Environmental Assessment Study for Warden Avenue between Major Mackenzie Drive East and Elgin Mills Road East - Environmental Study Report

The Regional Municipality of York

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3	April 11, 2023	Draft Submission of ESR to York Region
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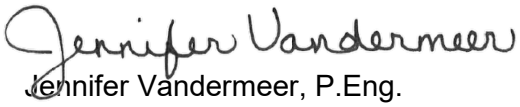

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Executive Summary

The Regional Municipality of York has undertaken a Schedule C Municipal Class Environmental Assessment (MCEA) Study for improvements to Warden Avenue between Major Mackenzie Drive East and Elgin Mills Road East in the City of Markham. This study builds on the recommendations from the approved 2016 York Region Transportation Master Plan (TMP) and the approved 2022 TMP.

The MCEA Study follows a comprehensive planning and design process to ensure protection of the environment, facilitate a proactive and meaningful consultation with a broad range of stakeholders, determine a solution that minimizes disruption to the existing residents and businesses and produce comprehensive documentation that meets the requirements of the MCEA process.

Study Area

The Warden Avenue study corridor runs between Major Mackenzie Drive East and Elgin Mills Road East. This portion of Warden Avenue is currently agricultural lands including rural residential homes. Adjacent lands to the east include the Angus Glen Golf Course; however, these lands are planned for development. Lands adjacent to the west are undeveloped agricultural lands planned for residential development. The Study Area falls within the North Markham Future Urban Area (FUA). The development areas to the east and west of Warden Avenue are referred to as the Angus Glen Block and Berczy Glen Block respectively. The south section of the Study Area is within the Urban River Valley and Protected Countryside designations of the Greenbelt Plan.

Planning Context Overview

Provincial, regional and municipal planning documents set the policy and planning framework for consideration in MCEA studies. For this MCEA Study, these documents include the Provincial Policy Statement, Growth Plan for the Greater Golden Horseshoe, Greenbelt Plan, Endangered Species Act, Clean Water Act, York Region Official Plan, York Region TMP, City of Markham Official Plan and North Markham FUA Conceptual Master Plan.

Public and Stakeholder Consultation

Public and stakeholder consultation was completed throughout the study including the following:

- Development of a stakeholder contact list, including federal, provincial, ministries / agencies, including Toronto and Region Conservation Authority (TRCA) and City of Markham
- Confirmation of project interest with identified Indigenous communities including Métis Nation of Ontario, Alderville First Nation, Beausoleil First Nation, Curve Lake First Nation, Chippewas of Georgina Island, Chippewas of Mnjikaning First Nation,

Hiawatha First Nation, Nation Huronne-Wendat, Mississaugas of the Credit First Nation, Mississaugas of Scugog First Nation and Williams Treaty First Nation

- Development of a project specific page on the York Region website (york.ca/WardenKennedyStudy)
- Distribution of project notices, including publishing in the local newspapers and mailings / emails
- Holding two Online Open Houses
- Development and meetings with the Stakeholder Advisory Committee with representatives of community interest groups, members of the public, developers and property owners within the Study Area
- Development and meetings with the Technical Advisory Committee with representatives from the City of Markham and TRCA
- Communication with Indigenous communities including follow up calls
- Public release of the Environmental Study Report

Transportation Conditions

Within the Study Area, Warden Avenue is presently a two-lane roadway with a posted speed of 80 km/hr. There are continuous 1.0 m to 3.0 m paved shoulders along Warden Avenue between Major Mackenzie Drive East and Elgin Mills Road East that are currently used by road cyclists; however, there are no bike-dedicated facilities. Improvements to the pedestrian and cycling environment should be implemented at the intersection of Elgin Mills Road East at Warden Avenue and Warden Avenue between Major Mackenzie Drive East and Elgin Mills Road East. There is no transit service currently provided along Warden Avenue within the Study Area. Transit services are currently provided along routes south of the Study Area. Warden Avenue between Major Mackenzie Drive East and Elgin Mills Road East is planned to be a Frequent Transit Network route which will provide more direct service and improved transfers between routes by creating a connective grid network of Viva and base routes operating along key corridors in urban areas of the Region.

A future conditions assessment was conducted for the year 2041 using a “Do Nothing” scenario with no geometric improvements to re-confirm the automobile needs and justification that was identified in the 2016 TMP. The proposed road improvements are addressed in the preliminary design concept developed as part of the MCEA Study.

Natural Environment

Bruce Creek provides habitat for 25 fish species within or in close proximity to the North Markham FUA; most of these species are a mix of warm-water, cool-water and cold-water species. A tributary to the Bruce Creek crosses the Study Area approximately 840 m north of Major Mackenzie Drive East.

All woodlands within the Bruce Creek Tributary corridor meet the criteria of “significance” due to their proximity to Redside Dace habitat. The City of Markham’s Natural Heritage

System passes through the Study Area. A total of ten headwater drainage features were identified in the Bruce Creek tributary subcatchment within the Study Area. These features are largely agricultural tile drainage systems or undefined overland flow routes through actively farmed areas.

Potential habitat is present for Species at Risk bats in the Study Area. Contributing habitat for Redside Dace is confirmed to be present in the Study Area. The wetlands within the Berczy and Bruce Creek valleys which are in proximity to the Study Area are part of the Bruce-Berczy Creek Provincially Significant Wetland Complex identified by Ministry of Natural Resources and Forestry within the North Markham FUA planning process.

Built Heritage and Cultural Landscape

The Cultural Heritage Assessment described the existing conditions of the Study Area and provided an inventory of the known and potential built heritage resources and cultural heritage landscapes. The background historical research and secondary source material indicated that the Study Area had a rural land use history dating back to the early nineteenth century. Five previously identified features of cultural heritage value were identified through a review of federal, provincial and municipal registers. One additional feature was identified as part of the cultural heritage study.

Archaeology

The Stage 1 Archeological Assessment background research and property inspection determined that the Study Area contains lands with potential for archaeological resources and will require Stage 2 survey, either by test pit or pedestrian survey, as appropriate to be completed during the detailed design phase of the project.

Utilities

The Subsurface Utility Engineering investigation identified utilities infrastructure and appurtenances such as Enbridge gas line and gas main, Bell, traffic light and streetlights. Utility owners in the area include York Region, Alectra-Powerstream, Bell and Enbridge Pipelines Gas Inc.

Storm Drainage and Low Impact Development Needs

Road improvements are expected to increase impervious area within the road right of way, thereby increasing the rate of storm runoff from the existing condition. Quantity controls will be necessary within the right-of-way if the runoff cannot be accommodated within end-of-pipe facilities, through low impact development features.

Source Water Protection

The potential impact to water quality associated with improvements to Warden Avenue is not anticipated to be greater than current existing conditions. As such project activities are not anticipated to pose an increased risk to drinking water.

Fluvial Geomorphology

A geomorphic assessment was completed to inform the evaluation of geomorphic impacts and associated mitigation measures during construction. Potential impacts to Bruce Creek tributary channel conditions primarily relate to the change in channel form that may be required for the new structure being proposed at this location. Impacts can be determined once detailed design is proposed. The need for additional fluvial geomorphology input to guide the design may be part of the design requirements based on regulatory approvals.

Geotechnical

A geotechnical investigation was completed for the Study Area that included field investigation of the existing pavement structure and subsurface soil and groundwater conditions in the Study Area. Field work included boreholes and a visual pavement condition survey. This field investigation provided information on the existing pavement structure and subsurface soil and groundwater conditions in the Study Area. Pavement engineering and geotechnical recommendations for proposed road improvements were provided, as well as storm sewer recommendations along Warden Avenue.

Problem and / or Opportunity Statement

The Problem and Opportunity Statement was developed through Phase 1 of the MCEA process, which was completed as part of the 2016 TMP and is supported by the 2022 TMP. The problem and opportunity statement included the following:

- 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
- Corridor improvements needed to support transit

Alternative Solutions

Alternative Solutions were evaluated through the 2016 TMP process which included:

- Do nothing
- Optimize existing facility with intersection improvements only
- Urbanize corridor but maintain two-lane cross-section
- Widen corridor to four lanes and maintain rural cross-section

- Widen corridor to four lanes and construct to urban cross-section
- Widen parallel / adjacent corridor

A preferred solution was selected based on its alignment with the following TMP objectives:

- Support transit
- Support road network
- Support active transportation
- Support goods movement
- Support last mile

Alternative Designs Concepts

Working within an approved right-of-way (ROW) of 41 m, the study team developed three alternative design concepts for Warden Avenue to address the Preferred Solution. Each of the three alternative design concepts contain similar features with varying widths. All three concepts provide two lanes of traffic in each direction, with Low Impact Development (LID) features that will receive and process stormwater runoff from the roadway and active transportation facilities such as a multi-use path or sidewalk, as well as plantings and streetlighting on both sides of the road. The preferred design concept for Warden Avenue includes a 1.0 m marked median in the center of the four-lane roadway with box trench design LID features, cycle tracks, sidewalks and tree planting within the boulevards on each side of the ROW.

Stormwater Management Assessment

A strategic approach to stormwater management for the Study Area has been developed including an appropriate storm sewer system within the ROW, transverse culvert replacements or extensions and stormwater drainage in conjunction with the proposed road widening to mitigate any potential impacts. A wide span three-sided, open-bottom structural culvert with a 9.144 m span and 1.525 m rise is proposed to replace the existing twin culvert at the regulated crossing on Warden Avenue approximately 840 m north of Major Mackenzie Drive. This proposed structural culvert can create a naturalized watercourse within the culvert and can also allow for a range of wildlife passage and connectivity of the Greenway system.

Hydrogeological Assessment

Properties in the Study Area north of Major Mackenzie Drive currently rely on private wells for water supply. Most of the private wells identified may be decommissioned and residents may be connected to municipal water. Potential receptors that could be impacted by short-term construction dewatering include private wells and surface water features. It is assumed that impacts to these receptors would be managed through a monitoring and mitigation plan. The plan will ensure that receptors are not negatively

impacted or that impacts are suitably mitigated and that the plan would be a condition of any permits for dewatering. These impacts are likely to be of short duration restricted to the period during which construction is taking place with the area returning to pre-construction conditions.

The Hydrogeological Assessment assessed the dewatering requirements at the watercourse crossing north of Major Mackenzie Drive. After construction it is expected that the area should return to preconstruction conditions as no adverse changes are predicted. A well survey is recommended to be completed during the detailed design phase of the project to confirm the potential for construction impacts.

Air Quality Impact Assessment

The Air Quality Impact Assessment was completed to understand the impacts of the proposed road improvements on local air quality. The future predicted air quality levels at sensitive receptor locations with and without the proposed undertaking were below the MECP criteria; therefore, no negative impact is expected due to the proposed project.

Noise Impact Assessment

The Noise Impact Assessment was completed to understand the noise impacts of the proposed road improvements. Although exceedances above York Region's Traffic Noise Mitigation Policy criteria of 60 dBA were found for receptors along the Warden Avenue alignment, standard mitigation options of acoustic barriers at the property lines for the exceeding Points of Reception are not recommended following the York Region Standard Operating Procedure for Noise for the existing properties not participating in the FUA. For properties that are participating in the FUA, noise mitigation will be provided as part of the development.

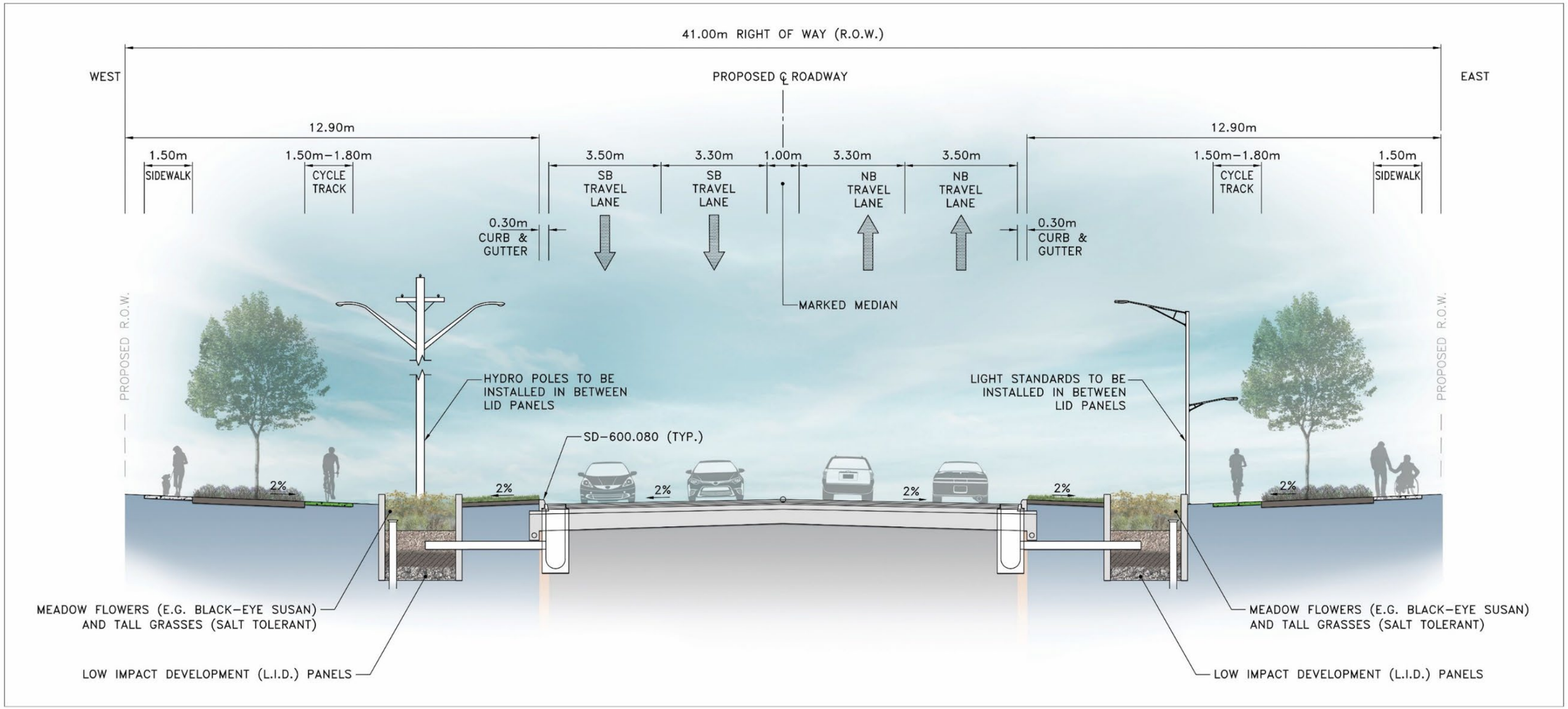
Contaminant Overview Study

The Contamination Overview Study evaluated each individual property ('Site') within the Study Area to provide an understanding of the potential environmental liabilities and risks. The Contamination Overview Study evaluated Sites using a risk matrix based on Site characteristics and potential risk factors into Low, Medium and High Environmental Concern. Most Sites were identified as Low or Medium Environmental Concern. One Site was identified as High Environmental Concern. This Site would need to have a Phase One ESA completed to identify details and specific locations of contaminant sources. Additionally, a Phase Two ESA is recommended for the High Environmental Concern Site to include delineation sampling around and beneath locations where potential sources of contamination were identified by the Phase One ESA.

Description of the Recommended Design Concept

Preliminary design plans have been prepared to illustrate the preferred design concept. An overview of the key features of the preferred design concept plans is provided in Section 10.0 of this report. This includes the horizontal alignment, vertical alignment, intersection design, cycling and pedestrian facilities, transit considerations, streetscaping, culverts and structures, access, property requirements, utilities, preliminary cost estimate and constructability, staging and detouring considerations. The Preliminary Design is provided based on the Design Speed of 60 km/hr.

The preferred design concept for Warden Avenue is shown below.



WARDEN AVENUE
PREFERRED ROAD DESIGN CONCEPT CROSS SECTION

BURNSIDE

Potential Environmental Effects and Mitigation Measures

To mitigate potential impacts of the proposed project on the environmental features of the Study Area, several mitigation measures are proposed for the construction, operation and maintenance of the proposed road improvements within the Study Area. A comprehensive summary of potential effects and mitigation measures and future commitments is provided in Section 11.0 of this report. In general, mitigation measures have been proposed for the following aspects of the environment:

- Natural Environment
  - Trees and Vegetation
  - Wildlife and Wildlife Habitat
  - Fish and Fish Habitat
- Physical Environment
  - Surface Water
  - Soils and Groundwater
- Socio-Economic Environment
  - Air Quality
  - Noise
  - Property Impacts
- Cultural Environment
  - Cultural Heritage
  - Archaeology
  - Human Health and Safety
  - Transportation Infrastructure

Climate Change Considerations

The potential greenhouse gas emission effect from the Preferred Solution was determined to be insignificant on a regional and local scale. Other carbon sources and emissions associated with this project would relate to construction vehicle emissions during the construction period. Emissions can be decreased by increasing efficiency and through regular maintenance of equipment. Landscape changes associated with a project can also impact climate change. A carbon sink is described as a land or ocean mass that can take in carbon, in particular carbon dioxide, from the atmosphere. Vegetation can assist in removing carbon dioxide from the atmosphere.

The pavement infrastructure is susceptible to deterioration from freeze-thaw events and roadside drainage features and the watercourse culvert may be impacted by increased precipitation events that are becoming more prevalent in Southern Ontario to due climate change effects, which can result in potential flooding and erosion. Vegetation loss will be further mitigated with tree planting within the corridor. LID features and stormwater quantity controls will enhance the resiliency of the corridor.

Approval and Permit Requirements

A permit approval will be required from TRCA in accordance with O.Reg. 166/06 Toronto and Region Conservation Authority: Regulation of Development, Interference with Wetlands and Alteration to Shorelines and Watercourses for construction works in TRCA regulated areas, which includes the area for the new structural culvert on Warden Avenue approximately 840 m north of Major Mackenzie Drive. TRCA permits will be obtained prior to initiation of all works within the areas regulated pursuant to Ontario Regulation 166/06. MECP Environmental Compliance Approvals (ECA) will be obtained for the storm sewers and LID features prior to their operation. Additional approvals and permits are summarized in Section 13.0.

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Glossary

AADT	Annual Average Daily Traffic
CRS	Contamination Risk Score
DFO	Fisheries and Oceans Canada
EASR	Environmental Activity and Sector Registry
ELC	Ecological Land Classification
ESC	Erosion and Sediment Control
ESR	Environmental Study Report
FTN	Frequent Transit Network
FUA	Future Urban Area
GGH	Greater Golden Horseshoe
GHG	Greenhouse Gas
HADD	Harmful Alteration, Disruption or Destruction
HDF	Headwater Drainage Feature
LID	Low Impact Development
LOS	Level of Service
MCEA	Municipal Class Environmental Assessment
MCM	Ministry of Citizenship and Multiculturalism
MECP	Ministry of the Environment, Conservation and Parks
MESP	Master Environmental Servicing Plan
MNRF	Ministry of Natural Resources and Forestry
NHS	Natural Heritage System
OGS	Oil/Grit Separator
OOH	Online Open House
OP	Official Plan
OPSS	Ontario Provincial Standards Specification
ORAC	Oak Ridges Aquifer Complex
POR	Point of Reception
PPS	Provincial Policy Statement
PSW	Provincially Significant Wetland
PTTW	Permit to Take Water
ROW	Right-of-way
SAC	Stakeholder Advisory Committee
SAR	Species at Risk
SWM	Stormwater Management
TAC	Technical Advisory Committee
TMP	Transportation Master Plan
TRCA	Toronto and Region Conservation Authority
TSS	Total Suspended Solids
YRT	York Region Transit

1.0 Introduction

The Regional Municipality of York (herein referred to as 'York Region' or 'Region') has undertaken a Schedule C Municipal Class Environmental Assessment (MCEA) Study for improvements to Warden Avenue between Major Mackenzie Drive East and Elgin Mills Road East in the City of Markham. This study builds on the recommendations from the approved 2016 York Region Transportation Master Plan (TMP) and the approved 2022 TMP. R.J. Burnside & Associates Limited (herein referred to as 'Burnside') is facilitating the MCEA Study for Warden Avenue on behalf of the Region.

The MCEA Study follows a comprehensive planning and design process to ensure protection of the environment, facilitate a proactive and meaningful consultation with broad range of stakeholders, determine a solution that minimizes disruption to the existing residents and business and produce comprehensive documentation that meets the requirements of the MCEA process.

1.1 Purpose of the Project and the Environmental Study Report

Warden Avenue is a two-lane north-south rural arterial road in the City of Markham. The Warden Avenue corridor for this study extends from Major Mackenzie Drive East to Elgin Mills Road East.

The purpose of the project is to identify infrastructure and active transportation improvements and to mitigate environmental impacts.

The MCEA Study will provide a preliminary assessment of the key transportation related issues, including a review of all relevant background reports / studies and existing traffic data. This Environmental Study Report (ESR) summarizes the Schedule C MCEA process the project will follow and confirms the corridor improvements required within the Study Area.

An evaluation of the existing traffic operations in the area will assist in identifying opportunities to improve traffic operations. This provides the Region an opportunity to:

- Review road and access options for improvements
- Facilitate an improved active transportation network for pedestrians and cyclists
- Provide a multi-modal facility that is safe and efficient and can be shared by all modes of travel
- Implement corridor improvements to support the transit network

1.2 Study Area

The Warden Avenue study corridor runs between Major Mackenzie Drive East and Elgin Mills Road East. This portion of Warden Avenue is currently agricultural lands including

rural residential homes. Adjacent lands to the east include the Angus Glen Golf Course; however, these lands are planned for development. Lands adjacent to the west are undeveloped agricultural lands planned for residential development. The Study Area falls within the North Markham Future Urban Area (FUA) and is expected to experience significant growth and development in the coming years. The south section of the Study Area around Warden Avenue is within the Urban River Valley and Protected Countryside designations of the Greenbelt Plan. The Study Area is illustrated in Figure 1.1.

Figure 1.1: Study Area

1.3 Study Process

1.3.1 The Municipal Class Environmental Assessment

The planning of public sector projects or activities that have the potential for environmental effect is subject to a MCEA as required by Ontario's Environmental Assessment Act, R.S.O. 1990.

The MCEA process was developed by the Municipal Engineers Association, in consultation with the Ministry of the Environment, Conservation and Parks (MECP), as an alternative method to Individual Environmental Assessments for recurring municipal projects that were similar in nature, usually limited in scale and with a predictable range of environmental impacts, which were responsive to mitigating measures. The MCEA solicits input from regulatory agencies, the municipality, Indigenous communities and the public at the local level. This process leads to an evaluation of the alternatives in view of the significance of the environmental effects, including the technical, natural, social / cultural and economic impact of a project and the choice of effective mitigation measures.

In March 2023, an update to the MCEA process included revised descriptions of the class of undertakings carried out by municipalities and subject to the MCEA process. Given the timing of the update to the MCEA process and the progress of the project, the Region will complete the project under the transition provisions set out in the 2023 update that allow for a proponent to continue with the MCEA process that was started for the project prior to the 2023 update.

Under the previous Municipal Engineering Association MCEA Document (October 2000, as amended in 2007, 2011 and 2015), there are four categories of assessment within the MCEA process that are dependent on the complexity and potential for environmental impact.

- Schedule A - Projects are limited in scale, have minimal adverse environmental impact and require no public notification or documentation.
- Schedule A+ - Projects are limited in scale, have minimal adverse environmental impact and require no documentation. The public is to be advised prior to implementation.
- Schedule B - Projects have the potential for some adverse environmental impacts. The proponent is required to undertake a screening process, involving mandatory contact with the directly affected public and regulatory agencies, to ensure that they are aware of the project and that their concerns are addressed. Schedule B projects require that a Project File Report be prepared and made available for public review. Proponents undertaking Schedule B projects are required to complete Phase 1, 2 and 5 of the MCEA Process.

