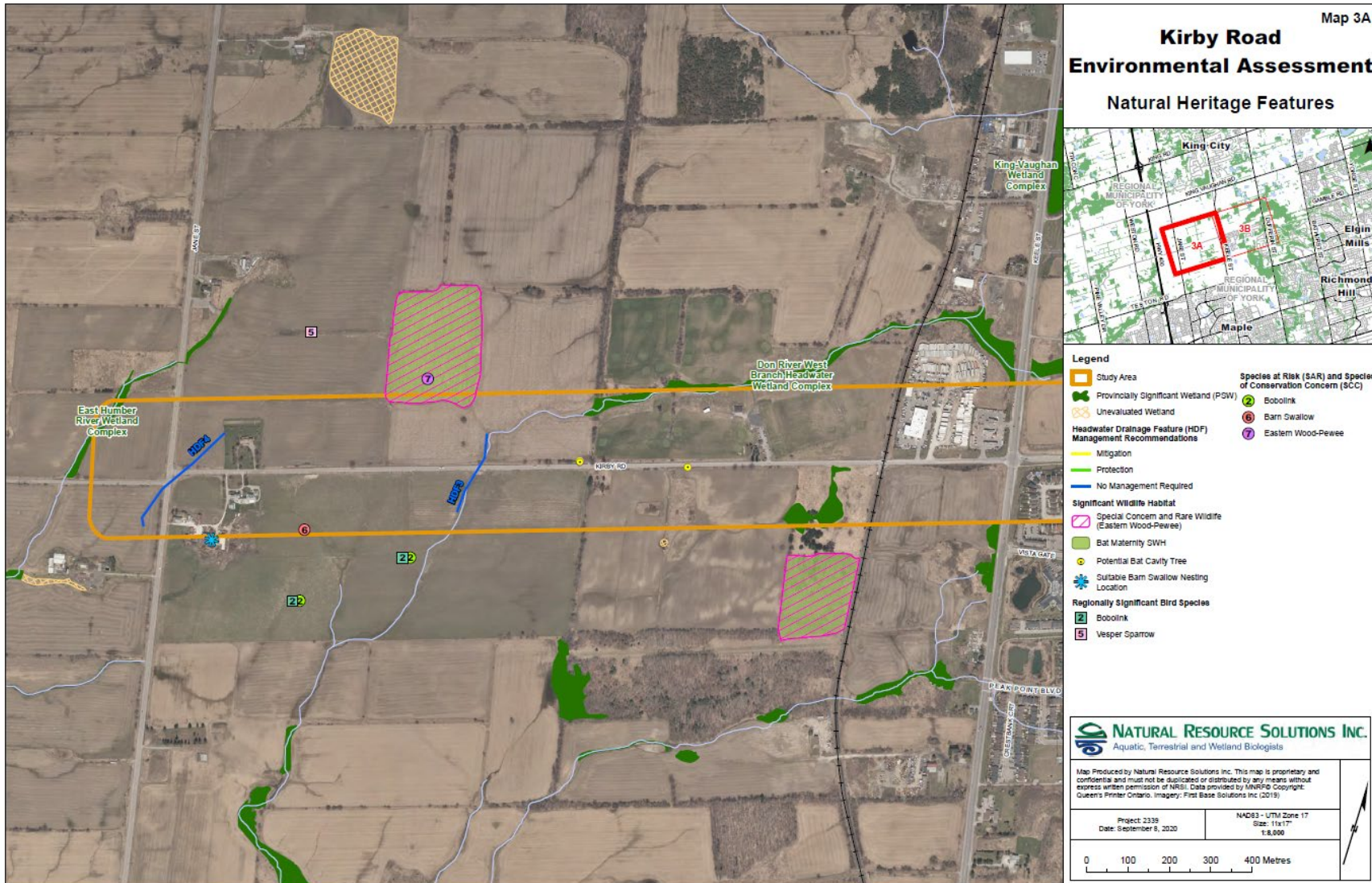
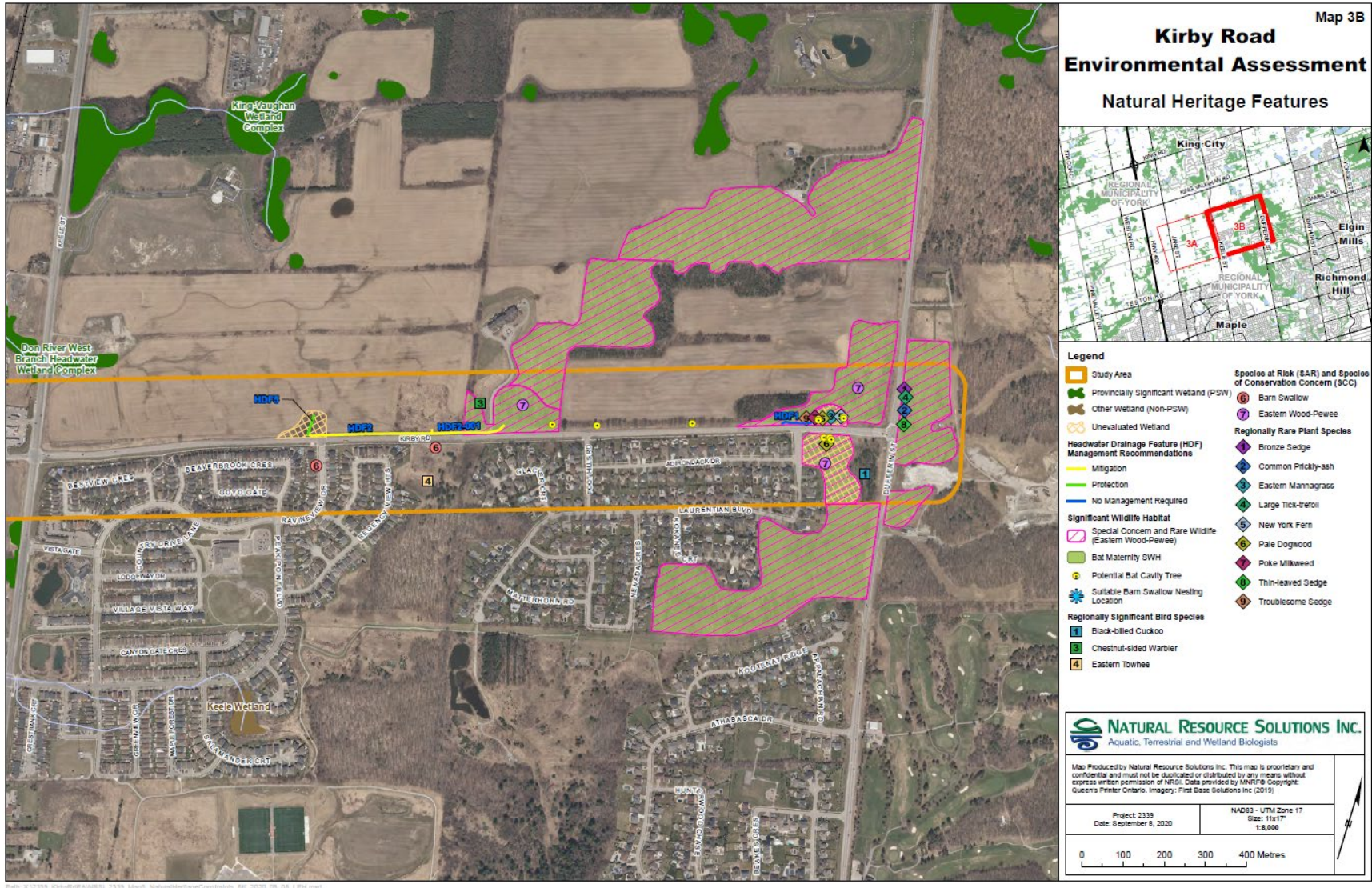


Figure 5-5: Natural Heritage Features from Keele St to Dufferin St



5.3 Agriculture

An Agricultural Impact Assessment (AIA) report was conducted as part of the Kirby Road Widening EA Study and can be found in **Appendix G**. The assessment considered a Study Area encompassing Kirby Road from Jane Street to Dufferin Street, and a Secondary Study Area approximately 750m beyond the boundary of the Study Area. Both the Study Area and the Secondary Study Area are located within the South Slope and Oak Ridges Moraine Physiographic regions with the division between the regions occurring at roughly Keele Street. The western portion of the Study Area and the Secondary Study Area are located within the South Slope Physiographic region. The eastern portions of the Study Area and Secondary Study Area are located within the Oak Ridges Moraine Physiographic region.

The Oak Ridges Moraine Physiographic region topography is characterized by steeper slopes and coarser open soil materials such as sands and gravels. The South Slope Physiographic region topography is characterized by gently undulating slopes and stream courses that flow south to Lake Ontario. The soil material in the South Slope Physiographic region developed on glacial ground moraine materials and will have higher clay content than the soils found in the Oak Ridges Moraine Physiographic region.

As part of the AIA, a policy review was completed with respect to agriculture. A portion of the Study Area and the Secondary Study Area north of Kirby Road between Jane Street and Dufferin Street fall within areas designated as Prime Agricultural Area, Protected Countryside and Oak Ridges Moraine within the Greenbelt Plan Area. A small portion of Protected Countryside was also noted south of Kirby Road east of Jane Street. Neither study area is located within provincially designated Specialty Crop lands. A portion of the Study Area and the Secondary Study Area part falls under Agricultural Areas, Rural and Subject to Minister's Order Feb 3, 2015 and Special Provision Policies 6.2.19 and 6.4.14 as per the designations of the ROP. The VOP 2010 also identified portions of the Study Area as Agricultural Lands, Lands Subject to Secondary Plans, New Community Areas, Greenbelt Plan Area, Low Rise Residential, Oak Ridges Moraine Natural Linkage areas. The City's Zoning By-Law (Number 001-2021) identified some lands as agriculture, Oak Ridges Moraine Area, Greenbelt Area and Open Space. Neither study area is designated or zoned as Specialty Crop lands. The Study Area land use comprises built up/disturbed areas, common field crop production, forage/pasture lands, recreational lands (golf course), scrublands, linear corridors (roads/rail) and wooded areas. The Secondary Study Area consists of a variety of land uses including built-up/disturbed areas, common field crops, unknown use, forage/pasture lands, open field, recreational (golf courses), roads/rail corridor, and woodlots.

There is no evidence of existing and no capital investment in artificial tile drainage, irrigation, or land levelling / landforming in either the Study Area or the Secondary Study Area.

One active agricultural operation is located within the Study Area located south of Kirby Road east of Jane Street and is located within the New Community Area from the VOP Schedule 1 – Urban Structure. There are an additional 12 agricultural facilities located within the Secondary Study Area. Of the 12 facilities, 3 are active, 6 are vestige and 3 are remnant. It was determined that the Study Area and the Secondary Study Area are areas of transitioned from a livestock

agricultural base to a cash crop base that is impacted by the urban environment pressures. A map identifying the location of the agricultural facilities is provided in **Figure 5-6**.

Figure 5-6: Agricultural Facilities



Legend	
Railway	Agricultural Facilities
Roads	Active
Municipal Boundary	Remnant
Secondary Study Area (750 m)	Vestige
Study Area	Tile System Type
	Systematic

Figure 7
Agricultural Investment

DBH Soil Services Inc.
January 2020

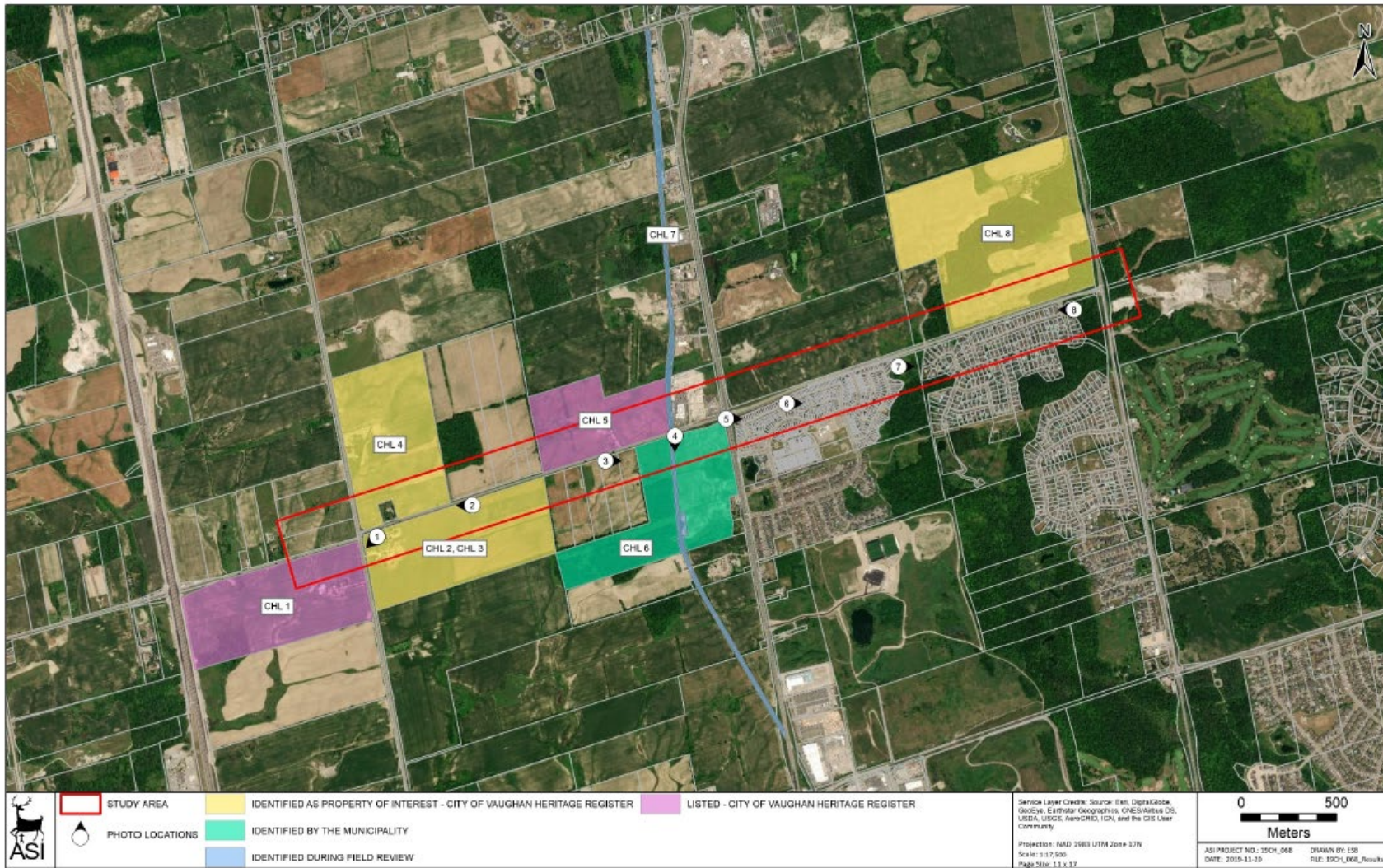
5.4 Built Heritage Resources and Cultural Heritage Landscapes

A Cultural Heritage Report (CHR) was conducted as part of the Kirby Road Widening EA Study. The results of background historic research and a review of secondary source material, including historical mapping, revealed a study area with a rural land use history dating back to the mid-nineteenth century. In total, eight cultural heritage landscapes (CHLs) were identified within and/or adjacent to the study area. Two of the properties are listed in the City of Vaughan's Heritage Inventory, four properties are identified as Properties of Interest, one property identified from a previous assessment and one property identified during the field review. Six of the properties are farmscapes, one is a residence and the last is a rail corridor.

A map identifying the location of CHLs can be found in **Figure 5-7**.

A detailed Cultural and Built Heritage Assessment Report can be found in **Appendix H**.

Figure 5-7: Location of Cultural Heritage Resources and Photographic Plates in the Study Corridor



5.5 Archaeology

An archaeological assessment report (AA) was conducted as part of the Kirby Road Widening EA Study. The Stage 1 background study determined that 37 previously registered archaeological sites are located within one kilometre of the Study Area, six of which are within 50 metres and retain Cultural Heritage Value or Interest (CHVI). The property inspection determined that parts of the Study Area exhibit archaeological potential and will require Stage 2 Archaeological Assessment. If there are impacts to any of the six CHVI properties are proposed Stage 3 Archaeological Assessment will be required.

In light of these results, the following recommendations are made:

1. The Study Area exhibits archaeological potential. These lands require Stage 2 archaeological assessment by test pit/pedestrian survey at five metre intervals, where appropriate, prior to any proposed impacts to the property;
2. AIGv-117, AIGv-118, AIGv-121, AIGv-122, AIGv-123 and AIGv-404 are within 50 metres of the Study Area and are considered to exhibit CHVI. All six sites should be subject to Stage 3 assessment, if impacted, prior to any proposed construction activities;
3. Part of the Study Area is located within 1000m of the a documented ancestral Huron-Wendat village site and within 300m of any current or former water source. If impacted, these areas should be subject to ossuary monitoring during construction, consistent with the recommendations of the York Region Archaeological Management Plan. Any areas of disturbance that overlap with ossuary potential should be subject to archaeological monitoring, as per the above recommendations;
4. The remainder of the Study Area does not retain archaeological potential on account of deep and extensive land disturbance, low and wet conditions, slopes in excess of 20 degrees, or having been previously assessed. These lands do not require further archaeological assessment; and,
5. Should the proposed work extend beyond the current Study Area, further Stage 1 archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands.

A detailed Archaeological Assessment Report can be found in **Appendix I**. A summary of the Stage 1 Archaeological Assessment results is shown in **Figure 5-8** through **Figure 5-10**.

Figure 5-8: Results of Stage 1 AA (Sheet 1 of 3)

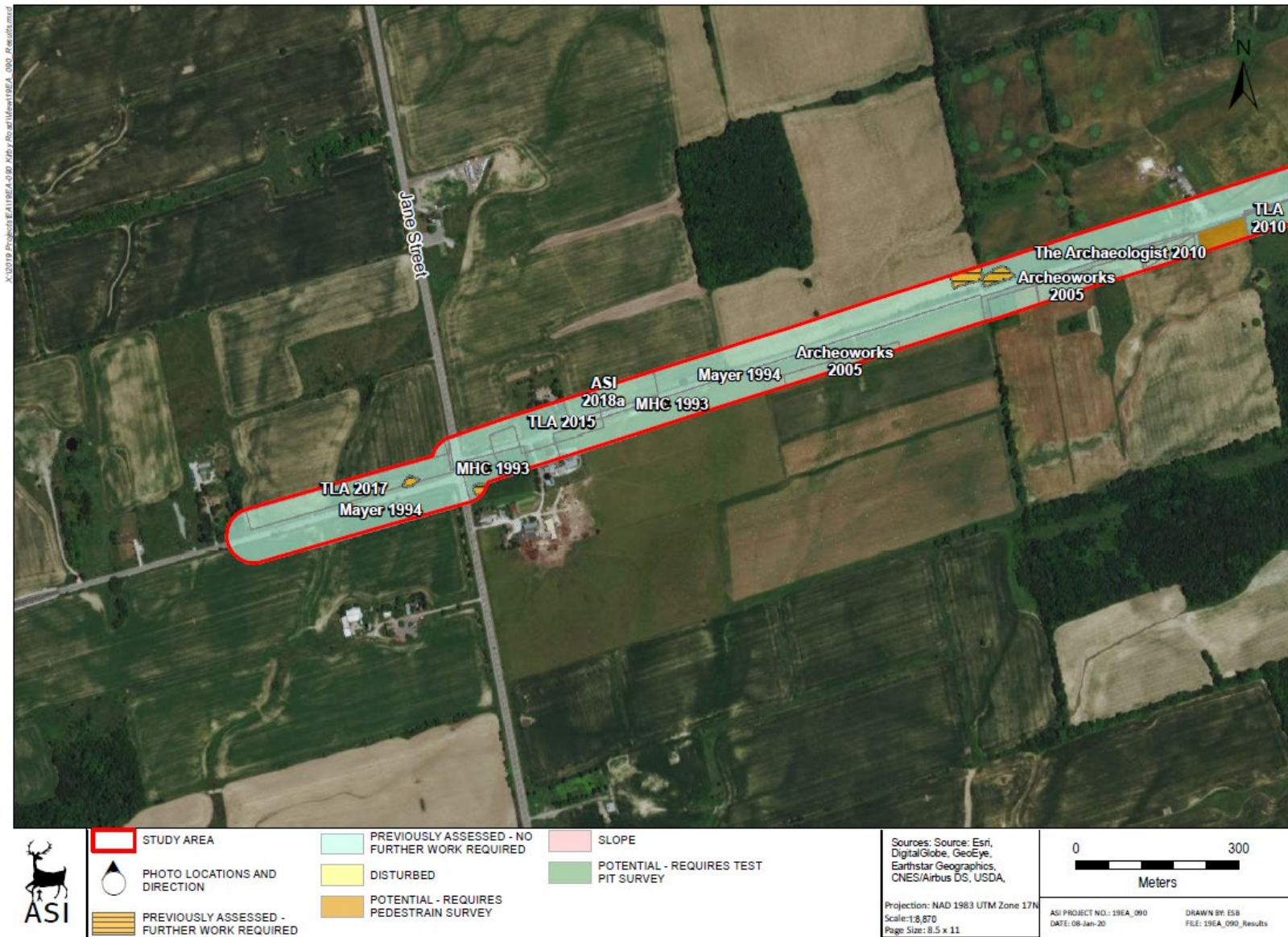


Figure 5-9: Results of Stage 1 AA (Sheet 2 of 3)

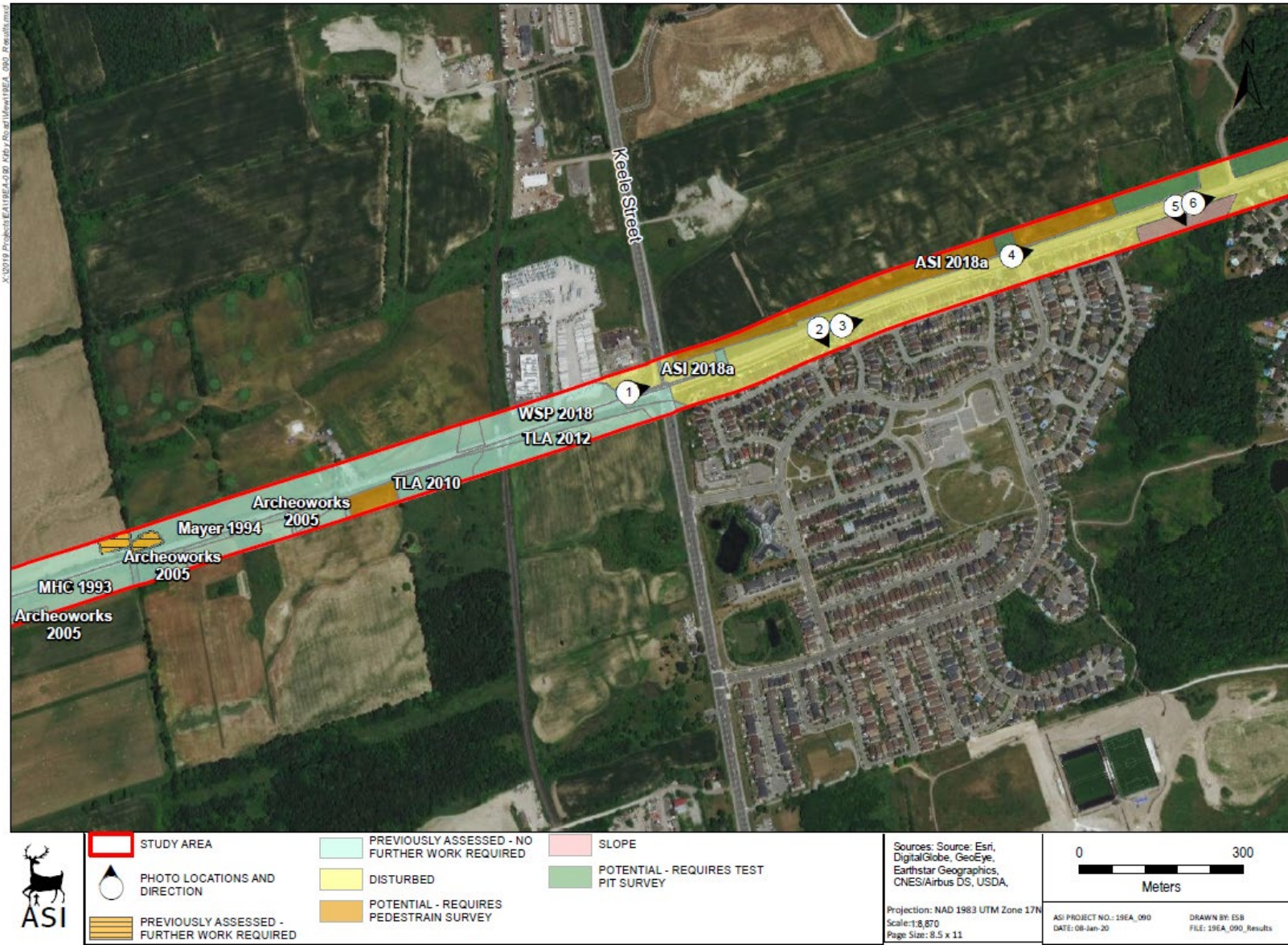
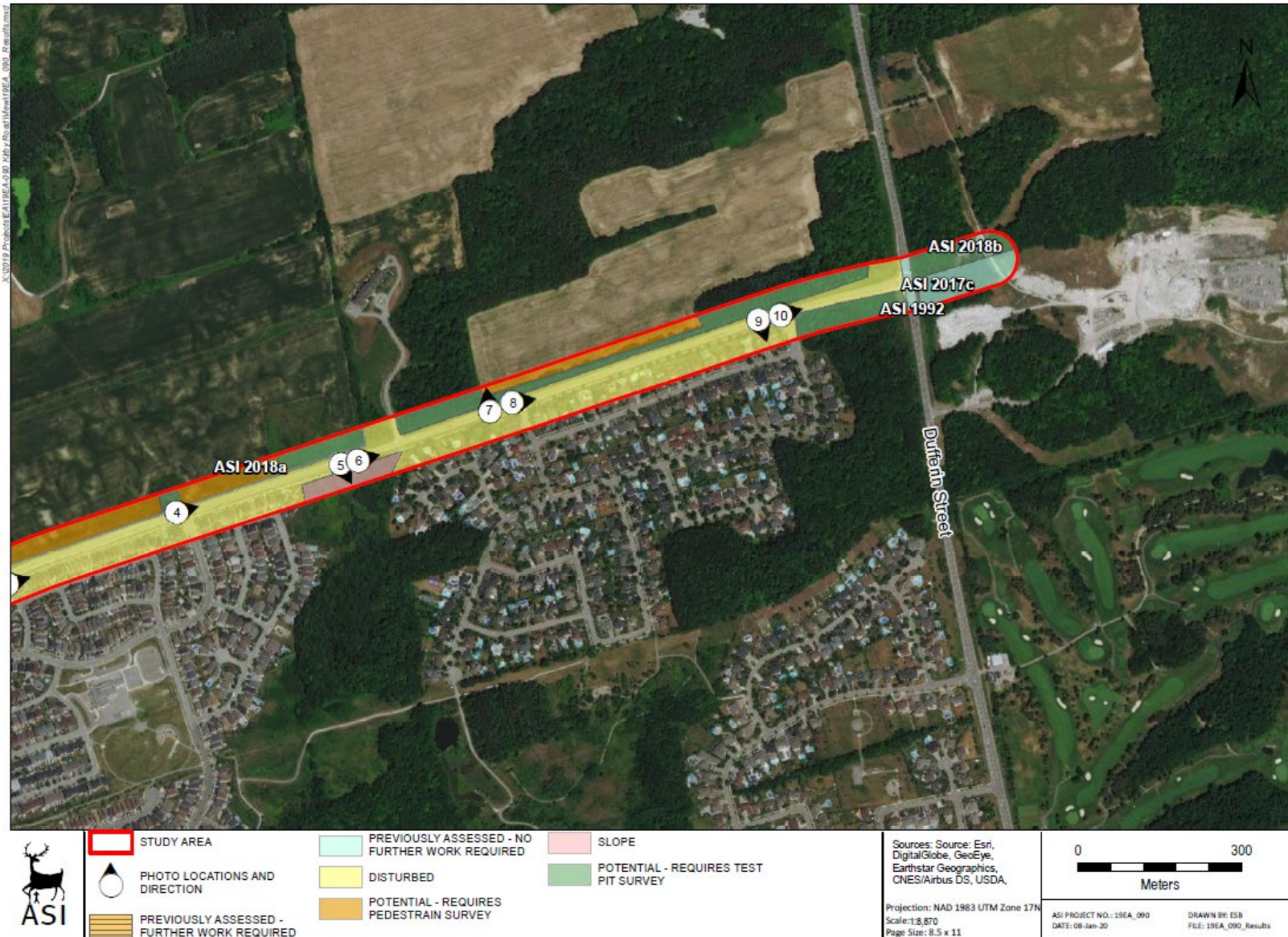


Figure 5-10: Results of Stage 1 AA (Sheet 3 of 3)



5.6 Source Water Protection

The Clean Water Act, 2006 ensures communities protect their drinking water supplies through prevention – by developing collaborative, watershed-based source protection plans that are locally driven and based on science. The proposed project is located in the Toronto and Region Source Protection Area. The study area for the proposed project transects the following vulnerable areas (shown in **Figure 5-11**) identified under the Clean Water Act, 2006:

- Significant Groundwater Recharge Area (SGRA)
- Recharge Management Area / Wellhead Protection Area-Q (WHPA-Q)
- Highly Vulnerable Aquifers (HVA)

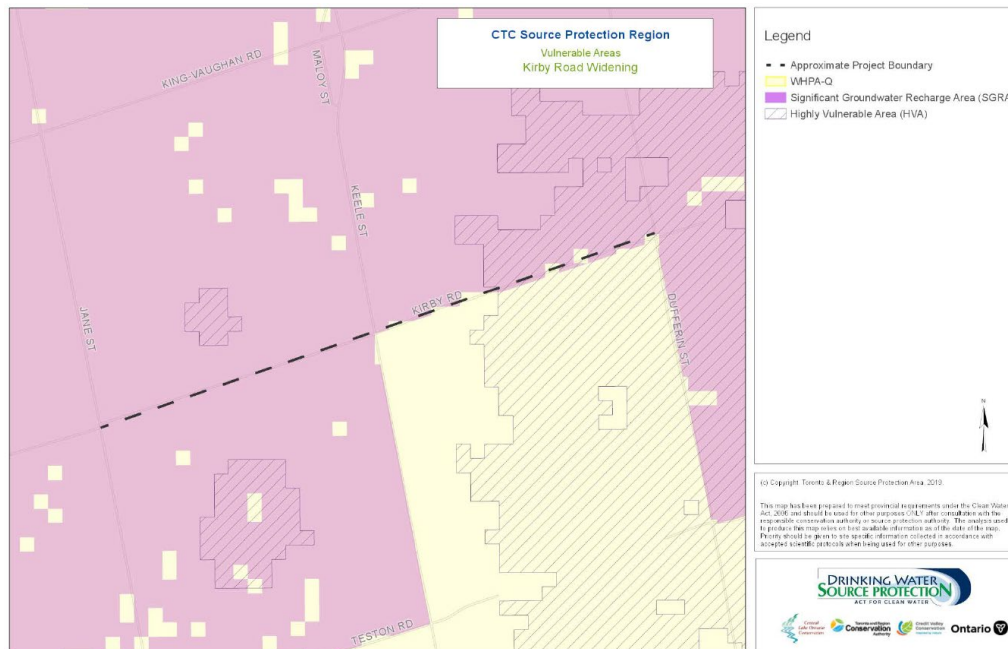
A description of these vulnerable areas follows below:

A Highly Vulnerable Aquifer can be easily changed or affected by contamination from both human activities and human process as a result of its intrinsic susceptibility (as a function of the thickness and permeability of overlaying layers), or by preferential pathways to the aquifer.

A Recharge Management Area / Wellhead Protection Area-Q are areas where water travels through the ground to a municipal well. Aquifers are replenished when water from rain and melting snow soak in the ground. Sometimes this water carries pollutants. However the speed for which the water reaches the well depends on the characteristics of the soil and bedrock in the area.

A Significant Groundwater Recharge Area supplies a community or private residence with drinking water and is characterized by porous soils, which allow water to seep easily into the ground and flow to an aquifer.

Figure 5-11 Source Protection – Vulnerable Areas



5.7 Drainage

A Drainage and Stormwater Management assessment was completed and is provided in **Appendix J**.

The Kirby Road corridor has a primarily rural cross-section within the study limit, the roadway is drained by roadside ditch and culvert systems with ultimate discharge to the tributaries of West Don Rivers and East Humber River.

The Study area falls within the Upper West Don and Upper East Don River subwatersheds and under the jurisdiction of the Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNR) Aurora District. There is one watercourse crossing within the study limit. The West Don River originated to the North of the Kirby Road and crosses Kirby Road approximately 750 m east of Jane Street. The West Don River is ephemeral where it crosses Kirby Road. The channel is intermittent in nature at the south of Kirby Road and gradually becomes permanent just upstream of the Teston Road. This tributary of Don River is entirely contained within the Natural Heritage System of the Protected Countryside area of the provincial Greenbelt Plan (MMAH 2010). It is classified as intermittent cool to warm water system.

Six potential Headwater Drainage Features (HDFs) were identified within the study area. HDF1 is a roadside ditch within the northeast corner of the study area. HDF2 and HDF2-001 are an unconstrained feature leading to a roadside ditch located along the northern edge of the study area. HDF3 and HDF4 are undefined features that connect to the roadside ditches in the western extent of the study area. HDF5 is the wetland along the northern extent of the study area.

A hydraulic assessment of the existing crossings was conducted to determine the hydraulic performance under existing conditions. It was completed in accordance with the Ontario Ministry of Transportation's Highway Drainage Design Standards (2008) and the York Region Road Design Guidelines (2020). HEC-RAS hydraulic models were provided by TRCA and were reviewed and updated to reflect the existing crossing conditions based on the available record drawings and survey data completed for the EA study.

Based on the MTO Highway Drainage Design Standards, culvert capacities were assessed based on the 50 year design storm event for structure with spans less than 6.0 m to determine the freeboard between the water surface elevation and the road elevation and the vertical clearance between water surface elevation and the lowest point of soffit.

The results presented in **Table 5-1** indicate that West Don River Crossing does not meet the freeboard criteria of minimum 1.0 m from the design high water level under the 50 year storm event. The Regional Storm event results in overtopping Kirby Road at the crossings.

Table 5-1: Hydraulic Assessment Results for Transverse Crossings (Existing Condition)

Crossing	Type	U/S Invert (m)	D/S Invert (m)	Length (m)	Road Elev. (m)	Water Surface Elev. (m)			Freeboard (m)	Remarks
						50 Yr	100 Yr	Reg.		
West Don River	Culvert	271.32	270.51	10	272.41	271.07 3	271.75	272.8 2	0.68 (50 yr)	Does not meet MTO freeboard criteria, Regional storm overtops roadway

5.8 Fluvial Geomorphology

A Fluvial Geomorphological Assessment was completed for two watercourse crossings, one tributary of the East Humber River (Crossing 1) and one tributary of the West Don River (Crossing 2). The tributary of the East Humber River is located immediately outside of the western study limit of the Kirby Road Widening EA study corridor. The assessment included a review of previously completed studies, topographic and geologic mapping, historical assessment using aerial photographs, field reconnaissance within the right-of-way (ROW) to document channel conditions, meander belt width calculations, and crossing recommendations.

Land use within the study area largely remained agricultural over the period assessed (1946 to 2019), especially within the immediate vicinity of both crossings. The channel form for both tributaries has also remained consistent over the period examined. The tributary of the East Humber River remained as a swale feature with a narrow grassy riparian zone. The tributary of the West Don River remained as a poorly defined swale feature with no riparian zone. Results of the field assessments indicated that both crossings were stable with little to no erosion. It was also noted that since the watercourses are heavily vegetated swales with limited drainage area, they don't have force to form a meandering channel and do not have a true erosion potential.

The Fluvial Geomorphological Study Report can be found in **Appendix K**.

5.9 Geotechnical Investigations

A Geotechnical Investigation was completed to explore the subsurface conditions within the project limits and based on the data obtained, to provide borehole logs, borehole location plans, a written description of the subsurface conditions, and preliminary geotechnical comments and recommendations regarding pavement design and/or rehabilitation, bridge and culvert foundations, high fill embankments, deep cuts, excavation, and dewatering. The field investigation was carried out in July 2020.

The subsurface stratigraphy encountered in the boreholes drilled for geotechnical investigations generally comprises a surficial pavement structure, fill and localized organic deposits underlain by a complex interbedding of native deposits consisting of silty clay till, silt and sand till and clayey silt with interspersed layers of sand to silt.

In general the existing roadway pavement is in good condition to the west of Keele Street and in fair condition to the east exhibiting primarily slight transverse, longitudinal and pavement edge cracking. However, areas of moderate to severe wheel track rutting and transverse, longitudinal, and pavement edge cracking are also present. The pavement structure encountered in the boreholes drilled on the roadway (Boreholes 20-01 to 20-04, 20-07 to 20-11 and 20-13) consisted of 100 to 150 mm of asphalt overlying a granular base varying from gravelly sand to sandy gravel. The granular materials extended to depths ranging from 0.6 to 2.0 m.

