Lakeshore Transportation Studies

Lakeshore Bus Rapid Transit Project

Environmental Project Report

Transit Project Assessment Process

City of Mississauga, Ontario, Canada

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NOTE: ENVIRONMENTAL PROJECT REPORT

This Environmental Project Report (EPR) and appendices are available starting July 27, 2023, for a 30-day public review and comment period, until August 28, 2023 at mississauga.ca/projects-and-strategies/environmental-assessments/lakeshore-bus-rapid-transit-brt-study/.

Comments about this project may be submitted online at mississauga.ca/projects-and-strategies/environmental-assessments/lakeshore-bus-rapid-transit-brt-study/ or by contacting:

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Executive Summary

ES 1. Introduction

Project Background and Purpose

The City of Mississauga is working with HDR to build upon the recently completed and Council-approved 2019 Lakeshore Transportation Master Plan, which was carried out under the Municipal Class Environmental Assessment (EA) process, and to complete the outstanding Transit Project Assessment and Class EA processes and approvals for the proposed improvements in the Lakeshore Corridor. The Studies are collectively named the Lakeshore Transportation Studies and feature the following three components:

- Bus Rapid Transit (BRT) Project: Transit Project Assessment Process (TPAP) and Preliminary Design for two (2) km section of Lakeshore Road from Etobicoke Creek to East Avenue;
- Complete Street Study: Schedule C Class EA Study and Preliminary Design for Lakeshore Road and Royal Windsor Drive from East Avenue to Oakville Border; and
- Active Transportation Bridge Study: Schedule B Class EA Study and Preliminary Design for an Active Transportation bridge crossing over the Credit River north of Lakeshore Road.

The BRT Project is being prioritized in support of the City's application for funding of two (2) kilometres of Lakeshore Road BRT segment between East Avenue and Etobicoke Creek, under the Federal Government's Investing in Canada Infrastructure Program (ICIP).

This project will progress the vision developed through the Lakeshore Road Transportation Master Plan and Implementation Strategy, following comprehensive and sound planning processes in order to recognize and accommodate the infrastructure and transportation needs of the corridor while protecting the established and proposed residential communities and businesses within the Project Area. The project will also address the requirements of internal and external stakeholders including the general public and agencies.

Project Area

The Project Area for the proposed BRT alignment is shown in **Figure ES-1**. The Project Area is centered on Lakeshore Road East in Mississauga, East Avenue in the west, to approximately Etobicoke Creek in the east. The lands immediately adjacent to the Lakeshore Road East corridor were included in the assessment. This Project Area represents the area upon which potential impacts from the project were assessed.

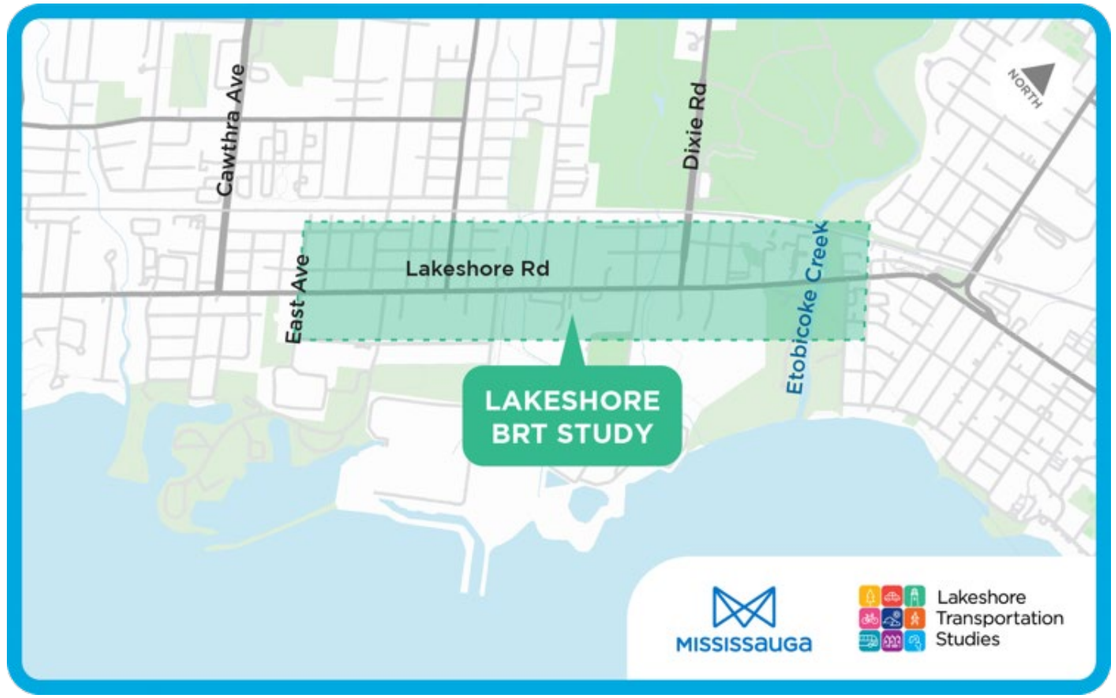


Figure ES-1: Project Area

Process

This project is being assessed in accordance with Ontario Regulation 231/08, *Transit Projects and Metrolinx Undertakings* (Transit Projects Regulation) of the Environmental Assessment Act. The project follows the steps prescribed in the Transit Projects Assessment Process (TPAP); which is a proponent-driven, self-assessment process. Proponents must follow the prescribed steps in the TPAP within specified timeframes, culminating with the Minister of the Environment's decision within six (6) months of the start of the process, which is marked by the Notice of Commencement. The six-month timeline includes:

- 120 days for consultation on positive or negative environmental impacts and the preparation of an Environmental Project Report (EPR);
- 30 days for the public, regulatory agencies, aboriginal communities and other interested parties to review and comment on the final EPR; and
- 35 days for the Minister of the Environment to respond to public requests for a review of the project.

ES 2. Planning and Policy Context

The most relevant planning, land use and transportation policies that were reviewed as part of this project from all levels of government are listed below:

- Provincial Policy Statement, 2020
- A Place to Grow: Growth Plan for the Greater Golden Horseshoe, 2020
- Peel Region Official Plan, 2018
- Peel Region Sustainable Transportation Strategy, 2018
- Peel Region Long Range Transportation Plan, 2019
- Peel Region Goods Movement Strategic Plan, 2017
- Peel Region 2018-2022 Active Transportation Implementation Plan, 2018
- Region of Peel Vision Zero Road Safety Strategic Plan, 2017
- City of Mississauga Official Plan, 2020
- City of Mississauga Cycling Master Plan, 2018
- City of Mississauga Strategic Plan, 2019
- Hurontario-Main LRT Environmental Project Report, 2014
- MiWay 5-Transit Service Plan (2016-2020)
- Miway Infrastructure Growth Plan, 2020
- Lakeview Local Area Plan, and Port Credit Local Area Plan, 2018
- Inspiration Lakeview Master Plan, 2014
- Inspiration Port Credit
- Metrolinx 2041 Regional Mississauga Transportation Master Plan, 2019
- GO Expansion Program

See **Section 2** for detailed findings from each of the documents listed above.

ES 3. Pre-Planning Activities

The pre-planning phase of the BRT Process entails the following activities:

- Reviewing the findings and recommendations of the Lakeshore Transportation Master Plan (2019) to be advanced through the Lakeshore BRT Process.
- A multi-modal needs assessment to determine the overall need and justification for transportation improvements to the Project Corridor from a transportation network perspective and considering the needs for each travel mode.
- Consultation with internal and external stakeholders, the public, and Indigenous groups identified by the Ministry of Environment, Conservation and Parks (MECP).
- Develop a vision and guiding principles for the Project.
- Refine the evaluation criteria and framework to be used to assess alternative solutions.
- Evaluation of alternative transit network solutions and the selection of the preferred solution.
- Evaluation of right-of-way alternatives and the selection of the preferred right-of-way.

ES 4. Existing Conditions

Natural Environment

The Natural Environment Assessment Report, found in **Appendix A,** details the findings of the natural heritage investigation including data analysis and field investigations, potential impacts and mitigation measures for aquatic and terrestrial wildlife and their habitats, vegetation, and other designated natural areas and features.

The review of the natural environment for this Project also includes an inventory of existing trees, an assessment of fluvial geomorphic conditions, an assessment of drainage and stormwater management conditions, a review of contaminated soils, as well as a review of water resources. Results from these assessments are detailed in the Arborist Report, Fluvial Geomorphology Assessment Report, Drainage and Stormwater Management Report, and Phase 1 Environmental Site Assessment report, which can be found in **Appendices B to E** respectively.

Cultural Environment

A Cultural Heritage Report was undertaken to identify Built Heritage Resources and Cultural Heritage Landscapes that may be subject to direct or indirect impacts as a result of the proposed undertaking. A Stage 1-2 archaeological assessment was undertaken to identify areas of archaeological potential and areas that warrant further archaeological assessment. The Cultural

Heritage Report and Stage 1-2 Archaeological Assessment Report are available in **Appendices F and G**.

Socio-Economic Environment

The existing land uses, air quality conditions, and noise and vibration conditions in the Project Area are further explored in **Section 4.7.** The land use in the Project Area is primarily characterized under two sub-areas: the Lakeview Employment Area, and Lakeview Waterfront, both are composed mostly of industrial uses and open spaces. Detailed findings regarding air quality and noise and vibration are available in the Air Quality Assessment Report and Environmental Noise Assessment Report found in **Appendices H and I**.

Transportation and Utilities Conditions

The existing transportation system within the Project Area reviewed as part of the BRT Project include pedestrian and cyclist facilities and level of service, existing transit services and road network, and an analysis of existing traffic operations. Existing streetscape and landscaping conditions are also included in the review.

A Subsurface Utility Engineering (SUE) investigation was conducted to identify alignment of existing mainline utilities within the existing right of way that may impact the project. Sanitary and storm sewers in the Project Area were also identified.

ES 5. Project Description

Design criteria

The intent of the design criteria is to establish the standards upon which the design for the project will be based. The design criteria for the project were developed based on current best practices in bus rapid transit, active transportation, and roadway design, and in consultation with the City's internal stakeholder team. The development of the criteria reflects the City's roadway design standards, supplemented where appropriate by the Transportation Association of Canada's *Geometric Design Guidelines for Canadian Roads*.

Lakeshore Road, in the Project Area, is an urban arterial road that consists of businesses on both the north and south side. The future roadway will consist of four general purpose lanes, two dedicated median transit lanes, continuous separated bike lanes and sidewalks on both sides of the corridor.

The geometric design for this road project shall be designed in accordance with the approved design criteria, standards, and manuals. If there is any difference between the approved design criteria and standards and manuals, the following shall apply in descending order of precedence:

1. The approved design criteria for this road design
2. MiWay Standard Drawings (September 2020)
3. City of Mississauga (CoM) Transportation & Works Standard Drawings (August 12, 2020)
4. Transportation Association of Canada Geometric Design Guidelines (June 2017)
5. ANSI/IES RP-8-18: Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting
6. Ontario Traffic Manual (OTM) Book 18 (2020), OTM Book 12, OTM Book 12A
7. Ministry of Transportation of Ontario (MTO) Design Supplement for TAC Geometric Design Guidelines (June 2017)

Given existing property constraints, the current design does not include the outer landscaped boulevards in all areas, which will be implemented as property becomes available through future redevelopment applications. At present, the proposal is to generally construct the cross-section from sidewalk to sidewalk.

Design criteria have been developed for:

- BRT guideway and stops
- Active transportation
- Roadway
- Streetscape

Transit Service Plan

As part of the Lakeshore Transportation Master Plan, a representative Transit Service Plan was developed, and applied to guide the development of the design concepts for the entire Lakeshore Road corridor. Key elements introduced in the Transit Service Plan include the routing of express and local buses as well as the proposed locations of express and local bus stops.

The proposed BRT stops are located within the roadway (adjacent to the BRT lanes) at signalized intersections only. The stop platforms are positioned on the far side of the intersection, in the shadow of the upstream left-turn lane. This configuration minimizes the property impacts associated with the stops and allows for pedestrians to access the stops via the signalized pedestrian crosswalks associated with the intersection.

BRT platforms will be approximately 65 m long, to accommodate two 21 metre articulated buses, and allow for an additional 20 m of mountable median for emergency services or maintenance vehicles. The specific layout of passenger amenities on the platforms is under development, but stops are planned to incorporate:

- Sheltered waiting areas;
- Accessibility features (ramps, railings, tactile warning strips, railings, etc.);

- Limited passenger seating/benches, garbage and recycling bins;
- Illumination;
- Signage, wayfinding, and next bus service information;
- Fare payment machines; and
- Unique architectural treatments.

Local transit stops will be provided throughout the Project Area, consistent with current stop locations, but adapted to fit within the proposed widened roadway cross-section. Two types of local bus stop configurations will be applied, depending on availability of property at the specific site of the stop:

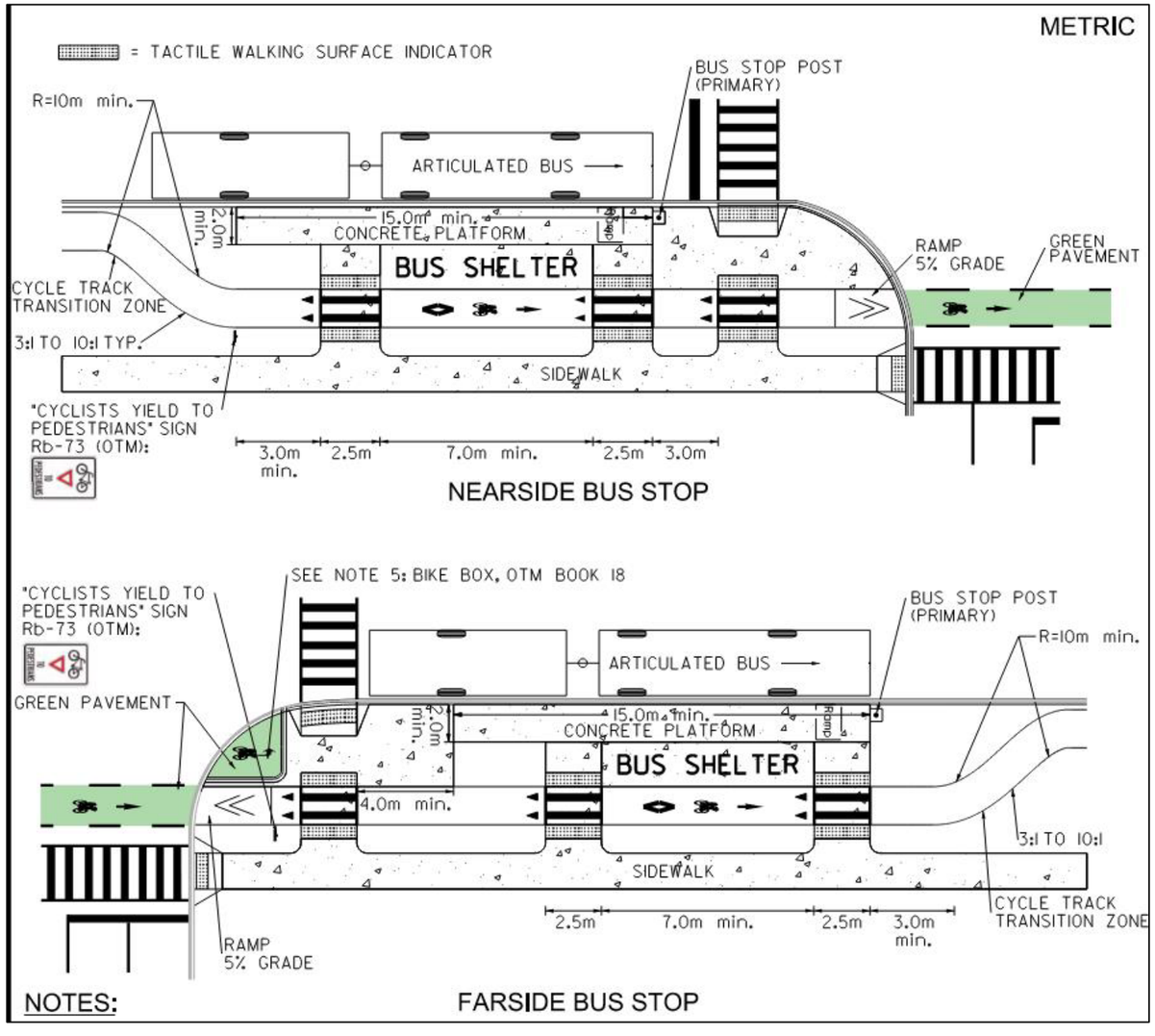
- **Configuration 1 - Preferred Stop Layout:** Where sufficient available property exists within the right-of-way, the bus stop layout illustrated in **Figure ES-3** will be employed. This layout allows for the bus stop pad and shelter to be installed immediately adjacent to the curb, and realigning of the proposed cycle track and sidewalk behind the stop.

- **Configuration 2 - Constrained Stop Layout**: Where right-of-way constraints preclude the implementation of Configuration 1, a modified layout will be employed. This configuration places the bus stop shelter behind the sidewalk, set back from the roadway curb, and is illustrated in **Figure ES-4**.

Table ES-1 summarizes the stop configurations to be applied at the existing stop locations in the Project Area

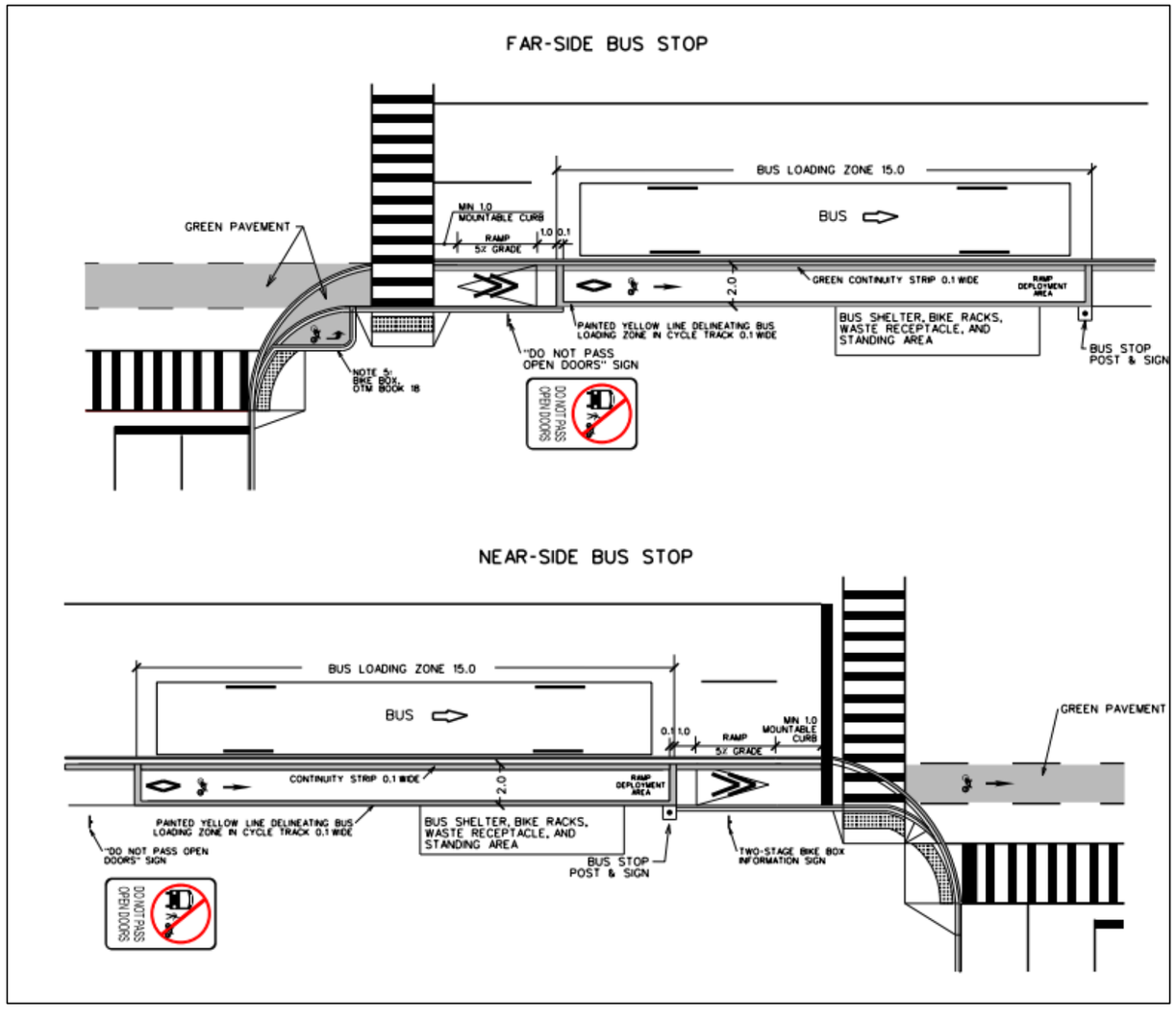
Table ES-1: Summary of Local Stop Layouts

Stop ID	Direction	Stop Location	Routes	Proposed Position	Stop Configuration
0445	Eastbound	Lakeshore Road E East of Island Road	5, 23	Far-side	Configuration 1
0447	Westbound	Lakeshore Road West of Forty-Third Street	5, 23	Mid-block	Configuration 2
0408	Westbound	Lakeshore Road E at Dixie Road	5,23	Near-side	Configuration 1
0443	Eastbound	Lakeshore Road E at Dixie Road	5,23	Near-side	Configuration 2
0450	Westbound	Lakeshore Road E West of Fergus Avenue	5, 23	Mid-block	Configuration 2
0442	Eastbound	Lakeshore Road E East of Orchard Road	5, 23	Mid-block	Configuration 1
0451	Westbound	Lakeshore Road E at Haig Boulevard	5, 23	Near-side	Configuration 2
0441	Eastbound	Lakeshore Road E at Haig Boulevard	5, 23	Far-side	Configuration 2
0440	Eastbound	Lakeshore Road E at Strathy Avenue	5, 23	Mid-block	Configuration 1
0452	Westbound	Lakeshore Road at Ogden Avenue	5, 23	Near-side	Configuration 2
0453	Westbound	Lakeshore Road E at Alexandra Avenue	23	Near-side	Configuration 2
0439	Eastbound	Lakeshore Road E at Lakefront Promenade	23	Near-side	Configuration 2
0454	Westbound	Lakeshore Road at East Avenue	23	Mid-block	Configuration 2
0438	Eastbound	Lakeshore Road E at East Avenue	23	Near-side	Configuration 1



(Source: City of Mississauga Standard 2240.085)

Figure ES-3: Configuration 1 – Preferred Stop Layout



(Source: City of Mississauga Standard 2250.040)

Figure ES-4: Configuration 2 - Constrained Stop Layout

Active Transportation

Active transportation infrastructure in the corridor will generally be comprised of an improved 1.8 m-wide sidewalk and dedicated 1.5 m-wide one-way cycle tracks on each side of the roadway, separated by a 0.6 m buffer. On the south side, the cycle track will generally be separated from the curb by a boulevard that varies between 1.5 m to 6.0 m providing a buffer for a paved strip, landscaping/streetscaping, and utility relocations (if necessary). On the north side of the roadway, given the property constraints, the cycle track will be implemented immediately adjacent to the curb for much of the corridor.

One notable exception to the proposed cycle track configuration is the section between (approximately) Hydro Road and east of Fergus Avenue, where there exists a multi-use pathway today that will be displaced by the proposed roadway widening. In this section, it is proposed to provide a 2.4 m-wide, two-way cycle track, adjacent to a 1.8 m-wide sidewalk. A 1.5 m-wide one-way cycle track will also be provided on the north side of the roadway in this section.

Roadworks and Access

The proposed BRT guideway consists of two dedicated bus lanes operating in the centre of the roadway, separated from general traffic by a 0.5 m painted buffer on either side of the median bus lanes. The implementation of the BRT guideway was predicated on the notion of maintaining general traffic capacity throughout the corridor. As such, Lakeshore Road will be widened to accommodate the guideway while maintaining the existing number of lanes for general traffic. Given the constraints on the north side of the roadway, the roadway is generally proposed to be expanded into the boulevard to the south of the roadway. A typical 44.5 m cross-section was developed as part of the Master Plan phase of the project and updated early in the TPAP process to reflect the City's current design standards and updated AT infrastructure guidelines.

The section from West Avenue to East Avenue forms the western transition from the existing roadway cross-section at West Avenue to the median-running BRT cross-section east of East Avenue. In this section, eastbound buses would transition from the centre General Purpose Lane (GPL) to the left to enter a newly-developed eastbound BRT lane on the approach to East Avenue. Westbound buses would make a similar opposing move, transitioning to the right from a westbound median BRT lane downstream of the East Avenue intersection to the median GPL on the approach to West Avenue.

The section from Dixie Road to Etobicoke Creek forms the eastern transition from the existing roadway cross-section at Etobicoke Creek to the median-running BRT cross-section west of Dixie Avenue. In this section, westbound buses would transition from the centre General Purpose Lane (GPL) to the left to enter a newly-developed westbound BRT lane on the approach to Dixie Road. Eastbound buses would make a similar opposing move, transitioning to the right from an eastbound median BRT lane downstream of the Dixie Road BRT stop to the median GPL at (approximately) Deta Road.

The proposed BRT corridor design includes a number of new auxiliary turn lanes to provide improvements to the level-of-service at selected signalized intersections throughout the corridor. The existing Lakeshore Road configuration in the Project Area includes a centre, two-way left-turn lane to facilitate access to adjacent properties and crossing streets with unsignalized intersections at Lakeshore Road. The implementation of the median BRT will preclude the ability for drivers to make mid-block left-turns; general traffic crossing of the median BRT guideway will be permitted only at signalized intersections for safety purposes. Rather, all left-turn movements will be relocated to the signalized intersections, where they can occur on a protected left-turn phase. U-turns will be allowed on protected left-turn phases to accommodate displaced mid-block left-turn movements (**Figure ES-5**). The only exception to the left-turn restriction will be for emergency services. Emergency services, when responding to a situation, will be permitted to both cross the median BRT facility or use the dedicated lanes to travel unimpeded to a destination.

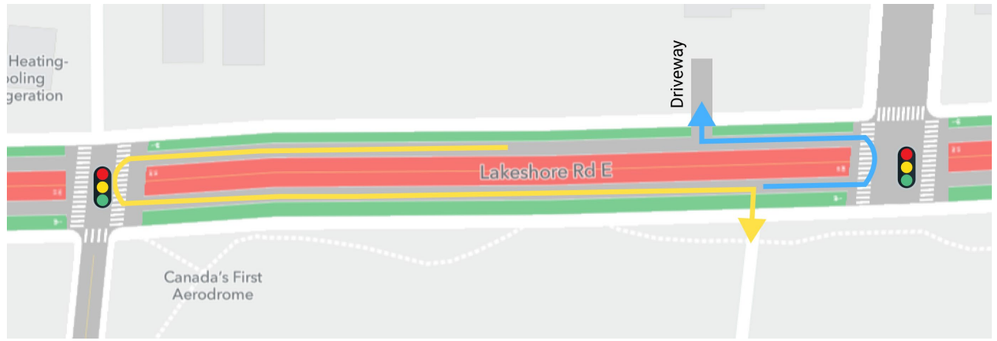


Figure ES-5: Proposed Mid-Block Left-Turn Mitigation

Landscape, Streetscape, and Utilities

There exists a large and complex network of utilities and municipal services underground in the Lakeshore Road corridor. Many of these utilities are situated south of the existing roadway, but within the right-of-way, and will be impacted by the widening of the roadway to the south as proposed. The presence of subsurface utilities in the proposed boulevard areas will potentially impact the ability to introduce street tree plantings in the corridor. The design concept includes a recommended approach of providing street trees within the boulevard using subsurface 2m x 2m soil cells, pending appropriate clearance of subsurface utilities.

Hydro poles are proposed to be relocated to the boulevard area as well, offset from the soil cells as appropriate. Consistent with current practice, it is proposed to accommodate roadway and sidewalk illumination on the overhead hydro poles where feasible. In areas where no hydro poles exist or are proposed, stand-alone illumination poles will be required. Supplemental illumination may be required at intersections and will be determined in the detailed design phase of the project. Corridor design, cross-sections, and landscape plans are enclosed in **Appendix J**.

Municipal services, including watermains, storm sewers, and sanitary sewers in the Project Area are generally located under the roadway or under the boulevard on the south side of Lakeshore Road. Much of the underground municipal services are anticipated to remain in place, however, sections of the infrastructure may need to be relocated to either accommodate proposed BRT stops or to accommodate other relocated utilities with sufficient offset spacing to meet municipal servicing and regulatory requirements. Underground municipal service crossings under planned BRT stop locations should be considered for relocation under the detailed design phase of this project to address future challenges in accessing the services in the event of a maintenance requirement.

Where service crossings cannot be relocated away from the stops, they should have a protective sleeve and additional isolation valves or maintenance hole structures. The Utility Conflict Plan and Utility Relocation Plan are enclosed in **Appendices K.1 and K.2** respectively.

Structural Design

Structural improvements are proposed for the crossing of Serson Creek and Applewood Creek through the Lakeshore BRT Study. To fulfill the requirements of the CVC, the improvements proposed at Serson Creek include a full replacement of the existing culvert to a larger culvert. The improvements proposed at Applewood Creek include the extension of the existing culvert.

ES 6. Impact Assessment, Mitigation and Monitoring

Construction and operational impacts of the proposed improvements on the natural, cultural heritage, and socio-economic environments as well as on transportation and utility facilities as part of the BRT Project have been assessed and detailed in **Section 6**. Construction impacts are generally temporary and are proposed to be avoided or mitigated through proper construction practices. Long-term impacts can be prevented or mitigated through the design process, following various monitoring and maintenance protocols, and best management practices. A summary of potential impacts as well as proposed mitigation and monitoring measures are identified in **Table 6-13.** Further details on impact and mitigation are available in the supporting technical studies found in the appendices.

ES 7. Consultation and Engagement

Consultation is a crucial and mandatory component of projects that are subject to O. Reg. 231/08, as the process requires meaningful consultation with persons and parties that are considered to have an interest in the transit project. Ongoing consultation throughout a transit project allows a Project Team to:

- Inform parties and individuals including who may potentially be affected by the transit project;
- Identify and assess the range of potential impacts of the transit project through environmental, technical, and socio-economic lenses; and
- Respond to the concerns of interested persons and agencies.

Key consultation activities and engagement methods used throughout the BRT Project include the following, which are further explored in the EPR:

- Regular updates to the City's project webpages and Twitter page.
- Consultation that took place during the Transportation Master Plan (2019) phase, including:
    - 3 rounds of Public Information Centres
    - 4 pop up workshops
    - 2 walkability audits
    - 3 technical advisory committee (TAC) meetings
    - Online website and survey
    - Business community workshop
- Mailing of a pre-TPAP and Public Information Centre (PIC) 1 notification to Property owners and tenants within 300 metres of Lakeshore Road and potentially impacted Indigenous groups identified by the MECP.
- Mailing of a notification for PIC 2 and the mailing of a TPAP notice of commencement to property owners and tenants within 300 metres of Lakeshore Road and potentially impacted Indigenous communities identified by the MECP. See **Appendix L.1.** for all notices issued.
- 2 TAC meetings were held to provide project updates and gather feedback, one before each PIC. See **Appendix L.3.** for minutes from the TAC meetings and a record of correspondences with stakeholder agencies.
- Two rounds of PICs were held to inform the public of project updates and gather feedback, one took place during the pre-planning phase, one after the issuing of the Notice of

Commencement. Feedback from the PICs is summarized in feedback reports available in **Appendix L.2**.

- All Indigenous groups involved in the consultation process were circulated a copy of the natural environment, arborist, cultural heritage, and archaeological reports, and were invited to provide comments. All correspondences with Indigenous groups are available in **Appendix L.4**.

ES 8. Approvals, Monitoring and Commitments to Future Work

The implementation of this project will require permits and approvals as well as further coordination with various conservation authorities and governing bodies at the municipal and regional level. **Section 8** outlines the permits that may be needed in future phases of the project as well as further environmental studies and assessments to be conducted during the detailed design stage.

The construction approach is envisioned to occur similar to a typical road widening project. Construction staging will likely proceed as follows:

- Relocate underground and surface utilities as required. This will include relocation of illumination poles and above ground utility poles, relocation of traffic signals and provision for temporary traffic signals where required. Relocation of underground utilities that fall on property to be acquired by the City will need to occur after the agreements have been signed for the proposed transfer of property.
- Reconstruct the curb line on the south side of the roadway and provide continuous traffic lanes on the existing roadway. The reconstruction will include rebuilding the curb lines, gutters, catch basins, etc. It should be noted that the reconstruction of the curb line may potentially occur simultaneously during utility relocations.
- Reconstruct the north side of the roadway after the south side is completed. Traffic lanes in each direction will be maintained where feasible. A minimum of one lane in each direction will be provided at all times. Access to adjacent developments will also be maintained at all times.
- Construct new bus facilities, including bus laybys, stops, shelters, lane markings, signage, and other finishes.
- Construct streetscaping and urban design elements and provide active transportation improvements on both sides of the roadway where applicable.

A detailed Construction Staging and Implementation Report is enclosed in **Appendix N.**

Glossary of Acronyms and Abbreviations

AA	Archaeological Assessment
AADT	Average Annual Daily Traffic
AAF	Avoidance Alternatives Form
ANSI	Areas of Natural and Scientific Interest
APC	Automatic Passenger Count
APECs	Areas of Potential Environmental Concern
AT	Active Transportation
AVL	Automatic Vehicle Location
BHR	Built Heritage Resource
BLOS	Bicycle Level of Service
BMP	Best Management Practices
CAAQS	Canadian Ambient Air Quality Standards
CCCEAP	Considering Climate Change in the Environmental Assessment Process
CHL	Cultural Heritage Landscape
CI/ASCE	Construction Institute/American Society of Civil Engineers
CTC	Credit Valley-Toronto and Region-Central Lake Ontario
CVC	Credit Valley Conservation
DBH	Diameter at Breast Height
DFO	Department of Fisheries and Ocean
EAA	Environmental Assessment Act
EBA	Event-Based Area
EPR	Environmental Project Report
ESA	Environmental Site Assessment
ESC	Erosion and Sediment Control
FOC	Fiber Optic Cable
GGH	Greater Golder Horseshoe
GHG	Greenhouse Gas
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GPL	General Purpose Lane
HDI	Haudenosaunee Confederacy
HIA	Heritage Impact Assessment
HVA	Highly Vulnerable Aquifer
IAA	Impact Assessment Act
ICIP	Investing in Canada Infrastructure Program
ICLR	Institute for Catastrophic Loss Reduction
IDF	Intensity Duration Frequency
IGF	Information Gathering Form
IPZ	Intake Protection Zone
ISA	International Society of Arboriculture
ISO	International Organization for Standardization
LCV	Long Combination Vehicles
LID	Low Impact Development
LIO	Lands Information Ontario
LOS	Level of Service
LRTP	Long Range Transportation Plan
MCFN	Mississaugas of the Credit First Nation
MHSTCI	Ministry of Heritage, Sport, Tourism and Culture Industries
MNRF	Ministry of Natural Resources and Forestry
MTO	Ontario Ministry of Transportation
NHIC	Natural Heritage Information Centre
NSA	Noise Sensitive Area
OBA	Ontario Butterfly Atlas
OGS	Oil/grit Separator
OLA	Outdoor Living Area

OP	Official Plan
OPSS	Ontario Provincial Standard Specification
ORAA	Ontario Reptile and Amphibian Atlas
OSAP	Ontario Stream Assessment Protocol
OTM	Ontario Traffic Manual
PCAs	Potentially Contaminating Activities
PIC	Public Information Centre
PIEVC	Public Infrastructure Engineering Vulnerability Committee
PLOS	Pedestrian Level of Service
PPS	Provincial Policy Statement
PSN	Public Section Network
PSW	Provincially Significant Wetlands
PTTW	Permits to Take Water
QEW	Queen Elizabeth Way
RCP	representative concentration pathways
RGA	Rapid Geomorphic Assessment
ROP	Regional Official Plan
ROW	Right of Way
RSAT	Rapid Stream Assessment Technique
RSSP	Road Safety Strategic Plan
SAA	Strategic Analysis Area
SAR	Species At Risk
SCC	Species of Conservation Concern
SGRA	Significant Groundwater Recharge Area
STS	Sustainable Transportation Strategy
SUE	Subsurface Utility Engineering
SWH	Significant Wildlife Habitat
SWHTG	Significant Wildlife Habitat Technical Guide
TAC	Technical Advisory Committee
TIS	Traffic Impact Study
TMC	Turning Movement Count
TMP	Transportation Master Plan
TPAP	Transit Project Assessment Process
TRCA	Toronto and Region Conservation Authority
TSP	Transit Signal Priority
TSS	Total Suspended Solids
TTC	Toronto Transit Commission
WHPA	Wellhead Protection Area
WWLRT	Waterfront West Light Rail

1 Introduction

1.1 Project Background and Purpose

Lakeshore Road intersects a mix of established and developing communities. Preserving and enhancing the community's character and sense of place is important. By 2041, the Lakeshore communities will grow by approximately 56,000 people and 16,500 jobs. Without any improvements to the transportation network in the Lakeshore communities congestion will worsen for all road users. The existing pedestrian and cycling network are discontinuous and can be better integrated into the overall network. The existing transit service will require additional capacity in the future and a greater degree of transit priority. With limited road capacity, greater reliance on transit, walking, and cycling is required. This requires making these methods of travelling more attractive.

The City developed a Strategic Plan (2009) with a key pillar being the development of a transit-oriented City. The Lakeshore Road Transportation Master Plan and Implementation Strategy built upon this vision to complete the first two phases of the Municipal Class EA processes for supporting multi-modal opportunities that include widening this segment of Lakeshore Road to accommodate dedicated bus lanes and stops, active transportation facilities, and maintaining the existing roadway capacity. In 2019, Mississauga City Council approved the Lakeshore Road Transportation Master Plan and Implementation Strategy, which guided the planning of Lakeshore Road (Southdown Road to the east City limit) and Royal Windsor Drive (Southdown Road to the west City limit) ("the Study Corridor"). Input from the public was integral to defining issues and opportunities and refining final recommendations. The aim of the Study was to provide a unified and seamless vision that:

- Recognized the different character areas and supported all modes of transportation;
- Connected people to places and moved goods to market;
- Supported existing and future land uses; and
- Established an implementation plan to make the vision a reality.

The Lakeshore Road Transportation Master Plan and Implementation Strategy developed a vision and a set of guiding principles for the corridor. The vision was based on local plans and policies and refined through considerable input and collaboration with the public. The guiding principles were the following:

- Enhance connections to the waterfront;
- Create vibrant public spaces;
- Design for all ages and abilities;
- Promote prosperity for local businesses;
- Integrate transportation and land use;
- Move people safely and efficiently;
- Preserve the natural environment;
- Enhance main street features;
- Improve quality of life; and
- Confirmation of Problem and/or& Opportunity Statement.