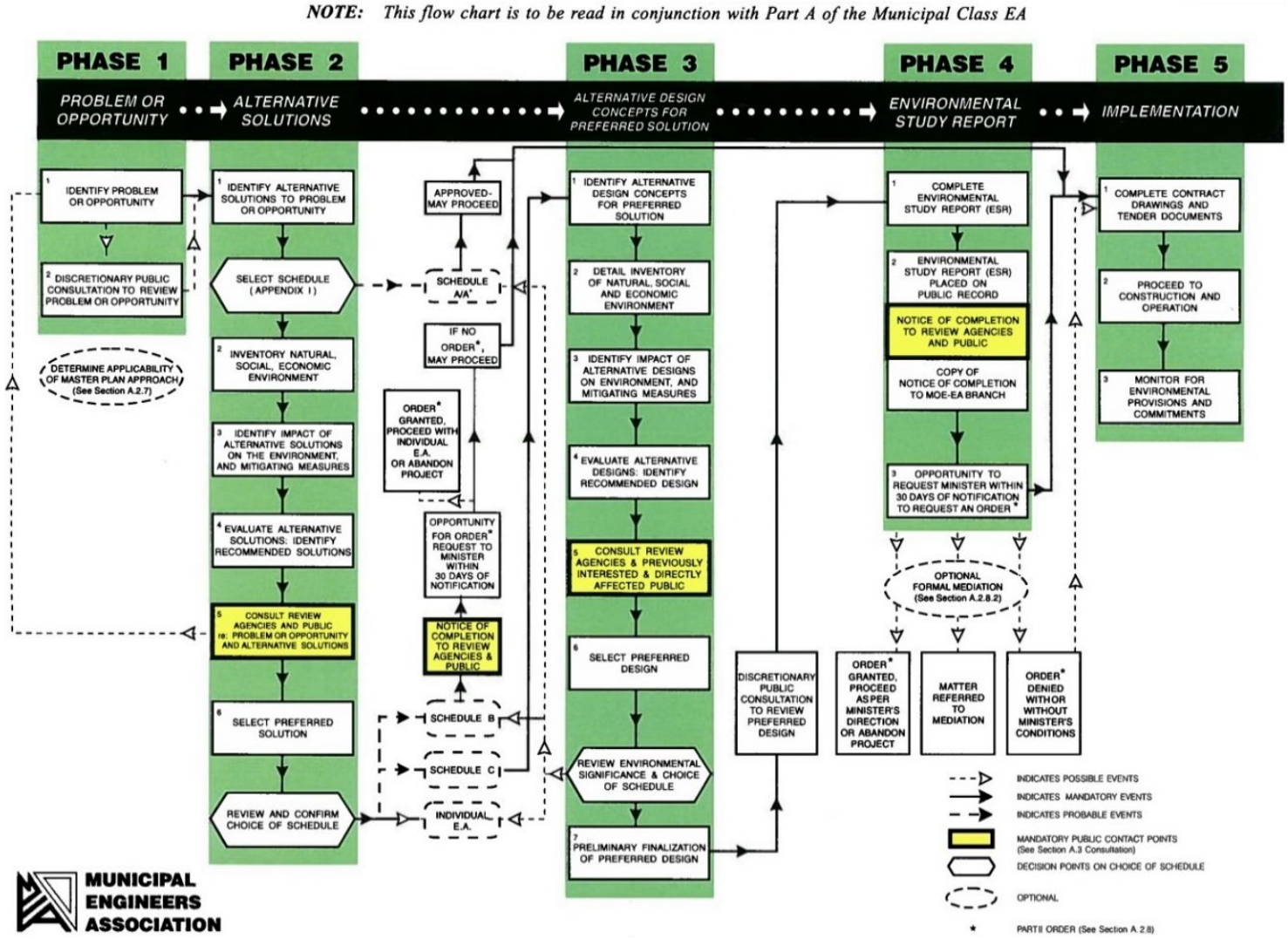
- Schedule C - Projects have the potential for significant environmental impacts and must proceed under the full planning and documentation procedures of the MCEA document. Schedule C projects require that an ESR be prepared and filed on the public record for review by the public and regulatory agencies. Proponents undertaking Schedule C projects are required to complete Phase 1 through 5 of the MCEA Process.

This study will follow the Schedule C MCEA process.

The phases of the Class EA are illustrated in Figure 1.2 and summarized as follows:

- Phase 1 - Identify the problem (deficiency) or opportunity.
- Phase 2 - Identify alternative solutions to address the problem or opportunity by taking into consideration the existing environment and establish the preferred solution taking into account the public and review agency input. At this point, determine the appropriate schedule for the undertaking and document decisions in a project file for Schedule B projects, or proceed through the following phases for Schedule C projects.
- Phase 3 - Examine alternative methods of implementing the preferred solution, based upon the existing environment, public and review agency input, anticipated environmental effects and methods of minimizing negative effects and maximizing positive effects.
- Phase 4 - Document, in an ESR, a summary of the rationale and the planning, design and consultation process of the project as established through the above phases and make such documentation available for scrutiny by review agencies and the public.
- Phase 5 - Complete contract drawings and documents and proceed to construction and operation monitor construction for adherence to environmental provisions and commitments. Where special conditions dictate, also monitor the operation of the completed facilities.

Figure 1.2: Municipal Class Environmental Assessment Process Flow Chart



1.3.2 Class Environmental Assessment Section 16(6) Order (formerly Part II Order)

Section 16 Order requests were previously known as Part II Order requests. The MECP has the authority and discretion to make an Order under Section 16 of the Environmental Assessment Act. A Section 16 Order may require that the proponent of a project going through a MCEA process:

1. Submit an application for approval of the project before they proceed. This is generally referred to as an Individual Environmental Assessment.

2. Meet further conditions in addition to the conditions in the Class EA. This could include conditions for:

- Further study
- Monitoring
- Consultation

The minister can also refer a matter in relation to a Section 16(6) Order request to mediation.

A Section 16(6) Order can be requested if:

- You have outstanding concerns that a project going through a Class EA process may have a potential adverse impact on constitutionally protected Aboriginal and treaty rights
- You believe that an Order may prevent, mitigate or remedy this impact

In accordance with the requirements of the MCEA, this ESR is available for public review and comment for a period of 30 calendar days following the publication of the Notice of Completion.

Interested persons may provide written comments to our project team within the 30-day comment period. All comments and concerns should be sent directly to the project team at:

York Region Transportation, Public Works
Phone: 1877-464-9675
TTY: 1-866-512-6228
Email: transportation@york.ca

In addition, a request may be made to the MECP for an order requiring a higher level of study (i.e., requiring an individual / comprehensive MCEA approval before being able to proceed), or that conditions be imposed (e.g., require further studies), only on the grounds that the requested order may prevent, mitigate, or remedy adverse impacts on constitutionally protected Aboriginal and Treaty rights. Requests on other grounds will not be considered. Requests should include the requester contact information and full name for the Ministry.

Requests should specify what kind of order is being requested (request for additional conditions or a request for an individual / comprehensive environmental assessment), how an order may prevent, mitigate, or remedy those potential adverse impacts and any information in support of the statements in the request. This will ensure that the ministry is able to efficiently begin reviewing the request.

The request should be sent in writing or by email to:

Minister of the Environment, Conservation and Parks
Ministry of the Environment, Conservation and Parks
777 Bay Street 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca

and

Director, Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West 1st Floor
Toronto ON M4V 1P5
EABDirector@ontario.ca

Requests must also be sent to the Project Team.

If the Minister does not receive a request for a Section 16 Order within the 30 calendar days, then the project will move forward to Detailed Design, approvals process and subsequent implementation of the Preferred Design Concept.

1.3.3 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 Warden Avenue MCEA Study does not constitute a “designated project” and therefore does not require an environmental assessment under the CEAA 2012. However, the MECP may order an assessment for any project not included in the project list, where there may be adverse environmental effects related to federal jurisdiction.

2.0 Federal, Provincial, Regional and Local Planning Context

2.1 Federal Planning Context

2.1.1 Fisheries Act

The Fisheries Act is administered by Fisheries and Oceans Canada (DFO) and provisions apply to all fish and fish habitat within Canada. Under the federal Fisheries Act, it is prohibited to cause Harmful Alteration, Disruption or Destruction (HADD) of fish habitat, as well as the death of fish by means other than fishing.

Proponents are responsible for planning and implementing works, undertakings or activities in a manner that avoids harmful impacts, specifically the death of fish and HADD.

Fish habitat is present within the Study Area. Should project activities occur below the highwater mark of any identified watercourses or headwater drainage features, an assessment of potential impacts to fish and fish habitat is required. DFO has provided standardized Codes of Practice and Measures to Protect Fish and Fish Habitat to mitigate contraventions of the Fisheries Act.

Proponents are required to ensure that activities meet the criteria outlined on the Fish and Fish Habitat Protection Program website (http://www.dfompo.gc.ca/indexeng.htm) and are responsible for the implementation of best management practices (i.e., Codes of Practice) into the project design.

If it is determined that impacts of the proposed works can be avoided and a HADD is unlikely to occur, then the project does not require a review by the DFO. If HADD is anticipated because of the project, even following the application of feasible avoidance and mitigation strategies, then DFO review is recommended and authorization may be required.

2.1.2 Migratory Birds Convention Act

The Migratory Birds Convention Act, 1994 (MBCA) and the Migratory Bird Regulations protects nests, eggs and young of certain species, controls the harvest of others and prohibits commercial sale of all species. The “incidental take” of migratory bird nests or the disturbance, destruction or taking of the nest of a migratory bird are prohibited under Section 6 of the Migratory Bird Regulations under the authority of the MBCA. MBCA has implications on development and construction activities that might occur during the breeding season.

2.2 Provincial Planning Context

2.2.1 Provincial Policy Statement

The Provincial Policy Statement (PPS) provides a vision for land use planning in Ontario that encourages the efficient use of land, resources and public investment in infrastructure. The 2020 PPS is the complimentary policy document to the Planning Act, 1990, issued under Section 3 of the Planning Act.

The PPS states that municipal projects should be directed to existing settlement areas, create stronger and improved communities and have little to no impact on the natural features of the area. In general, projects should have consideration for future needs to ensure the benefits of the project are far-reaching. Relevant policies are to be applied to each situation. Section 1.6 of the PPS provides specific direction for the planning and development of infrastructure and public service facilities, including transportation related policies: Section 2.1 of the PPS provides guidance on the protection of natural heritage features. Section 2.6 of the PPS provides guidance on the protection of cultural heritage and archaeology.

Provincial policies are implemented through municipal official plans and planning decisions. Land use planning decisions made by municipalities must be consistent with the PPS.

2.2.2 Growth Plan for the Greater Golden Horseshoe

The 2017 Growth Plan for the Greater Golden Horseshoe is a Provincial Plan that directs how regional growth in the Greater Golden Horseshoe (GGH) is to be managed up to 2041. The plan carries policies forward from the PPS, working to reduce development sprawl and providing direction in where intensification should take place. There are several provisions within the policy that are relevant to the Warden Avenue improvements. Section 3.2.2 of the Growth Plan outlines the general provisions of Transportation for the GGH. According to this policy, the transportation system within the GGH will be planned and managed to:

> *Provide connectivity among transportation modes for moving people and moving goods;*
>
> *Offer a balance of transportation choices that reduces reliance upon the automobile and promotes transit and active transportation*

Section 4 of the Growth Plan details the protection of natural features within the GGH. Within the Natural Heritage System (NHS):

> *iii. the removal of other natural features, not identified as key natural heritage features and key hydrologic features is avoided, where possible.*

> *Such features should be incorporated into the planning and design of the proposed use wherever possible*

Climate change is also addressed in Section 4 of the Growth Plan. According to the growth plan, in planning to reduce greenhouse gas emissions and address the impacts of climate change, municipalities are encouraged to:

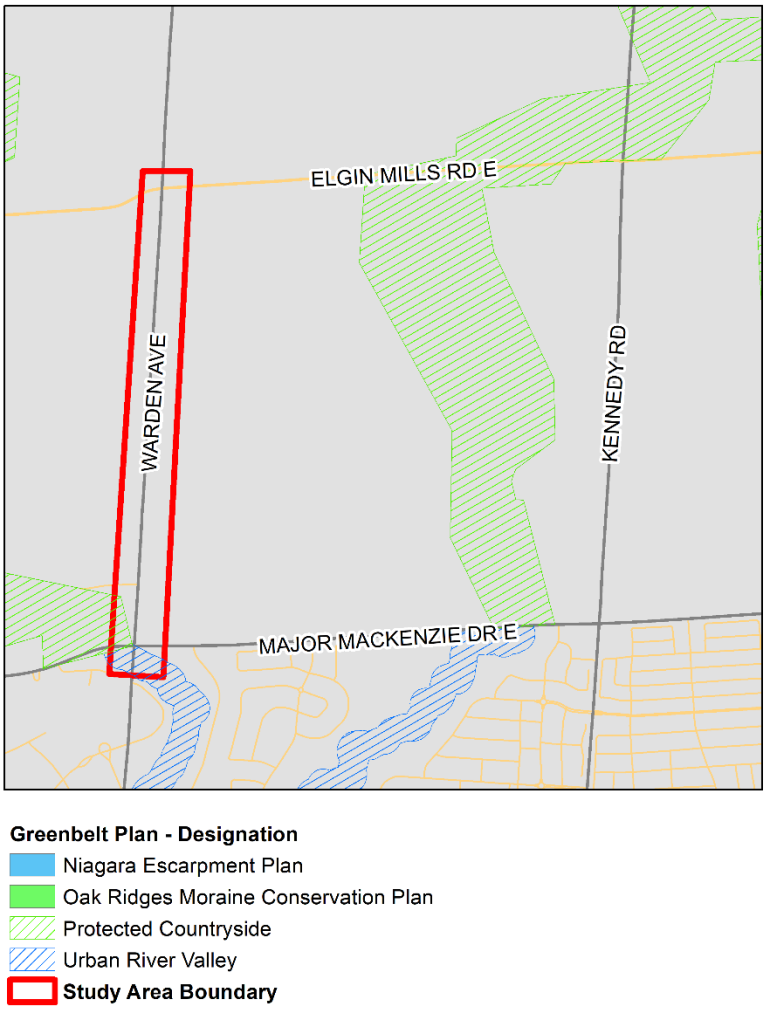
> *"develop strategies to reduce greenhouse gas emissions and improve resilience through the identification of vulnerabilities to climate change, land use planning, planning for infrastructure including transit and energy, green infrastructure, and low impact development, and the conservation objectives in policy 4.2.9.1."*

2.2.3 Greenbelt Plan

The Greenbelt Plan consists of policies and schedules aimed to permanently protect the agricultural land base and the ecological, hydrological features, areas and functions within the Greenbelt, which is in Ontario's Greater Golden Horseshoe region. More specifically, the Greenbelt Area includes lands within the Niagara Escarpment Plan Area, the Oak Ridges Moraine Area, the Parkway Belt West Area and lands designated as Protected Countryside and as Urban River Valley. The south section of the Study Area is within the Urban River Valley and Protected Countryside designations of the Greenbelt Plan. The vision for these areas is a broad band of permanently protected land which:

- Protects against the loss and fragmentation of the agricultural land base and supports agriculture as the predominant land use
- Gives permanent protection to the natural heritage and water resource systems that sustain ecological and human health and that form the environmental framework around which major urbanization in south-central Ontario will be organized
- Provides for a diverse range of economic and social activities associated with rural communities, agriculture, tourism, recreation and resource uses
- Builds resilience to and mitigates climate change
- The Study Area and Greenbelt Plan areas are illustrated in Figure 2.1.

Figure 2.1: Greenbelt Plan Areas



2.2.4 Endangered Species Act

The Endangered Species Act, 2007 (ESA) provides protection for Species at Risk (SAR) (Section 9) and their habitat (Section 10). The ESA is administered by the MECP and provides policies for the protection of Extirpated, Endangered and Threatened species. Species listed as provincially rare or special concern do not receive legal protection under the provincial ESA; however, they may receive protection from some agencies, such as provincial and national parks, or other Acts, such as the Ontario Fish and Wildlife Conservation Act, which prohibits the killing, capturing, injuring, harassment and trapping of specially protected species.

Any project activities taking place within designated habitats may require a permit under the ESA. It is the proponent's responsibility to practice due diligence to ensure that the ESA and its regulations are observed. It is the proponent's responsibility to be apprised of any amendments to the Act that may come into force for the duration of the project.

2.2.5 Clean Water Act - Source Water Protection

As a result of the Clean Water Act, (O.Reg.287/07) communities in Ontario are required to develop Source Protection Plans to protect their municipal sources of drinking water. These plans identify risks to local drinking water sources and develop strategies to reduce or eliminate these risks.

Ontario's Source Water Protection initiative is focused on protecting municipal drinking water sources. Key areas include Wellhead Protection Areas (areas that drain down toward municipal wells), Highly Vulnerable Aquifers (where groundwater lies close to ground surface) and Significant Groundwater Recharge Areas (areas that feed aquifers).

2.3 Regional Planning Context

2.3.1 York Region Official Plan

The York Region Official Plan (OP) contains policies and schedules to accommodate future growth and development while meeting the needs of existing residents and businesses in the Region. It provides directions and policies that guide economic, environmental and community planning decisions. The Region is currently undertaking a Municipal Comprehensive Review process to update population and employment forecasts and allocations, land needs budget and Regional OP policies. The Region completed their Municipal Comprehensive Review and Growth Plan conformity exercise which included allocating provincial growth forecasts of approximately 2,020,000 persons and 990,000 jobs to the Region by 2051. The Regional OP was adopted in June 2022 and received approval from the Minister of Municipal Affairs and Housing in November 2022. Development of the North Markham FUA is expected to be included in the updated OP. Warden Avenue is now a major north-south arterial roadway but was initially a two-lane rural road.

2.3.2 Transportation Master Plan

The TMP is the Region's long-term vision for York Region's transportation network, encompassing strategy, policy and infrastructure. The plan looks ahead 30 years and considers the Region's transportation infrastructure needs to support growth and the changing needs of travelers. The plan supports healthy communities and economic growth by planning for safe, reliable travel and efficient movement of goods.

As part of the 2016 TMP, the road needs and justifications were established for Warden Avenue meeting the requirements for Phase 1 and 2 of the MCEA process. During this MCEA study, the 2022 TMP was approved by York Regional Council on September 29, 2022. The recommendation for the Warden Avenue study corridor in the 2022 TMP aligned with the recommendations for Warden Avenue outlined in the 2016 TMP. The TMP identified Warden Avenue as requiring roadway improvements which included widening up to four lanes within the Study Area.

2.3.3 Other Regional Plans

There are several additional regional plans that provide guidance and overall direction with respect to the future design of Warden Avenue. A description of these additional plans and their relevance to the study are provided in Table 2.2.

2.4 Local Planning Context

2.4.1 City of Markham Official Plan

The City of Markham's OP sets out land use policies that guide future development and manage growth. The 2014 OP was approved on June 12, 2014, but was appealed. The Local Planning Appeal Tribunal issued a Partial Approval Order Update on April 9, 2018.

The 2014 OP contains policies on transportation, services and utilities. These policies aim to build a transportation system within the City of Markham which provides for the following:

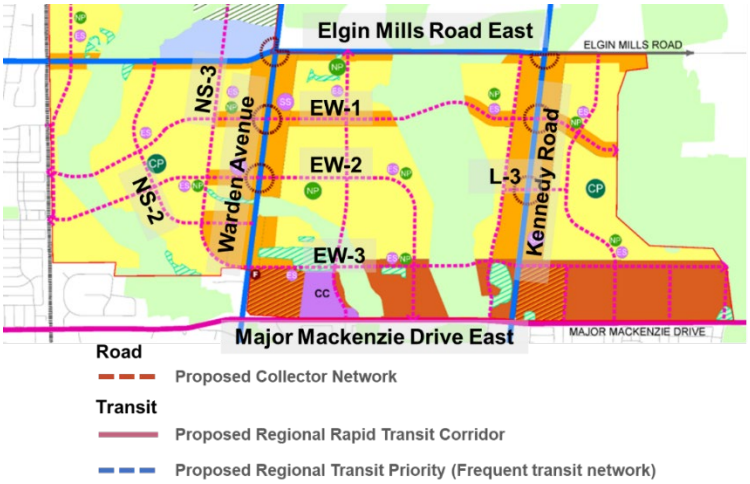
- Selective road capacity enhancements
- Increased and enhanced transit services
- Transit-supportive development
- Transportation demand management
- Active transportation

2.4.2 Future Urban Area Conceptual Master Plan

The City of Markham OP has identified 1,300 hectares of lands, which includes 975 ha of developable land, in the North Markham FUA. Approximately 700 ha of the developable land is designated 'Future Neighbourhood Area' which will accommodate approximately 38,000 persons by full build-out. Approximately 275 ha of developable land north of Elgin Mills Road is designated as 'Future Employment Area' which will accommodate approximately 19,000 jobs at full build-out.

The North Markham FUA Environmental Assessment Process began on October 3, 2014, with a Notice of Commencement. The Conceptual Master Plan – Volume 2 addresses Phases 1 and 2 of the MCEA process. The Conceptual Master Plan includes a Community Structure Plan which was endorsed by City of Markham Council on October 17, 2017. The Community Structure Plan includes four residential blocks which are the Victoria Glen Block, Angus Glen Block, Berczy Glen Block and Robinson Glen Block. A recommended collector road network was identified in the Conceptual Master Plan as illustrated in Figure 2.2.

Figure 2.2: Proposed Community Structure Plan (Conceptual Master Plan)



2.4.3 Future Urban Area Class Environmental Assessments

For each of the four development blocks within the North Markham FUA, MCEAs were completed or are in progress. As part of the background review for the Warden Avenue MCEA Study, the ESRs for these MCEAs were reviewed to understand planning context that would be relevant to the future design of Warden Avenue. The study areas for these four development blocks are illustrated on Figure 2.3 and their relevance to Warden Avenue is summarized in Table 2.1.

Figure 2.3: Future Urban Area Development Blocks

Source: North Markham Future Urban Area Collector Road Network Class Environmental Assessments Public Open House March 21, 2019

2.4.4 Elgin Mills Road Municipal Class Environmental Assessment

The Elgin Mills Road MCEA is currently in progress and has not yet been completed. As such, the final EA documents are not yet available. Some findings and additional information are available through the City of Markham's website for the public online engagements.

Table 2.1: Related Studies in Future Urban Area

Additional Local MCEAs	Supplemental Reports Available for Guidance
Robinson Glen EA (2020)	North Markham Future Urban Area Collector Roads Network Class Environmental Assessment (Robinson Glen Block) ESR Robinson Glen Traffic Impact Study Update
Elgin Mills Road EA	North Markham Future Urban Area Collector Roads Network Class Environmental Assessment (Elgin Mills Road Block) ESR – In progress Transportation Study Final Report – Environmental Assessment Study

Additional Local MCEAs	Supplemental Reports Available for Guidance
Berczy Glen EA (2020)	North Markham Future Urban Area Collector Roads Network Class Environmental Assessment (Berczy Glen Block) ESR Master Environmental Servicing Plan (MESP) Transportation Study Update
Victoria Glen EA (2020)	North Markham Future Urban Area Collector Roads Network Class Environmental Assessment (Victoria Glen Block) ESR
Angus Glen EA (2022)	North Markham Future Urban Area Collector Roads Network Class Environmental Assessment (Angus Glen Block) ESR

2.5 Relevant Planning and Policy Documents

There are several additional policies and plans that provide guidance and overall direction with respect to the future design of Warden Avenue. These plans and their relevance to Warden Avenue are summarized in Table 2.2.

Table 2.2: Relevant Planning and Policy Document Summary

Planning / Guidance Document	Key Policies / Recommendations	Relevance to the Study Area
York Region's Pedestrian and Cycling Planning and Design Guidelines (2019)	These design guidelines act as a manual for the planning of active transportation facilities in York Region. The document differentiates itself from the Pedestrian & Cycling Master Plan as it emphasizes facility types, emerging design treatments for intersections and how to achieve better integration with York Region's other planning and design initiatives.	These guidelines build upon the Ontario Traffic Manual to guide cycling facilities in York Region and will support planning and design of the corridor improvements.
York Region's Designing Great Regional Streets	These guidelines aim to improve regional streets based on an examination of various needs and objectives within rights-of-way and road design standards. These guidelines also integrate road design and land use context by taking a context-sensitive approach that promotes the following outcomes: Flexibility to design for community context through the EA process. Consistency with facility applications in similar contexts. Best practices and sound, professional judgement. A 'made-in-York-Region' approach that considers full lifecycle costs.	These guidelines feed into the decision making by the Region.
York Region Noise Policy "Mitigation of Traffic Noise on Regional Roads"	This policy provides technical and design criteria for determining noise level predictions, modeling and mitigation.	The project will follow this policy for appropriate mitigation measures.
York Region Standard Operating Procedures for Traffic Noise Mitigation	The purpose of the SOP is to ensure fundamental technical data is appropriately collected, interpreted and used in the evaluation of noise mitigation on regional roads and bus transit corridors during road reconstruction projects.	The project will follow this SOP for the appropriate use of data and establishment of adequate mitigation measures.
York Region current (2021) 10-Year Road Construction Program	The York Region current (2021) 10-Year Road Construction Program Map identifies road projects by year.	Warden Avenue is scheduled for improvement in 2027.
York Region Transit Study Information	Not available.	
York Region's Regional Streetscape Policy	The policy recognizes York's transition from being a primary residential suburb of Toronto to an urban area of its own. The document provides guidance to develop and evaluate streetscapes to maintain the role of the Regional Street as an urban "place" and meet the community's transportation needs.	The policy objectives will be followed to ensure effective streetscaping.
York Region's Regional Streets and Centres and Corridors Analysis	Not available.	
York Region Strategic Vision (Vision 2051), 2011	Vision 2051 is York Region's long-term strategy. This policy document describes the Region's ideal vision of the next 40 years and describes the action plan. One of the goals of Vision 2051 is to provide a seamless network for mobility that provides accessibility to all destinations using diverse transportation options for people in all communities, promotes active healthy living and safely and efficiently moves people and goods.	This goal is supported by the following actions relevant to the Warden Avenue corridor: Planning mixed-use pedestrian environments with attractive streets, high-quality urban design and distinct sense of place. Achieving a transit-oriented urban form. Achieving better connections between where people live, work, learn and play. Implementing and supporting transportation demand management initiatives that reduce automobile dependence. Providing convenient and reliable alternative modes of travel and prioritizing walking, cycling, public transit and carpooling.