Existing and projected traffic volumes were used to determine the pavement damage caused by the anticipated traffic volumes over the design life of the pavement. The existing pavement structure is not considered to be structurally adequate to carry the 20-year design of Equivalent Single Axle Loads (ESALs), and strengthening by such means an overlay would be required. However, the potential would exist for the observed cracks and other localized distresses to reflect up into the new pavement surface, as well as for differential performance between the existing pavement and new pavement in widening areas. Further, incorporation of the existing two-lane rural cross-section into a widened urban section with grade adjustments is unlikely to be practical.

The Geotechnical Investigations Report can be found in **Appendix L**.

5.10 Hydrogeological Investigations

Hydrogeological Investigations were completed to establish baseline hydrogeological conditions within the Site in support of the Class EA and preliminary design through subsurface investigation, including characterization of the soil and groundwater conditions. Preliminary discussion of potential construction dewatering needs is included.

To support the hydrogeological investigation, 12 monitoring wells, including 4 pair of nested wells, were installed in selected boreholes. Monitoring wells were considered to be shallow and deep wells depending on the depth of installation and the unit in which they were completed. Each monitoring well was developed following completion of drilling by removing a minimum of 3 well volumes of water or until dry to reduce silt or drilling debris from the sandpack and well casing.

The monitoring wells were used to measure groundwater levels, collect samples for groundwater quality analyses, and estimate hydraulic conductivity of the screened units. The nested deep and shallow monitoring wells were also installed to study the vertical groundwater gradient beneath the Site.

The water level elevations in the monitoring wells ranged from 265.0 m to 308.9 m. The highest groundwater level (Elev. 308.9 m, depth 1.8 m) was measured in Monitoring Well 20-09D and the lowest water level (Elev. 265.0 m, depth 26.1 m) was measured in Monitoring Well 20-05. Based on the measured groundwater levels on July 28, 2020, the local shallow lateral groundwater flow generally follows Site topography. Shallow groundwater in the eastern portion of the Site (within the ORAC) flows easterly toward Don River East Branch while shallow groundwater in the western portion of the Site flows westerly toward Don River West Branch.

The magnitude of vertical hydraulic gradients observed at Monitoring Wells 20-09S/D on July 28, 2020 was estimated to be relatively small (<-0.05 m/m) and can be considered as near neutral gradient. Long-term monitoring data will be used to calculate the vertical hydraulic gradients over time to determine stabilized gradients.

Additional groundwater level monitoring events of onsite wells are being conducted on a bi-monthly basis for a duration of two years from July 2020 to May 2022 to capture seasonal groundwater level fluctuations. In addition, eight (8) level loggers were instrumented in selected monitoring wells to record groundwater levels on an hourly basis, to measure seasonal groundwater fluctuations. A barologger was also installed to record barometric pressure to correct level logger readings for atmospheric pressure. Between the period of July 21, 2020 and May 20, 2022, 13 rounds of water level measurements were collected from twelve on-site monitoring wells. In general, the groundwater table reflects local topography. The water level elevations in the monitoring wells ranged from 263.9 m to 309.4 m. The highest groundwater level (Elev.309.4 m, depth 1.3 m) was measured in Monitoring Well 20-09D and the lowest water level (Elev. 263.9 m, depth 27.1 m) was measured in Monitoring Well 20-05. The additional monitoring results and observed long-term trends in groundwater levels at the Site are documented in two Groundwater Monitoring Program Technical Memos, for Year One and Year Two.

Groundwater taking for construction dewatering is governed by the Ontario Water Resources Act (OWRA), Environmental Protection Act (EPA) and the Water Taking and Transfer Regulation 387/04, a regulation under the OWRA.

If the water taking rate for this project will be greater than 50,000 L/day and less than 400,000 L/day, registration on the Environmental Activity and Sector Registry (EASR) is required. If the water taking rate will be greater than 400,000 L/day, a Category 3 Permit To Take Water (PTTW) is required.

Details of the Hydrogeological Investigations and the two Groundwater Monitoring Program Technical Memos, for Year One and Year Two are provided in **Appendix M**.

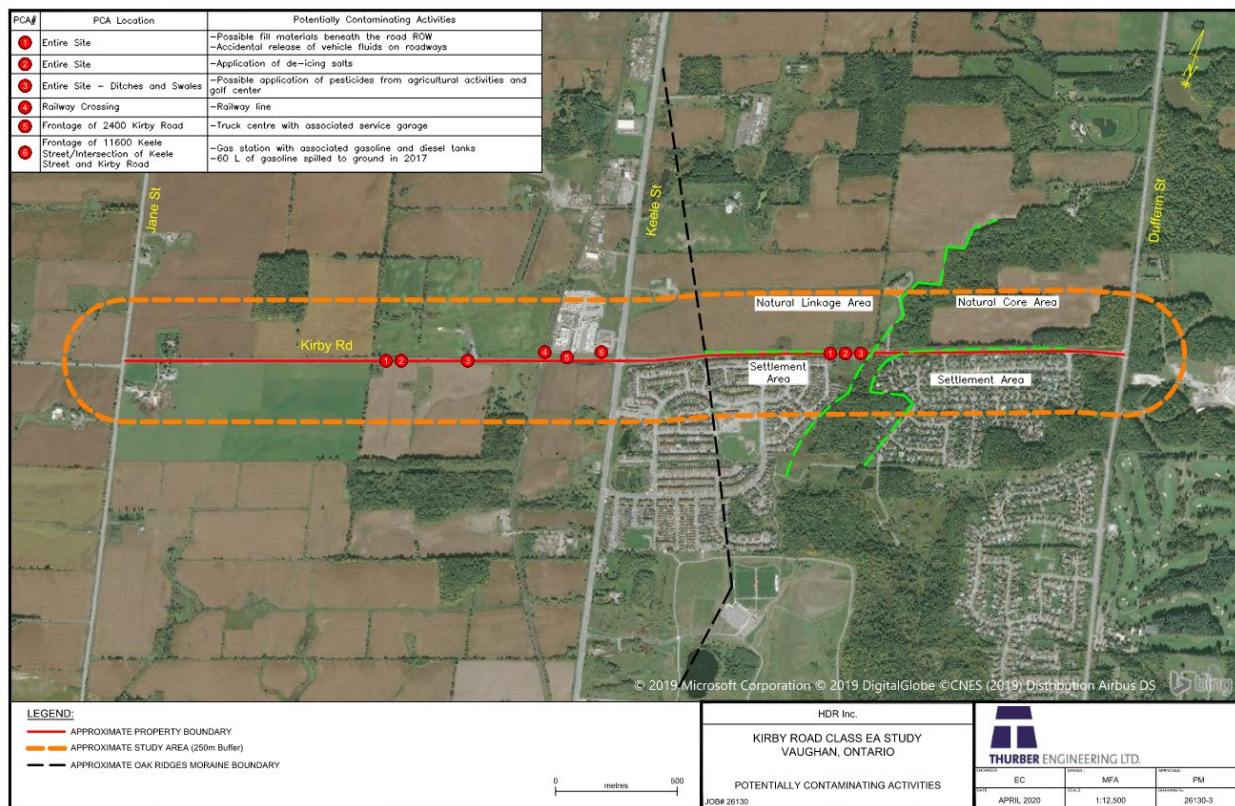
5.11 Contamination Overview Study

A Contamination Overview Study (COS) was completed as part of this EA study. The purpose of the COS was to identify evidence of actual and/or potential contamination at the Site and at adjacent properties within the Study Area which may pose implications on the management of materials generated during the proposed construction works. The Study Area for the COS was considered to include surrounding properties within a 250 m buffer from the study area.

The COS consisted of a desktop review and summary of select available historical records and a reconnaissance of the Study Area from publicly accessible locations. The collected information was used to assess and evaluate past and present uses, and conditions and activities within the Study Area to identify properties with potentially contaminating activities (PCAs) on the Site and the surrounding properties that may be contributors to areas of potential environmental concern (APECs) along the study area.

Based on the review and evaluation of information obtained through the COS, PCAs at six locations were identified at the Site or within the Study Area that are considered to be contributors to APECs on the Site. They are shown on **Figure 5-12**. The identified on-Site PCA contributors generally included the application of de-icing salts, potential fill materials and possible vehicle fluid releases, and a railway line crossing (Barrie Go Railway Line). Off-Site PCA contributors included a gas station, a truck service centre, and the potential application of pesticides on the adjacent agricultural fields and golf centre lands. The six properties listed as areas of potential environmental concern were assigned risk rankings (from low, moderate or high) relative to their potential to impact subsurface soil and/or groundwater conditions at the Site were evaluated. Of the six sites, where two properties were identified of moderate risk and four properties were identified as high risk.

Figure 5-12: Potentially Contaminating Activities



The contaminants of potential concern for the corresponding PCAs contributing to APECs included metals and inorganics, petroleum hydrocarbons (PHCs), benzene, toluene, ethylbenzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs) and organochlorine (OCs) pesticides and herbicides. A subsurface investigation involving sampling and analysis of soil and groundwater within the excavation depths for the proposed construction works would be required to confirm or refute potential for contamination from the identified PCAs and associated APECs on the Site.

The Contamination Overview Study can be found in **Appendix N**.

5.12 Noise

A Noise Assessment was undertaken for the Kirby Road study corridor. Based on the Ontario Ministry of Transportation (MTO)/ Ministry of the Environment, Conservation and Parks (MECP) Noise Protocol, where an existing roadway is proposed to be modified/ widened adjacent to a Noise Sensitive Area (NSA), MECP requires that the future noise levels without the proposed improvements be compared to the future noise level with the proposed improvements. The assessment is completed at the Outdoor Living Area (typically backyards) of each NSA. The provision of noise mitigation is to be investigated should the future noise level with the proposed improvements result in a greater than 5 dBA increase over the future noise level without the proposed improvements. If noise mitigation is provided, the objective is a minimum 5 dBA reduction. Mitigation will attempt to achieve levels as close to, or lower than, the objective level as is technically, economically, and administratively feasible.

Noise mitigation is warranted when increases in sound level over the “No-Build” ambient are greater than 5 dBA. Mitigation measures can include changes in vertical profiles and horizontal alignments, and/or noise barriers. Noise mitigation, where applied, must be administratively, economically, and technically feasible, and must provide at least 5 dBA of reduction averaged over the first row of noise-sensitive receivers.

The Noise Assessment was conducted based on thirty-three (33) NSAs identified along the Kirby Road corridor to represent the worst-case potential impacts at all nearby sensitive land uses within the study area.

The findings of the Noise Impact Assessment based on the project recommendations is discussed in later sections of this report (see **Section 9.18**) and is provided in **Appendix O**.

6 Need and Justification

The need for Kirby Road improvements was identified in the North Vaughan and New Communities Transportation Master Plan 2019 (NVNCTMP), York Region Transportation Master Plan Update 2016 (YRTMP), Vaughan Transportation Master Plan (VTMP) 2013 and City's Pedestrian and Bicycle Master Plan (PBMP) Update. These studies incorporated feedback from technical agencies, stakeholders and the public throughout the decision-making process.

The NVNCTMP and YRTMP followed Approach #1 for undertaking a Master Plan as per Appendix 4.4 of the MEA Municipal Class EA Master Plan Process, thereby fulfilling the requirements of Phases 1 and 2 of the Municipal Class EA process for roads including identification of problems and opportunities and the selection of preferred solution. The YRTMP and NVNCTMP project sheets for the Kirby Road corridor document the impacts and rationale for the preferred solution. The YRTMP and NVNCTMP and associated background technical reports are supporting documents for this Class EA.

The transportation assessment undertaken for this EA study, presented under separate cover, supplements the recommendations from the TMPs and confirms the needs for capacity improvements between Jane Street and Dufferin Street, the jog elimination at Jane Street intersection and grade separation at the Barrie GO Rail crossing of the Kirby Road corridor. The needs for improvements are in line with the vision described in the TMPs, by actively supporting city and regional objectives such as the development of a road network fit for the future and the integration of active transportation into urban areas along the corridor.

The following section documents the needs and justification and Preferred Solution for the study.

6.1 TMP Needs and Justification

The NVNCTMP is a long-range plan that supports policies, programs and infrastructure required to meet existing and future mobility needs and provide context for transportation decisions within North Vaughan. The master plan provides recommendations to address the network's transportation needs within the study area (shown in **Figure 6-1**) while providing sustainable transportation access for residents and businesses. The NVNCTMP satisfied Phases 1 and 2 of the Municipal Class EA process for the Kirby Road Widening EA and its recommendations are summarized as follows.

The NVNCTMP relied on the YRTMP and its recommendations are based on the regional significance of Kirby Road (currently under jurisdiction of the City of Vaughan) as a frequent transit (east of Weston Road), vehicular traffic, cycling, and strategic goods movement corridor. Based on these needs, YRTMP recommends widening of Kirby Road from 2 to 4 lanes between Keele Street to Bathurst Street. In order to support growth in North Vaughan, NVNCTMP recommended improvements on Kirby Road, between Weston Road and Bathurst Street, which has been divided into three sections, as shown in **Figure 6-2**, with section 2 being the subject of this EA study.

Figure 6-1 NVNCTMP Study Area

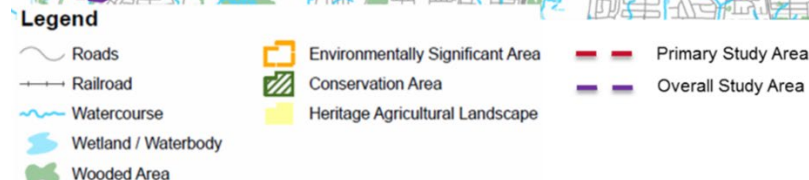
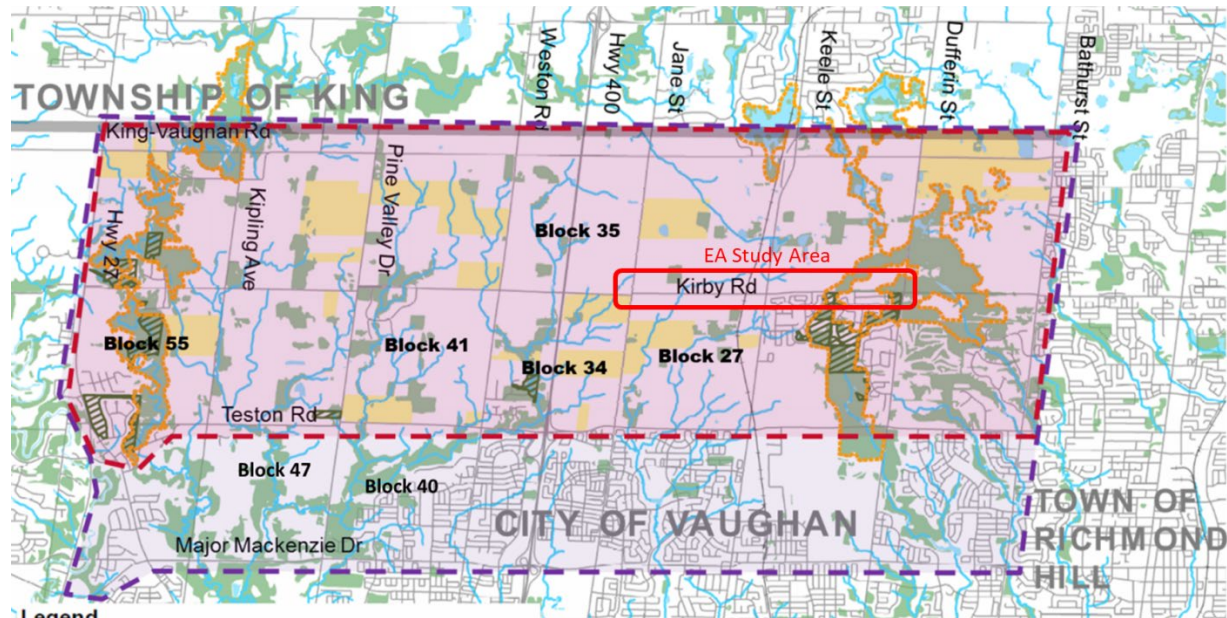
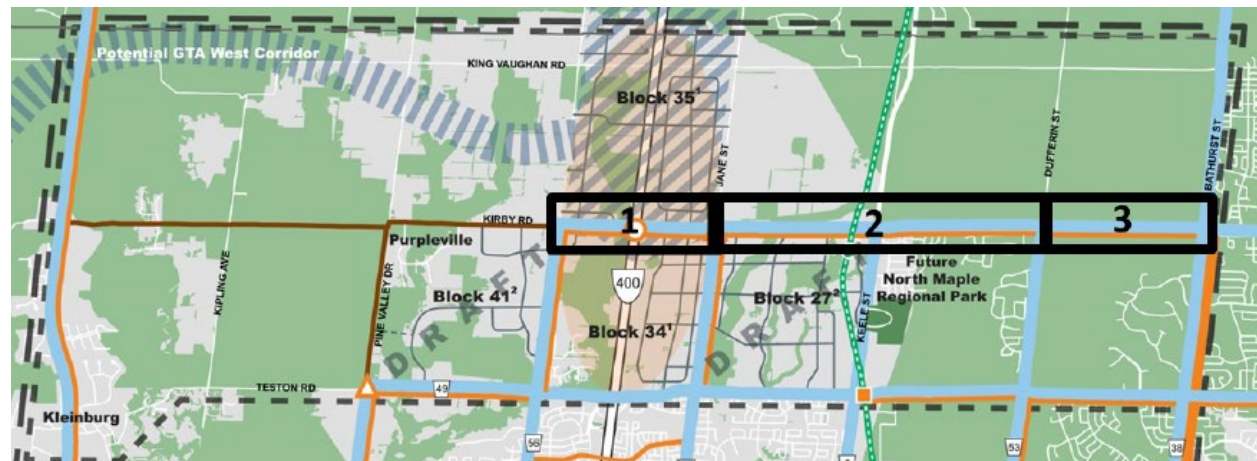


Figure 6-2 NVNCTMP Kirby Road Recommendations



- #1: Subject to outcome of GTA West EA Corridor EA Study
- #2 (this EA study): Widening from 2 to 4 lanes to a 36m ROW width to support Block 27, future Kirby GO Station
- #3: Approved Kirby Road Extension EA (separate study)

NVNCTMP further takes into consideration the future Block 27 plan, which is bounded by Kirby Road to the north, Keele Street to the east, Teston Road to the south and Jane Street to the west. Block 27 is envisioned as a complete community that will have a mix of low and mid-rise buildings with a blend of residential, commercial and institutional uses. As the role and function

of Kirby Road through the study area will change significantly with the development of the New Communities and Highway 400 North Employment Lands, the findings of the Block 27 analysis including its land use and transportation need identified potential options to implement a grade separation of Kirby Road at the Barrie GO Rail line and provide access to the lands between the railway crossing and Keele Street along Kirby Road. These lands are potential GO station lands which would benefit from access to both Kirby Road and Keele Street. Furthermore, a grade separation at Kirby Road is recommended due to projected increases in traffic volumes on Kirby Road and Metrolinx plans for Regional Express Rail (RER) - all day, two-way GO rail service every 15 minutes.

The Kirby Road grade separation has been identified as a Tier 1 priority for grade separation (as noted in Metrolinx's February 17, 2017 Memorandum regarding the Regional Express Rail Level Crossings Strategy) and recommended by NVNCTMP to be built prior or in parallel with the Kirby GO station construction for various reasons such as safety, avoiding delays and disruption of GO station access, and minimizing disruption to GO train services, construction duration as well as minimizing throwaway construction costs.

The VTMP 2013 identifies City-wide transportation needs to the year 2031, including local improvements, strong Regional investments in transit service, and arterial road improvements, sidewalks, on-street and off-street bicycle facilities, and a mix of land uses. Within the study area the VTMP identified the need for Kirby Road widening (from 2 to 4 lanes).

The City's PBMP Update is developing a visible and connected pedestrian and cycling network in Vaughan that integrates, enhances and expands the existing on- and off-road pedestrian and cycling facilities. While the PBMP did not identify cycling facilities on the Kirby Road corridor, it supports the proposed Vaughan Super Trail parallel to Kirby Road about 400m to the south. With sidewalks currently on the south side of Kirby Road between Keele Street and Dufferin Street and the City of Vaughan policy to explore active transportation facilities on all arterial roads, there are opportunities to provide continuous and dedicated connections along the Kirby Road corridor.

Summary of Needs and Justification

As documented in the various TMPs, the needs and justification for the Kirby Road Widening corridor are summarized as follows:

Needs:

- Capacity improvements to address existing congestion and future travel demands
- Corridor improvements to support walking and cycling
- Corridor improvements to support transit

Justification:

- NVNCTMP 2019 outlines existing and future traffic capacity deficiencies
- Kirby Road at Jane Street experiences congestion during peak periods
- Existing deficiencies with active transportation and transit network

- Traffic and train volumes are expected to exceed exposure warrant for grade separation. Grade separation improves pedestrian and cyclist safety and reduces delays to transit and traffic along the corridor and is needed to support planned RER

6.2 Problem and Opportunity Statement

Based on the findings of the TMPs, Kirby Road widening between Jane Street and Dufferin Street is recommended to improve capacity, address existing congestion and future travel demands, and support walking, cycling and transit.

The following problem and opportunity statement is identified for the Kirby Road corridor between Jane Street and Dufferin Street:

- Provide opportunities to maximize the person-carrying capacity of the Kirby Road corridor between Jane Street and Dufferin Street to accommodate the expansion of the Designated Urban Area and projected travel demands
- Improve pedestrian and cycling facilities and overall active transportation network
- Improve the efficiency and reliability of transit

7 Identification and Evaluation of Alternative Solutions

The Municipal Class EA process requires documentation and examination of all reasonable alternatives, or means to address the problem, referred to as Alternative Solutions (Phase 2).

The Municipal Class EA process recognizes that it is beneficial to begin the planning process for infrastructure by considering the overall system before dealing with corridor-specific issues. Master Plans provide for this system-wide approach to infrastructure planning and, at the same time, integrate environmental assessment principles.

The Alternative Solutions considered, evaluation methodology, evaluation of Alternative Solutions, and selection of the Preferred Solution were completed and documented in the YRTMP and NVNCTMP. For supporting documentation and details of the assessment from the YRTMP, refer to YRTMP Background Report C – Future Needs Assessment Report and YRTMP Background Report E – Project Details and Summary Sheets, Appendix A – Road Projects, Project ID: 2034 and 2147. For supporting documentation and details of the assessment from the NVNCTMP, refer to the Kirby Road Widening and New Construction Project Page.

The following highlights the overall methodology, key findings and recommendations from the YRTMP and NVNCTMP, as it relates to Phase 2 of the Kirby Road Widening EA study.

7.1 Alternative Solutions

The YRTMP and NVNCTMP analyzed various alternatives which considered the improvements needed along Kirby Road. The alternative solutions considered are listed as follows:

YRTMP Alternative Solutions (Kirby Road corridor – Project ID 2034):

- Do Nothing
- Optimize existing facility with intersection improvements only
- Urbanize corridor but maintain 2-lane cross-section
- Widen corridor to 4 lanes and construct to urban arterial standard
- Widen parallel/adjacent corridor

YRTMP Alternative Solutions (Barrie GO Grade Separation at Kirby Road - Project ID: 2147):

- Do Nothing
- Improve grade crossing safety
- Transportation improvements to adjacent / parallel corridor
- Construct rail grade separation structure

NVNCTMP Alternative Solutions:

- Do Nothing

- Improvements to other roadways but not Kirby Road
- Widen and Improvements to Kirby Road

7.2 Evaluation Methodology

The YRTMP assessed the Alternative Solutions for Kirby Road using a two-step evaluation methodology, where they were first assessed using a Network-Level Capacity Analysis and then reviewed against their alignment with five YRTMP Objectives.

The Alternative Solutions for the Kirby corridor were identified through an approach to assess Network-Level Capacity Analysis. The system-wide Network-Level Capacity analysis examined the distribution of future traffic for different scenarios of specific road and transit improvements. All scenarios assumed 40% intensification for residential growth in the urban built boundary. Additional sensitivity testing was done for other growth scenarios. Three scenarios were used in the analysis. The findings and recommendations from the YRTMP Network-Level Capacity Analysis to support the recommendation regarding road capacity, connectivity, and other recommendations are documented in YRTMP Background Report C – Future Needs Assessment Report.

Following the Network-Level Capacity analysis, evaluation of each of the alternatives, and extensive consultation, the YRTMP Preferred Solution was measured for its alignment with the YRTMP objectives. The five YRTMP objectives are: Support Transit, Support Road Network, Support Active Transportation, Support Goods Movement, and Support Last Mile. They were developed on a Region-wide scale and used to assess infrastructure improvements as it relates to transportation service, and natural and socio-economic environments. The YRTMP Preferred Solution was rated on a scale from 0 to 4, based on its ability to fulfill / align with each YRTMP objective and is documented in the YRTMP project sheets for Kirby Road and the Barrie GO Grade Separation at Kirby Road (IDs: 2034 and 2147) located in Appendix A of the YRTMP.

The NVNCTMP specifically analyzed alternatives such as improved transit services along the corridor which requires the missing link of Kirby Road, between Dufferin Street and Bathurst Street, for better connectivity within the network. Other alternatives considered include improvements to Kirby Road widening and new construction such as no construction of the Kirby Road missing link. The analysis, however, showed that without the missing link and road widening, total AM peak hour congested VKT grows by 4,000 while congested VHT grows by 150 and that other roadway improvements will not benefit east-west travel demand generated by the New Communities and 400 North Employment Lands.

7.3 Recommendations

The following tables summarize the YRTMP and NVNCTMP Alternative Solutions considered and the combined recommendations from the evaluations:

Table 7-1 Summary of YRTMP and NVNCTMP Recommendations

Alternative Solution	Recommendation
1. “Do Nothing”	Not recommended as the solution does not address the problem and opportunity statement.
2. Optimize existing facility with intersection improvements only	Not recommended as the solution does not address overall traffic congestion and travel demand needs and only provides a minor improvement to Kirby Road corridor traffic flow.
3. Urbanize Kirby Road but maintain 2-lane cross-section	Not recommended as the solution does not address traffic congestion and travel demand. There are opportunities to improve walking and cycling facilities.
4. Widen to 4 lanes, improvements to Kirby Road and construct to urban arterial standard	RECOMMENDED to be carried forward as the solution addresses travel demand. There is an opportunity to provide walking and cycling facilities and the potential to improve east-west transit service and connectivity.
5. Improvements to other roadways but not Kirby Road	Not recommended as the solution will not benefit east-west travel demand generated by the New Communities and 400 North Employment Lands. There are also no improvements to walking and cycling, or transit service along Kirby Road

Table 7-2: Summary of YRTMP and NVNCTMP Recommendations – Barrie GO Grade Separation

Alternative Solution	Recommendation
1. “Do Nothing”	Not recommended as the solution does not address the problem and opportunity statement.
2. Improve grade crossing safety	Not recommended as the solution has potential to improve walking and cycling facilities and address safety concerns but does no address future travel demand.
3. Transportation improvements to adjacent / parallel corridor	Not recommended as the solution has potential to divert travel demand to another corridor. There are no improvements to walking and cycling facilities and no improvement to transit.
4. Construct rail grade separation structure	RECOMMENDED to be carried forward as the solution addresses travel demand within corridor. There is an opportunity to provide walking and cycling infrastructure and improve transit service.

7.4 Selection of Preferred Solution

The TMPs provided the following recommendations for the broader Kirby Road corridor between Albion Vaughan Road and Dufferin Street emphasizing the regional context for this important corridor:

- Provide Regional east-west connectivity and transportation capacity

- Widen Kirby Road plus completion of missing link
- Construct interchange at Highway 400 and Kirby Road
- Designate as a strategic goods movement corridor
- Designate as a Frequent Transit Network corridor
- Cycling Facilities as a local cycling route of regional significance
- Grade Separation at the Barrie GO rail line at Kirby Road
- Kirby Road from Highway 27 to Bathurst Street as candidate for Regional Road

For the corridor specific Preferred Solution for Kirby Road between Jane Street and Dufferin Street, the following Preferred Solution was identified as:

- **Widen Kirby Road from two to four lanes and construct to urban arterial standard within a 36m right-of-way**
- **Grade separate the Barrie GO railway crossing at Kirby Road**
- **Eliminate the jogged intersection at Jane Street to improve traffic flow**
- **Improve walking and cycling facilities (active transportation)**

The Kirby Road Widening EA team completed a Transportation and Traffic study to assess and confirm the recommendations from the TMPs. The Transportation and Traffic study considered the existing traffic conditions at the key intersections along Kirby Road corridor, estimated and examined traffic growth and expected future traffic volumes, analyzed traffic impacts from the future traffic volumes, and identified infrastructure improvements to address the deficiencies and accommodate the future traffic growth for the horizon year of 2031. The findings from the EA's Transportation and Traffic study confirmed the Preferred Solution recommended by YRTMP and NVNCTMP for the Kirby Road corridor between Jane Street and Dufferin Street.

The project team then reviewed the Preferred Solution against the Problem and Opportunity Statement. This was completed to ensure that the Preferred Solution aligned with the study opportunities. The Preferred Solution was confirmed to align with the identified opportunities for the Kirby Road Widening EA study as documented in **Table 7-3** and illustrated in **Figure 7-1**.

Table 7-3: Preferred Solution’s Alignment with Study Opportunities

Opportunity	Preferred Solution’s Alignment with Study Opportunities
Provide opportunities to maximize the person-carrying capacity of the Kirby Road corridor between Jane Street and Dufferin Street to accommodate the expansion of the Designated Urban Area and projected travel demands	Provides improved multi-modal transportation link to increase the person-carrying capacity of the corridor via additional vehicular lanes, pedestrian and cycling facilities and opportunities for transit.
Improve pedestrian and cycling facilities and overall active transportation network	Completes gaps in the existing active transportation network by providing dedicated and continuous facilities for pedestrians and cyclists to improve safety, encourage active travel and reduce vehicular congestion.
Improve the efficiency and reliability of transit	Supports the development of the frequent transit network.

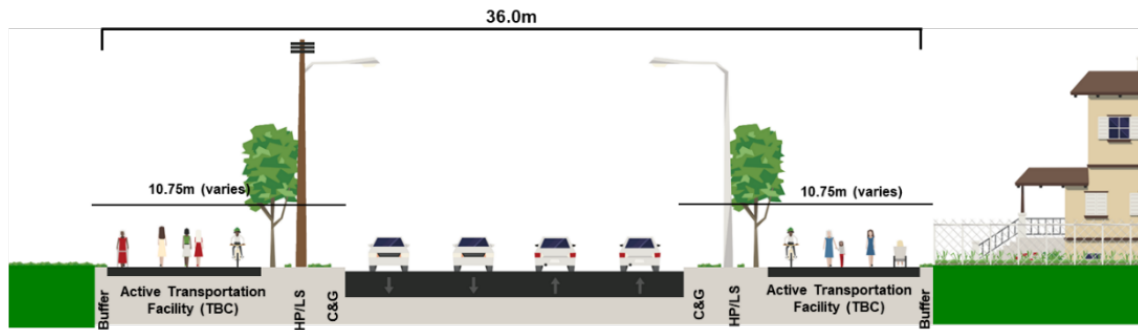


Figure 7-1: Preferred Solution

8 Alternative Design Concepts

The Municipal Class EA process requires examination of alternative methods of implementing the Preferred Solution, referred to as Alternative Design Concepts during Phase 3 of the Class EA process. The advantages and disadvantages of each were assessed. This section discusses the development of Alternative Design Concepts, evaluation criteria, evaluations and recommendations.

8.1 Alternative Design Concepts

The Preferred Solution was confirmed as widening Kirby Road from 2 to 4 lanes, urbanizing and providing continuous active transportation facilities and landscaping opportunities. The following section discusses the Alternative Design Concepts developed to address the preferred solution. It is noted that typical cross-section alternatives were developed for the corridor and at areas of special consideration following the evaluation and recommended road widening. They are discussed in **Section 8.3**.

8.1.1 Active Transportation Facilities

Prior to generating the typical cross-section alternatives, a review of various active transportation facility types for the corridor was undertaken as shown in **Figure 8-1**.

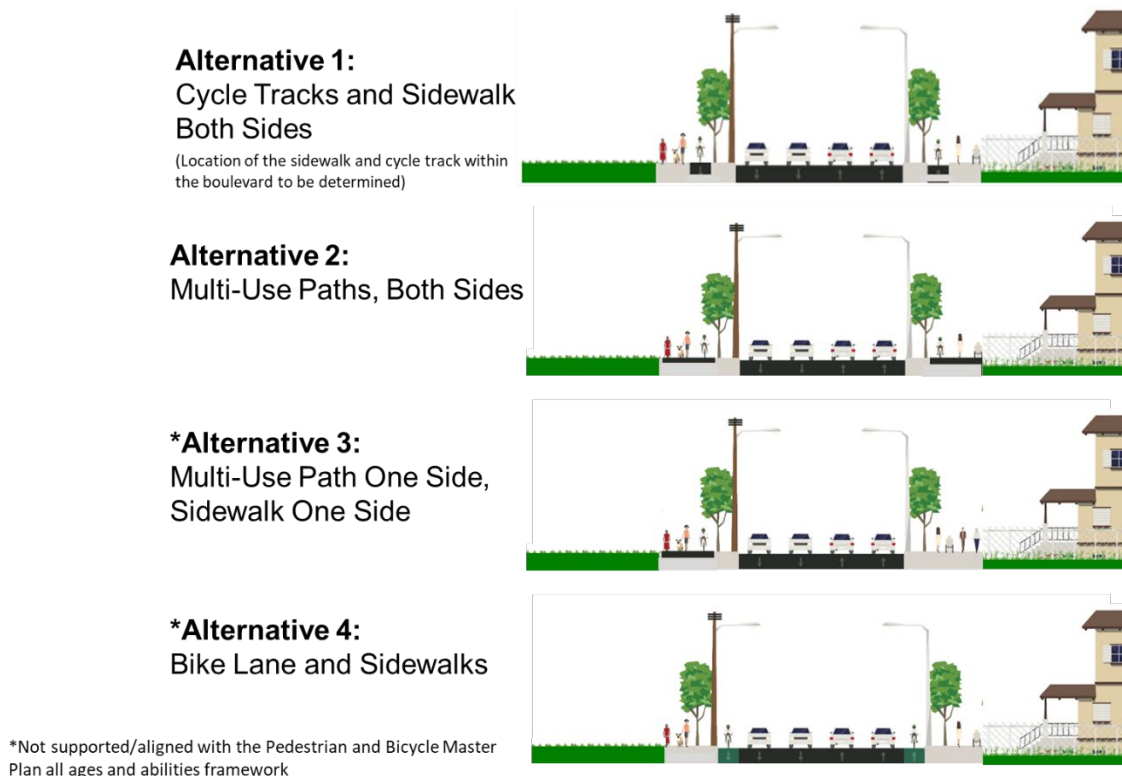


Figure 8-1: Active Transportation Facilities Alternatives

A high-level screening of Active Transportation facility alternatives is shown in **Table 8-1**. Consideration was given to the City of Vaughan’s 2019 Pedestrian and Bicycle Master Plan

recommendation which resulted in the elimination of two alternatives, namely Alternative 3 and Alternative 4 as documented.

Table 8-1: High Level Screening of Active Transportation Facilities

Alternative	Discussion	Recommendation
Alternative 1 Boulevard Cycle Tracks and Sidewalks, both sides	<ul style="list-style-type: none"> Provides grade separation and adequate horizontal distance from vehicular traffic Minimizes potential conflicts with transit Provides separation between cyclists and pedestrians Opportunities to provide active transportation connections in constrained locations 	Carry forward
Alternative 2 Multi-use Path (two- way shared facility), both sides	<ul style="list-style-type: none"> Provides grade separation and adequate horizontal distance from vehicular traffic Minimizes potential conflicts with transit Does not provide separation between cyclists and pedestrians Opportunities to provide active transportation connections in constrained locations 	Carry forward
Alternative 3 Multi-use Path One Side, Sidewalk One Side	<ul style="list-style-type: none"> Provides grade separation and adequate horizontal distance from vehicular traffic Does not provide cycling access on both sides of the corridor Not supported/ aligned with City of Vaughan’s Pedestrian and Bicycle Mater Plan (2019) 	Screened out – Do not carry forward
Alternative 4 On-road Bike Lane and Sidewalks	<ul style="list-style-type: none"> Does not provide grade separation from vehicular traffic Provides separation between cyclists and pedestrians Not supported/ aligned with City of Vaughan’s Pedestrian and Bicycle Mater Plan (2019) 	Screened out – Do not carry forward

Combinations of the AT facilities carried forward, listed from greatest separation between modes to least separation, are:

- Cycle Tracks and Sidewalks, both sides
- Multi-use Path, both sides

8.1.2 Widening Approach Alternatives

In order to widen and urbanize Kirby Road to four lanes, three widening alternatives were considered by the study team. Each alternative along with their features are illustrated in **Figure 8-2**.