The City of Mississauga intends to build upon the recent completion of the Master Plan that was carried out under the Municipal Class Environmental Assessment (EA) process and complete the outstanding Transit Project Assessment and Class EA processes and approvals for the proposed improvements in the Lakeshore Corridor. The Studies are collectively named the Lakeshore Transportation Studies and feature the following three components:

- Bus Rapid Transit (BRT) Project: Transit Project Assessment Process (TPAP) and Preliminary Design for two (2) km section of Lakeshore Road from Etobicoke Creek to East Avenue;
- Complete Street Study: Schedule C Class EA Study and Preliminary Design for Lakeshore Road and Royal Windsor Drive from East Avenue to Oakville Border; and
- Active Transportation Bridge Study: Schedule B Class EA Study and Preliminary Design for an Active Transportation bridge crossing over the Credit River north of Lakeshore Road.

The BRT Project is being prioritized in support of the City's application for funding of 2 km of Lakeshore Road BRT segment between East Avenue and Etobicoke Creek, under the Federal Government's Investing in Canada Infrastructure Program (ICIP).

This project will progress the vision developed through the Lakeshore Road Transportation Master Plan and Implementation Strategy and follow comprehensive and sound planning processes in order to recognize and accommodate the infrastructure and transportation needs of the corridor while protecting the established and proposed residential communities and businesses within the Project Area. The project will also address the requirements of internal and external stakeholders including the general public and agencies.

1.2 Project Area

The Project Area for the proposed BRT alignment is shown in **Figure 1-1**. The Project Area is centered on Lakeshore Road East in Mississauga, East Avenue in the west, to approximately Etobicoke Creek in the east. The lands immediately adjacent to the Lakeshore Road East corridor were included in the assessment. This Project Area represents the area upon which potential impacts from the project were assessed.

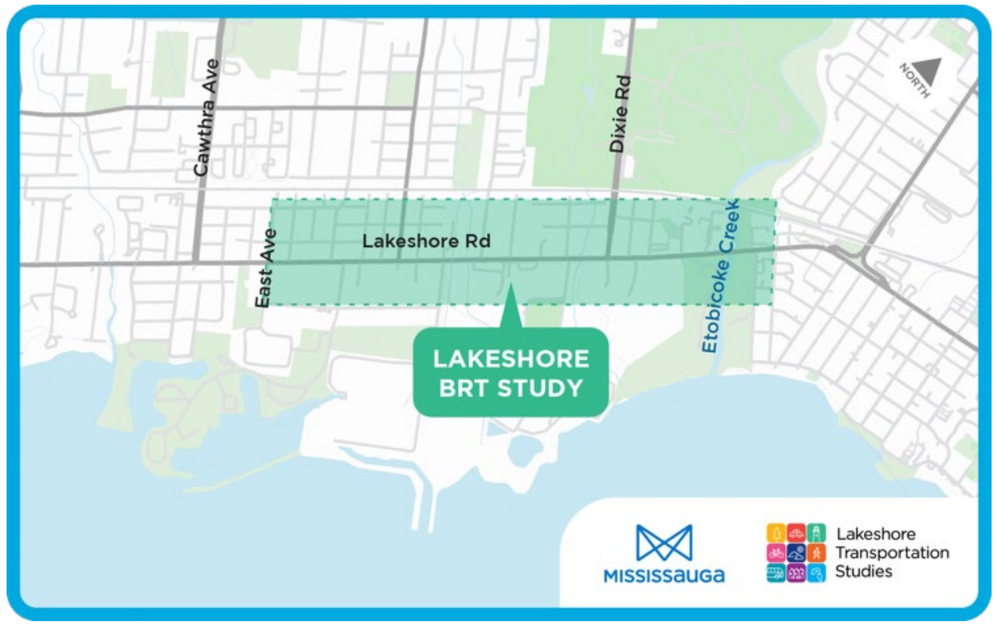


Figure 1-1: Project Area.

The existing conditions in the Project Area are presented in **Section 4**, and the range of anticipated impacts on the Project Area resulting from the proposed transit project are addressed in **Section 6**.

1.3 Project Team Organization

The Project is being led by the City of Mississauga's Project Team, which is composed of several key City staff along with various subject specialists, supported by a Steering Committee with staff from a wide array of City boards and councils. The City has retained HDR as the main consultant as well as several sub-consultants to assist with the Project. See **Figure 1-2** for a chart showing the key contributors of the Project.

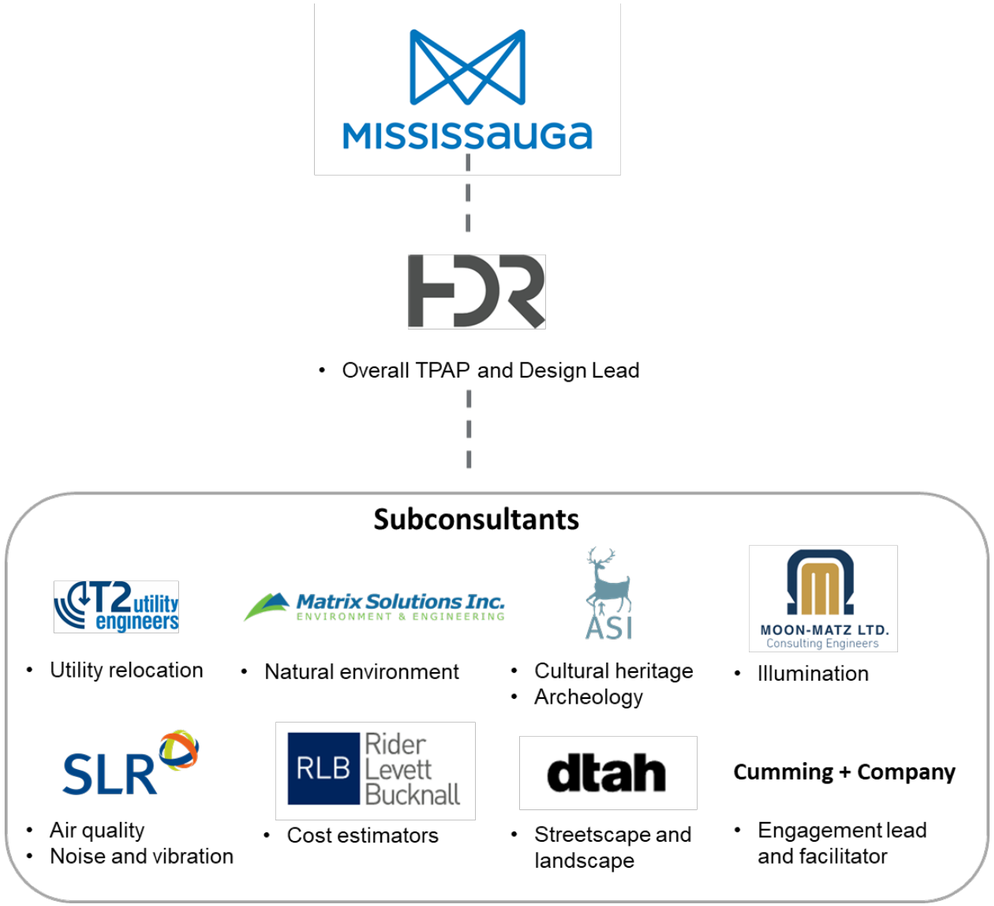


Figure 1-2: Project Organization

1.4 Environmental Assessment Process

1.4.1 Project Proponent

The sole proponent for this transit project is the City of Mississauga. The Ontario Environmental Assessment Act (EAA) defines "proponent" as a person who:

a) carries out or proposes to carry out an undertaking, or

b) is the owner or person having charge, management, or control of an undertaking.

Under the EAA, "person" includes a municipality, Her Majesty in right of Ontario, a Crown agency within the meaning of the Crown Agency Act, a public body, a partnership, an unincorporated joint venture and an unincorporated association.

The City of Mississauga has led the development of the Environmental Project Report (EPR), including the technical studies, as well as stakeholder and Indigenous community engagement. The City plans to continue to manage and implement the project throughout the subsequent design and construction phases of the project, ensuring a continuity of knowledge and commitments from the planning stage onward.

1.4.2 Transit Project Assessment Process (TPAP)

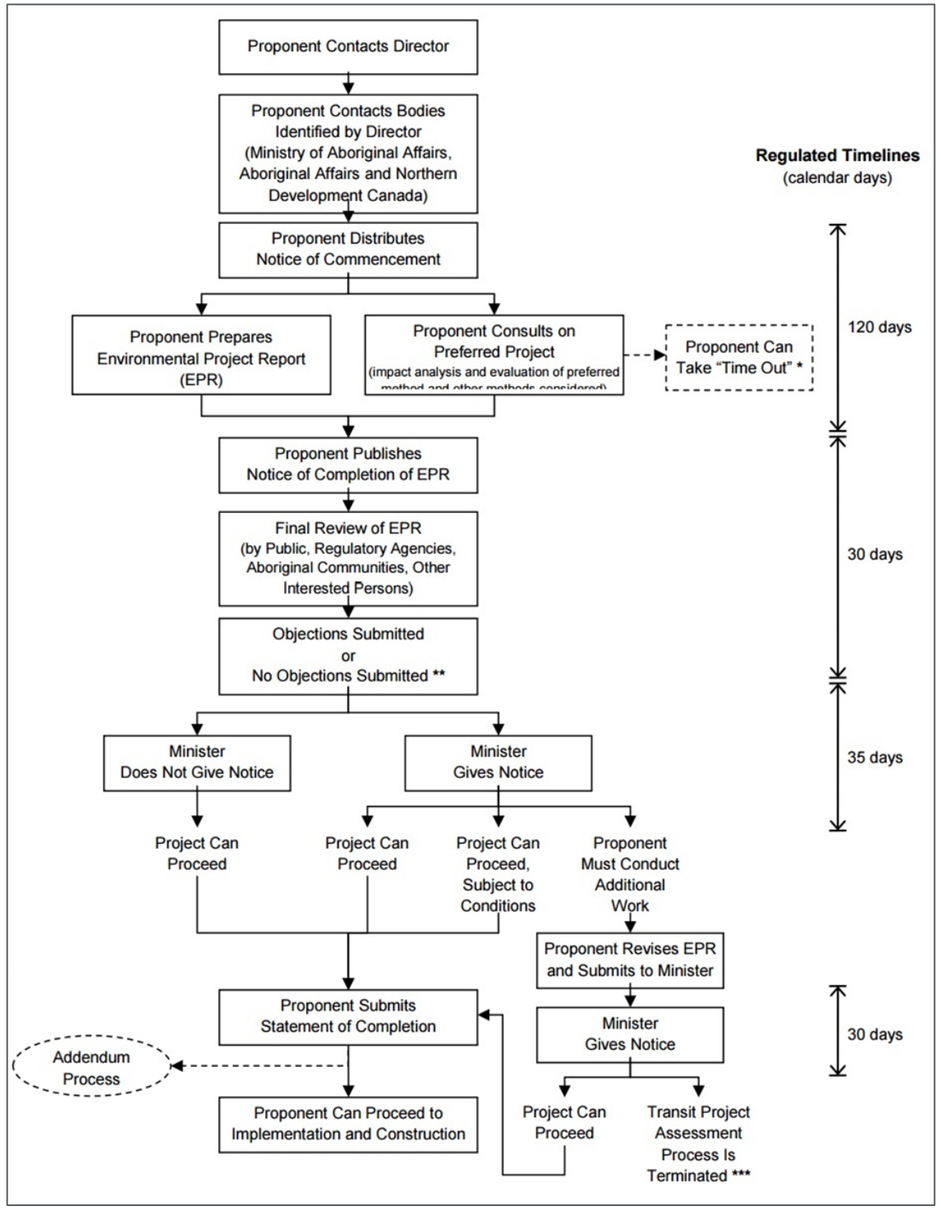
This project is being assessed in accordance with Ontario Regulation 231/08, *Transit Projects and Metrolinx Undertakings* (Transit Projects Regulation) of the Environmental Assessment Act. The Regulation exempts proponents of all public transit projects from the requirements under Part II and Part II.1 of the Environmental Assessment Act, provided the project follows the steps prescribed in the Transit Projects Assessment Process (TPAP); a proponent-driven, self-assessment process. Proponents must follow the prescribed steps in the TPAP within specified timeframes, culminating with the Minister of the Environment's decision within six (6) months of the start of the process, which is marked by the Notice of Commencement.

Schedule 1 of Ontario Regulation 231/08 defines the types of transit projects exempted from the Environmental Assessment Act provided they comply with the Transit Project Assessment Process. The Lakeshore Bus Rapid Transit Project falls within the project type described in the following:

- *Schedule 1, Item 1.8: Widening of an existing road to create new transit lanes for bus or light rail.*

A user-friendly guide to the TPAP process was developed by the Ministry of the Environment and Climate Change, and is available on the Ministry of the Environment's website: https://www.ontario.ca/page/guide-environmental-assessment-requirements-transit-projects).

The TPAP decision-making framework and associated timeframes are illustrated in **Figure 1-3**.



(Source: https://www.ontario.ca/page/guide-environmental-assessment-requirements-transit-projects)

Figure 1-3: TPAP Outline

The six-month timeline includes:

- 120 days for consultation on positive or negative environmental impacts and the preparation of an Environmental Project Report (EPR);
- 30 days for the public, regulatory agencies, aboriginal communities and other interested parties to review and comment on the final EPR; and
- 35 days for the Minister of the Environment to respond to public requests for a review of the project.

There remains a duty for the proponent to employ good planning and decision-making processes in advance of triggering the formal TPAP process, including sound technical assessment of impacts, consultation with stakeholders and the public, and reviews with affected technical review agencies. This will enable the proponent to best address the impacts of the project through identification of mitigating measures with input from stakeholders and affected members of the public.

1.4.3 Environmental Project Report

An Environmental Project Report (EPR) is the required culminating documentation of the TPAP and is to be submitted to the Ministry of Environment, Conservation and Parks (MECP) within 120 days of issuing the Notice of Commencement of the TPAP.

- **Section 1** – An overview of the Project scope and objectives, background, processes, and timelines
- **Section 2** – Relevant plans and policies of different levels of government that were reviewed as part of the project process
- **Section 3** – The pre-planning activities that were undertaken before the TPAP process officially began
- **Section 4** – The existing environmental, cultural, socio-economic, transportation, and utilities conditions in the Project Area
- **Section 5** – A final description of the Project, including a summary of the selection process of the preferred solution
- **Section 6** – The impact assessment of the preferred solution on the various conditions explored in Section 4
- **Section 7** – Consultation and stakeholder engagement processes undertaken during the Project
- **Section 8** – Additional permits, approvals, and future commitments required to implement the recommendations from this Project

1.4.4 Objection Process, Minister's Review and Statement of Completion

If members of the public, regulatory agencies, other stakeholders, or Indigenous communities have concerns regarding the transit project following the Notice of Completion of the EPR, they may submit an objection to the Minister. Objections must be provided during the 30-day review period for the EPR; objections received after the review period has ended will not be considered. Following the 30-day review period, the Minister has 35 days to consider whether the transit project will have a negative impact on a matter of provincial importance or a constitutionally protected Indigenous or treaty right. Following the Minister issuing a notice to proceed, or if the Minister does not act within the 35-day period, the Region of Waterloo will issue a Statement of Completion and proceed to implementation. The Statement of Completion will indicate that the Region intends to proceed with the Project in accordance with either:

- The EPR;
- The EPR subject to conditions set out by the Minister; or
- The revised EPR.

Following submission of the Statement of Completion of the EPR to the Director of the Environmental Approvals Branch and the Regional Director of the MECP, the Project can proceed to implementation and construction. For further details on this process, please reference the MECP Guide for Ontario's Transit Project Assessment Process (January 2014).

1.4.5 Addendum Process

The transit project presented in this EPR is not a static plan, nor is the context in which it is being assessed, reviewed, approved, and constructed. O. Reg. 231/08 includes an addendum process for proponents to make changes to a transit project after the Statement of Completion is submitted to the MECP. An addendum to the EPR may be required if Project developments during the approvals, future design phases, and construction processes result in design variations from what was assessed in the EPR. This addendum process is intended to address the possibility that in implementing a transit project, certain modifications may be made that are inconsistent with the EPR. A change that is inconsistent with the EPR is generally defined as one for which the impacts have not been accounted for in the EPR. If a proponent wishes to make a change to a transit project that is inconsistent with the EPR, the proponent must prepare an EPR addendum. For further details on this process, please reference the MECP Guide for Ontario's Transit Project Assessment Process (January 2014).

1.4.6 Impact Assessment Act

The Impact Assessment Act, 2019 (IAA 2019) and associated regulations came into effect on August 28, 2019 and replaced the Canadian Environmental Assessment Act (2012). Under IAA 2019, a federal environmental assessment is required for “designated projects.” A designated project is one that includes one or more physical activities that are set out in the regulations under IAA 2019 or by order of the Federal Minister of the Environment, Conservation and Parks. This Project was reviewed by the Project Team against the Federal Regulations Designating Physical Activities, and the Project Team determined that the project is not “designated” and therefore will not require a federal environmental assessment. More information about the Impact Assessment Act (2019) is available at the following link: https://www.canada.ca/en/impact-assessment-agency.html.

2 Planning and Policy Context

2.1 Relevant Policies

Growth and infrastructure improvements across Ontario are guided by planning policies from different levels of governments. Outlined in the following sections are the most relevant planning, land use and transportation policies that were reviewed as part of this project.

2.1.1 Federal and Provincial policies

Provincial Policy Statement (2020)

The Provincial Policy Statement (PPS) provides policy direction on land use planning and development within Ontario. The PPS is issued under Section 3 of the Planning Act and replaces the previous PPS issued on April 30th, 2014. The polices set out by the PPS is to promote strong communities, a clean and healthy environment, and a strong economy. Polices within the PPS that are applicable to this Project include, but are not limited to:

- Section 1.1.1 e): promoting the integration of land use planning, growth management, transit-supportive development, intensification and infrastructure planning to achieve cost-effective development patterns, optimization of transit investments, and standards to minimize land consumption and servicing costs;
- Section 1.6.7.1: Transportation systems should be provided which are safe, energy efficient, facilitate the movement of people and goods, and are appropriate to address projected needs.
- Section 1.6.7.2: Efficient use should be made of existing and planned infrastructure, including through the use of transportation demand management strategies, where feasible.
- Section 1.6.7.3: As part of a multimodal transportation system, connectivity within and among transportation systems and modes should be maintained and, where possible, improved including connections which cross jurisdictional boundaries.
- Section 1.6.7.4: A land use pattern, density and mix of uses should be promoted that minimize the length and number of vehicle trips and support current and future use of transit and active transportation.

The BRT Project meets the objectives of the PPS in encouraging transit-supportive development and improving network connectivity while reducing congestion.

A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2020)

The Places to Grow: Growth Plan for the Greater Golden Horseshoe (GGH) is a government initiative that address the planning challenges due to the projected population growth within the GGH. The plan was originally prepared as a result of the Place to Grow Act, 2005 and was implemented in 2006. The plan has since been amended in 2013, 2017 and 2019. The current plan, which took effect on August 28th, 2020, was the result of the addition of Amendment 1 (2020) to the 2019 plan.
The plan was developed with the intent of addressing the need for economic prosperity, protect the environment and help communities achieve a high quality of life. The framework outlines that the majority of growth should be focused to settlement areas in locations with existing or planned transit. Policies within Section 3.2.3 – Moving People of the plan that are applicable to this Project include, but are not limited to:

- Public transit will be the first priority for transportation infrastructure planning and major transportation investments; and
- All decisions on transit planning and investment will be made according to the following criteria:
    - prioritizing areas with existing or planned higher residential or employment densities to optimize return on investment and the efficiency and viability of existing and planned transit service levels;
    - increasing the capacity of existing transit systems to support strategic growth areas;
    - expanding transit service to areas that have achieved, or will be planned to achieve, transit-supportive densities and provide a mix of residential, office, institutional, and commercial development, wherever possible;
    - increasing the modal share of transit; and
    - contributing towards the provincial greenhouse gas emissions reduction targets.
- Municipalities will ensure that active transportation networks are comprehensive and integrated into transportation planning to provide:
    - safe, comfortable travel for pedestrians, bicyclists, and other users of active transportation; and
    - continuous linkages between strategic growth areas, adjacent neighborhoods, major trip generators, and transit stations, including dedicated lane space for bicyclists on the major street network, or other safe and convenient alternatives.

The Project will conform to the goals by expanding transit service along Lakeshore Road within Mississauga and provide more reliable transit within current and future communities within the Project Area.

2.1.2 Peel Region Policies

Regional Official Plan (2018)

The Regional Official Plan (ROP) provides a long-term policy framework for directing growth and development within Peel Region while protecting the environment and managing resources. The plan is updated every 5 years and was last updated in 2018.

The plan contains policies that supports the expansion of transit by encouraging transit-supportive development along identified rapid transit corridors.

A collective set of objectives and policies has been developed to guide development of the Region's transportation system (Chapter 5.9). The objectives and policies are intended to foster increased sustainability by:

- Considering all modes of travel and promoting the efficient movement of people and goods (with a focus of moving people by modes other than single-occupant automobiles);
- Maximizing the use of existing transportation infrastructure;
- Increasing travel choices to meet diverse needs;
- Minimizing the environmental and health impacts of transportation;
- Supporting economic development;
- Considering social and cultural objectives;
- Promoting the integration of transportation planning and land use planning; and
- Developing predictable and sustainable funding for multi-modal transportation system.

The following ROP schedules are applicable to the project corridor:

- Schedule A (Core Areas of the Greenlands System in Peel) indicates that the project corridor is adjacent to or crosses through several areas identified as Core Areas of the Greenlands System.
- Schedule D (Regional Structure) identifies the entire Project Area as Urban Area while Schedule D4 identities the Project Area as Built-Up Area.
- Schedule E (Major Road Network) identifies the entire Project Area of Lakeshore Road and Royal Windsor Drive as a Major Road.
- Schedule G (Rapid Transit Corridors –Long Term Concept) identifies Lakeshore Road East between Hurontario Street to beyond the eastern regional boundary (Lakeshore Boulevard within the City of Toronto) as a Rapid Transit Corridor. The intersection of Lakeshore Road and Hurontario Street is identified as a Gateway Mobility Hub. An Express Rail GO Rail Line and with is respective GO Stations are identified to the north of the project corridor.

Sustainable Transportation Strategy (2018)

The Sustainable Transportation Strategy (STS) developed by Peel Region identifies the role of the region to promote 'sustainable' transportation modes. These include walking, cycling, carpooling, transit, and teleworking. As Peel Region is expected to see a 40 percent increase in population by 2041, the growth cannot be sustained by single occupancy automobile alone. The strategy is defined by the Region's jurisdictional responsibilities, but also considers policies and plans of the municipality and provincial level of government.
More than 50 actions are recommended within the STS with the goal to increase the sustainable mode share from the current 37 percent to 50 percent by 2041. Actions recommended within the STS that are relevant and applicable to this Project include, but are not limited to:

- Provide comfortable, continuous walking routes.
- Provide comfortable, continuous cycling facilities.
- Make regional roads more transit supportive.
- Promote transit use across the Region.

The STS identifies the Project Area between Toronto and 70 Mississauga Road as planned transit infrastructure as a potential expansion of the streetcar/BRT service from Toronto to Peel.

In proximity to the Project Area, the STS identifies existing bike lanes on Dixie Road north of Lakeshore Road and that cycle tracks are proposed on Cawthra Road which will also connect onto Lakeshore Road.

Long Range Transportation Plan (2019)

The Peel Long Range Transportation Plan (LRTP), last updated in 2019, identifies that the population within the Region of Peel is expected to grow an additional 500,000 residence and 250,000 additional jobs by 2041. Traffic congestion is expected to increase by 45 percent and will have significant impact on the transportation network. The plan recommends accommodating growth in a sustainable way by drafting appropriate policies, strategies, and planned road improvements.

The Region recognizes that growth cannot be sustained by constructing new roads with a focus on single occupancy automobile alone. The LRTP recommends a combination of investing in both road improvements and sustainable modes to accommodate the projected population growth, with the goal achieving a sustainable mode share of 50 percent. No road widening is identified along the Lakeshore Road / Royal Windsor Drive corridor in the LRTP's recommended plan.

The Goods Movement Strategic Plan 2017-2021 (2017)

The Goods Movement Strategic Plan is a 5-year roadmap outlining actions to take within Peel Region to help move goods more efficiently, manage congestion while mitigating effects on health and the environment in Peel Region.

The Good Movement Strategic Plan does not have significant direct impact on the Lakeshore Transportation Studies, except to note that a section of Royal Windsor Drive between Winston Churchill Boulevard and Southdown Road is identified as a Connector Truck Route.

As such, this section may experience an increase in volume of freight trucks, especially in the number of Long Combination Vehicles (LCV), as the Region has been working to expand the use of LCVs since the Plan's implementation in 2017. Subsequently, this section of the corridor needs to be planned with freight traffic in mind.

2018-2022 Active Transportation Implementation Plan (2018)

The 2018-2022 Active Transportation (AT) Implementation Plan was developed under Peel Region's 2018 Sustainable Transportation Strategy. The AT Implementation Plan offers a short-term vision and direction in Peel Region for implementing AT initiatives and infrastructure.

Specifically, the 2018-2022 AT Implementation Plan encourages local municipalities to reduce parking requirements where feasible to incentivize the use of public transit and AT.

It should also be noted that an upgrade has been planned at the intersection crossing of Lakeshore Road and Winston Churchill Boulevard to provide cyclists access to the Waterfront Trail from paved shoulders.

2018-2022 Region of Peel Vision Zero Road Safety Strategic Plan

The Region of Peel Vision Zero Road Safety Strategic Plan (RSSP) aims to reduce the number of roadway collisions on regional roads by promoting safe mobility, walkability, healthy living, and various modes of transportation.

The Lakeshore BRT Project contributes to the objectives of the RSSP by improving the walkability and access to public transit in the Lakeshore corridor.

2.1.3 Municipal Policies

City of Mississauga Official Plan (2020)

Chapter 8 of the Mississauga Official Plan (OP) is important to the Lakeshore BRT Project as it states the policies for creating a multi-modal City. Lakeshore Road will continue to move large volumes of traffic and support goods movements; however, the design of the street must be sensitive to surrounding land uses. The needs of transit, pedestrians and cyclists will be prioritized at the forefront – transportation decisions will support the creation of a fine grain street pattern, low traffic speeds, a mix of travel modes and attention to design of the public realm.

The Plan specifically targets a multi-modal approach to planning transportation infrastructure in areas of redevelopment and intensification, to encourage more-sustainable modes of travel. It states, in Section 8.1:

"Improving connections from surrounding areas to Intensification Areas will also be a priority. These connections will focus on increasing opportunities for walking and cycling, which may result in consolidating vehicular entrances to support the creation of continuous building frontages with entranceways facing public streets and oriented to pedestrians.

Creating a multi-modal transportation system that supports transit and active transportation options goes hand-in-hand with creating compact, complete communities, and providing future generations with the opportunity to lead healthier, longer, more active lives. Transportation planning will complement environmental planning, land use planning and urban design."

Cycling Master Plan (2018)

According to the Mississauga Cycling Master Plan, the highest demand for cycling in the broader project corridor is along Burnhamthorpe Road, Waterfront Trail, Lakeshore Road, Eglinton Avenue West, Aquitaine Drive, Thomas Street and McLaughlin Road. Cycling volumes along major corridors represent 1 percent or less of all travel modes. There is a high demand for cycling where linking destinations to neighbourhood centres is critical, such as in Clarkson, Port Credit, along the Waterfront, and in proximity to GO Stations. The Master Plan identified Royal Windsor Drive from Winston Churchill Blvd to Southdown Road as a proposed primary boulevard route and Lakeshore Road from Southdown Road to the East City limit as a primary on-road route. It also identified two new crossings of the Credit River within the Strategic Analysis Area (SAA) at the Queen Elizabeth Way (QEW) and Mineola/Indian Road.

During the Lakeshore Road Transportation Master Plan study, the City of Mississauga updated the Cycling Master Plan and was endorsed by City Council on July 4, 2018. The updated Master Plan identified separated bike lanes for the entire Project Corridor between Winston Churchill Boulevard and Etobicoke Creek with proposed major barrier crossings at the QEW, Mineola/Indian Road, and the south side of the Lakeshore West GO railway line.

Strategic Plan (2019)

The City's Strategic Plan sets high level goals and objectives that the City aims to achieve. The Plan defines the City's Vision Statement and the Strategic Pillars for Change, and provides the structure and direction to the final phase of the Strategic Plan, the municipality's highest level policy document that was created to shape and direct strategic decision-making for the city (**Figure 2-1**).

There are two parts to the Strategic Plan. The first includes the Vision Statement and the five Strategic Pillars for Change, with each pillar including:

- A direction or vision of what the ideal future looks like for the city.
- A principal statement of values, derived from the vision.
- The strategic goals that we aim to achieve with the vision.

The strategic goals translate into specific actions that inform part two of the Strategic Plan – the Action Plan. The Action Plan includes the actions, indicators, targets, and funding approaches for each of the Strategic Pillars for Change.

Figure 2-1: Mississauga Strategic Plan Pillars for Change

While the Lakeshore BRT project generally supports the strategic pillars identified above, it directly contributes to the "Move" pillar and the "Green" pillar. The following key elements of the pillars are excerpted from the Plan:

Move Pillar:

"Direction - *Our Future Mississauga is a city where people can get around without an automobile, and where transit will directly influence and shape the form of the city. Transit will be a desirable choice that connects people to destinations, and will underpin an environmentally responsible, inclusive, vibrant and successful city.*

Principle - *Mississauga is a city that values clean air and healthy lifestyles through the promotion of transit as a preferred, affordable and accessible choice.*

Strategic Goals*:*

Develop Environmental Responsibility – to contribute to environmental responsibility by reducing private automobile use and developing compact mixed-use development.

Connect our City – to contribute to a vibrant, successful city by connecting communities within Mississauga and within the Greater Golden Horseshoe to support a 24-hour city.

Build a Reliable and Convenient System – to make transit a faster and more affordable alternative to the automobile, one that is frequent, clean, safe, reliable, and convenient, with a transit stop within walking distance of every home and an intricate web of higher order transit.

Increase Transportation Capacity – to add capacity to the transportation system through strategic investments in transit, additional links in the street network and active mobility choices.

Direct Growth – to direct growth by supporting transit-oriented development policies and deliberate civic actions."

Green Pillar:

*"**Direction** - Our Future Mississauga is a city that co-exists in harmony with its ecosystems, where natural areas are enhanced, forests and valleys are protected, the waterfront connects people to Lake Ontario, and communities are nurtured so that future generations enjoy a clean, healthy lifestyle.*

Principle - Mississauga is a city that values its shared responsibility to leave a legacy of a clean and healthy natural environment.

Strategic Goals:

Lead and Encourage Environmentally Responsible Approaches – to lead and promote the utilization of technologies and tactics to conserve energy and water, reduce emissions and waste, improve our air quality, and protect our natural environment

Conserve, Enhance and Connect Natural Environments – to be responsible stewards of the land by conserving, enhancing, and connecting natural environments.

Promote a Green Culture – to lead a change in behaviours to support a more responsible and sustainable approach to the environment, that will minimize our impact on the environment and contribute to reversing climate change."

The Lakeshore BRT project seeks to promote the development of a healthy and sustainable community through offering attractive alternative modes of transportation in the Lakeshore Road corridor.

Hurontario-Main LRT Environmental Project Report (2014)

The Hurontario-Main LRT EPR identified the terminal stop for the Hurontario LRT at Park Street on Hurontario Street with protection for a potential southerly extension to Lakeshore Road. Since the proposed location for the terminal is north of Lakeshore Road, improving multi-modal connectivity between Lakeshore Road and the future LRT is important. The Hurontario LRT will form the major north-south transit spine in central Mississauga, connecting the Port Credit area with the City Centre, downtown Brampton, and all communities in-between. The facility will also intersect with major east-west transit corridors, including the Lakeshore West GO Rail line, the Milton GO Rail Line, the Mississauga BRT, proposed 407 Transitway, Brampton Zum services on Steeles Avenue, and future Queen Street BRT in Brampton.

MiWay 5-Transit Service Plan (2016-2020)

MiWay 5 Transit Service Plan is the five-year service plan to guide transit expansion within the City of Mississauga and to support the implementation of a new light rail line along Hurontario Street. The plan is focused on revising existing routes and schedules to provide added frequency, more service hours and better connectivity throughout the network. Specifically, the plan builds on public and stakeholder preference for a grid route network with improved frequencies and increase service span on Sundays and early morning weekdays, improved reliability, faster travel times with more direct routes, improved connections to GO stations, more express routes, and improved service to neighbouring communities.

The Lakeshore Road Corridor between Clarkson GO Station and Long Branch GO Station is identified as a high frequency corridor. The MiWay 5 Service Plan informed the Project with respect to improving service on Lakeshore Road with frequencies improving on Route 23 in response to ridership demand.

MiWay Infrastructure Growth Plan (2020)

MiWay Infrastructure Growth Plan (MIGP) identifies infrastructure needs to support transit objectives and provides a roadmap for MiWay's capital program. The MIGP is guided by four principles, namely:

- Accessibility and pedestrian-friendliness
- Consistency
- Transit competitiveness
- Placemaking

The MIGP seeks to provide barrier-free transit infrastructure that enhances the customer experience, attracts new passengers, and strengthens the connection between land use and transit.

2.1.4 Mississauga Local Area Policies

Lakeview Local Area Plan and Port Credit Local Area Plan (2018)

Both the Lakeview Local Area Plan (generally Lakeshore Road from the Etobicoke Creek to Seneca Avenue) and the Port Credit Local Area Plan (generally Lakeshore Road from Seneca Avenue to Godfrey's Lane) state that Lakeshore Road should be maintained as a four-lane roadway during peak travel times. Lakeshore Road is identified as a high order transit corridor with pedestrian and cycling facilities in the Lakeview Local Area Plan. Furthermore, public transit is recommended on Dixie Road, Cawthra Road, and Ogden Avenue.

It was also noted that on-street parking should be permitted only where it can be accommodated into streetscaping.

A draft development master plan was released in October 2018 for "Lakeview Village" and received Council endorsement in 2021.

Inspiration Lakeview Master Plan (2014)

The City of Mississauga initiated the Inspiration Lakeview Master Plan in 2010 (received by the Planning and Development Committee in 2014) and led to the creation of the new Major Node Character Area within the Lakeview Employment Character Area which came into effect on August 1, 2018, following the City of Mississauga's adoption of Official Plan Amendment 89 on July 4, 2018.

Inspiration Port Credit

The City of Mississauga also initiated the Inspiration Port Credit Master Plan in 2013 which led to the development of Master Plans for 1 Port Street East and 70 Mississauga Road. A draft development master plan was approved by Council for 'Port Credit West Village' at 70 Mississauga Road and a Recommendation Report was present to the Planning & Development Committee in July 2019.

2.1.5 Metrolinx and GO Transit

Metrolinx 2041 Regional Mississauga Transportation Master Plan (2019)

Metrolinx 2041 Regional Mississauga Transportation Master Plan identifies part of the Project Corridor as the future Waterfront West Light Rail Transit (WWLRT) which is described as a new light rail transit corridor along the waterfront that links downtown Toronto and Port Credit. The Plan notes that all project definitions are subject to change based on negotiations and agreements with railways, environmental assessments, business case analyses, and further planning.

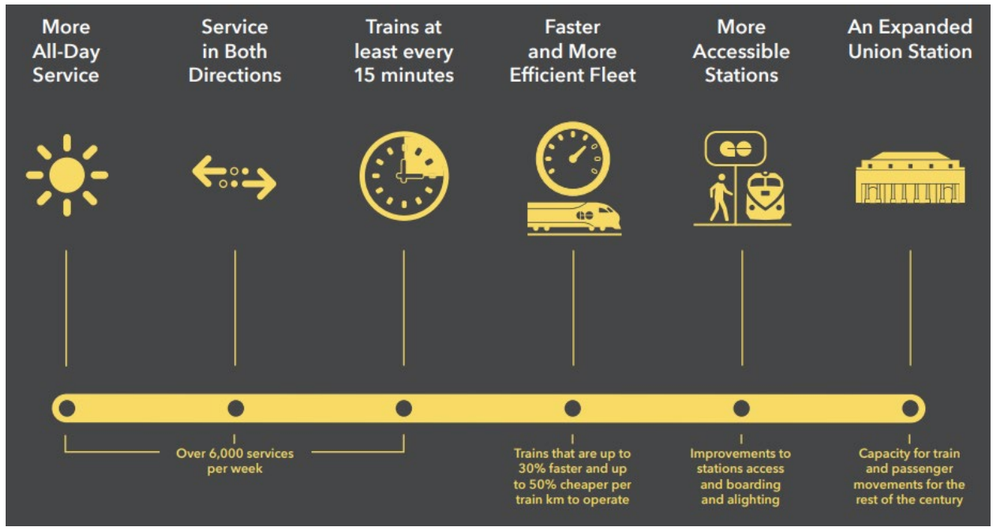
The Plan also identified 15 minute two-way all day GO train service on the Lakeshore West Line within the Strategic Analysis Area (SAA). This increase in service frequency within the SAA will improve transit availability for residents in the area and increase the need for improved multi-modal connections to GO Stations.

GO Expansion Program

The GO Expansion Program is comprised of individual projects aimed at providing a more comprehensive, faster, and more convenient transit service for the Golden Horseshoe Region. The backbone of the program includes the introduction of new train technology on the Barrie, Lakeshore, Stouffville and Kitchener rail lines that will accommodate faster trains offering two-way, all-day trips, as often as every 15 minutes. The GO Expansion Program is already underway, with a 33 percent increase in transit services provided in the past two years. The program is summarized in **Figure 2-2**.

The key projects in the program include:

- 10 stations already under construction (Bramalea, a new Bloomington, Weston, Rutherford, Agincourt, Milliken, Unionville, Cooksville, Kipling, Union Station).
- 29 stations slated for early station improvements (customer service and safety improvements, including PA systems, platform edge tiles, display boards).
- Corridors with track work underway (Stouffville double track, Barrie double track, Hamilton Junction track and signals in partnership with CN).
- Grade separations (Davenport Diamond, Steeles Avenue, Rutherford Road).
- Tunnel/bridge expansions (401/409 Tunnel expansion, Centennial bridge in partnership with CN, John Street in partnership with CN, and Desjardin Canal Bridge in partnership with CN).



(Source: https://www.metrolinx.com/en/greaterregion/projects/go-expansion.aspx)

Figure 2-2: GO Expansion Plan Summary

3 Pre-Planning Activities

Lakeshore Transportation Master Plan (2019)

As discussed in Section 1, the background investigations that shaped the plan for the Lakeshore Road East corridor in Mississauga were undertaken as part of the Lakeshore Road Transportation Master Plan study; a review of the existing and future transportation conditions in the Lakeshore Road corridor throughout Mississauga.
This study followed the master planning process described in the Municipal Engineers Association Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011, and 2015). The project involved multi-modal transportation planning, urban design, and land use planning. The Master Plan process satisfied Phases I (Identify Problem and Opportunity) and II (Identify and Evaluate Alternative Solutions to the Problem or Opportunity) of the Municipal Class EA process.

The Lakeshore Transportation Master Plan report documents the approach and recommendations from the TMP process per the Municipal Class EA process. It serves as the basis for, and will be used in support of, future investigations to fulfill Municipal Class EA requirements for the project recommendations identified from this Master Plan.

The key investigations and conclusions, as they relate to the subject transit project, are summarized in this section. A copy of the full study report is available at:

https://www.mississauga.ca/projects-and-strategies/city-projects/lakeshore-connecting-communities/

Multi-Modal Needs Assessment

A multi-modal needs assessment was undertaken to determine the overall need and justification for transportation improvements to the Project Corridor from a transportation network perspective and considering the needs for each travel mode.