Planning / Guidance Document	Key Policies / Recommendations	Relevance to the Study Area
York Region's Sustainability Strategy	The Sustainability Strategy provides a long-term framework for making smart decisions about growth management and all municipal responsibilities that better integrate the economy, environment and community. One of the goals of the strategy is to create self-sustaining and healthy communities that emphasize the human condition.	This goal recognizes the importance of land-use and infrastructure planning, human services and fiscal impacts. The relevant actions to the Warden Avenue corridor include: Ensure that all residents and employees, including new immigrants, the elderly, young people and the disabled have barrier-free, accessible and affordable transportation. Continue to provide rapid transit and public transit with connecting pedestrian- friendly access routes. Apply Transportation Demand Management to increase transit usage, carpooling and alternative transportation modes to improve access and mobility.
York Region's Forest Management Plan	This plan was developed to maximize the benefits of all trees in the Region and to combat threats. Two key pillars of the plan are: recognizing the value of all trees, not just those in woodland areas and taking them into account as living, green infrastructure assets and working to increase the tree canopy cover in all settings. The plan supports a vision of healthy trees and diverse, sustainable forest ecosystems that support the well-being and quality of life of residents and communities.	As this project area moves towards a more urbanized roadway, the corridor can enable spaces for urban trees and canopy cover contributing to the overall effectiveness of the other initiatives to support residents and all road users, including active transportation facilities, reducing urban heat while also positively contributing to the environment.
York Region Transit Business Plan (2021 – 2025)	The 2021 – 2025 Business Plan describes how York Region Transit (YRT) will address the impact of the COVID-19 pandemic and the Region's transit needs over the next five years. This business plan outlines the Frequent Transit Network (FTN) plan, which identifies high-ridership corridors where additional service is warranted. The FTN provides more direct service and improved transfers between routes by creating a connective grid network of Viva and base routes operating along key corridors in urban areas of the Region. The FTN supports travel between Regional Centres and along Regional Corridors and supports more direct inter-regional trips.	Warden Avenue between Elgin Mills Road East and Major Mackenzie Drive East was identified as a FTN route. Near to the Study Area, Major Mackenzie Drive East was identified as a bus rapid transit route and Elgin Mills Road East was identified as a FTN route. Any improvements to Warden Ave. will need to include accommodation for public transit.
City of Markham North Markham Urban Design Guidelines	The Urban Design Guidelines provide guidance at the community design scale, for street design, block design	Following these guidelines will ensure that the project meets North Markham standards to develop the area in to a sustainable and innovative community.
Markham Active Transportation Master Plan ('Ride & Stride')	The Markham Active Transportation Plan, which is currently underway, outlines the policies, directions, steps and projects that need to be undertaken to provide safe, comfortable and well-connected active transportation network in Markham. The City identified strengthening the active transportation network as an important initiative to combat climate change and safety for road users. The City's "Getting to Zero: Markham's Municipal Energy Plan" assumes that as part of future scenarios 50% of trips with a length between 1 and 5 km shift to cycling by 2040 and 50% of the potential walking trips that were less than 2 km were not supporting the travel of another passenger were shifted to walking by 2050.	The Markham Active Transportation Plan proposed an ultimate cycling network that includes paved shoulders on Warden Avenue between Major Mackenzie Drive East and Elgin Mills Road East. In the proposed network, these paved shoulders connect to the proposed boulevard multi-use path on Major Mackenzie Drive East at the south of the Study Area and proposed paved shoulder on Elgin Mills Road East at the north of the Study Area.

Planning / Guidance Document	Key Policies / Recommendations	Relevance to the Study Area
		The Markham Active Transportation Plan also proposed a network of off-road multi-use paths within the North Markham FUA with multiple accesses to Warden Avenue. Any improvements to Warden Ave. will need to accommodate Active Transportation Infrastructure.
The Living City: The Living City Policies for Planning and Development in the Watersheds of the Toronto and Region Conservation Authority (TRCA, 2014)	Toronto and Region Conservation Authority (TRCA) is supportive of sustainable development and sustainable transportation options. Section 6.4 of the Living City document indicates that: TRCA is supportive of working with our municipal partners to encourage connections from trails to streets, sidewalks and bicycle lanes. This may facilitate opportunities for destination driven use of trails (e.g., bike to work, to shops, etc.), increasing the choice of transportation modes – an important component of sustainable transportation. In addition, TRCA has several policies for the definition, protection, enhancement, of their natural system. It is their policy that: "…development and site alteration not be permitted in the Natural System, except in accordance with the policies in Sections 7.4 and 7.5 and 8.4 to 8.13"	This project will increase choice of transportation modes. The project will need to consider protection of natural heritage.
O.Reg. 166/06 Toronto and Region Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses	O.Reg. 166/06 prohibits development or alterations within the jurisdiction of the TRCA in Regulated Areas without the permission of the Conservation Authority.	A permit under O.Reg. 166/06 will be required from TRCA for all works within the Regulated Area.

3.0 Public and Stakeholder Consultation

Consultation is an important part of the MCEA process to ensure that anyone with an interest in the project has an opportunity to provide input into the decision-making process.

The key features of the consultation process included:

- Identifying key Stakeholders, agencies and other interested or potentially affected parties that need to be consulted during the MCEA Study
- Notifying key Stakeholders, agencies and other interested or potentially affected parties of the study at key points of the MCEA process
- Engaging key Stakeholders, agencies and other interested or potentially affected parties at key points of the MCEA process to gather input and help inform key decision making
- Responding to inquiries or comments in an efficient and timely manner

3.1 Identification of Stakeholder Groups

A Project Contact List was developed as a mailing list to distribute project Notices. The Project Contact List consisted of technical and provincial agencies, municipalities and utilities, local interest groups, developers, businesses and Indigenous communities that may have an interest in the project, as well as local residents within the vicinity of the Study Area. Throughout the MCEA process, the Project Contact List was used to maintain contact information for interested stakeholders, as well as to summarize comments received about the project and related responses. A copy of the Project Contact List is provided in Appendix A. Correspondence with Indigenous communities is provided in Appendix B. Stakeholder Advisory Committee and Technical Advisory Committee correspondence is provided in Appendix D. A copy of general correspondence received from agencies, developers and the public is provided in Appendix E.

3.2 Notification

The Schedule C MCEA requirements include three mandatory public points of contact during the MCEA process. The mandatory points of contact for this project included a Notice of Commencement, Notice of Online Open House (OOH) and a Notice of Completion. An additional point of contact was provided through a second Online Open House to present the preferred design concepts and obtain input from interested stakeholders.

Project Notices were published in the local newspaper, the Markham Economist and Sun and were emailed or mailed to those on the Project Contact List.

The Notice of Commencement for the Project was advertised in the Markham Economist and Sun on November 25 and December 2, 2021.

The Notice for the OOH#1 inviting public input from February 24, 2022, to March 24, 2022, was advertised in the Markham Economist and Sun on February 24, 2022, and March 3, 2022.

The Notice for the OOH#2 inviting public input from November 25, 2022, to January 6, 2023, was advertised in the Markham Economist and Sun on November 10, 2022, and November 17, 2022.

Additional methods of notification are described below.

On-road Signage – Two on-road signs were placed at strategic locations to display the project website and provide information about opportunities to provide input. The sign locations were:

- Warden Avenue and Major Mackenzie Drive East
- Warden Avenue and Elgin Mills Road East

Project Specific Website (www.york.ca/WardenKennedyStudy) – The project website posted project notices, project information and opportunities to provide comment.

Social Media – Region's Facebook and Twitter accounts.

A copy of the Notice of Commencement and Notice of OOH#1 and OOH #2 is provided in Appendix A. A Notice of Completion will be published in the Markham Economist and Sun, the Region's project specific website and social media accounts as well as mailed / emailed to all on the Project Contact List at the conclusion of the MCEA process for the project.

3.3 Consultation Activities

3.3.1 Indigenous Communities

MECP has developed guidance on the steps to rights-based consultation with Indigenous communities. Indigenous communities with a potential interest in the project were identified through correspondence and direction provided by the MECP (correspondence: Erinn Lee, Regional Environmental Planner, MECP, dated October 22, 2021). A copy of this correspondence with MECP is provided in Appendix E.

Individual letters and the notices were sent by email / mail to Indigenous communities. Follow-up phone calls were made to identified Indigenous communities following the Notice of Commencement to:

- Confirm receipt of Notice
- Ensure the appropriate contact has been identified
- Ensure the community is aware of the project and the opportunity to participate
- Determine the community's level and type of interest in the project and their wish for further engagement
- Confirm the community's preferred methods to communicate project information

A summary of communication with identified Indigenous communities was maintained by Burnside on the Project Contact List and is summarized in Table 3.1. Copies of all correspondence with Indigenous communities is provided in Appendix B.

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Table 3.1: Summary of Indigenous Community Consultation

Indigenous Community	Notices Sent	Follow-up Call	Comment Received	Study Team Correspondence
Métis Nation of Ontario	Yes	No	Note process for MNO is to email notice to dedicated consultation email. If within two weeks there is no response the proponent is to assume that there are no comments.	
Alderville First Nation	Yes	220303_Burnside call was forwarded to Dave Simpson voicemail. 220406_Call. Burnside spoke with Dave Simpson and it was noted that the notice could not be found and requested it to be resent.	220406_Email. Dave Simpson noted that notice had been received.	211125_Email. Burnside sent email with NOCm 220224_sent email with attached notice OOH #1. 220406_Notice resent by request 221117_sent email with attached notice OOH #2.
Beausoleil First Nation	Yes	220302_call with Susan Copegog, hired as the new Consultation Coordinator. S. Copegog commented that the community will NOT respond if there is no archaeological work or if there is no environmental impact.	220406_Email. S. Copegog confirmed receipt of notice. Requested that information only be sent to consulations@chimnissing.ca, S. Copegog and the Chief, with Williams Treaties Coordinator to be contacted separately	211125_Email. Burnside email with NOCm initially sent to msmith@chimnissing.ca, info@chimnissing.ca; lands@chimnissing.ca Subsequent notices sent by email to consulations@chimnissing.ca, jsandy@chimnissing.ca 220224_Email. Burnside sent emailed notice OOH #1. 220303_Email. Provided a link to online open house #1 materials and included contact information for the Project Manager to contact with any comments or questions. 220406_Email. Follow up to confirm receipt of notice. As per request, Burnside noted that a Stage 1 AA is being completed and inquired if community would like to be kept informed about the archaeological assessment. 221117_Email. Burnside emailed notice OOH #2.
Curve Lake First Nation	Yes	220303_Call. 220406_Call. 220425_Call., Burnside left message for J. Kapyrka and K. Hill. Inquiring whether notice was received, how the community would like to be involved, whether there are any comments, concerns or issues.	221117_Email. Julie Kapyrka out of office message to contact Kaitlin Hill	211125_Email. Burnside email with NOCm 220224_Email. Burnside email with notice OOH #1 221117_Email. Burnside email with notice OOH #2.
Chippewas of Georgina Island	Yes	220303_Call.Burnside spoke with reception and it was noted that Natasha Charles can only be reached by email as she is working from home.		211125_Email. Burnside email with NOCm 220224_Email. Burnside email with notice OOH #1. 221117_Email. Burnside email with notice OOH #2.
Chippewas of Mnjikaning First Nation (Rama)	Yes		211125_Email. Samantha Craig-Curnow, Assoc. General Counsel, Legal responded to NOCm, noting the community would be happy to work with Burnside to develop a plan for consultation. Requested Burnside staff become familiar with the protocol and submit a Request to Consult and provided link: https://www.ramafirstnation.ca/rama-research-ethics-andcommunity-consultation/. It was noted fees may be applicable. It was estimated that the project	211125_Email. Burnside email with NOCm 220224_Email. Burnside email with notice OOH #1. 220302_online information form completed and submitted per consultation protocol. 221117_Email. Burnside email with notice OOH #2.

Indigenous Community	Notices Sent	Follow-up Call	Comment Received	Study Team Correspondence
			will likely engage a “level 2 consultation”. Once all information on the process has been received and reviewed, RFN will review and engage to develop a consultation table to address concerns. 221219_Email. An email from the dedicated Community Consultation email, noted that Burnside should direct any future correspondence to consultation@ramafirstnation.ca . It was noted that the community is in a transitional period following the resignation of Sharday James, Community Consultation Worker and requested to remove shardayj@ramafirstnation.ca from contact list and add consultation@ramafirstnation.ca.	
Hiawatha First Nation	Yes	220303_Call. Burnside left a message for Tom Cowie and requested whether notice had been received, interest in the project and if there are any comments, concerns.	220304_Call.Tom Cowie left message confirming notice had been received. Noted that community has no questions or concerns at this time, however, would be interested in a copy of environmental impacts.	211125_Email. Burnside email with NOCm 220224_Email. Burnside email with notice OOH #1. 221117_Email. Burnside email with notice OOH #2.
Nation Huronne-Wendat	Yes		220303_Email. Dominic Ste-Marie acknowledged receipt of the NOCm and noted that he will be taking over requests on behalf of the Ontario consultation team. Inquired if any archaeological studies or fieldwork will be necessary as part of this project. 220324_Email. Dominic Ste-Marie noted that the community is interested in participating in the Archaeological Assessments, sending fieldworks monitors and commenting on reports. It was requested that information be sent and to Marie-Sophie Gendron (Marie-Sophie.Gendron@wendake.ca) with copy to D. Ste.Marie. 220324_Email. Marie-Sophie Gendron requested that the Stage 1 AA be forwarded and comments will be provided. Quote for participation was attached. 220426_Email. Marie-Sophie Gendron requested when comments would be required. 220725_Email. Marie-Sophie Gendron noted that the team reviewed the report and did not have any concerns or comments. 230106_Email. Dominic Ste-Marie requested to know if any Archaeological studies or fieldwork will be necessary as part of this project. 230209_Email. Invoice forwarded to the Region for the review of Stage 1 AA report.	211125_Email. Burnside email with NOCm 220224_Email. Burnside sent email with attached notice OOH #1. 220324_Email. Burnside responded that a Stage 1 Archaeological Assessment is being completed. The need for additional Archaeological Assessment is to be determined and will depend on the preliminary preferred solution(s) selected as part of the EA process. Contact information will be maintained on the Project Contact List. 220425_Email. Burnside provided a link to the draft Stage 1 Archaeological Assessment. 220427_Email follow up. Burnside requested any comments by May 27, 2022. 220601_Email. Burnside inquired about the status of review of the Stage 1 Archaeological Assessment. 221117_Email. Burnside email with notice OOH #2. 230213_Email. Region acknowledged receipt of invoice and will forward for payment. 230119_Email. Region responded Stage 1 AA has been completed. A copy of the report was sent to Marie-Sophie on April 25, 2022. Marie-Sophie commented there were no concerns or comments. Stage 1 identified areas of Archaeological potential within the study and recommended Stage 2 in selected areas. Stage 2 has not

Indigenous Community	Notices Sent	Follow-up Call	Comment Received	Study Team Correspondence
				been initiated yet. Dominic will be informed in advance if any field assessments are required.
Mississaugas of the Credit First Nation	Yes	220303_Call. Burnside spoke with reception and it was confirmed that the NOCm had been received. It was also noted that Mark Laforme would be the contact for this project. 220425_Call. Burnside spoke with M. Laforme, who requested that the notices be resent to his direct email. M. Laforme (and cc Abby Laforme) noted that the community is no longer using the DOCA email and that a new Consultation Coordinator has been brought on (Abby Laforme) to replace Fawn Sault who is now on Band Council. The location of the project was discussed and the community will be commenting upon receipt of the email.	221118_Email. Abby Laforme responded to notice OOH #2, with appreciation and commented the project is being proposed for development on the treaty lands of the MCFN. The MCFN Department of Consultation and Accommodation must be in receipt of all EA reports and a review of all reports prior to submission to the ministry for clearance and must be engaged for all Archaeological Assessments, including in-field participation This engagement is at the cost of the proponent. 221212_Email. Marie-Annick Prevost, Ph.D, Field Archaeologist responded after reviewing the Stage 1 Archaeological Assessment asking for clarification (from the Archaeologist) on recommendations noting a preferred recommendation for 3 properties on Warden Avenue. 230306_Email. Adrian Blake (email to Ed Chiu) noted that they are satisfied with the Stage 1 AA report and in agreement with its findings and recommendations for future work.	211125_Email. Burnside email with NOCm 220224_Email. Burnside email with notice OOH#1. 220425_Email. Burnside as per request, forwarded email with attached OOH (previously sent to DOCA email on February 24, 2022, and earlier email sent to Fawn Sault, regarding NOCm, on November 25, 2021). Per request during phone conversation, copied Abby Laforme, Consultation Coordinator. Acknowledged the community noted they will be commenting on this project and will review and comment. 221117_Email. Burnside email with notice OOH #2. 221205_Email. Burnside responded with appreciation and noted the comments will become part of the public record for the project. It was noted that a Stage 1 Archaeological Assessment has been completed and submitted to the Ministry of Citizenship and Multiculturalism (MCM) in early November 2022, prior to expiration of the MCM's Project Information Form. Burnside made the report available for review, by a link in the email. It was noted that the Stage 1 AA determined that the Study Areas retain potential for archaeological resources in select areas and a Stage 2 AA is required during the detailed design process if these areas are impacted by the project; to be determined depending on the preferred design solution selected. 230109_Email. Burnside acknowledged receipt of template agreement documents and noted the Region is reviewing the agreements to provide a reply soon. 230301_Email. Region provided fully executed agreements for Stage 1 and Stage 2 archeological field work monitoring to MCFN.
Mississaugas of Scugog Island First Nation	Yes	220303_Call Burnside left message for Monica Stanford regarding receipt of notice, interest in the project		211122_Mailed. Burnside mailed letter and NOCm 220224_Mail. Burnside sent notice OOH #1. 221117_Mail. Burnside sent notice OOH #2.
Williams Treaty First Nation	Yes	220303_Call. Burnside phoned, no answer and does not allow for messages to be received.		211125_Email. Burnside email with NOCm 220224_Email. Burnside email with notice OOH #1. 221117_Email. Burnside email with notice OOH #2.

3.3.2 Online Open Houses

Two OOHs were conducted during the MCEA process. Visualization techniques (AODA compliant) were employed including a video recorded presentation of display materials and illustrated project conditions using maps, tables, photos, etc. An online Comment Form was made available and included questions related to issues and suggestions for consideration within the Study Area.

The OOH #1 presentation material informed the public of the purpose of the project, provided background information on the project and Study Area, including the findings from the 2016 approved TMP and illustrated the existing environment in the Study Area and the design alternatives being considered.

The OOH #2 presentation material described the project, the study process and planning context, alternative design concepts, feedback received from the OOH #1, an evaluation of the alternative design concepts leading to the preferred design concepts and identified next steps in the process.

Following each OOH, comments received during the 30-day comment period were logged in the Project Contact List and summarized in an OOH Summary Report. Where necessary, responses to questions or comments were provided by the method in which received or summarized and addressed in the OOH Summary Report. The OOH Summary Reports were then posted to the project specific website.

The comments received during the OOH # 1 comment period included the following themes:

- Traffic (speed, flow, signals)
- Safety
- Active transportation
- Impact to the environment, including trees

The comments received during the OOH # 2 comment period included the following themes:

- Boulevard Plantings
- Pedestrian Crossings
- Low Impact Development
- Active Transportation
- Other

Details of the OOHs, along with the comments received, are provided in the OOH Summary Reports available in Appendix C.

3.3.3 Technical Advisory Committee

A Technical Advisory Committee (TAC) was formed to engage in proactive consultation with regulatory agencies, provincial ministries, municipalities, utilities and the local conservation authority. These groups were contacted at the commencement of the study and invited to participate. For this study, the TAC membership consisted of representatives from the City of Markham and TRCA.

TAC meetings were held to gather input to the project, discuss issues / concerns and inform members of the technical details at various decision-making points throughout the EA process. TAC meetings were scheduled in advance of the OOHs to obtain participants input on the project information. Copies of the minutes of meeting are provided in Appendix D.

3.3.4 Stakeholder Advisory Committee

With the publication of the Notice of Commencement the Region invited interested community members to form a Stakeholder Advisory Committee (SAC). Members included representatives of community interest groups, members of the public, developers and property owners within the Study Area.

The SAC met at key milestones of the project to exchange information and provide feedback. The meetings provided a forum to engage members in constructive discussion about the project. Copies of the meeting minutes are provided in Appendix D.

3.3.5 Agencies

Meetings with specific agencies were held to discuss key topics relative to each agency's area of interest, at key decision-making points through the EA process. A summary of the topics discussed at each meeting is provided in Table 3.2. Copies of the meeting minutes and agency correspondence are provided in Appendix E.

Table 3.2: Summary of Agency Meetings

Agency	Meeting Date	Discussion Topics
City of Markham	October 8, 2021	Update on MCEAs being completed separately as part of the North Markham FUA
TRCA	January 27, 2022	Project Overview: Feedback on the type of studies being completed as part of the MCEA
Enbridge	February 24, 2022	Project overview, alternative design concepts and infrastructure planning.
Enbridge	July 20, 2022	Discussion of planned gas main extension along west side of Warden Avenue.
City of Markham	September 6, 2022	Review of City staff comments on preferred design concept cross-section specifically

Agency	Meeting Date	Discussion Topics
		proposed boulevard elements and active transportation facilities.
TRCA	September 9, 2022	Discussion of Kennedy Road drainage interim solution.

4.0 Transportation Conditions

4.1 Existing Transportation Infrastructure

4.1.1 Roads

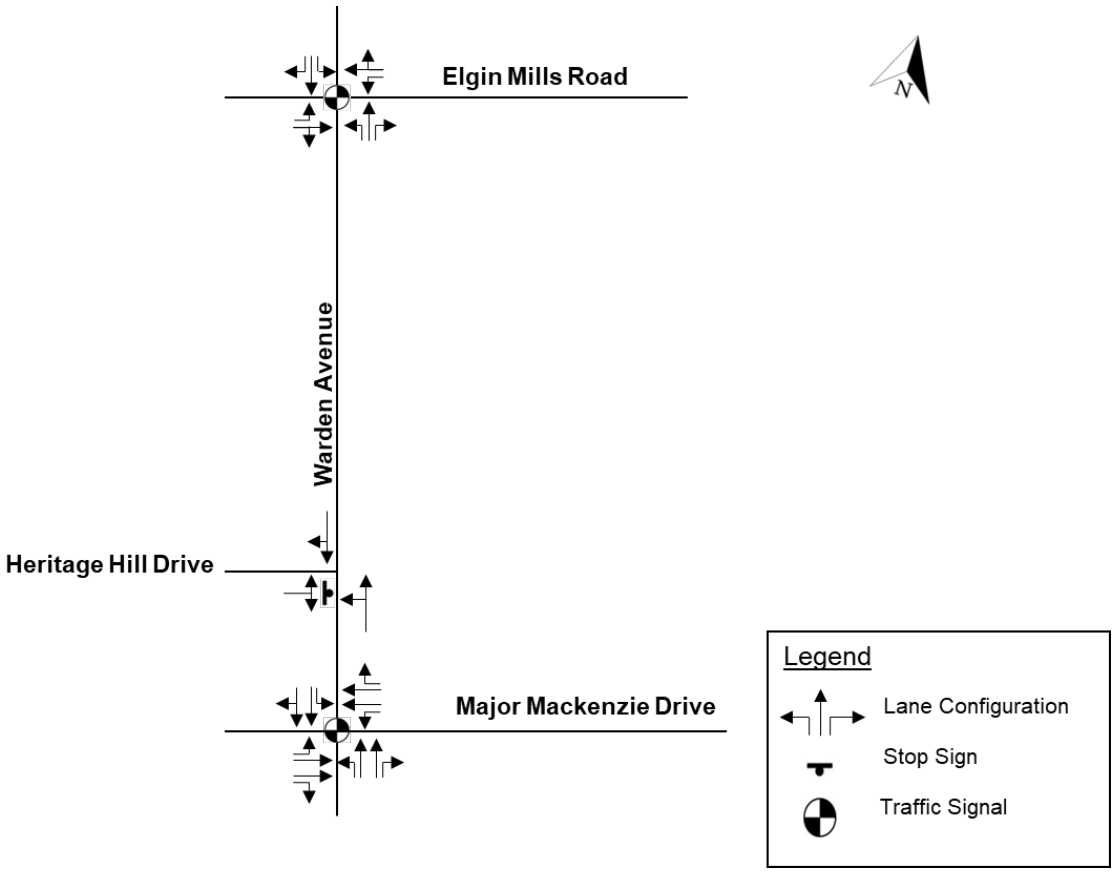
Warden Avenue is a north-south rural arterial road through the City of Markham. The Warden Avenue study corridor intersects Elgin Mills Road East to the north and Major Mackenzie Drive East to the south. The road characteristics of Warden Avenue in the Study Area including intersecting roads are shown in Table 4.1.