Figure 8-2: Widening Approach Alternatives

Alternative 1: Widening About the Centreline

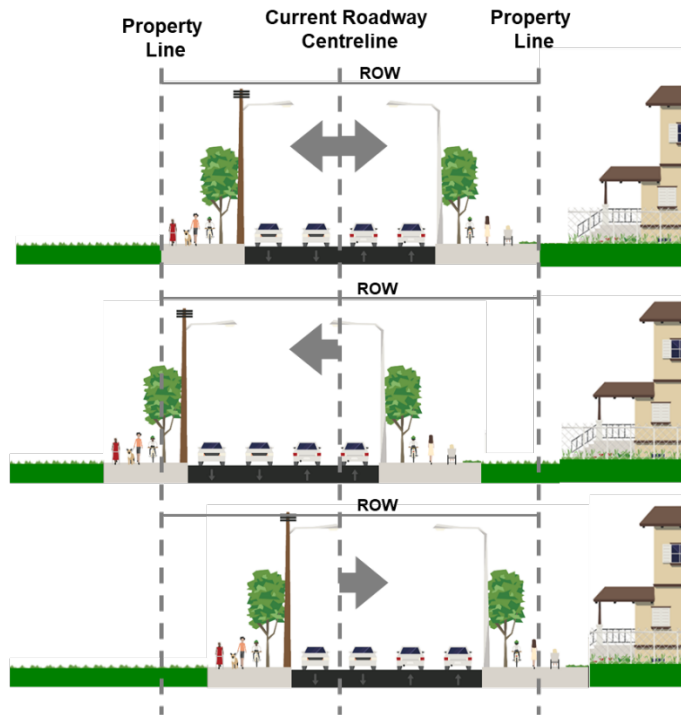
Provide additional lanes to both sides of the street to balance the impacts on both sides of Kirby Road

Alternative 2: Widening to the North

Shift road centreline so additional lanes and associated impacts occur on the north side of Kirby Road

Alternative 3: Widening to the South

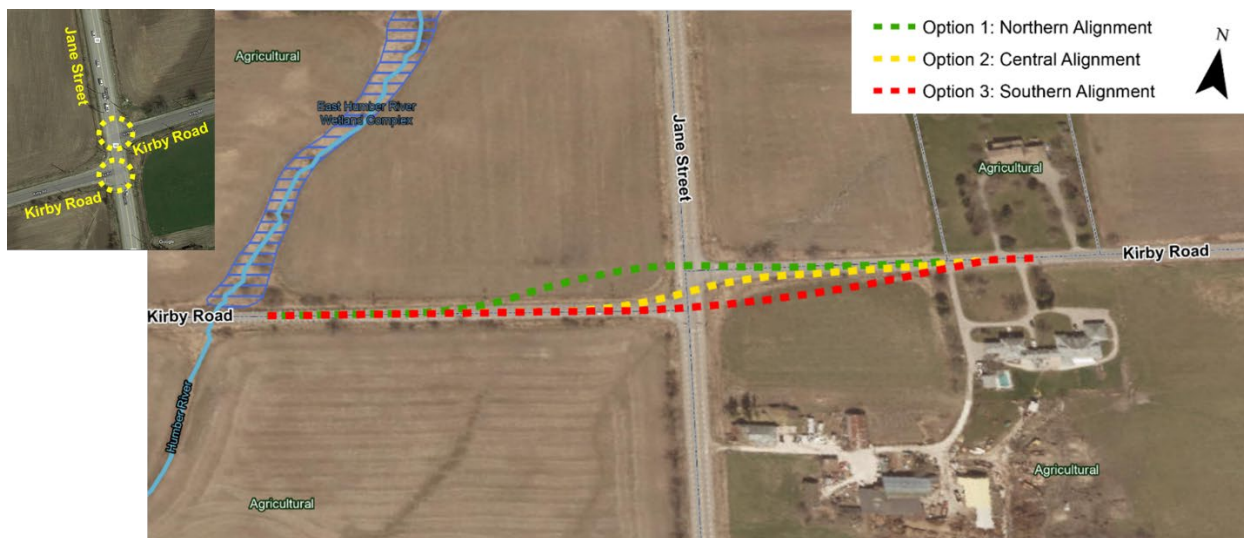
Shift road centreline so additional lanes and associated impacts occur on the south side of Kirby Road



8.1.3 Jog Elimination at Jane Street

The existing jog at the intersection of Kirby Road and Jane Street causes significant delay for drivers during both the AM and PM peak hours. The jog elimination would provide the opportunity to safely accommodate other users such as pedestrians and cyclists. The three alternatives considered for the jog elimination at Jane Street intersection are shown in **Figure 8-3**.

Figure 8-3: Jane Street Jog Elimination Alternatives



8.1.4 Barrie GO Rail Corridor Crossing

The Preferred Solution to grade separate the Barrie GO railway crossing at Kirby Road was supported by the City's Kirby GO Transit Hub Sub-Study, 2016 and the future rail exposure index computed for this crossing location (see **Section 4.2.6**). To address this recommendation the following alternatives were identified. Each alternative accommodates the widening and urbanization of Kirby Road and provision of continuous active transportation facilities.

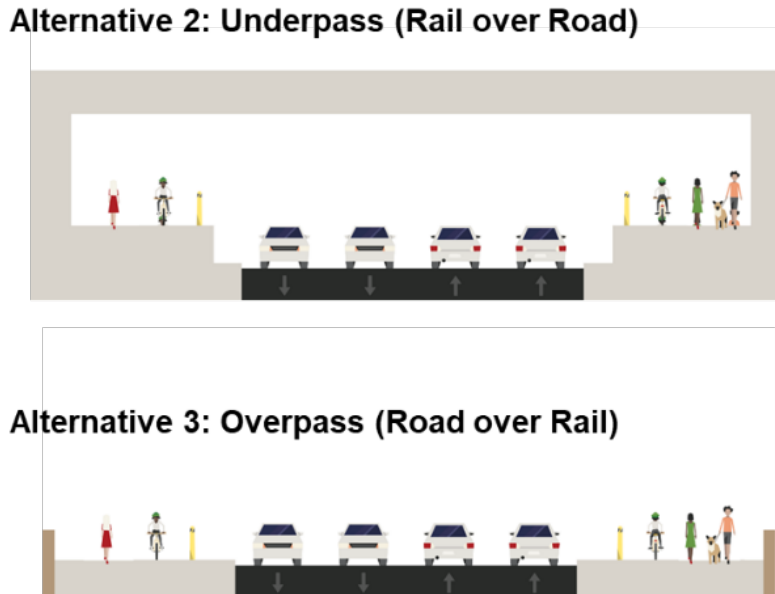
1. Alternative 1 – At-Grade Crossing (maintain the at-grade rail crossing with widened Kirby Road)
2. Alternative 2 – Underpass (Rail over Road)
3. Alternative 3 – Overpass (Road over Rail)
4. Alternative 4 – Hybrid (Hybrid Underpass: Raised rail with lowered road / Hybrid Overpass: Lowered rail with raised road)

The planned service along the Barrie GO Rail Corridor from Metrolinx's GO Expansion Project will offer all-day, two-way, 15-minute rail service along the Barrie GO line. The expansion will increase the number of trains from 12 to 120 by 2031. This resulted in the calculated exposure index to be more than ten times as large as the warranted value for a grade separation in the 2031 and 2041 horizon years. As a result, **Alternative 1 – At-Grade Crossing, was screened out** at a high level as it does not address potential conflict points at the rail crossing with the proposed active transportation facilities and vehicular traffic, and will result in greater delays and queues associated with additional time for crossing arms and signals to accommodate the increased GO train traffic planned for the future.

Alternative 4 – Hybrid was also screened out at a high level based on the geometrics of the existing rail corridor and in consultation with Metrolinx. It was noted that changes to the profile of the rail, which would be required for a Hybrid option, would be too impactful for the length of the rail corridor. This is due to the length of rail upstream and downstream of the Kirby Road crossing that would be required to be raised / lowered to accommodate a grade change at its crossing of Kirby Road, the potential impacts to the existing rail curvature south of the Kirby Road crossing, and the potential impacts from high groundwater table (when considering options to lower the rail).

As a result of the high level screening, **Alternative 2 - Underpass and Alternative 3 - Overpass were carried forward for detailed assessment** and are illustrated in **Figure 8-4**. Conceptual profiles for Alternatives 2 – Underpass and Alternative 3 – Overpass were prepared and are provided in the Crossing Assessment Report found in **Appendix Q**.

Figure 8-4: GO Rail Crossing Cross Section Alternatives



8.2 Evaluation

8.2.1 Evaluation Criteria

The evaluation of alternative design concepts included the formulation of evaluation criteria. The evaluation criteria were developed based on transportation considerations as well as impacts to the natural, cultural, and socio-economic environments. The alternative design concepts identified were evaluated based on the following criteria listed in **Table 8-2**. Where possible and appropriate, a Reasoned Argument approach to screen out alternatives to select the recommended design concept was also applied.

Table 8-2: Evaluation Criteria

Consideration	Criteria
Transportation Service	<ul style="list-style-type: none"> • Improve Public Transit Service • Reduce Traffic Congestion and Delays • Create a Pedestrian-Friendly Environment • Create a Cyclist-Friendly Environment • Improve Safety for all Travel Modes • Improve Mode Choice • Accommodate Emergency Services
Social Environment	<ul style="list-style-type: none"> • Minimize Impacts on Existing Residential, Institutional and Recreational Dwellings / Properties • Minimize impacts to Active Agricultural Lands • Minimize Traffic Noise • Conserve Cultural Heritage Resources • Improve Visual Aesthetics

Consideration	Criteria
Infrastructure Design and Economic Environment	<ul style="list-style-type: none"> • Minimize Utility Relocation • Accommodate Planned Development and Growth • Minimize Impacts and Improve Access to Businesses • Minimize Property Acquisition • Maximize Construction Value • Minimize Operating Costs • Minimize Disruption due to Construction
Natural Environment	<ul style="list-style-type: none"> • Protect Designated Areas • Protect Vegetation • Protect Wildlife • Protect Aquatic Habitat • Improve Air Quality • Protect Surface Water and Ground Water • Minimize Effects on Climate Change • Minimize Flooding and Erosion and Protect Slope Stability

8.2.2 Active Transportation Evaluation

The detailed evaluation for the Active Transportation Alternatives is presented **Figure 8-1** using the evaluation criteria identified in **Table 8-2**. Each category that was evaluated was summarized using the following rankings from Not Preferred to Preferred:

Not Preferred (Does not meet objectives)	Less Preferred (Partially meets objectives)	Preferred (Meets objectives)
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Each evaluation criteria were considered, however as the two alternatives are anticipated to have the same width and property impacts, in several instances no difference amongst the alternatives is indicated. It is noted the active transportation evaluation is to be considered in conjunction with the Widening Evaluation table for documentation of impacts of the overall Typical Section including the road widening, active transportation facility and streetscaping opportunities.

Table 8-3: Evaluation of Active Transportation Alternatives

Evaluation Criteria	Alternative 1: Boulevard Cycle Tracks and Sidewalks, both sides (4.0m AT width: 1.5m sidewalk with 0.5m buffer adjacent to 2.0m cycle track)	Alternative 2: Multi-use Path (two-way shared facility), both sides (4.0m MUP width)
Transportation Service		
Improve Public Transit Service Reduce Traffic Congestion and Delays Accommodate Emergency Services	<ul style="list-style-type: none"> No difference in alternatives as both alternatives encourage active modes of transportation which support trips by walking, cycling and transit thus reducing congestion and accommodate emergency services. 	<ul style="list-style-type: none"> Same as Alternative 1.
Create a Cyclist-Friendly Environment Create a Pedestrian-Friendly Environment <ul style="list-style-type: none"> Separation/ Protection for pedestrians and cyclists from vehicular lanes Separation for pedestrians from cyclists Compatible with adjacent land uses / destinations and access Direct, Continuous, and Convenient Connections Compatible with planned AT facilities east of Dufferin Street 	<ul style="list-style-type: none"> No difference in alternatives as pedestrians and cyclists will be separated/ protected from vehicular lanes in both alternatives. Accommodates separation between cyclists and pedestrians. Cycle tracks and sidewalks provide direct access for pedestrians and cyclists to existing and planned adjacent land uses / destinations on both boulevards. Cycle tracks are one-directional resulting in potentially longer cyclist travel distance (depending on origin and destination) due to the inability to travel eastbound in the west boulevard and westbound in the east boulevard. Pedestrians and cyclists provided dedicated and continuous space throughout the corridor. Separated pedestrian and cycling facilities have potential for discontinuous facility type in highly constrained areas with potential to transition to shared facility (minimum 2.4m MUP) if limited opportunities to acquire additional property result in insufficient width for separated facilities. Requires transition as a result of change in facility type from cycle track and sidewalk on both sides at Dufferin Street intersection to planned AT improvements (4.0m MUP on each side) along Kirby Road east of Dufferin Street. 	<ul style="list-style-type: none"> Vehicular separation to pedestrians and cyclists is the same as Alternative 1 Cyclists and pedestrians are in shared space on both sides. MUPs provide direct access for pedestrians and cyclists to existing and planned adjacent land uses / destinations on both boulevards. MUPs allow for two-way travel which minimize cyclist travel distance to destinations on either boulevard. Pedestrians and cyclists provided dedicated and continuous space throughout the corridor. Shared pedestrian and cyclist facilities will have continuous facility type in highly constrained areas with potential to reduce MUP facility width to minimum 2.4m if limited opportunities to acquire additional property. Provides continuous AT facility type of MUPs on both sides to planned AT improvements (4.0m MUP on each side) along Kirby Road east of Dufferin Street. Consistent facility type aids user recognition of potential conflict zones and increases safety in the corridor.
Improve Safety for all Travel Modes Improve Mode Choice <ul style="list-style-type: none"> Opportunity to provide safe facilities that accommodates different cyclist users and pedestrians 	<ul style="list-style-type: none"> Separated cycle tracks and sidewalks provide dedicated space to eliminate conflict between pedestrians and cyclists. Separated, dedicated and continuous AT facilities provide opportunity greater accessibility compliance through potential for visual delineation of dedicated spaces for through pavement markings, signage and material type. One-directional cycling facilities minimize potential conflicts at adjacent driveways and intersections, based on driver expectation of one-way cyclist travel. Minimize potential conflicts between cyclists and transit riders with transit rider expectation of one-way cyclist travel, however there is potential conflict for boarding/alighting at transit shelters/pads due to limited available right-of-way at intersections. 	<ul style="list-style-type: none"> MUPs have potential conflicts between pedestrians and cyclists due to shared facilities in shared space, and between cyclists traveling in opposing directions, on both sides. Shared, dedicated and continuous AT facilities improves accessibility compliance. Bi-directional facilities for cyclists increase potential conflicts at adjacent driveways and intersections, based on driver expectation of two-way cyclist travel. Increase potential conflicts between cyclists and transit riders with transit rider expectation of two-way cyclist travel, however there is potential conflict for boarding/alighting at transit shelters/pads due to limited available right-of-way at intersections.
Summary of Transportation Service	Preferred	Not Preferred

Evaluation Criteria	Alternative 1: Boulevard Cycle Tracks and Sidewalks, both sides (4.0m AT width: 1.5m sidewalk with 0.5m buffer adjacent to 2.0m cycle track)	Alternative 2: Multi-use Path (two-way shared facility), both sides (4.0m MUP width)
Social Environment		
Minimize impacts on Existing Residential, Institutional and Recreational Dwellings / Properties Minimize impacts to Active Agricultural Lands Conserve Cultural Heritage Resources	<ul style="list-style-type: none"> • No difference in alternatives as the typical right-of-way accommodates active transportation facilities in both boulevards and both alternatives are anticipated to have the same property impacts. • Potential to reduce impacts with minimum 3.3m facility width (1.5m sidewalk with 0.3m separation to 1.5m cycle track) where there are limited opportunities to acquire additional property. 	<ul style="list-style-type: none"> • Same as Alternative 1. • Minor increase in potential to reduce impacts compared to Alternative 1 with minimum 3.0m MUP width (or 2.4 m in highly constrained areas) where there are limited opportunities to acquire additional property.
Minimize Traffic Noise	<ul style="list-style-type: none"> • No difference in alternatives as both alternatives encourage active modes of transportation, including walking, cycling and transit thus reducing traffic noise. 	<ul style="list-style-type: none"> • Same as Alternative 1.
Improve Visual Aesthetics	<ul style="list-style-type: none"> • Separated sidewalk and cycle track have opportunities to provide visual delineation of dedicated spaces for pedestrians and cyclists through pavement markings, signage and material type for accessibility. Introduction of active transportation facility and streetscaping opportunities enhance visual aesthetics. 	<ul style="list-style-type: none"> • Introduction of active transportation facility and streetscaping opportunities enhance visual aesthetics.
Summary of Social Environment	Preferred	Preferred
Infrastructure Design and Economic Environment		
Minimize Utility Relocation Minimize Disruption due to Construction	<ul style="list-style-type: none"> • No difference in alternatives as both alternatives are anticipated to have the same utility relocation requirements and require similar construction techniques and level of disruption. 	<ul style="list-style-type: none"> • Same as Alternative 1.
Accommodate Planned Development and Growth	<ul style="list-style-type: none"> • No difference in alternatives as both alternatives provide active transportation facilities in both boulevards and have the potential to accommodate planned development and growth by supporting trips through additional modes of transportation. 	<ul style="list-style-type: none"> • Same as Alternative 1.
Minimize Impacts and Improve Access to Businesses Minimize Property Acquisition	<ul style="list-style-type: none"> • Cycle tracks and sidewalks provide direct access for pedestrians and cyclists to existing and planned businesses on both boulevards. Cycle tracks are one-directional resulting in potentially longer cyclist travel distance (depending on origin and destination) to access businesses due to the inability to travel eastbound in the west boulevard and westbound in the east boulevard. • No difference in alternatives as the typical right-of-way accommodates active transportation facilities in both boulevards and both alternatives are anticipated to have the same property impacts / requirements. • Potential to reduce impacts with minimum 3.5m facility width (1.5m sidewalk with 0.5m separation to 1.5m cycle track) where there are limited opportunities to acquire additional property. 	<ul style="list-style-type: none"> • MUPs provide direct access for pedestrians and cyclists to existing and planned businesses on both boulevards. MUPs allow for two-way travel which minimize cyclist travel distance to access businesses on either boulevard • Property impacts / requirements same as Alternative 1. • Minor increase in potential compared to Alternative 1 to reduce impacts with minimum 3.0m MUP width (or 2.4 m in highly constrained areas) where there are limited opportunities to acquire additional property.

Evaluation Criteria	Alternative 1: Boulevard Cycle Tracks and Sidewalks, both sides (4.0m AT width: 1.5m sidewalk with 0.5m buffer adjacent to 2.0m cycle track)	Alternative 2: Multi-use Path (two-way shared facility), both sides (4.0m MUP width)
Maximize Construction Value Minimize Operating Costs	<ul style="list-style-type: none"> • Minor-moderate capital cost for structure modification to accommodate sidewalks and cycle tracks on both boulevards through structure widening/ replacement/ extension • Potential for slightly increased capital costs then Alternative 2 if varying materials are required for sidewalk and cycle track (asphalt vs concrete) and if pavement markings and signage to delineate facility types and direction is required • Moderate operating and maintenance costs to maintain two AT facility types in both boulevards 	<ul style="list-style-type: none"> • Similar capital cost to Alternative 1 for structure modification to accommodate MUP on both boulevards through structure widening/ replacement/ extension. • Similar maintenance and operation costs to Alternative 1 to maintain wide MUPs in both boulevards.
Summary of Infrastructure Design and Economic Environment	Less Preferred	Preferred
Natural Environment		
Protect Designated Areas Protect Vegetation Protect Wildlife Protect Aquatic Habitat Protect Surface Water and Ground Water Minimize Flooding and Erosion and Protect Slope Stability	<ul style="list-style-type: none"> • No difference in alternatives as both alternatives are anticipated to have the same level of impact. • Potential to reduce impacts with minimum 3.5m facility width (1.5m sidewalk with 0.5m separation to 1.5m cycle track) where there are limited opportunities to acquire additional property. 	<ul style="list-style-type: none"> • Impacts are anticipated to be the same as Alternative 1. • Greater potential than Alternative 1 to reduce impacts with minimum 3.0m MUP width (or 2.4 m in highly constrained areas) where there are limited opportunities to acquire additional property.
Improve Air Quality Minimize Effects on Climate Change	<ul style="list-style-type: none"> • No difference in alternatives as both alternatives encourage safer and more comfortable pedestrian and cycling facilities, encouraging a more sustainable mode of transportation and reducing congestion. 	<ul style="list-style-type: none"> • Same as Alternative 1.
Summary of Natural Environment	Less Preferred	Preferred
Overall Summary for Kirby Road Widening (Jane Street to Dufferin Street)	<p style="text-align: center;">RECOMMENDED</p> <p>Although this alternatives results in increased cyclist travel distance due to one-way cycling facilities, requires a transition in facility type to the proposed AT facilities (4.0m MUP) recommended east of Dufferin Street and may result in a discontinuous facility type if required to reduce its width substantially in highly constrained areas, this Alternative is <u>Recommended</u> as it separates pedestrians and cyclists from vehicles, provides pedestrian and cyclist with direct access to adjacent lands / destinations in both boulevard, eliminates conflicts with pedestrians and cyclists with separated facilities, and minimizes potential conflicts at driveways and intersections with one-way cyclist travel and vehicles.</p>	<p style="text-align: center;">Not Preferred</p> <p>Although this alternative separates pedestrians and cyclists from vehicles, provides pedestrian and cyclist with access in both boulevards to adjacent lands / destinations with reduced cyclist travel distance, provides continuity with the proposed AT facilities (4.0m MUPs) recommended east of Dufferin Street and has the potential to provide a consistent facility type if required to reduce its width in highly constrained areas, this Alternative is <u>not preferred</u> as it does not provide physical separation between pedestrians and cyclists resulting in additional conflicts and also has potential conflicts at driveways and intersections with two-way cyclist travel and vehicles.</p>

8.2.3 Widening Evaluation

The detailed evaluation for the Widening Alternatives is presented in **Figure 8-2** and used the evaluation criteria identified in **Table 8-2**. Each category that was evaluated was summarized using the following rankings from Not Preferred to Preferred:

Not Preferred (Does not meet objectives)	Less Preferred (Partially meets objectives)	Preferred (Meets objectives)
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The evaluation documents the widening alternatives considered for the study corridor but **excludes the lands** subject to the **Jog Elimination at the Jane Street intersection** and the **Grade Separation at the Barrie GO Rail line crossing** which are assessed and evaluated under a separate Detailed Evaluation table.

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Table 8-4: Evaluation of Widening Alternatives

Evaluation Criteria	Alternative 1: Widen Road about the Centre of the Road	Alternative 2: Widen Road to the North Side	Alternative 3: Widen Road to the South Side
Transportation Service			
Improve Public Transit Service	<ul style="list-style-type: none"> All alternatives include road widening, intersection improvements and continuous and dedicated active transportation facilities which support Kirby Road as part of the Region's Frequent Transit Network by providing opportunities for more efficient transit service and routing addition of transit stops / amenities, and direct access to transit from walking and cycling modes. 		
Reduce Traffic Congestion and Delays	<ul style="list-style-type: none"> All alternatives include road widening plus auxiliary turning lanes which will increase traffic mobility and reduce traffic congestion and delays. Improves goods movement connectivity by providing additional capacity along the continuous east-west route 		
Create a Pedestrian-Friendly Environment	<ul style="list-style-type: none"> All alternatives accommodate pedestrians through the provision of continuous dedicated facilities, crosswalks / crossrides at intersections, and direct, convenient and accessible connectivity to adjacent neighbourhoods and to intersecting north-south AT corridors and adjacent land use / destinations. 		
Create a Cyclist-Friendly Environment	<ul style="list-style-type: none"> All alternatives accommodate cyclists through the provision of continuous dedicated cycling facilities, crossrides at intersections, and direct, convenient and accessible connectivity to adjacent neighbourhoods, intersecting north-south AT corridors and adjacent land use / destinations. 		
Improve Safety for all Travel Modes	<ul style="list-style-type: none"> All alternatives provide widening and intersection improvements including auxiliary lanes and crossrides/crosswalks which have the potential to reduce sudden stops to make turns and rear-end collisions, accommodate safe passage of pedestrians and cyclists at intersections, and provided dedicated space in boulevards to increase pedestrian and cyclist comfort, increase separation and minimize conflicts with vehicles 		
Improve Mode Choice	<ul style="list-style-type: none"> All alternatives improve mode choice though the provision of dedicated and continuous active transportation facilities, and road widening and intersection improvements to improve transit. 		
Accommodate Emergency Services	<ul style="list-style-type: none"> All alternatives include road widening and intersection improvements which reduce congestion and can improve the efficiency of travel and direct access to accommodate emergency services 		
Summary of Transportation Service	Preferred	Preferred	Preferred
Social Environment			
Minimize Impacts on Existing Residential, Institutional and Recreational Dwellings / Properties	<ul style="list-style-type: none"> No anticipated impacts to buildings Minor impact to golf course on north side of Kirby Road Minor-Moderate impact to one residential property on north side and one residential property on the south side of Kirby Road to acquire Official Plan requirements Potential impact to established residential subdivisions on south side can be minimized/eliminated with offset centreline widening. 	<ul style="list-style-type: none"> No anticipated impacts to buildings Moderate impact to golf course on north side of Kirby Road to acquire Official Plan requirements Moderate - Significant impact to one residential property on north side No anticipated impact to established residential subdivisions on south side 	<ul style="list-style-type: none"> Potential impacts to residential properties / buildings No anticipated impact to golf course on north side of Kirby Road Moderate -Significant impact to one residential property on south side Significant impact to established residential properties on the south side to acquire Official Plan requirements.
Minimize impacts to Active Agricultural Lands	<ul style="list-style-type: none"> No active agricultural operation identified 	<ul style="list-style-type: none"> No active agricultural operation identified 	<ul style="list-style-type: none"> No active agricultural operation identified

Evaluation Criteria	Alternative 1: Widen Road about the Centre of the Road	Alternative 2: Widen Road to the North Side	Alternative 3: Widen Road to the South Side
	<ul style="list-style-type: none"> Moderate impact balanced to agricultural lands on both the north side (common field crops) and south sides (forage / pasture and common field crop) of Kirby Road to acquire Official Plan requirements. No Provincially Designated Specialty Crop areas identified 	<ul style="list-style-type: none"> Moderate - Significant impact to agricultural lands on -the north side (common field crops) of Kirby Road to acquire Official Plan requirements. No Provincially Designated Specialty Crop areas identified 	<ul style="list-style-type: none"> Significant impact to agricultural lands on the south side (forage / pasture and common field crop) of Kirby Road to acquire Official Plan requirements. No Provincially Designated Specialty Crop areas identified
Minimize Traffic Noise	<ul style="list-style-type: none"> When widening about the centreline, travel lanes are in closer proximity to receptors (i.e. existing backyards) on the south side. However noise impacts due to additional traffic are equal for all alternatives 	<ul style="list-style-type: none"> When widening to the north, travel lanes are further away to receptors (i.e. existing backyards) on the south side than the other alternatives. However, noise impacts due to additional traffic are equal for all alternatives 	<ul style="list-style-type: none"> When widening to the south, travel lanes are in closest proximity to receptors to receptors (i.e. existing backyards) on the south side than the other alternatives. However noise impacts due to additional traffic are equal for all alternatives
Conserve Cultural Heritage Resources	<ul style="list-style-type: none"> Potential to impact CHL5 Farmscape (Listed on City's Heritage Register), and CHL 3 Residence and CHL 2, 4 and 8 Farmscapes (identified as properties of interest on the City of Vaughan's Heritage Register) Potential to impact lands on north side possessing archaeological potential and requiring Stage 2 archaeological assessment Anticipated impacts to two archaeological sites (AIGv-118 and ALGv-123) that will require Stage 3 Archaeological Assessment. Potential to impact ossuary site 	<ul style="list-style-type: none"> Potential to impact CHL5 Farmscape (Listed on City's Heritage Register), and CHL 4 and 8 Farmscapes (identified as properties of interest on the City of Vaughan's Heritage Register) Potential to impact lands on north side possessing archaeological potential and requiring Stage 2 archaeological assessment Anticipated impacts to two archaeological sites (AIGv-118 and ALGv-123) that will require Stage 3 Archaeological Assessment. Potential to impact ossuary site 	<ul style="list-style-type: none"> Potential to impact CHL 3 Residence and CHL 2 Farmscape (identified as properties of interest on the City of Vaughan's Heritage Register) Potential to impact lands on south side possessing archaeological potential and requiring Stage 2 archaeological assessment at two locations. Otherwise lands on south side generally do not retain archaeological potential. Anticipated impacts to one archaeological site (ALGv-123) that will require Stage 3 Archaeological Assessment. Potential to impact ossuary site
Improve Visual Aesthetics	<ul style="list-style-type: none"> Visual aesthetics will be slightly reduced due to increased pavement width for road widening and active transportation facilities, but can be improved through tree plantings and other boulevard treatments within available ROW 		
Summary of Social Environment	Preferred	Less Preferred	Not Preferred
Infrastructure Design and Economic Environment			
Minimize Utility Relocation	<ul style="list-style-type: none"> Existing utility poles are generally located along the south side of Kirby Road and will require relocation. Additional utility impacts anticipated and extent to be determined at a later stage. New utility corridors will be required on both sides of Kirby Road to accommodate additional services, urbanization and illumination. 		
Accommodate Planned Development and Growth	<ul style="list-style-type: none"> All alternatives accommodate planned development and growth by providing additional capacity to accommodate all road users. 		
Minimize Impacts and Improve Access to Businesses	<ul style="list-style-type: none"> Minor impact to golf course on north side of Kirby Road 	<ul style="list-style-type: none"> Moderate impact to golf course on north side 	<ul style="list-style-type: none"> No anticipated impact to golf course on north side of Kirby Road

Evaluation Criteria	Alternative 1: Widen Road about the Centre of the Road	Alternative 2: Widen Road to the North Side	Alternative 3: Widen Road to the South Side
Minimize Property Acquisition	<ul style="list-style-type: none"> Property acquisition anticipated on the both sides to meet Official Plan requirements Driveway and grading impacts balanced to two residential properties on north and south sides, east of Jane Street Property acquisition anticipated beyond Official Plan requirements to accommodate grading balanced on both north and south sides 	<ul style="list-style-type: none"> Greater property acquisition anticipated on north side to meet Official Plan requirements Driveway and grading impact to one residential property on north and south side, east of Jane Street Greater property acquisition anticipated beyond Official Plan requirements to accommodate significant grading on north side in naturalized areas 	<ul style="list-style-type: none"> Greater property acquisition anticipated on south side and to residential properties Driveway and grading impact to one residential property on south side, east of Jane Street Property acquisition anticipated beyond Official Plan requirements to accommodate grading on south sides
Maximize Construction Value	<ul style="list-style-type: none"> Significant capital cost, comparable for all options 		
Minimize Operating Costs	<ul style="list-style-type: none"> Comparable operation/maintenance cost for all options 		
Minimize Disruption due to Construction	<ul style="list-style-type: none"> Moderate construction complexity and disruption required for all alternatives to undertake the road widening, active transportation facilities, urbanization and improvements at the Tributary to the Don River West Branch. Access to be maintained during construction. 	<ul style="list-style-type: none"> Moderate construction complexity and disruption required for all alternatives to undertake the road widening, active transportation facilities, urbanization and improvements at the Tributary to the Don River West Branch. Access to be maintained during construction. Additional construction complexity due to more significant grading in naturalized areas on north side, east of Keele Street and existing slopes 	<ul style="list-style-type: none"> Moderate construction complexity and disruption required for all alternatives to undertake the road widening, active transportation facilities, urbanization and improvements at the Tributary to the Don River West Branch. Access to be maintained during construction. Additional construction disruption due to impacts to residential properties on south side, east of Keele Street
Summary of Infrastructure Design and Economic Environment	Preferred	Not Preferred	Not Preferred
Natural Environment			
Protect Designated Areas	<ul style="list-style-type: none"> Impacts to lands within Greenbelt Plan Area boundary, Environmentally Significant Area (ESA) surrounding Don River West Branch crossing equal among the alternatives Moderate impacts to Significant Woodland on north and south sides Minor-moderate impacts to lands within Oak Ridges Moraine Boundary Area, Environmentally Significant Areas ANSI, and Candidate ANSI balanced on both north and south sides No impact to Provincially Significant Wetlands (PSW) <i>(for discussion on impacts to PSW located west of Keele Street)</i> 	<ul style="list-style-type: none"> Impacts to lands within Greenbelt Plan Area boundary, Environmentally Significant Area (ESA) surrounding Don River West Branch crossing equal among the alternatives Significant impacts to Significant Woodlands on north side and minor impacts to Significant Woodland on south side closer to Dufferin Street Moderate impacts to lands within Oak Ridges Moraine Boundary Area, Environmentally Significant Areas ANSI, and Candidate ANSI greater on north side No impact to Provincially Significant Wetlands (PSW) <i>(for discussion on impacts to PSW located west of Keele Street)</i> 	<ul style="list-style-type: none"> Impacts to lands within Greenbelt Plan Area boundary, Environmentally Significant Area (ESA) surrounding Don River West Branch crossing equal among the alternatives Minor impacts to Significant Woodlands on north side and significant impacts to Significant Woodland on south side closer to Dufferin Street Moderate impacts to lands within Oak Ridges Moraine Boundary Area, Environmentally Significant Areas ANSI, and Candidate ANSI greater on south side No impact to Provincially Significant Wetlands (PSW) <i>(for discussion on impacts to PSW located west of Keele Street)</i>

Evaluation Criteria	Alternative 1: Widen Road about the Centre of the Road	Alternative 2: Widen Road to the North Side	Alternative 3: Widen Road to the South Side
	<i>west of Keele Street refer to evaluation of Grade Separation Alternatives at Barrie GO Rail crossing)</i>	<i>Keele Street refer to evaluation of Grade Separation Alternatives at Barrie GO Rail crossing)</i>	<i>refer to evaluation of Grade Separation Alternatives at Barrie GO Rail crossing)</i>
Protect Vegetation	<ul style="list-style-type: none"> • No significant tree species observed and no federally or provincially significant species will require removal as a result of the proposed works. • Between Jane Street and Keele Street anticipated impacts to vegetation communities (agricultural, cultural meadow and cultural savannah) are considered anthropogenically disturbed cultural meadows • Between Keele Street and Dufferin Street anticipated impacts to vegetation communities (cultural meadow, mineral meadow marsh ecosite, mixed forest ecosite, coniferous plantation type, maple mineral deciduous swamp ecosite and cultural woodland) including communities within significant woodlands. Impacts are balanced between north and south sides • Moderate anticipated tree removals within and beyond existing ROW. • Moderate impacts to Significant Woodland on north and south sides 	<ul style="list-style-type: none"> • No significant tree species observed and no federally or provincially significant species will require removal as a result of the proposed works. • Between Jane Street and Keele Street anticipated impacts to vegetation communities (agricultural) • Between Keele Street and Dufferin Street anticipated impacts to vegetation communities (cultural meadow, mineral meadow marsh ecosite, mixed forest ecosite, coniferous plantation type, and maple mineral deciduous swamp ecosite) including communities within significant woodlands. North side impacts closer to Dufferin Street (less preferred) are considered to have greater features / species than on south side • Moderate anticipated tree removals within and beyond existing ROW. • Significant impacts to Significant Woodland on north side and minor impacts to Significant Woodland on south sides 	<ul style="list-style-type: none"> • No significant tree species observed and no federally or provincially significant species will require removal as a result of the proposed works. • Between Jane Street and Keele Street anticipated impacts to vegetation communities (agricultural, cultural meadow and cultural savannah) are considered anthropogenically disturbed cultural meadows • Between Keele Street and Dufferin Street anticipated impacts to vegetation communities (cultural meadow, maple mineral deciduous swamp ecosite and cultural woodland) including communities within significant woodlands. South side impacts closer to Dufferin Street (preferred) are considered to have fewer features / species than on north side • Moderate anticipated tree removals within and beyond existing ROW. • Minor impacts to Significant Woodlands on north side and significant impacts to Significant Woodland on south side closer to Dufferin Street
Protect Wildlife	<ul style="list-style-type: none"> • Anticipated impact / removals of trees and vegetation have potential to disrupt nesting birds, fur-bearing mammals and raptors, as well as migratory birds • Anticipated impact / removals of trees with potential bat cavity on north side (6 locations) and south side (5 locations) • Moderate anticipated impact to Bat Maternity Colonies significant wildlife habitat and special concern and rare wildlife (Eastern Wood Peewee) significant wildlife habitat is balanced between north and south side • Barn Swallow were observed foraging in the study area however the Kirby Road area of impact is anticipated to be beyond their nesting location and the existing pasture lands. No negative impacts and no suitable locations for nesting for Barn Swallow are identified from the alternatives. 	<ul style="list-style-type: none"> • Anticipated impact / removals of trees and vegetation have potential to disrupt nesting birds, fur-bearing mammals and raptors, as well as migratory birds • Anticipated impact / removals of trees with potential bat cavity on north side (6 locations) and south side (1 location) • Significant anticipated impact to Bat Maternity Colonies significant wildlife habitat and special concern and rare wildlife (Eastern Wood Peewee) significant wildlife habitat as north side has greater area of habitat • Barn Swallow were observed foraging in the study area however the Kirby Road area of impact is anticipated to be beyond their nesting location and the existing pasture lands. No negative impacts and no suitable locations for nesting for Barn Swallow are identified from the alternatives. • Bobolink were observed in the western end of the study area however the Kirby Road area of impact is 	<ul style="list-style-type: none"> • Anticipated impact / removals of trees and vegetation have potential to disrupt nesting birds, fur-bearing mammals and raptors, as well as migratory birds • Anticipated impact / removals of trees with potential bat cavity on south side (5 locations) • Minor-moderate anticipated impact to Bat Maternity Colonies significant wildlife habitat and special concern and rare wildlife (Eastern Wood Peewee) significant wildlife habitat as south side habitat is limited to west of Dufferin Street • Barn Swallow were observed foraging in the study area however the Kirby Road area of impact is anticipated to be beyond their nesting location and the existing pasture lands. No negative impacts and no suitable locations for nesting for Barn Swallow are identified from the alternatives. • Bobolink were observed in the western end of the study area however the Kirby Road area of impact is anticipated