As the Lakeshore Road Corridor intensifies and redevelopment occurs, there will be greater demand on the existing pedestrian facilities – not only sidewalks but street cafes, benches, streetscaping, and walking trails. Improvements to the pedestrian environment should be made to make walking an attractive and viable alternative mode of transportation.

There is a high demand for cycling along Lakeshore Road and the Waterfront Trail as well as high demand for cycling linkages from neighbourhood centres, Clarkson Village, Port Credit, the waterfront, and GO Stations to destinations throughout the Corridor. The demand for cycling will continue to increase in the Network Analysis Area and the Lakeshore Road Corridor specifically as redevelopment occurs and new rapid transit is built.

Existing bus service is projected to be over capacity in the future. To test the potential for higher ridership along the route in the future, two scenarios were considered: BRT and an extension of the TTC streetcar. The results of these scenarios indicated that there is potential to support higher order transit east of Mississauga Road; however, ridership potential west of Mississauga is expected to remain low and would be adequately served by conventional or enhanced bus.

The road network within the broader Project Area continues to experience capacity constraints in the east-west direction with the Peel-Halton and Credit River screenlines becoming heavily congested in the PM peak hour in the westbound direction (**Figure 3-1**). Without any transportation improvements along Lakeshore Road, segments of Lakeshore Road are congested or above capacity between Winston Churchill Boulevard and Clarkson Road, through Port Credit (Mississauga Road to Cawthra Road) and between Dixie Road and the Etobicoke Creek.

Existing (2011) PM Peak Hour, East-West Travel Screenline Volume/Capacity Assessment

Future (2041) PM Peak Hour 'BAU', East-West Travel Screenline Volume/Capacity Assessment

Figure 3-1: Lakeshore Corridor Screenline Analysis

Consultation

Internal City of Mississauga stakeholders and external stakeholders were also consulted throughout the Project at key milestones to review recommendations and provide input.

A Technical Advisory Committee (TAC) was established at the onset of the Project to facilitate communication between the Project Team and other subject matter experts. TAC meetings were held throughout the Project before or after each Public Open House.

Indigenous Communities were also consulted throughout the Project. Notifications were sent via email and registered mail. Correspondence tracking log with Indigenous Communities is provided in Appendix B of the Lakeshore Road Transportation Master Plan and Implementation Strategy report.

Vision and Guiding Principles

The objectives of the Project were to:

- Develop a vision;
- Recognize the different character areas;
- Support all ways of travelling;
- Connect people to places and move goods to market;
- Support existing and future land uses; and
- Establish a plan to make the vision a reality.

A vision for the Project Corridor was developed early in the Project process. Public input helped shape the vision for the Project Corridor and resulted in a set of guiding principles which the Project Team referred to in the assessment of transportation and corridor design alternatives.

The following guiding principles for the Lakeshore Road Transportation Master Plan study were identified to reflect best practice in multi-modal complete streets design and public input:

- Enhance connections to the waterfront;
- Create vibrant public spaces Improve quality of life;
- Moving people safely and efficiently;
- Preserve the natural environment;
- Promote prosperity for local businesses;
- Design for all ages and abilities;
- Enhance main street features; and
- Integrate transportation and land use.

Lakeshore Road intersects a mix of established and developing communities. Preserving and enhancing the community's character and sense of place is important.

By 2041, the Lakeshore Communities will grow by approximately 56,000 people and 16,500 jobs. Without any improvements to the transportation network in the Lakeshore Communities congestion will worsen for all road users. The existing pedestrian and cycling network are discontinuous and can be better integrated into the overall network. The existing transit service will require additional capacity in the future and a greater degree of transit priority. With limited road capacity, greater reliance on transit, walking, and cycling is required. This requires making these methods of travelling more attractive.

Through the first Public Open House for the Project, the public had the opportunity to comment on the guiding principles as well as provide input on the vision for the Project Corridor specific to each mode of transportation through a visual preference exercise. The Project Team used the input from the first Open House to inform the alternative solutions that were developed following the Open House.

The public also provided input on the problem/opportunity statement at the first Open House. The problem/opportunity statement was confirmed following the meeting and summarized and presented again at the second Public Open House.

Evaluation Criteria

The evaluation of alternatives included the formulation of high-level evaluation criteria. The evaluation criteria include transportation considerations as well as impacts to the natural, cultural, and socio-economic environments. Evaluation criteria were presented to the public at PIC2 and confirmed following the open house.

Criteria used in the evaluation of the alternatives were categorized into three groups:

- Serving People
    - Choice: Develop an integrated network that connects different modes to provide for more travel options.
    - Experience: Capacity to ease crowding/congestion; reduce travel times; make travel more reliable, safe, and enjoyable.
    - Social Equity: Do not favour any group over others, allows everyone good access to work, school, and other activities.
- Strengthening Places
    - Shaping the City: Use the transportation network as a tool to shape residential development of the City.
    - Healthy Neighbourhoods: Changes in the transportation network should strengthen and enhance existing neighbourhoods; promote safe walking and cycling within and between neighbourhoods.
    - Public Health and Environment: Support and enhance natural areas; encourage people to reduce how far they drive.
- Supporting Prosperity
    - Supports Growth: Investment in public transportation should support economic development; allow workers to get to jobs more easily; allow goods to get to markets more efficiently.

- Affordable: Improvements to the transportation system should be adorable to build, maintain and operate.
- Resilient: The transit network should have the ability to adapt and accommodate unexpected disruption including manage.

Transit Network Alternatives and Preferred Solution

Five (5) transit network alternative families were considered. The alternatives were developed to address the need for rapid transit east of Mississauga Road and included standalone transit alternatives, extension of existing Toronto Transit Commission (TTC) service alternatives, and extension of the planned Hurontario LRT alternatives.

Details on each of the Alternatives considered are provided in the Lakeshore Transportation Master Plan report.

Alternative 2B, consisting of Express Bus/BRT service on Lakeshore Road, and Alternative 3B, consisting of a western extension of the TTC Streetcar were selected as the preferred alternatives. It was determined that Alternative 2B – Lakeshore BRT would serve as an interim solution and Alternative 3B – WWLRT Extension (streetcar configuration) as the ultimate preferred solution. Alternative 2B – Lakeshore Express Bus/BRT has relatively low construction complexity as it is a bus option with no need for construction of rail tracks. This is a flexible interim solution with very minor impacts to existing stable neighbourhoods due to construction, and can build ridership before a streetcar/LRT service is needed for the corridor.

The recommended ultimate solution, Alternative 3B – Waterfront LRT (WLRT) Extension (streetcar configuration), has high projected ridership making it highly compatible with community services and provides a seamless (i.e., no transfer) connection with TTC service, while also having only moderate impacts on noise and vibration due to construction and operation.

Through discussion with the City of Toronto and Toronto Transit Commission (TTC), it was confirmed that the WLRT is not planned to be implemented by 2041 between Legion Road and Long Branch. Based on the operating assumptions provided by TTC, the resulting ridership along Lakeshore Road, should the enhanced streetcar (i.e., Scenario 3B) be extended to Mississauga Road, would be approximately 1700 peak direction passengers per hour at the Etobicoke Creek, representing an approximate 30% decrease in peak hour direction ridership. Therefore, Alternative 2B – Lakeshore Express Bus/BRT was determined to be the preferred transit solution for the 2041 horizon year. Extension of the Streetcar can be considered beyond 2041.

With respect to the consideration of streetcars vs. express buses, the public generally showed a preference for express buses over streetcars. The public identified a number of benefits of having express buses which are seen to have more flexibility, to not necessitate overhead wires or streetcar tracks which are viewed by many as being an impediment for pedestrians and cyclists and are considered less costly to maintain.

Right of Way Alternatives

Through Phase 1 of the Project, it was determined that improvements to the right-of-way are required to address the multi-modal needs identified along the Project Corridor. Therefore, to address the needs identified in the problem/opportunity statement, in Phase 2 of the Project right-of-way alternatives were identified, assessed, and evaluated for the Project Corridor.

The corridor was divided into seven (7) segments based on differing characteristics, including: designated Official Plan (OP) right-of-way width, existing character, critical constraints, and future transportation needs. Segment 7 comprises the Project Area for this TPAP (**Figure 3-2**).

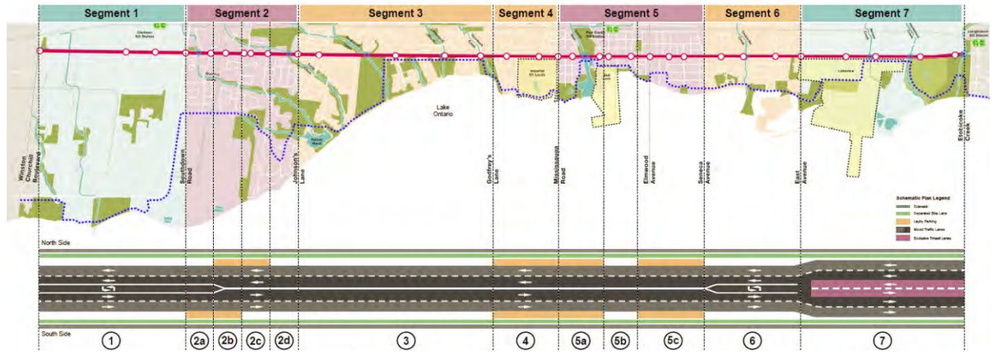


Figure 3-2: Lakeshore Transportation Master Plan Corridor Segments

Taking into consideration the different character areas along the corridor and the need for a context sensitive solution, a number of initial cross-section alternatives were developed for each segment. These cross-section alternatives provided a different emphasis and mix of transportation modes that could potentially fit into the available ROW. Trade-offs from different modes were considered between the various alternatives in order to satisfy the needs for each segment.

Using the public's input on the vision for the Project Corridor from Public Open House 1, the Project Team developed all reasonable and feasible alternative right-of-way configurations. At Public Open House 2, the right-of-way alternatives for each segment of the Project Corridor were presented to the public and they had the opportunity to give feedback and express their preference for an option. No recommendation for a preferred alternative was presented at Public Open House 2

From the input received about the right-of-way alternatives at Public Open House 2 and following internal stakeholder meetings with the City of Mississauga staff, the Project Team noted that layby parking in the Port Credit Neighbourhood was important; therefore, the right-of-way alternatives for Segment 5 were refined to include an option with 4 travel lanes and layby parking which alternates with streetscaping opportunities. The alternatives were then evaluated, and a preferred alternative was selected. The preferred alternative for each segment was presented to the public at Public Open House 3. Feedback from Public Open House 3 confirmed the preferred alternative for each segment.

Preferred Right-of-Way Alternative

The preferred cross-section for each segment of the Project Corridor is presented below. The preferred cross-sections were determined through discussions with the City of Mississauga internal departments and reflect public and stakeholder input received following the evaluation of alternatives.

Continuous separated bike lanes were recommended throughout the corridor, as well as sidewalks on both sides of the street. Lay-by parking is to be provided on the north side along segments 2B and 2C, as well as on the south side along segment 2C. Segments 4, 5A, and 5C will have lay-by parking on one or both sides, alternating with planting zones. Segments 1, 2A, and 6 will provide a centre left turn lane. Finally, Segment 7 – the subject of this TPAP – will have exclusive two-way transit lanes in the median (see **Figure 3-3**).

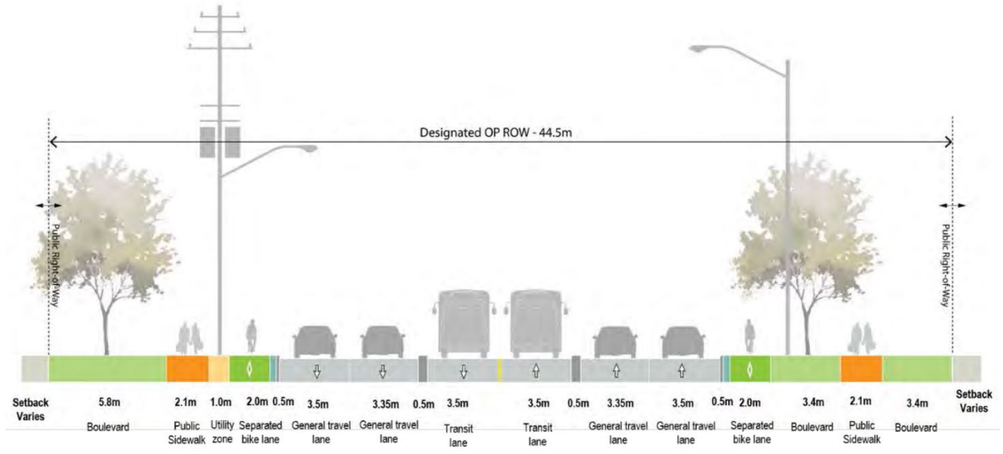


Figure 3-3: Recommended Cross-Section for Segment 7 (Mid-Block)

It should be noted that the median transit only lanes are not proposed to extend the entirety of Segment 7; the median transit lanes would run from East Avenue to just west of the Etobicoke Creek to minimize impacts to the Etobicoke Creek crossing and so that the express bus can merge back into general purpose lanes prior to crossing into the City of Toronto. Seeing that the Right of Way within Segment 7 varies between 26m and 44.5m, the boulevard space available for trees and utilities also varies throughout the Segment. Subsequently, **Figure 3-3** serves as a sample cross-section and does not represent the whole of Segment 7.

4 Existing Conditions

In order to establish baseline conditions against which the potential impacts of the project could be measured, a series of specialist investigations were undertaken. The specialist investigations were comprised of a mix of both field investigations and desktop reviews of available data. These are summarized in the following sections:

- Natural Environment;
- Fluvial Geomorphology;
- Drainage and Stormwater Management;
- Cultural Heritage Environment;
- Socio-Economic Environment;
- Transportation Conditions; and
- Utilities and Municipal Services.
- Existing Structures

4.1 Natural Environment

4.1.1 Methodology

A natural environment assessment encompasses all areas within 50 m of the Project Area right-of-way. Information pertaining to natural heritage resources within or adjacent to the assessment area was obtained through a review of background studies, databases, and field investigations.

Initial background requests regarding species at risk (SAR) were submitted to the Ontario Ministry of the Environment, Conservation and Parks (MECP). Other publicly available data sources were also reviewed to determine potential species of conservation concern (SCC) and SAR whose occurrence ranges overlap with the area. Lastly, the Golder (2016) natural environment constraints assessment was reviewed to ensure inclusion of any conclusions and constraints. Background review material for the assessment area has also been obtained from available secondary source reports.

The overall review was conducted using the following sources:

- Species at risk list (MECP, June 2021)
- Natural heritage information (CVC and TRCA)
- Etobicoke Creek Watershed Characterization Report (TRCA)
- Credit River Watershed and Region of Peel Natural Areas Inventory (Peel Region, CVC, and TRCA)
- Natural environment report (Golder Associated Ltd, 2016)
- Aquatic SAR distribution of fish species at risk map (DFO 2019)
- Natural Heritage Information Centre (NHIC) Natural Heritage Areas Make a Map (NHA MaM) (MNRF 2021a)
- Lands Information Ontario (LIO) Geospatial Data (MNRF 2021b)
- Ontario Reptile and Amphibian Atlas (ORAA; Ontario Nature 2015)
- Ontario Breeding Bird Atlas (OBBA; OBBA 2001)
- Ontario Butterfly Atlas (OBA; TEA 2019)
- Atlas of the Mammals of Ontario (Dobbyn 1994)

Field inventories were completed within the assessment area during the summer of 2021.

Vegetation community delineation was completed within the assessment area using aerial photography and refined thorough investigations in the field. Details of the vegetation communities were recorded including species composition and dominance, community structure, uncommon species or features, and evidence of anthropogenic disturbance. Vegetation community status rarity was assessed through NHIC vegetation community rankings and the local rarity rankings in the Annual Local Occurrence Score and Local Rank Update. A botanical inventory was completed during the field inventories for each of the vegetation communities and a list of species was compiled to determine the presence of SCC, SAR, and invasive species.

Following the protocol outlined in the Ontario Breeding Bird Atlas Guide for Participants (OBBA), two rounds or surveys were completed between May 24 and July 10. 2021 at nine stations spaced approximately 300 m apart to reflect the habitats within the assessment area. Observations of breeding evidence for each species were recorded based on the definitions provided by the OBBA.

An assessment of potential Significant Wildlife Habitat (SWH) and potential SAR habitat within the assessment area was conducted during the field surveys following the criteria outlined in the Significant Wildlife Habitat Technical Guide (SWHTG) and the Significant Wildlife Habitat Criterion Schedules for Ecoregion 7E. Natural areas were also assessed for their potential to provide habitat for SAR and SCC identified during background review or observed during field investigations.

A qualitative assessment of the habitat potential based on a modified Ontario Stream Assessment Protocol (OSAP) was conducted in all watercourse crossings within the assessment area to characterize the local aquatic habitat and assign a qualitative habitat

potential ranking. The greater the quantity of preferred habitat features present, the higher potential aquatic habitat ranking. The modified qualitative OSAP approach included assessment of the following watercourse conditions:

- General watercourse characteristics (i.e., stream pattern, general gradient, and flow)
- Channel characteristics (i.e., wetted width and depth, bankfull width and depth, and depth of riffles/pools/run)
- Substrate and bank materials
- Other pertinent habitat features (i.e., spawning, nursery, and refuge areas, barriers to fish movement, and macrophyte growth)
- Disturbances and evidence of past habitat alterations (i.e., channelization, channel hardening or straightening)

4.1.2 Aquatic Environment

Etobicoke Creek

The section of Etobicoke Creek that crosses Lakeshore Road flows as a defined watercourse within a narrow natural corridor through a highly urbanized environment. Both banks contain a narrow band of cultural woodland and thicket. Within the assessment area, the channel is an open aquatic habitat with some areas of meadow marsh/thicket inclusions along the periphery. At the bridge, both banks are lined with concrete, with a pedestrian underpass on the east side. The pedestrian path located on the east bank is paved and continues along the bank until the river mouth reaches Lake Ontario. The channel is sparsely shaded by overhead deciduous trees and overhanging shrubs in the understory along the banks. Channel morphology within the assessment area of Etobicoke Creek consisted of a combination of pools and riffles which are narrower under the Lakeshore Road bridge. On average, the watercourse is 24 m wide. Riffles had a mean depth of 0.18 m with an average wetted width of 17 m. Pools had a mean depth of 1 m with an average wetted width of 30 m. The substrates consisted of 80% cobble and shale, and 20% sand and gravel for both the riffles and pools. A shale channel bar that is under the west section of the bridge, vegetated with trees and long grasses, shows evidence of water flow during high flow seasons. Riparian vegetation within the assessment area consisted primarily of deciduous trees and shrubs within the cultural thicket and woodland along both banks. The ground cover consists of grasses and herbaceous plants for ground cover. No emergent instream vegetation was observed within the channel, however there were areas of filamentous algae on the substrate. Habitat within the assessment area was limited and included cover provided by large cobbles and shale. Overhanging trees and shrubs provide minimal shade offering additional habitat.

The Etobicoke Creek is a warm water system with an average health rating of fair for fish and poor for benthic communities. Fisheries data from TRCA including all fish species captured between 1989 and 2019 contained 43 species, which included one SAR and no SCC (**Table 4-1**). All other fish species within Etobicoke Creek are common and secure in Ontario.

Table 4-1: Etobicoke Creek

Common Name	Scientific Name
Alewife	*Alosa pseudoharengus*
American Eel	*Anguilla rostrata*
Blacknose Dace	*Rhinichthys atratulus*
Blacknose Shiner	*Notropis heterolepis*
Bluntnose Minnow	*Pimephales notatus*
Brook Stickleback	*Culaea inconstans*
Brown Bullhead	*Ameiurus nebulosus*
Brown Trout	*Salmo trutta*
Central Mudminnow	*Umbra limi*
Central Stoneroller	*Campostoma anomalum*
Chinook Salmon	*Oncorhynchus tshawytscha*
Coho Salmon	*Oncorhynchus kisutch*
Common Carp	*Cyprinus carpio*
Common Shiner	*Luxilus cornutus*
Creek Chub	*Semotilus atromaculatus*
Emerald Shiner	*Notropis atherinoides*
Fantail Darter	*Etheostoma flabellare*
Fathead Minnow	*Pimephales promelas*
Freshwater Drum	*Aplodinotus grunniens*
Golden Shiner	*Notemigonus crysoleucas*
Goldfish	*Carassius auratus*
Green Sunfish	*Lepomis cyanellus*
Johnny Darter	*Etheostoma nigrum*
Largemouth Bass	*Micropterus salmoides*
Longnose Dace	*Rhinichthys cataractae*
Logperch	*Percina caprodes*
Mimic Shiner	*Notropis volucellus*
Mottled Sculpin	*Cottus bairdii*
Northern Pearl Dace	*Margariscus margarita*
Northern Redbelly Dace	*Chrosomus eos*
Pumpkinseed	*Lepomis gibbosus*

Common Name	Scientific Name
Rainbow Darter	*Etheostoma caeruleum*
Rainbow Smelt	*Osmerus mordax*
Rainbow Trout	*Oncorhynchus mykiss*
Rock Bass	*Ambloplites rupestris*
Rosyface Shiner	*Notropis rubellus*
Round Goby	*Neogobius melanostomus*
Smallmouth Bass	*Micropterus dolomieu*
Spottail Shiner	*Notropis hudsonius*
Trout-perch	*Percopsis omiscomaycus*
White Bass	*Morone chrysops*
White Perch	*Morone americana*
White Sucker	*Catostomus commersonii*
Yellow Perch	*Perca flavescens*

Applewood Creek

The section of Applewood Creek that crosses Lakeshore Road East flows as a defined watercourse within a very narrow natural corridor through a highly urbanized environment. The Lakeview Golf Course surrounds the creek upstream of the project site. Both banks contain a very narrow band of vegetation consisting of forest, thicket, and meadow communities. Within the assessment area, the channel is considered an open aquatic habitat with the areas closest to the culvert acting as a meadow marsh. At the culvert there is a flood control culvert along with channel hardening using large armour stones on both sides of Lakeshore Road East. The channel is partly shaded by overhead deciduous trees and overhanging shrubs in the understory along the banks. Channel morphology within the assessment area of Applewood Creek consisted of a combination of pools and riffles along with a drop off point and cascade 50 m upstream of Lakeshore Road. On average the watercourse is 4 m wide. Riffles had a mean depth of 0.15 m with an average wetted width of 1.5 m. Pools had a mean depth of 0.43 m with an average wetted width of 4.5 m. The substrates consisted of 90% cobble and 10% gravel for both the riffles and pools. Downstream of Lakeshore Road East there is a large pool with a mud bottom measuring an average of 1.0 m in depth which becomes steep vegetated banks a few meters downstream from the road. Upstream has boulders lining the channel. Riparian vegetation within the assessment area consisted primarily of deciduous trees and shrubs (Oak and Maple dominant). The banks consisted of trees on the west bank while the east bank was mostly forbs and grasses. No instream vegetation was observed within the channel; however, filamentous algae was present. Habitat within the assessment area was limited and included cover provided by large cobbles. Overhanging trees and shrubs provide shade offering additional habitat.

Applewood Creek is a warm water system which contains a pollution tolerant mix of cyprinid species. Fisheries data collected by the CVC between 2001 and 2018 indicated the presence of five species within Applewood Creek (**Table 4-2**). No SAR or SCC were identified. The fish species within Applewood Creek are common and secure in Ontario.

Table 4-2- Applewood Creek

Common Name	Scientific Name
Creek Chub	*Semotilus atromaculatus*
Lake Chub	*Couesius plumbeus*
Longnose Dace	*Rhinichthys cataractae*
Western Blacknose Dace	*Rhinichthys obtusus*
White Sucker	*Catostomus commersonii*

Serson Creek

The section of Serson Creek that crosses Lakeshore Road East flows as a defined watercourse within a highly urbanized environment with a hydro corridor on the west bank consisting primarily of a grassy lawn (CUM1) and a very narrow strip of vegetation on the east bank. Both banks contain a narrow band of vegetation consisting of trees and shrubs with forbes and grasses as an understory. Within the assessment area, the channel is an open aquatic habitat with meadow marsh qualities both upstream and downstream of Lakeshore Road. Near the culvert, on both sides of Lakeshore Road, the banks are steep and covered in vegetation. The channel is partly shaded by overhead deciduous trees and overhanging shrubs along the banks.

Channel morphology within the assessment area of Serson Creek consisted of a combination of pools and riffles. On average the watercourse is 2.5 m wide and 0.24 m deep upstream and 0.5 m deep downstream. Riffles had a mean depth of 0.18 m with an average wetted width of 2 m. Pools had a mean depth of 1.0 m with an average wetted width of 2.5 m. Upstream of Lakeshore Road the substrates consisted of muck and has very little visual flow. Downstream of Lakeshore Road the substrate consisted of cobbles where the visible flow increases to a trickle.

Riparian vegetation within the assessment area consisted of deciduous trees and shrubs along both banks with grasses and herbaceous plants for ground cover. Instream vegetation consisting of cattails was observed within the channel as well as on the banks. Habitat within the assessment area was limited and included cover provided by large cobbles and cattails. Overhanging trees and shrubs provide some shade offering additional habitat further upstream and downstream of the Lakeshore Road.

Serson Creek is a warmwater system. Fish surveys completed by CVC in 2011 and 2021 did not yield any fish species. It is anticipated that recent restoration works downstream

have improved the connection and enhanced fish passage between Serson Creek and Lake Ontario. As such, it is assumed that fish are present within Serson Creek.

4.1.3 Terrestrial Environment

Vegetation Communities

Eight ELC communities and three aquatic communities were documented based on field assessments conducted by Matrix in 2021. Of the native vegetation communities found within the assessment area none are considered to be rare. **Table 4-3** summarizes the ELC communities within the assessment area. **Figure 4-1** to **Figure 4-4** outline the various ELCs.

Table 4-3: ELC Communities Within the Project Area

Ecological Land Classification Community Type	Location	Community Description
CUW1: Mineral Cultural Woodland	Park east of Etobicoke Creek (South of Lakeshore Road)	• Mostly manicured lawn • Several remnant pockets of woody vegetation dominated by Manitoba Maple (*Acer negundo*) • Other mature trees noted in these pockets include Black Walnut, Bur Oak, Norway Spruce, Red Maple • Pockets dominated in the outer margins by younger Manitoba Maple or shrubs and noxious or invasive weedy species
	Along both sides of Etobicoke Creek (80 m downstream of Lakeshore Road)	• The riparian corridor adjacent to Lakeshore Road East generally met the characteristics of moist lowland deciduous forest • Some areas dominated by Willow (FOD7-3) and Black Walnut (FOD7-4) • Canopy composition includes Manitoba Maple, Silver Maple (*Acer saccharinum*), Eastern Cottonwood (*Populus deltoides*), Siberian Elm (*Ulmus pumila*), and Sugar Maple (*Acer saccharum)* • A fragmented supercanopy of very large Crack Willow (*Salix fragilis*) is a consistent feature of this ecosite • Understory dominated by Manitoba Maple, with other common associates including European Buckthorn, Tatarian Honeysuckle, Gray Dogwood (*Cornus racemosa*), Green Ash regeneration (*Fraxinus pennsylvanica*), River Grape, and Virginia Creeper • The presence of litter and off-trail footpaths were noted. Dense areas of both Garlic Mustard and Japanese Knotweed (*Reynoutria japonica*) were noted in this ecosite
	Within Marie Curtis Park (south of Lakeshore Road)	• Several woodlots of variable composition were noted • Ecosites were characterized by fewer mature trees (Honey Locust [*Gleditsia triacanthos*]; Black Walnut, Manitoba Maple, Silver Maple) with a very open/broken canopy (approximately 40% to 50%) • Areas were not noted to have a robust shrub layer and were generally graminoid- and forb-dominated in the understory, potentially alluding to semi-regular maintenance/mowing in these areas • Dense areas of Garlic Mustard and Phragmites australis were noted in sections
	West of thicket adjacent to Etobicoke Creek (north of Lakeshore Road)	• This vegetation community replicates the species found in the CUW1 vegetation community within Marie Curtis Park on the south side of Lakeshore Road
	East of 1352 Lakeshore Rd. E. (south of Lakeshore Rd. E.)	• Small sections of open woodlot were observed bordering CUM1-H • Woodland was dominated by Manitoba Maple with one or several individuals of Basswood (*Tilia americana*), Black Walnut, Eastern Cottonwood, Norway Maple, Scotch Pine (*Pinus sylvestris*) and other tree species • Areas featured a robust shrub layer, especially on the outer margins due to the fragmented nature of these ecosites. Common shrubs included Gray Dogwood, European Buckthorn, Tatarian Honeysuckle, River Grape, and Virginia Creeper • The understory of interior habitat was dominated by dense Garlic Mustard
	Area adjacent to Serson Creek (both north and south of Lakeshore Road)	• Serson Creek is bordered on either side by narrow dense woodland • Ecosite dominated by Manitoba Maple but also features numerous species including Norway Maple, Norway Spruce, Siberian Elm, Ornamental Pear (Pyrus calleryana), and Eastern Red Cedar (*Juniperus virginiana*)

Ecological Land Classification Community Type	Location	Community Description
		• Outer margin is often overgrown with shrubby Manitoba Maple, Gray Dogwood, Red-Osier Dogwood, Virginia Creeper, and River Grape • Interior habitat was found to be often choked with downed woody debris and rampant growth of invasive species
	Areas west and east of hydro laneway (north of Lakeshore Road)	• Narrow, treed sections were dominated by Manitoba Maple; Black Walnut and Norway Maple were common in the canopy • Edge effect resulting in a dense, shrubby perimeter of Manitoba Maple, Gray Dogwood, Tatarian Honeysuckle, European Buckthorn, River Grape, and Virginia Creeper • Understory dominated by Garlic Mustard; vegetation assemblage was heavily influenced by the adjacent cultural meadow as well
CUT1-1: Sumac Mineral Cultural Thicket	Several sections within proximity to the Marie Curtis Park complex	• Dominated by thick strands of Staghorn Sumac (*Rhus typhina*) • Understory similar in characteristic to adjacent Cultural Meadow ecosites
CUT1: Mineral Cultural Thicket	Etobicoke Creek riparian corridor (south of Lakeshore Road)	• Where mature trees were not the dominant vegetation, a dense and variable shrub thicket was present • The thicket areas were similar in composition to edge areas of FOD7/CUW1-B and generally dominated by Manitoba Maple
	Etobicoke Creek riparian corridor (north of Lakeshore Road)	• The thicket areas were similar in composition to edge areas of FOD7/CUW1-B and generally dominated by Manitoba Maple
	Within Marie Curtis Park (south of Lakeshore Rd. E.)	• Relatively open thicket was dominated in areas by Gray Dogwood, Staghorn Sumac, and Tatarian Honeysuckle, with dense patches of Mugwort (*Artemisia vulgaris),* Stinging Nettle, and Plumeless Thistle (*Carduus acanthoides*)
FOD4: Dry- Fresh Deciduous Forest	Within Marie Curtis Park (south of Lakeshore Road)	• Higher proportion of mesic species (Red Oak [*Quercus rubra*]; Little-leaf Linden [*Tilia cordata*]; Sugar Maple, Staghorn Sumac) within this ecosite • Manitoba Maple was the dominant species in this area • FOD4 is a remnant woodlot that has been left to secede • Mature supercanopy of Red Oak, Silver Maple, Sugar Maple, Norway Maple (*Acer platanoides*), and Black Walnut is surrounded by relatively young Trembling Aspen (*Populus tremuloides*) and dense shrubby Manitoba Maple
FOD9-2: Fresh-Moist Oak-Maple Deciduous Forest	Adjacent to Applewood Creek (south of Lakeshore Road)	• Woodland canopy dominated by Silver Maple. Other tree species include Honey Locust, Manitoba Maple, Sugar Maple, and Red Oak • Manitoba Maple contributed a thick shrub-layer at the margins of these woodlots, along with Virginia Creeper and River Grape. • Undergrowth dominated by Garlic Mustard • Other common species included Poison Ivy (*Toxicodendron radicans*), Enchanter's Nightshade (*Circaea lutetiana*), and Yellow Avens (*Geum alleppicum*). • Spotted Jewelweed (*Impatiens capensis*) and Wild Mint were noted closer to the creek • Woodland bisected by a pedestrian trail and an open meadow which may be infrequently mowed
	East of pathway along Applewood Creek (south of Lakeshore Road)	• This vegetation community replicates the species found in the FOD9-2 community along Applewood Creek riparian corridor
CUM1/ CUM1-1: Mineral Cultural Meadow	West side of Etobicoke Creek (south of Lakeshore Road)	• Colonized by facultative hydrophilic species (Stinging Nettle, Willow sp., Wild Mint - *Mentha arvensis*), as well as more upland species (Canada Goldenrod - *Solidago canadensis*; Dame's Rocket - *Hesperis matronalis*; White Sweetclover - *Melilotus albus*)

Ecological Land Classification Community Type	Location	Community Description
	Between 1352 Lakeshore Rd. E. and Marie Curtis Park (south of Lakeshore Road)	• Ecosite was a graminoid-dominated meadow, with common grass species noted (Reed-canary Grass; Timothy - *Phleum pratense*; Orchard Grass - *Dactylis glomerata*; Quackgrass - *Elymus repens*; Creeping Red Fescue - *Festuca rubra; Poa sp*.) • Other species observed include Wild Carrot (*Daucos carota*), Bird's-foot Trefoil (*Lotus corniculatus*), Perforated St. John's Wort (*Hypericum perforatum),* Red and White Clover (*Trifolium pratense, Trifolium repens*), and Oxeye Daisy (*Leucanthemum vulgare*) • Cultural meadow was bordered by chain-link fencing overgrown in places by small trees and shrubs • Ecosite may transition to cultural thicket to the south
	East of Applewood Creek along pathway (south and north of Lakeshore Road)	• Common grasses included Orchard grass, Quackgrass, Timothy, Poa sp., and Reed-canary Grass • Other common species included Red and White Clover, Wild Carrot, Bird's-foot Trefoil, Tufted Vetch (*Vicia cracca*), and Philadelphia Fleabane (*Erigeron philadelphicus*) • A number of planted Ohio Buckeye (*Aesculus glabra*) were noted
	Hydro corridor west of Serson Creek (north of Lakeshore Road)	• Meadow comprised of the same species that characterized the previous cultural meadow and waste areas along the RoW • Community dominated by graminoid, with Creeping Red Fescue, Timothy, Reed-canary Grass, Quackgrass, Smooth Brome, (*Bromus inermis*), Green Foxtail (*Seteria viridis*) and Poa sp • Other common species included Canada/Tall Goldenrod, Philadelphia Fleabane, Annual Fleabane (*Erigeron annuus*), Perforated St. John's Wort, Red and White Clover, Bird's-foot Trefoil, and Black Medick (*Medicago lupulina*)
MAM2: Mineral Meadow Marsh	Portion of Serson Creek (north and south of Lakeshore Road)	• Largely unvegetated mineral banks • Where riparian vegetation was present, it predominantly consisted of Gray Dogwood, Red-osier Dogwood, and Reed-canary Grass • Within the channel was a mix of Common Cattail, Narrowleaf Cattail, Reed-canary Grass, and Water Smartweed • Most vegetated sections of the channel were found to be dominated by Wild Mint
MAM2-10: Forb Mineral Meadow Marsh	Portion of Applewood Creek (south of Lakeshore Road)	• Ecosite relatively unvegetated. • The bank on either side was sparsely vegetated with Spotted Jewelweed, Goldenrod species, Gray Dogwood, and Reed-canary Grass • Where vegetation within the channel was present, it was a mix of Common Cattail, Water Smartweed (*Persicaria amphibia*) and Wild Mint
OA: Open Aquatic	Etobicoke Creek, Applewood Creek, and Serson Creek	This community consists of the open aquatic systems.