Table 4.1: Road Characteristics within or near the Study Area

Name (Approximate Length)	Jurisdiction	Classification	Number of Through Lanes	Posted Speed Limit
Warden Avenue (2.1 km)	York Region	Regional Arterial Road	2	80 km/hr
Major Mackenzie Drive East	York Region	Regional Arterial Road	4	70 km/hr
Elgin Mills Road East	City of Markham	City Arterial Road	2	60 km/hr

The roadway configuration for Warden Avenue and surrounding geography is shown in Figure 4.1.

Figure 4.1: Roadway Configuration



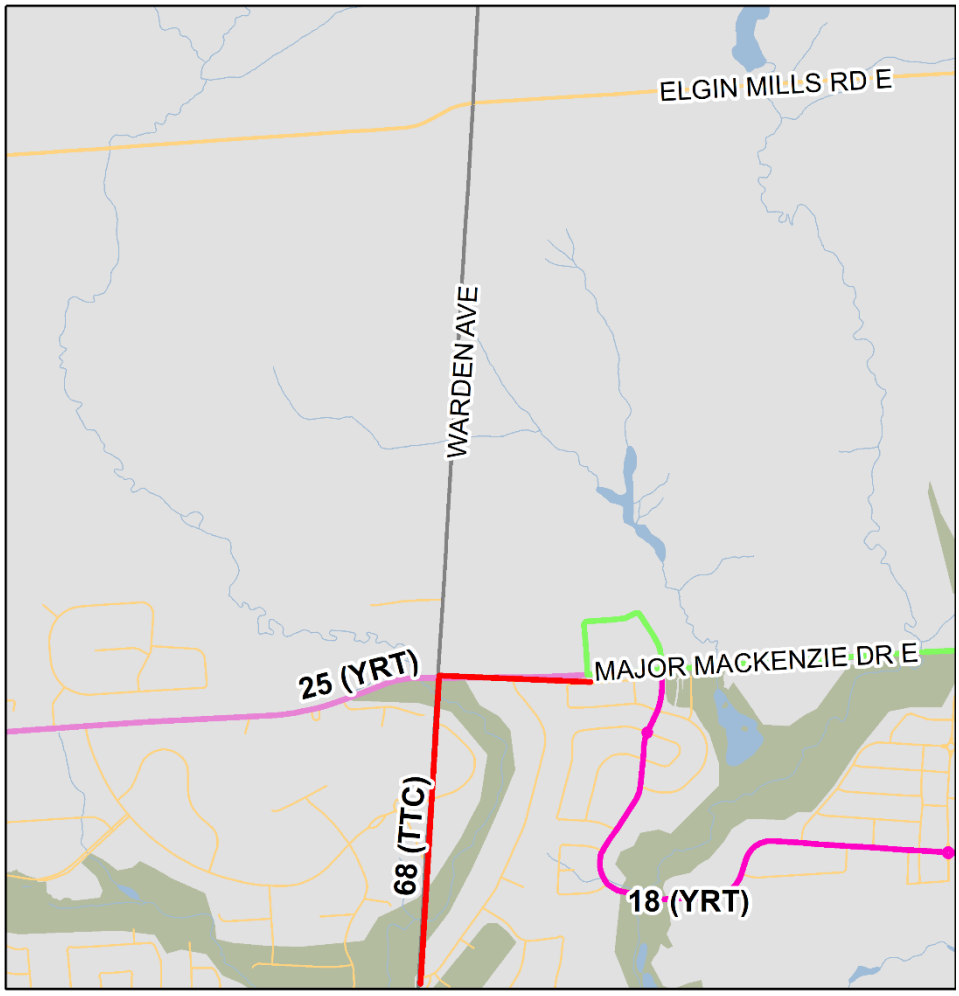
4.1.2 Transit

Along Warden Avenue, south of Major Mackenzie Drive East, Toronto Transit Commission ('TTC') operates Bus #68B. This route has a terminal at the Angus Glen Community Centre at Major Mackenzie Drive East, between Warden Avenue and Kennedy Road.

Along Major Mackenzie Drive, YRT operates Bus #25 that runs from Markham Stouffville Hospital at 9th Line to Mackenzie Richmond Hill Hospital near Yonge Street. This bus has stops along Major Mackenzie Drive including at Warden Avenue.

YRT also operates special routes including Bus #18 which runs between Markham Stouffville Hospital and Angus Glen Community Centre. The #18 bus runs during rush hours only. These bus routes are shown in Figure 4.2.

Figure 4.2: TTC and YRT Bus Routes Near the Study Area



4.1.3 Active Transportation

There are continuous 1.0 m to 3.0 m paved shoulders along Warden Avenue between Elgin Mills Road East and Major Mackenzie Drive East. The paved shoulders continue north of Elgin Mills Road East. Along Warden Avenue, south of Major Mackenzie Drive East, there are no bike-dedicated facilities.

4.1.4 Road Right-of-Way Characteristics

The road right-of-way (ROW) for Warden Avenue is 31.2 m to 50.2 m.

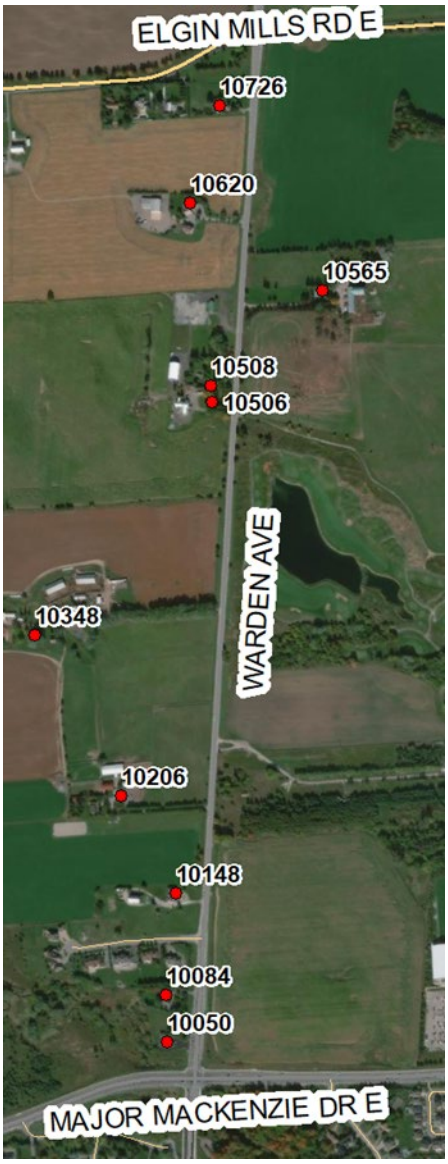
4.1.5 Existing Accesses

York Region manages new and re-development accesses onto regional roads using access management practices to preserve transportation capacity of regional roads for all modes of transportation. Access management establishes the recommendations for

appropriate location and design elements of the proposed public roads and private entrances onto regional roads.

There are ten properties that require ten driveway accesses onto Warden Avenue. These properties are shown in Figure 4.3.

Figure 4.3: Properties with Driveway Accesses Along Warden Avenue



4.2 Transportation Needs and Opportunities

As part of the 2016 TMP, the road needs and justifications were established for Warden Avenue meeting the requirements for Phase 1 and 2 of the MCEA process. During this study, the 2022 TMP was approved by York Regional Council on September 29, 2022. The 2022 TMP recommendation align with the 2016 TMP for Warden Avenue.

The 2022 TMP supports the planned growth to 2,020,000 people and 990,000 jobs by 2051.

The City of Markham OP has identified 1,300 ha of lands, which includes 975 ha of developable land, in the North Markham FUA. Approximately 700 ha of the developable lands are designated 'Future Neighbourhood Area', which will accommodate approximately 45,000 persons by full build-out. Approximately 275 ha of developable lands north of Elgin Mills Road are designated as 'Future Employment Area', which will accommodate approximately 19,000 jobs at full build-out. The four residential blocks within the North Markham FUA are shown in Figure 2.3. The TMP identified Warden Avenue as requiring roadway improvements which included a one to two-lane widening within the Study Area.

The following sections summarize the transportation needs and opportunities of Warden Avenue within the Study Area. A more comprehensive analysis is presented in the Transportation Systems Technical Report #1/2, which is provided in Appendix F of this report.

4.2.1 Vehicular Traffic

4.2.1.1 Existing Traffic Conditions

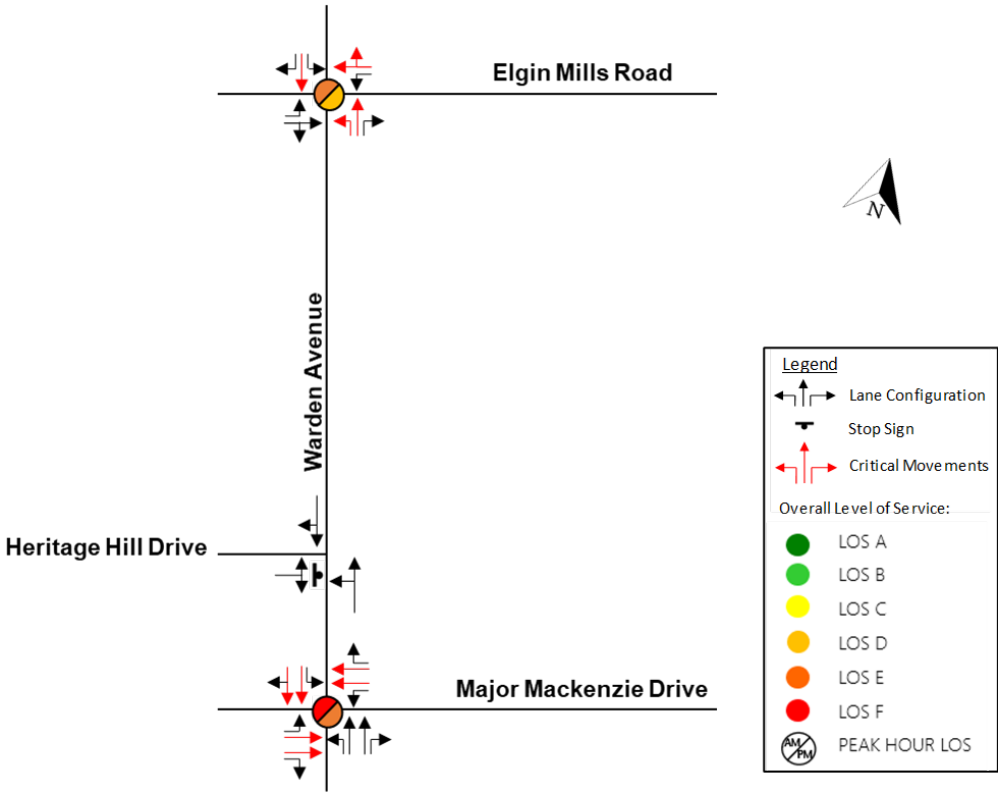
Intersection operations commonly present the most critical conditions of arterial road operations. Signalized intersection analysis considers two separate measures of performance:

- The capacity of all intersection movements, which is based on a volume to capacity ratio that measure of the degree of capacity utilized.
- The level of service (LOS) for all intersection movements, which is based on the average control delay per vehicle for the various movements through the intersection and overall. Delay is an indicator of how long a vehicle need to wait to complete a movement and is represented by a letter between A and F, with F being the longest delay. The link between LOS and delay (in seconds) for signalized intersections is summarized below.

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

The existing traffic conditions are illustrated in Figure 4.4.

Figure 4.4: Existing Traffic Conditions



During the AM peak hour, the traffic operations analysis indicated that Warden Avenue at Elgin Mills Road and at Major Mackenzie Drive is operating at LOS E and LOS F, respectively, due to demand exceeding capacity and long delays. During the PM peak hour, the traffic operations analysis indicated the Warden Avenue and Major Mackenzie Drive East intersection is operating at LOS E with demand exceeding capacity.

4.2.1.2 Future 2041 "Do Nothing" Traffic Conditions

The future conditions assessment was conducted for the year 2041 using a "Do Nothing" scenario with no geometric improvements. The "Do Nothing" scenario was assessed to re-confirm the automobile needs and justification that was identified in the 2016 TMP. The 2041 "Do Nothing" traffic conditions are illustrated in Figure 4.5.

Figure 4.5: 2041 "Do Nothing" Traffic Conditions

Many movements are critical in the 2041 future AM and PM peak hours. Conditions are expected to worsen relative to the existing conditions, with both signalized intersections operating with demand well above capacity. There is a need for improvements (capacity and signal timing optimization) to maintain operations at acceptable levels. Since traffic is anticipated to increase through these corridors in the future, if no improvements are undertaken such as accommodating for the additional vehicular demand or shifting travel to more sustainable modes, operational efficiency is anticipated to deteriorate significantly. These improvements will be addressed in the preliminary design concept.

4.2.2 Transit

There is no transit service currently provided along Warden Avenue. The Region supports transit as a robust transit network helps support growth to key centers and corridors and minimizes the need for travel and reduces dependence on single occupant vehicles. This sustainable mode of transportation also helps mitigate climate change, which is another important objective for York Region.

Warden Avenue between Elgin Mills Road East and Major Mackenzie Drive East is planned to be a FTN route. The FTN provides more direct service and improved transfers between routes by creating a connective grid network of Viva and base routes

operating along key corridors in urban areas of the Region. The FTN supports travel between Regional Centres and along Regional Corridors and supports more direct inter-regional trips.

4.2.3 Cyclists and Pedestrians

York Region's pedestrian and cycling LOS target is LOS C or better. The analysis shown in Table 4.2 and Table 4.3 analyzes the pedestrian and cycling performance, respectively, based on criteria from York Region's Mobility Plan Guidelines within the Study Areas and evaluates the performance based on the target. LOS that does not meet the target is highlighted.

Table 4.2: Pedestrian Level-of-Service Evaluation

Intersection	Direction	Segment		Intersection LOS
		Description	LOS	
Elgin Mills Road East and Warden Avenue	Eastbound	Elgin Mills Road East	E	C
	Westbound	Elgin Mills Road East	E	C
	Northbound	Warden Avenue	E	E
	Southbound	Warden Avenue	E	C
Major Mackenzie Drive East and Warden Avenue	Eastbound	Major Mackenzie Drive East	C	C
	Westbound	Major Mackenzie Drive East	B	B
	Northbound	Warden Avenue	E	C
	Southbound	Warden Avenue	C	C

Table 4.3: Cycling Level-of-Service Evaluation

Intersection	Direction	Segment		Intersection LOS
		Description	LOS	
Elgin Mills Road East and Warden Avenue	Eastbound	Elgin Mills Road East	E	E
	Westbound	Elgin Mills Road East	E	E
	Northbound	Warden Avenue	E	E
	Southbound	Warden Avenue	E	E
Major Mackenzie Drive East and Warden Avenue	Eastbound	Major Mackenzie Drive East	C	C
	Westbound	Major Mackenzie Drive East	C	C
	Northbound	Warden Avenue	E	F
	Southbound	Warden Avenue	C	C

Improvements to the pedestrian and cycling environment should be implemented at the intersections of Elgin Mills Road East at Warden Avenue and Warden Avenue between Elgin Mills Road East and Major Mackenzie Drive East.

Because the area is being redeveloped and reconstructed, pedestrian and cycling demand is anticipated to increase significantly. There will be a need to provide continuous cycling and pedestrian routes. Opportunities to improve the pedestrian and

cycling environment should be explored at the Major Mackenzie Drive East intersection at Warden Avenue concurrently with the improvements to the rest of the Study Area to ensure consistency and connectivity.

Warden Avenue south of Major Mackenzie Drive accommodates pedestrians and cyclists via an active transportation boulevard facility on the east side of the roadway and sidewalk on portions of the west side of the roadway. There is no current opportunity or plans for a continuous on-road cycling facility on Warden Avenue. To provide continuity of facility route and type, there is an opportunity to provide a cycle track for cyclists and sidewalk for pedestrians on both sides of Warden Avenue within the Study Area.

4.2.4 Safety Assessment

This section contains a safety assessment completed to identify and mitigate potential safety related concerns. The safety assessment consists of an in-office review of historical collision data. The in-office review helped identify any patterns with respect to collision type, direction, severity and other contributing factors. These collision analysis findings provide an understanding of the overall safety performance within the Study Area, for intersections and midblock segments.

4.2.4.1 Review of Collision Data

York Region provided historical collision records from January 1, 2010, to April 30, 2021, for the Study Area. Data for collisions during the years 2020 and 2021 were removed to ensure that full years and years that were not affected by travel restrictions due to the COVID-19 pandemic were assessed. Five years of collision records between the years 2015 to 2019 were analyzed to represent existing conditions. During this time there were 88 collisions along and at the intersections of Warden Avenue.

4.2.4.2 Collision Rates

Collision rates were calculated for intersection and roadway segments using the following formulas:

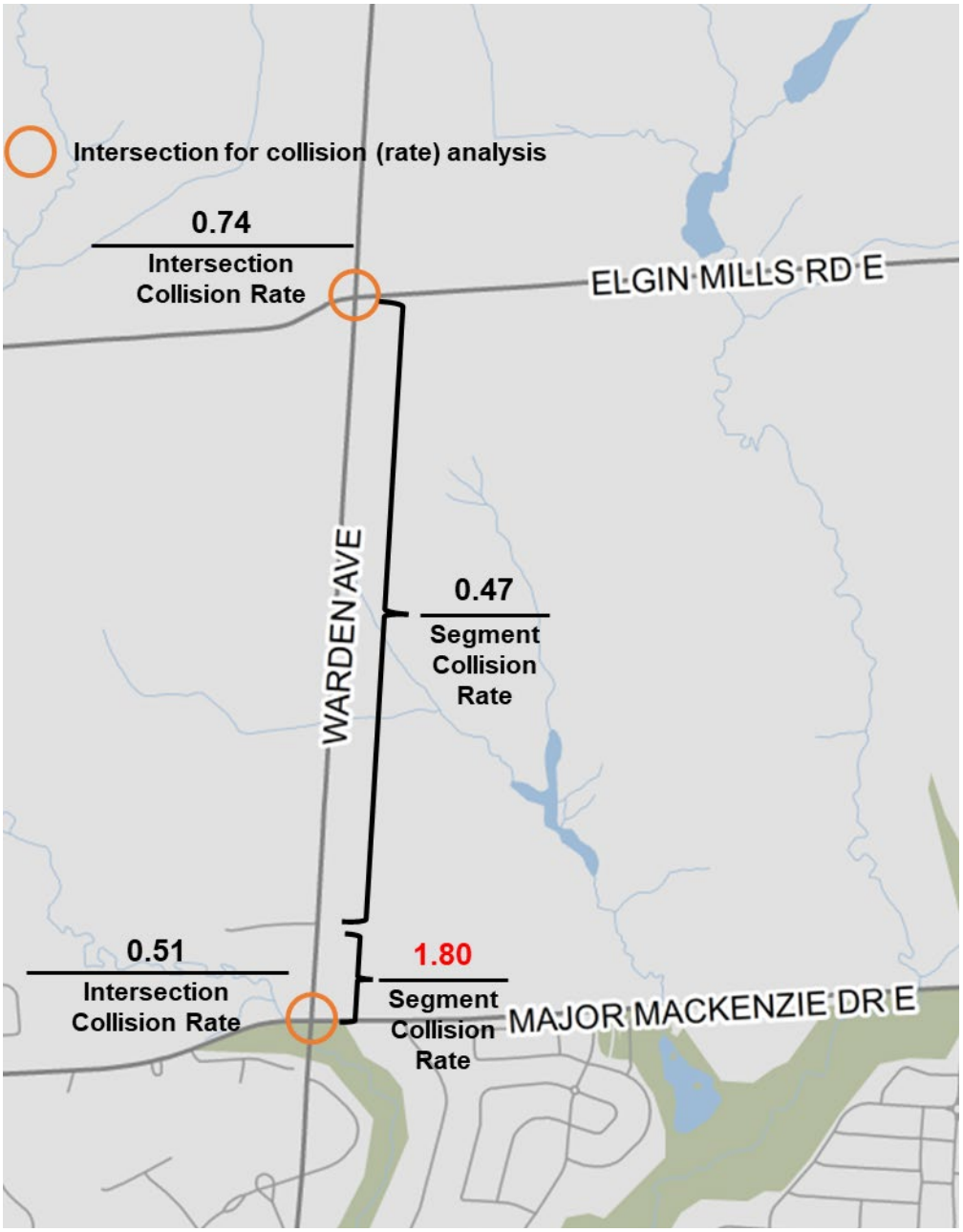
$$\text{Segment Collision Rate} = \frac{\text{Number of collisions x } 1{,}000{,}000}{\text{Average Annual Daily Traffic x } 365 \text{ x Length of Segment x Years}}$$

$$\text{Intersection Collision Rate} = \frac{\text{Number of collisions x } 1{,}000{,}000}{\text{Average Annual Daily Traffic x } 365 \text{ x Years}}$$

Annual Average Daily Traffic (AADT) was estimated by multiplying the sum of the AM and PM peak hour volumes by 5 and then adding together the total entering traffic volume. A hotspot, a location where safety countermeasures should be considered, is identified if the collision rate exceeds 1 or 1.5 crashes per million kilometers traveled.

A summary of the segment and intersection collision rates are illustrated in Figure 4.6.

Figure 4.6: Summary of Intersection and Segment Collision Rates



Details for the segment collision rates are shown in Table 4.4. Details for the intersection collision rates are shown in Table 4.5. Collision rates higher than 1.0 or 1.5 are highlighted in red.

Table 4.4: Segment Collision Rates (2015 – 2019)

Location	AADT (year)	Number of Collisions (2015 to 2019)	Segment Length (km)	Segment Collision Rate
Warden Avenue between Major Mackenzie Drive East and Heritage Hill Drive	11,481 (2018)	8	0.265	1.80
Warden Avenue between Heritage Hill Drive and Elgin Mills Road East	6,014 (2019)	9	1.735	0.47

Table 4.5: Intersection Collision Rates (2015 to 2019)

Intersection	AADT (Estimated 2019)	Number of Collisions	Intersection Collision Rate
Warden Avenue and Elgin Mills Road East	14,847	20	0.74
Warden Avenue and Major Mackenzie Drive East	53,380	49	0.51

The collision rates for Warden Avenue suggest that no additional safety countermeasures are immediately required.

5.0 Physical and Environmental Constraints

5.1 Natural Environment

This section is a summary of information collected by Beacon Environmental Limited ('Beacon') for the Natural Environment Report prepared in August 2021 for York Region and additional observations of the Study Area completed in 2022 by Burnside. A copy of the Beacon Natural Environment Report and the Burnside Existing Natural Features Technical Memo is provided in Appendix G of this report.

5.1.1 Watercourses

The Study Area is within the Rouge River watershed and the subwatersheds of Bruce Creek and Berczy Creek, under the jurisdiction of the TRCA. Along Warden Avenue a tributary of Bruce Creek crosses approximately 840 m north of Major Mackenzie Drive flowing southeast. The main branch of Berczy Creek flows across Warden Avenue just south of Major Mackenzie Drive, south of the Study Area.

Natural heritage and hydrologic features are contained within the Berczy Creek valleylands and are protected within the Greenway System.

5.1.2 Fisheries and Aquatic Habitat

Bruce Creek provides habitat for 25 fish species within or in close proximity to the North Markham FUA. Most of the fish species located within Bruce Creek system are a mix of warmwater, coolwater and coldwater species. Historical stocking of Brook Trout (*Salvelinus fontinalis*), a coldwater fish native to Ontario, occurred in the Rouge River watershed and has been identified in some of headwaters of Bruce Creek. Rainbow Trout (*Oncorhynchus mykiss*) are stocked in Bruce Creek and likely move throughout the system as permitted by barriers to passage. Bruce Creek provides habitat for American Brook Lamprey (*Lampetra lamottei*) and possibly habitat for additional identified target species of the Fisheries Management plan include Rainbow Darter (*Etheostoma caeruleum*) and Mottled Sculpin (*Cottus bairdii*).

Berczy Creek provides habitat for 22 fish species within or close to the North Markham FUA including SAR Redside Dace (*Clinostomus elongatus)* (Endangered). Berczy Creek provides spawning and nursery habitat for Rainbow Trout (*Oncorhynchus mykiss*), which are stocked in several locations within the creek and likely move through the system. Berczy Creek provides suitable habitat for additional identified target species of the Fisheries Management Plan including American Brook Lamprey (*Lampetra lamottei*) and Rainbow Darter (*Etheostoma caeruleum).*

Both Berczy and Bruce Creek provide good quality habitat for all life stages (including spawning, rearing, feeding, refuge and migration) for the several fish identified. The

Berczy Creek and Bruce Creek Redside Dace population is considered one of the three most significant in Ecodistricts 7E4 and 7E.

The Bruce Creek tributary within the Study Area is designated as contributing habitat for Redside Dace, a provincially Endangered Species.

In July 2015 and subsequently in May 2016 Beacon and the Berczy Glen landowner's consultants (along with Ministry of Natural Resources and Forestry (MNRF), TRCA and City of Markham staff) conducted a fish community survey to confirm presence / absence of fish within the upstream portion of Bruce Creek Tributary on the west side of Warden Avenue. No fish were captured during the fish sampling activities. Fish community sampling was not conducted in Berczy Creek due to the presence of Redside Dace and abundance of background information.