Evaluation Criteria	Alternative 1: Widen Road about the Centre of the Road	Alternative 2: Widen Road to the North Side	Alternative 3: Widen Road to the South Side
	<ul style="list-style-type: none"> Bobolink were observed in the western end of the study area however the Kirby Road area of impact is anticipated to beyond the existing active pasture lands. No negative impacts to Bobolink are identified from the alternatives. 	anticipated to beyond the existing active pasture lands. No negative impacts to Bobolink are identified from the alternatives.	to beyond the existing active pasture lands. No negative impacts to Bobolink are identified from the alternatives.
Protect Aquatic Habitat	<ul style="list-style-type: none"> Minor-moderate anticipated impacts to unevaluated wetland [Headwater Drainage Feature (HDF) 5] located north of Ravineview Drive Minor-moderate impacts to unevaluated wetland located west of Dufferin Street on north and south sides are balanced on both sides Moderate anticipated impacts to HDF 1 (roadside ditch) and HDF 2 (undefined channel) HDF2-001 (roadside ditch) on north side can be mitigated to maintain their function through piping (the feature) or moving/realigning it Minor-moderate anticipated impacts to HDF 3 (undefined feature tilled for agriculture and is the crossing of the Tributary to Don River West Branch) will require modification / replacement similar in all alternatives to address the road widening improvements and existing hydraulic capacity requirements 	<ul style="list-style-type: none"> Significant anticipated impacts to unevaluated wetland [Headwater Drainage Feature (HDF) 5] located north of Ravineview Drive Significant anticipated impacts to unevaluated wetland located west of Dufferin Street on north and south sides, as impacts are concentrated to north section of wetland Moderate anticipated impacts to HDF 1 (roadside ditch) and HDF 2 (undefined channel) HDF2-001 (roadside ditch) on north side can be mitigated to maintain their function through piping (the feature) or moving/realigning it Minor-moderate anticipated impacts to HDF 3 (undefined feature tilled for agriculture and is the crossing of the Tributary to Don River West Branch) will require modification / replacement similar in all alternatives to address the road widening improvements and existing hydraulic capacity requirements 	<ul style="list-style-type: none"> No / minor anticipated impacts to unevaluated wetland [Headwater Drainage Feature (HDF) 5] located north of Ravineview Drive Moderate anticipated impacts to unevaluated wetland located west of Dufferin Street on north and south sides, as impacts are concentrated to south portion of wetland No / minor anticipated impacts to HDF 1 (roadside ditch) and HDF 2 (undefined channel) HDF2-001 (roadside ditch) on north side can be mitigated to maintain their function through piping (the feature) or moving/realigning it Minor-moderate anticipated impacts to HDF 3 (undefined feature tilled for agriculture and is the crossing of the Tributary to Don River West Branch) will require modification / replacement similar in all alternatives to address the road widening improvements and existing hydraulic capacity requirements
Improve Air Quality	<ul style="list-style-type: none"> All alternatives include road widening and intersection improvements which will increase traffic mobility and reduce traffic congestion and delays as well as improvements to support active transportation modes and transit. This reduction in congestion and associated idling can reduce emissions and have potential for improvements to air quality. 		
Protect Surface Water and Ground Water	<ul style="list-style-type: none"> Increased roadway width and hard surface area is similar for all alternatives; stormwater quantity will increase, and quality mitigation must be implemented Land identified in the study area fall within the Significant Groundwater Recharge Area (SGRA) and Highly Vulnerable Aquifers (HVA) under the Clean Water Act, 2006. Moderate impact to shallow groundwater system due to potential increase in contaminants (for ex. road salt) resulting from increased roadway width is similar for all alternative. Stormwater quality mitigation required. 		
Minimize Effects on Climate Change	<ul style="list-style-type: none"> All alternatives include road widening and intersection improvements which will increase traffic mobility and reduce traffic congestion and delays as well as support active transportation modes. This reduction in congestion and infrastructure to support active transportation modes and improved transit operations can decrease vehicle greenhouse gases that contribute to climate change. Opportunities for implementation of tree plantings and Low Impact Development stormwater management strategies as part of road improvements can improve the study corridor resiliency to climate change 		
Minimize Flooding and Erosion and Protect Slope Stability	<ul style="list-style-type: none"> Opportunity to improve stormwater management and minimize erosion through replacement of rural road 	<ul style="list-style-type: none"> Opportunity to improve stormwater management and minimize erosion through replacement of rural road 	<ul style="list-style-type: none"> Opportunity to improve stormwater management and minimize erosion through replacement of rural road

Evaluation Criteria	Alternative 1: Widen Road about the Centre of the Road	Alternative 2: Widen Road to the North Side	Alternative 3: Widen Road to the South Side
	elements (ditches) with continuous urbanized section (curb and gutter).The drainage and stormwater management strategy and design and planned urbanization of the corridor will be similar amongst all alternatives and adverse impacts are not identified. <ul style="list-style-type: none"> Review of impacts to north boulevard and at Dufferin Street intersection to minimize grading requirements and steep slopes 	elements (ditches) with continuous urbanized section (curb and gutter).The drainage and stormwater management strategy and design and planned urbanization of the corridor will be similar amongst all alternatives and adverse impacts are not identified. <ul style="list-style-type: none"> More significant grading and review of impacts to north boulevard and at Dufferin Street intersection required to minimize grading requirements and address steep slopes. 	elements (ditches) with continuous urbanized section (curb and gutter).The drainage and stormwater management strategy and design and planned urbanization of the corridor will be similar amongst all alternatives and adverse impacts are not identified. <ul style="list-style-type: none"> More significant grading and review of impacts at Dufferin Street intersection required to minimize grading requirements and steep slopes
Summary of Natural Environment	Preferred	Not Preferred	Less Preferred
Overall Summary for Kirby Road Widening (Jane Street to Dufferin Street)	RECOMMENDED		

8.2.4 Jog Elimination Evaluation

The detailed evaluation for the Jog Elimination Alternatives is presented in **Figure 8-3** using the evaluation criteria identified in **Table 8-2**. Each category that was evaluated was summarized using the following rankings from Not Preferred to Preferred:

Not Preferred (Does not meet objectives)	Less Preferred (Partially meets objectives)	Preferred (Meets objectives)
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Table 8-5: Evaluation of Jog Elimination Alternatives

Evaluation Criteria	Alternative 1: Realign about a new intersection in the centre	Alternative 2: Realign to the north intersection	Alternative 3: Realign to the south intersection
Transportation Service			
Improve Public Transit Service	<ul style="list-style-type: none"> All alternatives include jog elimination to consolidate two intersections into one which provides a continuous route and reduced turning movements that support Kirby Road as part of the Region's Frequent Transit Network and provide opportunities for more efficient transit service and routing . 		
Reduce Traffic Congestion and Delays	<ul style="list-style-type: none"> All alternatives increase capacity to meet future demands and have the same potential to reduce traffic congestion and delays due to increased connectivity of the road network with a continuous route and reduced turning movements. The consolidation to one intersection and additional capacity also improves goods movement connectivity along a continuous east-west route. 		
Create a Pedestrian-Friendly Environment	<ul style="list-style-type: none"> All alternatives accommodate pedestrians and minimize conflict points at one consolidated intersection. 		
Create a Cyclist-Friendly Environment	<ul style="list-style-type: none"> All alternatives provide the potential to accommodate cyclists and minimize conflict points at one consolidated intersection. 		
Improve Safety for all Travel Modes	<ul style="list-style-type: none"> Improves road safety by reducing turning movements and conflict points. Jog elimination improves pedestrian and cyclist safety through accommodation through crossrides / cycle tracks and reduces crossing distance by providing protected crossing. Intersection with Jane Street is slightly skewed (~80°); but meets minimum geometric design standards. 	<ul style="list-style-type: none"> Same opportunities to improve road safety as Alternative 1 Same opportunities to improve pedestrian and cyclist safety as Alternative 1 Intersection with Jane Street is slightly skewed (~83° requires back to back curves); but meets minimum geometric design standards 	<ul style="list-style-type: none"> Same opportunities to improve road safety as Alternative 1 Same opportunities to improve pedestrian and cyclist safety as Alternative 1 Intersection with Jane Street maintains near-perpendicular intersection angle (~85° for reverse crown option); is preferred
Improve Mode Choice	<ul style="list-style-type: none"> All alternatives accommodate all road users through active transportation facilities, road capacity improvements and space for transit stops. 		
Accommodate Emergency Services	<ul style="list-style-type: none"> All alternatives provide the potential to efficiently move emergency services by increasing connectivity of the road network with a continuous route and reduced turning movements. 		
Summary of Transportation Service	Preferred	Preferred	Preferred
Social Environment			
Minimize Impacts on Existing Residential, Institutional and Recreational Dwellings / Properties	<ul style="list-style-type: none"> No impacts to existing dwellings and properties. 	<ul style="list-style-type: none"> No impacts to existing dwellings and properties. 	<ul style="list-style-type: none"> Significant loss of frontage Impacts existing dwellings and properties on only the south side of existing roads.
Minimize impacts to Active Agricultural Lands	<ul style="list-style-type: none"> Minor-moderate impact to one active agricultural operation located south of Kirby Road and east of Jane Street. 	<ul style="list-style-type: none"> Minor impact to one active agricultural operation located south of Kirby Road and east of Jane Street. Moderate impact to agricultural lands to common field crops and minor impact to forage / pasture to 	<ul style="list-style-type: none"> Moderate impact to one agricultural operation located south of Kirby Road and east of Jane Street. Moderate impact to agricultural lands to common field crops and moderate impact to forage / pasture to

Evaluation Criteria	Alternative 1: Realign about a new intersection in the centre	Alternative 2: Realign to the north intersection	Alternative 3: Realign to the south intersection
	<ul style="list-style-type: none"> Minor impact to agricultural lands to common field crops and minor impact to forage / pasture to accommodate jog elimination and acquire Official Plan requirements. No Provincially Designated Specialty Crop areas identified 	<p>accommodate jog elimination and acquire Official Plan requirements.</p> <ul style="list-style-type: none"> No Provincially Designated Specialty Crop areas identified 	<p>accommodate jog elimination and acquire Official Plan requirements.</p> <ul style="list-style-type: none"> No Provincially Designated Specialty Crop areas identified
Minimize Traffic Noise	<ul style="list-style-type: none"> All alternatives are not anticipated to impact traffic noise as there are no sensitive noise receptors or outdoor living areas adjacent to the corridor at this location 		
Preserve Archaeological and Cultural Heritage Features	<ul style="list-style-type: none"> Anticipated impact to one archaeological site (AIGv-404) that will require Stage 3 Archaeological Assessment. Remaining lands do not retain archaeological potential Potential to impact CHL1 Farmscape (Listed on City's Heritage Register) and CHL 3 Residence and CHL 2 and 4 Farmscapes (identified as properties of interest on the City of Vaughan's Heritage Register) 	<ul style="list-style-type: none"> Anticipated impact to one archaeological site (AIGv-404) that will require Stage 3 Archaeological Assessment. Remaining lands do not retain archaeological potential Potential for minor impact to CHL 3 Residence and CHL 2 and 4 Farmscapes (identified as properties of interest on the City of Vaughan's Heritage Register) 	<ul style="list-style-type: none"> Anticipated impact to one archaeological site (AIGv-404) and potential to impact a second archaeological site (AIGv-122) if it cannot be avoided, which will require Stage 3 Archaeological Assessments. Remaining lands do not retain archaeological potential Potential to impact CHL1 Farmscape (Listed on City's Heritage Register) and CHL 2 Farmscape and CHL 3 Residence (identified as properties of interest on the City of Vaughan's Heritage Register)
Improve Visual Aesthetics	<ul style="list-style-type: none"> No difference between the alternatives as all alternatives provide opportunities to improve the visual aesthetics with the consolidation to one intersection and opportunities for road improvements and streetscaping in the corridor 		
Summary of Social Environment	Preferred	Less Preferred	Not Preferred
Infrastructure Design and Economic Environment			
Minimize Utility Relocation	<ul style="list-style-type: none"> All alternatives will result in impacts to utilities which will require relocation. 		
Accommodate Planned Development and Growth	<ul style="list-style-type: none"> All alternatives provide the potential to accommodate planned development and growth by improving network connectivity and improving operations at Kirby Road / Jane Street intersection. 		
Minimize Impacts and Improve Access to Businesses	<ul style="list-style-type: none"> No impact to businesses in this segment of the corridor 		
Minimize Property Acquisition	<ul style="list-style-type: none"> Property acquisition generally balanced on north and south sides to two residential and three agricultural properties to obtain Official Plan requirements. 	<ul style="list-style-type: none"> Moderate property acquisition on north side to one residential and two agricultural properties ; minor impact to one agricultural and one residential property on south side to obtain Official Plan requirements. 	<ul style="list-style-type: none"> Significant property acquisition on south side to one residential and two agricultural properties ; minor impact to one agricultural property on north side to obtain Official Plan requirements.

Evaluation Criteria	Alternative 1: Realign about a new intersection in the centre	Alternative 2: Realign to the north intersection	Alternative 3: Realign to the south intersection
Maximize Construction Value	<ul style="list-style-type: none"> Comparable moderate capital costs to complete jog elimination. No additional structural costs as no impact is anticipated to the Tributary to East of Humber River culvert, located beyond study area. 	<ul style="list-style-type: none"> Comparable moderate capital costs to complete jog elimination. Additional capital costs required to address potential modification / replacement to Tributary to East of Humber River culvert located west of Jane Street, beyond the study area. 	<ul style="list-style-type: none"> Comparable moderate capital costs to complete jog elimination. No additional structural costs as no impact is anticipated to the Tributary to East of Humber River culvert, located beyond study area.
Minimize Operating Costs	<ul style="list-style-type: none"> Comparable operating/maintenance costs for all alternatives 		
Minimize Disruption due to Construction	<ul style="list-style-type: none"> Minor construction complexity and disruption required for re-alignment of Kirby Road and consolidation to one intersection. Access to be maintained during construction. 	<ul style="list-style-type: none"> Minor construction complexity and disruption anticipated for re-alignment of Kirby Road to north intersection and consolidation to one intersection. Access to be maintained during construction. Additional construction complexity required for culvert modification / replacement at Tributary to East of Humber River. 	<ul style="list-style-type: none"> Minor construction complexity and disruption anticipated for re-alignment of Kirby Road to north intersection and consolidation to one intersection. Access to be maintained during construction.
Summary of Infrastructure Design and Economic Environment	Preferred	Less Preferred	Not Preferred
Natural Environment			
Protect Designated Areas	<ul style="list-style-type: none"> No anticipated impact to Provincially Significant Wetland (PSW) located north of Tributary to East Humber River There are no Significant Woodland, ANSI identified within the Kirby Road area of impact for the jog elimination. This area is also outside of the Greenbelt Plan Area and Oak Ridges Moraine Conservation Plan boundaries. 	<ul style="list-style-type: none"> Potential impact to Provincially Significant Wetland (PSW) located north of Tributary to East Humber River There are no Significant Woodland, ANSI identified within the Kirby Road area of impact for the jog elimination. This area is also outside of the Greenbelt Plan Area and Oak Ridges Moraine Conservation Plan boundaries. 	<ul style="list-style-type: none"> No anticipated impact to Provincially Significant Wetland (PSW) located north of Tributary to East Humber River There are no Significant Woodland, ANSI identified within the Kirby Road area of impact for the jog elimination. This area is also outside of the Greenbelt Plan Area and Oak Ridges Moraine Conservation Plan boundaries.
Protect Vegetation	<ul style="list-style-type: none"> No federally or provincially significant species will require removal as a result of the proposed works. Anticipated impacts to two vegetation communities (agricultural hay and agricultural soy) Tree removals within existing ROW required to address subject improvements. 	<ul style="list-style-type: none"> No federally or provincially significant species will require removal as a result of the proposed works. Anticipated impacts to two vegetation communities (agricultural hay and agricultural soy) Tree removals within existing ROW required to address subject improvements. 	<ul style="list-style-type: none"> No federally or provincially significant species will require removal as a result of the proposed works. Anticipated impacts to two vegetation communities (agricultural hay and agricultural soy) Tree removals on private residence required to address subject improvements.
Protect Wildlife	<ul style="list-style-type: none"> Anticipated impact / removals of trees and vegetation have potential to disrupt nesting birds, fur-bearing mammals and raptors, as well as migratory birds Alternatives are not anticipated to impact potential bat cavity trees and significant wildlife habitat is not identified in the subject lands for the jog elimination. Barn Swallow were observed foraging in the study area however the Kirby Road area of impact for the jog elimination is anticipated to be beyond their nesting location and existing pasture lands. No negative impacts and no suitable locations for nesting for Barn Swallow are identified from the alternatives. Bobolink were observed in the western end of the study area however the Kirby Road area of impact for the jog elimination is anticipated to be beyond the existing active pasture lands. No negative impacts to Bobolink are identified from the alternatives. 		

Evaluation Criteria	Alternative 1: Realign about a new intersection in the centre	Alternative 2: Realign to the north intersection	Alternative 3: Realign to the south intersection
Protect Aquatic Habitat	<ul style="list-style-type: none"> No impact to aquatic habitats. Headwater drainage feature 4 is an undefined feature that connects to a roadside ditch. This feature will be impacted however this is not a feature of significance. 	<ul style="list-style-type: none"> Potential to impact culvert to Tributary to East of Humber River that may require culvert modification / replacement. Potential to impact aquatic habitat is not confirmed. Headwater drainage feature 4 is an undefined feature that connects to a roadside ditch. This feature will be impacted however this is not a feature of significance. 	<ul style="list-style-type: none"> No impact to aquatic habitats. Headwater drainage feature 4 is an undefined feature that connects to a roadside ditch. This feature will be impacted however this is not a feature of significance.
Improve Air Quality	<ul style="list-style-type: none"> All alternatives include road widening plus auxiliary turning lanes and intersection consolidation which will increase traffic mobility and reduce traffic congestion and delays as well as support active transportation modes. This reduction in congestion and associated idling can reduce emissions and have potential for improvements to air quality 		
Protect Surface Water and Ground Water	<ul style="list-style-type: none"> Increased roadway width and hard surface area is similar for all alternatives; stormwater quantity will increase, and quality mitigation must be implemented Land identified in the study area fall within the Significant Groundwater Recharge Area (SGRA) under the Clean Water Act, 2006. Moderate impact to shallow groundwater system due to potential increase in contaminants (for ex. road salt) resulting from increased roadway width is similar for all alternative. Stormwater quality mitigation required. 		
Minimize Effects on Climate Change	<ul style="list-style-type: none"> All alternatives include road widening plus auxiliary turning lanes and intersection consolidation which will increase traffic mobility and reduce traffic congestion and delays as well as support active transportation modes. This reduction in congestion and infrastructure to support active transportation modes and improved transit operations can decrease vehicle greenhouse gases that contribute to climate change. Opportunities for implementation of tree plantings and Low Impact Development stormwater management strategies as part of road improvements can improve the study corridor resiliency to climate change 		
Minimize Flooding and Erosion and Protect Slope Stability	<ul style="list-style-type: none"> Opportunity to improve stormwater management and minimize erosion through replacement of rural road elements (ditches) with continuous urbanized section (curb and gutter). The drainage and stormwater management strategy and design and planned urbanization of the corridor will be similar amongst all alternatives and adverse impacts are not identified. This location is not identified to be a concern for significant grading impacts and slopes. 		
Summary of Natural Environment	Preferred	Less Preferred	Preferred
Overall Summary for Kirby Road Jog Elimination at Jane Street	RECOMMENDED		

8.2.5 Barrie GO Rail Corridor Crossing Evaluation

The detailed evaluation for the rail corridor crossing alternatives is presented in **Figure 8-4** using the evaluation criteria identified in **Table 8-2**. Each category that was evaluated was summarized using the following rankings from Not Preferred to Preferred:

Not Preferred (Does not meet objectives)	Less Preferred (Partially meets objectives)	Preferred (Meets objectives)
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Table 8-6: Evaluation of Rail Crossing Evaluations

CRITERIA	ALTERNATIVE 2: UNDERPASS - Kirby Road under Rail	ALTERNATIVE 3: OVERPASS - Kirby Road over Rail
TRANSPORTATION SERVICES		
Improve Public Transit Service	<ul style="list-style-type: none"> Road widening, intersection improvements and continuous and dedicated active transportation facilities and grade separation support Kirby Road as part of the Region's Frequent Transit Network by providing opportunities for more efficient transit service and routing, addition of transit stops / amenities, vehicular and pedestrian/cyclist access to future Kirby GO Station and direct access to transit stops from walking and cycling modes Reduction in delays to transit service with elimination of at-grade rail crossing 	
Reduce Traffic Congestion and Delays	<ul style="list-style-type: none"> Improvement to traffic operations by reducing delays caused by at-grade train crossings 	
Create a Pedestrian-Friendly Environment	<ul style="list-style-type: none"> Significant improvement to pedestrian environment with continuous AT facilities on both sides through elevated structure that provides separation from rail crossing with reduced incline for AT users (5%) than road grade. Direct pedestrian access to adjacent land use with increased travel distance Moderate reduction to perceived safety due to reduced visibility of pedestrian passage within underpass structure and likely to be noisy 	<ul style="list-style-type: none"> Moderate improvement to pedestrian environment with continuous AT facilities on both sides of elevated structure that provides separation from rail crossing. Greatest travel distance with wind exposure and substantial incline (7%) along west side Reduction in direct pedestrian access to adjacent land use due to steeper slopes and longer travel distance Significant improvement to perceived safety with elimination of at-grade crossing and clear visibility of pedestrian passage
Create a Cyclist-Friendly Environment	<ul style="list-style-type: none"> Significant improvement to cyclist environment with continuous AT facilities on both sides through elevated structure that provides separation from rail crossing with reduced incline for AT users (5%) than road grade (7%) Direct cyclist access to adjacent land use with increased travel distance Moderate reduction to perceived safety due to reduced visibility of cyclist passage within underpass and likely to be noisy 	<ul style="list-style-type: none"> Moderate improvement to cyclist environment with continuous AT facilities on both sides of elevated structure that provides separate from rail crossing. Greatest travel distance with wind exposure and substantial incline (7%) along west side Limited cyclist direct access to adjacent land use due to steeper slopes and longer travel distance Significant improvement to perceived safety with clear visibility of cyclist passage
Improve Safety for all Travel Modes	<ul style="list-style-type: none"> Improved safety with separation of conflict points and road users and rail crossing with grade-separation Improved safety for cyclists and pedestrians with dedicated infrastructure providing greater separation on both sides of Kirby Road 	
Improve Mode Choice	<ul style="list-style-type: none"> Improvement in mode choice with provision of additional travel lanes to support more efficient transit service and routes, dedicated and continuous AT facilities and reduction in conflict points at the at-grade rail crossing 	
Accommodate Emergency Services	<ul style="list-style-type: none"> Improvement in access for emergency services due to increased number of lanes and elimination of delays at rail crossing from passing trains and crossing gates Direct access from Kirby Road anticipated to be maintained to commercial driveways to the north 	<ul style="list-style-type: none"> Improvement in access for emergency services due to increased number of lanes and elimination of delays at rail crossing from passing trains and crossing gates Direct access from Kirby Road anticipated to be maintained to commercial driveways to the north
<i>Summary of Transportation Service</i>	Preferred	Not Preferred
SOCIAL ENVIRONMENT		
Minimize Impacts on Existing Residential, Institutional and Recreational Dwellings / Properties	<ul style="list-style-type: none"> Property requirement from golf course lands north of Kirby Road. No change to access 	
Minimize Impacts to Active Agricultural Lands	<ul style="list-style-type: none"> No active agricultural operation identified. Impacts to common field crop and scrub land south side can be minimized with retaining walls. No Provincially Designated Specialty Crop areas identified 	
Minimize Traffic Noise	<ul style="list-style-type: none"> Noise level associated with an underpass is anticipated to be higher than that associated with an overpass dependent on design of underpass walls Elimination of train whistles at the crossing with grade separation 	<ul style="list-style-type: none"> Noise level associated with an overpass is anticipated to be lower than that associated with an underpass Elimination of train whistles at the crossing with grade separation

CRITERIA	ALTERNATIVE 2: UNDERPASS - Kirby Road under Rail	ALTERNATIVE 3: OVERPASS - Kirby Road over Rail
	<ul style="list-style-type: none"> • Significant temporary noise impact due to construction expected as a result of proximity between detour roadway to commercial buildings adjacent to Kirby Road 	<ul style="list-style-type: none"> • Significant temporary noise impact due to construction expected as a result of proximity between detour roadway to commercial buildings adjacent to Kirby Road
Preserve Archaeological and Cultural Heritage Features	<ul style="list-style-type: none"> • Potential to impact CHL5 Farmscape (Listed on City's Heritage Register), CHL 6 Farmscape and CHL 7 Rail corridor • Lands do not retain archaeological potential 	
Improve Visual Aesthetics	<ul style="list-style-type: none"> • Moderate reduction to visual aesthetics for the travelling public on Kirby Road with all road users crossing under the rail • Opportunity for tree planting or landscaping in screening buffer and beyond limits of underpass walls • Temporary reduction in aesthetics with detour roads 	<ul style="list-style-type: none"> • Significant reduction to visual aesthetics due to visual obstruction of new overpass structure anticipated to be 9.58m in height, including potential parapet walls • Opportunity for tree planting or landscaping in embankment or by retaining walls • Temporary reduction in aesthetics with detour roads
<i>Summary of Social Environment</i>	Preferred	Less Preferred
INFRASTRUCTURE DESIGN AND ECONOMIC ENVIRONMENT		
Minimize Utility Relocation	<ul style="list-style-type: none"> • Moderate utility conflicts and impacts based on existing utilities. • Anticipated relocation of above ground and underground facilities, including telecommunications aerial lines and underground conduits, and gas. Underground utility relocation includes buried facilities. 	<ul style="list-style-type: none"> • Minor-moderate utility conflicts and impacts based on existing utilities. • Anticipated relocation of above ground and underground facilities, including telecommunications aerial lines and underground conduits, and gas.
Accommodate Planned Development and Growth	<ul style="list-style-type: none"> • Supports approved development in the study area by providing adequate capacity and transportation choices to accommodate planned growth, eases congestion at the rail crossing and supports future Kirby GO Station • Provides multi-modal future access to Kirby GO Station from Kirby Road to tie into underpass may result in steeper access 	<ul style="list-style-type: none"> • Supports approved development in the study area by providing adequate capacity and transportation choices to accommodate planned growth, eases congestion at the rail crossing and supports future Kirby GO Station • Provides multi-modal future access to Kirby GO Station from Kirby Road to tie into underpass may result in steeper access than Underpass Alternative
Minimize Impacts and Improve Access to Businesses	<ul style="list-style-type: none"> • Property requirement identified from commercial / industrial uses, with potential to reduce grading impacts with retaining walls. • Moderate impact to two commercial accesses (Mid Ontario Truck Centre) may result in significant regrading and / or steeper slopes of entrances. • Minor impact to existing entrance (Tim Hortons/Gas Station) to tie into underpass design due to little / no road re-profiling • Potential temporary encroachment on commercial parking lot as a result of the construction of the detour route • Improvement to transit, pedestrian, and cycling access with provision of dedicated facilities 	<ul style="list-style-type: none"> • Property requirement commercial / industrial uses, with potential to reduce grading impacts with retaining walls. • Significant impact to two commercial accesses (Mid Ontario Truck Centre) resulting in potential access closures / re-alignment, or significant regrading and / or steeper slopes of entrances. • Minor impact to existing entrance (Tim Hortons/Gas Station) to tie into overpass design due to little / no road re-profiling • Potential temporary encroachment on commercial parking lot as a result of the construction of the detour route • Improvement to transit, pedestrian, and cycling access with provision of dedicated facilities
Minimize Property Acquisition	<ul style="list-style-type: none"> • Moderate property requirements with potential to reduce property requirements and grading impacts with retaining walls. 	<ul style="list-style-type: none"> • Moderate property requirements with potential to reduce property requirements and grading impacts with retaining walls.
Maximize Construction Value	<ul style="list-style-type: none"> • Very significant capital costs to construct rail bridges, second rail track, retaining walls, detour roads, raised AT facilities, underpass, and drawdown pumping system (if required) • Approximate Structure Cost <i>considers bridge design/construction, rail work, and excavation/retaining wall/U-channel excluding earthworks</i>: \$\$\$\$ (with retaining walls) OR \$\$\$ (without retaining walls, excluding earthworks) • Approximate Pumping Station Cost: \$ (if required) • Approximate Road Cost due to more excavation: \$\$ 	<ul style="list-style-type: none"> • Significant capital costs to construct overpass structure, retaining walls, and detour roads • Approximate Structure Cost <i>(excluding earthworks)</i>: \$\$\$ • Approximate Road Cost: \$\$
Minimize Operating Costs	<ul style="list-style-type: none"> • Significant increase in operating costs with rail bridges, retaining walls, raised AT facilities, and drawdown pumping system (if required) 	<ul style="list-style-type: none"> • Moderate increase in operating costs with retaining walls and overpass

CRITERIA	ALTERNATIVE 2: UNDERPASS - Kirby Road under Rail	ALTERNATIVE 3: OVERPASS - Kirby Road over Rail
Minimize Disruption due to Construction	<ul style="list-style-type: none"> • Potential moderate disruption to rail corridor users due to tunneling, support for rail lines and construction of underpass • Moderate delays to road corridor users due to potential lane closures, construction of detour roads (potential for at-grade and/or grade-separated), and AT facilities to maintain access throughout construction • Longer construction duration - anticipated to be 3 to 4 years • Significant constructability concerns identified: <ul style="list-style-type: none"> ○ Construction staging and requirement for detour roads (potential for at-grade and/or grade-separated detours) ○ Multi-level dewatering system required during construction ○ Internal drainage and pumping system, or long-term groundwater drawdown pumping system required for long-term ○ Additional second track to be constructed. Track modifications, if required, will require scheduled short duration track outages ○ Need for construction of concrete base slab and contiguous caisson walls along north and south sides of Kirby Road • Risk of flooding if long-term groundwater drawdown system shuts down; however, retaining walls should be designed for full hydrostatic pressure 	<ul style="list-style-type: none"> • Potential minor disruption to rail corridor users due to construction of overpass structure • Moderate delays to road corridor users due to potential lane closures, construction of detour roads (potential for at-grade and/or grade-separated), and AT facilities to maintain access throughout • Short construction duration - anticipated to be 2 year • Moderate constructability concerns: <ul style="list-style-type: none"> ○ Construction staging and requirement for detour roads (potential for at-grade and/or grade-separated detours) ○ Approach embankment east and west of the rail line can be constructed with side slopes, or Retained Soil System walls could be constructed to retain the approach embankment • No change to risk of flooding
<i>Summary of Infrastructure Design and Economic Environment</i>	Less Preferred	Not Preferred
NATURAL ENVIRONMENT		
Protect Designated Natural Areas	<ul style="list-style-type: none"> • Moderate impact to Provincially Significant Wetlands (PSWs) on south side • No impact to Areas of Natural and Scientific Interest (ANSI) or Environmentally Sensitive Area (ESA) within the study area segment • No impact to Greenbelt Plan Area 	<ul style="list-style-type: none"> • Moderate impact to Provincially Significant Wetlands (PSWs) on south side • No impact to Areas of Natural and Scientific Interest (ANSI) or Environmentally Sensitive Area (ESA) within the study area segment • No impact to Greenbelt Plan Area
Protect Vegetation	<ul style="list-style-type: none"> • Moderate impact to vegetation due to construction of widening with larger footprint and excavation; adjacent vegetation communities consist of a golf course on the north side and cultural meadows on the south side • No impact to trees with 50dbh or higher • No impact to rare, threatened, or endangered species 	<ul style="list-style-type: none"> • Moderate impacts to vegetation due to construction of widening; adjacent vegetation communities consist of a golf course on the north side and cultural meadows on the south side • No impact to trees with 50dbh or higher • No impact to rare, threatened, or endangered species
Protect Wildlife	<ul style="list-style-type: none"> • Minimal impact to vegetative communities yielding wildlife habitat, as they are generally sparse on both sides of the study corridor at this section due to existing land-use. • Minimal impact to Eastern Towhee found in cultural meadows on the south side 	
Protect Aquatic Habitat	<ul style="list-style-type: none"> • No anticipated impact to aquatic habitat 	
Improve Air Quality	<ul style="list-style-type: none"> • Improved air quality through elimination of at-grade crossing which eliminates vehicle queuing caused by increased GO Train service and additional train crossings. Additional capacity to address congestions and more efficient transit service and provisions of continuous active transportation facilities that will encourage people to divert from cars 	
Protect Surface Water and Ground Water	<ul style="list-style-type: none"> • Significant impact with increased roadway width and hard surface area; stormwater quantity will increase and quality mitigation must be implemented • Land identified in the study area fall within the Significant Groundwater Recharge Area (SGRA) under the Clean Water Act, 2006. Moderate impact to shallow groundwater system due to potential increase in contaminants (for ex. road salt) resulting from increased roadway width. Stormwater quality mitigation required. • Significant excavation-based impacts to groundwater are anticipated • Dewatering will be required to lower the groundwater table at least 1.0 m below the excavation base, with the majority of the dewatering quantities arising from 	<ul style="list-style-type: none"> • Moderate impact with increased roadway width and hard surface area; stormwater quantity will increase and quality mitigation must be implemented. Corridor will be urbanized • Land identified in the study area fall within the Significant Groundwater Recharge Area (SGRA) under the Clean Water Act, 2006. Moderate impact to shallow groundwater system due to potential increase in contaminants (for ex. road salt) resulting from increased roadway width. Stormwater quality mitigation required. • No excavation-based impacts to groundwater are anticipated as excavation is expected to remain above the groundwater level

CRITERIA	ALTERNATIVE 2: UNDERPASS - Kirby Road under Rail	ALTERNATIVE 3: OVERPASS - Kirby Road over Rail
	the sand layer. If lowering of the groundwater table is not permitted, installation of a permanent shoring and groundwater control system (such as a contiguous caisson wall enclosure) will be required to retain both soil and groundwater during and after construction. <ul style="list-style-type: none"> • Category 3 Permit to Take Water anticipated to be required for construction and to support long-term improvements • If permanent drainage of groundwater is permitted by external agencies, dewatering soils can be achieved by either: gravity drainage if topography and discharge location feasible; or pumping station. • If permanent drainage is not permitted, then requires watertight “bathtub” structure that is designed to resist uplift. 	<ul style="list-style-type: none"> • No construction dewatering to lower the groundwater level is expected to be required. • Permanent dewatering is not required • Permit to take water not anticipated to be required for construction or to support long-term improvements • Unwatering to remove seepage entering the excavation would be less than 400,000 litres per day and thus registration on the Environmental Activity and Sector Registry (EASR) would be required.
Minimize Effects of Climate Change	<ul style="list-style-type: none"> • Lower reliance on automobiles through increased non-auto mode share can reduce vehicle emissions and reduce effects on climate change • Decreased congestion resulting from elimination of vehicle queuing caused by gate closures at the rail crossing can decrease vehicle emissions and negative associated effects on climate change 	
Minimize Flooding and Erosion and Protect Slope Stability	<ul style="list-style-type: none"> • Deep cut slopes inclined at 2H:1V with a 2 m wide mid-height berm are expected to be stable provided permanent groundwater control is provided to dewater the sand layer. 	<ul style="list-style-type: none"> • High fill embankment slopes inclined at 2H:1V with a 2 m wide mid-height berm are expected to be stable. Settlement of the foundation soils under the fill loads to be documented if carried forward for further assessment.
<i>Summary of Natural Environment</i>	Less Preferred	Preferred
OVERALL SUMMARY		
	This option provides continuous active transportation facilities, additional vehicle, and mitigates vehicle queuing caused by increased GO Train service. Pedestrian and cyclists also travel along a raised platform to minimize travelling distance and are grade separated from the rail crossing.	This option provides continuous active transportation facilities, additional vehicle lanes, and mitigates vehicle queuing caused by increased GO Train service. Pedestrian and cyclists travel along a steep incline (~7%) west of the tracks resulting in increased travel distance.
	Recommended	

8.3 Typical Sections

The Official Plan right-of-way for Kirby Road is 36.0m and the existing right-of-way for the corridor varies from 20m to 63m, which was used as a basis to generate typical cross-sections.