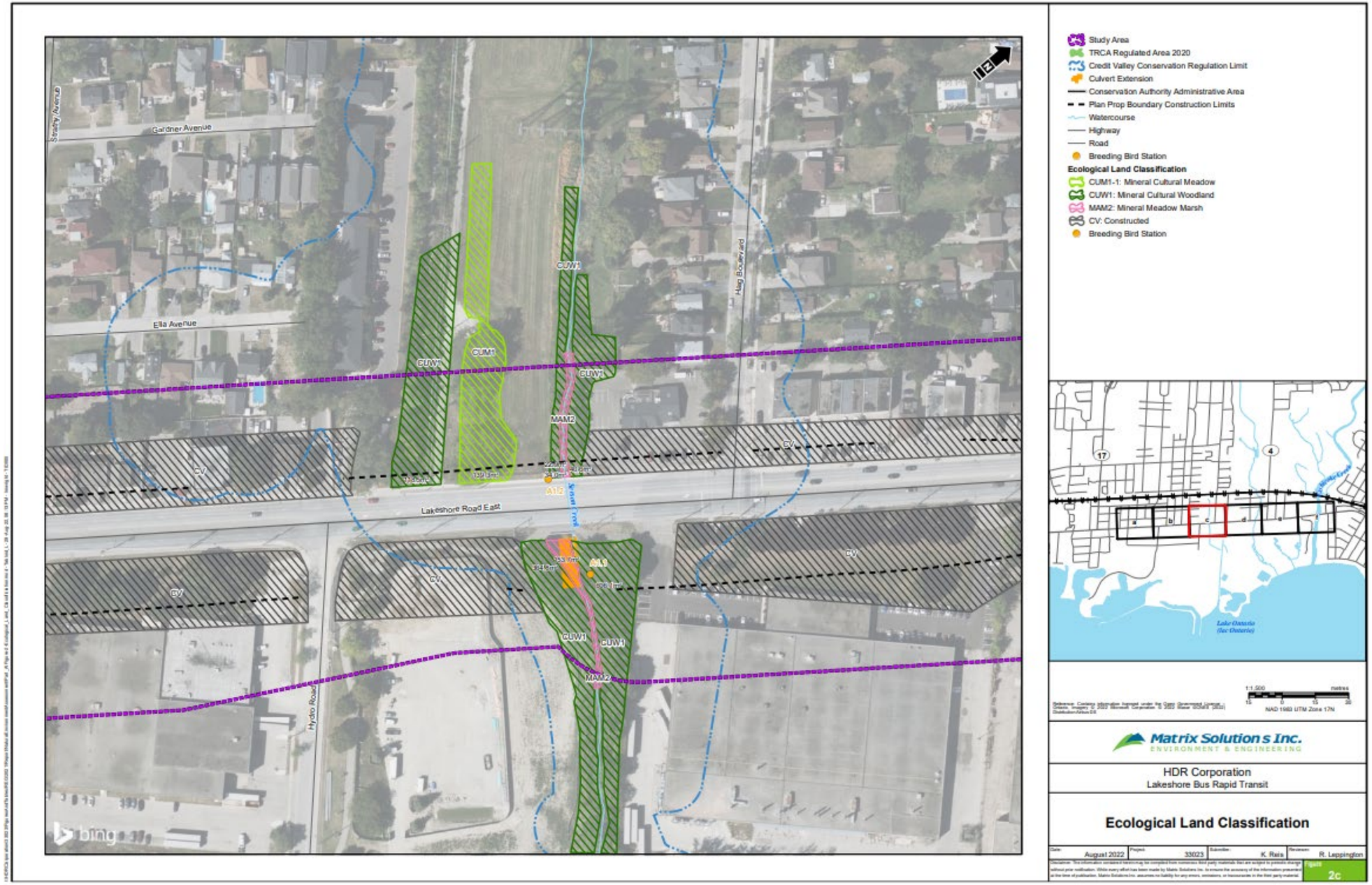


Figure 4-1: Ecological Land Classification (1 of 4)

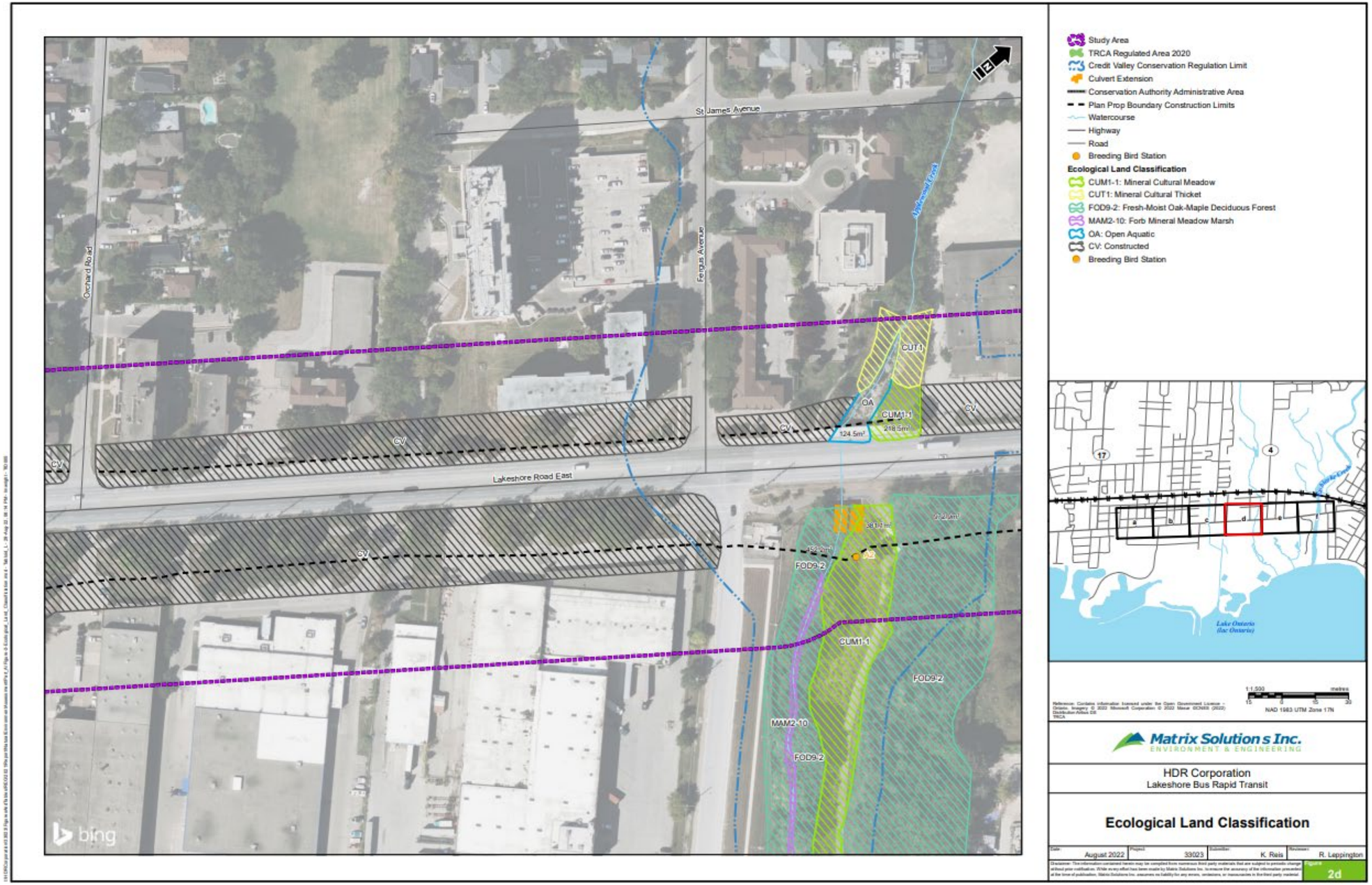


Figure 4-2: Ecological Land Classification (2 of 4)

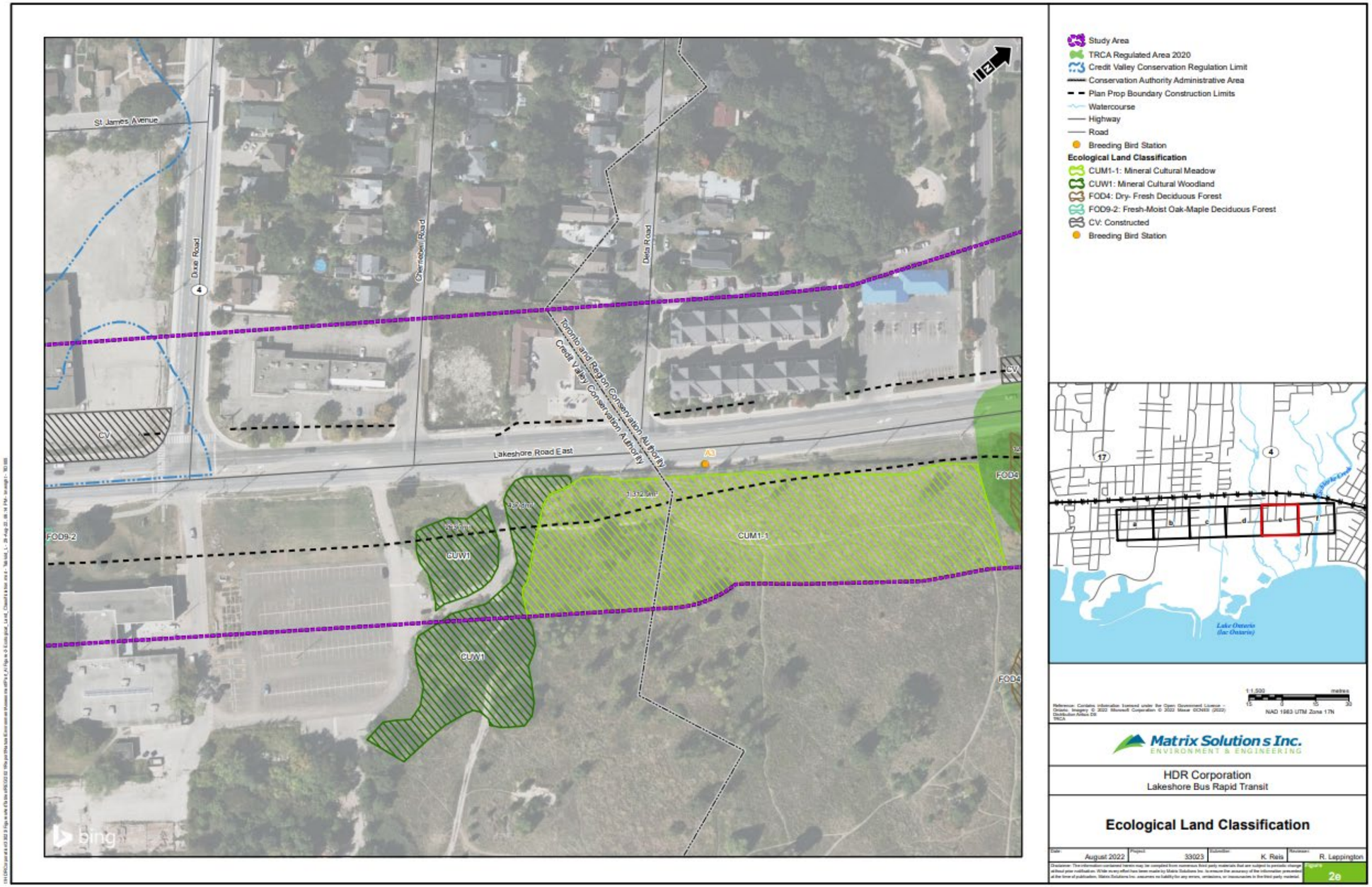


Figure 4-3: Ecological Land Classification (3 of 4)

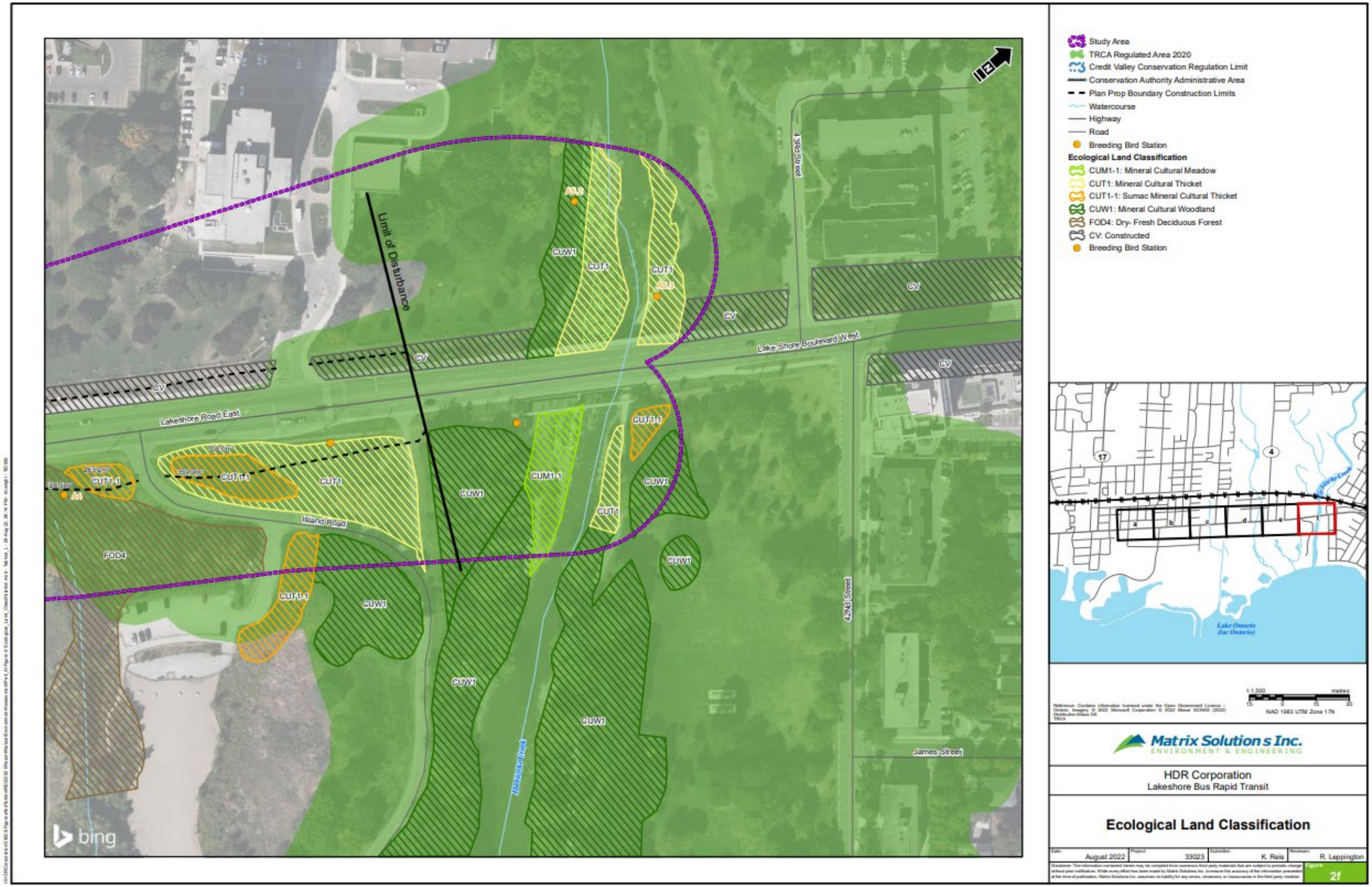


Figure 4-4: Ecological Land Classification (4 of 4)

Flora

One-hundred and sixty eight (168) vascular plant species were identified within the assessment area through the botanical inventory, 44% of which are considered native or naturalized within the province; 46% are considered non-native, introduced, or a cultivar and 10% were unclassified. An Ohio Buckeye tree was found in a CUM1 vegetation community to the east of Applewood Creek and south of Lakeshore Road that is provincially rare as it has an S1 rank. Since this species was planted within the area (i.e., a cultivar), it is not considered an SCC and its habitat (CUM1) is not considered to be SWH. No SAR were identified during the botanical inventory. **Table 4-4** outlines all flora species observed.

Table 4-4: Observed Flora Species

Species Name	Species Name- Continued
American Elm	Sugar Maple
Apple	Sycamore
Balsam Poplar	Trembling Aspen
Basswood	Weeping Willow
Black Locust	White Ash
Black Spruce	White Cedar
Black Walnut	White Mulberry
Bur Oak	Eastern White Pine
Common Lilac	White Spruce
Crabapple	Willow sp.
Crack Willow	Aster sp.
Eastern Cottonwood	Black Huckleberry
Eastern White Cedar	Black Raspberry
Freeman's Maple	Chokeberry
Green Ash	Choke Cherry
Hackberry	Climbing Nightshade
Honey Locust (Shademaster)	Dog-strangling Vine
Horse Chestnut	English Hawthorn
European Larch	European Buckthorn
Little-leaf Linden	Flowering Raspberry
Manitoba Maple	Fragrant Sumac
European Mountain Ash	Grey Dogwood
Norway Maple	Indian Hemp
Norway Spruce	Japanese Knotweed
Ohio Buckeye	Canada Moonseed
Ornamental Pear	Multiflora Rose
Paper Birch	Ninebark
Red Cedar	Ornamental Pear
Red Maple	Prickly Wild Rose
Red Oak	Red Osier Dogwood
Sandbar Willow	River Grape
Scots Pine	Russian Olive
Siberian Elm	Smooth Serviceberry
Silver Maple	Shrubby Cinquefoil
Slender Willow	Tartarian Honeysuckle
Smooth Wild Rose	Virginia Creeper
Eastern Snowberry	Witchhazel
Sweet Cherry	Alfalfa
Staghorn Sumac	Annual Fleabane
Bird's-foot Trefoil	Oxeye Daisy
Black-eyed Susan	Perforated St. John's Wort
Black Medick	Philadelphia Fleabane
Bull Thistle	Phragmites
Buckwheat	Plumeless Thistle
Burdock	Poison Ivy
Carex sp.	Prickly Lettuce
Canada Anemone	Purple Loosestrife
Canada Thistle	Purslane
Catnip	Quackgrass
Chenopodia (Goosefoot) sp.	Red Clover
Chicory	Reed-canary Grass
Cleavers	Rough Cinquefoil
Common Blue Violet	Small-flower Agrimony
Broad-leaved Cattail	Smooth Bedstraw
Common Mallow	Smooth Brome
Common Milkweed	Smooth Crabgrass
Common Mullein	Sow Thistle
Common Plantain	Spotted Jewelweed
Common Ragweed	Spotted Knapweed
Common Wormwood	Spotted Water Hemlock
Common Yellow Wood-sorrel	Stickseed
Creeping Bellflower	Stinging Nettle
Creeping Red Fescue	Stinkweed
Crepis	Sweet Cicily
Curly Dock	Tall/Canada Goldenrod
Dame's Rocket	Tall Buttercup
Dandelion	Tansy
Daylily	Teasel

Species Name	Species Name- Continued
Enchanter's Nightshade	Timothy
English Plantain	Tufted Vetch
Field Bindweed	Water Smartweed
Foxtail Barley	White Campion
Fowl Blue Grass	White Clover
Garlic Mustard	Wild Asparagus
Giant Ragweed	Wild Red Raspberry
Green Foxtail	White Sweet-clover
Ground Ivy	White Vervain
Hawkweed	Wild Carrot
Herb Robert	Wild Mint
Kentucky Blue Grass	Witchgrass
Leafy Spurge	Yarrow
Mugwort	Yellow Avens
Narrow-leaved Cattail	Yellow Rocket
Orchard Grass	

Avian Species

Based on the database inquiries, there were 112 avian species within the assessment area which had the potential to occur, 13 of which are SAR, and 4 SCC were noted to potentially occur within the assessment area. Breeding bird surveys were conducted on June 1 and June 22, 2021 within the nine ELCs. The breeding bird survey confirmed the presence of 37 species, which included confirmed breeding of seven species, and probable breeding of an additional five species. Two SAR were identified within the assessment area foraging or flying over the assessment area with no breeding evidence. No SCC were observed within the assessment area. **Table 4-5** outlines the bird species observed.

Table 4-5: Observed Bird Species

Common Name	Scientific Name
American Goldfinch	*Spinus tristis*
American Redstart	*Setophaga ruticilla*
American Robin	*Turdus migratorius*
Baltimore Oriole	*Icterus galbula*
Barn Swallow	*Hirundo rustica*
Black-capped Chickadee	*Poecile atricapillus*
Belted Kingfisher	*Megaceryle alcyon*
Brown-headed Cowbird	*Molothrus ater*
Blue Jay	*Cyanocitta cristata*
Cedar Waxwing	*Bombycilla cedrorum*
Chipping Sparrow	*Spizella passerina*
Chimney Swift	*Chaetura pelagica*
Cliff Swallow	*Petrochelidon pyrrhonota*
Common Grackle	*Quiscalus quiscula*
Common Yellowthroat	*Geothlypis trichas*
Downy Woodpecker	*Picoides pubescens*
Eastern Kingbird	*Tyrannus*
European Starling	*Sturnus vulgaris*
Gray Catbird	*Dumetella carolinensis*
Herring Gull	*Larus argentatus*
House Finch	*Haemorhous mexicanus*
House Sparrow	*Passer domesticus*
House Wren	*Troglodytes aedon*
Killdeer	*Charadrius vociferus*
Mallard	*Anas platyrhynchos*
Mourning Dove	*Zenaida macroura*
Northern Cardinal	*Cardinalis*
Northern Flicker	*Colaptes auratus*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Red-eyed Vireo	*Vireo olivaceus*
Red-winged Blackbird	*Agelaius phoeniceus*
Song Sparrow	*Melospiza melodia*
Tree Swallow	*Tachycineta bicolor*
Warbling Vireo	*Vireo gilvus*
White-breasted Nuthatch	*Sitta carolinensis*
Willow Flycatcher	*Empidonax traillii*
Yellow Warbler	*Setophaga petechia*

4.1.4 Significant Natural Heritage Features

Significant natural heritage features and functions include those listed in the Provincial Policy Statement (MMAH 2020), the NHRM (MNR 2010), the SWHTG (MNR 2000) and the Ecoregion 7E Schedules (MNRF 2015). Reference was also obtained from the natural heritage system from the City's Official Plan (City of Mississauga 2021). The findings of the site investigations were cross-referenced with the criteria provided in these documents in order to identify the presence of or potential presence of significant natural heritage features. The following significant features were not present within the assessment area:

- ANSIs
- Environmentally Significant Areas
- PSWs
- Special Management Areas

Significant Valleylands, Unevaluated Wetlands, and Significant Woodlands

Valleylands are linear natural areas that occur in a valley or other landform depressions that have water flowing through or standing for some period of the year. These areas are important corridors that serve as linkages between terrestrial and aquatic habitats. The valleylands associated with Etobicoke, Applewood, and Serson Creeks would be considered significant.

The NHIC database has identified unevaluated wetlands directly upstream and downstream of Etobicoke Creek. However, during field investigations for the assessment area, these wetlands were not observed.

Based on the significant woodlands designation criteria stated in Section 6.3.12 of the City's Official Plan, the forested areas surrounding Etobicoke Creek and Applewood Creek are to be considered as significant woodlands.

Linkages and Corridors

Linkages and corridors are continuous, often linear bands of vegetation in the landscape which provide opportunities to connect natural areas and provide cover for wildlife movement and dispersal of otherwise isolated populations. as per the City's Official Plan, Etobicoke Creek and Applewood Creek are considered linkages under their "Significant Natural Area" designation. These linkages are significant for both terrestrial and aquatic organisms. The wooded riparian area along the edge of the creeks provides a linkage to other natural areas within the system.

4.1.5 Significant Wildlife Habitat

The wildlife habitat assessment followed the guidelines in the NHRM and was based on vegetation communities and incidental wildlife observations documented during the site investigations, as well as data collected from the background review. The results of the assessment indicated the potential for candidate SWH and included the following:

- **Bat Maternity Colonies:** there are FOD communities within the assessment area that are located adjacent to water that allow for areas of feeding. In addition, both Oak (*Quercus*) and Maple (*Acer*) species were recorded in these areas which are preferred by SAR bats.
- **Migratory Butterfly Stopover Area:** a cultural meadow is located between the forested riparian area surrounding Etobicoke Creek and Applewood Creek. This area is located within 1 km of Lake Ontario.
- **Landbird Migratory Stopover Area:** there are forested areas surrounding both Etobicoke Creek and Applewood Creek that are contiguous with areas outside of the assessment area making them greater than 5 ha in size. Both of these areas are within 5 km of Lake Ontario.
- **Bald Eagle and Osprey Nesting/Foraging/Perching:** there is forested area surrounding all watercourses within the assessment area.
- **Rare Wildlife Species:** candidate habitat for the following SCC species within the assessment area: Monarch, Eastern Wood-pewee, Eastern Ribbonsnake, Northern Map Turtle, and Snapping Turtle.
- **Amphibian Movement Corridors:** Etobicoke Creek and Applewood Creek corridors act as north-south linkages associated with water and may act as movement corridors for amphibian species.

4.1.6 Species at Risk

A total of 28 SAR was identified as potentially occurring within the assessment area based on background review and site investigations, 20 of which were identified as unlikely to inhabit the area due to the lack of appropriate habitat. See list below for confirmed and potential SAR:

- Barn Swallow (Threatened)- Confirmed
- Chimney Swift (Threatened) – Confirmed
- Little Brown Myotis (Endangered) – Potential
- Northern Myotis (Endangered) – Potential
- Tricoloured Bat (Endangered) – Potential

- Bobolink (Threatened) – potential
- Eastern Meadowlark (Threatened) – Potential
- American Eel (Endangered) – Potential

Additional details on the investigations and findings associated with the natural environment are provided in **Appendix A**.

4.2 Tree Inventory

Methodology

An International Society of Arboriculture (ISA)-certified arborist conducted the tree inventory and assessment on June 1 and 10, 2021. All trees 10 cm or greater in diameter at breast height (DBH) within the Lakeshore Road East RoW along the extent of the BRT Project Area were included in the inventory. Trees that have a portion of the canopy hanging within the Lakeshore Road East RoW were also included. The following information was collected for each tree:

- Genus or species identification based on physical characteristics of each tree
- Measurement of dbh which is the diameter of the trunk at 1.4 m above the ground
- Radial dripline estimation based on spread of canopy from trunk to limit of overhead branches: radial dripline is used as a starting point to determine the minimum limits of a tree protection zone (tpz) for a particular tree as part of tree protection planning.
- General rating (“good,” “fair,” “poor”) of trunk integrity, crown structure, and crown vigour based on observations of overall physical appearance of tree. No detailed structural assessment of roots, trunk, or branches were conducted.
- Condition observations including presence of multiple or codominant stems, percentage of crown dieback, lean direction, presence or absence of pathogens, insect pests, epicormics growth, cavities or wounds, and other physical anomalies
- Other general comments relating to unique conditions or surrounding growing conditions

A species at risk (SAR) information request was submitted to the Ontario Ministry of the Environment, Conservation and Parks (MECP) on May 27, 2021. The MECP indicated that there were no SAR tree species in the assessment area but that Butternut, as recorded in the Natural Heritage Inventory Centre database, may be found. No SAR were found during the tree inventory of the BRT Project Area.

Table 4-6 presents the detailed guidelines used for the general rating of trunk integrity, crown structure, and crown vigour.

Table 4-6: Tree Condition Rating Guidelines

Rating	Guidelines
Good	Minimal to no wounds on trunk and branches; ≤10% crown dieback; crown structure is appropriate for tree species and is not influenced by infrastructure.
Fair	Wound on trunk or branches that has little impact on integrity; 11% to 30% crown dieback; crown structure is potentially impacted by infrastructure or is naturally not appropriate for tree species (i.e., trunk has inappropriate lean angle).
Poor	Extensive wounds on trunk or branches that has an impact on integrity; >31% crown dieback; crown structure is impacted by infrastructure (i.e., pruned to avoid hydro lines) or is naturally not appropriate for tree species.

Tree Inventory Results

A total of 298 trees were collected within the Lakeshore Road East RoW on both the south and north sides of Lakeshore Road (**Table 4-7**). This includes 18 different genus and 30 different species. They range in size from 8 to 120 cm DBH, and the dripline ranges from 1 to 9 m.

Additional details on the investigations and findings associated with tree inventory are provided in **Appendix B**

Table 4-7: Tree Inventory

Species Common Name	Species Scientific Name	Quantity
American Elm	*Ulmus americana*	4
Amur Maple	*Acer ginnala*	3
Apple sp.	*Malus sp.*	34
Ash sp.	*Fraxinus sp.*	8
Basswood	*Tilia americana*	12
Blue Spruce	*Picea pungens*	1
Cherry sp.	*Prunus sp.*	1
Elm sp.	*Ulmus sp.*	1
Fir sp.	*Abies sp.*	4
Freeman's Maple	*Acer x freemanii*	9
Ginkgo	*Ginkgo biloba*	1
Hackberry	*Celtis occidentalis*	4
Honey Locust	*Gleditsia triacanthos*	7
Norway maple 'King Crimson'	*Acer platanoides 'King Crimson'*	24
Lilac sp.	*Syringa sp.*	4
Little Leaf Linden	*Tilia cordata*	4
Manitoba Maple	*Acer negundo*	21
Northern Catalpa	*Catalpa speciosa*	1
Norway Maple	*Acer platanoides*	84
Red Oak	*Quercus rubra*	8
Red Pine	*Pinus resinosa*	17
Scots Pine	*Pinus sylvestris*	8
Siberian Elm	*Ulmus pumila*	2
Silver Maple	*Acer saccharinum*	17
Sugar Maple	*Acer saccharum*	1
Tulip	*Liriodendron tulipafera*	1
White Birch	*Betula Papyifera*	1
White Spruce	*Picea glauca*	1
Willow sp.	*Salix sp.*	4
Unknown species	*Unknown species*	11
	TOTAL	**298**

4.3 Fluvial Geomorphology

The geomorphic assessment included the following tasks:

- Background review
- Field reconnaissance, rapid geomorphic assessment, and pebble count at significant watercourses
- Erosion hazard delineation
- Geomorphic impacts and mitigation strategies for the preliminary design of the preferred solution

4.3.1 Background

Watercourse crossings identified in the Transportation Master Plan (2019) in the Project Area include Etobicoke Creek, Applewood Creek and Serson Creek. Etobicoke Creek is under the jurisdiction of the Toronto and Region Conservation Authority (TRCA) and Applewood and Serson Creek are under the jurisdiction of the Credit Valley Conservation Authority (CVC).

The Project Area is situated within the beveled till plains and crosses the lower reaches of Etobicoke Creek, Applewood Creek and Serson Creek. Etobicoke Creek drains a watershed of 211 km^2 from the south slope of the Oak Ridges Moraine, down the south slope and over the Lake Iroquois Plain, to empty into to Lake Ontario. The surficial geology of Etobicoke Creek is characterized by recent river deposits of silt, sand, and gravel alluvium, with bedrock exposures as it is situated within well-defined valley corridor. The surficial geology of the Applewood Creek corridor is similar, and both valley landforms are more prominent upstream with the Lake Iroquois Plain and become less-well defined approaching the Lake Ontario shoreline. The Project Area also includes a lower reach of Serson Creek with a much smaller drainage area and a less-well defined valley landform and flows through a glaciolacustrine deposits of sand and clay.

The natural fluvial process of flooding and erosion have been modified within the valleylands or floodplains, and thus the geomorphic erosion hazard is in some reaches highly managed and constrained by bank protection, recent channel stabilization works, existing transportation crossings and other urban land uses within former floodplains.

The 2019 Lakeshore Master Plan provides information about existing watercourse crossing structures in the Project Area, and structural modifications required.

The Applewood Creek and Serson Creek structures were recommended to be retained and widened. The Etobicoke Creek structure was recommended to be widened, however altering the Etobicoke Creek structure was not proposed as part of the current project.

4.3.2 Existing Geomorphic Conditions

Drainage Area, Hydrological Flows, and Floodlines

The watercourse drainage areas obtained using the Ontario Flow Assessment Tool indicated that the drainage areas for Etobicoke Creek, Applewood Creek and Serson Creek are 211.5 km^2, 5.7 km^2 and 1.6 km^2, respectively. **Table 4-8** summarizes the existing peak flow rates of the watercourses with values taken from the HEC-RAS models provided by the CVC and the TRCA.

Table 4-8: Existing Peak Flow Rates of Project Area Watercourses

Watercourse	2-year (m^3/s)	5-year (m^3/s)	10-year (m^3/s)	25-year (m^3/s)	50-year (m^3/s)	100-year (m^3/s)	350-year (m^3/s)	Regional (m^3/s)
Etobicoke Creek	130.50	173.28	210.96	262.16	301.55	344.69	570.61	895.64
Applewood Creek	13.40	20.90	28.70	35.80	43.10	51.30	Not available	53.40
Serson Creek	4.90	8.20	11.80	14.30	16.70	19.20	Not available	19.10

Regulatory floodline mapping shows that the floodplain of Etobicoke Creek has an estimated width of 240 to 280 m and extends further to the east than to the west in the vicinity of Lakeshore Road. The Regulatory floodline of Applewood Creek is contained within a 12 to 25 m wide corridor in the reach upstream of Lakeshore Road, and within a 12 m wide corridor for approximately 35 m downstream of Lakeshore Road. Further downstream, the channel is less constrained and the width between floodlines is over 40 m. At Serson Creek, the Regulatory floodplain is approximately 30 m wide immediately upstream of Lakeshore Road, narrows to 10 m wide immediately downstream of the crossing and widens to an estimated 25 m further downstream.

Geomorphic Field Assessment

For the purposes of conducting geomorphic assessments, the watercourses had been divided into six (6) distinct reaches, the location and description of each reach are summarized in **Table 4-9**.

Table 4-9: Geomorphic Field Assessment

Watercourse	Location in relation to Lakeshore Road	Reach name	Average bankfull width (m)	Reach description
Etobicoke Creek	Near lake (backwatered)	ET1	30	The reach is backwatered by the lake and the dominant process is deposition. Creek bed was obscured. Banks are protected with sheet piling near the river's mouth, with riprap and armour stone up to the pedestrian bridge and are natural upstream. Natural banks were approximately 1.5 m high with minor erosion and exposed roots. The floodplain is park land with scattered trees. A parking lot and boat launch are present on the west bank near the shore.
	Upstream and downstream	ET2	30	Reach has riffle-pool morphology. A large, vegetated bar has developed near the Lakeshore Road bridge. The thalweg passes through east bridge cell, with secondary flow through west. Areas of shale exposure were also observed. Riffles are composed of platey cobble and gravel. A pebble count indicated that the median grain size is very coarse gravel (D50 = 5.7 cm). The D10 was 0.6 cm, and the D90 was 17.6 cm. Shale exposures common on creek bed. Substrate within ET2 pools was also coarse with evidence of bed scour. Bank height varies from 1.2 to 4.5 m. Banks partially protected with block stone, gabion basket through reach. Water depth was 0.45 to 0.65 m. Nearby land use includes parks and private lands.
Applewood Creek	Downstream	AP1	5.1	Downstream of the Lakeshore right-of-way, the channel has been straightened, banks are not armoured, bank slumps are frequent, and connection to the floodplain is poor. At the culvert outlet, deposition has occurred within a constructed outlet pool (measured length approx. 18 m). Downstream of pool a constructed cobble riffle low-flow channel extends for approx. 20 m. 2-cell culvert with limited opening heights, soffit elevation 0.35 m lower in east cell than west cell at outlet.
	Upstream	AP2	5.1	Steep constructed riffle-pool system consisting of a series of armour stone grade control steps, boulder riffles and stone-lined pools. The banks were steep, hardened and lacked overhanging vegetation. Wetted width ranged between 4 and 5 m.
Serson Creek	Downstream	SE1	6.5	Straight, entrenched channel with low gradient and vertical banks. Bank height varies between 0.75 to 2.0 m, right bank partially confined. Run-pool morphology. Pools had a water depth of 0.5 with run depths of 0.15 m. Bank erosion is extensive through reach. Channel hardening consists of cobble lining near Lakeshore Road. Substrate includes silt, sand, and gravel. S
	Upstream	SE2	6.5	Straightened channel with low gradient, moderate entrenchment, and vertical bank angles. Bank heights ranged between 1.0 to 1.5 m. Substrate within the riffles was platey gravel and cobbles. Exposed tree roots common. Exposed clay till observed on lower banks. Lined with a narrow riparian strip in lower reach. In upper portion of reach, lawns lie near the left bank with dense grass along the right bank.

The Rapid Geomorphic Assessment technique uses a set of indices to evaluate dominant geomorphic processes and indicate current channel stability. The Rapid Stream Assessment Technique (RSAT) uses a scoring system to assess a set of stream characteristics and produces a cumulative score to indicate overall stream health. **Table 4-11** and **Table 4-12** summarize findings of the RGA and RSAT.

The stream crossing assessment collected data specific to the channel and crossing structure within the vicinity of the road crossing (**Table 4-13**).

Table 4-11: Summary of RGA Scores

Reach	Factor Value				Stability Index	Condition	Dominant Process
	Aggradation	Degradation	Widening	Planimetric Adjustment			
ET1	Not Applicable (backwatered)						
ET2	0.43	0.33	0.25	0.00	0.25	Transitional	Aggradation
AP1	0.50	0.75	1.00	0.14	0.60	In Adjustment	Widening
AP2	Not Applicable (too recently constructed)						
SE1	0.29	0.20	0.50	0.43	0.32	Transitional	Widening
SE2	0.25	0.29	0.56	0.29	0.35	Transitional	Widening

Table 4-12: Summary of RSAT Results

Reach	Factor Value						Overall Score	Condition
	Channel Stability	Scour/ Deposition	Instream Habitat	Water Quality	Riparian Condition	Biological Indicators		
Maximum Score	11	8	8	8	7	8	50	
ET1	Not Applicable (backwatered)							
ET2	6	5	5	5	3	6	30	Moderate
AP1	4	3	4	4	4	2	21	Moderate
AP2	10	6	4	4	3	3	30	Moderate
SE1	2	3	2	3	3	2	15	Low
SE2	4	5	3	3	3	2	20	Moderate

Table 4-13: Crossing Assessment Results

Crossing	Structure			Local Bankfull Dimensions		Channel Width : Opening Width	Gradient	Flow Restriction
	Type	Opening Width (m)	Skew Angle (degrees)	Width (m)	Depth (m)			
Applewood Creek	Two-span concrete	13.5 (6.0 m & 7.5 m)	7°	6.0 to 6.5	0.5 to 0.8	Opening Wider than Channel	Low	Constructed cobble riffle acting as grade control downstream of outlet pool
Etobicoke Creek	Two-span bridge	42.6 (21.3 m × 2)	12°	31	1.2 to 1.4	Opening Wider than Channel	Moderate to Low	West bridge span partially blocked by vegetated island / bar
Serson Creek	Single-span concrete	10 m	<5°	3 to 3.5	0.3 to 0.4	Opening Wider than Channel	Low	Constructed cobble riffle acting as grade control downstream of outlet pool

Table 4-10: Recommended Erosion Hazard Widths

Crossing	Valley Considerations and Historic Observations	Empirical (Theoretical) Meander Belt Width[1] (m)	MNR (2002) Toe Erosion Allowance (m)	Three times Bankfull Width (m)	Existing Crossing Span (m)	Recommended Erosion Hazard Width (m)	
						Existing Urban Corridor	Unmanaged Natural Corridor
Etobicoke Creek	Limited change since mid-1900s floodplain modifications; Floodplain width 240 to 280 m	200 to 300	8 to **15**	3 × 31 = **93**	21.3 × 2 = **42.6**	**148**	250
Applewood Creek	Confined US of Lakeshore Rd; Maximum lateral meander belt widths (1960-1978): 15 to 20 m	50 to 80	5 to **8**	3 × 6.5 = **19.5**	6.0 + 7.5 = **11.5**	**43**	70
Serson Creek	West bank confined DS Lakeshore Road modification predates earliest available photograph	20 to 40	**5** to 8	3 × 3.3 = **10**	10 × 1 = **10**	**24**	30

Erosion Hazard Assessment

Erosion hazard limits were assessed using historic observations, empirical meander belt relations, OMNR toe erosion allowances and multiples of channel bankfull width. The recommended erosion hazard widths included estimates of the existing urban corridor and the unmanaged natural corridor. The existing urban corridor is based on three times the bankfull channel width plus two times the toe erosion allowance, with an added 20% factor of safety (10% per corridor side). Results of the erosion hazard assessment are summarized in **Table 4-10**.

Additional details on the investigations and findings associated with fluvial morphology are provided in **Appendix C**.

4.4 Drainage and Stormwater Management

4.4.1 Watershed and Subwatershed

Credit Valley Conservation (CVC) has jurisdiction with respect to drainage and stormwater management of the Credit River watershed within the majority of Lakeshore Road TPAP project corridor. Within this watershed, the Project Area crosses Lake Ontario Shoreline East subwatershed.

The far eastern portion of the project corridor is located within the Toronto and Region Conservation Authority (TRCA) jurisdiction (Etobicoke Creek watershed); therefore, the TRCA criteria for stormwater management will be applied to the catchment that is draining to Etobicoke Creek.

The Project Area also falls under the jurisdiction of the Ministry of Natural Resources and Forestry (MNRF) Aurora District. There are two (2) regulated watercourse crossing within the project limits, both located within the Credit River watershed. Refer to the Drainage Plans in **Appendix D** for the crossing locations.

4.4.2 Land Use

Based on the site investigation and the available background information, the existing land use along Lakeshore Road East varies along the project corridor and includes mixed used properties, residentials, commercial warehouse, and a mixture of park/open space and watercourse valleylands.

4.4.3 Hydrogeological Conditions

Based on the information from the Geotechnical Investigation, the soil material at the locations where low impact development (LID) measures are proposed can be classified as sandy silt, clayey silt, and silty clay. During the detailed design stage, borehole investigations and in-situ infiltration rate measurements should be completed at all proposed LID locations to confirm the soil infiltration rates and groundwater levels.

4.4.4 Existing Drainage Pattern

Lakeshore Road between Etobicoke Creek and East Avenue has primarily an urban cross-section and stormwater runoff is primarily managed by an underground storm sewer system. The corridor runs along the natural drainage gradient towards east. The majority of the corridor directly discharges either to Serson Creek, Applewood Creek, or Etobicoke Creek via storm sewer outfalls. The remainder of the corridor ultimately discharges into Lake Ontario. Refer to the Drainage Plans in **Appendix D** for additional details.

4.4.5 Aquatic Resources

The two watercourses that exist within the project limits, namely Serson Creek and Applewood Creek, are within the Credit River watershed and are under the jurisdiction of Credit Valley Conservation's (CVC) and the Ministry of Natural Resources and Forestry (MNRF) Aurora District.

Applewood Creek is classified as a warmwater system, which contains a pollution tolerant mix of cyprinid species. The fish species within Applewood Creek are common and secure in Ontario and no SAR or SCC is identified. Fish survey competed by CVC in 2011 and 2021 did not yield any fish species in Serson Creek.