Observations of the Bruce Creek tributary in 2022 noted the watercourse functions as a roadside drain upstream, west of Warden Avenue and then flows in a linear and densely vegetated channel from west to east downstream of the road. The watercourse was observed to represent marginal fish habitat and aquatic sampling would be required to confirm presence / absence of fish. It is considered to be contributing to the Redside Dace habitat.

South of Major Mackenzie, observations of Berczy Creek in 2022 noted a large and deep pool at the outlet of the culvert. An old structure was observed upstream of the culvert and a large concrete weir was observed downstream. Berczy Creek is considered to be fish habitat and Redside Dace habitat.

5.1.3 Vegetation and Terrestrial Habitat

Vegetation communities were described based on the Ecological Land Classification (ELC) for Southern Ontario (Lee et al., 1998). The ELC is a nested classification system, which groups vegetation types into Ecosites with common soil and vegetation characteristics. ELC characterization is available in the Natural Environment Report, with updated observations available in the Burnside technical memo provided in Appendix G of this report. Much of the land adjacent to the road ROW is classified in the Beacon report as anthropogenic (ANT), agricultural-Row Crop (AG-RC), agricultural pasture (AG-Pasture) and agricultural-Corn Crop (AG-Corn). The forest community associated with the Berczy Creek valley crossing, east of Warden Avenue is Dry-Fresh Deciduous Forest (FOD4). Wetland communities in the Study Area include Open Aquatic (OA), Reed-canary Grass Mineral Meadow Marsh (MAM2-2), Cattail Mineral Shallow Mash (MAS2-1), Meadow Marsh (MAM), Deciduous Swamp (SWD) and Duckweed Floating-leaved Shallow Aquatic (SAF1-3). Cultural Communities include Red Spruce Coniferous Plantation (CUP3-12), Red Pine Coniferous Plantation (CUP3-1), Sumac Cultural Thicket (CUT1-1), Dry-Moist Old Field Meadow (CUM1-1), Mineral Cultural Meadow (CUM1) and Cultural Woodland (CUW). Burnsides 2022 observations of natural features in the Study Area resulted in updates to six agricultural

ELC communities' descriptions as identified in the Burnside technical memo in Appendix G of this report.

Amphibians

Previous surveys of the Berczy Glen Block did not identify the presence of amphibians or suitable amphibian habitat. Previous surveys of the Angus Glen Block and Robinson Block identified a total of four amphibian species, including Green Frog (*Rana clamitans*), American Toad (*Bufo americanus*), Grey Treefrog (*Hyla versicolor*) and Bullfrog (*L. catesbeiana*) located within the vicinity of the Study Area. All species observed are considered to be widespread and common in Ontario. Of the species observed, the Grey Treefrog and Bullfrog may be less tolerant of disturbance.

Breeding Birds

Previous surveys of the Angus Glen Block identified 59 species of birds, 52 of which were breeding or suspected breeders. Within the Berczy Glen Block, 47 species of birds were observed, with 42 showing evidence of breeding. Four SAR birds and five species of birds of regional concern (L-rank 1 to 3) were recorded within the Berczy Glen Block and Angus Glen Block.

Potential Bat Habitat

Forested areas and cultural woodlands within the Study Area may provide suitable habitat for bat maternity and day roosting, including:

- The CUP communities on the east central side of Warden Avenue within the Study Area
- Cultural woodland community at the northeast corner of the Study Area
- Forested community associated with the southern side of the Bruce Creek Tributary corridor

5.1.4 Key Natural Heritage Features

The entire Berczy Creek valley that crosses Warden Avenue south of the Study Area has been identified as a Significant Valleyland. All woodlands within Berczy Creek valley and Bruce Creek Tributary corridor meet the criteria of "significance" due to their proximity to Redside Dace habitat as well as portions of the woodlands falling within the Bruce-Berczy Creek Provincially Significant Wetland (PSW) Complex. Based on the conclusion of the MESP, SWH has not been confirmed within the Study Area. SWH as it relates to Candidate Bat Maternity Colonies may be present within the wooded areas of the Study Area, located within deciduous or mixed forests with large diameter wildlife trees. The presence of Bat Maternity Colonies is to be determined through field survey in areas of potential impact as a result of the design.

The Greenway System, identified by the MESPs for the Berczy Glen and Angus Glen blocks passes through the Study Area. The Greenway System is the City of Markham's NHS. Beacon's report included the need for specific environmental design and mitigation measures to ensure the connectivity of the Greenway System is maintained with enhanced habitat connectivity by allowing the movement of amphibians and "other wildlife". In addition, the south section of the Study Area around Warden Avenue is within the Urban River Valley and Protected Countryside designations of the Greenbelt Plan.

5.1.5 Headwater Drainage Features

A total of nine headwater drainage features (HDF) were identified in the Bruce Creek tributary subcatchment within the Study Area. These features are largely agricultural tile drainage systems or undefined overland flow routes through actively farmed areas. The HDF within the Study Area were evaluated as part of the MESP using the Evaluation, Classification and Management of Headwater Drainage Features Guidelines (CVC and TRCA, 2014). The Subwatershed Study identified recommendations for five of the HDFs in the Study Area as "Mitigation" management. One reach was recommended "Protection" status; however, this section of the channel is approved for realignment and improvement. Through the HDF assessments of the MESP, it was decided that the hydrologic functions of these HDFs will be replicated throughout the Study Area. No further assessment is required for the remaining three HDFs.

5.1.6 Habitat of Endangered and Threatened Species

Species at Risk, Threatened and Endangered, are species listed as protected by law under the Provincial ESA (2007) or the federal Species at Risk Act (SARA) (2002). Special Concern species do not have species or habitat protection under Ontario's ESA (2007) or the federal SARA (2002), however, they may receive protection by some agencies, such as provincial and national parks, or other Acts, such as the Ontario Fish and Wildlife Conservation Act and the Migratory Birds Convention Act (MBCA), which prohibits the killing, capturing, injuring, harassment and trapping of specially protected species.

The following Endangered and Threatened species were identified by Beacon and observed within the Study Area during the field studies completed in 2014:

- Barn Swallow
- Bobolink
- Eastern Meadowlark
- Redside Dace

Barn Swallow habitat was confirmed within various buildings on farmland within the Study Area. In January of 2023, Barn Swallow was re-classified from Threatened to

Special Concern through amendments to Ontario Regulation 230/08. Barn Swallow and its habitat is no longer protected under the ESA.

Based on the observations of the natural features in the Study Area completed by Burnside in 2022, habitat suitable for Bobolink / Eastern Meadowlark was not observed within or immediately adjacent to the Study Area. Potentially suitable nesting habitat previously identified by Beacon (2021) has since been fragmented or removed by earthworks and development. Consequently, no potential habitat remains in the Study Area or immediately adjacent to the Study Area.

Redside Dace habitat was confirmed in Berczy Creek within the Study Area. Contributing Redside Dace habitat was identified within the Bruce Creek tributary within the Study Area and the HDF with a recommended management of protection or conservation within the Study Area.

Significant woodlands within the Study Area were identified as possibly providing suitable maternity roost habitat for bats. Targeted surveys were not completed during Beacon's investigations. Additional surveys to assess the presence of SAR bats may be required in areas of potential impact as a result of the design.

Potential habitat is present in the Study Area for the following Endangered or Threatened species protected under the Provincial ESA (2007):

- Bats e.g., Little Brown Myotis (*Myotis lucifugus*) (Endangered), Northern Myotis (*Myotis septentrionalis*) (Endangered), Tri-colored Bat (*Perimyotis subflavus*) (Endangered)

Confirmed habitat is present in the Study Area for the following Endangered or Threatened species protected under the Provincial ESA (2007):

- Redside Dace (Endangered)

5.1.7 Wetlands and Environmentally Sensitive Areas

The wetlands within the Berczy and Bruce Creek valleys which are in proximity to the Study Area are part of the Bruce-Berczy Creek PSW Complex identified by MNRF within the North Markham FUA planning process. A portion of the Bruce-Berczy Creek PSW Complex is identified in the Study Area associated with the upstream reach of the Berczy Creek crossing of major Mackenzie Drive East and the Bruce Creek tributary.

5.2 Built Heritage and Cultural Landscape

A Cultural Heritage Report for Existing Conditions was completed by Archaeological Services Inc. ('ASI'), a copy of which is provided in Appendix H of this report. The Cultural Heritage Report describes the existing conditions of the Study Area and provides an inventory of the known and potential built heritage resources and cultural

heritage landscapes. The background historical research and secondary source material indicate that the Study Area had a rural land use history dating back to the early nineteenth century. Five previously identified features of cultural heritage value were identified through a review of federal, provincial and municipal registers. One additional feature was identified as part of the Study.

5.3 Archaeology

A Stage 1 Archeological Assessment was completed by ASI, a copy of which is provided in Appendix I of this report. The background research and property inspection determined that the Study Area contains lands with potential for archaeological resources and may require Stage 2 survey, either by test pit or pedestrian survey, as appropriate. A previously registered archaeological site located within the Warden Avenue Study Area (Euro-Canadian site AlGu-515) has further cultural heritage value or interest and will require further assessment if it is to be impacted by the project.

5.4 Utilities

A Subsurface Utility Engineering investigation report was completed by MultiVIEW Locates Inc., a copy of which is provided in Appendix J of this report. This study included fieldwork Quality level B (QL-B) and a desktop investigation for the Study Area from Elgin Mills Road to Mackenzie Drive East. The Subsurface Utility Engineering investigation identified utilities infrastructure and appurtenances such as Enbridge gas line and gas main, Bell, hydro cable, traffic light and streetlights. Utility owners in the area include York Region, Alectra, Bell and Enbridge Pipelines Gas Inc.

5.5 Storm Drainage and Low Impact Development

Burnside conducted a Storm Drainage and Low Impact Development (LID) review for the Study Area, a copy of which is provided in Appendix K of this report. Storm drainage considerations such as relevant design criteria, topography and drainage features, conveyance, quantity and quality control were reviewed.

The Study Area is characterized by gently sloped topography, with slopes generally being southward towards the watercourse valleys. Along Warden Avenue the ground elevations range from 229 masl at Elgin Mills Road down to 210 masl at Major Mackenzie Drive East. The Study Area includes an existing road-crossing culvert, which is regulated by TRCA. Conveyance of ROW runoff and external areas draining to the ROW is currently via roadside ditches. Road improvements will include urbanization of the Study Area which will result in this system being replaced with a storm sewer system designed to York Region standards to convey the 10-year storm. Runoff from storms exceeding the 10-year storm will be conveyed overland within the ROW.

Road improvements are expected to result in increased impervious area within the ROW, thereby increasing the rate of storm runoff from the existing condition. York

Region standards require stormwater quantity control to reduce the proposed runoff peak flow rates to existing rates or lower for events up to and including the 100-year storm. Quantity controls will be necessary within the ROW if the runoff cannot be accommodated within end-of-pipe facilities, through LID features.

Due to presence of Redside Dace habitat, stormwater management (SWM) facilities in affected areas should attempt to have outflow temperatures less than 24°C, dissolved oxygen levels above 7 mg/L, Total Suspended Solids (TSS) levels less than 25 mg/L above background conditions, as per the Guidance for Development Activities in Redside Dace Protected Habitat (MNRF, March 2016).

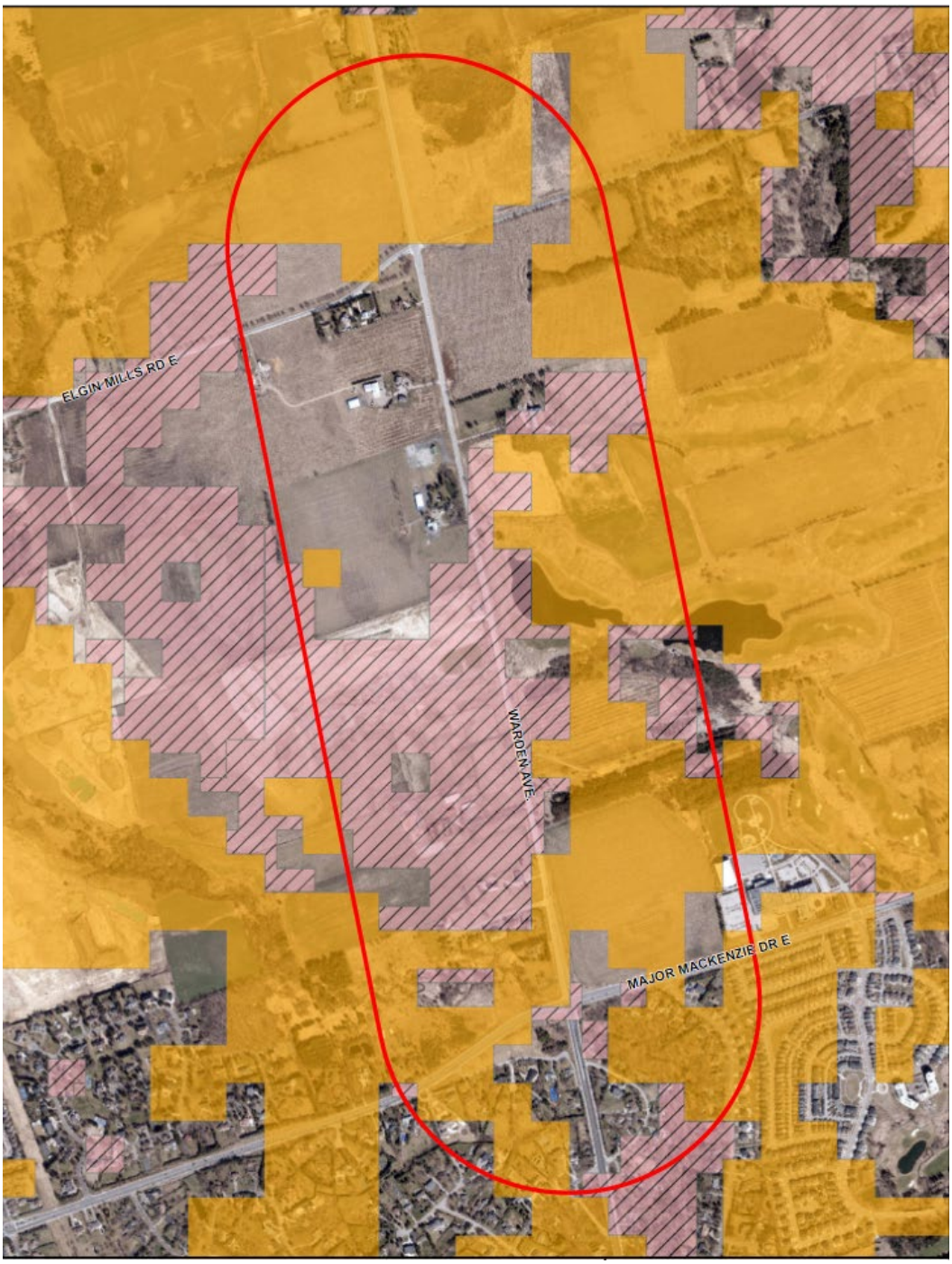
As quality control requirements are generally determined based on drainage area and imperviousness, these will be determined at the design stage, based on preferred road design criteria. Quality controls will be necessary within the ROW if the runoff cannot be accommodated within end-of-pipe facilities, through the use of oil / grit separators (OGS) or LID measures such as bioswales or infiltration trenches.

LID Best Management Practices were examined and design alternatives which have been previously installed as pilot projects in York Region and other municipalities were selected for evaluation for the recommended design concept.

5.6 Source Water Protection

Burnside conducted a Hydrogeological Existing Conditions Review for the Study Area, a copy of which is provided in Appendix L of this report. This report included a review of the source water protection features in the Study Area. The Study Area is located in the Toronto and Region Source Protection Area. Municipal supply for Markham is sourced from Lake Ontario, therefore, there are no wellhead protection areas in the vicinity of the Study Area. Mapping from the MECP Source Protection Information Atlas indicates that the Study Area includes lands mapped as highly vulnerable aquifer and significant groundwater recharge area on Figure 5.1.

Figure 5.1: Vulnerable Areas along Warden Avenue



LEGEND

- STUDY AREA
- Highly Vulnerable Aquifers
- Significant Groundwater Recharge Areas

Sources:

1. Ministry of Natural Resources and Forestry, © Queen's Printer for Ontario
2. Natural Resources Canada © Her Majesty the Queen in Right of Canada.

The surficial soils of the Study Area are generally low hydraulic conductivity, fine grained soils, so the shallow depth to the Oak Ridges Aquifer Complex (ORAC) is the primary reason that the area would be considered to have high vulnerability. Results of site-specific geological and hydrogeological work completed for previous studies suggests that there are some areas where aquifer layers are close to surface within the Study Area; however, a review of water well records indicates that the deeper Thorncliffe Aquifer is the main aquifer used for private well supplies and the shallow sediments of the ORAC are not used extensively.

The Clean Water Act defines a "prescribed threat" as "*an activity or condition that adversely affects or has the potential to adversely affect the quality or quantity of any water that is or may be used as a source of drinking water and includes an activity or condition that is prescribed by source protection regulation as a drinking water threat*."

The province has identified 22 activities that could pose a threat if they are present in vulnerable areas (listed in Section 1.1 of the Clean Water Act, 2006 (Ontario Reg. 287/07). The project activities associated with the road improvements are not identified as a prescribed drinking water threat. The application of road salt is identified as a prescribed drinking water threat.

As such, the improvements to Warden Avenue may represent an indirect potential to impact the quality of water that is or may be used as a source of drinking water as it relates to the application of road salt with winter maintenance; however, the potential impact is not anticipated to be greater than under existing conditions. As such project activities are not anticipated to pose an increased risk to drinking water.

As part of this assessment, Burnside also reviewed Areas of Concern and found no Areas of Concern for groundwater in the Study Area. The nearest Area of Concern is over 3 km northwest of Warden Avenue at Highway 404.

5.7 Fluvial Geomorphology

Beacon completed a geomorphic assessment report for the Study Area to support the EA process. A copy of the geomorphic assessment report is provided in Appendix M of this report. The assessment summarized available background information and confirmed existing conditions for watercourses relevant to the EA to inform the road improvement design process. This background review included a review of relevant federal, provincial and local policies in addition to published subwatershed studies and environmental servicing plans for the Study Area. Background information informed evaluation of geomorphic impacts and associated mitigation measures during construction.

The Bruce Creek tributary (Reach BR2-H15) located north of Berczy Creek was assessed for general morphology and meander belt width to inform future development and road widening. This watercourse is tile drained west of Warden Avenue and flow is

conveyed through an open channel system downstream of the road (east). There is an "enhanced corridor" proposed for the Berczy Glen lands development and the watercourse was considered "contributing habitat" for Redside Dace. The meander belt width was determined as 10 m with a 30 m protected riparian buffer on each side.

Potential impacts to Bruce Creek channel conditions primarily relate to the change in channel form that may be required should a new structure be proposed. Impacts can be determined once detailed design is proposed and the need for additional fluvial geomorphology input to guide the design may be part of the design requirements based on regulatory approvals.

5.8 Geotechnical

Golder Associated Ltd. completed a combined pavement and geotechnical investigation with environment quality testing on the existing conditions to support this EA. A copy of the geotechnical investigation report is provided in Appendix N of this report. This field investigation provided information on the existing pavement structure and subsurface soil and groundwater conditions in the Study Area. Field work included boreholes and a visual pavement condition survey. The report provided pavement engineering and geotechnical recommendations for proposed road improvements, as well as watermain and storm sewer recommendations along Warden Avenue.

5.9 Hydrogeology

Burnside conducted a Hydrogeological Existing Conditions Review for the Study Area, a copy of which is provided in Appendix L of this report. There are three major overburden aquifer systems identified in the Study Area. In the North Markham area, the ORAC tends to be thin and sporadic as the aquifer is pinching off to the south. Within the Study Area, the ORAC has been identified as isolated layers and lenses of sand / gravel and silty sand within 5 m to 15 m below ground surface (Angus Glen MESP and Robinson Glen MESP, 2017). A geological cross-section completed in the Hydrogeological Existing Conditions Review report along Warden Avenue shows a thick layer of fine-grained soils (glaciolacustrine silt and clay and glacial till deposits) at surface, interspersed with lenses and layers of sand of variable thickness and extent. The sand layers are interpreted to be discontinuous lenses of ORAC sediments separated by finer-grained layers of silty sand and silty sand till. Because of the discontinuous nature of the occurrence of ORAC sediments, the aquifer is not interpreted to be expressed in this location.

Properties in the Study Area north of Major Mackenzie Drive still rely on private wells for water supply. Within 500 m of the Study Area, 88 well records are listed as water supply wells. The MECP well records suggest that most of the local private wells tap the Thorncliffe Aquifer (more than 30 m below ground surface) for water supply; however, some shallow wells are completed in the ORAC sediments. The reported well yields are generally considered good and sufficient for typical domestic use with yields ranging

from 0.2 L/s to 15 L/s (2 gpm to 200 gpm). Most of the private wells identified will be decommissioned and residents will be connected to municipal water. Based on review of available MECP data there is only one active Permit to Take Water identified within 500 m of the Study Area, which is associated to irrigation wells located on the Angus Glen Golf Club Ltd. Potential receptors that could be impacted by short-term construction dewatering include private wells and surface water features. It is assumed that impacts to these receptors would be managed through a monitoring and mitigation plan to ensure that receptors are not negatively impacted or that impacts are suitably mitigated and that the plan would be a condition of any permits for dewatering. These impacts are likely to be of short duration restricted to the period during which construction is taking place with the area returning to pre-construction conditions.

Groundwater impacts from agricultural land use is observed in some wells with reported nitrate concentrations ranging from 0.12 mg/L up to 18.5 mg/L. Elevated sodium and chloride has been observed in monitoring wells located near the Study Area with chloride concentrations ranging from 55 mg/L to 361 mg/L and sodium concentrations ranging from 7 mg/L up to 227 mg/L.

5.10 Structural

Burnside completed a summary of the existing structural condition of the vertical ellipse, structural plate corrugated steel pipe culvert (Structure 65-08 C1940) located on Warden Avenue, just south of Major Mackenzie Drive East, a copy of which is provided in Appendix O of this report. The 2020 Ontario Structure Inspection Manual inspection indicated a Bridge Condition Index of 54.01 to this structure and identified it to have several deficiencies of structural concern. Structural defects have resulted in a reduction of the structures load carrying capacity. Defects include global deformations, tears and separation of joints and severe corrosion near the waterline and along the obvert of the culvert. The structural capacity of the structure is reduced and localized repairs are no longer considered cost effective. The recommended action would consist of re-lining or replacement options which both provide the opportunity for widening of the existing roadway.

6.0 Problem and / or Opportunity Statement

The Problem and Opportunity Statement was developed through Phase 1 of the MCEA process, which was completed as part of the 2016 TMP and is supported by the 2022 TMP. The transportation assessment summarized in Section 4.2 supplements the TMP and confirms the need for transportation network improvements. Current analysis of existing and future traffic and development in the Study Area confirmed the problem and opportunity statement as outlined below.

The problem and opportunity statement included the following:

- 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
- Corridor improvements needed to support transit

7.0 Alternative Solutions

7.1 Development of Alternative Solutions by TMP (2016)

The development of the 2016 TMP involved significant community and stakeholder engagement. The TMP identified Warden Avenue between Major Mackenzie Drive to Elgin Mills Road as requiring road improvements. Alternative Solutions were evaluated through the 2016 TMP process which included:

1. Do nothing
2. Optimize existing facility with intersection improvements only
3. Urbanize corridor but maintain two-lane cross-section
4. Widen corridor to four lanes and maintain rural cross-section
5. Widen corridor to four lanes and construct to urban cross-section
6. Widen parallel / adjacent corridor

A preferred solution was selected based on its alignment with the following TMP objectives:

- Support Transit
- Support Road Network
- Support Active Transportation
- Support Goods Movement
- Support Last Mile

The results of the evaluation of alternative solutions are summarized in Table 7.1.

Table 7.1: Alternative Solutions Evaluation Results

	Alternative Solution	Evaluation
1	Do Nothing	Did not address the problem or opportunity statement.
2	Optimize existing facility with intersection improvements only	Provided minor improvements to traffic flow; did not address overall traffic congestion.
3	Urbanize corridor but maintain 2lane cross-section	Did not address traffic congestion; addressed opportunity to improve walking and cycling facilities.
4	Widen corridor to four lanes and maintain rural cross-section	Addressed traffic capacity; did not address opportunity to improve walking and cycling facilities.

	Alternative Solution	Evaluation
5	Widen corridor to four lanes and construct to urban cross-section	Addressed traffic capacity; addressed opportunity to improve walking, cycling and transit facilities.
6	Widen parallel/adjacent corridor	Potential to divert some traffic to other corridors; did not address corridor congestion and provided no improvements to walking and cycling facilities.

Alternative Solution 5, to widen corridor to four lanes and construct to an urban cross section, was identified by the TMP to be carried forward to the phase of the MCEA process, Alternative Design Concepts. The forecasted traffic volume meets the threshold for a four-lane widening and this recommendation included an opportunity to improve walking, cycling and transit facilities. Conversion to an urban arterial standard included curb and gutter, active transportation, streetscaping and transit.