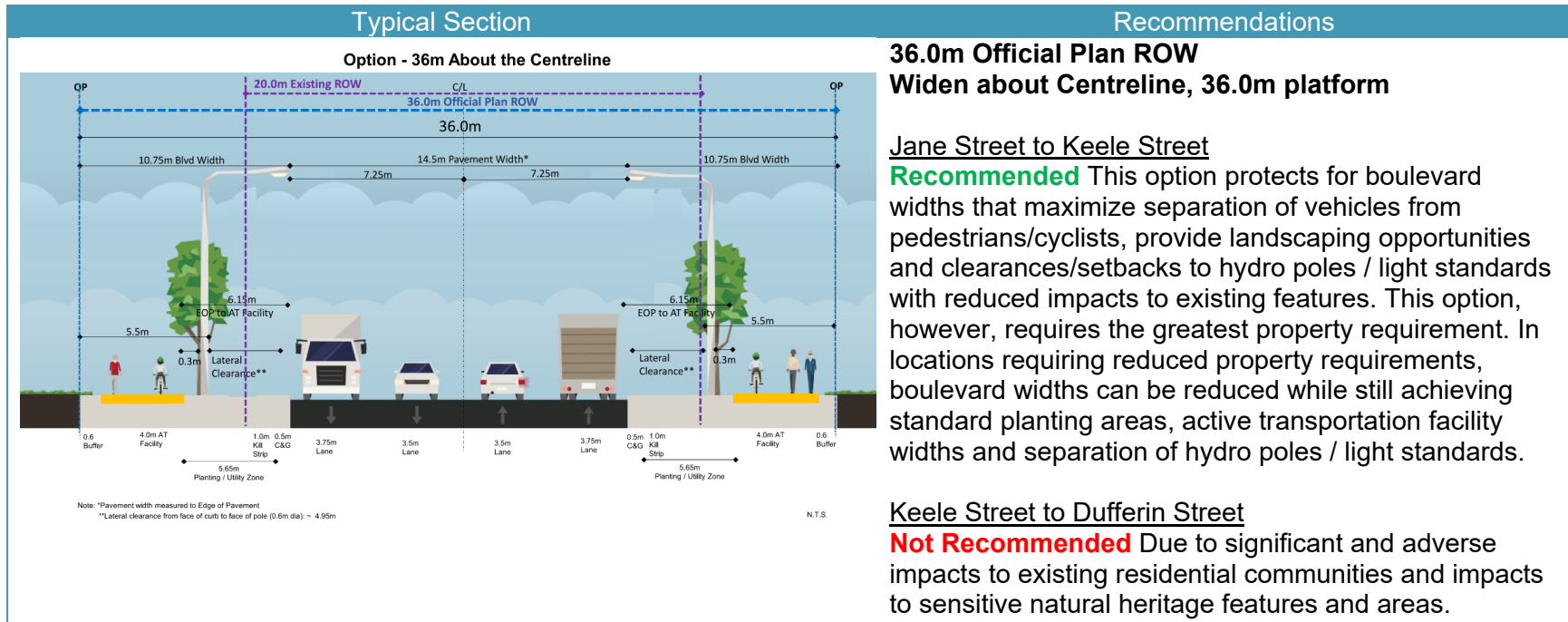
Key design parameters were identified to establish typical cross-section alternatives and were based on a review of established guidelines and standards. Where applicable, the design elements were based on a design speed of 80km/h and posted speed of 60km/h. As Kirby Road is to be uploaded to the Region in the future, York Region design standards were considered. A review for compatibility with the Kirby Extension EA Design (Dufferin Street to Bathurst Street), which is adjacent to this Kirby Road Widening EA corridor at its intersection with Dufferin Street, resulted in the recommendation to maintain the proposed lane widths from the Kirby Extension EA Design and a 4.0m width to accommodate AT facilities. The 4.0m AT width did not preclude either of the AT facility alternative types carried forward for evaluation in **Section 8.2.2**.

The key design parameters used to inform the development of the typical section alternatives are documented in **Table 8-7**.

Table 8-7: Key Design Parameters

Road Design Parameters	Design Standards	Source
Pavement Width	3.5 m Travel Lane (Centre) 3.75 m Travel Lane(Curb) 3.5 m RTL 3.5 m – 5.0 m Continuous CTL 5.0m LTL with island	York Region Road Design Guidelines, Pg. 18 Match Kirby Road Extension EA lane widths
Median Width	4.0 m – 5.0 m Landscaped Median	York Region Road Design Guidelines, Pg. 18
Active Transportation Facilities	In-boulevard Cycle Track: 1.5 m minimum, 1.8m preferred, with 0.5 m minimum Lateral Clearance Multi-use path (MUP): 3.0 m minimum, 4.0m preferred, with 0.5 m minimum Lateral Clearance Sidewalk: 1.5m minimum; 2.6m preferred with 0.5 m minimum lateral clearance 4.0m for AT facilities	York Region Pedestrian and Cycling Planning and Design Guidelines, Pg. 37-38&42 Pg. 39-40&42 Pg. 34-35&66 Match Kirby Road Extension EA AT width

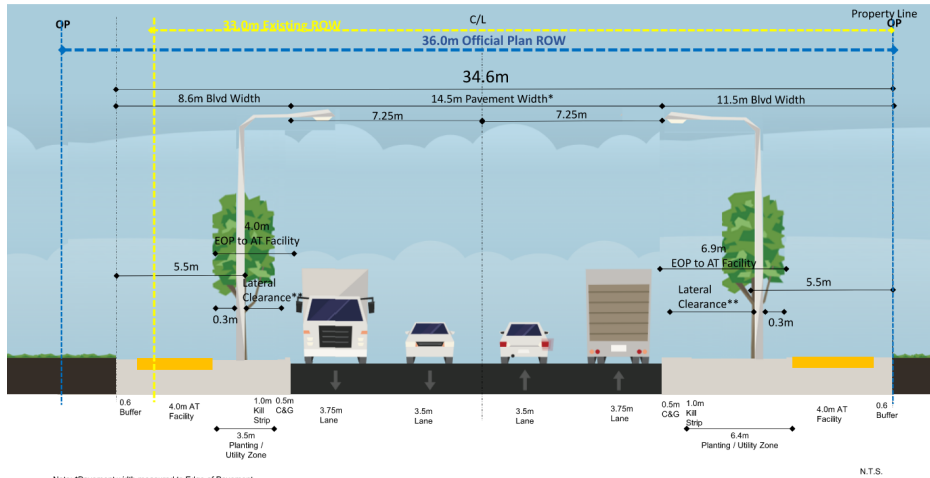
The following typical sections were generated to accommodate the recommendation to widen Kirby Road about the centreline following the Best Fit Approach (as recommended in **Section 8.2.3**). A high level screening was undertaken to identify the preliminary preferred Typical Section(s) for the corridor and at constrained locations.



Typical Section

Recommendations

Option – 34.6m Offset Centreline, hold south EOP



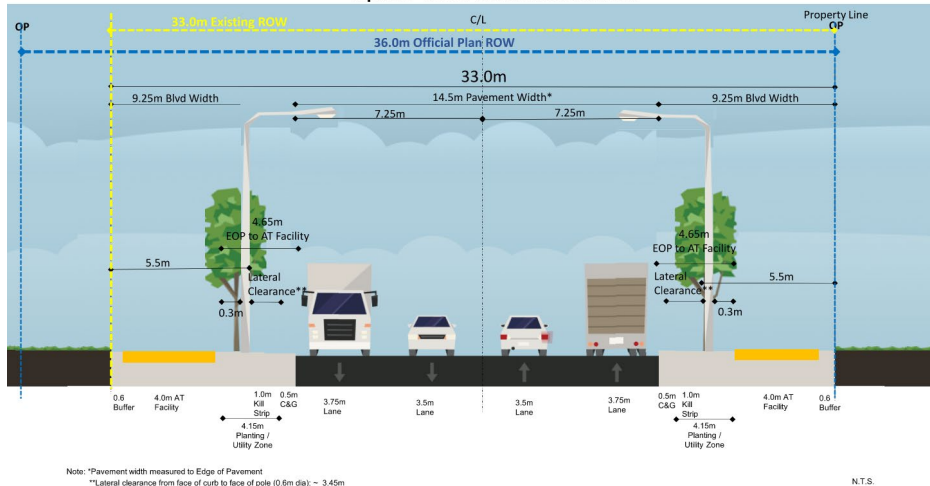
36.0m Official Plan ROW

Hold South ROW and South EOP, Offset Centreline, 34.6m platform

Keele Street to Dufferin Street

Not recommended Although this option minimizes impacts to the existing south boulevard and has the potential to minimize impacts to some utilities and existing trees, this alternative results in additional grading beyond the 36.0m official plan ROW that impacts sensitive natural heritage features. The south boulevard is still anticipated to be impacted to accommodate urbanization of the corridor and wider AT facility widths and may still require some utility relocations and impacts to existing trees.

Option - 33m About the Centreline

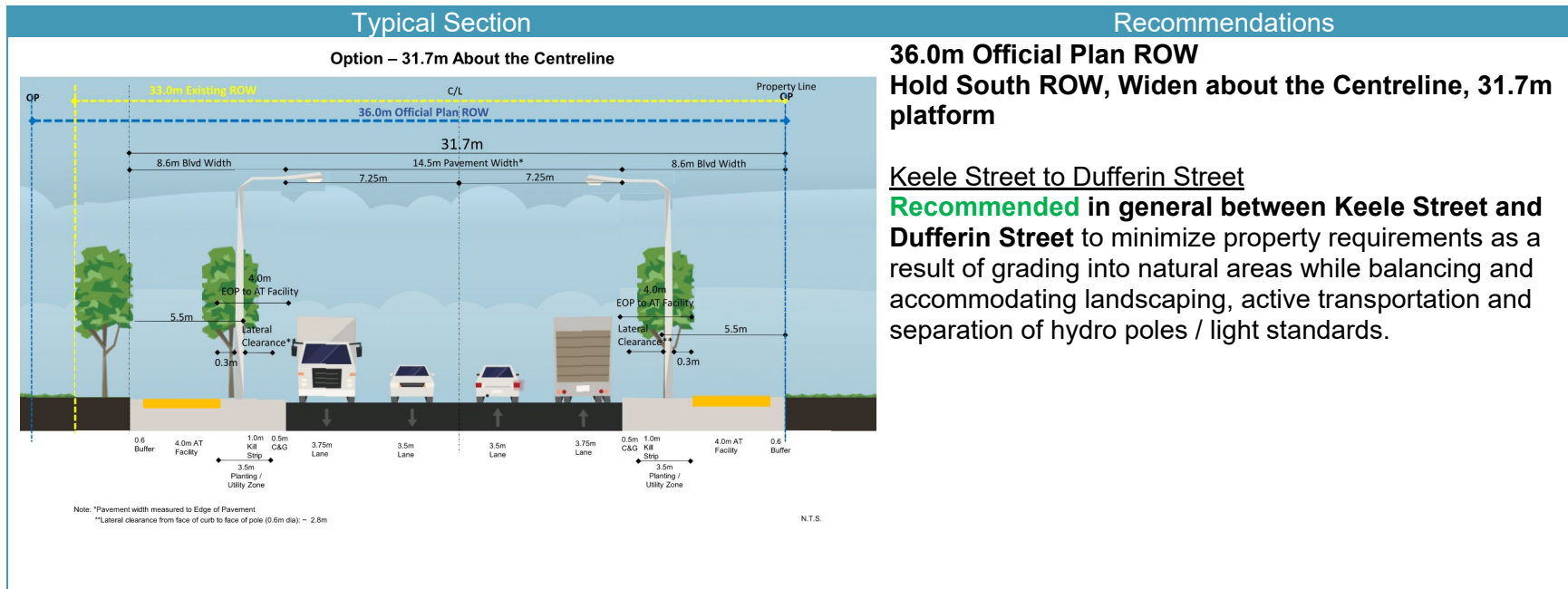


36.0m Official Plan ROW

Hold South ROW, Widen about the Centreline, 33.0m platform with wider landscaping

Keele Street to Dufferin Street

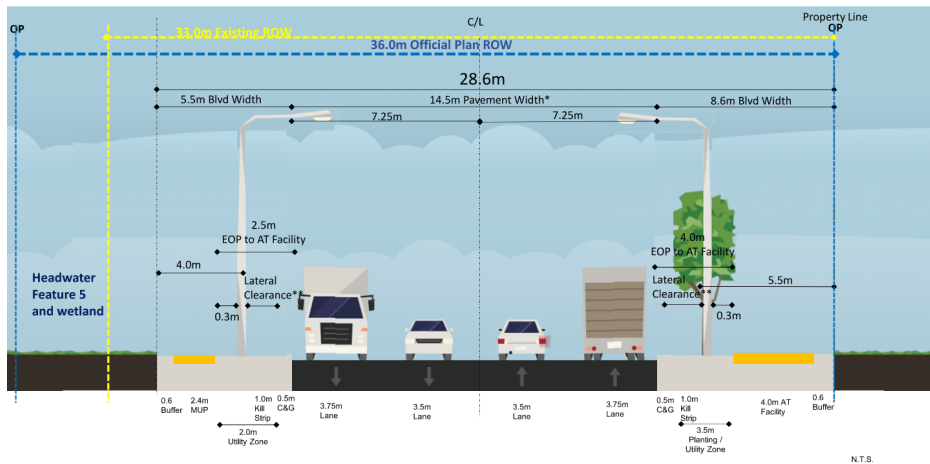
Not Recommended Although this option provides separation of pedestrians and cyclists from vehicles and increased landscaping area it results in impacts to sensitive natural heritage features and areas.



Typical Section

Recommendations

Option- 28.6m Offset Centreline



Note: *Pavement width measured to Edge of Pavement
**Lateral clearance from face of curb to face of pole (0.6m dia) = 1.2m and 2.8m

N.T.S.

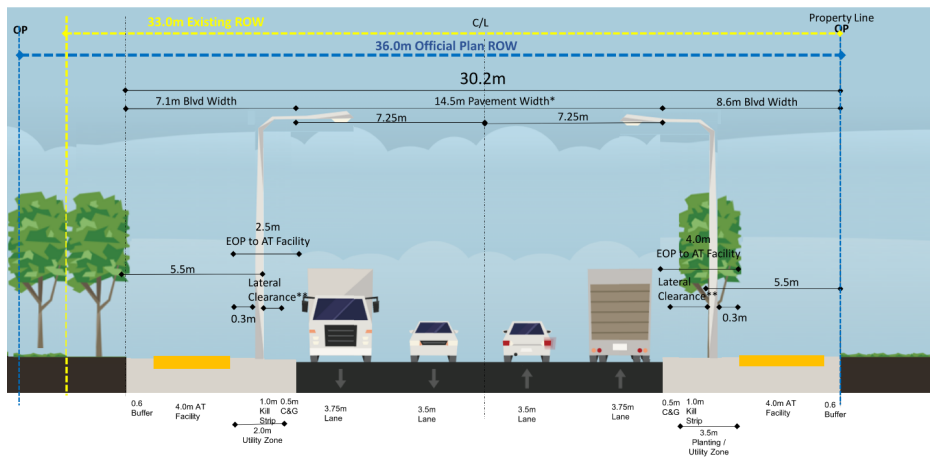
36.0m Official Plan ROW

Hold South ROW, Offset Centreline, 28.6m platform with reduced 2.4m MUP and reduced landscaping in north boulevard

Keele Street to Dufferin Street

Recommended north of Ravineway Drive. This option provides a south boulevard width that accommodates landscaping and 4.0m AT facility. To minimize impacts to the wetland and Headwater Feature 5, the north boulevard accommodates a reduced MUP width of 2.4m and utility zone, but does not accommodate landscaping sufficient for tree planting.

Option – 30.2m About the Centreline



Note: *Pavement width measured to Edge of Pavement
**Lateral clearance from face of curb to face of pole (0.6m dia) = 1.2m and 2.8m

N.T.S.

36.0m Official Plan ROW

Hold South ROW, Offset Centreline, 30.2m platform with reduced landscaping in north boulevard

Keele Street to Dufferin Street

Recommended west of Laurentian Boulevard to minimize impacts resulting from grading into natural heritage features and sensitive habitat, and maintain landscaping on north side where feasible.

8.4 Overall Design Recommendation

Based on the findings of the Active Transportation Alternatives Evaluation, **Alternative 1- Boulevard Cycle Tracks and Sidewalks, both sides** is recommended as the preferred active transportation alternative because it:

- Separates pedestrians and cyclists from vehicles
- Eliminates conflicts between pedestrians and cyclists with dedicated and separate facilities
- Provides pedestrians and cyclists with direct access to adjacent lands / destinations in both boulevards
- Minimizes potential conflicts at driveways and intersections with one-way cyclist travel

Based on the findings of the Roadway Widening Evaluation, **Alternative 1- Widening About the Centreline** is the recommended widening alternative because it:

- Maximizes the existing right-of-way and balances property impacts where additional property is required
- Provides opportunities to mitigate impacts following the best fit approach (varying boulevard widths and localized shifts in the road centreline) to minimize impacts to the natural environment and avoid residential displacement

Based on the findings of the Jog Elimination Evaluation, **Alternative 2 – Central Alignment** is recommended jog elimination alternative because it:

- Provides a new intersection that improves intersection operations and accommodates all users
- Is not anticipated to impact aquatic habitat or provincially significant wetland
- Minimizes impacts to archaeological sites
- Minimizes property impacts to residential properties and active agricultural operations

Based on the findings of the Barrie GO Rail Crossing evaluation, **Alternative 2 - Underpass (Rail over Road)** is the recommended rail crossing alternative because it:

- Removes rail conflicts with pedestrians and cyclists, and minimizes pedestrian and cyclist travel distance with elevated pedestrian and cyclist platform
- Mitigates vehicle queuing caused by increased GO Train service
- Although the underpass is more costly it allows access to be maintained to adjacent land uses

The recommended Typical Cross-sections for the corridor are based on a context sensitive approach to balance the needs of the improvements and minimize adverse impacts. In some locations the width of the boulevards and area for street trees / landscaping were reduced to minimize impacts to properties and sensitive natural features. The recommended typical sections were further refined and are discussed in the next section.

9 Recommended Design Concept

9.1 Description of the Recommended Design Concept

The recommended design to Kirby Road between Jane Street and Dufferin Street was chosen with consideration of transportation service for all road users (pedestrians, cyclists, transit riders, and motorists) and potential impacts to the natural environment, community, cultural heritage, operations, aesthetics, driveway access, property requirements, and capital construction and maintenance costs. It best meets the goals of the project with regards to transportation service improvements, while also considering the overall impact of the project and mitigation measures.

The recommended design is illustrated in the preliminary design drawings in **Appendix P** and includes the following elements:

- Four general purpose lanes (two in each direction). Through lanes will be 3.5m and curb lanes will be 3.75m through a fully urbanized corridor
- 5.0m left turn lane (3.3m left turn lane with 1.7m island)
- Separated 2.0m boulevard cycle tracks (traveling in the same direction as the road) and 2.0m sidewalks on both sides of the road
- 0.5m curb and gutter with 0.6m rounding buffer
- Accessibility for Ontarians with Disabilities (AODA) compliant intersections with crossrides at intersections
- Re-aligned Kirby Road at a central new signalized intersection at Jane Street
- Culvert replacement at the Tributary to West Don River
- Underpass structure at Barrie GO Rail Crossing
- Extension of private driveway access to Keele Street
- Illumination along the corridor
- Utility relocations
- Opportunities for streetscaping in the boulevard
- Property requirements with temporary and permanent easements for construction, maintenance, and grading purposes

9.2 Design Criteria

The Design Criteria for the Study Corridor is summarized in **Table 9-1** through to **Table 9-6**. The standards and guidelines referenced in preparation of the Design Criteria include:

- York Region Design Guidelines (YRRDG) – June 2020
- York Region Pedestrian and Cycling Planning and Design Guidelines – 2019
- City of Vaughan Engineering Design Criteria and Standard Drawings, 2016
- Geometric Design Guide for Canadian Roads - (TAC) – September 1999, Updated June 2017

- MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, April 2020
- MTO Roadside Design Manual, December 2017
- Ontario Traffic Manual Book 18 (OTM) – December 2013
- Metrolinx - General Guidelines for Design of Railway Bridges and Structures, 2018
- Metrolinx Performance Specifications for Structures Passing Over Electrified Corridors, MX-ELEC STR - SPEC-2017-Rev3.0

At the time of Detailed Design, any changes to design standards and/or industry best practices are to be considered.

The proposed structures documented in later sections of **Section 9** are to be designed in accordance with CAN / CSA – S6 – 19 Canadian Highway Bridge Design Code (CHBDC), Ministry of Transportation of Ontario’s Structural Manual and other current directive and standards.

In addition, the railway bridge discussed in **Section** □ will be designed in accordance with the latest edition of the American Railway Engineering and Maintenance of Way Association (AREMA) Manual and Metrolinx General Guidelines for Design of Railway Bridges and Structures.

Table 9-1: Design Criteria - Road Design Parameters

ROAD DESIGN PARAMETERS	PRESENT CONDITIONS	DESIGN STANDARDS	PROPOSED STANDARDS	SOURCE
Design Classification	N/A	UAU80 or RAU80	UAU80	City of Vaughan Engineering Design Criteria's & STD. DWG's, Pg. 12
R.O.W. Width	20 m to 63 m	36 m	36m	City of Vaughan Official Plan, Schedule 9
Posted Speed	60 km/h	60 km/h	60 km/h	N/A
Design Speed	80 km/h	80 km/h	80km/h	York Region Road Design Guidelines, Pg. 17
Minimum Stopping Sight Distance	120 m	130 m	130 m	TAC Chapter 2, Pg. 38
Equivalent Minimum 'K' Factor	11 Crest 8 Sag	26 Crest 30 Sag (non-illuminated) 12-16 Sag (illuminated)	26 Crest 12 Sag	TAC Chapter 3, Pg. 59 and Pg. 62

ROAD DESIGN PARAMETERS	PRESENT CONDITIONS	DESIGN STANDARDS	PROPOSED STANDARDS	SOURCE
Grades Maximum	6.5%	8.0% for Regional Roads 5.0% rolling topography 7.0% mountainous topography 6.0 - 8.0 %	7.0%	York Region Road Design Guidelines, Pg. 41 TAC Chapter 3, Pg. 55 MTO D STD., Exhibit 3-M
Radius Minimum (Urban Design)	N/A	2130 m (NC) 400 m (RC) 280 m ($e_{max}=4%$)	2130 m	TAC Chapter 3, Pg. 23
Maximum Rate Of Super Elevation (4% Max)	N/A	4%	Normal Crown	TAC Chapter 3, Pg. 8
Pavement Width	(Rural) Per direction for two lane (one in each direction) roadway: 3.5 m through lane 3.3 m – 3.5 m right-turn lane	Per direction for four lane (two in each direction) roadway (urban): 3.0 m – 3.3 m Inside Travel Lane 3.5 m Outside Travel Lane 3.5 m RTL 3.0 m – 3.3 m LTL 3.5 m – 5.0 m Continuous Centre Turn Lane 5.0 m LTL with island	<u>Matching Kirby Road Extension EA lane widths:</u> 3.5m inside Travel Lane 3.75m Outside Travel Lane (Curb)* 5.0 m LTL with island 3.5 m RTL	York Region Road Design Guidelines, Pg. 18 City Direction
Shoulder Width	Varies (1.0 – 4.0 m)	2.5 m	2.5 m	York Region Road Design Guidelines, Pg. 18

ROAD DESIGN PARAMETERS	PRESENT CONDITIONS	DESIGN STANDARDS	PROPOSED STANDARDS	SOURCE
Shoulder Rounding	N/A	0.5 m (1.0 m with SBGR)	0.5 m (1.0 m with SBGR)	York Region Road Design Guidelines, Pg. 18
Median Width (Urban Design)	N/A	4.0 m – 5.0m (landscaped median)	N/a	York Region Road Design Guidelines, Pg. 18
Signals & Illumination	Non-Illuminated Existing Traffic Signals and illumination at Jane Street, Keele Street and Dufferin Street intersections only	Illuminated	Illuminated	York Region Road Design Guidelines, Pg. 22&23
Erosion & Sediment Controls For Design	N/A	To Be Determined during Design Phase	To Be Determined during Design Phase	As per the Greater Golden Horseshoe Area Conservation Authorities – ESC Guidelines – December 2006
Minimum Grade	0.5 %	0.5% minimum (Curbed Roadway)	0.5 %	TAC Chapter 3, Pg. 56
Intersection Angle	82 - 98 degrees	70 - 110 degrees	80 degrees	TAC Chapter 9, Pg. 42
Intersection Curb Radius	Radii 10m-15m	7.5m minimum Use Vehicle Turning Template to confirm	15 m	York Region Road Design Guidelines, Pg. 30, DS-105
Concrete Curb	N/A	Concrete Barrier Curb with Standard Gutter	Concrete Barrier Curb with Standard Gutter	OPSD 0600.0400

ROAD DESIGN PARAMETERS	PRESENT CONDITIONS	DESIGN STANDARDS	PROPOSED STANDARDS	SOURCE
Sight Triangles	15m x 15m at some of the intersections	Regional x Regional: 20m x 20m Other intersections: 15m x 15m	Regional x Regional: 20m x 20m Other intersections: 15m x 15m	York Region STD. DWG. DS-108 York Region STD. DWG. DS-107

Table 9-2: Design Criteria - Intersection Design: Turning Lane Design Parameters

TURNING LANE		PRESENT CONDITIONS	DESIGN STANDARDS	PROPOSED STANDARDS	SOURCE
Right Turn Lane	Storage	N/A	(30m minimum) TBD	30 m	York Region Road Design Guidelines, Pg. 19 To be confirmed-Traffic analysis
	Taper	45 m	70 m	70 m	York Region STD. DWG. DS-104
Left Turn Lane	Storage	N/A	TBD 15 m minimum	Varies (45 m – 65 m)	York Region Road Design Guidelines, Appendix E, Left Turn Lane Storage Calculations
	Taper	N/A	130 m	130 m	York Region STD. DWG. DS-104
	Parallel Lane	N/A	50 m	50 m	York Region STD. DWG. DS-104

Table 9-3: Design Criteria - Grade Separation Design Parameters

DESIGN PARAMETERS	PRESENT CONDITIONS	DESIGN STANDARDS	PROPOSED STANDARDS	SOURCE
Minimum Vertical Clearance Underpass	N/A	5.3 m from proposed road profile to underside of rail structure (7.3m from proposed road profile to top of rail (assumes 2m deck depth with 5.3m clearance))	5.3 m from proposed road profile to underside of rail structure (7.3m from proposed road profile to top of rail (assumes 2m deck depth with 5.3m clearance))	Metrolinx -General Guidelines for Design of Railway Bridges and Structures, Pg. 1-3

Table 9-4: Design Criteria - Roadside Design Parameters

DESIGN PARAMETERS	PRESENT CONDITIONS	DESIGN STANDARDS	PROPOSED STANDARDS	SOURCE
Guiderail	Cable Guiderail (Kirby Road north and south boulevards from Laurentian Blvd to Dufferin Street)	TBC Cable Guiderail not permitted	Steel Beam Guide Rail (Kirby Road north and south boulevards from Laurentian Blvd to Dufferin Street)	York Region Road Design Guidelines, Section 7, Pg. 24 Roadside Safety Manual MTO Guideline
Clear Zone	Unknown	N/A	N/A	TAC Chapter 7, Section 7.7 (pg. 76-77)
Lateral Clearance	N/A	Minimum: 0.5m from curb face Desirable: 1.2m – 1.8m from curb face	0.5m – 6.75m	TAC Chapter 7, Section 7.7 (pg. 76-77)

Table 9-5: Design Criteria - Active Transportation Design Parameters

CYCLING AND PEDESTRIAN DESIGN PARAMETERS	PRESENT CONDITIONS	DESIGN STANDARDS	PROPOSED STANDARDS	SOURCE
Cycling Facility Type (e.g. on-street, off-street, MUP)	N/A	In-boulevard Cycle Track: 1.5 m minimum, 1.8m preferred, with 0.5 m minimum lateral Clearance Multi-use path (MUP): 3.0 m minimum, 4.0m preferred, with 0.5 m minimum Lateral Clearance	2.0 m In-boulevard Cycle Track:	York Region Pedestrian and Cycling Planning and Design Guidelines, Pg. 37-38&42 York Region Pedestrian and Cycling Planning and Design Guidelines, Pg. 39-40&42
Minimum Boulevard Width (Urban Design)	N/A	3.5 m minimum from edge of pavement	Varies (2.0 m – 5.65 m)	York Region Road Design Guidelines, Pg.51
Sidewalk Width	1.5 m (South Side Keele to Dufferin)	1.5 m 1.5 m minimum, 2.6 m preferred, with 0.5 m minimum lateral clearance	2.0 m	City of Vaughan STD. DWG. E-1 York Region Pedestrian and Cycling Planning and Design Guidelines, Pg. 34-35&66
Maximum Grade	6.5 %	5.0 % Maximum. Or match adjacent roadway grade when >5%	4.0 %	York Region Pedestrian and Cycling Planning and Design Guidelines, Pg. 46
Minimum Vertical Clearance Underpass	N/A	3.0 m from proposed cycling facility profile to underside of rail structure	3.0 m from proposed cycling facility profile to underside of rail structure	York Region Pedestrian and Cycling Planning and Design Guidelines, Pg. 168
Cross Slope	Varies	2.0 % Recommended 5.0 % Maximum	2.0 %	York Region Pedestrian and Cycling Planning and Design Guidelines, Pg. 47

CYCLING AND PEDESTRIAN DESIGN PARAMETERS	PRESENT CONDITIONS	DESIGN STANDARDS	PROPOSED STANDARDS	SOURCE
Signalized Intersection Crossing	Sidewalk crossing at some intersections	Sidewalk & In-boulevard cycle tracks: Exhibit 5-14 or 5-19 MUP: Exhibit 5-7	MUP: Exhibit 5-7	York Region Pedestrian and Cycling Planning and Design Guidelines, Pg. 103, 111, 117
Unsignalized Intersection Crossing	No crosswalk provided	Sidewalk & In-boulevard cycle tracks: Exhibit 5-26 MUP: Exhibit 5-27	Exhibit 5-26	York Region Pedestrian and Cycling Planning and Design Guidelines, Pg. 125, 126,

Table 9-6: Design Criteria- Entrance Design Parameters

ENTRANCE DESIGN PARAMETERS	PRESENT CONDITIONS	DESIGN STANDARDS	PROPOSED STANDARDS	SOURCE
Minimum Width	Varies - Rural (6 m – 33m)	3.0 m minimum (5.0m desirable) residential 5.0 m minimum (9.0 m desirable) commercial	3.0 m	York Region Road Design Guidelines, Pg. 63&64 DS-215 & DS-214 residential DS-200 & DS-203 commercial
Minimum Length (Row to Building)	N/A	N/A	N/A	As per local municipality standard
Minimum Radius	Varies	3.0 m minimum (5.0m desirable) residential 5.0 m minimum (9.0 m desirable) commercial 5 m Res. 9 m Com.	6.0 m	York Region Road Design Guidelines, Pg. 64 DS-215 & DS-214 residential DS-200 & DS-203 commercial
Maximum Grade	20.2% (farm entrance at Sta. 1+070)	10%	10%	DS-200 & DS-214

ENTRANCE DESIGN PARAMETERS	PRESENT CONDITIONS	DESIGN STANDARDS	PROPOSED STANDARDS	SOURCE
Max. Algebraic Grade Change (4% Max)	18%	4%	4 %	DS-200 & DS-214
Sight Triangles	N/A	Major intersections: 20m x 20m Other intersections: 15m x 15m	Major intersections: 20 m x 20 m	YR Sight Triangle Manual Pg. 21

9.3 Road Geometry

9.3.1 Horizontal Alignment

The horizontal alignment for the preferred design (with an 80km/h design speed) generally follows the existing centreline of Kirby Road, with the exception where it is proposed to be shifted about a central alignment at Jane Street to create a new intersection. This new alignment at Jane Street will consolidate the two existing north and south offset intersections to provide a new intersection with an 80 degree skew angle.

In addition there are locations along the Kirby Road corridor where the centreline is shifted slightly to the north or south of the existing alignment to provide a best fit for Kirby Road within the existing and proposed right-of-way and minimize impacts to adjacent properties and features. Minor adjustments in the horizontal alignment are proposed at some locations in order to address geometric deficiencies and ensure that minimum design standards are met. The proposed horizontal alignment is illustrated on the preliminary design drawings in **Appendix P**.

9.3.2 Vertical Alignment

The proposed vertical alignment accommodates an 80 km/h design speed. This vertical alignment was chosen to match the existing road profile where possible, with minor adjustments proposed at some locations to address geometric deficiencies and meet the geometric standards required for the class of the road, as per the design criteria identified in **Section 9.2**

Between approximately 500m west of Keele Street and Keele Street, an underpass is proposed to grade-separate the Barrie GO Rail crossing at Kirby Road. The proposed underpass is designed to accommodate the required vertical clearances at the rail crossing adhering to Metrolinx design standards and requires a slope of ~2.25% west of the rail tracks and ~7.0% east of the rail tracks for vehicular travel. Pedestrian and cyclists will be elevated from the road to travel in 3.85% slopes where possible.

The vertical alignment aims to minimize impacts to existing entrances and driveways, minimize impacts on watercourse crossings, and reduce grading impacts to adjacent properties and

features. The proposed vertical alignment is illustrated on the preliminary design drawings in **Appendix P**.

9.4 Typical Cross-Section

The typical cross-sections for Kirby Road between Jane Street and Keele Street and between Keele Street and Dufferin Street are illustrated in **Figure 9-1** and **Figure 9-2** and generally consist of:

- Four general purpose lanes (two in each direction). Through lanes will be 3.5m and curb lanes will be 3.75m through a fully urbanized corridor
- 5.0m left turn lane (3.3m left turn lane with 1.7m island)
- 2.0m boulevard cycle tracks (traveling in the same direction as the road) adjacent to 2.0m sidewalks on both sides of the road
- Landscaping within the boulevards as feasible, allowing for space to accommodate utilities (minimum 2.0m to accommodate utilities and light poles from back of curb; tree planting opportunities identified where 3.5m or wider boulevard space is available)
- 0.5m curb and gutter with 1.0m kil strip
- 0.6m rounding buffer

In areas where opportunities to acquire the full 36.0m official plan right-of-way are constrained, including areas adjacent to sensitive natural features, boulevard widths have been reduced.

The typical cross-section for the Underpass at the GO Transit Barrie Railway Corridor crossing protects for greater separation between active transportation (AT) facilities and curb lanes and is discussed in further detail in **Section 9.14**.

Grading will be contained within the proposed right-of-way where feasible. In areas where grading extends beyond the proposed right-of-way, and grading easements or property acquisition may be required as discussed in **Section 9.9**.

Figure 9-1: Typical Cross-Section - Kirby Road (Jane Street to Keele Street)

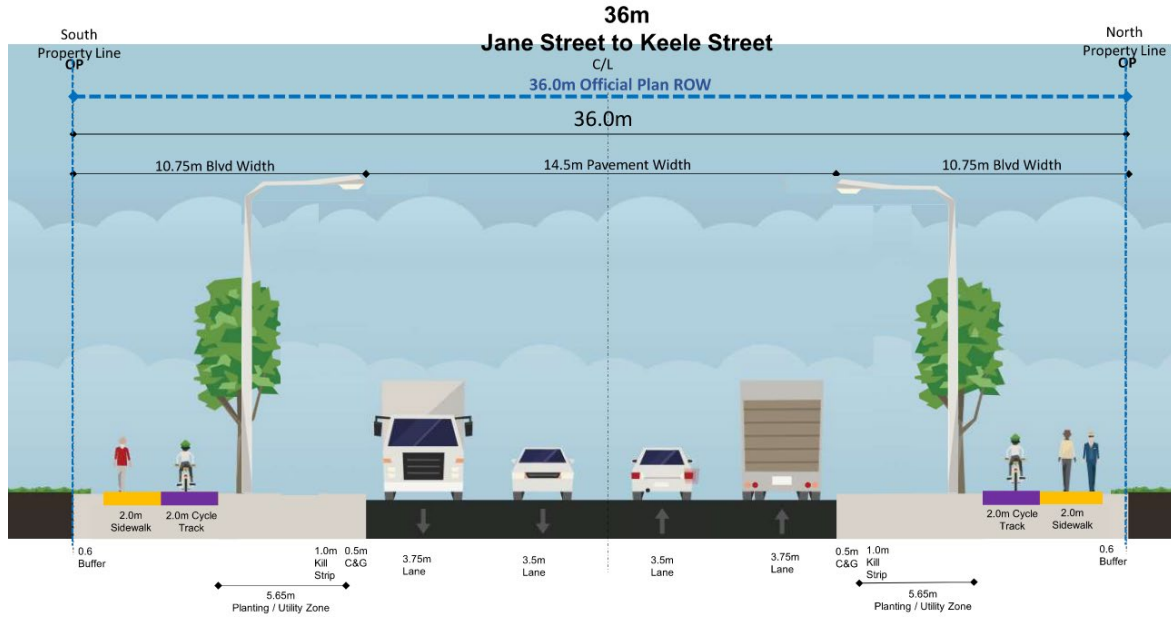
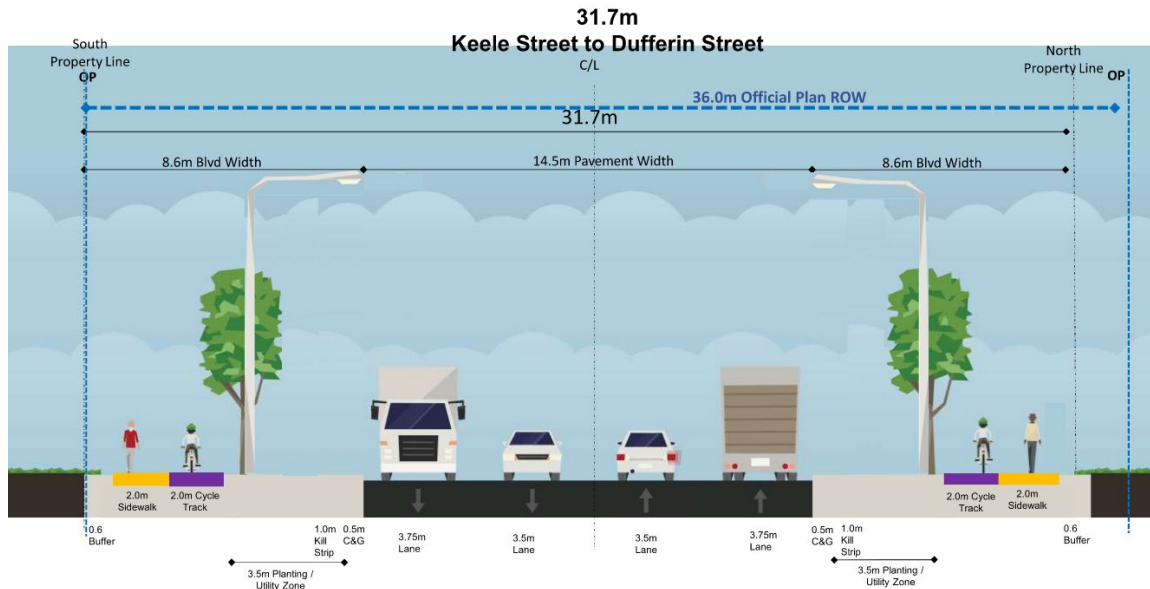


Figure 9-2: Typical Cross-Section - Kirby Road (Keele Street to Dufferin Street)



9.5 Cycling and Pedestrian Facilities

Continuous pedestrian and cycling facilities, consisting of 2.0m sidewalks immediately adjacent to 2.0m cycle tracks are proposed along both sides of Kirby Road between Jane Street and Dufferin Street.