A portion of the project corridor discharges to Etobicoke Creek, which is under the jurisdiction of TRCA and MNRF Aurora District. The Etobicoke Creek is a warmwater system and the fisheries data shows except for one SAR specie, the fish species within Etobicoke Creek are common and secure in Ontario.

4.4.6 Transverse Drainage Crossings

There are two (2) regulated watercourse crossings within the project limits, which are culvert crossings at Serson Creek and Applewood Creek. In addition, there are two unregulated culvert crossings within the project limits that convey the local drainage.

Drainage Plans in **Appendix D** for additional details.

4.4.7 Hydraulic Assessment of Transverse Crossings

The design peak flows for the culvert crossings were obtained from the existing hydraulic models (HEC-RAS) for Serson Creek and Applewood Creek provided by CVC. The hydraulic model (HEC-RAS) provided by CVC for Applewood Creek was developed for the preferred option by AECOM in 2015, as part of an EA study for culvert and creek improvements on Lakeshore Road East over Applewood Creek. This model is updated and used as the base condition for this study. There are no existing hydraulic models for the two unregulated crossings within the project limits.

It is recommended that during detailed design, the design flows be reviewed and verified to confirm any changes to the land-use, channel geometry and associated hydrologic information that may affect the peak flows presented in this study.

A summary of the design storm peak flows for the transverse crossings is presented in **Table 4-14**.

Table 4-14: Design Peak Flows - Transverse Crossings

Watercourse/Drainage Crossing	Type	Peak flow (m^3/s)		
		50 yr	100 yr	Regional
Serson Creek	Culvert	16.7	19.2	19.1
Applewood Creek	Culvert	43.1	51.3	53.4

A hydraulic assessment of the culvert crossings was conducted to determine the hydraulic performance under the existing conditions. The culvert capacities were assessed based on the 100 year and Regional design storm as per the City of Mississauga Storm Drainage Design Requirements. **Table 4-15** summarizes the hydraulic analysis results for the crossings within the project limits. All hydraulic assessment output files are provided in **Appendix D**. The results indicate that the 100 year and Regional Storm events do not overtop the road at Serson Creek and Applewood Creek crossings.

Table 4-15: Hydraulic Analysis Results for the Transverse Culverts (Base Condition)

Crossing	Type	U/S Invert (m)	D/S Invert (m)	Length (m)	Road Elev. (m)	Water Surface Elev. (m)			Remarks
						50 Yr.	100 Yr.	Reg.	
Serson Creek	Culvert	81.69	81.54	27.56	84.50	83.29	83.41	83.41	100 year and Regional flows do not overtop road
Applewood Creek	Culvert	78.85 79.15	78.41 78.71	28.02	83.68	81.89	82.31	82.42	100 year and Regional flows do not overtop road

4.5 Environmental Site Assessment

To determine the potential for impacts to contaminated soils, a Limited Phase 1 Environmental Site Assessment (ESA) was undertaken for the Project Area. For the purposes of this corridor-wide Limited Phase I ESA, the Phase I Property (the site) was assumed to be the land within the proposed right-of-way (RoW) along the project route, and the site boundary was assumed to be the proposed RoW outline. The Phase I Project Area encompassed a 250 m buffer, which included the properties wholly and partially located within 250 m from the boundaries of the site. The 250 m buffer was added to either side of the road to account for surrounding properties that could potentially impact the site.

The corridor-wide Limited Phase I ESA provided a general overview of the site and Project Area to identify current and historical Potentially Contaminating Activities (PCAs) and Areas of Potential Environmental Concern (APECs) within the Project Area. The assessment of PCAs and APECs have been conducted on a broad level when compared with property specific or individual Phase I ESAs, due to the scope of the corridor wide Limited Phase I ESA (i.e., assessment of a large number of properties rather than one single property). Individual APECs (i.e., properties of potential environmental concern) have been identified within the Project Area, which have been assigned with a risk rating of “high” or “medium” potential for contamination.

The findings of the Limited Phase I ESA provide a baseline of understanding for the planning of property acquisition, dewatering/groundwater management, and excess soil management work in the future design and planning stages and to identify appropriate environmental work and mitigation measures recommended for completion during the detailed design and construction phases of the project.

The Limited Phase I ESA includes a review of historical records available for the properties within the Project Area and a drive-by, windshield site visit to make observations of the properties within the Project Area from public roadways and lands.

The site visit did not include property-specific inspections and/or building inspections. No interviews have been conducted for any properties within the Project Area.

Information gathered from the historical records review and site visits was used to identify PCAs and properties or APECs (properties or areas of potential environmental concern) in the Project Area. The APECs within the Project Area have been assigned with a risk rating of “high” or “medium” potential for contamination in accordance with the MTO (2016). The remaining properties, which have not been identified as APECs, have been assigned with a risk rating of “low” potential for contamination.

The properties or APECs with risk ratings of “high” and/or “medium” have been assigned property identification numbers, which are referenced throughout this report.

The rationale for risk rating assignments is provided in the following subsections.

High Potential for Contamination

Properties with a high potential for contamination include:

- Properties with confirmed soil and groundwater contamination based on the review of historical records;
- Current and historical industrial facilities; the potential for contamination is high due to the industrial processes and materials involved;
- Current or historical waste disposal sites and waste receiving and transfer sites;
- Potential environmental impacts related to waste disposal/handing/transfer sites can be more severe and may extend to neighbouring properties
- Some commercial operations, such as dry cleaners, vehicle and equipment repair, automobile wrecking yards, or fuel service stations due to the chemical, fuel, and/or material usage, storage, and handling on these properties
- Properties with PCAs, as defined in *Table 2, Schedule D of O. Reg. 153/04* (provided in Appendix A of the Limited Phase 1 ESA Report in **Appendix E**); these PCAs must be identified and evaluated when preparing Phase I ESAs for filing a Record of Site Condition.
- Certain agricultural properties, such as historical orchards, due to the concern of large-scale pesticide/herbicide applications
- High potential for soil contamination within the railway corridor beneath and or adjacent to railway tracks, as railway ties are impregnated with creosote, and railways are often developed on poor quality fill; and
- Properties with visible transformers, potential fill material of unknown quality, and where significant spills have been reported.

Medium Potential for Contamination

Properties with medium potential for contamination include:

- historical and/or current commercial facilities, unless evidence suggests a “high” or “low” potential for contamination
- light industrial facilities, such as warehouses, shipping and receiving operations, light assembly and vehicle and equipment storage
- nurseries, tree farms, and golf courses which may involve the application of pesticides/herbicides
- institutional facilities, such as churches, public schools, large office buildings, nursing homes, and community centres due to the concern of potential use or storage of larger quantities of chemicals (including generator/heating oils), unless specific sources of information suggest that they have “high” or “low” potential.

Low Potential for Contamination

Properties with low potential for contamination include:

- Properties where land uses consist of undeveloped lands, open spaces, and residential properties
- In general, agricultural properties (except for orchards, nurseries, and golf courses):
    - Agricultural equipment use, storage, and repair may increase the potential for contamination if present.
    - In addition, certain pesticides and fertilizers applied on agricultural lands can accumulate in surficial soil.

Based on the review of available historical information and observations made during the site visit, 69 properties and/or areas within the Phase I Project Area have been identified as having a “high” potential for soil and groundwater contamination, including gas stations or service centres, dry-cleaning facilities, vehicle repair garages, and industrial or manufacturing sites. Sixteen properties and/or areas within the Project Area have been identified as having a “medium” potential for soil and groundwater contamination, including light industrial, commercial and/or institutional facilities. The remaining properties in the Project Area, which were never developed or were developed but only used for agricultural (excluding orchards, nurseries, tree farms, and golf courses), residential, or parkland uses, were rated as having a “low” potential for contamination. In addition, 30 significant spill incidents, representing 11 spill locations, and 2 historical fill areas are also considered as having a “high” potential for soil and/or groundwater contamination.

The properties or areas rated “high” and “medium” potentials for contamination, significant spill, and historical fill locations represent APECs in the Project Area. In addition to the APECs, potential impacts from de-icing salt applications during the winter season and unrecorded spill incidents on the site and other municipal roadways are also considered as potential environmental concerns to impact the nearby soil and groundwater quality.

A key plan illustrating the results of the Limited Phase 1 ESA is provided in **Figure 4-5** to **Figure 4-7**.

Additional details on the investigations and findings associated with the *Limited Phase 1 ESA* are provided in **Appendix E**.

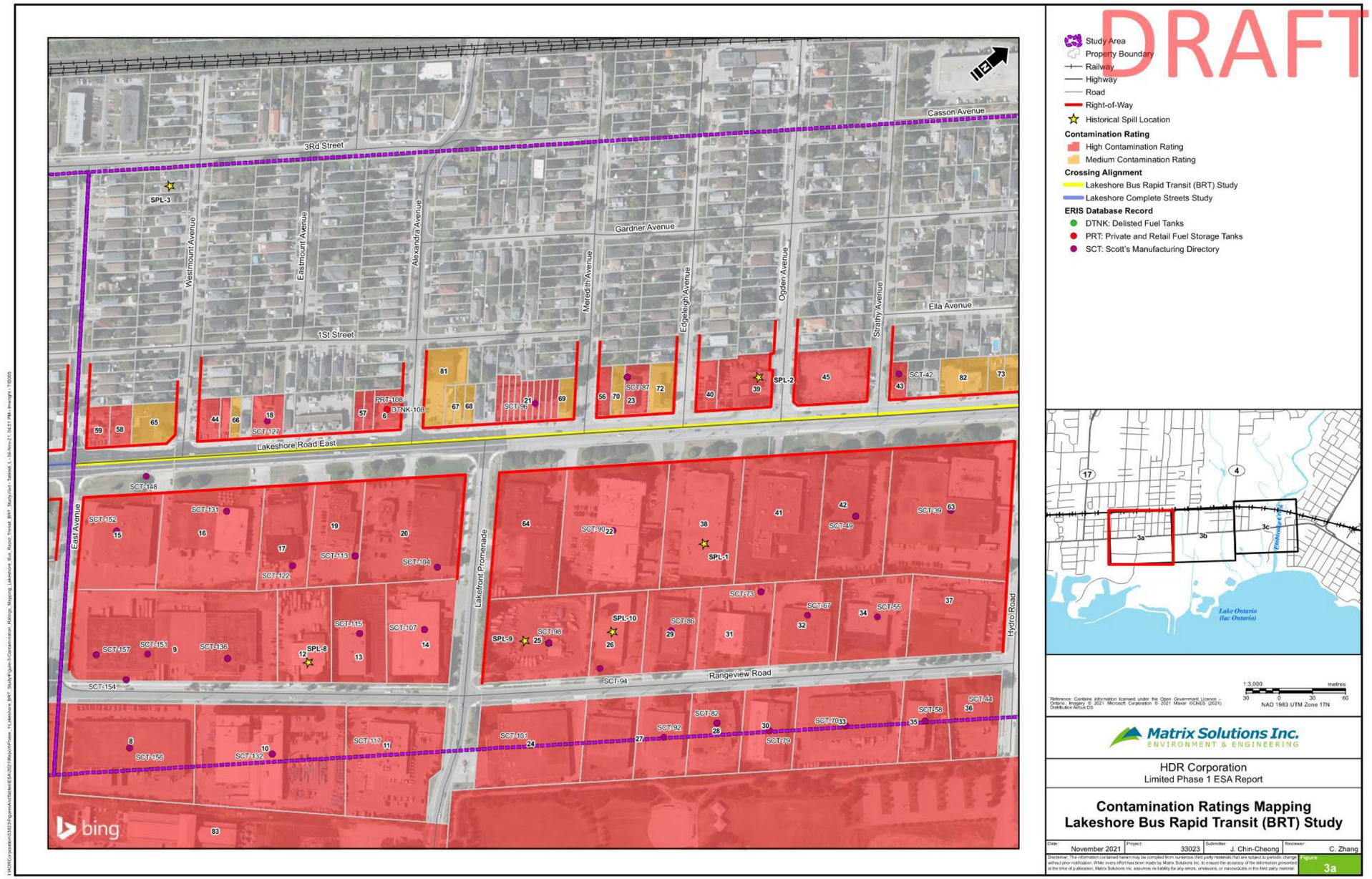
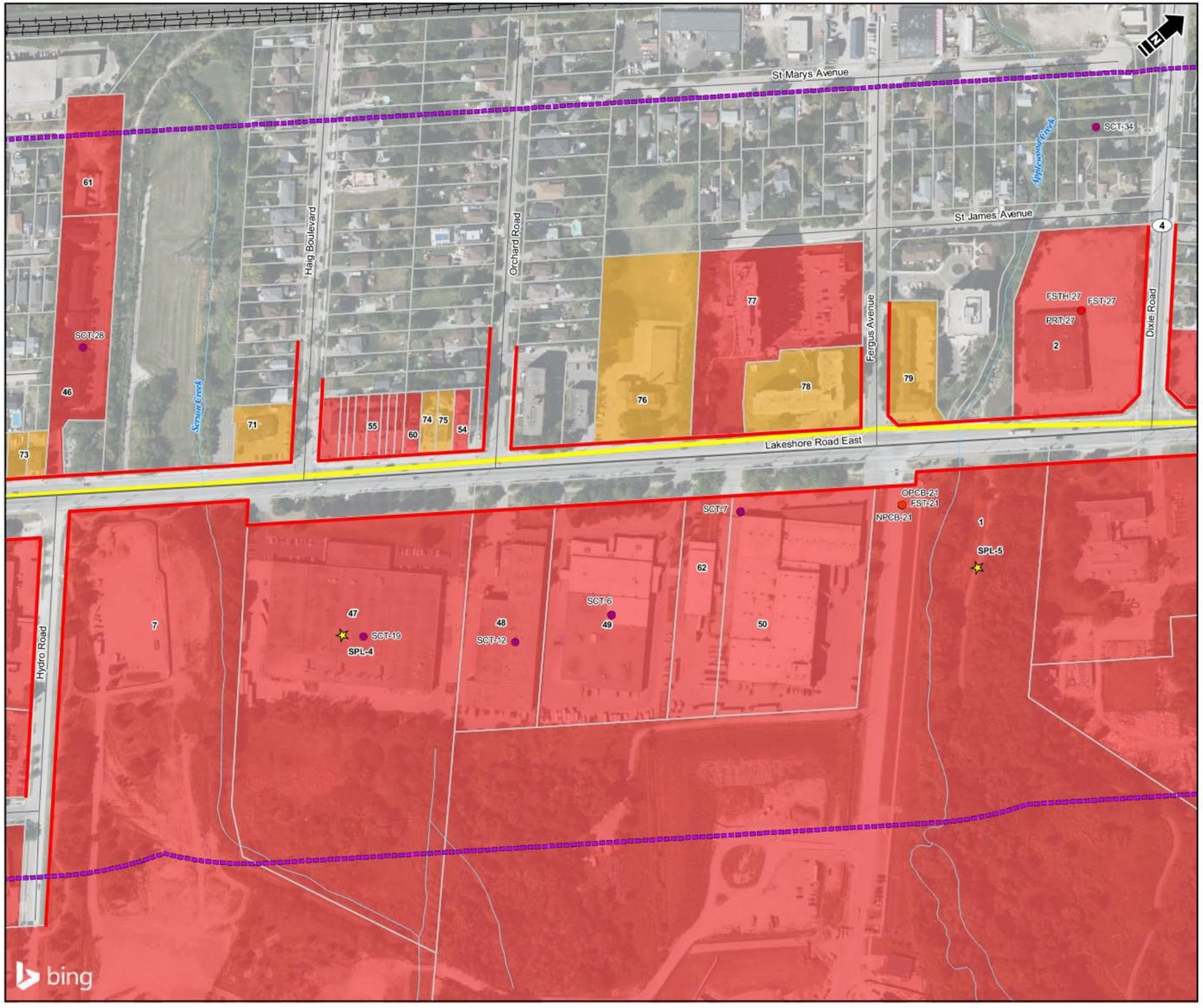


Figure 4-5: Limited Phase 1 ESA (1 of 3)



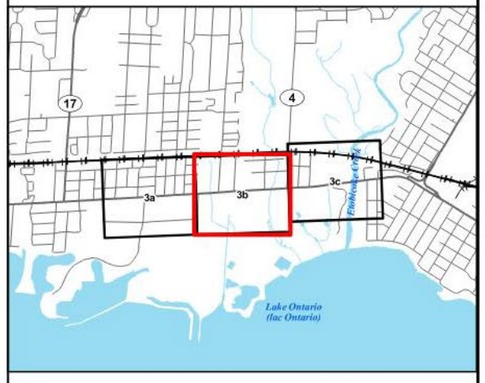
DRAFT

Study Area
Property Boundary
Watercourse
Railway
Highway
Road
Right-of-Way
Historical Spill Location

Contamination Rating
High Contamination Rating
Medium Contamination Rating

Crossing Alignment
Lakeshore Bus Rapid Transit (BRT) Study

ERIS Database Record
FST: Fuel Storage Tank
FSTH: Fuel Storage Tank – Historic
NPCB: National PCB Inventory
OPCB: Inventory of PCB Storage Sites
PRT: Private and Retail Fuel Storage Tanks
SCT: Scott's Manufacturing Directory



Reference: Contains information licensed under the Open Government Licence – Ontario. Imagery © 2021 Microsoft Corporation © 2021 Maxar ©CNES (2021) Distribution Airbus DS

1:3,000 metres
30 0 30 60
NAD 1983 UTM Zone 17N

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

HDR Corporation
Limited Phase 1 ESA Report

Contamination Ratings Mapping
Lakeshore Bus Rapid Transit (BRT) Study

Date:	Project:	Submitter:	Reviewer:
November 2021	33023	J. Chin-Cheong	C. Zhang

Disclaimer: The information contained herein may be compiled from numerous third party materials that are subject to periodic change without prior notification. While every effort has been made by Matrix Solutions Inc. to ensure the accuracy of the information presented at the time of publication, Matrix Solutions Inc. assumes no liability for any errors, omissions, or inaccuracies in the third party material.

Figure 3b

Figure 4-6: Limited Phase 1 ESA (2 of 3)

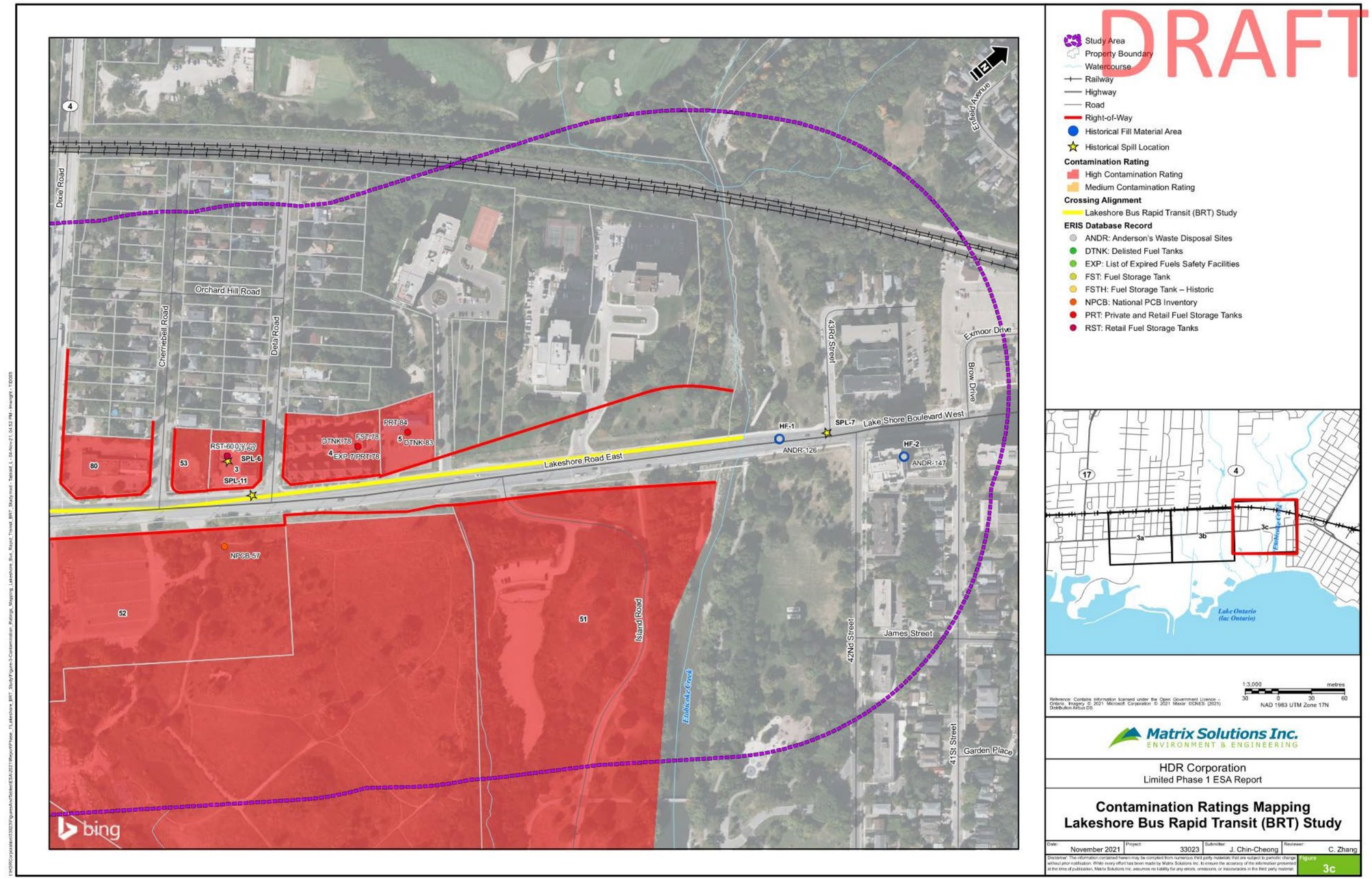


Figure 4-7: Limited Phase 1 ESA (3 of 3)

4.6 Cultural Heritage Environment

4.6.1 Built Heritage Resources and Cultural Heritage Landscapes

A Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment (Cultural Heritage Report) was undertaken by Archaeology Services Inc. (ASI) for the Project Area. This assessment followed guidelines presented in the Ministry of Heritage, Sport, Tourism and Culture Industries' (MHSTCI) guidance document: Sample Tables and Language for "Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment" and Environmental Project Reports (EPR) under Transit Project Assessment Process (TPAP) for Proponents and their Consultants (MHSTCI. 2019).

The Cultural Heritage Report focused on the Project Area with an additional 50 m buffer. This Project Area has been defined as inclusive of those lands that may contain Built Heritage Resources (BHRs) or Cultural Heritage Landscapes (CHLs) that may be subject to direct or indirect impacts as a result of the proposed undertaking. A field review of the Project Area was undertaken in June 2021 to document the existing conditions of the Project Area from existing rights-of-way.

Based on the results of the background research and field review, six BHRs and one CHL were identified within the Project Area. Of these seven known BHRs and CHLs, three properties are designated under Part IV of the OHA, one landscape is identified in the Cultural Landscape Inventory (The Landplan Collaborative Ltd. 2005), two properties are listed in the Heritage Register for Mississauga (City of Mississauga 2018), and one property features an Ontario Heritage Trust plaque. There are two potentials BHRs, one identified in A Heritage Tour – Lakeview (Heritage Mississauga 2020) and one identified during background research and field review. Based on the type of resources, their physical location, architectural style and/or function, some of these individual resources were combined into a larger CHL, resulting in six BHRs and one CHL identified within the Project Area. **Table 4-16** outline the known and potential BHRs and CHLs within the Project Area.

Table 4-16: Known and Potential BHRs and CHLs Within the Project Area

Feature ID	Type of Property	Address or Location	Heritage Status and Recognition
BHR 1	School	1239 Lakeshore Road East	Known BHR – Listed in the Heritage Register for Mississauga
BHR 2	Plaque	Corner of Lakeshore Road East and Hydro Road	Known BHR – Commemorative Feature
BHR 3	Church	999 Lakeshore Road East	Potential BHR – Identified during background research and field review
BHR 4	Residence	940 First Street	Known BHR - Listed in the Heritage Register for Mississauga
BHR 5	Former Radial Substation	811 Lakeshore Road East	Potential BHR – Identified in A Heritage Tour - Lakeview
BHR 6	Former Miliary Industrial Complex	1352 Lakeshore Road East	Known BHR – Designated under Part IV of the OHA (By-law # 0258-2009).
CHL 1	Industrial	Arsenal Lands CHL	Known CHL – Identified in the 2005 Cultural Landscape Inventory Features: 1300 Lakeshore Road East, Designated under Part IV of the OHA (By- law # 0144-2017) 1300A Lakeshore Road East, Designated under Part IV of the OHA (By- law # 0170-2012) 1352 Lakeshore Road East, Designated under Part IV of the OHA (By- law # 0258-2009) (See BHR 6)

Figure 4-8 illustrates the location of identified BHRs and CHLs in the Project Area.

The Lakeview Generation Plant is included in the Cultural Landscape Inventory (The Landplan Collaborative Ltd. 2005), however, municipal consultation and field survey confirmed that the CHL is no longer extant and therefore is not included in this assessment.

A complete copy of the report entitled Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment (October 2021) is provided in **Appendix F**.

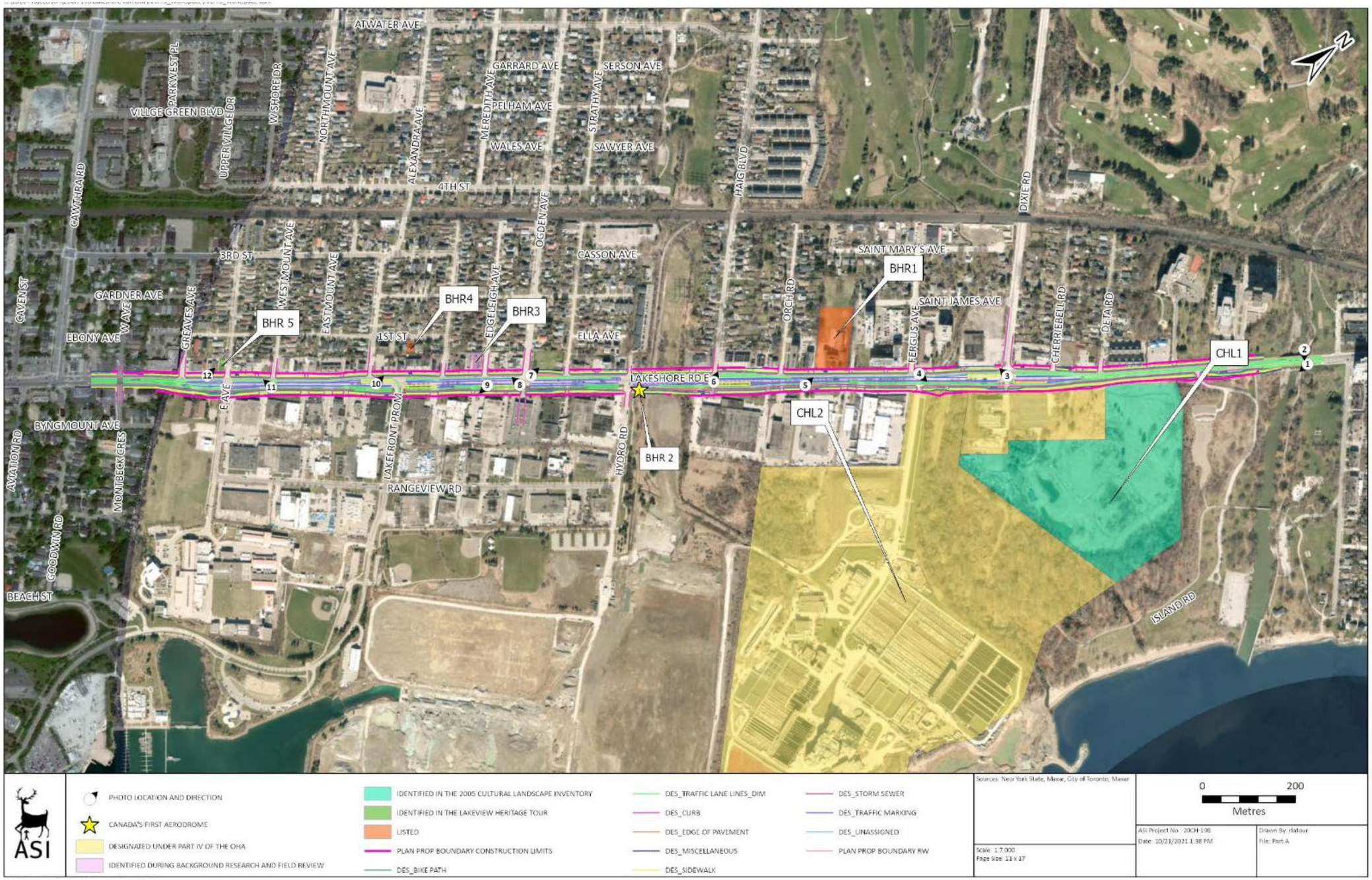


Figure 4-8: Built Heritage Resources and Cultural Heritage Landscape

4.6.2 Archaeological Resources

A Stage 1-2 archaeological assessment was undertaken in November 2021 by Archaeology Services Inc. (ASI) for the Project Area. A Stage 1 AA consists of a review of geographic, land use and historical information for the property and the relevant surrounding area, a property visit to inspect its current condition and contacting MHSTCI to find out whether, or not, there are any known archaeological sites on or near the property. Its purpose is to identify areas of archaeological potential and further archaeological assessment as necessary.

The Stage 1 archaeological assessment property inspection was conducted under the field direction of Alexis Dunlop (P1146) of ASI, on November 12, 2021, to gain first-hand knowledge of the geography, topography, and current conditions and to evaluate and map archaeological potential of the Project Area. It was a systematic from publicly accessible lands/public rights-of-way only and did not include excavation or collection of archaeological resources.

The Stage 1-2 AA determined that approximately 4.7 percent of the Project Area (0.6 hectares) was previously assessed as having no further archaeological potential due to previous assessment and was not subject to the Stage 2 assessment. An additional 94.3 percent of the Project Area (11.8 hectares) was determined to have been previously disturbed during the construction of the Lakeshore East right-of-way and the adjacent industrial and commercial properties on its south side, in addition to the channelized watercourses of Applewood Creek and Serson Creek. The Stage 1-2 property survey did not identify any lands with archaeological potential and test pit survey was not conducted. The remaining 0.2 percent of the Project Area (0.02 hectares) has been previously recommended for construction monitoring due to the potential for deeply buried deposits. Should any impacts be proposed for these lands, all land disturbing activities should be monitored by a licensed archaeologist. If any intact deposits are identified during the monitoring program, additional Stage 2 survey will be required. Approximately 0.8 percent of the Project Area (0.1 hectares) comprises a portion of Etobicoke Creek. While no impacts have been proposed for Etobicoke Creek, its archaeological potential must be evaluated following the MHSTCI.'s Criteria For Evaluating Marine Archaeological Potential checklist if impacts to the creek bed is proposed. Findings of the Stage 1-2 AA are summarized in **Figure 6-1** to **Figure 6-3**, in **Section 6.6.2**

The complete Stage 1-2 Archaeological Assessment - Lakeshore Corridor - Part A (November 26, 2021) is provided in **Appendix G** for reference. The Stage 1-2 AA is entered into the register with the Ministry of Citizenship and Multiculturalism (MCM, formerly MHSTCI).

4.7 Socio-Economic Environment

4.7.1 Land Uses

The existing land uses in the Project Area are characterized under two sub-areas: the Lakeview Employment Area, and Lakeview Waterfront. These areas are illustrated in the key plan in Figure 4-9, and key characteristics of each are described in the following paragraphs.

LAKEVIEW EMPLOYMENT AREA: Bounded by Lakeshore Road to the north, Lake Ontario to the south, East Ave. to the west, and the city limits to the east. Primarily industrial uses, with open space and park areas. Lakeshore Road provides access to adjacent properties, set well back from the street. Several large parcels that appear to be vacant (former Lakeview Generating Station).

LAKEVIEW WATERFRONT: The boundaries are south of Lakeshore Road East to Lake Ontario, and from East Avenue to the Toronto municipal boundary. This new Major Node Character Area within the Lakeview Employment Character Area came into effect on August 1, 2018 following the City of Mississauga's adoption of Official Plan Amendment 89 on July 4, 2018.This change is not reflected in **Figure 4-9** as it was prepared prior to the adoption of the amendment.

Exhibit 2-2 Existing Land Uses in the Study Area (2015)
Note: Does not reflect changes to Lakeview EA as a result of MOPA#89 for addition of Lakeview Waterfront Major Node

Figure 4-9: Existing Project Area Land Uses

4.7.2 Air Quality

In order to best understand the impacts of the proposed transit project on air quality, an assessment of the existing 2021 conditions was undertaken. The objective is to assess the local air quality impacts associated with the BRT and Lakeshore Road realignment and includes an overview of construction impacts and a screening level assessment of greenhouse gases (GHG). To meet these objectives, the following scenarios were considered:

- 2021 No Build (NB) – Assess the existing and future air quality conditions at representative receptors without the project in place. Predicted contaminant concentrations from the respective traffic levels were combined with hourly measured ambient concentrations to determine combined impacts.
- 2041 Future Build (FB) – Assess the future air quality conditions with the proposed project in place. Predicted contaminant concentrations associated with traffic levels for the preferred alternative were combined with hourly measured ambient concentrations to determine combined impacts.

The modelling assessment considered guidance provided in MTO's Environmental Guide for Assessing and Mitigating Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (AQ&GHG Guide; May 2020) and included vehicle emissions from Lakeshore Road East from East Avenue to 42/43 Street, along with arterial roads: East Avenue, Lakefront Promenade, Ogden Avenue, New Hydro Road, Haig Boulevard, Fergus Avenue, Dixie Road, 1515 Lakeshore Condo and, the BRT itself.

Contaminants of Interest

The contaminants of interest from vehicle emissions are based on the regularly assessed contaminants of interest for transportation assessments in Ontario, as determined by MTO and Ministry of Environment, Conservation and Parks (MECP). Motor vehicle emissions have largely been determined by scientists and engineers with United States and Canadian government agencies such as the U.S. Environmental Protection Agency (EPA), MECP, Environment Canada (EC), Health Canada (HC), and MTO. These contaminants are emitted due to fuel combustion, brake wear, tire wear, the breakdown of dust on the roadway, fuel leaks, evaporation and permeation, and refueling leaks and spills. Note that emissions related to refueling leaks and spills are not applicable to motor vehicle emissions from roadway travel. Instead, these emissions contribute to the overall background levels of the applicable contaminants. All the selected contaminants are emitted during fuel combustion, while emissions from brake wear, tire wear, and breakdown of road dust include only the particulates.

General Assessment Methodology

The worst-case contaminant concentrations due to motor vehicle emissions from the roadways were predicted at nearby receptors using dispersion modelling software on an hourly basis for a five-year period. Historical meteorological data from Billy Bishop Toronto City Airport for the period 2013-2017 was used. Five years were modelled to capture the worst-case meteorological conditions. Two emission scenarios were assessed: 2021 No Build (NB) and 2041 Future Build (FB). Combined concentrations were determined by adding modelled and background (i.e., ambient data) concentrations together on an hourly basis. Background concentrations for all available contaminants were determined from MECP and NAPS (National Air Pollution Surveillance) stations nearest to the Project Area with applicable datasets.

Maximum 1-hour, 8-hour, 24-hour, and annual predicted combined concentrations were determined for comparison with the applicable guidelines using emission and dispersion models published by the U.S. Environmental Protection Agency (EPA). The worst-case predicted impacts are presented in this report; however, it is important to note that the worst-case impacts may occur infrequently and at only one receptor location.

Background Ambient Conditions

A review of MECP and NAPS ambient monitoring stations in Ontario was undertaken to identify the monitoring stations that are in relative proximity to the Project Area and that would be representative of background contaminant concentrations in the Project Area. The closest MECP station is located 9km west of the site at 3359 Mississauga Rd. N., U of T Campus, in Mississauga. The closest NAPS station is located 5.5km northeast at 461 Kipling Avenue Etobicoke South and 9km north at Elmcrest Road, Etobicoke West, therefore these monitoring stations were used to summarize background concentrations in the Project Area. Note that CO is only monitored at the Toronto West Station, therefore this station was used only to assess background CO concentrations. Also note that Windsor is the only station in Ontario at which background Acrolein, Formaldehyde, and Acetaldehyde are measured in recent years. Only these contaminants were considered from the Windsor station; the remaining contaminants from the Windsor station were not considered given the stations' distance from the Project Area. The locations of the relevant ambient monitoring stations in relation to the Project Area are shown in **Figure 4-10**.

Figure 4-10: Location of Ambient Monitoring Stations, Relevant to the Project Area

A detailed statistical analysis of the selected worst-case background monitoring station for each of the contaminants was performed. Based on a review of ambient monitoring data from 2013-2017, background concentrations were generally below their respective guidelines. The exceptions are particulate matter and benzene, as well as the 1-hour and annual NO2 Canadian Ambient Air Quality Standards (CAAQS) standards. In many cases the exceedances represent maximum concentrations and the 90th percentile and/or average concentrations are below the guideline. It should be noted that PM10 and TSP were calculated based on their relationship to PM2.5. Background concentrations for benzo(a)pyrene were not included in the cumulative assessment but are discussed with the presentation of results.

Further details on the Air Quality Assessment are provided in **Appendix H**.

4.7.3 Noise and Vibration

For transportation projects, operational noise is of primary importance. This section of the report provides an analysis of operational noise impacts from road traffic noise related to this undertaking. The Ontario provincial policies and guides from the Ministry of Transportation, Ontario (MTO) and the MECP are directly applicable under the TPAP process for transportation projects such as this one and they are discussed in detail in this report.

Ontario has several guides and documents related to assessing transportation noise impacts. The document most applicable to municipal roadway projects is: The Ontario MECP/MTO, “Joint Protocol”, A Protocol for Dealing with Noise concerns during the Preparation, Review and Evaluation of Provincial Highway’s Environmental Assessments (MTO & MECP, 1986)

In May 2007, the MTO released the Environmental Guide for Noise (MTO, 2006) which superseded the Joint Protocol and previous MTO Quality and Standards Directive QST-A1 Noise Policy and Acoustic Standards for Provincial Highways (MTO 1992). Currently the Environmental Guide for Noise (the Guide) has not been adopted by the MECP for municipal road or transit projects. Therefore, the Joint Protocol has been used for this project. A summary of the effort required under the Joint Protocol is shown in **Table 4-17**.

Table 4-17: Summary of Mitigation Efforts Under the MECP/MTO Joint Protocol

Future Sound Levels	Change in Noise Level Above Future “No-Build” Ambient	Mitigation Effort
< 55 dBA	0 to 5 dBA	None
	> 5 dBA	
> 55 dBA	0 to 5 dBA	None
	> 5 dBA	• Investigate noise control measures on right-of-way. • If project cost is not significantly affected introduce noise control measure within right-of-way. • Noise control measures, where introduced, should achieve a minimum of 5 dBA attenuation averaged over first row receivers. • Mitigated to ambient, as administratively, economically, and technically feasible.

The Joint Protocol sets out an Outdoor Objective sound level of the higher of 55 dBA L_{eq}, or the existing ambient. For sound levels less than 65 dBA either the Guide or the Joint Protocol assesses noise impacts in a similar manner.
Only in the case where sound levels exceed 65 dBA, is the Guide more stringent. The evaluation of noise impacts is determined by the change in cumulative sound levels from the 2041 “no-build” scenario to the future “build” scenario. Assessments are based on a minimum 10-year future horizon year (i.e., traffic volumes 10 years after the completion of the project). Accordingly, a design year of 2041 applies to this project, corresponding to the traffic forecasts for the project.