The forecasted 2041 Do Nothing average modelled traffic volume was 2,000 vehicles per hour in the peak direction. This modelled traffic volume resulted in an average volume-to-capacity (v/c) ratio of 1.81. This v/c ratio suggests a road widening is required to mitigate congestion.

With the widening to 4 lanes, the forecasted 2041 average modelled traffic volume was 2,610 vehicles per hour in the peak direction. This modelled traffic volume resulted in an average v/c ratio of 1.36.

The TMP recommended the widening of Warden Avenue to four-lanes and construction to urban arterial standard. The forecasted traffic volume met the threshold for a four-lane widening and this recommendation provided an opportunity to improve walking, cycling and transit facilities. The supplemental analysis confirmed the findings of the TMP and the Preferred Solution moved forward for the development of Alternative Design Concepts.

7.2 Supplemental Analysis to Confirm TMP Findings

Through supplemental transportation analysis in Phase 1 of the EA, the need to widen the corridor to 4 lanes, as recommended in the 2016 TMP (and supported by the 2022 TMP), was confirmed.

This supplemental transportation analysis included a 2041 future conditions traffic assessment which was conducted for the AM and PM peak hours. This assessment was undertaken using a “Do Nothing” scenario where Warden Avenue remained at two lanes. The 2041 v/c ratio was calculated using forecasted traffic volumes. Congested links are assumed to have a volume-to-capacity (v/c) ratio greater than 0.90.

For the AM peak, the 2041 forecasted traffic volume was 2,000 vehicles per hour in the peak direction. This traffic volume resulted in a volume-to-capacity ratio of 2.22. For the PM peak, the 2041 forecasted traffic volume was 1,664 vehicles per hour in the peak direction. This traffic volume resulted in a volume-to-capacity ratio of 1.85. In the AM and PM peak direction, the v/c indicated that Warden Avenue will operate above link capacity. This assessment confirms the need to widen the corridor to four lanes.

8.0 Alternative Designs

8.1 Generation of Alternative Design Concepts

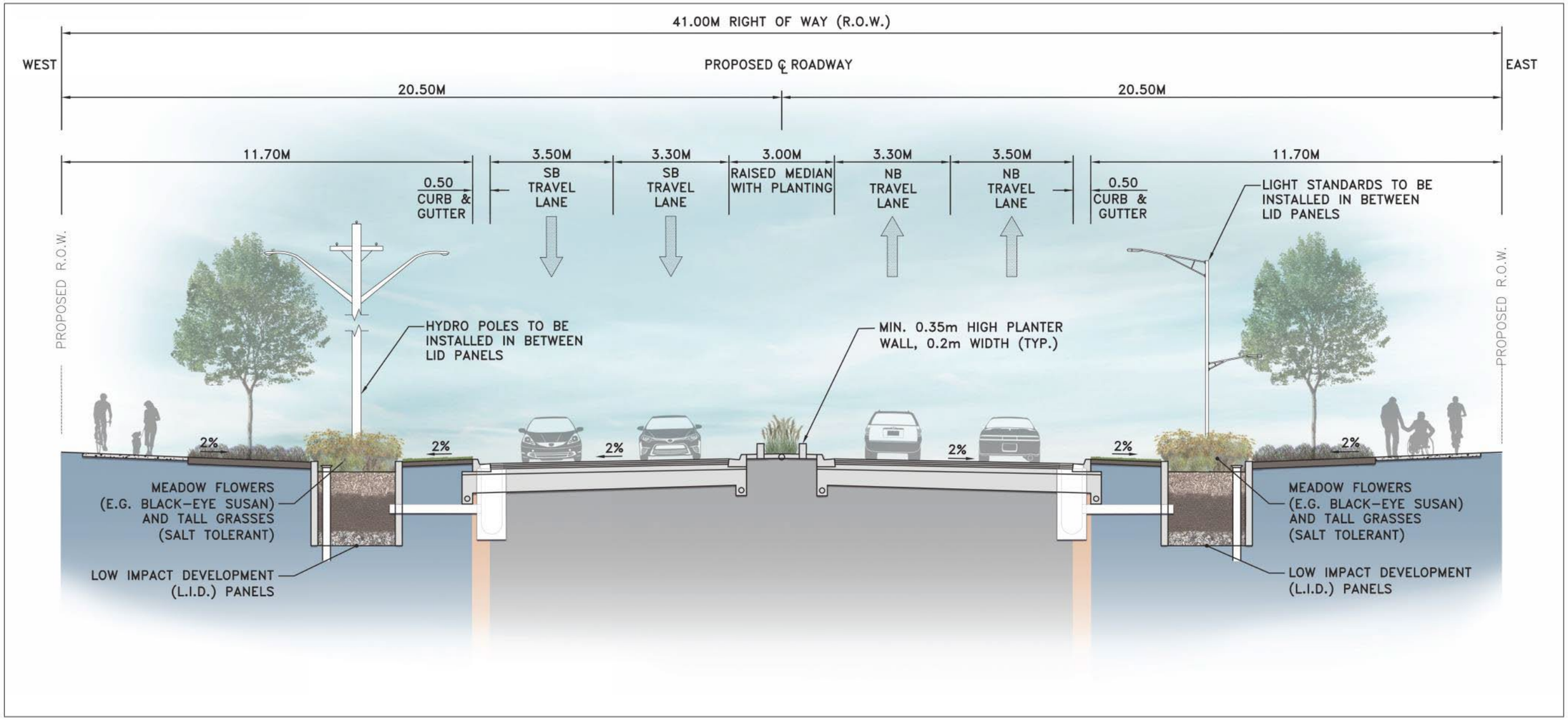
Working within an approved ROW of 41 m, the study team developed three alternative design concepts for Warden Avenue to address the Preferred Solution. Each of the three alternative design concepts contain similar features with varying widths. All three concepts provide two lanes of traffic in each direction, with LID features that will receive and process stormwater runoff from the roadway and active transportation facilities such as a multi-use path or sidewalk, as well as plantings and streetlighting on both sides of the road.

For Alternative Design Concept 1, a 3.0m raised median with shrubs is proposed. Alternative Design Concept 2 includes the same features as Concept 1, except for a 5.0 m wide raised center median with tree plantings instead of shrubs. The boulevard is reduced on each side of the road due to the wider center median. Alternative Design Concept 3 does not include a center median and the boulevard space is larger on both sides of the road to allow further separation between vehicles, pedestrians and active transportation users, which also allows for more planting and larger LID features.

Alternative Design Concept 1, 2 and 3 are illustrated in Figure 8.1, Figure 8.2 and Figure 8.3 respectfully.

After further consideration, a modified Alternative Design Concept 3 including a narrow-marked median, illustrated in Figure 8.5 was carried forward for evaluation with Alternative Design Concept 1 and 2.

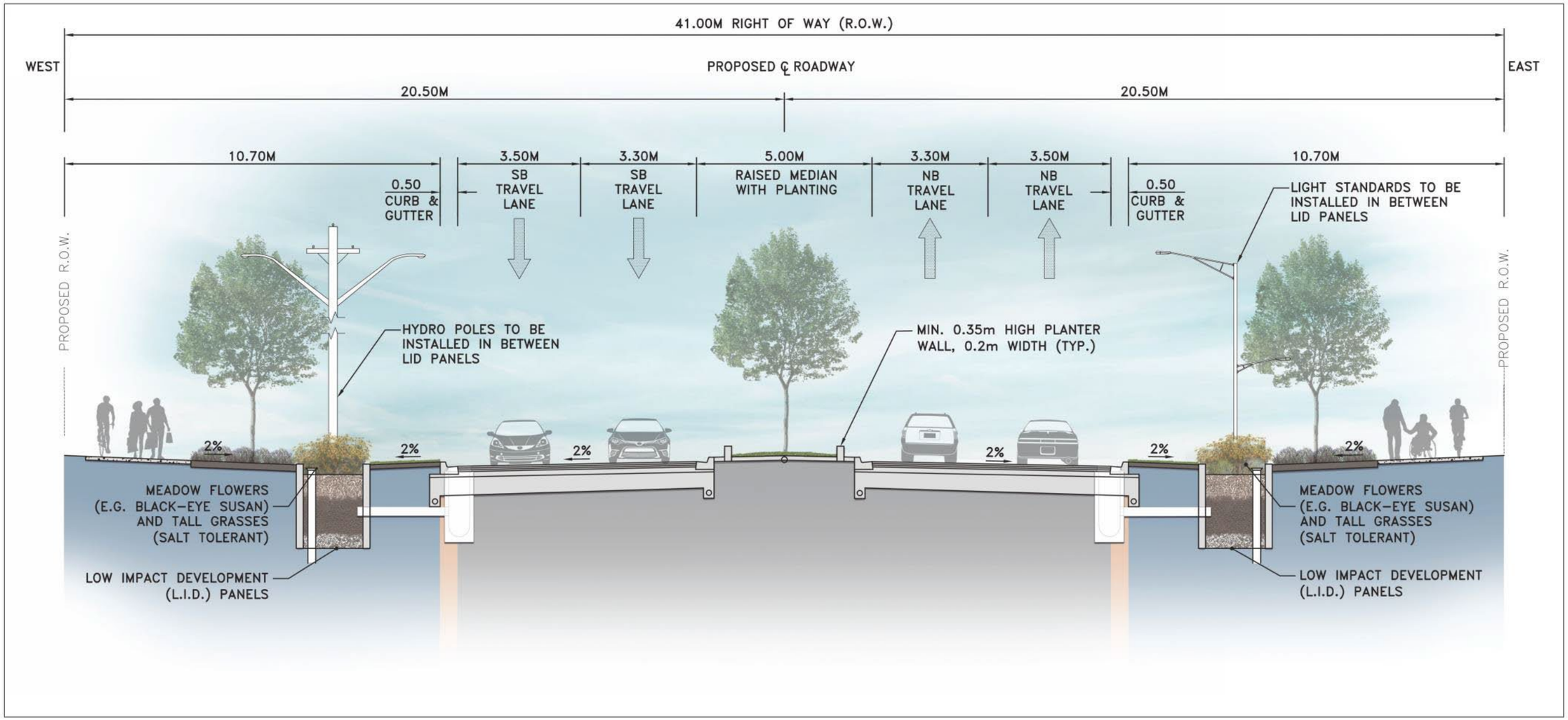
Figure 8.1: Alternative Design Concept 1



WARDEN AVENUE AND KENNEDY ROAD

TYPICAL 4-LANE CROSS SECTION | WITH 3.0M MEDIAN ISLAND

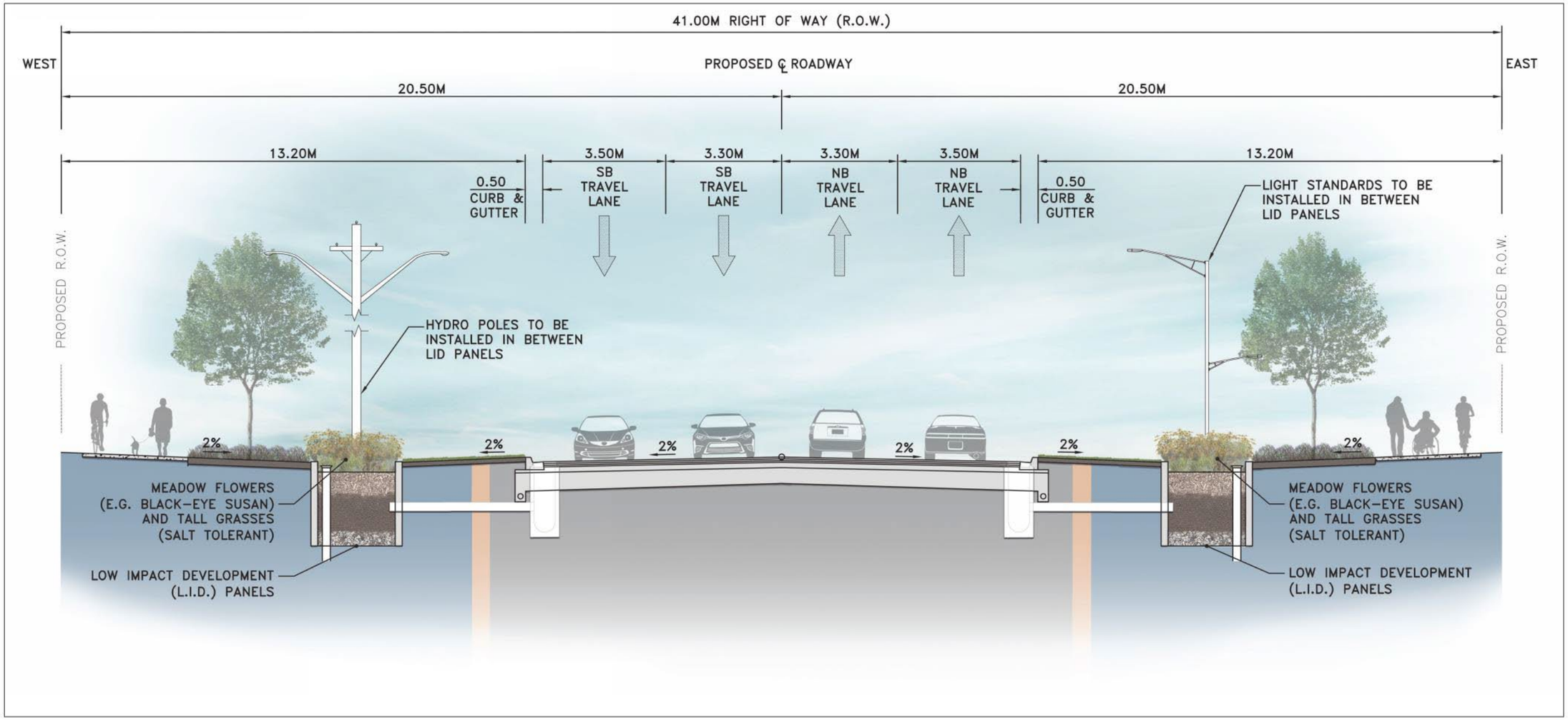
Figure 8.2: Alternative Design Concept 2



WARDEN AVENUE AND KENNEDY ROAD

TYPICAL 4-LANE CROSS SECTION | WITH 5.0M MEDIAN ISLAND

Figure 8.3: Alternative Design Concept 3



WARDEN AVENUE AND KENNEDY ROAD

TYPICAL 4-LANE CROSS SECTION | WITHOUT MEDIAN ISLAND

BURNSIDE

8.2 Analysis and Evaluation of Alternative Design Concepts

8.2.1 Assessment Criteria and Evaluation Methodology

A comparative evaluation was completed for the three design concepts based on a set of evaluation criteria grouped under four major areas / environment areas including: Natural Environment, Socio-Cultural Environment, Engineering Environment and Financial Environment. A list of the evaluation criteria is provided below.

Natural Environment

- Potential impact to vegetation and designated natural features
- Potential impact to wildlife
- Potential impact to aquatic habitat
- Potential impact to species at risk
- Potential impact to water resources and drainage
- Potential climate change impact and resilience
- Potential impact from contaminated sites

Socio-Cultural Environment

- Potential impact to heritage resources
- Nuisance impacts
- Land acquisition needs / Impacts to driveway access
- Conformity to municipal and agency policy
- Connectivity

Engineering Environment

- Level of service / traffic congestion
- Speed management
- Traffic safety
- Design constraints
- Utility impacts
- Constructability

Financial Environment

- Estimated capital costs
- Estimated operation and maintenance costs
- Property acquisition costs

8.2.2 Evaluation of Alternative Design Concepts

The alternative road designs were compared based on an assessment of potential impacts and a review of input received from public and regulatory agencies during the MCEA process. The alternatives were compared to each other based on all criteria under each of the four major environments by applying a ranking from most preferred to least preferred, with a full pie representing the least anticipated impact and therefore most preferred compared to an empty pie representing the greatest anticipated impact and therefore least preferred.

Figure 8.4 provides a summary of the evaluation of alternatives as an average range under each major environment category. A copy of the detailed evaluation is provided in Appendix P of this report.

As noted in Section 8.1, Alternative Design Concept 3 was modified to include a limited marked median (1.0 m median) versus no median as originally envisaged. The addition of a limited marked median was seen as an important feature for traffic safety. The modified Alternative Design Concept 3 was determined as the preferred road design concept through the comparative evaluation of the three design concepts.. It is ranked higher across all four of the environment areas.

Under Natural Environment, Alternative Design Concept 3 receives the highest score due to the potential climate change impact and resilience criteria. The wider boulevard creates an opportunity for increased LID treatment capacity with greater reduction of impacts. Mitigation includes the ability for maintaining impermeable surface area for infiltration.

Under Socio-Cultural Environment, Alternative Design Concept 3 receives the highest score under the Connectivity criteria. The wider boulevard provides the greatest setback from traffic and provides the most comfortable pedestrian environment.

In Engineering Environment, Alternative Design Concept 3 receives the highest score due to the Constructability criteria for which the limited, marked median requires less complex construction staging and traffic management.

For Financial Environment, Alternative Design Concept 3 receives the highest score across all criteria with the lowest capital and operation and maintenance costs.

The preferred design concept for Warden Avenue is illustrated in Figure 8.5.

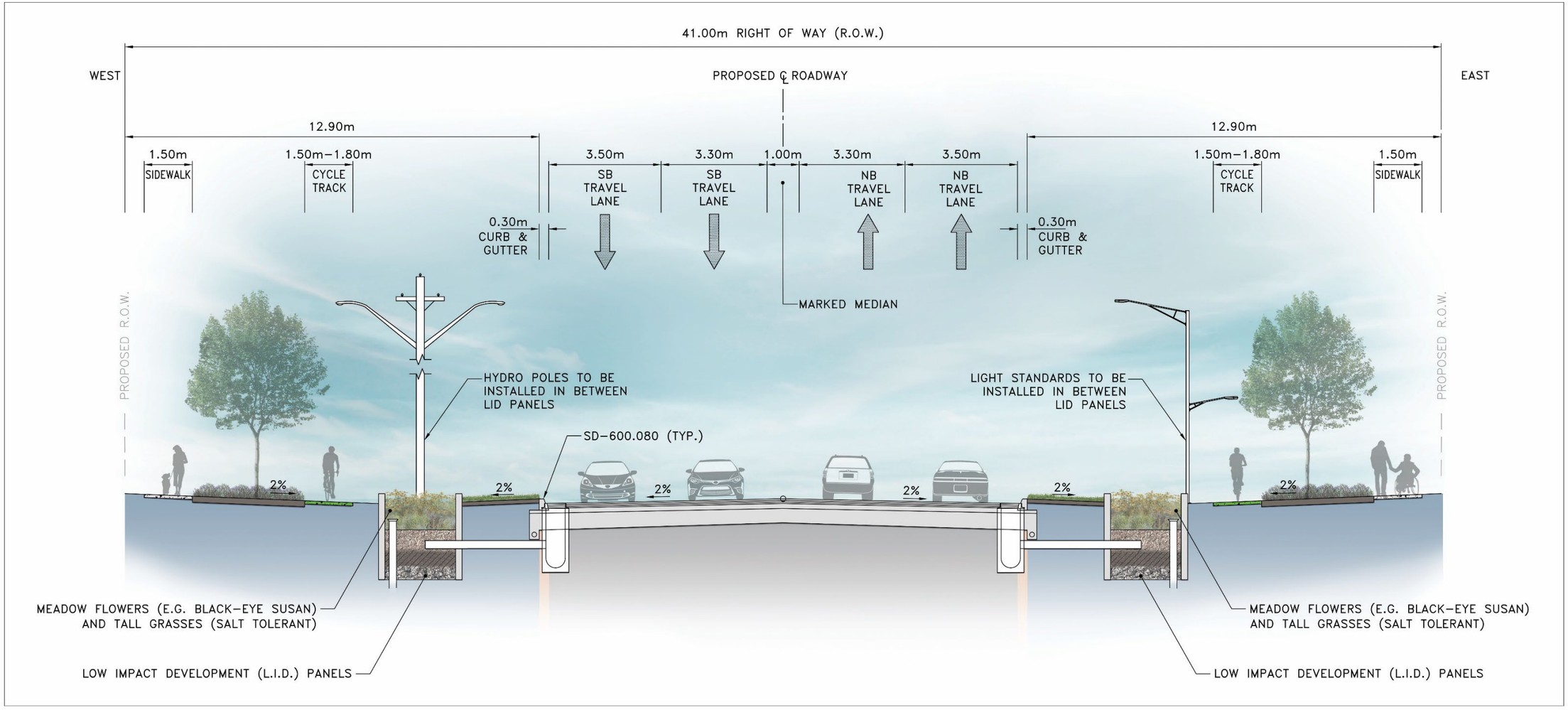
Figure 8.4: Evaluation of Alternative Design Concepts

Criteria for Evaluating Alternatives	Alternative Design Concept 1 Construction of typical 4-lane road with 3.0m median island.	Alternative Design Concept 2 Construction of typical 4-lane road with 5.0m median island.	Alternative Design Concept 3 Construction of typical 4-lane road with limited marked median island.
Natural Environment			
Socio-Cultural Environment			
Engineering Environment			
Financial Environment			
Overall Summary	**More Preferred**	**Least Preferred**	**Most Preferred**

Order of Preference:

Most Preferred  More Preferred  Somewhat Preferred  Less Preferred  Least Preferred 

Figure 8.5: Preferred Design Concept for Warden Avenue



WARDEN AVENUE
PREFERRED ROAD DESIGN CONCEPT CROSS SECTION

BURNSIDE

8.3 Generation of Low Impact Development Options

As part of the assessment of alternative design concepts for Warden Avenue, the study team identified several LID technologies (options) that could potentially be implemented for the roadway. LID options considered included:

- Box trench design
- Vegetated / bioswale design
- Bioretention rain garden design
- Infiltration trenches
- Underground storage tanks

8.4 Analysis and Evaluation of Low Impact Development Options

8.4.1 LID Options Assessment Criteria and Evaluation Methodology

Similar to the evaluation of alternative design concepts, a comparative evaluation was completed for the five LID options based on a set of evaluation criteria grouped under four major areas / environment categories including: Natural Environment, Socio-Cultural Environment, Technical Factors and Financial Factors.

Natural Environment

- Ecological benefit
- Soil permeability
- Impacts to groundwater

Socio-Cultural Environment

- Aesthetics
- Educational opportunities

Technical Factors

- Quality control
- Quantity control
- Erosion control
- Maintenance requirements
- Surface footprint

Financial Environment

- Estimated capital costs
- Estimated maintenance costs
- Life-cycle costs and savings

8.4.2 Evaluation of Low Impact Development Options

The LID options were compared based on an assessment of potential impacts and a review of input received from public and regulatory agencies during the MCEA process. Similar to the evaluation of alternative design concepts, the LID options compared to each other based on all criteria under each of the four major environments by applying a ranking from most preferred to least preferred.

Figure 8.6 provides a summary of the evaluation of alternatives as an average range under each major environment category. A copy of the detailed evaluation is provided in Appendix P of this report.

Option 1: Box Trench Design will be carried forward as the preferred LID concept for Warden Avenue. Although ranked the same as Option 2 overall, Option 1 is preferred over Option 2 as it can achieve a greater degree of pollutant removal, which will reduce impacts to groundwater. In areas with higher groundwater table, Option 2 will be considered as a viable preferred LID concept to Option 1. The Region will continue to explore additional LID options during the detailed design phase of the project where appropriate. Figure 8.5 illustrates the preferred design concept for Warden Avenue showing the preferred LID concept (Box Trench Design). Figure 8.7 illustrates the preferred design concept for Warden Avenue with an optional vegetated swale on the east side of the cross-section instead of the Box Trench for reference and comparison purposes.