Generally, the proposed active transportation facilities are located as close to adjacent properties as possible to maximize the separation between pedestrians and cyclists and the

roadway vehicles and promote comfort, maximize tree planting opportunities in the boulevard, and allow for sufficient space for utilities. At a minimum a 2.0m utility buffer zone is allocated between the back of the curb and edge of the cycle track. This 2.0m minimum utility buffer is allocated as follows: 1.0 m from back of curb to face of pole, 0.7m diameter hydro pole / light standard, 0.3m clearance to edge of cycle track. A 1.0m kil strip is provided between the curb and cycle track. Where there is 1.0m spacing or more between curb and cycle track, topsoil and sod shall be provided.

The material type, treatment and pavement markings / signage for the sidewalk and cycle track will be confirmed during Detailed Design. The material type and treatment style will consider the interface between the respective active transportation facility and transit stops. The need for delineation through bus stop areas by signage, tactile warning or change in elevation will be confirmed during Detailed Design.

At the proposed underpass at the Go Transit Barrie Railway Corridor crossing, a 2.0m cycle track is provided adjacent to a 2.0m sidewalk on either side. The AT facilities are proposed to be elevated from the road profile to minimize crossing distance for AT users and to provide a less steep slope where feasible.

Steel beam guide rail is proposed adjacent to steep slopes. The design and extent of guiderail will be confirmed during Detailed Design.

Pedestrians and cyclists will cross signalized intersections via crossrides provided on all approaches of each signalized intersection, regardless of if the cross-street has a formalized / dedicated cycling facility. During Detailed Design, the final intersection configuration will be based on York Region's latest Pedestrian and Cycling Planning and Design guidelines, to ensure the proposed design and treatments conform to current guidelines.

9.6 Transit Provisions

There are no existing transit stops along Kirby Road, however at the Keele Street / Kirby Road intersection there are existing transit stops servicing the northbound and southbound transit routes. As per York Region's TMP, Kirby Road is designated as a future higher order Frequent Transit Network with service planned up to every 15 minutes by 2041. At the time of the EA study new transit stop locations have not been identified. During Detailed Design, transit stop locations and transit infrastructure requirements will be reviewed, identified and confirmed in consultation with York Region Transit. Transit amenities (bus stops/pads) will conform to the latest York Region's Concrete Bus Pad Specifications and Drawings. At locations where the cycle track and sidewalk intersect with bus pads, it is recommended that passenger standing areas with shelters be placed behind the cycle track and sidewalk.

9.7 Intersections Design, Traffic Signals and Illumination

Intersections have been designed in accordance with Accessibility for Ontarians with Disabilities (AODA) standards and to facilitate the movement of all road users, including pedestrians and cyclists.

The existing traffic signals are proposed to be maintained with the exception for the intersection at Jane Street where the existing two offset intersections are proposed to be combined along a new alignment of Kirby Road into one centralized signalized intersection at Jane Street. No new additional signalized intersections are proposed along the corridor. However future proposed intersections to align with the future street network to support the Block 27 lands and development will be identified through the Secondary Plan and supporting studies. Signalization of these future intersections shall consider future traffic needs, increases in pedestrian traffic, increased crossing distances for pedestrians, and the safety risk associated with unsignalized left-turn movements.

9.8 Access

The recommended design introduces a raised centre median in the underpass from the centre pier at the proposed rail bridge to the Keele Street intersection. Where the raised median restricts full access to individual properties, only right-in-right-out (RIRO) access is accommodated. U-turns are permitted at signalized intersections.

Due to the proposed grades of the underpass, two existing Kirby Road accesses to the Mid-Ontario Truck Centre and Street 2 are proposed to be closed. A new right-in-right-out access on Kirby Road is proposed closer to Keele Street and will provide access to the Mid-Ontario Truck Centre and adjacent lands served by Street 2. A secondary right-in-right-out access, which will be an extension of the existing private driveway access is proposed to connect to Keele Street, and is recommended in addition to the new RIRO access at Kirby Road. This recommendation is made as per the findings of the Keele Street Driveway Access Review Memo provided in **Appendix T**. This secondary private driveway access at Keele Street provides improved routing options when compared to only the Kirby Road RIRO access. It is designed to accommodate truck turning paths for WB-33 and WB-20 vehicles and includes construction of a pork-chop island at the connection of Keele Street to manage the right-in-right-out movement. In consultation with the representatives of the two impacted properties, the property owners noted their objection to the right-in right-out restriction on Keele Street and requested provision of left turn movements at the new access and traffic signals. It was clarified that right-in right-out was recommended based on safety and operational issues with left turn movements. Traffic signals are also not recommended at the access based on the proximity to the signalized Keele Street / Kirby Road intersection, which is about 140m away. It was also clarified that locating the driveway connection to Keele Street further north is not recommended given it will result in additional impacts to the Provincially Significant Wetland (PSW) and Greenbelt Plan boundary lands. Additional details to support these recommendations are documented in **Appendix T**. During Detailed Design the City will consult with York Region, TRCA and the impacted property owners to confirm closure of the Truck Centre and Street 2 accesses, the provision of the new right-in-right-out access on Kirby Road, and the new right-in-right-out private driveway access on Keele Street.

Some driveways along the corridor will need to be re-graded to accommodate the proposed road improvements. Property owners will be notified of temporary impacts to driveway access prior to construction and in advance of work related to their access.

9.9 Streetscaping and Landscaping

Streetscaping and landscaping opportunities are identified, as feasible and based on constraints, to enhance and improve the urban design along Kirby Road while minimizing adverse impacts to sensitive natural features and balancing the need for additional property requirements.

The preferred design considers maximizing the available boulevard space for plantings and streetscaping between the roadway, active transportation facilities, and property line. In general, the space in the boulevard between the active transportation facilities and the roadside curb is dedicated for landscaping and utility poles. In locations where there is less than 1.0m between the curb and gutter and AT facility, a kil strip shall be provided. Where there is 1.0m spacing or greater, topsoil and sod shall be provided. Boulevard space of 3.5m or greater is identified as an opportunity for street tree planting area. Where the boulevard width between the AT facility and curb and gutter is less than 3.5m in width, considerations for other landscaping treatments such as grass or other small vegetation should be considered during Detailed Design.

Where existing streetscape features (e.g. entry walls, pillars, decorative fencing, planting beds, planter curbs/edges, plaza paving, site furnishing, etc.) are impacted as a result of the proposed improvements, features are to be restored or relocated, where feasible.

Areas identified as opportunities for street tree planting are shown on the preliminary design drawings in **Appendix P**. An Arborist Report identifying Tree Protection Zones is provided in **Appendix F**. During Detailed Design streetscaping opportunities will be confirmed and a streetscaping planting plan including individual tree planting locations will be developed.

9.10 Illumination

A preliminary street lighting design was prepared and is provided on the preliminary design drawings in **Appendix P** and the utility conflict plan in **Appendix S**. Illumination along the study corridor considers the roadway profile, the urban cross-section, and active transportation requirements. .

The plan was prepared to meet the following requirements which will be confirmed during Detailed Design:

- All design light levels for streets and sidewalks shall be in accordance with RP-8-18.
- Luminance method is used for tangent sections of the roadway lighting and illuminance method is used for curved roadway sections.
- Illuminance method is used for intersection and sidewalk lighting design.
- All roadways have been classified as “Major” and pedestrian activity classification as “High” to determine the light levels per RP-8-18, Table 11-1.

- All intersections within project limits are classified as “Major/Major” and pedestrian activity level classification as “High” to determine the light levels per RP-8-18, Table 12-1.
- All sidewalks have been classified for “High” pedestrian activity and “Pedestrian Only” to determine the light levels per RP-8-18, Table 16-1
- All hydro pole mounted luminaires shall have mounting height of 8.23m with a mast arm length of 2.4m.
- All luminaires mounted on city owned light poles shall have mounting height of 15.24m with a mast arm length of 2.4m.
- All sidewalk luminaires shall have mounting height of 6.25m with mast arm length of 0.5m.
- All intersection luminaire shall have mounting height of 15.24m with mast arm length of 2.4m.
- IES files were provided for both street lighting (GE Evolve ERL Series) and sidewalk (GE EACL series) lighting currently used for city lighting projects. It was suggested to also use any other luminaire in the same series with higher or lower wattage as needed to meet the light levels.
- Total light loss factor for all LED luminaire shall be 0.85.

To meet and design in accordance with the above listed design requirements, following IES files were used to perform the street lighting and sidewalk lighting analysis.

- Sidewalk luminaire (21 Watts) – EACL01_A2AN730_120-277V.ies
- Hydro pole mounted luminaire (50 Watts) – ERL1_07E530_120-277V.ies
- City owned pole mounted luminaire (120 Watts) – ERL2_16E330__.ies
- Intersection luminaires (191 Watts) – ERL2_25D530__.ies

All luminaires are placed between the edge of sidewalk and roadway curb. During Detailed Design hydro pole locations and spacing will be coordinated with Alectra Utilities and the lighting analysis will be updated as needed to accommodate the modifications to hydro pole spacing. In addition the intersection lighting shall also be coordinated with traffic signal design to mount the luminaires on traffic signal pole rather than standalone lighting poles to minimize the number of poles at the intersection.

9.11 Property Requirements

Based on the City’s Official Plan, the City may acquire up to 36.0m right-of-way for improvements to the Kirby Road corridor. Additional land may be acquired to accommodate intersection requirements, culvert crossings, etc. The proposed design attempts to minimize property requirements.

Proposed property acquisition resulting from the proposed design is summarized in **Table 9-7**. In general, grading will be contained within the proposed right-of-way where feasible. Temporary and permanent easements will be considered for construction, maintenance, and grading purposes. During Detailed Design, opportunities to reduce property requirements and to use temporary or permanent grading easements instead of permanent property takings should

be reviewed where feasible. Any property requirements from TRCA lands will be subject to Archaeological Assessment completed by TRCA.

Property requirements identified are preliminary and will be finalized during Detailed Design.

Table 9-7: Property Requirement Table

Location and Description of Property Requirement	Approximate Area Required (m ²)	Temp/Perm Grading Easement (m ²)	Owner
Kirby Road, West of Jane Street			
11424 Jane Street [PIN 03345-0446] Sta. 0+088 to 0+201 west of Jane Street (south side) Sta. 0+277 to 0+293 west of Jane Street (south side)	500 m ²		Private
[PIN 03345-0158] Sta. 0+114 to Sta. 0+309 west of Jane Street (north side)	2968 m ²		Private
Kirby Road, Jane Street to Keele Street			
2939 Kirby Street [PIN 03344-0036] Sta. 0+321 to 1+329 east of Jane Street (south side)	8204 m ²	4728 m ²	Private
11665 Jane Street [PIN 03344-0228] Sta. 0+355 to 0+462 east of Jane Street (north side) Sta. 0+533 to 0+820 east of Jane Street (north side)	2800 m ²	1446 m ²	Private
[PIN 03344-0027] Sta. 0+820 to 1+078 east of Jane Street (north side)		1028 m ²	Private
[PIN 003344-0086] Sta. 1+078 to 1+206 east of Jane Street (north side)		541 m ²	Private
[PIN 003344-0095] Sta. 1+206 to 1+267 east of Jane Street (north side)		183 m ²	Private
[PIN 003344-0094] Sta. 1+267 to 1+335 east of Jane Street (north side)		204 m ²	Private
[PIN 03344-0202] Sta. 1+329 to 1+430 east of Jane Street (south side)	8204 m ²	4728 m ²	Private
2480 Kirby Road [PIN 03344-0241] Sta. 1+335 to 2+032 east of Jane Street (north side)	5651 m ²	1162 m ²	Private
[PIN 03344-0203] Sta. 1+430 to 1+530 east of Jane Street (south side)	783 m ²	454 m ²	Private
162 Riverview Avenue [PIN 03344-0208] Sta. 1+530 to 1+631 east of Jane Street (south side)	764 m ²	253 m ²	Private
[PIN 03344-0204] Sta. 1+631 to 1+732 east of Jane Street (south side)	734 m ²	287 m ²	Private
[PIN 03344-0207] Sta. 1+732 to 1+833 east of Jane Street (south side)	705 m ²	505 m ²	Private

Location and Description of Property Requirement	Approximate Area Required (m ²)	Temp/Perm Grading Easement (m ²)	Owner
11390 Keele Street [PIN 03344-0206] Sta. 1+833 to 2+023 east of Jane Street (south side)	1242 m ²	31 m ²	Private
11390 Keele Street [PIN 03344-0205] Sta. 2+304 to 2+322 west of Keele Street (south side)	83 m ²		Private
[PIN 03344-0199] Sta. 2+310 to 2+333 west of Keele Street (north side)	84 m ²		Private
Kirby Road, Keele Street to Dufferin Street			
11621 Keele Street [PIN 03343-0363] Sta. 2+383 to 3+400 east of Keele Street (north side)	8056 m ²	2411 m ²	Private
Keele Street [PIN 003344-0199] Sta. 0+308 to 0+365 north of Kirby Road (west side)		116 m ²	Private
11724 Dufferin Street [PIN 03343-0362] Sta. 3+400 to 3+600 east of Keele Street (north side)	604 m ²	1174 m ²	Private
11724 Dufferin Street [PIN 03343-0361] Sta. 3+600 to 4+404 west of Dufferin Street (north side)	2094 m ²	2850 m ²	Private
[PIN 03343-0772] Sta. 4+231 to 4+399 west of Dufferin Street (south side)	78 m ²	1312 m ²	Private

9.12 Hydrogeology

The findings of the Hydrogeological Study provided in **Appendix M** for the proposed works include:

- Tributary to the West Don River Culvert
 - Dewatering is not expected. Over the monitoring period documented in the report, the shallow monitoring well was dry and water level elevations in the deep monitoring well ranged from 268.2 to 267.6m, with the highest groundwater elevation of 268.2 (depth 4.4m)
 - Assuming maximum depth of excavation for replacing the culvert is less than 4m, no significant construction dewatering is anticipated
 - Any perched water or rainfall would need to be managed
 - Additional groundwater level monitoring events will be conducted to capture seasonal groundwater level fluctuations
- Go Transit Barrie Railway Corridor – Underpass
 - Over the monitoring period documented in the report, the highest groundwater elevations at the shallow and deep monitoring wells were 288.3m (depth 3.7m) to 264.9m (depth 26.6m). The ground water levels are anticipated to be near the ground surface, however a groundwater profile cannot be determined based on

- limited data during the preliminary investigation. Additional monitoring wells are required to be installed to confirm the water levels during Detailed Design
- The underpass excavation is anticipated to extend through the sand layer and into the clay till. Based on the borehole logs these layers will likely behave as an unconfined aquifer. A watertight structure would be required to control the groundwater level; otherwise permanent drainage of the groundwater is required. A fully waterproof design will need to be designed to resist uplift.
- The GO Transit crossing work will require a Category 3 Permit To Take Water as construction dewatering estimates exceed the threshold of 400m³/day
- Municipal Service Installation
 - There is insufficient information to provide preliminary dewatering estimates for municipal service installation. Detailed dewatering estimates should be completed during Detailed Design once engineering drawings for municipal services are finalized. It is anticipated that minimal dewatering will be required for open cut installation of shallow municipal services (proposed not deeper than 3m)
 - During Detailed Design the analysis of hydrogeological conditions will need to be refined, notably near Borehole 20-01, and estimate dewatering rates and radius of influence
 - Water may be perched locally within native s

The estimated construction dewatering volumes for the Underpass is provided in **Table 9-8** and shall be reviewed and confirmed during Detailed Design.

Table 9-8: Estimated Construction Dewatering Volumes

Structure Location	Base Groundwater Flow (L/ day)	Groundwater Flow with Safety Factor of 3 (L/ day)	Stormwater Allowance (L/ day)	Estimated Peak Flow Rate (L/ day)	Approximate Radius of Influence (ROI) (m)
Underpass	259,000	777,000	313,000	1,090,000	70

9.13 Pavement Design

The preliminary pavement investigation recommendations are detailed in **Appendix L**.

Based on the assessment, to avoid the development of reflection cracks and to provide a uniform pavement performance, it was recommended that the roadway pavement would be fully reconstructed.

Based on the borehole data, the anticipated traffic volumes, and assuming adequate subgrade drainage, the following preliminary pavement design is recommended for widening and reconstruction of Kirby Road:

- HL1 – 50mm
- HDBC (2 lifts) – 140mm
- OPSS Granular A Base – 150mm
- OPSS Granular B Base – 500mm

The pavement design recommendations will need to be reviewed and confirmed during Detailed Design by a geotechnical engineer.

9.14 Go Transit Barrie Railway Corridor Grade Separation

The Recommended design at the Go Transit Barrie Railway Corridor crossing is to widen and urbanize Kirby Road to four lanes, and provide active transportation facilities (boulevard cycle tracks and sidewalks) in an Underpass. The Underpass will address vehicle queuing once the GO Train service increases.

The Underpass is a depressed corridor along the section of Kirby Road under the railway track to by-pass the existing Barrie GO Rail crossing. The roadway has a maximum of 7% grade and the sidewalk and boulevard cycle tracks has a maximum of 3.85% grade as it would be elevated where feasible, which complies with AODA standards. The depressed corridor consists of a concrete base slab and retaining walls on both sides of the concrete base slab forming a U shaped structure. The retaining walls and concrete base slab are approximately 465m in length and the concrete base slab varies in width from 27.75m to 31.3 m. Due to the high ground water level indicated in the geotechnical report, waterproofing around the structure is recommended. The design speed for Kirby Road is 80km/hr.

A two (2) span concrete slab on steel girders (deck plate girder) bridge is recommended for the railway track crossing. Based on preliminary borehole data, the geotechnical engineer suggested considering driven piles or augered caissons as foundation for the substructure. The foundation of the substructures shall be refined during Detailed Design. Vertical clearance between the bottom flange of the steel girder and the roadway shall not be less than 5.3 m. The proposed bridge should be designed in accordance with the latest AREMA Manual and Metrolinx Guidelines. The bridge should be designed to carry Cooper E-80 live loading plus diesel vehicle impact, with a service life of 100 years. The Underpass structure proposes to maintain the existing Barrie Go Railway crossing at the same elevation and widen Kirby Road to accommodate the new Cycle tracks, Sidewalks and traffic lanes.

As per the Metrolinx General Guidelines for Design of Railway Bridges and Structures (Metrolinx Guidelines), Part 1, Section 8, semi-integral and integral abutment bridges will not be permitted unless there is written approval from the Rail Corridor Infrastructure Senior Manager Track and Structures. Semi-integral connections between superstructure and substructure can eliminate the need for costly maintenance more common with expansion joint connections. Per

Metrolinx Guidelines, Part 2A, Section 1.2, the superstructure of proposed railway bridges shall be simply-supported spans.

The constructability of this option is complex, this is due to the extensive coordination with Metrolinx, York Region, the City of Vaughan, utility companies and stakeholders of properties adjacent to the Go Barrie Railway crossing. Vehicular (2 lanes in each direction) and train traffic must be maintained at all times. It is expected that construction of the Underpass could take multiple years to complete. A significant area around the railway crossing will be required to be closed during construction. This option will require relocation of existing utilities.

A temporary railway line may be required for the construction of the railway bridge Underpass, this will depend on the construction staging planned during Detailed Design. The temporary railway line could result in substantial project schedule risk due to rail operational coordination factors; for example, rail traffic and operations must be substantially maintained daily during construction.

Significant excavation with temporary shoring will be required for this option to construct the substructure, this has the possibility of disturbing existing contaminated soils. In turn this may require environmental clean-up of the contaminated soils. The depressed corridor will also require underground catch basins and drainage to collect stormwater and ground water runoff from the roadway to prevent flooding. Water collected by the catch basins shall be drained to the wet area on the west side of the structure.

The Underpass excavation is anticipated to extend through the sand layer and into the clay till. Based on the borehole logs these layers will likely behave as an unconfined aquifer. A watertight structure is required to control the groundwater level; otherwise permanent drainage of the groundwater is required. The recommended structure type has been designed to be water tight and therefore a pumping station for ground water is not anticipated.

The Underpass will result in the disruption of surface flow at this location, as the roadway profile will be lowered. Under proposed conditions, the runoff generated from a portion of drainage area will flow towards the low point in the profile below the GO Rail crossing. Based on the available information of the existing catchment outlet location, it may be feasible to drain the surface runoff generated within the underpass area by connecting it to Don River culvert, located approximately 1 km west of the underpass, using a long stretch of storm sewer. This approach may be more cost effective compared to constructing a pumping station to provide drainage during both minor and major storm events for surface water. Further investigation and design details, including required water quality and quantity control measures, will need to be completed in the Detailed Design of the underpass.

Refer to the Crossing Assessment in **Appendix Q** for the General Arrangement Drawings, the Geotechnical Study in **Appendix L**, and Hydro-geotechnical Study in **Appendix M** for additional details on the Underpass design requirements.

9.15 Tributary to West Don River Structure

The existing twin CSP is proposed to be replaced with Two Single Concrete Box culverts (3.9m x 1.2m and 3.6m x 0.9m respectively) of 33.6m length with a perpendicular crossing of Kirby Road . This proposed culverts will result in eliminating the existing overtopping depth, and avoid the effect on the upstream Regional flood level, and the MTO freeboard criteria would be met.

At the existing crossing a minor linkage for small wildlife may occur crossing under Kirby Road via the existing twin corrugated steel pipe culverts. This minor linkage corresponds with the Greenbelt Plan Natural Heritage System corridor that crosses Kirby Road in this location however, this corridor is tilled for agriculture within the immediate vicinity of Kirby Road and it is unlikely that wildlife would specifically use this as a movement path. This crossing is also not identified for fish habitat. The proposed replacement culvert on the east side of the crossing will have an openness ratio of 0.14, with a width and height of 3.9m and 1.2m, respectively. The proposed replacement culvert on the west side of the crossing will have an openness ratio of 0.10, with a width and height of 3.6m and 0.9m, respectively. Both culverts will have a length of 33.6m. Based on these dimensions, the culverts will accommodate passage of small and medium-sized wildlife (CVC 2017).

The feature at the existing crossing is generally poorly defined swale feature with no riparian zone. The crossing was stable with little or no erosion. Typically a crossing that spans 3 times the bankfull width (0.8 m x 3 = 2.4 m) would be recommended. The 3.9m wide span proposed to address hydraulic requirements exceeds three times the bankfull width and given the limited channel definition and limited evidence of erosion, the proposed crossing span is adequate from a fluvial geomorphological perspective.

The proposed crossing angle will result in an overall reduction in the length of the proposed crossing. Local realignment will be required to accommodate a perpendicular crossing. To ensure long-term stability, it is recommended that stone core wetland features be implemented at the crossing inlet and outlet. In addition, bioengineered bank treatments such as brush mattress or vegetated buttresses should be installed at the crossing inlet and outlet to provide flow training. Given the existing drainage feature has limited form and is vegetation controlled, it is recommended that the realigned feature be replicated as a vegetated swale positioned within the ROW.

To ensure proper implementation of the realigned drainage feature, the following additional recommendations are provided for the Detailed Design stage:

- Confirm the gradient and upstream and downstream tie-in locations for the realigned drainage feature
- Design a formalized low flow channel with natural substrates through the crossing
- Complete hydraulic sizing for any stone to be used within the crossing, upstream and downstream wetlands and bioengineered bank treatments
- Develop a native planting plan for the realigned drainage feature that will complement bioengineered treatments and wetland features

- Establish site access routes, staging and storage areas for construction
- Prepare an erosion and sediment control plan
- Complete instream works during periods of limited to no flow

Pre-cast structures are recommended however depending on the construction schedule and road closure requirements during detailed design, cast-in-place concrete box culverts may be utilized as well.

The following outlines the design requirements of the recommended structure

- The site is readily accessible from Kirby Road. A traffic staging plan will need to be developed during the detailed design in consultation with York Region.
- The design of the culverts and retaining wall will be undertaken in accordance with the CAN/CSA-S6—19 Canadian Highway Bridge Design Code (CHBDC), Ministry of Transportation of Ontario's (MTO) "Structural Manual", York Region standards and all other current directives and standards.
- All cast-in-place concrete will be class C-1, 30MPa concrete and precast concrete shall be 45 MPa as per CSA A23.1-19 and Section 12 of the MTO Structural Manual 2021.
- Reinforcing bars shall be in accordance with the requirements of CSA G30.18 Grade 400W or 500W and as specified in Section 8 of CHBDC-2019 and MTO Bridge Office Memorandum dated July 7, 2021 "500MPa Steel Reinforcement".

Refer to the Crossing Assessment Report provided in **Appendix Q** for additional details and the General Arrangement Drawing of the proposed culvert replacement at the West Don Tributary Crossing.

9.16 Wildlife Corridor Crossing

Increased motorist use of the road will lead to increased potential for conflicts with crossing wildlife. Due to the lack of highly-defined vegetated corridors (e.g., permanent watercourse channels) that cross Kirby Road within the western end of the study area, wildlife crossings may occur across a broad front within the study area lands, particularly where agricultural fields or fragmented vegetated features exist on both sides of the road. However, there are potential wildlife linkages where the municipally-mapped ESA/ANSI lands cross Kirby Road between Keele and Dufferin Streets. Consideration should be made at the Detailed Design stage for the need for measures that would mitigate wildlife road mortality as well as hazards to motorists, including but not limited to the use of wildlife eco-passages and deer crossing signage.

Depending on the nature of recommended measures to mitigate wildlife road crossing and ecological connectivity impacts, monitoring tasks tailored to those measures may be warranted as determined through consultation with agency staff. The monitoring measures are to be designed such that negative effects (e.g., as caused by ineffective mitigation) may be recognized through the data. To achieve this, baseline/pre-construction monitoring may be

recommended where feasible against which to compare post-construction data. The need for and details of such monitoring measures are to be determined during the Detailed Design stage.

Refer to the Natural Heritage Assessment Report in **Appendix E** and Crossing Assessment Report in **Appendix Q** for additional details.

9.17 Drainage/ Stormwater Management Plan

The Drainage and Stormwater Management Report including the Drainage Area Plans is provided in **Appendix J**. Overall, the existing drainage patterns and discharge locations will not be altered per the proposed roadway improvements, with the exception of the drainage pattern at the underpass, as a result of the proposed roadway profile.

9.17.1 Roadway Drainage System

The overall drainage pattern will be consistent with the existing conditions. The storm sewer system for the proposed roadway configuration is to be designed for a 5 year storm event per the City of Vaughan Design Criteria. To accommodate the widening and urbanizing the roadway cross-section between Jane Street to Dufferin Street, the existing conveyance ditches will be replaced with a series of catchbasins and storm sewers, which will convey runoff to the existing discharge locations. The area west of Jane Street will remain rural and should be tied back to the existing system.

The major drainage system utilizes the Kirby Road right-of-way to convey overland flows from major storm events (greater than 5 year storm event up to and including the 100 year storm event). Major system relief will occur at major watercourse crossing and intersections. At these locations, major system inlets will capture the 100 year flow and direct it to the appropriate outfalls.

Storm sewer discharge locations and major system flow route details are provided on the Drainage Plans.

9.17.2 Transverse Crossings

Under proposed conditions, the drainage boundary and design peak flow values for the transverse crossings are considered to remain unchanged compared to the existing conditions. The increase in the pavement area as a result of the corridor improvements is negligible in comparison to the large external drainage areas contributing to the watercourse crossing location. Therefore, the design peak flows based on the current land use conditions (obtained from TRCA's HEC-RAS model) were used to assess the hydraulic performance of the proposed crossings. The proposed inverts of the crossing culverts are to be confirmed during Detailed Design to accommodate the road design and the roadside ditch grading.

Under existing conditions, the current culvert crossing at the Tributary to the West Don River is overtopped by the Regional Storm event by approximately 0.44 m at the crossing. Different scenarios were run to assess the proposed conditions to address the hydraulic requirements. Based on the recommendations as documented in the Crossing Assessment Report, to address

the hydraulic requirements the recommended proposed condition is to slightly raise the road profile in addition to increasing the hydraulic capacity. The existing culverts would be replaced with two Single Concrete Box culverts with dimensions of 3.9m x 1.2m x 33.6m and 3.6m x 0.9m x 33.6m respectively, crossing perpendicular to Kirby Road. This will result in eliminating the existing overtopping depth, and avoid the effect on the upstream Regional flood level, and the MTO freeboard criteria would be met. Refer to **Table 9-9**.

Table 9-9: Hydraulic Analysis Results for Tributary to West Don River Crossing

Description	Culvert Dimensions (Span x Rise) (m)	Overtopping Elev. (m)	U/S Regional Water Surface Elevation (m)	U/S Water Level Increase (m)	Overtopping Depth (m)	Freeboard (m)
Raising Boulevard, aligning to downstream channel	2 Concrete Box Culverts (3900mm x 1200mm and 3600mm x 900mm)	272.87	272.85	0	0	1.01

Additional coordination with both the City of Vaughan and TRCA shall be carried out to finalize the detail design of the culvert and to minimize impacts to the watercourse. The selected alternative will be confirmed during Detailed Design by completing additional supporting modelling and analysis, using the information available at that time. Updates to the hydraulic modelling and floodplain assessment shall be completed during Detailed Design to reflect the final design and grading footprint of the crossing.

9.17.3 Barrie GO Rail Corridor Crossing

The grade separation proposed at the Barrie GO Rail corridor west of Keele street, will result in Kirby Road being constructed as an underpass beneath the GO Rail crossing. This will result in the disruption of surface flow at this location, as the roadway profile will be lowered by approximately 7.3 meters. Under proposed conditions, the runoff generated from a portion of the drainage area will flow towards the low point in the profile below the GO Rail crossing. Based on the available information of the existing catchment outlet location, it may be feasible to drain the surface runoff generated within the underpass area by connecting it to Don River culvert, located approximately 1 km west of the underpass, using a long stretch of storm sewer. This approach may be more cost effective compared to constructing a pumping station to provide drainage during both minor and major storm events. Further investigation and design details, including required water quality and quantity control measures, will need to be completed in the detailed design of the underpass. The proposed design will also address the existing floodplain spill north of the proposed Metrolinx Railway underpass.

9.17.4 Stormwater Management Plan

The stormwater management plan for the Kirby Road Class EA Study was developed to comply with the MECP Stormwater Management Practices Planning and Design Manual, Toronto and Region Conservation Authority (TRCA), York Region Road Design Guidelines, and the City of Vaughan's Policies and Standards.

The total roadway pavement area, including cycle tracks and sidewalks within the boulevard areas, will increase by 6.15 ha. The runoff from the proposed paved roadway area will be conveyed to the proposed oil-grit separators and bioretention system through the roadway storm sewer systems and discharge into either existing storm sewer systems or natural watercourses. Stormwater best management practices, including catchbasin inserts, oil-grit separators, bioretention systems, and online storage pipes, are proposed to provide storm water quality treatment, water balance, erosion control, and quantity control for the increased runoff from the roadway right-of-way. As part of the SWM strategy, a total of 6.54 ha of pavement area will receive quality treatment through the proposed bioretention cells, which exceeds the MECP requirement of providing treatment to the increased pavement area. The bioretention cells will also provide 410 m³ of water balance storage and 1,231 m³ of water quality and erosion control storage volume, which exceeds the required volumes to meet the TRCA criteria. A total of 6.15 ha of pavement area will receive quantity control through the proposed online storage pipes. Opportunities to implement supplemental BMP measures may be considered during the next phases of design in series with the proposed measures to augment the overall water quality treatment.

The stormwater management plan for this project is provided on the Drainage Plans. **Table 4-4** provides a summary of the water quality treatment and quantity control strategies proposed to mitigate the increase in impervious surface within the project limits, where road widening is proposed.

Table 9-10: Summary of Stormwater Management Plan

Drainage Area ID	Existing Pavement Area (ha)	Additional Pavement Area (ha)	Pavement Area Receiving Quality Treatment (ha)	Water Balance Storage Volume Provided (m ³)	Required Quantity Control Storage ³ (m ³)
A	0.26	0.22	0.22	14	52
B ¹	0.27	0.23	0.00	-	54
C ²	1.58	2.82	4.40	274	664
D	0.70	0.95	0.00	-	223
E	1.58	1.92	1.92	122	452
Total	4.38	6.15	6.54	410	1445

¹ Areas discharging to municipal systems will be pre-treated using catchbasin inserts and OGS units

² Total pavement area is treated in order to meet MECP requirements of treating the overall increased pavement area in the corridor

³ Based on TRCA requirement (up to 100 year storm)

9.18 Noise

A Noise Impact Assessment was conducted to determine potential noise impacts resulting from the proposed road improvement activities. Based on analysis using approved simulation techniques and software, the potential change in noise levels, as a result of the proposed improvements to Kirby Road when compared to the future without roadway improvements condition, were predicted to be minor / negligible. The results show no greater than approximately 2.7dBA for homes located closest to Kirby Road and away from a north south crossing roadway. Most homes will have less than 2.0 dBA increase in sound levels with improvements. It takes approximately a 3dBA change in sound levels for most people to perceive a change, therefore slight increase in sound levels are expected to be imperceptible. Based on the assessment the impacts were identified to be relatively low and much less than the 5 dBA impact criteria in the Noise Protocol. As a result no noise mitigation is recommended.

During the Detail Design of Kirby Road, from west of Jane Street to Dufferin Street, additional noise analysis is recommended to reassess project sound levels and impacts. There is some uncertainty on both the road traffic volumes and the truck percentages that will be present following the construction of this project and the construction of Kirby Road between Dufferin Street and Bathurst Street. If there are noise impacts greater than the criteria set in provincial or local municipal policies or guidelines, there should be a consideration of providing additional noise mitigation to protect the noise sensitive areas within the project limits.

Construction noise impacts are temporary in nature but may be noticeable at times in nearby noise sensitive areas. Methods to minimize construction noise impacts should be followed as outlined in the Noise Impact Study.

The detailed assessment and construction noise mitigation is provided in the Noise Impact Study included in **Appendix O**.

9.19 Air Quality

An Air Quality Impact Assessment was conducted to determine potential impacts of the proposed road widening on local air quality in the vicinity of the study area. The guiding documents used to conduct this assessment are MECP Ambient Air Quality Criteria (AAQC), Health Canada/Environment Canada National Ambient Air Quality Objectives (NAAQOs), and Canadian Council of Ministers of the Environment (CCME) Canadian Ambient Air Quality Standards (CAAQS).

The “hot spot methodology” was applied for the analysis to assess the location where worst-case impacts were likely to occur. The segment of Kirby Road at Keele Street was selected as the Hot Spot Area as it has one of the highest future intersection volumes and high concentrations of critical and sensitive receptors. The modelling considered a 1km hotspot centred around Kirby Road and Keele Street intersection.

The worst-case contaminant concentrations due to motor vehicle emissions from the roadways were predicted at nearby receptors using dispersion modelling software on an hourly basis for a five year period. 2012-2016 historical meteorological data from Pearson International Airport was used. Two emission scenarios were assessed: 2019 No Build and 2031 Future Build.

Nineteen (19) sensitive receptor locations were selected to be representative of potential impacts within the study area. They are all residential houses with the closest proximity to the study intersection, and thus the most likely impacted by the lane expansion. The receptors were along the southeast side of the study intersection.

The maximum combined concentrations for the Future Build were all below their respective MECP guidelines or CAAQS, with the exception of the 1-hr and annual NO₂ CAAQ, annual PM_{2.5}, 24-hr PM₁₀, 24-hr TSP, and annual benzene. Note that background concentrations exceeded the guideline for all of these contaminant averaging periods. The contribution from the roadway emissions to the combined concentrations was small. Additional dust mitigation measures are recommended in the vicinity of receptor 18 from the assessment.

A greenhouse gas (GHG) emissions assessment was also undertaken to assess the impacts of Kirby Road expansion. The contribution of GHG emissions from the study corridor will represent 0.0066% of the provincial target and 0.0013% of the Canada-wide target. The contribution of emissions from the project is small in comparison to these provincial and national targets.

Construction activities have the potential to create temporary, localized effects on air quality in the immediate vicinity of the project. Emissions from construction are primarily comprised of fugitive dust and combustion products from the movement and operation of construction equipment and vehicles.

Additional details from the Air Quality Assessment are included in **Appendix R**.

9.20 Utilities

Existing utilities along the corridor were identified based on available information provided by the utility companies at the time of the EA study. Existing utilities along the Kirby Road corridor, will be relocated as necessary to accommodate the preferred design. The existing utilities and the identified conflicts of the proposed improvements are documented on the Utility Composite and Conflict Plan provided in **Appendix S**.

The location and alignment of existing municipal services is to be confirmed during Detailed Design, which may result in changes to the identified utility impacts. Formal definition of impacts on utilities will be determined during Detailed Design, in consultation with individual utility companies. All utility information should be updated prior to construction to ensure that the data is accurate and to finalize relocation requirements as necessary. During Detailed Design, meetings will be held with utility companies as required where potential impacts to existing or future services are identified.

9.21 Preliminary Cost Estimate

Based on preliminary cost estimates, the cost of the recommended improvements is estimated at **\$108M**. This preliminary cost estimate includes costs for road work, bridge and retaining wall construction, underpass, utility relocation, addition of streetlights, storm sewers and traffic signals, culvert replacement, landscaping, traffic control, and engineering services; however, property acquisition costs are not included in the estimate.