Noise mitigation is warranted when increases in sound level over the “no-build” ambient are greater than 5 dBA. Mitigation measures can include changes in vertical profiles and horizontal alignments and noise barriers. Noise mitigation, where applied, must be administratively, economically, and technically feasible, and must provide at least 5 dBA of reduction averaged over the first row of noise-sensitive receivers. Mitigation measures are restricted to within the roadway right-of-way. Off right-of-way noise mitigation, such as window upgrades and air conditioning, is not considered.

Local Noise Policies and Guides

The City of Mississauga has a noise policy. Noise barriers, if warranted, will be designed according to City of Mississauga Policy 09-03-03 Noise Attenuation Barriers on Major Roadways. Replacement of existing noise barriers should be considered if the existing noise barriers are in poor physical condition or if the daytime sound levels with the project in place (“build” scenario) are above 60 dBA. There are no existing noise barriers within the Project Area that are impacted by this project and that would require possible replacement.

Location of Noise Sensitive Areas Within the Project Area

Definition of Outdoor Living Area (OLA) and Noise Sensitive Areas (NSAs) Noise impacts from transportation projects are evaluated at noise sensitive receptors commonly referred to as NSAs. The OLA is the part of an outdoor amenity area provided for the quiet enjoyment of the outdoor environment. The OLA is typically an area at ground level accommodating outdoor living activities. For sound level calculation purposes, the usual distance from the dwelling unit wall is 3 m where the actual OLA is not known. The vertical height is 1.5 metres (approximate head-height) above ground level. Where unknown, the side closest to the source of noise is assumed. Paved areas for multiple dwelling residential units are not defined as OLA. The OLA may include private areas used by individual dwelling occupants or “common” areas used by multi-tenant dwelling occupants.

Under the Joint Protocol, NSAs include the following land uses, provided they have an OLA associated with them:

- Private homes (single family units and townhouses);
- Multiple unit buildings such as apartments, provided they have a communal OLA associated with them;
- Hospitals and nursing homes for the aged, provided they have an OLA for use by patients;
- Schools, educational facilities, and daycare centres where there are OLAs for students;
- Campgrounds that provide overnight accommodation;
- Hotels and motels with outdoor communal OLAs for visitors; and
- Churches and places of worship.

The following land uses are generally not considered to qualify as NSAs:

- Apartment balconies;
- Cemeteries;
- Parks and picnic areas not part of a defined OLA;
- All commercial; and
- All industrial.

Fifteen (15) NSAs have been used in the analysis to represent worst-case potential noise impacts at all nearby noise sensitive land uses within the Project Area. NSAs were chosen to assess areas with similar overall noise levels and similar changes in noise (“build” versus “no-build”). Not all the noise sensitive areas within the project limits were modeled. In a search of the City of Mississauga website for planed or approved new residential developments they were in similar locations as the ones modeled in this project. These NSAs and modelled receptor locations are described in **Table 4-18**.

Table 4-18: Noise Sensitive Areas

Receptor Location	Municipal Street Address	Distance (m) to Existing Lakeshore Road East*	Characteristic of Property in Relation to Lakeshore Road East
Receptor 1	729 Byngmount Avenue	59	South
Receptor 2	1012 East Avenue	51	North
Receptor 3	1005 East Avenue	49	North
Receptor 4	1014 Westmount Avenue	55	North
Receptor 5	698 First Street	60	North
Receptor 6	1014 Meredith Avenue	57	North
Receptor 7	1017 Edgeleigh Avenue	65	North
Receptor 8	1015 Ogden Avenue	63	North
Receptor 9	1074 Ella Avenue	54	North

Receptor Location	Municipal Street Address	Distance (m) to Existing Lakeshore Road East*	Characteristic of Property in Relation to Lakeshore Road East
Receptor 10	1115 Lakeshore Road East	47	North
Receptor 11	1016 Haig Boulevard	62	North
Receptor 12	1018 Orchard Road	67	North
Receptor 13	1015 Orchard Road	29	North
Receptor 14	1285 Lakeshore Road East	23	North
Receptor 15	1049 Cherriebell Road	78	North

Under the Noise Protocol a “noise impact” is defined as the difference in projected noise levels at the “no-build” and the projected noise levels at the “build” design year. Traffic volumes from the year 2041 were the best available at the time of this assessment to assess possible noise impacts.

Traffic volumes for the 2041 “no-build” and 2041 “build” scenarios for multiple roadways were provided by HDR Inc and are found in the draft Noise Report (SLR, December 2021) in **Appendix I**. Traffic data was provided as Average Annual Daily Traffic (AADT), with percentage of commercial vehicles, day/night traffic split and the posted speeds. The noise prediction models accepted for use by MECP are only capable of using a minimum speed of 50 km/h, so if the posted speeds were 40 km/h, a more conservative speed of 50 km/h was used. These traffic volumes and associated data are at least 10 years in the future as required in the Noise Protocol.

The roadway noise prediction model used is the ORNAMENT road noise prediction algorithms produced by the MECP.

The noise prediction model relies on the use of vehicle noise emission levels to generate a noise source that can then be assessed at the receptors based on the following factors:

- Speeds for the roadways in the area used in the noise analysis;
- Pavement surface used for construction of the roadway (hot mix asphaltic pavement for all roadways);
- Elevations, contours and locations of all the NSA's near the right-of-way;
- Roadway grades;
- Intervening rows of homes and barriers;
- Type of ground cover, soft or hard ground;
- Percentage of commercial traffic; and
- Distance from the roadway.

Table 4-19 presents predicted 2041 “no-build” sound levels at receptors in the Project Area during the 16-hour daytime period. The “no-build” assumes that there are no roadway improvements on Lakeshore Road East.

Table 4-19: 2041 “No-Build” Noise Conditions

Receptor Location	Number of Homes Represented by Receptor	“No-Build” L_{eq} (16h)	“Build” L_{eq} (16h)	Change (“Build” minus “No-Build”)	Increase Above 5 dBA (Yes/No)	> 60 dBA (Yes/No)
Receptor 1	4	59.4	59.7	0.3	No	No
Receptor 2	2	52.3	52.2	-0.1	No	No
Receptor 3	3	59.1	58.8	-0.3	No	No
Receptor 4	2	58.5	58.3	-0.2	No	No
Receptor 5	6	54.5	54.4	-0.1	No	No
Receptor 6	7	49.7	49.5	-0.2	No	No
Receptor 7	3	57.4	57.3	-0.1	No	No
Receptor 8	4	60.9	60.9	0.0	No	No
Receptor 9	5	57.8	57.5	-0.3	No	No
Receptor 10	2	58.6	58.4	-0.2	No	No
Receptor 11	2	58.7	59.2	0.5	No	No
Receptor 12	4	53.2	53.4	0.2	No	No
Receptor 13	1	64.5	63.7	-0.8	No	Yes
Receptor 14	2	67.7	66.6	-1.1	No	Yes
Receptor 15	4	56.0	56.0	0.0	No	No

4.8 Transportation Conditions

As part of the pre-planning activities undertaken during Phase 1 and 2 of the Environmental Process (as part of the Lakeshore Transportation Master Plan Study), a detailed inventory of all existing transportation network conditions for each mode within the Project Area, including pedestrians, cyclists, transit, and motorized vehicles, has been documented in the Lakeshore Road Transportation Master Plan report, Appendix D: Existing Conditions.

The following sub-sections will provide a high-level summary of existing conditions as it relates to the Project Area.

4.8.1 Pedestrian

A pedestrian level of service (PLOS) analysis was performed for the entire Lakeshore Corridor between Winston Churchill Boulevard and the east City limit at Etobicoke Creek for the pedestrian network on both sides of Lakeshore Road.

A letter grade between 'A' and 'F' was given to various segments and intersection; 'A' is the most preferred and 'F' is the least preferred.

The PLOS within the Project Area varies between 'B' and 'D' along various segments:

- East Avenue to Lakefront Promenade – 'D' (north side) and 'E' (south side)
- Lakefront Promenade to Hydro Road – 'C' (both sides)
- Hydro Road to Dixie Road – 'E' (north side) and 'B' (south side)
- Dixie Road to Etobicoke Creek – 'E' (north side) and 'F' (south side)

The Project Area does not contain any significant pedestrian generators. Peak hour pedestrian demand volumes in the Project Area vary between 50 to 75 trips per hours; with the entrance to 1515 Lakeshore Road E (located east of Dixie Road) generating the highest level of demand in the AM peak.

4.8.2 Cycling

Within the vicinity of the Project Area, there is a paved multi-use trail generally on the south side of Lakeshore Road between Hydro Road and Etobicoke Creek, which forms a section of the overall Waterfront trail. Cycling facilities on intersecting streets include a signed bike route on Ogden Avenue.

Similar to the PLOS, a bicycle level of service (BLOS) analysis was performed for the entire Lakeshore Corridor between Winston Churchill Boulevard and the east City limit at Etobicoke Creek. The PLOS within the Project Area varies between 'A' to 'E' along various segments:

- East Avenue to Hydro Road – 'E'
- Hydro Road to Dixie Road – 'A'
- Dixie Road to Island Road – 'E'

Cycling volumes at intersections during the AM, midday, and PM peak hours were documented as part of the Lakeshore Transportation Master Plan Study. Cyclist volumes were shown to be larger in the Port Credit and Lakeview Character Area within the Project Area. This is generally consistent with the proximity of Lakeshore Road to the waterfront in these areas and the multitude of connections to the Waterfront Trail.

A detailed exhibit for all PLOS and BLOS analysis results for each segment and all intersection within the Project Area can be found in the Lakeshore Road Transportation Master Plan report, Appendix D: Existing Conditions.

In addition to the cycling operations on Lakeshore Road, the Region of Peel has also introduced curbside cycle lanes on Dixie Road, from Lakeshore Road East northerly to Rometown Road, and a signed cycle-route on Ogden Avenue from Lakeshore Road East northerly to South Service Road.

4.8.3 Transit Services

The TPAP Project Area is served by three transit services: MiWay, Toronto Transit Commission (TTC) and GO Transit.

MiWay Bus Routes

During the course of the Lakeshore Transportation Master Plan study, MiWay provided daily bus boarding and alighting counts for a typical weekday and weekend for all routes serving the Project Corridor in Fall 2015. **Table 4-20** presents the total daily ridership in persons for each route serving the TPAP Project Area.

Table 4-20: MiWay TPAP Project Area Transit Routes and Weekday Ridership

Route	Daily Weekday Ridership (Fall 2015)
5 Dixie	7,574
8 Cawthra	2,239
23 Lakeshore	4,404

Considering both boarding and alighting activity, the busiest bus stops are the Long Branch GO Station platforms as well as the intersections of Lakeshore Road/Ogden Avenue. **Table 4-21** summarizes the total daily ridership activity of route 23 Lakeshore

within the TPAP Project Area; ranges represent the number of boarding and alightings at each stop.

Table 4-21: Total Daily Boarding and Alighting (Route 23)

Stop	East Bound Direction Transit Stop Total	Westbound Direction Transit Stop Total
East Ave	85-200	< 85
Alexandra Ave	85-200	85-200
Ogden Ave	201-400	201-400
Hydro Rd	< 85	< 85
Haig Blvd	< 85	< 85
Orchard Rd	85-200	85-200
Dixie Rd	< 85	< 85
Island Rd	< 85	< 85
Forty-First St	< 85	< 85
Long Branch GO Station	750-2,300	750-2,300

GO Lakeshore West

The TPAP Project Area is indirectly served by GO Transit's Lakeshore West Rail Line. The Lakeshore West Line operates between Union Station in Toronto and Aldershot Station in Burlington with limited service to Hamilton with stops at Long Branch (to the east of the Project Area), and Port Credit (to the west of the Project Area). The rail service is supplemented by a GO Lakeshore West Bus service that operates on the Gardiner Expressway/QEW, and Hurontario Street between Union Station and the Port Credit GO Station. None of these services operate within the subject section of Lakeshore Road East, and no direct impacts to GO Transit operations are anticipated as a result of this project.

TTC Streetcar and Bus

In addition to the MiWay routes listed in **Table 4-20**, the Toronto Transit Commission (TTC) provides local transit connections at key transfer stations. MiWay routes 5 and 23 connect to the Long Branch GO Station and TTC loop for connections to the GO Lakeshore West Rail Line and TTC routes 110, 123, 501, and 508.

A detailed description of transit conditions, including the existing network, demand, and quality of service, within the Project Area can be found in Lakeshore Transportation Master Plan, Appendix D: Existing Conditions.

4.8.4 Road Network

A detailed description of road network conditions within the Project Area can be found in the Lakeshore Transportation Masterplan report, Appendix D: Existing Conditions Report. The existing overall travel demand in the Project Corridor and a safety analysis is also documented. The road network within the Project Area includes Regional and Local roads as listed in **Table 4-22**.

Table 4-22: Road Network Classification

Classification	Jurisdiction	Name
Regional Road	Peel Region	Dixie Road
Local Road - Major	City of Mississauga	Lakeshore Road Ogden Avenue

The existing ROW width in the Project Area varies between 35.0 m and 44.5 m:

- East Avenue to Hydro Road – 44.5 m
- Hydro Road to west of Haig Boulevard – 26.0 m
- Haig Boulevard to Fergus Avenue – 44.5 m
- Fergus Avenue to east of Dixie Road – 35.0 m
- East of Dixie Road to Etobicoke Creek – 26.0 m

4.8.5 Traffic and Transportation Analysis (East Avenue to Etobicoke Creek)

Transit

Existing transit service performance was evaluated using AVL and APC data provided by MiWay for periods before and during Covid-19. Metrics pertaining to ridership and transit service levels were considered.

The existing ridership for Route 23 is shown in **Figure 4-11** and **Figure 4-12**. Between East Avenue and Etobicoke Creek, the area with the greatest passenger activity is at Long Branch GO Station, as expected given that is it the terminal and there is an exchange with commuter rail. The ridership loading is relatively even throughout the Route, indicating most of the Route is evenly utilized.

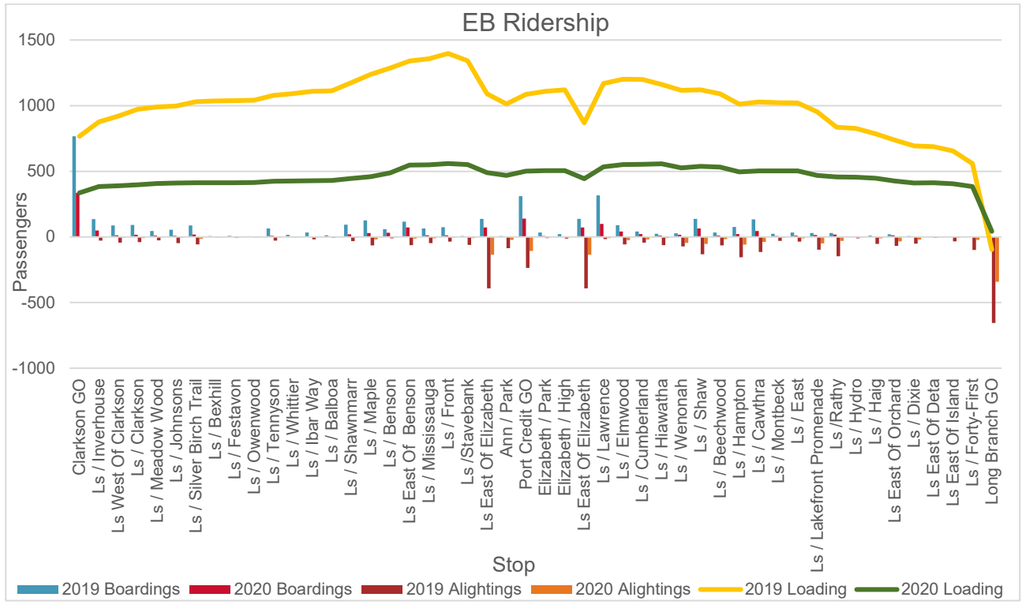


Figure 4-11: Existing Eastbound Ridership on Route 23

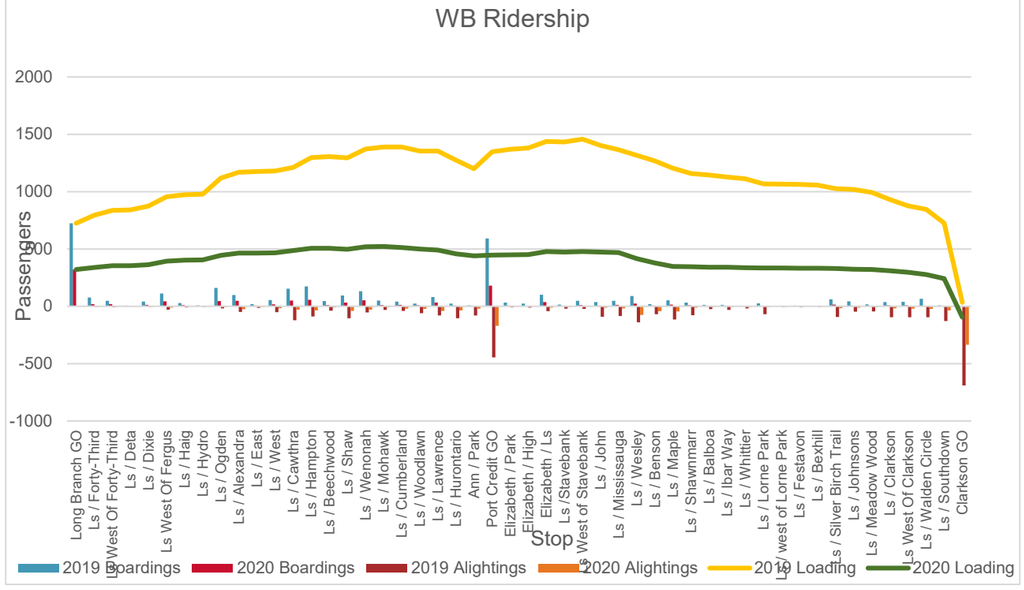


Figure 4-12: Existing Westbound Ridership on Route 23

The average runtime of the Route 23 for is shown in **Table 4-23** for weekdays. Before Covid, the Route took 4-5 minutes longer than the scheduled time to finish its route. However, during Covid when traffic and ridership levels are lower, the Route finished its route 1-2 minutes less than the scheduled time, on average. This suggests that congestion on the road likely impacted the punctuality and general run time of the bus. The potential travel speed without congestion could be even greater than that suggested by the runtimes during Covid, since the scheduled runtime did not change, and drivers would make an effort to follow the schedule.

Table 4-23: Actual vs. Scheduled Runtime for Route 23

	Direction	Scheduled Runtime	Actual Runtime	Runtime Difference
2019	East	34.5	38.8	4.3
	West	32.9	37.6	4.7
2020	East	34.5	33.3	-1.1
	West	32.9	31.3	-1.6

Traffic

An evaluation of the existing operations for the intersections within the TPAP Project Area was performed using the calibrated/validated Vissim micro-simulation model. The intersection operational analysis was assessed based on average vehicular delays, level of service (LOS) and queuing conditions. **Table 4-24** summarizes the LOS criteria for signalized and stop-controlled intersections.

Table 4-24: Intersection Level of Service Criteria

Level of Service	Average Delay Per Vehicle (seconds)		Traffic Operation
	Signalized Intersections	Stop-controlled Intersections	
A	≤ 10	≤ 10	Acceptable Operation
B	> 10 and ≤ 20	> 10 and ≤ 15	
C	> 20 and ≤ 35	> 15 and ≤ 25	
D	> 35 and ≤ 55	> 25 and ≤ 35	
E	> 55 and ≤ 80	> 35 and ≤ 50	Marginally Acceptable – Occasional Queuing
F	> 80	> 50	Unacceptable – Persistent Queueing

A summary of existing traffic conditions for both AM and PM traffic peak hours is presented in **Figure 4-13** and **Figure 4-14** respectively. As recent TMC were not available for the intersection of Hydro Rd/Lakeshore Road E, the intersection was not modeled in the existing conditions.

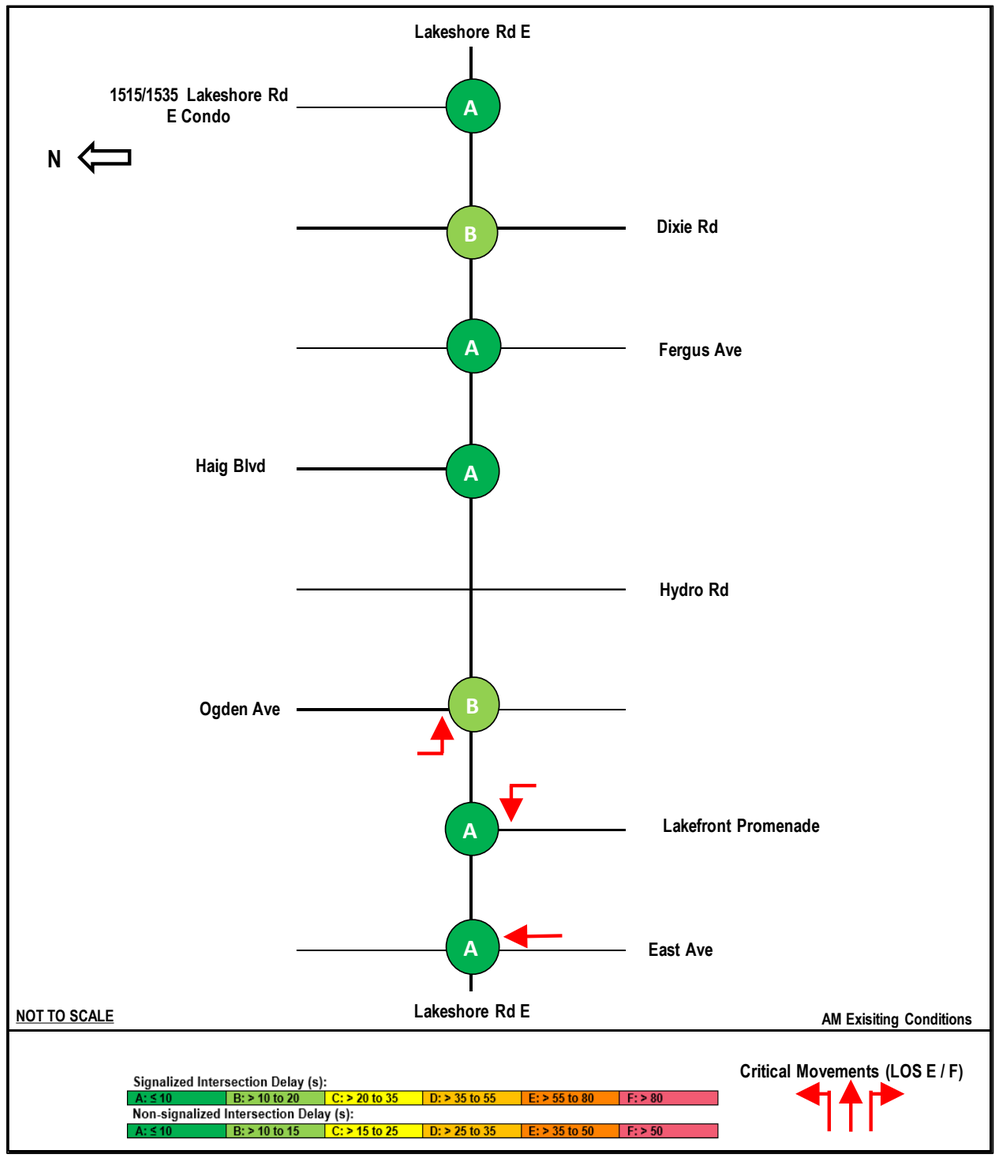


Figure 4-13: AM Existing Traffic Condition

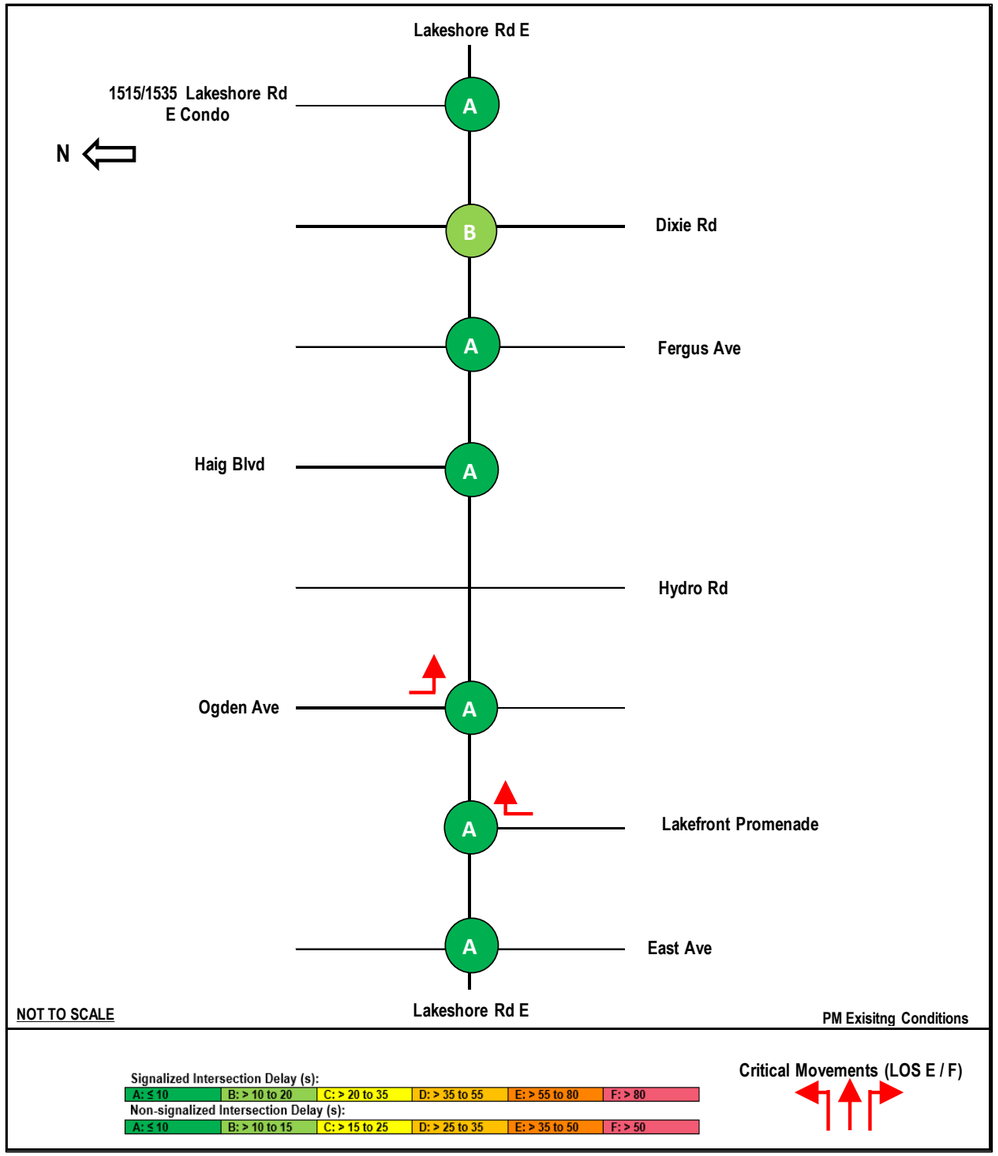


Figure 4-14: PM Existing Traffic Condition

The results from the models during the weekday AM peak hours showed:

- All intersections within the TPAP Project Area are operating at LOS A or B.
- All individual movements area operating at LOS D or better except for three movements. These are the North Bound through at East Ave, North Bound left at

Lakefront Promenade and South Bound left at Ogden Avenue which are operating at LOS E.

- No significant queueing issues was observed during AM peak hour simulation.

The results from the models during the weekday PM peak hours showed:

- All intersections within the TPAP Project Area are operating at LOS A or B.
- All individual movements area operating at LOS D or better except for the North Bound through movement at East Avenue and North Bound left movement at Lakefront Promenade which are both operating at LOS E.
- No significant queueing issues was observed during PM peak hour simulation.

Overall, the intersection within the Project Area is operating well with little to moderate delays. Traffic is directional with East Bound traffic is higher during the AM peak and West Bound is higher during the PM peak.

4.8.6 Streetscape and Landscaping

The streetscape, beyond the limits of the roadway, are typically characterized by hardscape on the north side of Lakeshore Road, and green frontage with street trees on the south. The northern streetscape is comprised of a sidewalk of varying width (typically 1.5 m), with paving stones providing a visual distinction between the sidewalk and hardscape boulevard, which serves (in areas) as frontage parking for the abutting commercial and residential developments.

Street trees are typically located on the south side of the roadway, within the green frontage of adjacent properties or lining the Waterfront Trail between Hydro Road and Dixie Road. Further detail is provided on corridor foliage in **Section 4.2**.

Illumination for the corridor is typically provided on hydro poles throughout the corridor. Supplemental illumination is provided on dedicated illumination poles where no hydro poles exist, with the exception of (approximately) Westmount Avenue and Lakefront Promenade, where there is no illumination infrastructure provided on the south side of Lakeshore Road. Throughout the corridor, illumination is provided in the boulevard, with localized median illumination provided at selected signalized intersections, including East Avenue and Dixie Road. On the north side of Lakeshore Road East, luminaires are placed more frequently than those on the south, but at a lower height.

4.9 Utilities and Municipal Services

In support of the preliminary design for the Lakeshore BRT project, the Project Team completed a Subsurface Utility Engineering (SUE) investigation in accordance with Construction Institute/American Society of Civil Engineers (CI/ASCE) Standard 38-02 Standard Guideline for the Collection and Depiction of Existing Subsurface Utility. The objective of the SUE investigation is to identify alignment of existing mainline utilities within the existing right of way that may impact the project and reduce the uncertainty that existing utilities create on the project.

According to the record documents obtained in support of the SUE investigation, and field investigations, the project area contains subsurface utilities and municipal services.

Underground utilities within the project area include:

- Alectra Utilities electric power,
- Bell, Rogers, Public Sector Network (PSN), and Cogeco telecommunications,
- Enbridge Gas Distribution natural gas mains,
- Region of Peel watermains,
- Region of Peel sanitary sewers,
- City of Mississauga storm sewers,
- Unknown conductive utilities.

The existing utility plan for the corridor is on file with the City.

Watermains

Watermains within the project area are owned and operated by the Region of Peel. According to records provided by the Region, the following are the active watermains with the Lakeshore Road East right-of-way;

- 300 mm PVC watermain (Cawthra to Etobicoke Creek);
- 600 mm (21”) CPP watermain (Cawthra to Dixie Road);
- 400 mm PVC watermain (Dixie Road to Deta Road);
- 300 mm PVC watermain (Deta Road to Etobicoke Creek);
- 900 mm CPP watermain (East Avenue to Westmount Avenue); and
- 2400 mm CPP Feedermain (Lakefront Promenade to Dixie Road).

Sanitary and Storm Sewers

Sanitary sewers are owned and operated by the Region of Peel. Storm sewers are owned and operated by the City of Mississauga. Records include the installation of a 450 mm forcemain along the south edge of the Lakeshore Road right of way from Greaves Avenue to the connection chamber at Alexandra Avenue. The records included a note for the installation of a "future 18" (450 mm) forcemain" 1.2 m offset to the north. Records provided did not include the installation of the second 450 mm forcemain, including the realignment of the connection chamber at Alexandra Avenue. GIS records indicate a second 500 mm forcemain, but the project team was unable to verify this information. Additional investigations would be required to confirm if the second forcemain was installed.

Records indicate a large connection chamber south of Lakeshore Road at Lakefront Promenade that collects flow from the twin 750mm forcemains into the 1650mm gravity sewer. The large gravity sewers drain towards the G.E. Booth Treatment Plant with large collection chambers on the south side of Lakeshore Road, across from Fergus Avenue.

Adjacent to the Project Area, the Region of Peel is planning to install a new sanitary sewer line along the centre line of Lakeshore Road East from West Avenue to Beechwood Avenue. The new sanitary sewer line will be a 375 mm diameter line installed by open cut from West Avenue to Aviation Road. From Aviation Road to Beechwood Avenue, the new sanitary sewer line will be a 600 mm line installed within a 1200 mm diameter microtunnel. The Region of Peel is currently undertaking a Municipal Class Environmental Assessment for this project. The construction of this new sanitary sewer line is planned for 2023, and the project team will continue to coordinate with the Region of Peel throughout detailed design.

4.10 Existing Structures

Within the Lakeshore BRT project area, there are three (3) existing structures that would be impacted by future planned improvements in the study corridor. The existing conditions of these three structures are outlined in **Table 4-25**.

Table 4-25: Existing Structures

Structure	Existing Structure Dimensions	Structural Modification Required
Serson Creek Culvert	Span= 8.0 m L= 27.4 m H= 1.4 m	Replace
Applewood Creek Twin Cell Culvert	Span = 7.58 m and 6.1 m L= 32.75 m H= 1.56 m and 1.63 m	Retain and widen
Lakeshore Road over Etobicoke Creek	L = 48.8m W=23 m TW = 18.58 m Clearance = 5 m	None

4.11 Source Water Protection

The Project Area is in the Credit Valley Source Protection Area and the Toronto Region Source Protection Area and is therefore subject to the approved CTC Source Protection Plan (2019). As identified in the CTC Source Protection Plan and confirmed by MECP staff, the Project Area is located in the intake protect zones (IPZs) 2 and 3 of the Lakeview Water System and the R. L. Clark Water System, with a maximum vulnerability score of 4.5 (**Figure 4-15**).

MECP staff identified that a portion of the Project Area is also located in an event-based area (EBA), which is delineated where modeling has shown that spills from fuel oil pipeline breaks could impact the quality of water at the drinking water intakes. However, the preferred alternative recommended as part of this project does not anticipate any impacts to fuel oil pipelines and does not pose any significant threats to drinking water due to the low vulnerability score.

Lastly, as indicated by the Province of Ontario's Source Protection Information Atlas, the Project Area coincides with highly vulnerable aquifer (HVA).

Potential construction and operating threats and their associated regulatory policies as well as mitigation measures are outlined in **Section 6.10.**

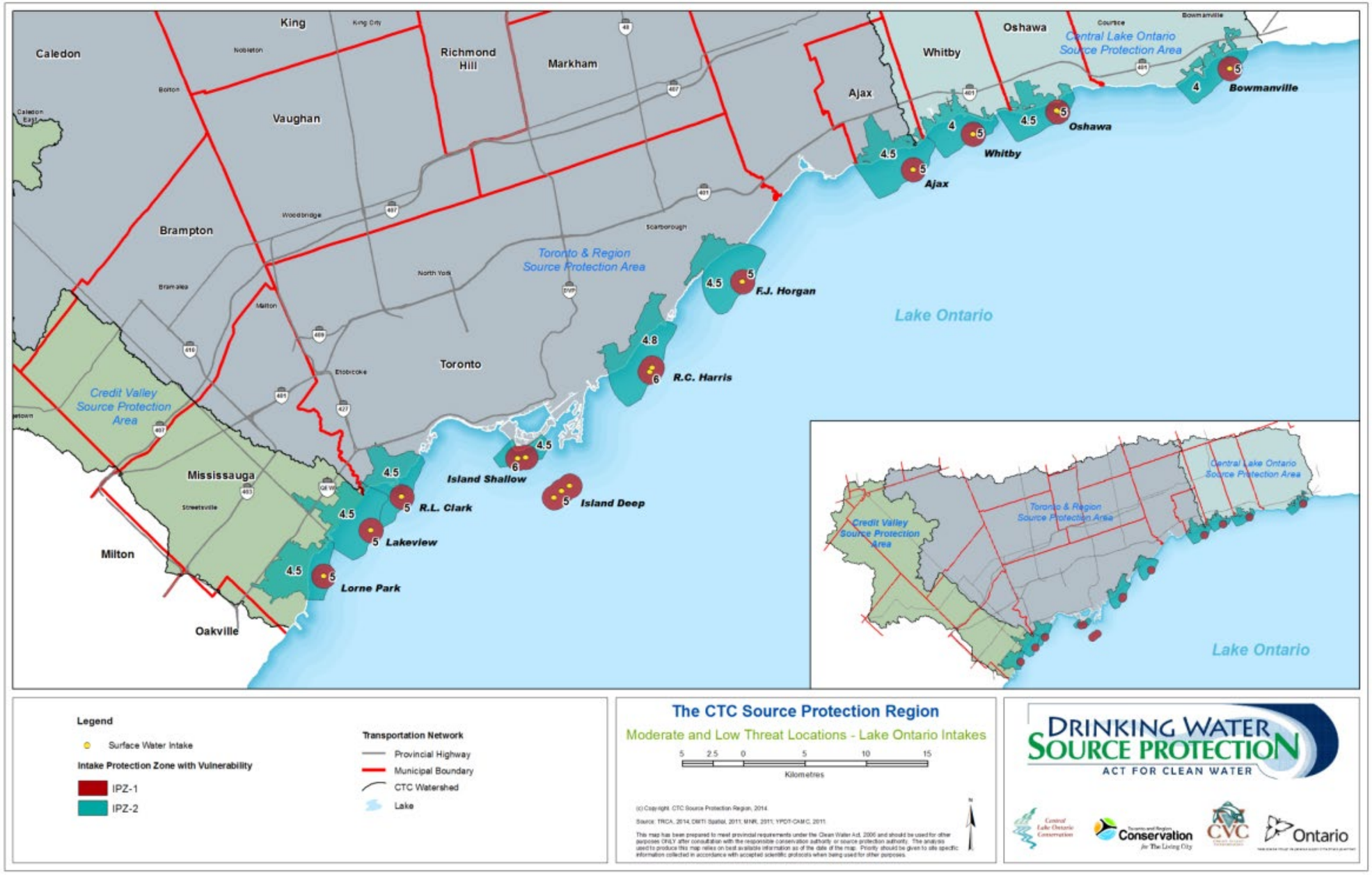


Figure 4-15: IPZ and Vulnerability Scores

5 Project Description

As discussed earlier, in June of 2019, the City of Mississauga completed the Lakeshore Road Transportation Master Plan, which guided the planning of Lakeshore Road. The study is used as the basis for the investigations completed under the TPAP stage and serves as the basis for the development of the preliminary design.

This roadway segment is approximately 2.3 km from East Avenue to Etobicoke Creek along Lakeshore Road, and part of the segment abuts the Inspiration Lakeview development lands. This segment has some existing pedestrian and cycling facilities; however, per the recommendations of the Lakeshore Transportation Master Plan, requires higher order transit to address future transportation demand in an efficient and effective manner consistent with the policies described in **Section 2**.

The development of the BRT design concept for the corridor was based on a "Complete Streets" concept of accommodating all transportation modes in a comfortable and attractive manner, and providing transit users with an efficient, safe, and attractive service that would further encourage transit use in the corridor. As such, the design process had to carefully balance the needs of many stakeholders within the limited roadway right-of-way.

During preliminary planning for the BRT portion of the Lakeshore Road corridor, the following design principles were applied:

- Provide fast, reliable, and comfortable transit service from a passenger perspective;
- Provide a safe and secure environment for passengers;
- Fully accessible to persons with mobility difficulties;
- Minimize environmental impacts associated with the project; and
- Incorporate a high-standard pedestrian realm, including urban design elements, facilities, amenities, and landscaping.

The following sections describe the proposed project.