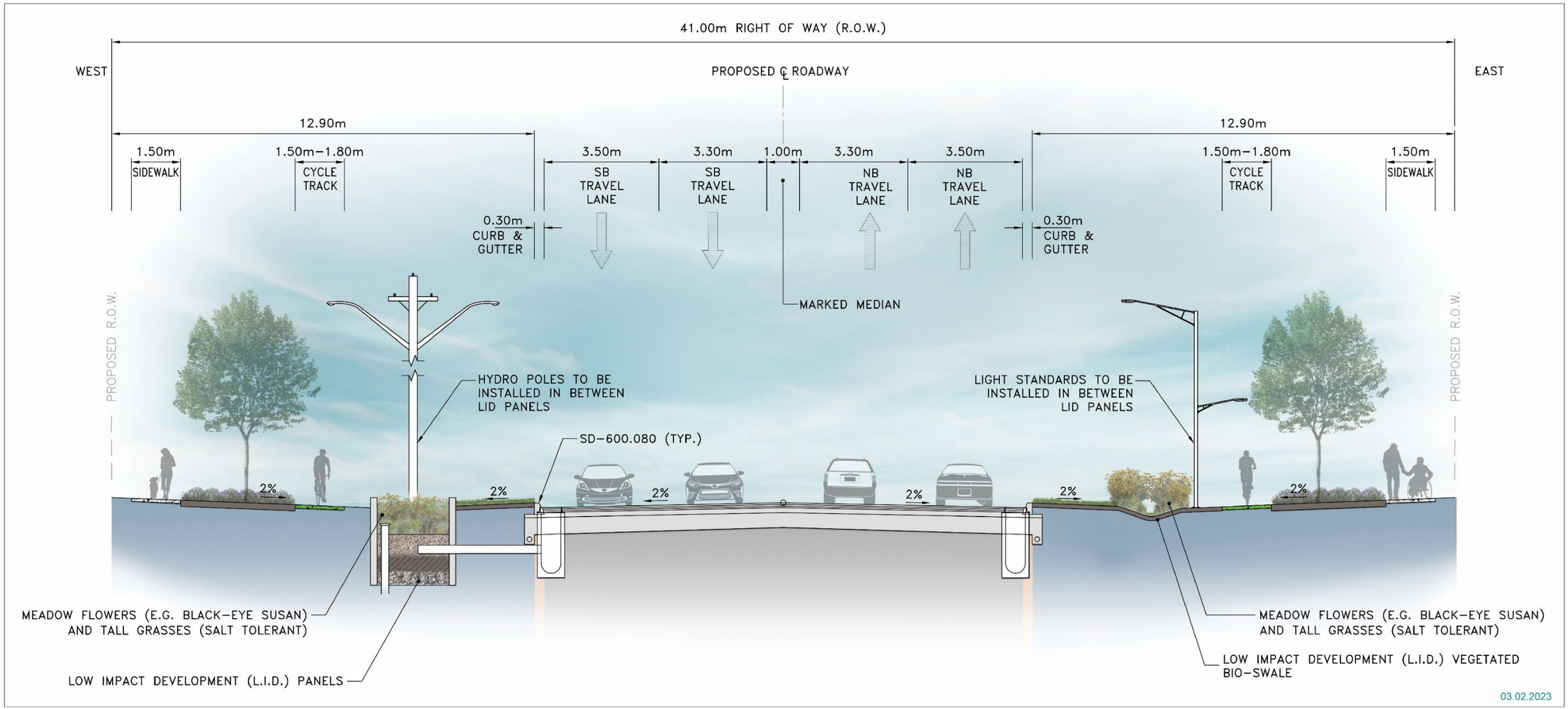
Figure 8.6: Evaluation of Low Impact Development Options

Criteria for Evaluating Alternatives	Indicators	Option 1: Box Trench Design	Option 2: Vegetated / Bio Swale Design	Option 3: Bioretention and Rain Garden Design	Option 4: Infiltration trenches and soak-aways	Option 5: Underground storage tanks
Natural Environment	Ecological Benefit, Soil Permeability, Impacts to Groundwater					
Socio-Cultural Environment	Aesthetics, Educational Opportunities					
Technical Factors	Quality and Quantity Control, Erosion Control, Maintenance, Surface footprint					
Financial Factors	Estimated Capital and Maintenance Costs, Life-cycle costs and savings					
Overall Summary		**Most Preferred**	**Most Preferred**	**More Preferred**	**Least Preferred**	**Somewhat Preferred**

Order of Preference:

Most Preferred  More Preferred  Somewhat Preferred  Less Preferred  Least Preferred 

Figure 8.7: Preferred Design Concept for Warden Avenue with Optional Vegetated Swale LID Feature



WARDEN AVENUE

PREFERRED ROAD DESIGN CONCEPT CROSS SECTION

BURNSIDE

9.0 Phase 3 Technical Studies

9.1 Stormwater Management Assessment

The Stormwater Management, Drainage and Hydrology Assessment Report was completed to develop a strategic approach to SWM that will identify and evaluate existing drainage patterns and traverse culvert and bridge locations, identify potential stormwater runoff quality and quantity impacts to the receiving watercourses from any potential increase in pavement area and propose an appropriate drainage system, transverse culvert and bridge upgrades and a SWM system in conjunction with the proposed road widening to mitigate any potential impacts. A copy of the Stormwater Management, Drainage and Hydrology Assessment Report is provided in Appendix Q.

One watercourse crossing exists within the Study Area, where the Bruce Creek Tributary crosses Warden Avenue approximately 840 m north of Major Mackenzie Drive. This crossing consists of two 600 mm diameter CSP culverts and is regulated by the TRCA with an associated regional floodplain. The crossing of the Bruce Creek tributary coincides with the Greenway System within the Study Area that connects to the Bruce and Berczy Creek PSW. There are additional road crossing culverts that are not associated with watercourses. Visual inspection of these culverts did not identify any condition concerns, or any signs of erosion or scouring.

As a conservative approach, we have assumed the proposed centreline for the road profile will be higher than the existing regional flood elevation and no road overtopping will occur. To maintain the existing regional floodplain elevation, all flows including the regional storm, will be conveyed below the road, through the proposed culvert opening. The proposed model incorporates the raised road centreline and longer culvert to accommodate the proposed road improvements and widening. Through iterations of available culvert sizes, a three-sided rigid frame precast concrete culvert with a 9.144 m span and 1.525 m rise was chosen to provide regional conveyance without increasing the upstream floodplain elevation. The proposed structure allows sufficient cover to the proposed road deck. The wide span three-sided, open-bottom culvert is well suited for creating a naturalized watercourse within the culvert and can also allow for a range of wildlife passage and connectivity of the Greenway system. Any requirements for these considerations will be reviewed and addressed during the Detailed Design phase of the project.

The Preferred Road Design concept results in a 53% imperviousness, across a typical section, however imperviousness increases at the existing and proposed intersections. The imperviousness for each catchment area was calculated based on measurements from the preliminary design plans.

Enhanced quality control is provided for the impervious surfaces through a combination of oil / grit separators and infiltrating LIDs and Stormwater Management Ponds, which

also provide temperature mitigation, erosion control and water balance. Quantity control is provided to reduce proposed peak flows to existing flow rates through underground pipe storage and the Berczy Warden Stormwater Management Ponds 7 and 8.

The minimum erosion control and water balance requirement within the TRCA watershed is retention of the first 5 mm of every rainfall event. The preliminary box trench and vegetated bioswale design indicates this volume can be provided within the infiltration storage for each outlet.

Hydraulic assessment of the existing culvert crossing Warden Avenue provides a Preliminary Culvert Design to confirm hydraulic capacity and demonstrates the anticipated floodplain impacts.

The preliminary SWM measures are designed to mitigate the impacts of the Preferred Design. As the project proceeds, the Design is expected to be refined with the development of additional data and finalized road layout.

The Sustainable Technologies Evaluation Program ('STEP') LID Lifecycle Costing Tool was used to estimate the capital (construction) costs, operation and maintenance costs and overall lifecycle costs associated with the implementation of each of the five LID options evaluated. Infiltration trenches had the greatest lifecycle costs and box trench design and bioretention rain garden design followed. Vegetated / bioswale design and underground storage tanks followed after infiltration trenches, box trench and bioretention rain garden. Bioretention, permeable pavement and infiltration trench LID measures show similar capacity for reduction of TSS in effluent concentration. Infiltration trenches demonstrate greater effectiveness in TSS reduction out of these three LID measures.

9.2 Hydrogeological Assessment

The Hydrogeological Assessment was completed to build on the earlier characterization of existing groundwater conditions in the area of the proposed work and identification of potential hydrogeological impacts from the proposed improvements to Warden Avenue (see discussion of these findings in Section 5.9 of this report) and included an assessment of the dewatering requirements at the regulated watercourse crossing approximately 840 m north of Major Mackenzie Drive. A copy of the Hydrogeological Assessment Report is provided in Appendix R of this report.

An estimate of dewatering volumes required for the installation of a new culvert where the tributary of Bruce Creek crosses Warden Avenue was completed as part of a Dewatering Assessment Report completed by Burnside in December 2021 (Burnside, 2021). Details on the dewatering assessment and assumptions used in the calculations are provided in Appendix D of the Hydrogeological Assessment Report. Based on soils information and an estimated hydraulic conductivity, a maximum

dewatering volume of about 11,300 L/day was estimated with a zone of influence of 11 m (Burnside, 2021). This volume is below the requirement for an Environmental Activity and Sector Registry (EASR) or Permit to Take Water (PTTW).

Based on the hydrogeological conditions of the Study Area, potential receptors that could be impacted by road construction and short-term construction dewatering include private wells and surface water features. These impacts are likely to be of short duration and limited to the period during which actual construction is taking place. After construction it is expected that the area should return to preconstruction conditions as no adverse changes are predicted.

Road construction may impact shallow groundwater wells that are in close proximity to the construction. Potential impacts include the cutting off or removal of sand lenses that contribute to the well or damage to the well integrity due to vibrations or heavy machinery use. It is expected that only shallow wells in close vicinity to the construction may be impacted in this way. There is no water well records mapped within the zone of influence for the watercourse crossing along Warden Avenue. To confirm the potential for construction impacts, the locations of the wells should be confirmed in a well survey conducted within the Study Area to identify any shallow wells near the road widening that could be potentially impacted by the construction. The well survey is recommended to be completed during the detailed design phase of the project. A well interference and reporting protocol should be established before construction that outlines the actions taken should a complaint from a private well owner be received and ensures that a supply of water is provided for the private resident.

The estimated dewatering volumes for the Bruce Creek Tributary crossing are minor and temporary in duration. Impacts to the watercourse are not anticipated.

Additional lanes on the road will result in greater surface area for application of road salt and therefore a greater loading of sodium and chloride to groundwater which may be mitigated in part by the implementation of LID features. Potential impacts to groundwater discharge in wetlands or watercourses at road crossings are not anticipated but can also be mitigated through the use of LID features. Best Management Practices for salt management and construction of service trenches may also help with a reduction in salt loading.

9.3 Air Quality Impact Assessment

The Air Quality Impact Assessment was completed to understand the impacts of the proposed road improvements on local air quality. A copy of the Air Quality Impact Assessment Report is provided in Appendix S of this report. Based on the forecasted 2041 traffic volumes, future predicted air quality levels with and without road improvements were compared to the existing air quality levels to understand the impacts of proposed improvements on local air quality. Air quality modelling for current future

scenarios was completed for contaminants typical of automobile exhaust including Particulate Matter ($PM_{2.5}$ and PM_{10}), Total Suspended Particulates (TSP), Nitrogen Dioxide (NO2), Carbon Monoxide (CO), 1,3-Butadiene, Benzene, Acrolein, Acetaldehyde and Formaldehyde. The current scenario results show the current impact of the local road on selected sensitive receptors. The Future No Build scenario shows emissions due to traffic in the vicinity of the Study Area in the future (2041) without the proposed road improvements. Modelling impacts from local roads were added to the background measurement recorded by MECP for all scenarios to understand the total cumulative effects of the proposed road improvements on local air quality.

The future predicted air quality levels at sensitive receptor locations (residential properties and the Angus Glen Montessori School) with and without the proposed undertaking were below the MECP criteria; therefore, no negative impact is expected due to the proposed project. A potential greenhouse gas emission effect from the proposed road improvement was determined to be insignificant on the regional scale. The total annual emissions are expected to be well below 0.01% of the provincial levels and similarly, the local impact is negligible.

9.4 Noise Impact Assessment

The Noise Impact Assessment evaluated changes to the road traffic noise levels within the Study Area due the road improvements and to determine whether any mitigation measures are required. A copy of the Noise Impact Assessment Report is provided in Appendix T of this report. The assessment determined that no significant increases to traffic noise are expected because of the project. Therefore, the impact on receptors will not increase due to the redesign of the road.

The traffic data relied upon was provided by York Region. This report presents the results of road traffic noise impact assessment conducted using STAMSON, the MECP road traffic noise calculation program. The assessment used four Points of Reception (POR) at the plane of window on the most exposed side of the dwelling. All four PORs also had a corresponding Outdoor Living Area location. Modelled noise levels were calculated for two scenarios: Start of Construction Year, Mature State of Development. The Mature State Build scenario represents conditions with the proposed roads improvements. The results of this assessment for each of the scenarios were compared to criteria in York Region's Traffic Noise Mitigation Policy ('TNMP') (2006) which is supported in the York Region Standard Operating Procedure for Noise ('SOP') to determine whether the potential increase or the magnitude of the noise levels due to the Mature State Build scenario would merit mitigation measures under the regional procedure. The traffic noise was assessed up to the mature state of development in the year 2041. The planned future road centerline is not proposed to change from the existing centerline.

Although exceedances above the TNMP criteria of 60 dBA were found for receptors along the Warden Avenue alignment, standard mitigation options of acoustic barriers at the property lines for the exceeding PORs are not recommended following the terms of the SOP.

9.5 Contamination Overview Study

The Contamination Overview Study evaluated each individual property ('Site') within the Study Area to provide an understanding of the potential environmental liabilities and risks. A copy of the Contamination Overview Study Report is provided in Appendix U of this report. While the Contamination Overview Study combines the approach of a Ministry of Transportation (MTO) contaminant overview study with components of the reporting structure for a Phase One Environmental Site Assessment ('ESA') in Ontario Regulation 153/04, Schedule D, potential risk determined does not represent the findings and conclusions of conducting a full Phase One ESA.

Table 9.1 lists the applicable categories of environmental concern and related Contamination Risk Score (CRS) results along with the number of Sites that were identified in each. Each Site was evaluated using a risk matrix based on Site characteristics and potential risk factors. Phase One ESAs are recommended for Sites identified as Low Environmental Concern. Sites identified as Medium Environmental Concern are recommended Phase One ESAs and Phase Two ESAs. Sites identified as High Environmental Concern are recommended Phase One ESAs to identify details and specific locations of contaminant sources as these Sites generally have a contaminant source identified. Additionally, Phase Two ESAs are recommended to include delineation sampling around and beneath locations where potential sources of contamination were identified by the Phase One ESA.

Table 9.1: Potential Risk of Environmental Concern Categories

Potential Risk of Environmental Concern	Number of Sites
High Environmental Concern (CRS greater than 70)	1
Medium Environmental Concern (CRS 45 to 70)	3
Low Environmental Concern (CRS 35 to 45)	10
No Environmental Concerns Identified (CRS less than 35)	16
Total Sites	**30**

10.0 Description of the Recommended Design Concept

This section provides and overview of the key features of the recommended design concept plans for Warden Avenue corridor improvements that were developed based on the needs of the Study Area and feedback received from members of the public and stakeholders throughout the EA Study process.

The preliminary design plans for the preferred design concept are provided in the Drawings section of this report.

10.1 Design Criteria

The Warden Avenue widening should be designed and constructed per the current York Region, Transportation Association of Canada, City of Markham and Ontario Provisional Standards. The design criteria for the Study Area are summarized Table 10.1.

Table 10.1: Design Criteria

Proposed Standards	Value
Posted speed	60 km/hr
Design speed	60 km/hr
Vertical curve	crest curve K = 11 sag curve K = 9
Maximum grades	6.0%
Inside travel lane	3.3 m
Outside travel lane	3.5 m
Right turn lane	3.5 m
Left turn lane	3.3 m
Left turn taper	15:1 per Transportation Association of Canada Table 9.17.1
Median width	1.0 m wide painted median
Cycle track	1.5 m minimum
Sidewalk	1.5 m per City of Markham Standards
Minimum boulevard widths	2.7 m boulevard, 3.5 m tree planting boulevard
Low Impact Development	3.1 m minimum
Entrance radius minimum	5.0 m residential, 9.0 m commercial
Entrance width minimum	N/A

10.2 Road Cross Section

A typical cross-section has been developed for Warden Avenue between Major Mackenzie Drive and Elgin Mills Road. The key elements of the cross section

include widening the road to a four-lane urban cross section including the addition of sidewalks, cycle tracks and LID features.

The preferred typical cross-section for Warden Avenue as illustrated in Figure 8.5 and includes the following elements:

- 41 m proposed ROW
- Four travel lanes (two in each direction)
- A 1.0 m painted median
- A modified 0.3 m wide curb and gutter
- 2.7 m wide boulevard (opportunity for tree planting between LID features and active transportation facilities or sidewalks, if trees are offset minimum 2.8 m from back of curb)
- Streetlighting within the boulevard
- 3.1 m low impact development (LID) area
- 1.5 m wide cycle tracks
- 3.5 m wide tree planting boulevard
- 1.5 m wide sidewalks

Where possible, grading will be maintained within the proposed ROW. In areas where grading will extend beyond the proposed ROW, grading easements may be required.

10.3 Horizontal Alignment

Warden Avenue will be widened mostly along the west side of the ROW, shifting the existing centerline of the road to the west to avoid the need for additional property along the east side of the ROW, which has already been dedicated to the Region.

10.4 Vertical Alignment

The proposed profile of Warden Avenue will generally be raised between 0.3 m and 1.0 m to improve drainage along the corridor and accommodate the new storm system. The vertical alignment generally follows the existing road profile with adjustments proposed at some locations to address deficiencies and to meet minimum requirements per the design criteria identified in Section 10.1.

The proposed road profile is illustrated on the preliminary design drawings in the Drawings section of this report.

10.5 Intersection Design

Intersections have been designed in accordance with AODA standards, the intersections have been designed to balance movement of all road users, including pedestrians and cyclists.

Existing signals are present at the Major Mackenzie Drive and Elgin Mills Road intersections. All new intersections within the Study Area were assessed for signalization. Proposed signalized intersections include E-W1, E-W2, N-S2 and E-W3 based on the approved Collector Roads EA locations and in discussion with the developers.

Minimum storage lengths were based on the traffic analysis. Taper lengths were designed based on the Region's Intersection Design Standard Drawings (2023), which is consistent with the Transportation Association of Canada Guidelines.

The traffic analysis and more information regarding the taper length design are documented in Appendix V of this report.

Details regarding intersection design are to be completed during the detailed design phase of the project.

10.6 Cycling and Pedestrian Facilities

Proposed active transportation facilities on Warden Avenue consist of a continuous 1.5 m sidewalk and a separate 1.5 m minimum (preferred to be 2.0 m) wide cycle track on both sides of the road. In areas where the corridor is constrained, the boulevards separating the facilities will be reduced. The final cycling and pedestrian facility will be determined in consultation with the City of Markham and York Region Forestry team to balance tree planting, LID treatments, cycle track and other requirements within the boulevard.

In general, the proposed sidewalk is located as close to the property line as possible to provide opportunity for tree planting within the boulevard separating the sidewalk and cycle track, this space is a minimum of 3.5 m wide. The cycle track is separated from the roadway by a 3.1 m LID feature and a 2.7 m wide boulevard behind the proposed curb to allow for snow storage. The material type for the cycle track will be determined during the detailed design phase of the project; however, the City of Markham has indicated a preference of concrete. The Region will explore opportunities to use porous asphalt for the cycle track with the City of Markham during the detailed design phase of the project to optimize infiltration.

Where feasible, protected intersections will be reviewed during the detailed design phase of the project. Currently a bend-in / bend-out design was integrated into the preliminary design plans.

10.7 Transit Considerations

Transit will service the Study Area, provisions for future bus landing zones have been accommodated along the corridor. Further coordination with YRT will be required during the detailed design phase of the project. Further consideration with the placement of the

cycle track in relation to the proposed bus landing zones will be reviewed in the detailed design phase of the project.

10.8 Streetscaping

The proposed cross section gives space for a 3.5 m planting buffer located between the proposed sidewalk and cycle track. This planting buffer will be supported with the installation of Engineering Growing Media for tree planting. Where the cross section permits, there is an opportunity for additional tree planting in the boulevard between the curb and low impact development (LID) feature.

In addition to opportunities for tree planting, an LID planting feature will be installed along the corridor to improve water quality control. The planting feature will contain local low-rise native woody and herbaceous plant material and grasses supported and tested by the Conservation Authority. These proposed plant materials shall be flowering to offer seasonal visual aesthetics along the roadway and opportunity for supporting habitat and insect pollinators.

The preliminary scrubbing and capture of roadway debris and insoluble solids should be the initial capture along the surface of the grass areas along the back of curb along the transportation corridor. Once the surface water enters the LID infrastructure, the designed organic stratification that mimics natural soil and subgrade act as natural filters to capture and digest fine pollutants before it enters the natural ground water table to recharge our regional aquifer system. The native plant material installed in these LID systems should act as natural filters and digesters collecting and mitigating roadway pollutants from entering the natural groundwater systems.

Other enhancements to the cross section will include architectural detail to bridge structures, railings, plaques, architectural finishes, columns, pilasters, lighting and accent lighting, coloured concrete splash pads, planted center medians (if applicable) and unit paver medians.

York Region’s Forestry is currently undertaking a pilot project implementing LID features. During detailed design, York Region’s Forestry should be consulted to determine appropriate LID design.

10.9 Culverts and Structures

The final design will include installation of catch basins and storm sewers to convey runoff to existing outlet locations. The catchment areas will generally remain the same. Oil / Grit Separator (OGS) units will be installed at each outlet location, including the at the Major Mackenzie Drive outlet and the Bruce Creek outlet and will provide a level of stormwater quality control that replaces the stormwater quality function of the existing roadside ditches. The detailed design will confirm the models and locations of the OGS

units and will demonstrate how each unit meets MECP and Environmental Technology Verification criteria.

Oversized underground pipe is proposed in the preliminary design and is considered to provide quantity control storage. At the detailed design phase of the project, other storage options or configurations may be considered, such as underground storage tanks and additional surface storage within the proposed box trench LID features may be utilized for quantity control.

The existing culvert crossing located approximately 840 m north of Major Mackenzie Drive intersection will be replaced with a structural culvert that spans the entire width of the proposed road. As a conservative approach, we have assumed the proposed centerline will be higher than the existing Regional flood elevation and no road overtopping will occur. To maintain the existing Regional floodplain elevation, all flows including the Regional storm, will be conveyed below the road, through the proposed culvert opening.

Through iterations of available culvert sizes, a three-sided rigid frame precast concrete culvert with a 9.144 m span and 1.525 m rise was chosen to provide regional conveyance without increasing the upstream floodplain elevation. The proposed structure allows sufficient cover to the proposed road deck.

A General Arrangement Drawing for the proposed structural culvert is provided in the Drawings section of this report. The proposed structural culvert will span over the proposed 750 mm diameter watermain (to be installed by others) on the west side of the Warden Avenue ROW. Clearance between the watermain and structural culvert footings will need to be confirmed during the detailed design phase of the project in consultation with the adjacent developments.

The culvert crossing design for a widened Warden Avenue is within recommended wildlife passage specifications for amphibian and reptile guidelines as outlined within TRCA's Crossing Guideline for Valley and Stream Corridors (2015) and MNRF's Best Management Practices for Mitigating the Effects of Roads on Amphibians and Reptiles Species at Risk in Ontario (2016) while having regard for TRCA's Living City Policies. Additional features such as substrate, moisture, light and placement of drift fences to direct target species to the passage will be further developed during the detailed design phase of the project.

10.10 Access

The preferred design concept maintains access to existing entrances and driveways, at intersections where a median is proposed, right in only turns to the driveway will be required.

Driveways along the corridor will be graded to accommodate the proposed road improvements, these details will be confirmed at the detailed design phase of the project.

During construction temporary impacts to driveways is expected, advance notification to property owners will be given before any anticipated access impacts.

10.11 Property Requirements

Property will be required along the corridor to accommodate the proposed road widening to a 41 m ROW, based on York Region's OP. Additional land may be acquired to accommodate intersection requirements.

Although the proposed design attempts to minimize grading impacts, there will be a need to acquire grading easements to accommodate grading that extends beyond the Regional ROW. Temporary grading easements are illustrated on the preliminary design plans provided in the Drawings section of this report.

10.12 Utilities

A Subsurface Utility Engineering Quality Level B Investigation was completed by MultiVIEW Locates Inc. in June 2020.

Generally, the utilities (hydro, communications and gas) are not in conflict with the proposed road improvements. Due to the proposed grade changes along the corridor, during the detailed design phase of the project, any potential conflicts with utilities should be reviewed and if a conflict with an existing underground utility is suspected, daylighting of the utility should be completed to confirm the location.

Coordination with all utilities that exist along the corridor will be required during the detailed design phase of the project to ensure protection of existing facilities and minimize utility relocations and disruptions to service.

Alectra is proposing new locations for hydro poles along the Study Area to facilitate the adjacent subdivision development. Further coordination during the detailed design phase of the project will be required to mitigate any potential conflicts with the proposed design.

10.13 Preliminary Cost Estimate

Based on the preliminary cost estimate, the cost of the recommended improvements is estimated at approximately $26.2M. The preliminary cost estimate includes costs for road work, LID feature installation, addition of traffic signals, culvert replacement, landscaping, traffic control and engineering services. Items that have been excluded from the estimate include property acquisition and utility relocation.

Any cost-sharing with the City of Markham (potentially including sidewalk, landscaping, cycle tracks and illumination) will be confirmed during the detailed design phase of the project.

A breakdown of preliminary costs is included in Table 10.2. These costs are preliminary and based on the conceptual design and will need to be confirmed and reviewed during the detailed design phase of the project.