From the total project costs listed above, implementation of the Underpass will result in costs of approximately **\$74M**. This includes the structural (structure of underpass and rail bridge), design and construction administration, and contingency identified costs of the underpass, and retaining walls.

The extent of cost sharing with developers (including stormwater management facilities within the development and storm sewer systems), and with Metrolinx for the underpass design will be confirmed during Detailed Design.

The breakdown of the preliminary cost estimate is provided in **Appendix U**. The estimated costs are preliminary only and would be reviewed and confirmed during Detailed Design.

9.22 Constructability, Staging and Detour Considerations

Construction staging for Kirby Road improvements will attempt, where feasible, to maintain one lane of traffic in each direction and pedestrian movements equal to pre-construction levels during construction. However, the nature of the required work is such that traffic disruption and delays cannot be entirely avoided.

Impacts will be temporary in nature and the City will attempt to mitigate impacts as much as possible. During Detailed Design, a traffic management plan will be developed to determine how traffic and pedestrian access will be accommodated during construction and how access to properties adjacent to Kirby Road will be maintained.

Construction staging and road and rail detour considerations for the underpass at the GO Rail crossing will be reviewed in consultation with Metrolinx to coordinate and minimize disruption to both the road and rail corridors.

As part of the construction of the GO crossing underpass, temporary two-lane (one lane in each direction) detour roads (at-grade and / or grade separated) and a rail detour track may be constructed. The existing road traffic may alternate from an at-grade detour road and a grade-separated detour road during construction depending on the recommended construction staging strategy. The recommended construction staging strategy will be developed during Detailed Design in consultation with Metrolinx. Pedestrians are not currently accommodated along the existing portion of Kirby Road within the limits of the proposed underpass. At-grade detour roads will require temporary at-grade railway crossings with gates and warning devices. Temporary at-grade detour roads and at-grade crossings will be removed once construction of the underpass is complete, and the area will be landscaped. Requirements for a rail detour will

be reviewed, confirmed and developed in consultation with Metrolinx. Opportunities to minimize potential impacts from the underpass design, temporary detour roads, rail detour, and other potential construction impacts, will be reviewed further during Detailed Design in consultation with Metrolinx.

9.23 Construction Monitoring and Maintenance Considerations

The reconstruction of Kirby Road should be staged to maintain both local and through traffic within the study area. Any necessary interruptions to traffic should be kept brief and to a minimum. In particular, there should be close coordination with YRT and Metrolinx to minimize impacts on Kirby Road traffic, YRT buses, rail operations, and EMS operations.

Property owners and tenants may experience temporary interruptions to their property access during construction. To reduce this impact, all property owners should be notified prior to construction and in advance of work related to their access. Detailed design plans should include details to describe how temporary accesses will be maintained, and contract specifications should specify the allowable lengths of closures and the notification requirements to property owners.

Construction of the improvements has the potential to create noise and dust for the adjacent property owners. Construction noise is temporary noise and will vary periodically during the construction depending on the specific activities being performed. Contract specifications will include provisions to define the allowable work hours, in accordance with local ordinances, to minimize impacts to the adjacent landowners in the evenings. However, some considerations will be given to the ability of completing the work in a lesser duration by allowing longer work hours. The impact of construction noise will vary based on the type of equipment used, number of pieces of equipment, time and duration of operation, and the proximity to noise sensitive receivers in question. Construction noise will be kept to a minimum through the use of well-maintained equipment with appropriate noise controls by the contractors.

Removal of existing paved surface and existing landscaping will expose native soils to wind and rain erosion, and result in a temporary increase in dust in the project area. This dust can become airborne as construction traffic runs on the exposed ground and may be noticeable by the adjacent property owners. This increase in dust levels will be temporary, and the application of best management practices, including the application of non-chloride dust suppressants, by the contractor during normal operations can help minimize the exposure of native soils to wind and rain erosion.

All waste generated during construction must be disposed of in accordance with ministry requirements and best management practices. Contractors must be made aware of all environmental considerations so that all environmental standards and commitments for both construction and operation are met.

Communication protocols for construction will be developed during Detailed Design. Generally, if a resident has a concern during construction, they can typically contact either the Construction

Administrator (CA) or the Communications and Community Engagement Specialist (CCES). A Notice of Construction distributed prior to the start of construction lists the contact information for the applicable CA (for construction related inquiries) and CES (for general inquiries) on the project.

Construction and post-construction monitoring plans should be developed during Detailed Design in consultation with MECP and other regulatory agencies. Details of the monitoring plans can be found in **Section 11.3**

10 Potential Environmental Impacts and Mitigation

10.1 Greenbelt Plan, 2017

The Greenbelt Plan, 2017 (GBP) identifies environmentally and agriculturally protected lands within the Golden Horseshoe, where urbanization should not occur, to provide permanent protection to these ecological features and functions, and agricultural lands.

Section 6.2.3 (3) of the Greenbelt does allow for infrastructure projects within natural heritage features subject to approvals under the Environmental Assessment Act. Section 4.2.1(1) and 4.2.1(2) of the Greenbelt Plan outlines the general policies for infrastructure projects.

A portion of the study area falls within the Greenbelt Plan lands identified as Protected Countryside Area as shown in **Figure 10-1**. Specifically, the Tributary to the West Don River (HDF3) corridor crossing of Kirby Road falls within the Greenbelt Natural Heritage System. There are no lands in the study area that are located within any Provincially designated Specialty Crop areas, however the study area also contains prime agricultural area. The proposed works for Kirby Road have been developed to minimize adverse impacts as follows:

- Encroachment into the Greenbelt Natural Heritage System (associated with the HDF3 corridor) has been minimized. Intrusion into the Natural Heritage System is limited to one watercourse crossing.
- Ecological connectivity through the Natural Heritage System corridor will be maintained or improved by incorporating wildlife road crossing measures into the design planning for the road improvements.
- Enhancement of the watercourse corridor, where it passes through the ROW, is recommended through the installation of native vegetation plantings.
- Measures have been recommended (e.g., ESC, location of materials stockpiling) to mitigate negative impacts to the natural feature during construction.

Lands within the Protected Countryside Area are subject to the entirety of the Greenbelt Plan, except for Section 6 of the GBP. **Table 10-1** documents how this Class EA meets and complies with these guidelines.

Figure 10-1 Lands Subject to Provincial Land Use Plans

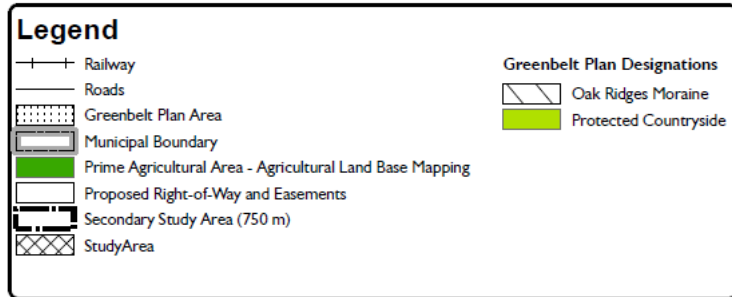
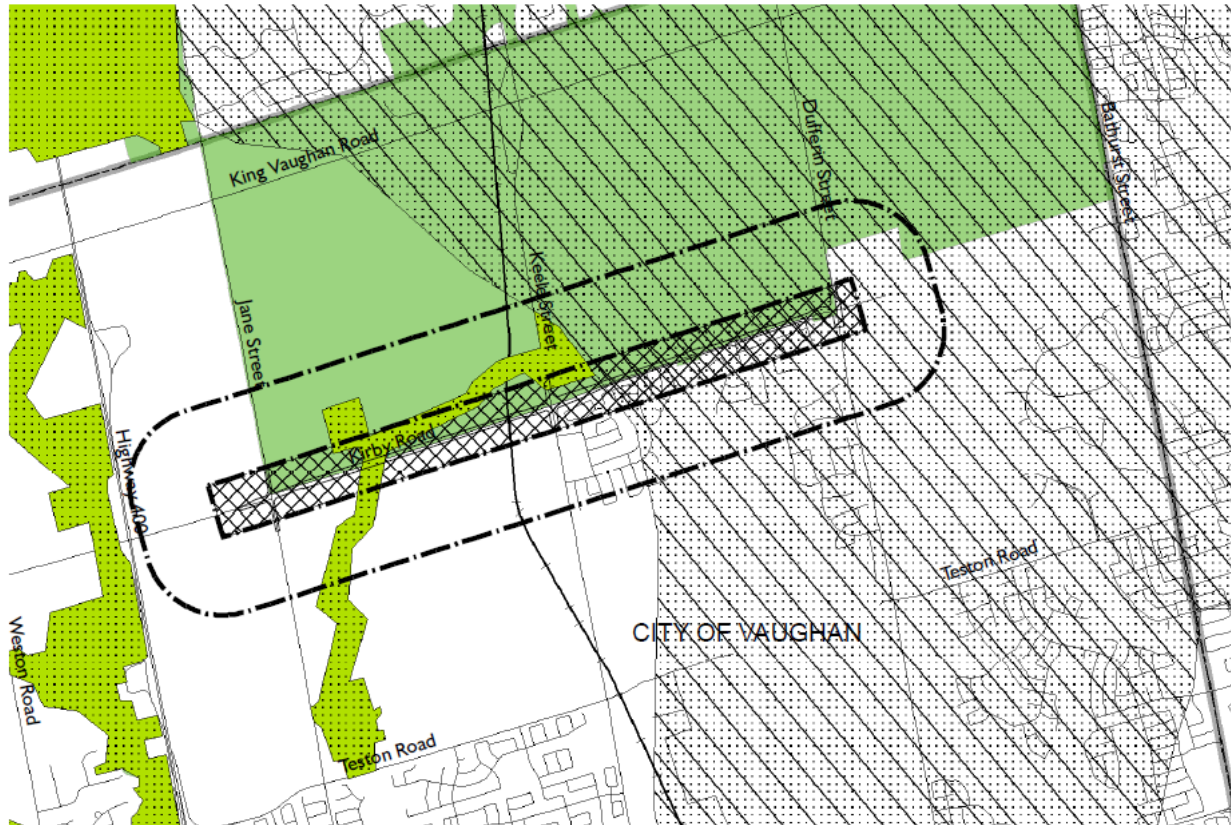


Figure 2
Provincial Land Use Plans

DBH Soil Services Inc.
October 2021

Table 10-1: Kirby Road Widening EA Study’s Compliance with GBP Requirements

Greenbelt Plan Requirements	How the GBP is addressed in this Study
The Requirements of Section 4.2.1(1) of the GBP	
<p>All existing, expanded or new infrastructure subject to and approved under the Canadian Environmental Assessment Act, the Environmental Assessment Act, the Planning Act, the Aggregate Resources Act or the Telecommunications Act or by the National or Ontario Energy Boards, or which receives a similar environmental approval, is permitted within the Protected Countryside, subject to the policies of this section and provided it meets one of the following two objectives:</p> <ul style="list-style-type: none"> a) It supports agriculture, recreation and tourism, Towns/Villages and Hamlets, resource use or the rural economic activity that exists and is permitted within the Greenbelt (GBP – Section 4.2.1 para. 1(a)) b) It serves the significant growth and economic development expected in southern Ontario beyond the Greenbelt by providing for the appropriate infrastructure connections among urban centres and between these centres and Ontario’s borders. (GBP – Section 4.2.1 para. 1(b)) 	<p>Widening Kirby Road from 2 to 4 lanes and active transportation facilities will help accommodate growth within the City and Region by providing different travel options and creating better connections to support goods and people movement. The culvert crossing within the Natural Heritage System is required to support the wider road platform.</p>
The Requirements of Section 4.2.1 (2) of the GBP	
<p>The location and construction of infrastructure and expansions, extensions, operations and maintenance of infrastructure in the Protected Countryside are subject to the following:</p>	
<p>Minimize the Amount of the Greenbelt Traversed and/or Occupied by the Infrastructure (GBP – Section 4.2.1 para. 2(a)) Demonstrate how the amount of greenbelt traversed or occupied by the infrastructure has been minimized</p>	<p>Three widening design alternatives were evaluated in detail, as documented in Section 8– Alternative Design Concepts. Based on the evaluation criteria, the preferred alternative was chosen. All options would have a similar footprint and similar amount of greenbelt traversed. The preferred option minimizes the amount of Greenbelt traversed with the proposed works essentially being along the existing alignment.</p>

Greenbelt Plan Requirements	How the GBP is addressed in this Study
<p>Minimize Impacts on the Existing Landscape (GBP – Section 4.2.1 para. 2(b)) Describe how modifications to the existing landscape will be minimized</p>	<p>Widening about the existing centreline was selected as the recommended design for the Kirby Road Corridor. Balancing the impacts on both sides of Kirby Road will minimize impacts on either side of the street. The preferred recommendation would have the least impact as it follows a best fit approach, where widening is proposed along the centreline with localized alignment shifts in a context sensitive manner and would balance the impacts and maximize the available right-of way.</p>
<p>Coordination with Other Infrastructure (GBP – Section 4.2.1 para. 2(c)) Identify other infrastructure ROWs or facilities located within the vicinity of the project regardless of ownership.</p>	<p>The proposed works for the Kirby Road within the GBP are limited to the Tributary to West Don River crossing. The work at this crossing will be coordinated with the TRCA to meet the requirements of ON. Reg 166/06.</p>
<p>Avoid Key Natural Heritage Features (KNHFs) and Key Hydrologic Features (KHF) unless needed and no reasonable alternative demonstrated (GBP – Section 4.2.1 para. 2(d)) Choose the option that is able to avoid traversing or occupying KNHFs or KHF if possible.</p>	<p>Widening about the centreline was selected as the recommended design the Kirby Road. Balancing the impacts on both sides of Kirby Road will minimize impacts. There are limited features at the watercourse crossing.</p>
<p>Minimize Negative Impacts on KNHFs and KHF and, where reasonable, maintain or improve connectivity (GBP – Section 4.2.1 para. 2(e)) Planning, design and construction practices to be adopted that will minimize adverse effects on KNHFs and KHF.</p>	<p>Section 10 provides details on anticipated impacts and proposed mitigation measures to be used to minimize impacts on vegetation, wildlife, fisheries and aquatic habitat, surface water, ground water and other factors.</p>

Greenbelt Plan Requirements	How the GBP is addressed in this Study
<p>New or expanding infrastructure shall avoid specialty crop areas and other prime agricultural areas in that order of priority (GBP – Section 4.2.1 para. 2(f)) Unless need has been demonstrated and it has been established that there is no reasonable alternative.</p>	<p>There are no Provincially designated Specialty Crop areas in the study corridor. The study area however contains prime agricultural areas. An Agricultural Impact Assessment was completed as documented in Section 5.3 to assess the widening and active transportation design alternatives to assess the agricultural impacts within the study area. Enhancement of the existing road does not allow for avoidance of Prime Agricultural Lands. There will be a small net loss of lands which has been kept to a minimum by expanding the existing Kirby Road right-of-way.</p>
<p>Where infrastructure crosses prime agricultural areas, including specialty crop areas, an agricultural impact assessment or equivalent analysis as part of an environmental assessment shall be undertaken (GBP – Section 4.2.1 para. 2(g))</p>	<p>There are no Provincially designated Specialty Crop areas in the study corridor. The study area however contains prime agricultural areas.. An Agricultural Impact Assessment was completed as documented in Section 5.3 to assess the widening and active transportation design alternatives to assess the agricultural impacts within the study area.</p>
<p>New waste disposal sites and facilities, and organic soil conditioning sites are prohibited in key natural heritage features, key hydrologic features and their associated vegetation protection zones (GBP – Section 4.2.1 para. 2(h))</p>	<p><i>Not applicable to the study area</i></p>

10.2 Oak Ridges Moraine Conservation Plan, 2017

The boundaries of the study area that fall within the Oak Ridges Moraine are shown in **Figure 10-1**. The ORMCP features mapped within the study area include the Natural Core Area and the Natural Linkage Area. Encroachment into the Natural Core Areas and Linkage Areas has been minimized through the proposed design. The proposed works for Kirby Road have been developed to minimize adverse impacts as follows:

- Opportunities to further minimize encroachment into the Natural Core Areas and Linkage Areas be explored during Detailed Design.
- Since the undertaking is to occur along an existing transportation corridor, potential impacts are limited to edges of the significant natural features, and no natural feature interior areas will be disturbed.
- Opportunities to maintain and enhance ecological connectivity between Natural Core Areas will be realized where wildlife road crossing measures are proposed in locations where Natural Core Area has been mapped on both sides of Kirby Road, between Keele Street and Dufferin Street (coincident with municipally-mapped ESA/ANSI connections across the Kirby Road ROW).
- Natural Core Areas and natural features within the Linkage Areas will be restored and enhanced where roadside construction encroachment is required, including plantings of suitable native vegetation species among other measures in accordance with an Edge Management Plan.
- Measures have been recommended (e.g., ESC, location of materials stockpiling) to mitigate negative impacts to the natural features during construction

Table 10-2: Kirby Road Widening EA Study’s Compliance with ORMCP Requirements

The Oak Ridges Moraine Conservation Plan Requirements	How the ORMCP is addressed in this Study
The Requirements of Section 41(2.1) of the ORMCP	
<p>An application for the development of infrastructure in or on land in a prime agricultural area shall not be approved unless,</p> <ul style="list-style-type: none"> a) the need for the project has been demonstrated and there is no reasonable alternative that could avoid the development occurring in a prime agricultural area; and b) an agricultural impact assessment or equivalent analysis carried out as part of an environmental assessment, is undertaken that demonstrates that there will be no adverse impacts to the prime agricultural area or that such impacts will be minimized and mitigated to the extent possible.” 	<p>Widening about the existing centreline was selected as the recommended design for the Kirby Road Corridor. Balancing the impacts on both sides of Kirby Road will minimize impacts on either side of the street. The preferred recommendation would have the least impact as it follows a best fit approach, where widening is proposed along the centreline with localized alignment shifts in a context sensitive manner and would balance the impacts and maximize the available right-of way.</p> <p>An Agricultural Impact Assessment was completed as documented in Section 5.3 to assess the widening and active transportation design alternatives to assess the agricultural impacts within the study area</p>

10.3 Climate Change

The Ministry of the Environment, Conservation and Parks (MECP) guide, Consideration of Climate Change in Environmental Assessment in Ontario, sets out ministry expectations and supports the province’s Climate Change Plan by outlining climate change considerations for EA study. The guide notes “climate consideration” within a project means that consideration has

been given methods to reduce greenhouse gas emissions and developing a design that is more resilient to future changes in climate and helps maintain the ecological integrity of the local environment in the face of a changing climate.

Climate change impacts related to this study are related to operations and maintenance as the transportation sector is one of the biggest contributors to CO₂, a key greenhouse gas. Climate Change will also impact the study area in the future as extreme weather conditions will affect the conditions of the roadways and will require more frequent repairs and updates as time passes.

10.4 Anticipated Impacts and Mitigation Measures

A summary of the potential impacts to natural, social/economic and cultural environments, together with recommended mitigation measures, is provided in **Table 10-3**.

Table 10-3: Summary of Anticipated Impacts and Proposed Mitigation Measures

Factor	Details/Anticipated Impact	Proposed Mitigation
<i>Social Environment</i>		
<p>1. Land Use and Socio-Economic Impacts</p>	<p>a. Impacts on residents during construction, including increased travel time or possible detours. b. Impacts to driveway access during and post-construction. c. Some driveways will need to be re-graded.</p>	<p>i. Prior to construction, specific notices and contact information will be delivered to area residents and property owners informing them of construction details, including temporary impacts to driveway access prior to construction and in advance of work related to their access. ii. Maintain access to individual driveways during construction</p>
<p>2. Archaeology</p>	<p>a. The Study Area exhibits areas of archaeological potential that will require State 2 AA and Stage 3 AA. Potential for additional archaeological studies based on the findings of Stage 2 and 3 AA to be confirmed. b. AIGv-117, AIGv-118, AIGv-121, AIGv-122, AIGv-123 and AIGv-404 are within 50 metres of the Study Area and are considered to exhibit CHVI. All six sites should be subject to Stage 3 assessment, if impacted, prior to any proposed construction activities. c. Part of the Study Area is located within 1000m of a documented ancestral Huron-Wendat village site and within 300m of any current or former water source. If impacted, these areas should be subject to ossuary monitoring during construction, consistent with the recommendations of the York Region Archaeological Management Plan. Any areas of disturbance that overlap with ossuary potential</p>	<p>i. Stage 2 archaeological assessment by test pit/pedestrian survey at five metre intervals, where appropriate, are required prior to any proposed impacts to the property; ii. Stage 3 archaeological assessment, where appropriate to address potential impacts to AIGv-118, AIGv-122, AIGv-123 and AIGv-404 prior to any proposed construction activities. iii. Should the findings of the Stage 2 and 3 archaeological assessments determine additional archaeological potential, complete further archaeological assessment or mitigation measures as recommended in the future Stage 2 and Stage 3 AA investigations. iv. Complete ossuary monitoring during construction, consistent with the recommendations of the York Region Archaeological Management Plan. Any areas of disturbance that overlap with ossuary potential should be subject to archaeological monitoring.</p>

Factor	Details/Anticipated Impact	Proposed Mitigation
	<p>should be subject to archaeological monitoring, as per the above recommendations;</p> <p>d. The remainder of the Study Area does not retain archaeological potential on account of deep and extensive land disturbance, low and wet conditions, slopes in excess of 20 degrees, or having been previously assessed. These lands do not require further archaeological assessment.</p>	<p>v. Should the proposed work extend beyond the current Study Area, further Stage 1 archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands.</p> <p>vi. Should any archaeological resources be unexpectedly encountered during construction, all activities impacting archaeological resources will cease immediately. MHSTCI will be notified, and a licensed archaeologist is required to carry out an archaeological assessment in accordance with the Ontario Heritage Act and the Standards and Guidelines for Consultant Archaeologists</p> <p>vii. If human remains are encountered, all activities will cease immediately and the local police or coroner as well as the Registrar of Cemeteries at the Ministry of Consumer Services will be contacted. In situations where human remains are associated with archaeological resources, MHSTCI will also be notified to ensure that the site is not subject to unlicensed alterations which would be a contravention of the Ontario Heritage Act.</p> <p>viii. Where burial sites are encountered during any excavation or other action, the provisions of the Cemeteries Act and its regulations shall apply. Where First Nations burials are discovered, consultation shall occur in accordance with the “York Region First Nations Consultation Protocol”, with the nearest First Nation and the First Nation with the closest cultural affiliation, if that can be determined.</p>

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<p>3. Built Heritage Resources and Cultural Heritage Landscapes</p>	<p>a. There are direct impacts anticipated to the Barrie GO Rail Corridor (CHL 7) and indirect adverse impacts due to construction.</p> <p>b. There are indirect impacts anticipated to these properties from the proposed improvements: 11724 Dufferin Street (CHL 8) identified as Property of Interest on the City of Vaughan’s Heritage Inventory. There are no direct impacts that are anticipated to impact any heritage attributes of these properties.</p> <p>c. There are indirect impacts that include property encroachment and change in setting anticipated to 2480 Kirby Road (CHL5) from the proposed improvements. It is Listed on the City of Vaughan’s Heritage Inventory. There are indirect adverse impacts from construction related vibration as the structure is within 50m form the proposed work. There are no direct impacts that are anticipated to impact any heritage attributes of these properties.</p>	<p>i. Complete baseline vibration monitoring during Detailed Design and prepare and implement vibration monitoring plan if required to minimize potential construction impacts to CHL3, CHL5, and CHL 7</p> <p>ii. Plan excavation and staging work to avoid unintended impacts to CHL 7</p> <p>iii. Plan and undertake construction activities and staging to avoid impacts which may include: establishing buffer zones, erecting temporary fencing, and instructing construction crews to avoid CHLs.</p> <p>iv. Indirect impacts to CHL1, CHL2, CHL3, CHL4, CHL6, CHL7 and CL8 from property encroachment is expected to be limited and does not impact heritage attributes. No further work is required to mitigate the indirect impacts.</p> <p>v. Indirect impacts to CHL5 from property encroachment and change in setting will require completion of a Cultural Heritage Impact Assessment by a qualified cultural heritage specialist as soon as possible during Detailed Design</p> <p>vi. Should future work require an expansion of the study area then a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on potential heritage resources</p>
<p>4. Noise</p>	<p>a. Predicted future sound level impacts along the study corridor are expected to be negligible.</p> <p>b. Construction noise impacts are temporary in nature but may be noticeable at times in nearby NSAs.</p> <p>c. Construction vibration can affect surrounding structures</p>	<p>i. Noise mitigation is not recommended as noise impacts are minor and less than the 5dBA impact criteria in the Noise Protocol.</p> <p>ii. Methods to minimize construction noise impacts should be included in the contract documents: <ul style="list-style-type: none"> a. Construction hours should be abide by City of Vaughan noise control by-law 062-2018. If </p>

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		<p>construction activities are required outside of these hours, the Contractor should minimize the amount of noise being generated to not be clearly audible in any noise sensitive areas.</p> <ul style="list-style-type: none"> b. Provide explicit indication that the Contractor is expected to comply with all applicable requirements of the contract. c. Maintain all equipment to limit noise emissions and operate with effective muffling devices that are in good working order. d. Contractor should assess for potential vibration impacts from their planned activities prior to the start of construction and mitigate accordingly e. Construction practices should abide by Ontario Provincial Standard Specification (OPSS) MUNI 120 vibration limits
<p>3. Property Requirements</p>	<ul style="list-style-type: none"> a. Potential property acquisition and construction easements are anticipated at some locations as a result of the proposed design. b. Impacts to trees located outside of the existing right-of-way. 	<ul style="list-style-type: none"> i. Formal definition of property requirements to be confirmed during Detailed Design ii. Temporary or permanent easements, modifications to grading slopes (in accordance with geotechnical recommendations) to reduce the amount of area required, or in some cases considering a retaining wall or other type of soil retention feature to minimize grading footprint iii. Where impacts to trees cannot be avoided, compensation will be provided as per a compensation strategy developed during Detailed Design. This will consist of a plan to either replant trees at these locations, or provide compensation to the property owner.

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		iv. During Detailed Design, opportunities to optimize design and cross-sectional elements will be reviewed to identify potential to minimize impacts at constrained locations.
4. Climate Change	a. Increased CO2 levels	<p>The project specific recommendations directly support climate change policies:</p> <ul style="list-style-type: none"> i. Opportunities for tree planting within the boulevard and minimizing adverse impacts the existing tree line where feasible ii. Provision of dedicated active transportation improvements (boulevard cycle tracks, sidewalks, crossrides at intersections) iii. Grade separation of the Barrie GO Rail Corridor crossing at Kirby Road to minimize idling and delays from at-grade crossing with increase projected train volumes iv. Intersection improvements including the re-alignment of Kirby Road and jog elimination at its intersection with Jane Street to minimize idling and delays v. The proposed improvements make use of an existing transportation route and propose to accommodate all road users in such a way that minimizes impacts to surrounding areas including residences, businesses, and the natural environment. <p>To mitigate potential effects during the construction phase of the project, the following best practices will be implemented:</p> <ul style="list-style-type: none"> i. Develop and implement detailed erosion and sediment control measures to be carried out during all construction phases in order to limit the amount of sediment/ laden material entering receiving drainage systems

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		<ul style="list-style-type: none"> ii. Dust suppression techniques to be employed for the duration of construction activities iii. A traffic staging plan to be developed during Detailed Design to accommodate local access and through traffic during construction to minimize excessive detouring and congestion in alternate routes. Further opportunities to reduce idling to be considered during Detailed Design. iv. Potential effects to consider pertaining to construction include the greenhouse gas (GHG) emissions associated with the construction period, including the physical machinery and equipment, travel distance and time for construction workers to get to and from the site, and the sourcing of building materials. Movement and access to the site for construction vehicles are to be described in the contract documents to be prepared at the time of Detailed Design. Conditions within the contract documents related to idling and hours of work should also be considered. <p>To mitigate potential effects during the operational phase of the project, aligning with best practices for infrastructure design, practices such as the improvement of hydrological data collection, use of models and monitoring localized effects, more frequent monitoring and maintenance and improvement of road design to be more climate change resistant are recommended. In addition, measures to adapt to climate change impacts and minimize impacts to individuals using Kirby Road in the future may include (but are not limited to):</p> <ul style="list-style-type: none"> i. Updating plans for weather emergencies, closures and rerouting during severe weather conditions/events, and

Factor	Details/Anticipated Impact	Proposed Mitigation
		<p>traveler information systems to include future climate change projections</p> <ul style="list-style-type: none"> ii. As the amount of impervious surface areas will increase, appropriate stormwater capacity should be considered to mitigate additional runoff, climate change and the likelihood of extreme precipitation, as described in Section 9.17 iii. Exploring opportunities of using LID treatment to store drainage during storm events beyond the minimum requirements will be reviewed during Detailed Design
5. Air Quality	<ul style="list-style-type: none"> a. The maximum combined concentrations for the Future Build were all below their respective MECP guidelines or CAAQS, with the exception of the 1-hr and annual NO₂ CAAQ, annual PM_{2.5}, 24-hr PM₁₀, 24-hr TSP, and annual benzene. Note that background concentrations exceeded the guideline for all of these contaminant averaging periods. The contribution from the roadway emissions to the combined concentrations was small. b. Greenhouse Gas (GHG) emissions will represent 0.0066% of the provincial target and 0.0013% of the Canada-wide target. The contribution of emissions from the project is small in comparison to these provincial and national targets. c. Construction activities have the potential to create temporary, localized effects on air quality in the immediate vicinity of the project. Emissions from construction are primarily comprised of fugitive dust and combustion 	<ul style="list-style-type: none"> i. Additional dust mitigation measures are recommended in the vicinity of receptor 18 (Kirby and Keele intersection). ii. Mitigation measures are not warranted, due to the small number of days which are expected to exceed the guideline. iii. Best Management Practices should be followed during construction to reduce any air quality impacts such as material wetting, use of chemical suppressants, use of non-chloride dust suppressants to reduce dust, use of wind barriers, planting of additional vegetation and limiting exposed areas which may be a source of dust, and equipment washing.

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	<p>products from the movement and operation of construction equipment and vehicles.</p>	
<p>6. Source Water Protection</p>	<p>a. Based on the MECP Source Protection Information Atlas and correspondence with TRCA, the study corridor is located in the Toronto and Region Source Protection Area and parts of the study area are located on lands designated as Significant Groundwater Recharge Area (SGRA) and Highly Vulnerable Aquifers (HVA).</p> <p>b. A Highly Vulnerable Aquifer can be easily changed or affected by contamination from both human activities and human process as a result of its intrinsic susceptibility (as a function of the thickness and permeability of overlaying layers), or by preferential pathways to the aquifer.</p> <p>c. A Significant Groundwater Recharge Area supplies a community or private residence with drinking water and is characterized by porous soils, which allow water to seep easily into the ground and flow to an aquifer.</p> <p>d. Potential threats associated with the Kirby Road improvements include:</p> <ul style="list-style-type: none"> • The establishment, operation, or maintenance of a system that collects, stores, transmits, treats, or disposes of sewage (limited to stormwater runoff) • The application of road salt • The storage of snow (limited to roadway clearing operations only) 	<p>i. The additional impervious surface associated with the roadway improvements would reduce the amount of groundwater infiltration from the surface. To offset these impacts and balance water quantity, the stormwater management strategy described in Section 9.17 addresses infiltration of stormwater runoff from the road right-of-way. In addition, the implementation of Low Impact Development (LID) measures will be considered during Detailed Design.</p> <p>ii. Additional road salt associated with winter maintenance for the proposed roadway improvements may increase impacts to source water protection areas. Consistent with best management practices and as suggested in the Clean Water Act policies, the City of Vaughan has developed Salt Management Plans for effective winter maintenance to reduce the amount of salt present in roadside snow banks and minimize the amount of salt entering the environment.</p> <p>iii. The stormwater management strategy (described in Section 9.17) addresses other contaminants that may be present in roadside snow banks. These would be treated by stormwater management facilities alongside the corridor prior to discharge into receiving watercourses.</p>

Factor	Details/Anticipated Impact	Proposed Mitigation
7. Streetscaping/ Urban Design	a. Impact to existing trees and landscaped features in the boulevard	<ul style="list-style-type: none"> i. Where impacts to trees cannot be avoided, compensation will be provided as per a compensation strategy developed during Detailed Design. ii. Impacted features will be restored or relocated, where feasible iii. Increased opportunity for aesthetics throughout the corridor with the provision of landscaped boulevards where feasible to be implemented within the right-of-way.
8. Utilities	a. Existing utilities in conflict with proposed improvements.	<ul style="list-style-type: none"> i. A utility composite and conflict plan is provided in Appendix S. A utility relocation plan will be developed during Detailed Design as necessary. ii. All utility information will be updated prior to construction to ensure that the data is accurate and to finalize relocation requirements as necessary, in consultation with utility companies.
9. Construction Detours/ Temporary Lane Restrictions	a. Inconvenience during construction	<ul style="list-style-type: none"> i. Impacts will be temporary in nature. The City will attempt to mitigate impacts as much as possible. ii. During Detailed Design, a traffic management plan will be developed to determine how traffic will be accommodated during construction and how access to properties adjacent to Kirby Road will be maintained. iii. Construction detours for rail and road traffic for the construction of the underpass design will be developed during Detailed Design in consultation with Metrolinx, City of Vaughan and York Region

Factor	Details/Anticipated Impact	Proposed Mitigation
Natural Environment		
<p>10. Vegetation and Vegetation Communities</p>	<p>Direct impacts to distinct natural features are:</p> <ul style="list-style-type: none"> a. PSW (0.01ha encroachment) at approximately Station 1-890 to 1-940 which comprises the Reed Canary Grass Mineral Meadow Marsh (MAM2-2) inclusion b. Unevaluated wetland that is presumed PSW at approximately Stations 2-960 to 3-060 (0.15ha encroachment) which comprises the Mineral Meadow Marsh (MAM2) ecosite c. Significant Woodland at approximately Stations 3-400 to 3-620 (0.32ha encroachment) which comprises the Dry-Fresh White Pine-Maple-Oak Mixed Forest (FOM2) ecosite d. Significant Woodland at approximately Stations 4-050 to 4-400, north of Kirby Road (0.42ha encroachment) which comprises the White Pine Coniferous Plantation (CUP3-2), FOM2 and Maple Mineral Deciduous Swamp (SWD3) ecosites e. The SWD3 ecosite represents unevaluated wetland that is presumed PSW; 0.21ha encroachment into this feature specifically f. Significant Woodland at approximately Stations 4-220 to 4-400, south of Kirby Road (0.23ha encroachment) which comprises the SWD3 and Cultural Woodland (CUW) ecosites g. The SWD3 ecosite represents unevaluated wetland that is presumed PSW; 0.15ha encroachment into this feature specifically 	<ul style="list-style-type: none"> i. During Detailed Design review opportunities to further reduce encroachments into significant natural features to the extent feasible. ii. Compensation for tree removals will follow guidance from the City of Vaughan. The Tree Protection Protocol (2018) is anticipated to form the major basis to help inform the calculations necessary for adequate compensation requirements (excluding woodland edge compensation). iii. Compensation for tree removals within forested / woodland communities will follow guidance from the City of Vaughan, Region of York and the TRCA in order to ensure a net ecological gain to the Natural Heritage System. iv. Prepare Restoration and Compensation Plans, Woodland Compensation Plan, Edge Management Plan in accordance with relevant policies (e.g., TRCA Guideline for Determining Ecosystem Compensations (TRCA 2018)) and based on agency consultation v. A compensation and monitoring plan will be prepared to mitigate impacts associated with the widening of Kirby Road on the regionally significant plant species found within the ROW. vi. Wetland compensation will be required, as approved by the MNR and TRCA. Wetland boundaries will be delineated through use of the Ontario Wetland Evaluation System methodology (MNR 2014). Wetland and woodland dripline boundaries will be staked, and reviewed and confirmed on-site with agency staff. Confirmed boundaries will be surveyed

Factor	Details/Anticipated Impact	Proposed Mitigation
	<p>No federally or provincially significant species will require removal as a result of the planned road improvements.</p> <p>Direct impacts to other natural feature designations:</p> <ul style="list-style-type: none"> a. Maple Uplands & Kettles Life Science ANSI/McGill Area ESA which primarily includes, but is not limited to, Significant Woodland and wetland features b. Growth Plan NHS which comprises both natural features and adjacent agricultural lands c. Greenbelt Plan NHS which is associated with the HDF 3 watercourse channel and adjacent lands d. Oak Ridges Moraine Conservation Plan (ORMCP) Natural Core and Natural Linkage areas e. City of Vaughan Core Features (coincident with Significant Woodlands, ANSI and ESA features) f. Region Greenlands System (coincident with Greenbelt and ORMCP natural area designations) 	<p>to refine natural feature encroachment requirements, and associated compensation requirements, based on the Detailed Design</p> <ul style="list-style-type: none"> vii. Monitoring must include at least 1 year of monitoring to ensure survival of regionally significant species. viii. Storage of construction materials should be at least 30m from any significant natural feature. ix. Timing of construction activities, especially vegetation clearing and site grading, must have consideration for the MBCA. Habitat removal to occur outside of peak breeding bird window (April 1st – August 31st). Habitat removal in simple habitat may occur within peak breeding bird window, where nest clearances confirm no breeding bird activity. x. Any vegetation removals or site alterations within wetlands be maintained outside of the period March 15-June 30 to avoid impacts to breeding amphibians. xi. Timing of construction activities, especially vegetation clearing and site grading, must have consideration for bird nesting and den sites of furbearing mammals. xii. During Construction erect Sediment and Erosion Control Fencing to prohibit encroachment and minimize external inputs.
<p>11. Fisheries and Aquatic Habitat</p>	<ul style="list-style-type: none"> a. Temporary changes to water quality b. Changes in water temperature c. Accidental spills in watercourses d. None of the HDF features within the study area provide direct habitat for fish e. Planned road improvements are not anticipated to cause the Harmful Alteration, Disruption or 	<ul style="list-style-type: none"> i. Work areas will be delineated with construction fencing to minimize the area of disturbance ii. Appropriate sediment control structures will be installed prior to and maintained during construction to prevent entry of sediments into the watercourse