5.1 What is BRT?

To clearly define the design concept being proposed, it is important to first understand the general Bus Rapid Transit concept. The Institute for Transportation and Development Policy defines Bus Rapid Transit, in general, as:

> *"Bus Rapid Transit (BRT) is a high-quality bus-based transit system that delivers fast, comfortable, and cost-effective services at metro-level capacities. It does this through the provision of dedicated lanes, with busways and iconic stations typically aligned to the center of the road, off-board fare collection, and fast and frequent operations.*
>
> *Because BRT contains features similar to a light rail or metro system, it is much more reliable, convenient, and faster than regular bus services. With the right features, BRT is able to avoid the causes of delay that typically slow regular bus services, like being stuck in traffic and queuing to pay on board." (Source: Institute for Transportation and Development Policy - https://www.itdp.org/library/standards-and-guides/the-bus-rapid-transit-standard/what-is-brt/)*

A key factor in the success of a BRT system is the higher standard of complimentary corridor elements, such as the pedestrian realm, active transportation infrastructure, landscaping and streetscaping, urban design, etc. These elements contribute to the enhancement of the transit user experience, and that of compatible modes of transport. This is critical, as all bus transit users begin and end their trip as pedestrians, and recognizing this, the proposed Lakeshore BRT project includes improvement for these elements in the Project Area.

5.2 Design Criteria

The intent of the design criteria is to establish the standards upon which the design for the project will be based. The design criteria for the project were developed based on current best-practices in bus rapid transit, active transportation, and roadway design, and in consultation with the City's internal stakeholder team. The development of the criteria reflects the City's roadway design standards, supplemented where appropriate by the Transportation Association of Canada's *Geometric Design Guidelines for Canadian Roads*.

Lakeshore Road, in the Project Area, is an urban arterial road that consists of businesses on both the north and south side. The future roadway will consist of four general purpose lanes, two dedicated median transit lanes, continuous separated bike lanes and sidewalks on both sides of the corridor.

The geometric design for this road project shall be designed in accordance with the approved design criteria, standards, and manuals. If there is any difference between the approved design criteria and standards and manuals, the following shall apply in descending order of precedence:

- The approved design criteria for this road design
- MiWay Standard Drawings (September 2020)

- City of Mississauga (CoM) Transportation & Works Standard Drawings (August 12, 2020)
- Transportation Association of Canada Geometric Design Guidelines (June 2017)
- ANSI/IES RP-8-18: Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting
- Ontario Traffic Manual (OTM) Book 18 (2020), OTM Book 12, OTM Book 12A
- Ministry of Transportation of Ontario (MTO) Design Supplement for TAC Geometric Design Guidelines (June 2017)

Given existing property constraints, the current design does not include an outer landscaped boulevards in all areas (as envisioned in the Master Plan design concept, illustrated in **Figure 5-1**), which will be implemented as property becomes available through future redevelopment applications. At present, the proposal is to generally construct the cross-section from sidewalk to sidewalk.

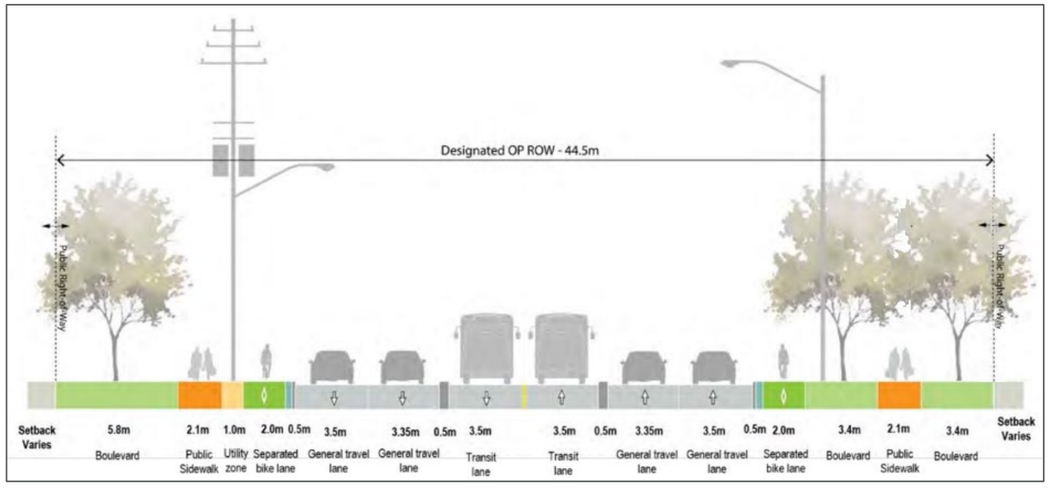


Figure 5-1: Lakeshore Connecting Communities Proposed Typical Cross-Section (Mid-Block)

5.2.1 BRT Guideway and Stops

Table 5-1 summarizes the design criteria for key functional elements of the BRT guideway.

Table 5-1: BRT Guideway Design Criteria

Design Parameters	Proposed Standards	Source
Design Vehicle	A-BUS	TAC Chapter 2. Section 2.4.5
Design Speed	60 km/h	TMP Design Criteria
Posted Speed	50 km/h	TMP Design Criteria
BRT Lane Widths	3.5m	TMP Design Criteria
Median Width	Intersection = 4.5m Mid-block = 0.5m painted buffer between transit lane and adjacent traffic lane, 1.0m concrete median in select areas	CoM Standards (2211.210)
Median Transitway Platform	4.2m stop width 65m stop length (5m pedestrian ramp, 40m stop to accommodate two articulated buses (21m each), and 20m mountable median for EMS and service vehicles)	City of Mississauga Steering Committee direction

5.2.2 Active Transportation

Table 5-2 summarizes the design criteria for key functional elements of the active transportation network.

Table 5-2: Active Transport Design Criteria

Design	Proposed Standards	Source
One-way cycling track (raised)	Desired width: 2.0 m Min. width: 1.5 m* **1.5 m may be used only when not adjacent to the curb (with at least 0.75 m separation from the curb unit)*	OTM Book 18
2-way cycling track	Desired width: 3.5 m Min. width: 2.4 m* **2.4 m only to be used between Hydro Road and Dixie Road (south side)*	OTM Book 18
Multi-use trail	3.0 m	CoM Standards 2240.080
Tactile strip between cycle track and sidewalk	0.6 m* **A narrower buffer may be used only in constrained areas (or eliminated if necessary). 0 m to be used between Hydro Road and Dixie Road.*	OTM Book 18
Minimum Boulevard Width	Varies	TAC Chapter 4, Figure 4.6.1
Sidewalk Width	Desired width: 2.1m Min. width: 1.8m	City Project Team direction
Signalized Intersection Crossing (for pedestrians and cyclists)	Combined Crossride = 5.0 m min	OTM Book 18 (Figure 4.101 and 4.102 Pg.122) CoM Standards 2240.084
Unsignalized Intersection Crossing (for pedestrians and cyclists)	Mixed Crossride = 4.0 m min	OTM Book 18 (Figure 4.103 Pg.124)
Driveway Crossing	Typical elephant's feet markings (0.4m x 0.4m) at all driveway crossings	CoM Standards 2240.082
Two-Stage Left-Turn Queue Boxes (cyclist)		TAC (2017) 5.6.6

5.2.3 Roadway

Table 5-3 summarizes the design criteria for key functional elements of the roadway.

Table 5-3: Roadway Design Criteria

Design Parameters	Proposed Standards	Source
Design Classification	4-Lane Arterial (Divided)	TMP Design Criteria
R.O.W. Width	44.5 m	TMP Design Criteria
Design Vehicle	Intersection Type Design Vehicle: • Trucks Allowed: WB-20 • No trucks allowed: MSU	TAC Chapter 2. Section 2.4.5
Design Speed	60 km/h	TMP Design Criteria
Posted Speed	50 km/h	TMP Design Criteria
Minimum Stopping Sight Distance	85 m	TAC 2017 (Table 3.3.2 Pg., 59)

Design Parameters	Proposed Standards	Source
Equivalent Minimum 'K' Factor	11 (Crest) 9 (Sag)	TAC 2017 (Table 3.3.2 Pg. 59 & Table 3.3.4 Pg. 62)
Grades Maximum* **Profile grades meet provisions for LRT conversion in the future.*	6.0% (max) 0.5% (min)	CoM Standards (2211.010)
Maximum Grade through an intersection * **Profile grades meet provisions for LRT conversion in the future.*	2.0%	CoM Standards (2211.010)
Radius Minimum	Min R for NC=1290m Min R for RC=185m	TAC 2017 (Table 3.2.8 Pg.23)
Lane Widths* **City of Mississauga measures curb lane width to face of curb.*	Thru-Lane = 3.35 m Curb Lane = 3.50 m	CoM Standards (2211.050) TAC Chapter 4. Table 4.2.3 TAC Chapter 4. Section 4.3.3.5 TAC Chapter 8. Section 8.6. TMP Design Criteria
Median Width	Intersection = 4.5m max Mid-block = 0.5m painted buffer between transit lane and adjacent traffic lane (not a curb or a parapet wall)	CoM Standards (2211.210)
	1.0m raised median in sections where required to prevent mid-block left-turns	City Project Team direction

Design Parameters	Proposed Standards	Source
Concrete Curb	0.5 m	CoM Standards (2230.010)
Intersection Curb Radius	Based on Vehicle Turning Movement Envelope according to intersection type.	CoM Standards (2211.160, 2211.170, 2211.200) TMP Design Criteria
Property Line Buffer / Rounding	Desired: 0.3m Minimum: 0 m	CoM Standards (2211.120)
Minimum Planting Zone	Desired width: 2.5 m Min. width: 2.0 m* **Minimum soil cell corridor is 2 m wide, soil volume is 30 m^3 for single tree, and 20 m^3 for trees in a shared trench will be accepted. Soil cells require a min 0.5 – 0.75 m setback from the back of the curb.*	City Project Team direction
Concrete Bus Shelter Pad and Platform	2.1 x 4m Pad 2.1 x 1.5 m (min) sidewalk links (if required)	CoM Standards 2250.030 2250.040 2250.050
Concrete Bus Stop Platform	2.0 x 15m Platform	CoM Standards 2250.010
Signals	Signal Warrant Analysis to be conducted at unsignalized intersections.	OTM Book 12 - Traffic Signals OTM Book 12A – Bicycle Traffic Signals
Streetlighting (Illumination)	Illumination analysis and design to provide lighting requirements.	ANSI/IES RP-8-18: Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting

Design Parameters	Proposed Standards	Source
Splash zone	1.5 m width, including: • Horizontal offset from back of curb to pole: 0.6 m • Pole: 0.5 m • Horizontal offset from vertical obstruction to cycle track: 0.5 m desired, 0.3 m min	OTM Book 18 City Project Team direction

5.2.4 Streetscape

The following directions were received from the City Project Team as confirmed with the applicable City departments and policies with regards to developing the preliminary design as it pertains to streetscaping components, the directions are also included in **Table 5-2** and **Table 5-3**:

- Maximize tree corridor along property line (minimum 2.0 m wide, 2.5 m preferred) and relocate utilities as required.
- Provide a 1.5 m wide splash/pole zone (which accounts for a minimum 0.6 m offset from back of curb to pole, 0.5 m pole, and 0.3 m horizontal offset to vertical obstruction for cycling facilities).
- Where a corridor wider than 2.5 m is possible along property line, allocate remaining space to buffer between cycle track/sidewalk to allow for LID measures or to allow for a wider tree zone adjacent to the property line (to be decided on a case-by-case basis).
- In existing Waterfront Trail limits (Hydro Road to Dixie Road) provide a 1.8m wide sidewalk and a 2.4 m wide two-way cycle track with no buffer between (4.2 m total). A 1-way cycle track remains on the north side.
- One-way cycle track is to be on both sides of the street (except where existing Waterfront Trail is present on the south side). Cycle track minimum width is 1.5 m when not adjacent to the curb (with at least 0.75 m splash pad buffer). If the cycle track is adjacent to the curb, the minimum is 2.0 m.
- Use a consistent 1.8 m sidewalk width for the design of sidewalks in the study are.
- Maintain a 0.6 m tactile strip between cycle track and sidewalk, only minimize or eliminate to avoid property taking or achieve minimum 2.0 m tree zone.

5.3 Transit Service Plan

As part of the Lakeshore Master Plan, a representative transit service plan was developed, and applied to guide the development of the design concepts for the entire Lakeshore Road corridor. The methodology and approach to the service plan will align with the project's opportunity statement, specifically the objective of making transit travel more attractive. Transit service characteristics that can make the travel mode more attractive and competitive in comparison to personal autos include competitive travel times, reliable service, and sufficient capacity. These characteristics are direct outcomes of service planning elements such as frequency, stop placement, and transit priority features that are discussed throughout this chapter.

5.3.1 Routing

Routing recommendations from the Master Plan consist of the proposed BRT route providing express service and for the 23 Lakeshore to continue all-stops service in the corridor between Long Branch and Clarkson GO stations. The Master Plan noted that the western terminal for the BRT is dependent on completion of the 70 Mississauga Road development, however MiWay may choose to run the express bus between Clarkson and Long Branch GO Stations. While the 23 Lakeshore Route will travel curbside throughout the entire project segment, the express/BRT route will travel in a dedicated centre lane between Dixie Road and East Avenue.

5.3.2 Stop Locations

The Lakeshore Transportation Master Plan conceptual design protected for far-side median transit platforms throughout the dedicated segment to be served by the BRT only (i.e., the subject of this TPAP); local stops and BRT stops outside of the dedicated segment are proposed to be located near side. Because the stops in the proposed BRT portion of the corridor will be in a center-running separated transit lane, use of these stops by the 23 Lakeshore route is likely to preclude serving local stops in between express stops due to geometrical issues involved in exiting and re-entering the center-running busway. Thus, to maintain local stop spacing in this segment, local stops will have to be separate from BRT stops. However, to the extent possible, they will be located at the corresponding curb-side location for legibility and customer convenience.

Since completion of the Master Plan, MiWay has conducted a review of all stops along the project segment and recommended the relocation of the majority of existing stops from near side to far side. This is consistent with best practice, with few exceptions calling for near side stops, such as stop-controlled intersections and stops at intersections with high right-turn volumes from cross-streets onto the far side location. MiWay also recommended the removal of several existing local stops. **Table 5-4** summarizes the recommended express stop locations.

Table 5-4: Proposed Express Service Stops

Stop Location	Proposed Position
70 Mississauga Development (Within the development)	Exact position TBD
Lakeshore Road W at Mississauga Road	Far-side
Lakeshore Road E at Stavebank Road	Far-side
Lakeshore Road E at Hurontario Street/Lawrence Drive	Far-side
Lakeshore Road at Mohawk Avenue/Hiawatha Parkway	Near-side
Lakeshore Road E at Shaw Drive	Near-side
Lakeshore Road E at Cawthra Road	Far-side
Lakeshore Road E at Lakefront Promenade/Alexandra Avenue (BRT)	Far-side
Lakeshore Road E at Haig Boulevard (BRT)	Far-side
Lakeshore Road E at Dixie Road (BRT)	Far-side
Long Branch Station	Platform

The following existing stops are serviced by local transit routes and will be retained in addition to the proposed BRT stops identified above (**Table 5-5**).

Table 5-5: Proposed Local Service Stops

Stop ID	Stop Location	Routes	Proposed Position	Type
0445	Lakeshore Road E East of Island Road	5, 23	Near-side	Local
0447	Lakeshore Road West of Forty-Third St	5, 23	Mid-block	Local
0408	Lakeshore Road E at Dixie Rd	5,23	Near-side	Local and Express
0443	Lakeshore Road E at Dixie Rd	5,23	Near-side	Local and Express
0450	Lakeshore Road E West of Fergus Ave	5, 23	Mid-block	Local
0442	Lakeshore Road E East of Orchard Rd	5, 23	Mid-block	Local
0451	Lakeshore Road E at Haig Blvd	5, 23	Near-side	Local and Express
0441	Lakeshore Road E at Haig Blvd	5, 23	Far-side	Local and Express
0440	Lakeshore Road E at Strathy Ave	5, 23	Stop to Stay Mid-block / Far Side due to Route 5 Routing	Local
0452	Lakeshore Road at Ogden Ave	5, 23	Near-side	Local
0453	Lakeshore Road E at Alexandra Ave	23	Near-side	Local and Express
0439	Lakeshore Road E at Lakefront Promenade	23	Near-side	Local and Express
0454	Lakeshore Road at East Ave	23	Mid-block	Local
0438	Lakeshore Road E at East Ave	23	Near-side	Local

5.4 Roadworks

5.4.1 BRT Guideway

The proposed BRT guideway consists of two dedicated bus lanes operating in the centre of the roadway, separated from general traffic by a 0.5 m painted buffer on either side of the median bus lanes. It is preferred to have express bus services operate in the median of the roadway for a number of reasons. While dedicated bus lanes can be applied in either a curb-running or median-running configuration, for this particular Project Area, the median-running alternative is preferred. The following is a summary of the key advantages of such an operation:

- Increased transit service reliability: By placing buses in the centre of the roadway, they are removed from the influences of right-turning vehicles, delivery operations, taxi stopping operations, and disabled automobiles. Conversely, by operating in the median, express transit services would no longer impact any of the aforementioned activities.
- Increased service speed: Express bus services operating in the median are more easily and more safely controlled at intersections, and this configuration offers more opportunity to apply transit signal priority schemes as desired to improve transit operating speeds.
- Implementation of a median rapid transit facility is anticipated to result in a positive impact on traffic collisions. By eliminating the potential for mid-block left-turn movements (which currently occur throughout the corridor in an uncontrolled environment) and relocating such movements to signalized intersections where they can occur on protected signal phases, the frequency and severity of collisions is anticipated to decrease. York Region, after implementing their comparable Viva Rapidways on Highway 7 and Davis Drive, experienced reductions in collisions between 51%-74% “likely due to eliminating mid-block left turns across traffic” (per the YRRTC Annual Report, 2019).
- A comparable amount of right-of-way is required regardless of whether the transit lanes are on the side or in the centre, provided the stop infrastructure would be consistent among the options.

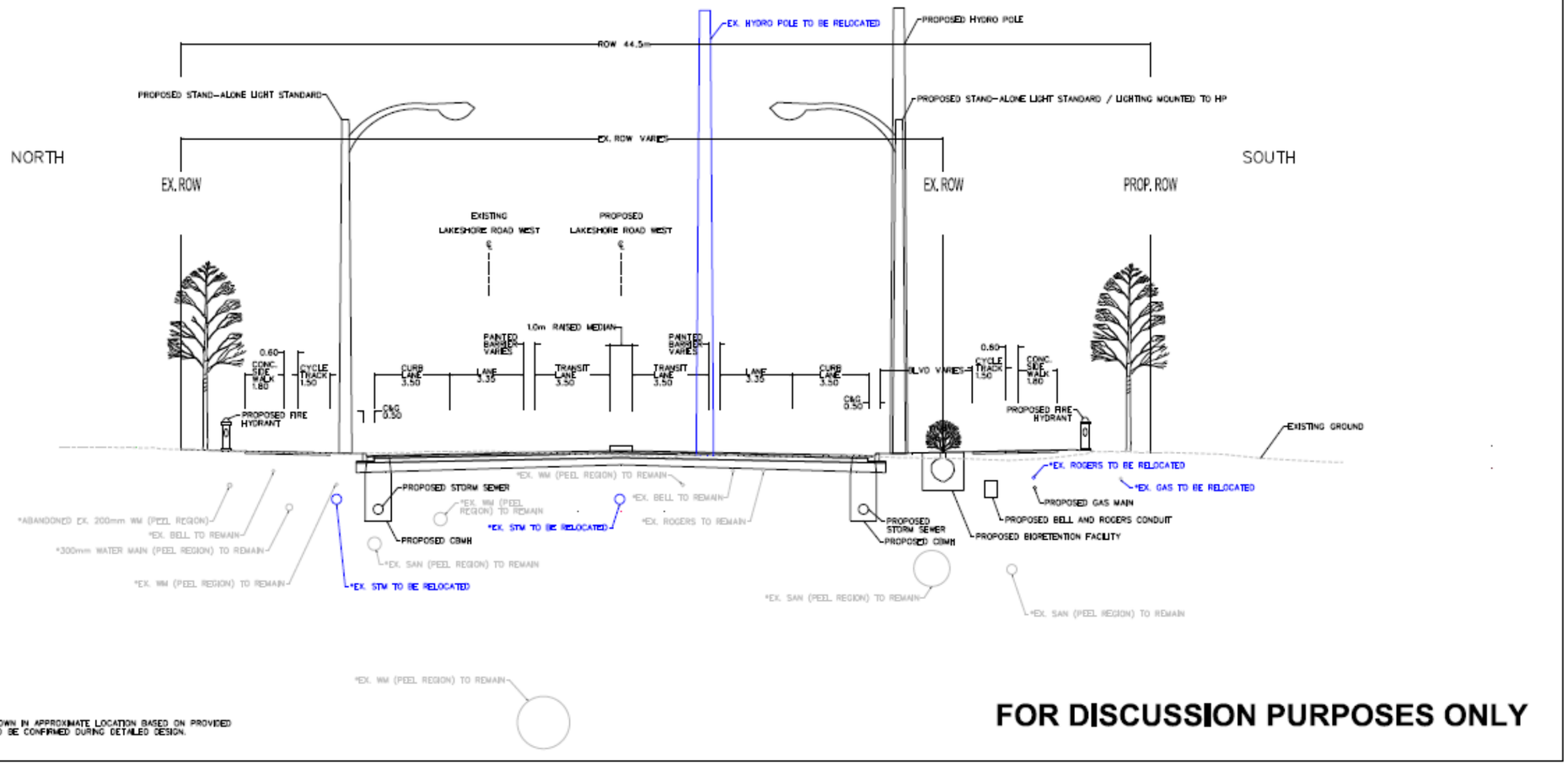
5.4.2 Roadway Cross-Section

The implementation of the BRT guideway, recommended in the Lakeshore Transportation Master Plan, was predicated on the notion of maintaining general traffic capacity throughout the corridor.

As such, Lakeshore Road will be widened to accommodate the guideway while maintaining the existing number of lanes for general traffic. Given the constraints on the north side of the roadway, the roadway is generally proposed to be expanded into the boulevard to the south of the roadway. A typical 44.5 m cross-section was developed as part of the Master Plan phase of the project and updated early in the TPAP process to reflect the City’s current design standards and updated AT infrastructure guidelines. See **Figure 5-2** for the recommended cross section elements for midblock.

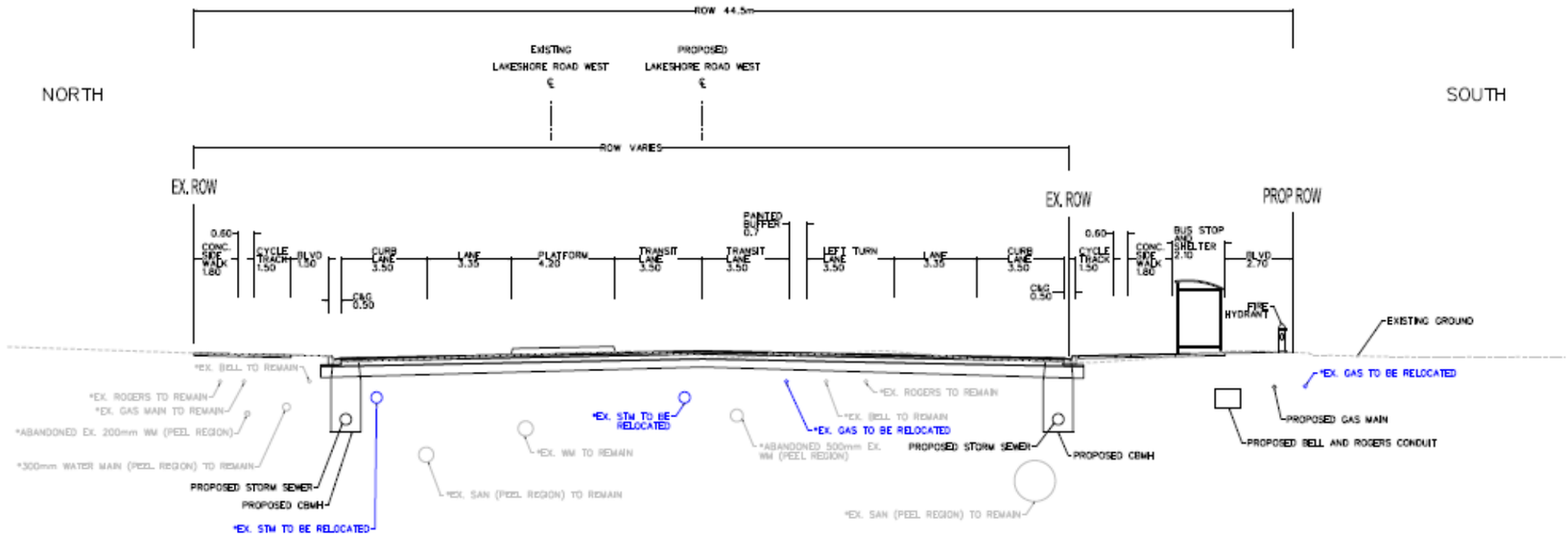
The typical layout for the roadway and cross-section at the proposed BRT stops is shown in **Figure 5-3** and **Figure 5-4.** It should be noted that the design may require minor modifications during the detailed design phase of the project, however the general layout and associated impacts are not anticipated to change. Depending on the overall available right of-way width and auxiliary traffic lane requirements, streetscaping features could be provided where there is sufficient space.

The corridor plans illustrating the design concept and typical cross-sections are presented in **Appendix J**.



UTILITY LOCATION TYPICAL MID-BLOCK	HDR	MISSISSAUGA	LAKESHORE ROAD (PART A) (EAST AVE W TO ETOBICOKE CREEK) TRANSPORTATION STUDY	PLAN NO. 03 SCALE N.T.S. DATE JUNE 2023

Figure 5-2: Midblock Cross Section



UTILITY LOCATION TYPICAL INTERSECTION (NEAR SIDE)

MISSISSAUGA

LAKESHORE ROAD (PART A)
(EAST AVE W TO ETOBICOKE CREEK)
TRANSPORTATION STUDY

PLAN NO. 01
SCALE N.T.S.
DATE JUNE 2023

Dedicated right turn lane at select intersections only

Figure 5-3: intersection Cross Section (Near Side)

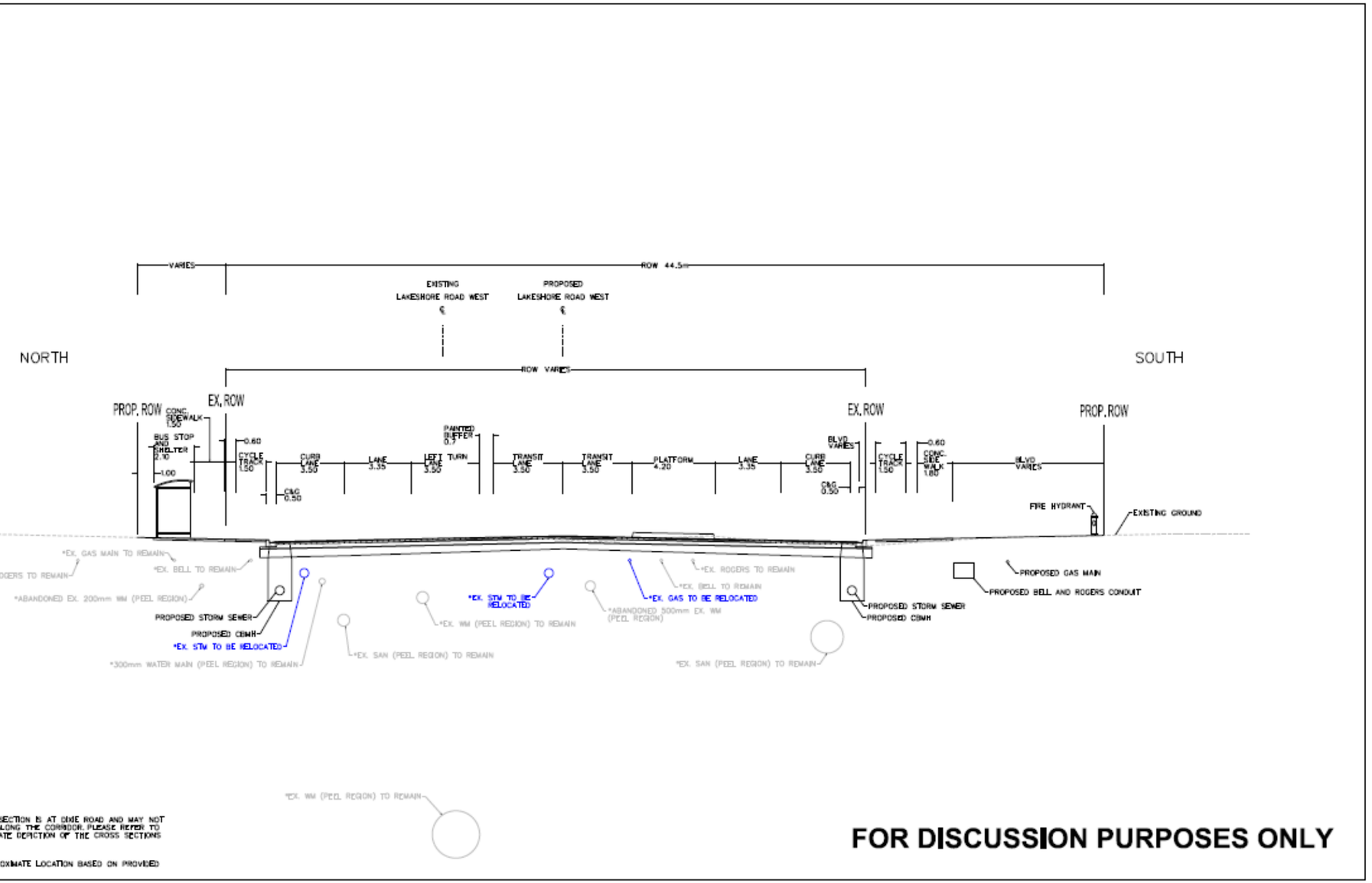


Figure 5-4: Intersection Cross Section (Far Side)

5.4.3 Transition Segments

The following sections describe the proposed roadway configuration through the Project Area where there exist notable variations from the typical configuration described in the preceding sections.

- **West Avenue to East Avenue**: This section forms the western transition from the existing roadway cross-section at West Avenue to the median-running BRT cross-section east of East Avenue. In this section, eastbound buses would transition from the centre General Purpose Lane (GPL) to the left to enter a newly-developed eastbound BRT lane on the approach to East Avenue. Westbound buses would make a similar opposing move, transitioning to the right from a westbound median BRT lane downstream of the East Avenue intersection to the median GPL on the approach to West Avenue.
- **Dixie Road to Etobicoke Creek**: This section forms the eastern transition from the existing roadway cross-section at Etobicoke Creek to the median-running BRT cross-section west of Dixie Avenue. In this section, westbound buses would transition from the centre GPL to the left to enter a newly-developed westbound BRT lane on the approach to Dixie Road. Eastbound buses would make a similar opposing move, transitioning to the right from an eastbound median BRT lane downstream of the Dixie Road BRT stop to the median GPL at (approximately) Deta Road.

5.4.4 Auxiliary Turning Lanes

The proposed BRT corridor design includes several new auxiliary turn lanes, introduced to provide improvements to the level-of-service at selected signalized intersections throughout the corridor. It should be noted that, while the auxiliary lanes are incorporated into the BRT plan, a number of the proposed auxiliary lanes result from the recently-completed Lakeview Developments Traffic Impact Study, and are associated with the proposed development-generated traffic. Other recommended auxiliary lanes were identified as part of the Project Team's traffic level-of-service assessment as part of this project. The proposed new auxiliary lanes reflected in the design for the Lakeshore BRT corridor are at the locations below:

- Lakeshore Road East at Lakefront Promenade (eastbound)
- Lakeshore Road East at Ogden Avenue (eastbound)
- Lakeshore Road East at Hydro Road (eastbound)
- Lakeshore Road East at Dixie Road (westbound)

It should be noted that, while the auxiliary lanes and their associated impacts are addressed in this EPR, their implementation may be phased to coincide with the redevelopment of adjacent properties to minimize the property impacts associated with this project in its initial implementation.

5.5 Active Transportation

A key component of the proposed Lakeshore Road corridor redevelopment is improving the pedestrian realm, encouraging more active transportation use. This is particularly important in areas of high transit use, as all transit users begin and end their trip as pedestrians. As such, emphasis was placed on ensuring that the corridor plans reflected a high standard of active transport infrastructure.

Active transportation infrastructure in the corridor will generally be comprised of an improved 1.8 m-wide sidewalk and dedicated 1.5 m-wide one-way cycle tracks on each side of the roadway, separated by a 0.6 m buffer. On the south side, the cycle track will generally be separated from the curb by a boulevard that varies between 1.5 m to 6.0 m providing a buffer for a paved strip, landscaping/streetscaping, and utility relocations (if necessary). On the north side of the roadway, given the property constraints, the cycle track will be implemented immediately adjacent to the curb for much of the corridor.

One notable exception to the proposed cycle track configuration is the section between (approximately) Hydro Road and east of Fergus Avenue, where there exists a multi-use pathway today that will be displaced by the proposed roadway widening. In this section, it is proposed to provide a 2.4 m-wide, two-way cycle track, adjacent to a 1.8 m-wide sidewalk. A 1.5 m-wide one-way cycle track will also be provided on the north side of the roadway in this section.

5.6 Transit Stops

5.6.1 BRT Stops

The proposed BRT stops are located within the roadway (adjacent to the BRT lanes), at signalized intersections only. The stop platforms are positioned on the far side of the intersection, in the shadow of the upstream left-turn lane. This configuration minimizes the property impacts associated with the stops and allows for pedestrians to access the stops via the signalized pedestrian crosswalks associated with the intersection. This configuration is employed throughout the world and represents the current best practice in urban arterial roadway bus rapid transit design. Locally, this stop configuration is consistent with many of the TTC streetcar stops, the proposed Eglinton Crosstown LRT stops, and most applicably, the Viva BRT system (**Figure 5-5**).

(Source: York Region)

Figure 5-5: Typical Viva BRT Stop

See **Section 5.4.2** for the layout of intersections, featuring elements of a BRT stop.

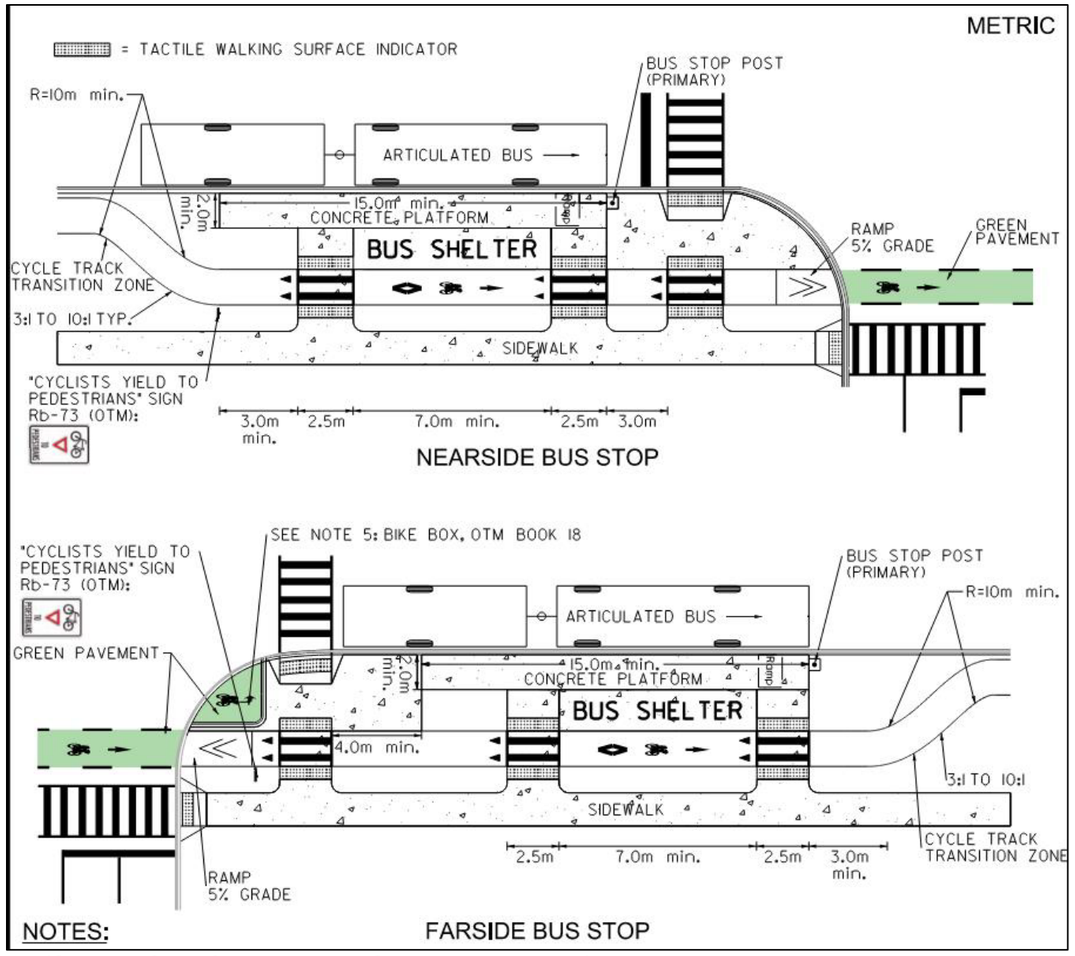
BRT platforms will be approximately 65 m long, to accommodate two 21 m articulated buses, and allow for an additional 20 m of mountable median for emergency services or maintenance vehicles. The specific layout of passenger amenities on the platforms is under development, but stops are planned to incorporate:

- Sheltered waiting areas;
- Accessibility features (ramps, railings, tactile warning strips, railings, etc.)
- Limited passenger seating/benches, garbage and recycling bins;
- Illumination;
- Signage, wayfinding, and next bus service information;
- Fare payment machines; and
- Unique architectural treatments.