Table 10.2: Preliminary Cost Estimate

Item	Description	Amount
1	General	$1,140,000.00
2	Removals	$1,150,000.00
3	Road	$7,432,500.00
4	Storm	$5,354,500.00
5	Streetscaping	$2,671,800.00
6	Electrical	$2,396,000.00
	Total Items 1 – 6	**$20,144,800.00**
Contingency (30%)		$6,050,000.00
	Construction Total	**$26,194,800.00**

10.14 Constructability, Staging and Detouring Considerations

Construction staging for Warden Avenue will strive to maintain one lane of traffic in each direction. Due to the nature of the work and grade changes, short-term local road closures will be necessary and will be permitted during off-peak hours. In areas where profile grade changes are greater than 1 m and where the corridor is constrained and it is not possible to shift traffic to accommodate one lane of traffic in each direction further review of construction staging is to be considered, as there may be a need to close the road to through traffic temporarily. Opportunities to shift traffic to the east or west and stage the work to accommodate temporary or proposed lanes of travel are to be considered, limitations to this would be existing utility poles.

The Region will mitigate impacts to traffic disruption and delays as much as possible. During the detailed design phase of the project, a traffic management plan will be developed to detail how traffic and pedestrian access will be accommodated during construction and how access to existing properties will be maintained.

The assessment of construction staging options should be further investigated during the detailed design phase of the project as part of the staging plan.

11.0 Potential Environmental Effects, Mitigation and Future Commitments

The potential environmental effects associated with construction, operation and maintenance of the proposed road improvements within the Study Area have been identified and are summarized in Table 11.1 below. Proposed measures to mitigate these effects are also provided in the table. All mitigation measures, which include commitments to be satisfied during the detailed design or construction phases of the project will be reviewed and confirmed during the detailed design phase of the project.

Table 11.1: Potential Environmental Effects and Mitigation Measures

Environmental Component	Environmental Sub-Component	Potential Environmental Effects	Proposed Mitigation Measures and Future Commitments
Natural Environment	Trees and Vegetation	Loss of trees and vegetation. Trees adjacent to the ROW may be subject to impacts within the rootzone from grading and other construction activities.	• Minimize disturbance to existing vegetation. Adjust grading prior to construction to reduce impacts to trees by increasing the steepness of slopes in isolated locations, where feasible. • Disturbed areas shall be stabilized and re-vegetated with an appropriate seed mix upon project completion and restored to a pre disturbed state where practical. An appropriate seed mix will be selected based on consultation with the appropriate reviewing agency (TRCA). • Erosion and Sediment Control (ESC) measures shall be developed during the detailed design phase of the project and installed prior to commencement of any grading or vegetation disturbance. • An Arborist Report and associated tree inventory and tree protection plan, including removals, will be developed during the detailed design phase of the project once the final grading limits and vegetation removals are known. Protection measures (e.g., tree protection, erosion and sediment control) are recommended where construction is proposed to protect trees from grading impacts and when adjacent construction is occurring to prevent access, stockpile and storage within the adjacent vegetation communities. • A certified arborist should carry out or oversee the mitigation of any impacts to trees, including proper pruning techniques (crown or root) throughout the construction period and before contractor demobilization. • An Environmental Inspector shall be engaged during the construction phase to review ESC measures that will also act as tree protection measures for deficiencies. The Environmental Inspector will identify all deficiencies and ensure the Contractor will address the deficiencies.
Natural Environment	Wildlife and Wildlife Habitat	Temporary displacement of and disturbance to wildlife and wildlife habitat during the construction phase (e.g., vegetation removals, noise disturbance).	• The footprint of the proposed disturbed area shall be minimized as much as possible. • Avoid vegetation clearing during sensitive times of the year for local wildlife, such as spring and early summer (when many animals bear their young or migrate between wintering and summer habitats). • To reduce the risk of potential impact to wildlife, including SAR, vegetation clearing should not be completed between April 1 to October 31 to avoid the active period for the following: – Breeding birds – Broadly from April 1 to August 31 for most species (regardless of the calendar year). Active nests (nests with eggs or young birds) of protected migratory birds cannot be destroyed at any time of the year. – Bat species – Considered to be between April 1 to October 31, of any calendar year. • Temporary silt fence barriers are recommended to exclude wildlife (i.e., amphibians and reptiles) from the earthwork and construction activities in areas adjacent to low-lying areas. Temporary exclusion fencing shall be installed to allow wildlife to leave the fenced area during vegetation clearing. Once the work area has been cleared, it can be securely fenced to prevent wildlife from returning. The excluded area shall be searched immediately following fencing installation for any wildlife that may have become trapped. Any wildlife shall be permitted to escape, to a suitable habitat. • If a nesting migratory bird or SAR protected under ESA is identified within or adjacent to the construction site and the activities are such that continuing works in that area would result in a contravention of the MBCA or ESA, all activities shall stop and the Contract Administrator (with assistance from an Avian Biologist) shall discuss mitigation measures / with the Region. • Should SAR be identified, all activities shall stop and MECP, responsible for administering SAR under the ESA, shall be contacted immediately to ensure compliance with the ESA. The Contract Administrator shall instruct the Contractor on how to proceed based on the mitigation measures established through discussions with the Region, the MECP and / or Environment Canada. • An Environmental Inspector shall be engaged during the construction phase to review ESC measures that protect adjacent natural features and prevent certain wildlife such as reptiles and amphibians from entering the work zone. The Environmental Inspector will identify all deficiencies and ensure the Contractor will address the deficiencies.

Environmental Component	Environmental Sub-Component	Potential Environmental Effects	Proposed Mitigation Measures and Future Commitments
Natural Environment	Wildlife and Wildlife Habitat	Vegetation clearing within the widened ROW may impact select trees with potential roosting habitat for SAR bats.	If avoidance of individual candidate bat habitat trees is not possible in areas of potential impact as a result of the design, additional surveys to assess the presence of SAR bats are required, in consultation with the MECP. Acoustic sampling should be employed to determine presence or absence of species at risk Bats. If present, acoustic sampling will help to determine species, relative abundance and type of permissions required.
Natural Environment	Wildlife and Wildlife Habitat	Works associated with the road improvements may limit wildlife movement and reduce useable habitat during and following the construction phase.	Consideration will be given during the detailed design phase of the project to facilitate wildlife passage utilizing the culvert crossing design for a widened Warden Avenue to reduce road mortality for reptiles and amphibians and enhance habitat connectivity of the Greenway System in the Study Area. The culvert crossing design for a widened Warden Avenue is within recommended wildlife passage specifications for amphibian and reptile guidelines as outlined within TRCA's Crossing Guideline for Valley and Stream Corridors (2015) and MNRF's Best Management Practices for Mitigating the Effects of Roads on Amphibians and Reptiles Species at Risk in Ontario (2016) while having regard for TRCA's Living City Policies. Design details should be coordinated with MECP and TRCA during the detailed design phase of the project to confirm specifications and additional features such as substrate, moisture, light and placement of drift fences to direct target species to the passage in accordance with applicable guidelines.
Natural Environment	Fish and Fish Habitat	The replacement of the culvert crossing of Bruce Creek Tributary may result in impact to fish and fish habitat, including contributing habitat for SAR Redside Dace through sediment mobilization and modification to the road embankments during construction.	• A request for project review should be submitted to the DFO. • Redside Dace and its habitat are protected under the Endangered Species Act, 2007. Under Ontario Regulation 242/08, provision is made for activities that are likely to kill, harm, or harass Redside Dace or damage or destroy of the habitat of Redside Dace without requiring a permit, provided a number of requirements are met (including the work area being under 300 m2, not increasing the footprint by more than 25%, working in the timing window of July 1st to September 15th), as outlined O. Reg. 242/08, s. 23.4. If the requirements set out in O. Reg 242/08 cannot be met, an overall benefit permit from MECP may be required impacts to Redside Dace habitat. The Region will be required to secure necessary approval prior to alteration to Redside Dace contributing habitat. • The timing for in-water works for culvert replacement in Redside Dace contributing habitat is July 1st to September 15th, to be confirmed with the MNRF during the detailed design phase of the project. The duration of in-water work is to be minimized to the greatest extent possible. • Overflow from proposed LID features in the study area is directed to other SWM facilities during large rain events, such as O&G separators as well as adjacent SWM ponds on development lands and then discharged to a watercourse that is considered contributing habitat for Redside Dace. As such, SWM facilities in affected areas should attempt to have outflow temperatures less than 24°C, dissolved oxygen levels above 7 mg/L, TSS levels less than 25 mg/L above background conditions, as per the Guidance for Development Activities in Redside Dace Protected Habitat (MNRF, March 2016). • Work zone isolation shall be performed for in-water works while maintaining flow downstream. Cofferdams constructed of clean, non-erodible materials shall be constructed upstream and downstream of the works area to isolate it. Downstream flows should be maintained through pumping, or a by-pass culvert and the isolated work area should be dewatered. All pump intakes must be screened to prevent the entrainment of impingement of fish. A fish salvage is required prior to commencement of in-water works and following any subsequent flow events that overtop the cofferdams to mitigate the death of fish. A license to collect fish must be obtained from the MNRF. • ESC shall be installed throughout the work area to prevent sedimentation of the watercourse or other sensitive features present. Inspection of the ESC measures is recommended during construction to ensure that they protect the watercourse. Implementation of the ESC measures shall conform to recognized standard specifications, such as Ontario Provincial Standards Specification (OPSS) and the requirements of the TRCA. • Post construction, the disturbed area of the watercourse shall be restored with a mix of suitably sized round stone and native substrate placed through the culvert and at the inlet and outlet. Angular stone is not to be placed below the annual high-water mark. • The embankments disturbed above the annual highwater mark shall be restored with erosion control blankets, topsoil and dressing and plantings where appropriate.

Environmental Component	Environmental Sub-Component	Potential Environmental Effects	Proposed Mitigation Measures and Future Commitments
Physical Environment	Surface Water	Potential for erosion hazards	At the detailed design phase of the project, a fluvial geomorphologist will be engaged to look at the proposed crossing on Warden Avenue (approximately 840 m north of Major Mackenzie Drive) and determine if it complies with TRCA requirements for morphology. The fluvial geomorphology investigation at detailed design shall determine 100-year erosion limits, in addition to the meander belt, to inform the sizing of the proposed hydraulic structure.
Physical Environment	Surface Water	Potential for localized water quality impacts as a result of spills and sediments entering a watercourse due to the following project activities: • Stockpiling • Excavation • Construction	• The footprint of disturbed area should be minimized as much as possible; for example, vegetated buffers and setbacks should remain untouched adjacent to the watercourse wherever possible. • All equipment and personal protective equipment must arrive on-site clean to prevent the potential transfer of invasive species (e.g., *Phragmites australis*) to the local environment. • Implementation of the erosion and sediment control measures should conform to recognized standard specifications, such as OPSS and the requirements of the TRCA. ESC measures (e.g., silt curtains, silt fence, rock check dams, etc.) shall be installed and maintained during the work phase, until the site has been stabilized. Control measures shall be inspected daily to ensure they are functioning and shall be maintained as required. If control measures are not functioning properly, no further work shall occur until the problem is resolved. • In-water operation of heavy equipment shall be avoided and operation on the banks of a watercourse will be minimized to the extent feasible. Wherever possible, machinery should be operated above the high-water mark. • Stockpiled material shall be stored and stabilized at least 30 m from the watercourse. All materials and equipment shall be operated and stored in a manner that prevents any deleterious substance (e.g., petroleum products, silt, etc.) from entering adjacent natural features. • All equipment fueling and maintenance shall occur at least 30 m from the watercourse to ensure that no deleterious substances enter the waterway. • The Contractor shall be required to develop spill prevention and contingency plans for construction and operational phases of the project. Personnel shall be trained in how to apply the plans and the plans will be reviewed to strengthen their effectiveness and ensure continuous improvement.
Physical Environment	Soil and Groundwater	Potential for localized groundwater quality impacts as a result of spills during construction.	• Refueling of equipment and fuel storage shall be conducted in designated areas at least 30 m away from the watercourses and any existing wells. • The Contractor shall be required to develop Spill Prevention and Contingency Plans for construction and operational phases of the project.
Physical Environment	Soil and Groundwater	Potential dewatering of the work area may be required. Potential reduction of baseflow in watercourse downstream of dewatering zone of influence.	• Geotechnical conditions should be reviewed when Design Details are known, including final grading and when service inverts are available. • The geotechnical report shall fully assess groundwater conditions and dewatering requirements and the need for Site Specific Hydrogeological Site Assessment and application for a PTTW or EASR, additional investigation and / or analysis in order to finalize the geotechnical and hydrogeological recommendations. • The contractor shall be required to implement a construction monitoring and mitigation program to ensure there are no negative impacts to existing private wells and surface water features due to short-term construction dewatering, or that impacts are suitably mitigated. The monitoring and mitigation plan will be a condition of any permits for dewatering. • ESC shall be installed throughout the work area to prevent sedimentation of the watercourse or other sensitive features present. Inspection of the ESC measures is recommended during construction to ensure that they protect the watercourse. Implementation of the ESC measures shall conform to recognized standard specifications, such as Ontario Provincial Standards Specification (OPSS) and the requirements of the TRCA. • Groundwater collected through dewatering will be discharged back into the watercourse feature to mitigate any changes to baseflow.

Environmental Component	Environmental Sub-Component	Potential Environmental Effects	Proposed Mitigation Measures and Future Commitments
Physical Environment	Soil and Groundwater	Potential increase in loading of sodium and chloride to groundwater as a result of greater surface area (additional lanes) for application of road salt.	• Increased loading may be mitigated in part by the implementation of LID features. • Quantity controls will be necessary within the ROW if the runoff cannot be accommodated within end-of-pipe facilities, through low impact development features. • Best Management Practices for salt management may also help with a reduction in salt loading.
Physical Environment	Soil and Groundwater	Potential for impacts to shallow groundwater wells during construction.	• Locations of the wells should be confirmed in a well survey conducted within the Study Area to identify any shallow wells in close proximity to the road widening that could be potentially impacted by the construction. The well survey is recommended to be completed during the detailed design phase of the project. • A well interference and reporting protocol should be established before construction that outlines the actions taken should a complaint from a private well owner be received and ensures that a supply of water is provided for the private resident. Mitigation measures should include the following: – Notification of residents of construction with contact information. – A reporting and investigation protocol to address complaints. • Supply of alternate water source in case of confirmed impact.
Physical Environment	Soil and Groundwater	Potential for excess soil as a result of road reconstruction and replacement of underground utilities.	• Activities involving the management of excess soil should be completed in accordance with O. Reg. 406/19 and the MECP's current guidance document titled "Management of Excess Soil – A Guide for Best Management Practices" (2016, Updated 2021). All waste generated during construction must be disposed of in accordance with ministry requirements.
Socio-Economic Environment	Air Quality	Temporary increase in dust in air, emissions from construction activities.	• A complaint response protocol for nuisance impacts including dust emissions will be prepared during the detailed design phase of the project and implemented prior to construction. • During construction, the following mitigation measures shall be used: – The road shall be graded as required to remove potholes, ruts and ripples in the road surface. Efforts to prevent contamination of the road surface, such as spilling sands, silts and clays, will also help to minimize dust. – If appropriate equipment is available, the roadway should be sprayed with water as required to minimize dust generation prior to paving. – The construction contractor will be required to develop a Construction Management Plan that specifically addresses dust controls and contingency plans to mitigate dust when it occurs. • Vehicles / machinery and equipment shall be in good repair, equipped with emission controls, as applicable and operated within regulatory requirements. The contractor shall also be required to implement dust suppression measures to reduce the potential for airborne particulate matter resulting from construction activities. This should be in the form of water applications on exposed soils.
Socio-Economic Environment	Noise	Temporary nuisance noise during construction activities.	• A complaint response protocol for nuisance impacts including construction noise shall be prepared during the detailed design phase of the project and implemented prior to construction. • Noise control measures shall be implemented where required during the construction phase, such as restricted hours of operation and the use of appropriate machinery and mufflers. The noise produced by the equipment can be limited through proper equipment maintenance. • All construction activities shall conform to the criteria set out in NPC115 of 83 dB. • The construction contractor will be required to develop a Construction Management Plan that specifically addresses noise controls, mitigation to be implemented and frequency of equipment inspection.

Environmental Component	Environmental Sub-Component	Potential Environmental Effects	Proposed Mitigation Measures and Future Commitments
Socio-Economic Environment	Property Impacts	Property loss due to property acquisition to accommodate proposed road ROW.	• Property acquisition required for this project will be undertaken by the Region with the objective being to respect and protect individual rights and to provide fair compensation within the framework of applicable municipal and provincial policies and associated legislative instruments governing the acquisition of property. • The acquisition process emphasizes negotiation with a willing seller with the objective being to achieve a mutually satisfactory agreement between the Region and the individual property owner. • The Region, together with the Region's appraiser, will engage and negotiate with affected property owners regarding land acquisition and easements required for the proposed works.
Cultural Environment	Cultural Heritage	Potential impact to cultural heritage resources.	• The following recommendations are excerpted from the Cultural Heritage Report completed by ASI (January 2022, updated April 2022) and provided in Appendix H of this report: – Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to identified built heritage resources and cultural heritage landscapes. Avoidance measures may include, but are not limited to erecting temporary fencing, establishing buffer zones, issuing instructions to construction crews to avoid identified cultural heritage resources, etc. – Once a preferred alternative or detailed designs of the proposed work are available, this report will be updated with a confirmation of impacts of the undertaking on the cultural heritage resources identified within the Study Area and will recommend appropriate mitigation measures. Mitigation measures may include, but are not limited to, completing a property-specific heritage impact assessment or documentation report, or employing suitable measures such as landscaping, buffering or other forms of mitigation, where appropriate. In this regard, provincial guidelines should be consulted for advice and further heritage assessment work should be undertaken as necessary. – 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. • The existing conditions report should be submitted to heritage staff at the City of Markham and the Heritage Markham Committee for review and comment. Once the report is updated with the preliminary impact assessment of the preferred alternative, the report should be submitted to the City of Markham and the MCM for review and comment and any other local heritage stakeholders that may have an interest in this project. The final report should be submitted to the City of Markham for their records.
Cultural Environment	Archaeology	Potential impact to archaeological resources.	• The following mitigation is excerpted from the Stage 1 Archaeological Assessment Report completed by ASI (March 2022) and provided in Appendix I of this report: – The property inspection determined that the Warden Avenue Study Area contains lands that retain potential for archaeological resources and requires Stage 2 survey, either by test pit or pedestrian survey, as appropriate. Previously registered Euro-Canadian site AlGu-515 has further cultural heritage value or interest and will require further assessment if impacted by the project. • Mississaugas of the Credit First Nation are to be kept informed and engaged for participation in the future stages of archaeological assessment. • Huron Wendat Nation are to be kept informed and engaged for participation in the future stages of archaeological assessment.
Transportation and Built Environment	Human Health and Safety	Potential safety hazard to humans from construction activities, heavy equipment and increased construction traffic.	• The Health and Safety Plan shall be developed in accordance with the Occupational Health and Safety Act, 1990 and regulatory requirements.

Environmental Component	Environmental Sub-Component	Potential Environmental Effects	Proposed Mitigation Measures and Future Commitments
Transportation and Built Environment	Transportation Infrastructure	Potential safety hazards on roadways from construction activities, heavy equipment and increased construction traffic.	• Operation of construction related vehicles will be done in accordance with all appropriate safety policies and procedures and based on Canadian Standards (Transport Canada, etc.). • All contractors will be required to complete and follow appropriate construction site training and adhere to appropriate road safety regulations during construction. Work shall be done in such a manner as to minimize disruption to the adjacent neighbourhoods. Noise and dust emissions shall be controlled. Contract specifications shall ensure that all equipment and vehicles are compliant with noise and air emission standards for applicable equipment.
Transportation and Built Environment	Transportation Infrastructure	Temporary traffic flow / access disruptions.	• Consult with public agency and/or adjacent landowners / tenants regarding temporary access routes. Contractor shall develop and implement a Traffic Management Plan in coordination with Region. Adequate signage to give advance notice of disruptions and detours shall be provided by the contractor.

12.0 Climate Change Considerations

Climate change is defined as any significant change in long-term weather patterns. The term can apply to any major variation in temperature, wind patterns or precipitation that occurs over time. Global warming describes the recent rise in the average global temperature caused by increased concentrations of greenhouse gases (GHGs) trapped in the atmosphere.

Scientists have concluded that human activity is largely responsible for recently observed changes to our climate since GHGs are mainly caused by burning fossil fuels to produce energy.

The MECP finalized a document entitled “Considering Climate Change in the Environmental Assessment Process” in 2017 that provides guidance relating to the ministry’s expectations for considering climate change during the MCEA process. It is suggested that this guide be consulted if an approved MCEA has no climate consideration method.

There are two types of climate change effects that can be considered. The first is the effect that a project can have on climate change. In this case, the degree to which the project can provide some climate change mitigation measures is to be assessed. The second is the effect climate change has on the project. In this case, the degree to which the project can demonstrate adaptation to climate change impacts is assessed. Climate Change was considered during this MCEA and is discussed in this Section.

12.1 Effects of the Project on Climate Change

There is potential for the works proposed to impact the atmosphere through the emission of GHGs on an ongoing basis.

An increase in traffic over time may result in an increase in associated GHG emissions. Road improvements are anticipated to reduce traffic congestion. The potential GHG emission effect from the Preferred Solution was determined to be insignificant on a regional and local scale. The total annual emissions are expected to be well below 0.01% of the provincial levels.

Other carbon sources and emissions associated with this project would relate to construction vehicle emissions during the construction period. Emissions can be decreased by increasing efficiency and through regular maintenance of equipment.

Landscape changes associated with a project can also impact climate change. A carbon sink is described as a land or ocean mass that can take in carbon, in particular carbon dioxide, from the atmosphere. Vegetation can assist in removing carbon dioxide from the atmosphere.

The proposed undertaking will result in some vegetation removal during grading activities. Vegetation loss (and related carbon sink removal) is anticipated to be minimized as much as possible by reducing the footprint of grading activities where feasible. Vegetation loss will be further mitigated with tree planting within the corridor.

12.2 Effects of Climate Change on the Project

The pavement infrastructure is susceptible to deterioration from freeze-thaw events and roadside drainage features and the watercourse culvert may be impacted by increased precipitation events that are becoming more prevalent in Southern Ontario to due climate change effects, which can result in potential flooding and erosion. LID features and stormwater quantity controls will enhance the resiliency of the corridor.

The detailed design of the road improvements and associated drainage infrastructure will consider peak flows and capacity.

13.0 General Approval and Permit Requirements

The following list is based on the Detailed Design and Construction phases and provides a preliminary set of approval and permit requirements. A final list shall be determined during the detailed design phase of the project.

- The Region is required to comply with the Ontario Water Resources Act with respect to the quality of water discharging into natural receivers. The footprint of disturbed area will be minimized as much as possible. For example, minimizing distribution of excavated soil to minimize sedimentation to storm sewers.
- An ESC Plan will be developed in consultation with TRCA and York Region. Implementation of the erosion and sediment control measures will conform to recognized standard specifications such as OPSS and the requirements of the TRCA. The ESC Plan will also consider the TRCA Erosion and Sediment Control Guide for Urban Construction (2019).
- Acoustic sampling should be employed to determine presence or absence of SAR bats in candidate bat habitat trees that may be impacted by the proposed works. If present, acoustic sampling will help to determine species, relative abundance and type of permissions required, in consultation with the MECP.
- Redside Dace and its habitat are protected under the Endangered Species Act, 2007. Under Ontario Regulation 242/08, provision is made for activities that are likely to kill, harm, or harass Redside Dace or damage or destroy of the habitat of Redside Dace without requiring a permit, provided a number of requirements are met as specified in O. Reg. 242/08, s. 23.4. The Region will be required to secure necessary approval prior to alteration to Redside Dace contributing habitat.
- Any plans for work in water are recommended to be submitted to the DFO under a Request for Project Review, authorization may be required. For projects near water, proponents are required to ensure that activities meet the criteria outlined on the Fish and Fish Habitat Protection Program website and are responsible for the implementation of best management practices (i.e., Codes of Practice) into the project design.
- When all matters relating to archaeological sites within the project area of the project have been addressed to the satisfaction of the MCM, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development. No grading or other activities that may result in the destruction or disturbance of any archaeological sites are permitted until notice of approval has been received.
- A permit approval will be required from TRCA in accordance with O.Reg. 166/06 Toronto and Region Conservation Authority: Regulation of Development, Interference with Wetlands and Alteration to Shorelines and Watercourses for construction works in TRCA regulated areas, which includes the area for the new structural culvert on Warden Avenue approximately 840 m north of Major Mackenzie Drive.

- TRCA permits will be obtained prior to initiation of all works within the areas regulated pursuant to Ontario Regulation 166/06.MECP Environmental Compliance Approvals (ECA) will be obtained for the storm sewers and LID features prior to their operation.
- The contractor will need to obtain an Occupancy Permit from the Region.
- If fish salvage is required to remove fish from the work area, prior to dewatering, a License to Collect Fish will be required from the MNRF prior to the salvage activities.

14.0 References

Beacon. August 2021. Natural Environment Report: Warden Avenue from Major Mackenzie to Elgin Mills Road, Markham Ontario.

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MECP. 2016, Updated 2021. Management of Excess Soil – A Guide for Best Management Practices. Available at: https://www.ontario.ca/page/management-excess-soil-guide-best-management-practices

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TRCA. 2015. Crossing Guideline for Valley and Stream Corridors. Available at: https://sustainabletechnologies.ca/app/uploads/2015/12/TRCA_2015_Stream-Crossings-Guideline.pdf

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