Factor	Details/Anticipated Impact	Proposed Mitigation
	<p>Destruction (HADD) of fish or fish habitat provided construction mitigation and BMP measures are implemented including the installation of erosion and sediment control measure</p> <p>f. No HDF management measures are required for HDF-001, -003 or -004 impacts. Mitigation measures are required to maintain or enhance the contributing hydrological functions of HDF-002 and 002-01</p>	<p>iii. Good housekeeping practices related to materials storage/stockpiling, equipment fueling/maintenance, etc. will be implemented during construction</p> <p>iv. Disturbed riparian areas will be vegetated and/or covered with an erosion control blanket as quickly as possible to stabilize the banks and minimize the potential for erosion and sedimentation</p> <p>v. Changes to water quality will be mitigated through the deployment and maintenance of erosion and sediment controls (silt fencing, flow checks, etc.) which will prevent sediments from reaching the watercourses from exposed soils upslope</p> <p>vi. Spills will be reported and documented to MECP's Spill Response Hotline. Efforts will be made to contain a spill if it is safe to do so.</p> <p>vii. A DFO Request for Review will not be required to undertake the planned road improvements, provided the standard and appropriate mitigation measures are implemented during construction to avoid negative impacts or degradation of the aquatic features (e.g., erosion and sediment control measures).</p> <p>viii. Contributing flow functions of impacted HDR-002 and HDF-002-01 can be replicated through use of LID systems such as the bioretention cells that are proposed as part of the road improvements</p> <p>ix. Channel realignment of HDF 3 (Tributary to West Don River) is required within the ROW to accommodate the wider flow path and increased hydraulic conductivity associated with the new concrete box culvert. Re-design of the watercourse channel within the ROW should follow natural channel design principles in consultation with the TRCA.</p>

Factor	Details/Anticipated Impact	Proposed Mitigation
<p>12. Wildlife and Wildlife Habitat</p>	<ul style="list-style-type: none"> a. Displacement of wildlife and wildlife habitat b. Barrier effects on wildlife passage c. Wildlife/vehicle conflicts d. Disturbance to wildlife from noise, light and visual intrusion; e. Displacement of rare, threatened or endangered wildlife or significant wildlife. f. Impacts to designated natural areas g. Bats: All 11 mapped potential bat habitat trees are anticipated to require removal based on the Preliminary Design. They are assumed to be for roosting by bats, including SAR bats h. Potential impacts to migratory birds. Eastern Wood-Pewee is expected to maintain breeding territories within existing features post-construction. The relatively small areas of woodland edge to be removed within the features, relative to their overall size, are not expected to negatively impact the quality of the woodlands as breeding habitat for the species. There is potential for construction-stage disturbances. i. Vegetation clearing has the potential to directly impact bird breeding activity through damage and destruction of nests, eggs and young, or avoidance of the area by breeding adults. j. Minor ecological linkage for small wildlife may occur along the HDF3 corridor. k. Potential for additional linkage at Maple Spur Channel ESA and Maple Uplands and Kettles Life Science ANSI or where Significant Woodland associated with the ESA and ANSI 	<ul style="list-style-type: none"> i. Tree removal to occur outside of the bat active window (i.e. removals can occur October 1st – April 30th) ii. Consultation with the MECP will be required prior to the removal of identified potential habitat trees and woodland edges that are mapped as Candidate SWH for Bat Maternity Colonies, to determine appropriate next steps in accordance with the ESA. iii. Additional targeted surveys may be required by the MECP to assess the use of woodland edge features by SAR bats, prior to their removal. iv. Timing of construction activities, especially vegetation clearing and site grading, must have consideration for the MBCA. Habitat removal to occur outside of peak breeding bird window (April 1st – August 31st).Habitat removal in simple habitat may occur within peak breeding bird window, where nest clearances confirm no breeding bird activity. v. An Edge Management Plan should be developed to detail the ecological restoration, enhancement, management and monitoring of disturbed natural feature edges within the ROW. vi. A detailed Monitoring Plan should be developed to identify pre-, during-, and post-construction monitoring requirements. vii. Ecological connectivity through the Natural Heritage System corridor will be improved with the culvert replacement at Tributary to the West Don River by incorporating wildlife road crossing measures into the design planning for the road improvements. viii. Opportunities to maintain and enhance ecological connectivity between Natural Core Areas will be realized where wildlife road crossing measures are

Factor	Details/Anticipated Impact	Proposed Mitigation
	<p>however there are no cross-road culverts at either of these potential linkage and wildlife crossing data was not available at the time of the study.</p> <p>I. Dust and noise associated with construction is anticipated to be temporary. Significant effects on wildlife and vegetation from dust and noise are not expected.</p>	<p>proposed in locations where Natural Core Area has been mapped on both sides of Kirby Road, between Keele Street and Dufferin Street (coincident with municipally-mapped ESA/ANSI connections across the Kirby Road ROW).</p> <p>ix. Dust mitigation measures will be followed during construction. Construction work to follow applicable Noise by-laws.</p>
<p>13. Groundwater / Hydrogeology</p>	<p>a. Permanent drainage may be required for a drained underpass grade separation configuration if permitted which may affect local ground water features.</p> <p>b. When the potential daily withdrawal construction dewatering estimate are greater than 50 m³/day but less than 400 m³/day, an Environmental Activity and Sector Registry (EASR) may be required to permit the construction dewatering as stipulated by MECP. An EASR for construction dewatering would apply to the entire project and therefore construction would need to be staged such that the dewatering demands of the entire project do not exceed the 400 m³/day limit at any time. If simultaneous dewatering is required that would result in the project takings exceeding the 400 m³/day rate, then a Permit to Take Water (PTTW) would be required from the MECP to permit this level of water taking.</p> <p>c. Construction dewatering for the underpass is not anticipated to impact domestic wells that are</p>	<p>i. A long-term dewatering strategy is not anticipated to be required for the Underpass if a watertight design of the structure is provided.</p> <p>ii. The Underpass will require a Category 3 Permit To Take Water as construction dewatering estimates exceed the threshold of 400m³/day</p> <p>iii. Consider a preconstruction survey of all structures and utilities within the radius of influence prior to dewatering activities</p> <p>iv. Develop a Settlement Monitoring Program in accordance with railway requirements for review and approval by the railway</p> <p>v. Discharge of groundwater will require pre-treatment due to exceedances of the PWQO limits and storm limits of the City of Vaughan sewer use Bylaw respectively. An experienced Dewatering Contractor and Water Treatment Specialist are recommended to design and operate dewatering and / or treatment options as required. They would need to develop methods and means to meet PWQO or selected sewer-use limits. A discharge agreement would be needed by the Contractor from the City of Vaughan to meet requirements. Discharge to the natural</p>

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	<p>assumed to be screened within the deeper aquifers.</p> <p>d. The impact of water taking for construction of the Tributary to the West Don River crossing on water quantity is anticipated to be minimal.</p> <p>e. Dewatering discharge that may be directed to nearby tributaries could potentially alter the physical, chemical and thermal regime of the receiving streams. Pre-treatment is required.</p> <p>f. Potential for contaminated groundwater from dewatering activities will require treatment before discharge or disposal.</p>	<p>environment may require approval from MECP, MNRF, TRCA and others depending upon approach and location.</p> <p>vi. Conduct a groundwater water quality monitoring program within the excavation dewatering system to confirm the water quality is appropriate for the selected discharge location</p> <p>vii. Discharge at least 30m away from water bodies including streams where possible</p> <p>viii. During construction employ temporary ESC measures at discharge points</p> <p>ix. Complete private well survey in advance of construction and identify baseline water levels and quality prior to, during and following construction</p> <p>x. Refine analysis for hydrogeological conditions to estimate dewatering estimates and radius of influence to confirm watering taking requirements and to confirm if private well survey is warranted.</p> <p>xi. Record daily water taking volumes daily and register on Regulatory Self-Report System as required</p>
14. Surface Water	<p>a. Impacts resulting from any excavating or cut and fill operations will be temporary in nature</p> <p>b. Changes to the existing pavement area may result in an increase in quantity runoff</p>	<p>i. Erosion and sedimentation mitigation measures will be implemented prior to the construction phase. Control measures will include, but not be limited to: limiting the geographical extent and duration soils are exposed to the elements; implementing standard erosion and sediment control measures in accordance with Ontario Provincial Standard Specification (OPSS); and managing surface water outside of work areas to prevent water from coming in contact with exposed soils.</p>

Factor	Details/Anticipated Impact	Proposed Mitigation
		<ul style="list-style-type: none"> ii. Monitoring of erosion and sediment control measures during and after construction will be implemented to ensure their effectiveness. These environmental measures should reduce/ minimize adverse environmental impacts iii. A drainage/stormwater management plan has been prepared to mitigate potential changes to the existing pavement area resulting from potential increase in quantity runoff.
<p>15. Soil Removal and Contaminants</p>	<ul style="list-style-type: none"> a. Potential for fill material and salt-related impacts as a result of roadway de-icing activities may be present in the study area. The quality and source of this suspected fill material and any salt-related soil and groundwater impacts are unknown. b. Potential for removal of contaminated soils. c. Management of excavated soil must not result in the discharge of a contaminate into the natural environment that causes or may cause an adverse effect. Should this occur, appropriate mitigation measures are required. d. Potential impacts to properties associated with issues of potential environmental concern and spill locations. The study corridor contains 6 APECs; two moderate potential for impact and four properties with high potential to impact. The proposed project is anticipated to impact all six sites as three of the APECs are identified as the entire site. 	<ul style="list-style-type: none"> i. An assessment of the quality of the fill material and any sub-surface soils is recommended as part of the proposed construction activities prior to the reuse of any excavated and/or excess material. Similarly, the quality of water generated during any construction/dewatering activities should be assessed prior to being discharged into the environment ii. If soil removed during construction is determined to be contaminated, the disposal of contaminated soil is to be consistent with Part XV.1 of the Environmental Protection Act and Ontario Regulation 153/04, Records of Site Condition, which detail the requirements related to site assessment and clean up. In addition, should contaminated soil be present at the site, the MECP’s York Durham District Office is to be contacted for further consultation. iii. Activities related to management of excess soil through construction should be completed in accordance with MECP’s current guidance document called “Management of Excess Soil – A Guide for Best Management Practices” updated in 2017. It provides guidance on how to handle excess soil beginning at

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		<p>the place where the soil is excavated (a “Source Site”), during the transportation of the excess soil, and through a site where the excess soil can be reused for a beneficial purpose (a “Receiving Site”).</p> <ul style="list-style-type: none"> iv. Should there be discharge of a contaminate into the natural environment, notice of the discharge must be provided in accordance with the provisions of the Environmental Protection Act, R.S.O 1990, c. E. 19 (EPA). v. If, at any time, the management of excavated soil or excess soil causes an adverse effect, such as odour, litter, dust, noise, or other impacts to the natural environment or water quality, appropriate preventive and remedial actions will immediately be taken to alleviate the adverse effect or impact. Until these issues are addressed, all soil management activities may need to be suspended, including soil excavating, transporting or receiving. vi. Each spill location would require additional subsurface environmental investigations to assess related impacts. vii. Compliance with O. Reg. 406/19 as applicable for on-site and excess soil management during construction. viii. Conduct a subsurface investigation involving sampling and analysis of soil and groundwater within the excavation depths of the proposed construction to confirm or refute the potential for contamination from the identified PCAs and associated APECS to assist in management of excess soil and / or future planning for potential land acquisitions. ix. A Salt Management Plan will be required for approval at Detailed Design.

Factor	Details/Anticipated Impact	Proposed Mitigation
16. Agricultural	<ul style="list-style-type: none"> a. Interim or permanent loss of agricultural lands – there will be a permanent loss of the use of 5.6 ha of land. b. Fragmentation, severing or landlocking of agricultural lands and operations – there will be no additional land fragmentation as a result of the construction and operation of the proposed right-of-way and associated easements. c. The loss of existing and future farming opportunities – there will be a loss of land use of approximately 0.3 ha of built-up/disturbed areas, 2.2 ha of common field crop, 1.2 ha of forage/pasture lands, 0.6 ha of recreational lands (golf course), 0.5 ha of scrublands, and 0.7 ha of woodlands. d. The loss of infrastructure, services or assets – there is no loss of agricultural infrastructure, services or assets. e. The loss of investments in structures and land improvements – there is no loss of agricultural investments in structures or land improvements. f. Disruption or loss of functional drainage systems – there is no loss of investment in agricultural drainage systems. g. Disruption or loss of irrigation systems – there is no loss of investment in agricultural irrigation systems. h. Changes to soil drainage – there will be no changes to agricultural soil drainage as a result of the enhancements to Kirby Road within the 	<ul style="list-style-type: none"> i. The type of change in land use, a proposed enhancement of an existing road, does not allow for an avoidance of Prime Agricultural Lands. There will be a small net loss of lands, some of which include the use for agriculture. The loss of lands has been kept to a minimum by expanding the existing Kirby Road right-of-way. ii. To minimize impacts, a potential method may be to enhancing Kirby Road within the existing road right-of-way. The proposed right-of-way and associated easements will be an expansion of the existing Kirby Road right-of-way, thereby minimizing the loss of agricultural lands. iii. Enhance Kirby Road by including wide shoulders to allow safe transportation of agricultural equipment or increasing the number of lanes to allow for safe passing of farm vehicles. The road is proposed to be widened from two to four lanes. iv. Use of natural heritage feature or a road to separate agriculture from non-agricultural land uses to create a defined boundary to reduce trespassing and potential vandalism. v. Create berms or vegetated feature between the different types and intensities of land uses to reduce the potential for trespassing and potential vandalism. Streetscaping plan to be developed during Detailed Design

Factor	Details/Anticipated Impact	Proposed Mitigation
	<p>proposed right-of-way and associated easements.</p> <ul style="list-style-type: none"> i. Changes to surface drainage – there will be no changes to surface drainage on adjacent agricultural lands as a result of the proposed enhancements to Kirby Road within the proposed right-of-way and associated easements. j. Changes to landforms – there will be no changes to landforms (with respect to agriculture) as a result of the proposed enhancements to Kirby Road. k. Changes to hydrogeological conditions – would need to be addressed under separate cover by the hydrogeological consultant. l. Disruption to surrounding farm operations – there will be limited disruption to surrounding/adjacent farm operations as a result of the proposed enhancements to Kirby Road within the proposed right-of-way and associated easements. m. Effects of noise, vibration, dust - there will be limited potential for noise, vibration and dust as a result of the enhancements to Kirby Road within proposed right-of-way and associated easements. There is a potential for noise, vibration and dust during the initial construction phase. n. Potential compatibility concerns – there should be no potential for compatibility concerns as the proposed enhancements include a widening of the existing Kirby Road through a new 	<ul style="list-style-type: none"> vi. Use of adequate fencing to reduce the potential for trespassing and potential vandalism to be considered during Detailed Design. vii. Use of signage between the different types and intensities of land uses to indicate No Trespassing or Private Property to be considered during Detailed Design. viii. Use of plantings/vegetation as buffers to reduce visual impacts and sounds. ix. Implementation of surface and/or groundwater monitoring in areas where agricultural operations make use of surface or groundwater as part of their normal farm practices. x. Limit the use of tall streetlights or use lighting that is directed down and away from agricultural lands.

Factor	Details/Anticipated Impact	Proposed Mitigation
	<p>proposed right-of-way and associated easements, as the majority of the enhancements will occur with the existing Kirby Road right-of-way.</p> <ul style="list-style-type: none"> <li data-bbox="457 402 1104 496">o. Traffic concerns - Traffic issues should be limited in scope as this study relates to proposed enhancements of an existing road. <li data-bbox="457 505 1104 764">p. Changes to adjacent cropping due to light pollution – there is the potential for agricultural impacts depending on the type of street lights that might be used adjacent to the agricultural areas. Recent studies have identified impacts to soybean crops due to the use of tall street light poles, high pressure sodium lights and light casting onto adjacent agricultural lands. 	

11 Timing of Implementation and Future Commitments

11.1 Project Schedule

As part of the Environmental Assessment process, this Environmental Study Report is to be filed and placed on the public record for at least 30 calendar days for review by the public and review agencies.

After the review period, provided that no Section 16 Orders are received, the City may proceed to Phase 5 of the Class EA process – design and construction. Property acquisition and utility relocation will then be scheduled, followed by construction.

11.2 Lapse of Time

According to the Municipal Class EA, “If the period of time from the filing of the Notice of Completion of ESR in the public record or the MECP’s denial of a Section 16 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 period. The review shall be recorded in an addendum to the ESR which shall be placed on the public record.”

Notice of Filing of Addendum shall be placed on the public record with the ESR and shall be given to the public and review agencies, for a minimum 30-day public review period. The notice shall include the public’s right to request a Section 16 Order during the 30-day review period. If no Section 16 Order request is received the proponent is free to proceed with implementation and construction.

11.3 Commitments for Future Work

The ESR identifies specific items to be reviewed and confirmed during Detailed Design. Some of these commitments will address specific concerns raised by property owners and review agencies during the EA process. Items of particular interest to be addressed include:

1. Property Requirements
 - a. Review design opportunities to minimize property acquisition requirements at constrained locations.
 - b. Property requirements identified in this report and shown on the preliminary design drawings are preliminary and will be finalized during Detailed Design. Where feasible, review opportunities for easements instead of property acquisition.

- c. Obtain Permission to Enter Agreements from landowners where access to their property is required.
- d. Obtain construction easements as required.
- e. Consult with property owners during the development of construction staging plans to maintain access to properties and minimize impacts as feasible.
- f. During Detailed Design consult with impacted property owners of 2400 Kirby Road (Mid-Ontario Truck Centre) to consider the opportunity to maintain a Kirby Road street address with the proposed change in access

2. Archaeology

- a. Should future work require an expansion of the study area, complete Stage 1 Archaeological Assessment (AA) to confirm presence / absence of archaeological potential.
- b. Complete Stage 2 AA and Stage 3 AA for impacted lands as per recommendations of the Stage 1 AA.
- c. Consult with Huron Wendat and Curve Lake First Nation for additional archaeological assessment (Stage 2 AA and Stage 3AA) .
- d. Findings from subsequent archaeological assessments are to be filed with the Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) for review and entry into the Ontario Public Register of Archaeological Reports.
- e. Complete Ossuary Monitoring and Archaeological Monitoring as per recommendations of the Stage 1 AA during Construction.
- f. All outstanding stages of archaeological assessment (including those arising from the planned Stage 2 and 3 studies,) will take place as early as practicable during detailed design, and before the commencement of ground-disturbing activities
- g. Consult with Indigenous Communities (CLFN) to identify opportunities for participation in field investigations if Stage 2 and 3 AA are deemed warranted
- h. During Detailed Design, any property owned and required from TRCA will be subject to a Stage 2 Archaeological Assessment completed by TRCA. A site visit can clarify if the investigation is required.
- i. Indigenous communities that express interest in archaeological assessments will be included and consulted throughout the assessment process.
- j. Should any archaeological resources be unexpectedly encountered during construction, all activities impacting archaeological resources will cease immediately. MHSTCI will be notified, and a licensed archaeologist is required to carry out an archaeological assessment in accordance with the

Ontario Heritage Act and the Standards and Guidelines for Consultant Archaeologists.

- k. If human remains are encountered, all activities will cease immediately and the local police as well as the Registrar, Burials of the Ministry of Government and Consumer Services will be contacted. In situations where human remains are associated with archaeological resources, MHSTCI will also be notified to ensure that the site is not subject to unlicensed alterations which would be a contravention of the *Ontario Heritage Act*.

3. Cultural Heritage

- l. Complete a Cultural Heritage Impact Assessment for CHL5 by a qualified cultural heritage specialist as soon as possible during Detailed Design
- m. Complete baseline vibration monitoring during Detailed Design and prepare and implement vibration monitoring plan if required to minimize potential construction impacts to CHL3, CHL5, and CHL 7
- n. Plan and undertake construction activities and staging to avoid impacts which may include: establishing buffer zones, erecting temporary fencing, and instructing construction crews to avoid CHLs.
- o. Should future work require an expansion of the study area, then a qualified heritage consultant will be contacted in order to confirm the impacts of the proposed work on potential heritage resources.

4. Noise

- a. During Detail Design additional noise analysis is recommended to reassess project sound levels and impacts due to the uncertainty on both the road traffic volumes and the truck percentages that will be present following the construction of this project and the construction of Kirby Road between Dufferin Street and Bathurst Street. If there are noise impacts greater than the criteria set in provincial or local municipal policies or guidelines, there should be a consideration of providing additional noise mitigation to protect the noise sensitive areas within the project limits
- b. Construction practices to abide by construction code of practice and City Noise Control By-Law to minimize temporary construction noise impacts as outlined in the Noise Impact Assessment Report in **Appendix O**

5. Natural Environment

- a. A TRCA permit under *Ontario Regulation 166/06- Development, Interference with Wetlands and Alterations to Shorelines and Watercourses* will be required for all works within regulated areas.

- b. Opportunities to reduce the design footprint and minimize impacts to natural features will be reviewed during Detailed Design
- c. Channel realignment of HDF 3 (Tributary to West Don River) should follow natural channel design principles in consultation with the TRCA.
- d. Opportunities to maintain and enhance ecological connectivity between Natural Core Areas will be realized where wildlife road crossing measures are proposed in locations where Natural Core Areas has been mapped on both sides of Kirby Road, between Keele Street and Dufferin Street (coincident with municipally-mapped ESA/ANSI connections across the Kirby Road ROW). During Detailed Design further review and agency consultation is needed to determine if measures to mitigate wildlife road mortality and hazards to motorists are warranted. In the segment between Keele Street and Dufferin Street, if existing data suggests that deer crossings are more concentrated, or if deer-vehicle collisions have occurred, potential mitigation measures may include deer crossing signage or wildlife eco-passage.
- e. Prepare Restoration and Compensation Plans, Woodland Compensation Plan, Edge Management Plan in accordance with relevant policies (e.g., TRCA Guideline for Determining Ecosystem Compensations (TRCA 2018), TRCA's ESC Guidelines for Urban Construction (2019)) and based on agency consultation
- f. An Edge Management Plan should be developed to detail the ecological restoration, enhancement, management and monitoring of disturbed natural feature edges within the ROW.
- g. A detailed Monitoring Plan should be developed to identify pre-, during-, and post-construction monitoring requirements. The monitoring program will include:
 - Key impacts to be monitored
 - Monitoring requirements during construction and during operation of the facility
 - The period during which monitoring will be necessary
 - Frequency and timing of surveys, the location of monitoring sites and the methods of data collection, analysis and evaluation
 - The content, manner and form in which records of monitoring data are to be prepared and retained
 - Where and for how long monitoring records and documentation will be on file
 - Specific requirements for monitoring appropriate to the particular circumstances and conditions under which the project will be implemented
- h. Consultation with the MECP will be required prior to the removal of identified potential habitat trees and woodland edges that are mapped as Candidate SWH for Bat Maternity Colonies, to determine appropriate next steps in

accordance with the ESA. Additional targeted surveys may be required by the MECP to assess the use of woodland edge features by SAR bats, prior to their removal.

- i. An Information Gathering Form will be submitted to MNRF/MECP during Detailed Design to determine permit requirements under the Ontario *Endangered Species Act, 2007* for potential impacts to SAR bats habitat from vegetation removals. If required, the necessary permit(s) will be secured during Detailed Design.
- j. Timing of construction activities, especially vegetation clearing and site grading, must have consideration for the MBCA for bird nesting and den sites of furbearing mammals. Habitat removal should be completed outside of the bat active window (May 1 – September 30) and breeding bird season (April 1 – August 31). Habitat removal in simple habitat may occur within peak breeding bird window, where nest clearances confirm no breeding bird activity. Any vegetation removals or site alterations within wetlands be maintained outside of the period March 15-June 30 to avoid impacts to breeding amphibians.
- k. Compensation for tree removals will follow guidance from the City of Vaughan (Tree Protection Protocol (2018)), and guidance from the City of Vaughan, Region of York and the TRCA for tree removals within forested communities. Supplementary tree surveys may be required to inform compensation agreements in Detailed Design.
- l. Movement of excess material from the project to the nearby park will be considered and discussed with North maple Regional Park Staff during detailed design.
- m. A compensation and monitoring plan will be prepared to mitigate impacts associated with the widening of Kirby Road on the regionally significant plant species found within the ROW. Monitoring must include at least 1 year of monitoring to ensure survival of regionally significant species.
- n. Wetland compensation will be required, as approved by the MNRF and TRCA. Wetland boundaries will be delineated through use of the Ontario Wetland Evaluation System methodology (MNRF 2014). Wetland and woodland dripline boundaries will be staked, and reviewed and confirmed on-site with agency staff. Confirmed boundaries will be surveyed to refine natural feature encroachment requirements, and associated compensation requirements, based on the Detailed Design
- o. Good housekeeping practices related to materials storage/stockpiling, equipment fueling/maintenance, the deployment and maintenance of erosion and sediment controls, etc. will be implemented during construction
- p. Spills will be reported and documented to MECP's Spill Response Hotline. Efforts will be made to contain a spill if it is safe to do so.

- q. Dust mitigation measures will be followed during construction. Construction work to follow applicable Noise by-laws.

6. Roadway Design

- a. The City will address design requirements through the preparation of contract drawings and specifications.
- b. Consider feasibility and location of retaining walls to minimize grading impacts.
- c. Proposed re-grading at driveways to be confirmed during Detailed Design once each driveway design is developed.
- d. Signage and pavement markings to be confirmed during Detailed Design.
- e. At the time of Detailed Design, any changes to design standards and/or industry best practices compared to those available at the time of the EA are to be considered.

7. Active Transportation Facilities

- a. Material type and treatment for cycle track and sidewalk to be confirmed
- b. Review Region's latest Active Transportation guidelines during Detailed Design to ensure the proposed design conforms to the most recent guidelines.

8. Go Transit Barrie GO Railway Corridor Crossing

- a. All works on, above or below Metrolinx property will need to be coordinated with railway operations and comply with the following Metrolinx requirements:
 - 1. Rules, policies, standards and procedures for working within Metrolinx right-of-way;
 - 2. Liability insurance requirements for works performed on and/or in proximity to the railway or within railway right-of-way; and,
 - 3. Safety and related requirements and instructions for work on railway right-of-way by non- Metrolinx personnel.
- b. All works during prearranged work blocks under railway flagging protection have to be planned and carried out in a manner to leave the work zone at the end of work block in safe condition for railway traffic and operations.
- c. Review potential to reduce proposed grade of AT facility through underpass during Detailed Design.

9. Keele Street Private Driveway Access

- a. During Detailed Design the City will consult with York Region, TRCA and the impacted property owners to confirm closure of the Mid-Ontario Truck Centre

and Street 2 accesses, the provision of the new right-in-right-out access on Kirby Road, and the new right-in-right-out driveway access on Keele Street.

- b. During Detail Design the City and York Region to discuss opportunities to implement and construct northbound and southbound left turn lanes at the Keele Street and Kirby Road intersection as part of the intersection improvements subject to approvals and cost-sharing agreements with York Region.
- c. Prepare a stormwater drainage plan for the driveway, including management of flows and to mitigate water quality impacts to the adjacent natural features. Confirm appropriate culvert sizing and other design details to maintain existing stormwater flows that input to the wetland feature and HDF3 watercourse;
- d. Complete vegetation removal activities outside of the period March 15-August 31 to avoid direct impacts to amphibian and bird species that may use the wetland as breeding habitat. If construction must occur within this timing window, additional targeted surveys by a qualified biologist may be required to confirm the presence or absence of nesting birds, and/or to capture and relocate amphibians within the construction zone. Identify details of an amphibian/small wildlife capture and relocation plan, if applicable based on potential timing of vegetation removal;
- e. Demarcate the limits of construction with silt fencing to impede small wildlife movement into the construction zone;
- f. Prepare a detailed Erosion and Sediment Control (ESC) Plan for review and approval by the City and TRCA. Install heavy-duty silt fencing along the limits of construction, minimize exposed soils and re-vegetate exposed soil areas where necessary. Silt fencing must be regularly inspected and repaired when necessary;
 - i. Areas of exposed soil within or adjacent to the wetland should be re-seeded with a suitable native seed mix. This may be augmented with or preceded by an application of a standard nurse crop (e.g., Annual Oats (*Avena sativa*), Annual Rye (*Lolium multiflorum*), or White Millet (*Panicum miliaceum*)) to provide soil stabilization. Seeding details are to be provided in the ESC Plan;
- g. Maintain all construction activities within the authorized work zone;
- h. All material and equipment stockpiles should be located at least 15m from the wetland. Silt fencing should be installed around stockpiles where runoff of sediments or deleterious substances may occur;
- i. Construction work that occurs within the drainage channel should be completed “in the dry” if possible, to avoid potential water quality impacts downstream;
- j. Prepare a Spill Response Plan, if applicable to the undertaking; and
- k. Prepare a Restoration and Enhancement Plan, based on TRCA guidelines, for review and approval by the City and TRCA.

10. Intersection Design, Signals, and Illumination

- a. During Detailed Design consult with York Region to confirm if modifications to Jane Street, as identified through a future separate EA study completed by the Region, are required at the Jane Street and Kirby Road intersection.
- b. During Detailed Design consult with City Kirby Road Extension Detail Design project team to coordinate final design at Dufferin Street intersection, which is in progress at the time of writing of this report.
- c. During Detailed Design coordinate with City active transportation regarding proposed Keele Street 3.0m MUP planned along east side from Teston Road to Kirby Road
- d. During Detailed Design coordinate hydro pole locations and spacing with Alectra Utilities and update the lighting analysis as needed to accommodate the modifications to hydro pole spacing. Coordinate the lighting design with the traffic signal design to mount the luminaires on traffic signal pole rather than standalone lighting poles to minimize the number of poles at the intersection.
- e. During Detailed Design the street lighting plan will consider opportunities to have directional lighting that avoids lightwash of the adjacent natural features.

11. Transit Facilities

- a. Stop locations and transit amenities to be identified and confirmed during Detailed Design in consultation with York Region Transit (YRT).
- b. The need for delineation through proposed bus stop area by signage, tactile warning or change in elevation with active transportation facilities will be confirmed during Detailed Design.

12. Streetscaping and Landscaping

- a. Streetscaping opportunities as identified in the preliminary designs to be confirmed. A streetscaping plan, including individual tree planting locations, is to be developed during Detailed Design.

13. Geotechnical Investigations

During Detailed Design the following detailed geotechnical investigations are required to confirm the subsurface conditions and recommendations:

- a. A detailed pavement investigation including additional boreholes within the existing roadway pavement and widening areas to further define the subgrade conditions, determine topsoil thickness, and confirm the pavement design recommendations.
- b. Boreholes within the envelope of all structure foundation units to confirm the subsurface conditions at the structure locations and develop detailed

geotechnical recommendations for design and construction of the new grade separation structures and culvert foundations.

- c. Additional investigation along the proposed high fill embankments or deep cuts, and temporary track and roadway protection locations
- d. Further assessment of dewatering requirements and the need for a PTTW.
- e. Supplemental chemical testing to confirm the requirements for reuse or disposal of excavated material, including additional samples at the railway crossing.

14. Contamination

- a. Conduct a subsurface investigation involving sampling and analysis of soil and groundwater within the excavation depths for the proposed construction works to confirm or refute potential for contamination from the identified PCAs and associated APECs impacted by the project.

15. Hydrogeological Investigations

- a. Revisit construction dewatering, and long-term dewatering estimate calculations during Detailed Design. Complete detailed investigations to support PTTW applications as required. As part of this assessment, contact the Oak Ridges Moraine Groundwater Program and/or the Regional Municipality of York to inquire about City of Vaughan Groundwater “Areas of Concern” Mapping – v1., Technical Memo, August 25, 2021
- b. Refine analysis for hydrogeological conditions to estimate dewatering estimates and radius of influence to confirm watering taking requirements and to confirm if private well survey is warranted.
- c. Complete private well survey in advance of construction and identify baseline water levels and quality prior to, during and following construction
- d. Consider a preconstruction survey of all structures and utilities within the radius of influence prior to dewatering activities
- e. Develop a Settlement Monitoring Program in accordance with railway requirements for review and approval by the railway
- f. During Construction it is recommended to retain an experienced Dewatering Contractor and Water Treatment Specialist to design and operate dewatering and / or treatment options to meet requirements
- g. Conduct a groundwater water quality monitoring program within the excavation dewatering system to confirm the water quality is appropriate for the selected discharge location
- h. During construction employ temporary ESC measures at discharge points

- i. Record daily water taking volumes daily and register on Regulatory Self-Report System as required
- j. Review potential impacts to the natural environment and surface water features, and detailed monitoring and mitigation plans
- k. During Detailed Design review use of trench plugs and anti-seepage collars where infrastructure is located where appropriate.
- l. During Detailed Design refine the dewatering rates and radius of influence.
- m. During Detailed Design clarify how infiltration rate of 98 mm/hr was determined. TRCA recommends for design of LIDs TRCA an insitu test (i.e. Guelph Permeameter, Single Well Response Test, etc.) at the site of the proposed LID.

16. Drainage and Stormwater Management

- a. During Detailed Design complete in-situ measurements at all proposed LID locations to confirm the soil infiltration rates and groundwater levels.
- b. During Detailed Design review and verify the design flows to confirm any changes to the land-use and associated hydrologic information that may affect the peak flows present.
- c. During Detailed Design confirm the proposed inverts of the crossing culverts.
- d. During Detailed Design confirm the culvert replacement recommendations at the Tributary to the Don River Crossing. Update the hydraulic modelling and floodplain assessment to reflect the final design and grading footprint of the crossing.
- e. During Detailed Design review and confirm the required water quality and quantity control measures based on the final Underpass design.
- f. During Detailed Design confirm adequate separation from the proposed facilities at each location and determine the percolation rate of the native soils using in-situ infiltration testing to ensure the maximum allowable depth of the reservoir is not exceeded.
- g. During Detailed Design confirm the location and performance characteristics of the bioretention facilities to ensure that all bioretention cell design criteria are met.

- h. During Detailed Design determine the location, pipe sizing, and orifice sizing of the online storage pipes to ensure that the water quantity control criteria can be met.
- i. During Detailed Design review the latest available standards for the drainage design in consultation with TRCA to address current requirements.
- j. During Detailed Design demonstrate that the spill north of the proposed Metrolinx Railway underpass will not affect the proposed underpass and ensure design works in the area are coordinated with Metrolinx.
- k. During Detailed Design include a detailed performance monitoring and maintenance plan for the proposed stormwater management facilities to remove any clogs and to ensure the treatment efficiency as per designed has been added.

17. Utilities

- a. Location of existing utilities and resulting impacts and required relocations are to be confirmed.
- b. Coordination of utilities, including hydro pole relocation and overhead wiring, is to be reviewed during Detailed Design.
- c. During Detailed Design coordinate with HydroOne regarding the 44 kV feeder (Armitage TS M34) owned and operated by HydroOne that runs south on Dufferin St at the Kirby Road intersection if impacted. HydroOne does not own the poles. Drawings and information including proposed Alectra designs are to be sent to Zone8Scheduling@HydroOne.com.
- d. Formal definition of impacts on utilities will be determined during Detailed Design, in consultation with individual utility companies.
- e. All utility information will be updated prior to construction to ensure that the data is accurate and to finalize relocation requirements as necessary.
- f. During Detailed Design, meetings will be held with utility companies as required where potential impacts to existing or future services are identified.
- g. During Detailed Design coordinate with City servicing staff regarding status of future watermain on Kirby Road from Jane St. to Keele Street.

18. Constructability, Staging and Detours

- a. Develop a traffic management plan and staging concept to determine how vehicular (maintain one lane in each direction) and pedestrian traffic will be accommodated during construction and how access to properties adjacent will be maintained.

- b. During Detail Design consult with North Maple Regional Park staff regarding movement of excess material from the project to the nearby park
- c. Consult and coordinate with Metrolinx regarding road detour and rail detour for construction of underpass.

19. Additional Consultation and Coordination

- a. Consult with affected property owners including those where property is required or where access to their property will be impacted.
- b. Consult with regulatory agencies and individual municipalities as required.
- c. Coordinate with developers as required to determine their status, timelines, and any impacts to the study corridor.
- d. The extent of cost sharing with the developers (including stormwater management facilities within the development and storm sewer systems) and with Metrolinx for the underpass design will be confirmed during Detailed Design.

20. Summary of Anticipated Permits and Approvals

- a. TRCA permit under *Ontario Regulation 166/06- Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*.
- b. Ontario *Endangered Species Act (ESA), 2007* permit requirements to be confirmed in Detailed Design for potential impacts to SAR bats habitat from vegetation removals. An Information Gathering Form will be submitted to MNRF/MECP.
- c. Environmental Activity and Sector Registry (EASR) and/or Permit to Take Water (PTTW) under the *Ontario Water Resources Act* based on the required water takings.
- d. Environmental Compliance Approval (ECA) will be required from MECP for stormwater management facilities and storm sewers.
- e. Confirm if work permit and review is required by Metrolinx.
- f. Permission to Enter Agreements.
- g. Submit built heritage resources and cultural heritage landscapes assessments and archaeology assessments for review to MHSTCI.

11.4 Timing of Improvements

Timing of improvements is to be confirmed during Detailed Design. Construction timing is anticipated to follow the timing outlined in the City's current (2022) Capital Plan. This plan is reviewed and approved by Council annually and is subject to change.