5.6.2 Local Transit Stops

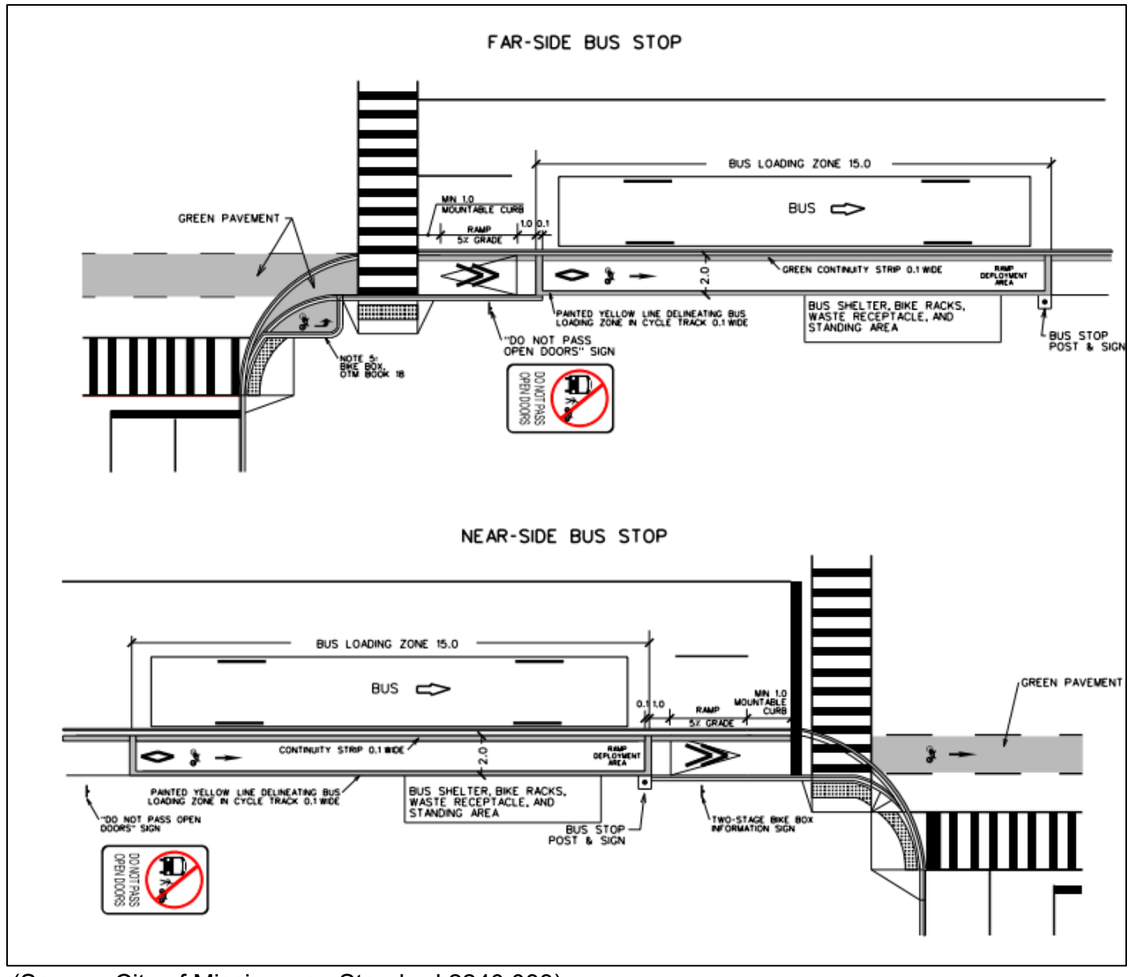
Local transit stops will be provided throughout the Project Area, consistent with current stop locations, but adapted to fit within the proposed widened roadway cross-section. Two types of local bus stop configurations will be applied, depending on availability of property at the specific site of the stop:

- **Configuration 1 - Preferred Stop Layout**: Where sufficient available property exists within the right-of-way, the bus stop layout illustrated in **Figure 5-6** will be employed. This layout allows for the bus stop pad and shelter to be installed immediately adjacent to the curb and realigning of the proposed cycle track and sidewalk behind the stop. This configuration is preferred, as it minimizes the potential for conflicts between cyclists and passengers, however does require more area than the alternative.
- **Configuration 2 - Constrained Stop Layout**: Where right-of-way constraints preclude the implementation of Configuration 1, a modified layout will be employed. This configuration places the bus stop shelter behind the sidewalk and cycle track, set back from the roadway curb**.** The bus stop pad is integrated with the cycle track (as illustrated in **Figure 5-7)**, providing for a more compact layout, at the expense of an increased potential for conflict between boarding passengers and cyclists passing through the stop area. That being said, this configuration is conventional, safe, and has been applied recently in Toronto, as illustrated in **Figure 5-8**. Note that the design also incorporates a sidewalk between the cycle track and bus shelter pad.



(Source: City of Mississauga Standard 2240.085)

Figure 5-6: Configuration 1 – Preferred Stop Layout



(Source: City of Mississauga Standard 2240.083)

Figure 5-7: Configuration 2 - Constrained Stop Layout

(Source: Google Earth, 2021)

Figure 5-8: Sherbourne Street (Toronto) Bus Stop/Cycle Track Example

Table 5-6 summarizes the stop configurations to be applied at the existing stop locations in the Project Area.

Table 5-6: Summary of Local Stop Layouts

Stop ID	Direction	Stop Location	Routes	Proposed Position	Stop Configuration
0445	Eastbound	Lakeshore Road E East of Island Road	5, 23	Far-side	Configuration 1
0447	Westbound	Lakeshore Road West of Forty-Third Street	5, 23	Mid-block	Configuration 2
0408	Westbound	Lakeshore Road E at Dixie Road	5,23	Near-side	Configuration 1
0443	Eastbound	Lakeshore Road E at Dixie Road	5,23	Near-side	Configuration 2
0450	Westbound	Lakeshore Road E West of Fergus Avenue	5, 23	Mid-block	Configuration 2
0442	Eastbound	Lakeshore Road E East of Orchard Road	5, 23	Mid-block	Configuration 1
0451	Westbound	Lakeshore Road E at Haig Boulevard	5, 23	Near-side	Configuration 2
0441	Eastbound	Lakeshore Road E at Haig Boulevard	5, 23	Far-side	Configuration 2
0440	Eastbound	Lakeshore Road E at Strathy Avenue	5, 23	Mid-block	Configuration 1
0452	Westbound	Lakeshore Road at Ogden Avenue	5, 23	Near-side	Configuration 2
0453	Westbound	Lakeshore Road E at Alexandra Avenue	23	Near-side	Configuration 2
0439	Eastbound	Lakeshore Road E at Lakefront Promenade	23	Near-side	Configuration 2
0454	Westbound	Lakeshore Road at East Avenue	23	Mid-block	Configuration 2
0438	Eastbound	Lakeshore Road E at East Avenue	23	Near-side	Configuration 1

5.7 Access

General Traffic

The existing Lakeshore Road configuration in the Project Area includes a centre, two-way left-turn lane to facilitate access to adjacent properties and crossing streets with unsignalized intersections at Lakeshore Road. The implementation of the median BRT will preclude the ability for drivers to make mid-block left-turns; general traffic crossing of the median BRT guideway will be permitted only at signalized intersections for safety purposes. Rather, all left-turn movements will be relocated to the signalized intersections, where they can occur on a protected left-turn phase.

U-turns will be allowed on protected left-turn phases to accommodate displaced mid-block left-turn movements. **Figure 5-9** illustrates the proposed operation for existing mid-block left-turn movements.

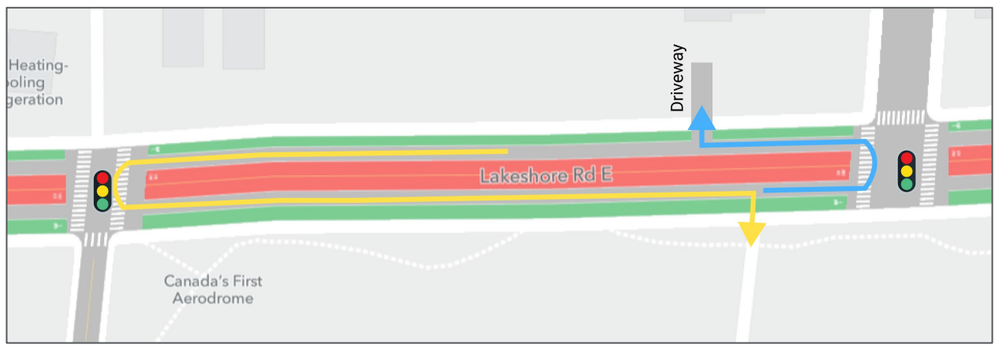


Figure 5-9: Proposed Mid-Block Left-Turn Mitigation

Future mid-block accesses and crossing streets will only permit right-in and right-out turns.

Emergency Services

The only exception to the left-turn restriction will be for emergency services. Emergency services, when responding to a situation, will be permitted to both cross the median BRT facility or use the dedicated lanes to travel unimpeded to a destination.

5.8 Landscape and Streetscape Design

There exists a large and complex network of utilities and municipal services underground in the Lakeshore Road corridor. Many of these utilities are situated south of the existing roadway, but within the right-of-way, and will be impacted by the widening of the roadway to the south as proposed. The presence of subsurface utilities in the proposed boulevard areas will potentially impact the ability to introduce street tree plantings in the corridor. The design concept includes a recommended approach of providing street trees within the boulevard using subsurface 2m x 2m soil cells, pending appropriate clearance of subsurface utilities.

Hydro poles are proposed to be relocated to the boulevard area as well, offset from the soil cells as appropriate. Consistent with current practice, it is proposed to accommodate roadway and sidewalk illumination on the overhead hydro poles where feasible. In areas where no hydro poles exist or are proposed, stand-alone illumination poles will be required. Supplemental illumination may be required at intersections and will be determined in the detailed design phase of the project.

The Landscape Plans are enclosed in **Appendix J.**

5.9 Utilities and Municipal Services

Municipal services, including watermains, storm sewers, and sanitary sewers in the Project Area are generally located under the roadway or under the boulevard on the south side of Lakeshore Road. Much of the underground municipal services are anticipated to remain in place, however, sections of the infrastructure may need to be relocated to either accommodate proposed BRT stops or to accommodate other relocated utilities with sufficient offset spacing to meet municipal servicing and regulatory requirements. Underground municipal service crossings under planned BRT stop locations should be considered for relocation under the detailed design phase of this project to address future challenges in accessing the services in the event of a maintenance requirement.

Where service crossings cannot be relocated away from the stops, they should have a protective sleeve and additional isolation valves or maintenance hole structures.

Any relocation of municipal services will have to be undertaken in accordance with the City of Mississauga and Region of Peel standards. See **Section 6.9** for details on utility impacts and mitigation.

The Utility Conflict Plan and Utility Relocation Plan are enclosed in **Appendices K.1 and K.2** respectively.

5.10 Structural Design

Structural improvements are proposed for the crossing of Serson Creek and Applewood Creek through the Lakeshore BRT Study. To fulfill the requirements of the CVC, the improvements proposed at Serson Creek include a full replacement of the existing culvert to a larger culvert. The improvements proposed at Applewood Creek include the extension of the existing culvert. See **Table 5-7** for the dimensions of the proposed improvements. General arrangement drawings for Applewood Creek and Serson Creek Crossings are enclosed in **Appendix O.**

Table 5-7: Summary of Proposed Culvert Dimensions

	Existing Dimensions	Proposed Improvements
Serson Creek Culvert	Span= 8.0 m L= 27.4 m H= 1.4 m	**Culvert replacement** is required to accommodate roadway improvements. The required replacement is 47.00 m long, 11 m wide, and remains 1.4 m high.
Applewood Creek Twin Cell Culvert	Span = 7.58 m and 6.1 m L= 32.75 m H= 1.56 m and 1.63 m	**Culvert extension** is required to accommodate roadway improvements. The required extension is 12.0 m on south of the crossing, for a total culvert length of 44.75 m.

6 Impact Assessment, Mitigation Measures, and Impact Monitoring

6.1 Natural Environment

The following sections outline possible impacts of construction and operation on various aquatic and terrestrial features in the Project Area as well as mitigation measures that can be adapted to minimize the negative impacts.

The results of the natural heritage assessment indicated a number of ecological features that are present within the Project Area:

- Significant woodland (The forested area surrounding both Etobicoke Creek and Applewood Creek)
- Significant valleyland (confirmed)
- Fish and fish habitat (confirmed)
- Candidate SWH, specifically for:
    - Bat Maternity Colonies
    - Migratory Butterfly Stopover Area
    - Landbird Migratory Stopover Area
    - Bald Eagle and Osprey Nesting/Foraging/Perching
    - Rare Wildlife Species (SCC)
    - Potential: Monarch, Eastern Wood-Pewee, Eastern Ribbon snake, Northern Map Turtle, and Snapping Turtle
    - Amphibian Movement Corridors
- SAR, specifically for:
    - Potential SAR Bats
    - Potential Bobolink
    - Potential Eastern Meadowlark
    - Potential American Eel

Each of these natural features are significant, as they support flora and fauna communities, connections between aquatic and terrestrial environments and, in the case of the SAR, support species that have limited habitats elsewhere both nationally and provincially. If the preferred alternative damages or interferes with these features and their function, habitat and species loss can occur. Both direct and indirect impacts on natural heritage features and functions can occur as a result of the preferred alternative. Impacts and residual effects on natural heritage features were assessed based on the following criteria:

- Duration: long or short-term
- Extent: localized or expansive
- Permanent: permanent or temporary
- Severity: positive or negative

Most direct impacts occur during the construction phase of a project, and contain localized, short-term, temporary, negative effects that can be reduced through avoidance and proper construction practices. After construction, there may be more long-term, indirect impacts while the site recovers, and vegetation growth takes place. Typically, after the site revegetates, there is either a neutral or positive impact due to intentional native plantings, improved sediment control, and runoff control. Predicted potential impacts associated with the short list of alternatives are described in the sections below including recommended mitigation measures and residual impacts (after mitigation).

Construction activities associated with the Lakeshore BRT will require permanent land alternation, in-water works, and re-vegetation of the Project Area.

The widening of Lakeshore Road will result in the loss of edge vegetation. The majority of vegetation lost will be street trees within commercial and residential areas with mowed grass under the trees. Within the naturalized areas, the amount of edge vegetation being removed is described in **Table 6-1** and is based on the ELC polygons. As noted above, the Applewood Creek culvert will require an extension while the Serson Creek culvert will require a replacement, this will require in-water works and will alter 151 m^2 and 190 m^2 of aquatic habitat respectfully.

Table 6-1: Estimated Edge Vegetation Impacts

Ecological Land Classification	Amount of Habitat Lost (m^2)	Habitat Loss (TRCA Jurisdiction)	Habitat Loss (CVC Jurisdiction)
FOD9-2	1,425	-	1,425
CUM1/CUM1-1	2,052	421	1,631
CUW1	1,866	-	1,866
FOD4	121	121	-
CUT1-1	623	623	-
CUT1	700	700	-
MAM2	177	-	177

6.1.1 Aquatic Environment

In-water works will include the lengthening of the Applewood Creek culvert and the replacement of the Serson Creek culvert which will result in the alteration of fish habitat within the culvert works areas. It has been suggested that natural channel design be employed for channel improvements to better tie-into the culvert at the upstream and downstream ends to provide added stability and enhance fish passage. A qualified professional in fluvial geomorphology should be consulted for design, and consultation with aquatic and terrestrial ecologists should be completed to ensure appropriate habitat improvements. If mitigation measures are followed, there should be no long-term negative impacts to fish or fish habitat.

Construction Impacts

Construction activities associated with the Lakeshore BRT will require permanent land alternation, in-water works, and re-vegetation of the Project Area. This will result in an isolated, temporary disturbance and loss of habitat while construction is taking place; however, the long-term impacts associated with this project are expected to create no net impact once the new vegetation has reached maturity, and the channel design has been completed.

The greatest potential impacts are associated with the removal of vegetation within the significant woodlands and valleylands of Etobicoke Applewood Creek, and Serson Creek, as well as in-water works within Applewood Creek and Serson Creek.

Mitigating Measures

The measures recommended to mitigate impacts to aquatic habitat are consolidated with those of the Terrestrial Environment discussed in **Section 6.1.2**.

In addition, the constructor will be required to employ effective erosion and sediment control (ESC) throughout the project with careful planning and design, stringent construction supervision, monitoring of the site, and maintenance of control works throughout their operational life. ESC measures will include:

- 1F: Develop an ESC plan to minimize the potential for erosion and construction-related sediment release into nearby natural features/water bodies and prepare ESC plan condition reports as part of the monitoring and maintenance plan.
- 2F: Install ESC measures before ground-breaking.
- 3F: Monitor and maintain ESC measures as per specifications.
- 4F: Delineate storage, stockpiling, and staging areas prior to construction and inspected.
- 5F: Install sediment control fence along the channel margins to prevent the entry of sediment into the watercourse.
- 6F: Dewatering plans should follow the Ontario Provincial Standard Specification (OPSS 517). This will include install intake screens on all pumps during dewatering, and have discharge directed to a sediment basin, sediment bag, etc. before release to the watercourse.
- 7F: Avoid construction during high volume rain events or significant snow melts/thaws. Construction will resume once soils have stabilized to avoid risk of erosion, soil compaction, or the potential for sediment release into nearby natural features/watercourses.
- 8F: Direct discharge from sediment clean out to a filter bag or taken offsite for disposal.
- 9F: Implement construction monitoring to ensure erosion and sediment measures are in place and working effectively. ESC should be checked weekly and after major rain events (>10 mm) to ensure it is installed and functioning properly. Daily monitoring will be completed by the contractor. Any deficiencies should be repaired immediately. A construction monitoring log should be maintained to ensure any deficiencies and corrective actions are documented.
- 10F: Remove all temporary ESCs following construction once disturbed areas have stabilized.

6.1.2 Terrestrial Environment

The greatest potential impacts are associated with the removal of vegetation within the significant woodlands and valleylands of Etobicoke Applewood Creek, and Serson Creek, as well as in-water works within Applewood Creek and Serson Creek. This work could include the removal of potential SAR trees or SAR bat habitat, as well as destruction to fish and fish habitat. Table 6-2 summarizes the potential impacts to the natural heritage features, as well as mitigation measures which should be followed to avoid serious harm. Once the mitigation measures are implemented, the residual effects are assessed to determine their duration, extent, severity, and permanence.

Construction Impacts

As discussed in **Section 6.1.1**, construction activities associated with the Lakeshore BRT will require permanent land alternation, in-water works, and re-vegetation of the Project

Area. The greatest potential impacts are associated with the removal of vegetation within the significant woodlands and valleylands of Etobicoke Applewood Creek, and Serson Creek, as well as in-water works within Applewood Creek and Serson Creek.

Tree removals will result in a short-term disturbance to the area as well as permanent habitat alteration. The majority of natural vegetation being removed is existing edge habitat. This should include a replacement of trees with species approved by TRCA and/or CVC in accordance with the arborist plan as well as native seed mix. This should include a replacement of trees in accordance with the arborist plan as well as native seed mix. It has also been recommended that a snag survey be performed surrounding Applewood and Etobicoke creeks to identify candidate bat snag trees within the construction area. If the prescribed mitigation measures are followed, then the compensation planting of new, native, vegetation within the area is anticipated to result in higher-value wildlife habitat and promote establishment of native genetic material that will result in net-positive long-term impacts to the local and regional environment.

Mitigation Measures

The following outlines mitigation recommendations for construction and operational effects to the natural heritage features within the Project Area. These mitigation measures are designed to prevent or significantly reduce impacts to terrestrial habitat communities.

Timing Windows/Working in the Dry

The magnitude of effects to aquatic habitat and communities is related to the extent, timing, and duration of the project. The following mitigation measures are recommended:

- 1A: Remove trees outside of the breeding bird window of April 10 to August 15 (Government of Canada 2021) If trees are to be removed during the breeding bird window, then an avian biologist must conduct a nesting survey before tree removals.
- 2A: Confine the contractor to the minimum area necessary to perform the work.
- 3A: No in-water work should occur between July 1 to March 31 to protect spawning fish.
- 4A: Ensure candidate SAR bat snag trees are protected during construction. If snag trees cannot be avoided, it is recommended that snag removal occur between October 1 and March 31, of a given year.
- 5A: To minimize potential impacts to SAR species, any tree removal within candidate habitat areas should occur outside of the extended activity period (April 1 to September 30).

Best Construction Practices

Implementation of best construction practices during construction will reduce the potential for spills or other materials/equipment entering the water. The following measures will be employed:

- 1B: Control all equipment maintenance and refueling to prevent any discharge of petroleum products. Conduct vehicular maintenance and refueling at least 30 m from the watercourse, watercourse banks, and natural heritage features.
- 2B: Implement surface protection measures to minimize soil compaction.
- 3B: Store construction material, excess material, construction debris, and empty containers at least 30 m from the watercourse and banks to prevent entry.
- 4B: Enlist an environmental monitor onsite to provide advice and ensure that activities will not have any negative effects. Information for site-specific SAR should be posted in construction trailer.
- 5B: Implement a stormwater management plan to maintain pre-construction drainage patterns and flows during all project phases.
- 6B: Implement an emergency and response management plan to address the potential for spills.
- 7B: Implement “Clean Equipment Protocol for Industry” (Halloran et al. 2013) to inspect and clean equipment for the purposes of invasive species prevention.

Prevention of Wildlife Mortality and Disturbance

Preventative measures during construction will reduce the potential mortality and disturbance of wildlife within the Project Area, and should include the following:

- 1C: Demarcate wildlife habitat to avoid offsite disturbance and to restrict construction activities to the work areas.
- 2C: Implement traffic limits if onsite vehicle use is required.
- 3C: Install exclusionary fencing to prevent wildlife from entering the construction site. Exclusionary fencing should not prohibit access to nearby habitats. Where required, redirect wildlife to areas where they can avoid the potential for incidental take, and still have access to habitats. Exclusionary fencing should be monitored daily throughout construction. Exclusionary fencing is to meet or exceed guidelines as detailed by MNR (2013) in the Reptile and Amphibian Exclusion Fencing Best Practices Technical Note.

- 4C: Inspect construction area for wildlife each morning before the commencement of construction activities. Removal of trapped wildlife should be completed by a qualified biologist.
- 5C: Educate workers to be aware of potential wildlife occurrences and measures to take to minimized potential for injury or incidental take. Maintain a log to record and report incidents of injury and/or mortality.
- 6C: Complete a snag survey surrounding Applewood Creek and Etobicoke Creek to identify if there are any candidate snag trees which may be utilized by bats.
- 7C: Where culvert replacement and /or extension is recommended, potential wildlife crossing opportunities should be considered at detailed design following CVC Fish and Wildlife Crossing Guidelines (2017).
- 8C: Ensure all prescribed survey work and subsequent permitting requirements have been met for SAR bats and area-sensitive grassland birds (Bobolink, Eastern Meadowlark) prior to any vegetation removal in natural areas.

Prevention of Terrestrial Disturbance

Preventative measures during construction will reduce the likelihood of disturbance and destruction of the terrestrial features, and should include the following:

- 1D: Identify setbacks from natural features and trees with the installation of tree protection fencing along the disturbance limit (10 m). No construction activities are to occur outside of these fences (including overhead), nor the piling of construction materials.
- 2D: Minimize the construction disturbance area to the extent feasible. Particular care should be taken to ensure minimal tree removal and natural habitat within significant woodland areas.
- 3D: Retain an Arborist during detailed design to create a tree preservation plan to protect as many healthy, native trees as possible through the process.
- 4D: Implement a dust management plan for the suppression of fugitive dust.
- 5D: Ensure that temporarily disturbed areas are restored with native vegetation and monitored during construction and post construction based on TRCA/CVC and the cities specifications.
- 6D: Develop a restoration plan at detailed design to prescribe when and how disturbed areas will be restored. Tree compensation ratios for restoration plans should incorporate CVC's ecological offsetting guidelines and TRCA's habitat compensation guidelines. Plantings should consist of native trees, shrubs, and seed mixes. Replace tree species at the ratios specified within the arborist report.
- 7D: Develop an edge management plan at detailed design for the wooded terrestrial habitats which will be removed during construction.

Prevention of Fish Mortality and Aquatic Disturbance

The potential for fish mortality will be mitigated through following the DFO measures to protect fish and fish habitat (DFO 2021):

- 1E: Preventing death of fish through the use of appropriate timing windows as indicated by mitigation measures in **Section 9.1**.
- 2E: Maintain fish passage by isolating the work area.
- 3E: Install intake screen at all pumps to prevent fish mortality.
- 4E: Rescue any fish trapped during dewatering of the work area by a qualified biologist and release captured fish to suitable habitat within the same watercourse.
- 5E: Limit heavy equipment (wheeled or tracked) from entering the wetted area at any time pre-, during, or post-construction.
- 6E: Ensure proper sediment and erosion controls are in place as identified in Section 8.6.
- 7E: Where culvert replacement and /or extension is recommended, natural channel design principles should be employed for channel improvements to better tie-into the culvert at the upstream and downstream ends to provide added stability and enhance fish passage. Consideration should be given to extending natural channel design beyond the anticipated areas of impact if it would serve to improve overall channel stability or enhance fish passage. A qualified professional in fluvial geomorphology should be consulted for design, and consultation with aquatic and terrestrial ecologists should be completed to ensure appropriate habitat improvements.

6.1.3 Summary

Table 6-2 provides a summary of the potential impacts, mitigation measures, and net effects that the project is anticipated to have on the natural heritage features in the Project Area.

Table 6-2: Natural Heritage Features Impact Summary

Project Activity	Natural Heritage Features	Potential Impacts	Mitigation Measures	Net Effects
Construction access, staging, and laydown areas	General Wildlife and Habitat	<u>Habitat Loss and/or Alteration</u> • soil compaction and rutting outside of construction zone • damage to edge trees (i.e., outside of construction zone) • fugitive dust • spills (e.g., fuel) • erosion and sedimentation	Timing Windows • 1A- 2A, 4A Best Construction Practices • 1B-7B Prevention of Terrestrial Disturbance • 1D-7D Erosion and Sedimentation Control • 1F- 5F, 7F, 9F-10F	• It is anticipated that construction access and staging will utilize the existing paved areas to reduce impacts to the natural heritage features. • Impacts associated with construction access, staging, and laydown areas are anticipated to be isolated, temporary, and will not result in long term effects.
		<u>Disturbance/Avoidance of Habitat</u> • increase noise during construction • increased human presence	Timing Widows 1A- 2A, 4A Prevention of Wildlife Mortality and Disturbance 1C-7C	
		<u>Injury or Incidental Take</u> (particularly during migration to and/or emergence from hibernacula, nesting sites, or during natural travel patterns to and from habitats) • increased collision with machinery	Timing Widows 1A-2A, 4A Prevention of Wildlife Mortality and Disturbance 1C-7C	
Vegetation clearing, earthworks/grubbing, and disposal	Significant Woodlands Significant Valleylands Potential SWH: • Bat Maternity Colonies • Migratory Butterfly Stopover Area Potential Landbird Migratory Stopover Area • Potential Bald Eagle and Osprey Nesting/Foraging/Perching • Rare Wildlife Species • Monarch • Eastern Wood-Pewee Eastern Ribbonsnake Amphibian Movement Corridors Potential SAR • SAR bats • Bobolink • Eastern Meadowlark	<u>Habitat Loss and/or Alteration</u> permanent/temporary loss of edge habitat along the Project Area including potential SWH • soil compaction and changes in moisture regime • changes to the structure and composition of vegetation communities (e.g., introduction of invasive species) • fugitive dust • spills (e.g., fuel)	• Timing Windows • 1A-2A, 4A, 5A • Best Construction Practices • 2B, 4B, 6B, 7B Prevention of Terrestrial Disturbance • 1D-7D • Erosion and Sedimentation Control • 1F -5F, 7F, 9F-10F	• The vegetation clearing will result in a permanent removal of terrestrial habitats. This habitat is primarily edge habitat directly adjacent to the existing roadway. • The approximate amount of vegetation being removed within the naturalized areas is included in Table 9 in Section 7. • Minor encroachment into terrestrial habitats along the BRT is unlikely to have a significant impact on the quality or size of habitat for SAR species. • If the prescribed mitigation measures are followed, then the compensation planting of new, native, vegetation within the area should result in no long-term impacts to the environment.

Project Activity	Natural Heritage Features	Potential Impacts	Mitigation Measures	Net Effects
Vegetation clearing, earthworks/grubbing, and disposal (cont'd)		SAR • There is potential for SAR bat species within the forest stands adjacent to Etobicoke, Applewood, and Serson creeks. Vegetation and tree removal to accommodate the BRT has the potential to reduce the availability of suitable cavity trees. • There is potential for Bobolink and Eastern Meadowlarks within the large CUM1 habitat between Applewood and Etobicoke creeks. Vegetation removals to accommodate the BRT has the potential to impact these species during the breeding season through avoidance of habitat or destruction of nests.	Prevention of Terrestrial Disturbance • 1D-4D, 6D-7D Prevention of Wildlife Mortality and Disturbance • 5C-7C	
		Disturbance/Avoidance of Habitat • increased noise during construction • increased human presence	Timing Widows • 1A-2A, 4A, 5A Prevention of Wildlife Mortality and Disturbance • 1C-8C	
		Injury or Incidental Take (particularly during migration to and/or emergence from hibernacula, nesting sites, or during natural travel patterns to and from habitats) increased collision with machinery removal of nests and eggs smothering hibernacula or nesting site	Timing Widows • 1A-2A, 4A, 5A Prevention of Wildlife Mortality and Disturbance • 1C-8C	
In-water and Near-water construction works	• Fish and Fish habitat Significant Valleylands Potential SWH: • Potential Rare Wildlife Species • Eastern Ribbon snake • Northern Map Turtle • Snapping Turtle • • Potential SAR • American Eel	Habitat Loss and/or Alteration In-water works have the potential to impact aquatic and semi-aquatic species and their habitat through the following: temporary and permanent loss of fish habitat which may include potential SWH • fugitive dust • spills (e.g., fuel) • erosion and sedimentation • temporary impacts to fish passage and fish habitat during construction	Timing Windows • 2A, 3A Best Construction Practices • 1B-6B Prevention of Wildlife Mortality and Disturbance • 7C Prevention of Fish Mortality and Aquatic Disturbance • 1E-7E Erosion and Sedimentation Control • 1F-10F	• In-water works are anticipated to occur within Serson and Applewood Creek for the extension of the culverts. • A DFO self-assessment will be required to determine the risk for death of fish or HADD to fish habit. • Where culvert extension is proposed, natural channel design principles should be employed for channel improvements to better tie into the culvert at the upstream and downstream ends to provide added stability and enhance fish passage. Bedforms, bank, and bed treatments should be appropriately selected and designed at the detailed design phase. Design should consider extending restoration beyond anticipated zone of impact to enhance channel stability or
		SAR • American Eel has the potential to inhibit Etobicoke Creek. Currently no in-water works are anticipated for Etobicoke Creek, and therefore this species is not anticipated to be impacted.	• Only Applewood and Serson Creek require in-water works, and there are no SAR associated with those waterbodies.	

Project Activity	Natural Heritage Features	Potential Impacts	Mitigation Measures	Net Effects
		Disturbance/Avoidance of Habitat • increased noise during construction • increased human presence	Timing Widows • 2A, 3A Prevention of Fish Mortality and Aquatic Disturbance • 1E-7E	improve fish passage where appropriate. • Wildlife crossing should be considered during the detailed design phase of the culvert to improve wildlife passage and linkages. • If the mitigation measures are followed, there should be no long-term impacts within the aquatic system.
		Injury or Incidental Take (particularly during migration to and/or emergence from hibernacula, nesting sites, or during natural travel patterns to and from habitats) • increased collision with machinery • removal of nests and eggs • smothering hibernacula or nesting site • incidental take of fish species while performing in water works	Timing Widows • 1A, 2A, 4A Prevention of Fish Mortality and Aquatic Disturbance • 1E-7E	

6.2 Tree Inventory

At stated earlier, the alignment and construction limits have become more defined as the project has progressed since the inventory took place. As a result, several small areas both the north and south of Lakeshore Road within the Lakeshore Road East RoW will require tree inventory during the detailed design phase.

Based on the proposed limit of disturbance due to road widening, a general understanding of tree impacts can be gained. Of the 298 trees that were inventoried, an estimate of 229 trees will require removal and 12 trees will be potentially injured, while the remaining 57 trees will not be impacted. These impacts will need to be reassessed during the detailed phase to evaluate the potential for lessened impact.

6.2.1 Construction Impacts

Tree preservation is an important aspect of all construction activity within Mississauga, as it aids in maintaining the current tree canopy cover that provides essential ecological functions. Protection barriers are important in preventing injuries to trees during construction. They prevent mechanical injuries to the trunk and branches, as well as impacts to the roots from compaction. By using proper pruning techniques, the tree will not be negatively affected; however, branches that are fractured or experience uneven breaks due to construction equipment may cause long-term negative effects.

Two options of protective barrier can be used throughout the Project Area to provide sufficient protection of trees during the construction phases of the project. Orange plastic fencing framed with solid top and bottom rail shall be utilized in the protection of trees throughout this project. If required, a second option is to use plywood barriers. Preferably, the protection barrier should encompass the entire TPZ; however, at a minimum the protection barriers should encompass the dripline to provide sufficient protection. Details on the construction and installation of both protection barrier types can be found in Appendix C of the Draft Arborist Report.

A tree preservation plan has been created showing the recommended placement of tree protection fencing for the BRT Project Area (Appendix D of the Draft Arborist Report). The tree preservation plan presented in this report is preliminary and will need to be finalized during detailed design. At detailed design, the details and plans should be updated to incorporate the additional areas that were not surveyed in 2021 (Figures 2a and 2b of the Draft Arborist Report) and updated to reflect any changes to the disturbance limits for the BRT.

Pruning is to be conducted by a certified arborist or a qualified employee of the City Forestry Department. Pruning should be conducted according to ISA standards. The minimum amount of pruning should be conducted to avoid negative effects to the structure and integrity of the tree. Pruning may include both the branches and roots depending on the extent of the dripline. Extra care should be taken when pruning roots so as to not impact the structure of the tree or its ability to uptake water and nutrients.

Additional tree inventory may be required during the detailed design phase, as the alignment and construction limits become more defined. Based on the current proposed limit of disturbance due to road widening, an estimate of 229 trees will require removal and 12 trees potentially injured, while the remaining 57 trees will not be impacted.

6.2.2 Mitigation Measures

As stated in Section 4, tree impacts (i.e., removals and potential injuries) can only be estimated at this stage (i.e., preliminary design) in the project. At this time, it is estimated that 229 trees will require removal and 12 trees will be potentially injured. Based on these estimates, estimated compensation can be calculated. Compensation will allow for the restoration of an area that has undergone tree removals or that experiences tree injuries. Replacing trees will aid in the goal of increasing the canopy cover in the Mississauga to reach the target of 15% to 20% urban forest cover by 2033 (City of Mississauga 2014).

Both Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC) have habitat compensation guidelines that can be applied to this project. **Table 6-3** and **Table 6-4** summarize the compensation requirements according to tree size within the TRCA and CVC jurisdictions, respectively. The estimated compensation required for the BRT Project Area is 3201 trees.

Table 6-3: Compensation Results for Estimated Tree Removals within Toronto and Region Conservation Authority Jurisdiction

Diameter at Breast Height (cm)	Compensation Ratio	Quantity Being Removed	Compensation Requirement
0 - 10	1:1	5	5
10.1 – 20	1:3	19	57
20.1 – 30	1:10	6	60
30.1 - 40	1:15	4	60
40.1 - 50	1:20	2	40
50.1 - 60	1:30	2	60
60.1 - 70	1:40	1	40
70.1 +	1:50	1	50
ESTIMATED TOTAL COMPENSATION			**372**

Table 6-4: Compensation Results for Estimated Tree Removals within CVC Jurisdiction

Diameter at Breast Height (cm)	Compensation Ratio	Quantity	Compensation Requirement
0 - 10	1:1	6	6
10.1 – 20	1:3	16	48
20.1 – 30	1:10	61	610
30.1 - 40	1:15	47	705
40.1 - 50	1:20	33	660
50.1 - 60	1:30	17	510
60.1 - 70	1:40	6	240
70.1 +	1:50	1	50
ESTIMATED TOTAL COMPENSATION			**2829**

In addition to City tree by-laws, it is expected that all tree removals and pruning will be conducted in accordance with the Migratory Birds Convention Act. It is recommended that all removals are avoided during the breeding bird season, which extends from the beginning of April to the end of August (ECCC 2018). If it is necessary to work during the breeding bird season, then mitigation measures to avoid incidental harm to migratory birds must be in place.

6.3 Fluvial Geomorphology

As part of planned improvements to the Lakeshore BRT system, Lakeshore Road is proposed to be widened to the south. To accommodate this work, the existing Applewood Creek and Serson Creek culverts are proposed to be extended to the south. No alterations are proposed to the Etobicoke Creek bridge.

The following documents informed the impact assessment for Fluvial Geomorphology:

- Draft Roll Plan, Lakeshore Road (Part A) Transportation Project, East Ave to Etobicoke Creek. Date: October 2021.
- AutoCAD file showing the proposed culvert extensions and road work

6.3.1 Etobicoke Creek

Currently, the existing bridge at this location consists of a two-span 42.6 m wide bridge (opening width of each span = 21.3 m). Reach ET2 has a straight planform with an average bankfull channel width of 31 m.

The main flow path passes through the east span of the Lakeshore Bridge, near the pedestrian walkway.

Concentrated flows approaching and through the east span appear to have locally increased velocities and caused local bed scour near the east abutment. A large, vegetated bar extends upstream and downstream of the bridge from the bridge pier through the west cell. A smaller split flow channel has developed around the island through the west bridge cell. There are no meanders near the bridge.

The combined bridge spans are wider than average bankfull channel width, but do not span three times the bankfull channel width (93 m), the existing urban corridor of 148 m or the unmanaged natural corridor width of 250 m. The pier and bridge configuration appear to be locally impacting channel processes by altering nearby depositional patterns which narrow the active channel at the bridge and encourage bed scour through the east span, as the hardened east bank cannot adjust to accommodate the deposition on the west bank. Based on the risk methodology outlined above, the existing crossing is considered to have a high erosion risk.

However, due to the nearby effects of lake backwatering, the erosion-resistance of the bedrock channel and the erosion protection measures already in place, the effective erosion risk at the bridge is considered moderate. Monitoring is recommended to ensure the bed scour in the east span does not impact the stability of the pedestrian crossing.

No alterations are proposed to the existing Etobicoke Creek bridge. However, a path is proposed on the south side of Lakeshore Road on the western floodplain. The grading limits should be confirmed to ensure there will be minimal encroachment by the road embankment into the floodplain.

6.3.2 Applewood Creek

The existing Applewood Creek culvert at Lakeshore Road (13.5 m total span) is wider than the bankfull channel width (6.0 to 6.5 m) but is less than three times bankfull width (6.5 × 3 = 19.5), the existing urban corridor width of 43 m, and the unmanaged natural corridor width of 70 m. As such the existing crossing is considered to have a high erosion risk based on the methodology outlined above. It is noted however that the reconstruction of Applewood Creek into a rocky riffle-pool system upstream of the crossing, and the constructed outlet pool and cobble riffles downstream of the crossing provide grade control and erosion protection. As such, the effective erosion risk at the crossing is considered moderate, and erosion mitigation works are recommended as part of the Lakeshore Road widening and culvert extensions.

The CVC recommends that natural channel works extend upstream of the proposed culvert to remove excess rock and enhance aquatic habitat and fish passage, subject to engineering constraints. The feasibility, type, and extent of these works will be determined at detailed design. Should such works go forward, they may extend outside the future road ROW, which would require consideration of land acquisition or easement requirements at detailed design.

Downstream of Lakeshore Road, the proposed 12.5 m culvert extension will intercept the existing outlet pool which extends from the current culvert outlet for approximately 18 m (based on site assessment). To provide space for flow dissipation, it is recommended that the outlet pool be reconstructed downstream of the culvert extension. This will require grading of the channel banks and local tree removal. The approximately 18 m long cobble-lined channel which backwaters and provides grade control to the outlet pool should also be replicated to maintain existing channel processes through the culvert and upstream. Tie-in recommendations are depicted schematically on Figure 4 of the Fluvial Morphology Report. The specific channel restoration lengths and areas recommended above are to be confirmed at the detailed design stage.

6.3.3 Serson Creek

The existing Serson Creek culvert at Lakeshore Road (10 m total span) is larger than the bankfull channel width (avg. 3.3 m) and is approximately equivalent to three time the average bankfull width (3.3 m × 3 = 10 m), but does not span the existing urban corridor of 24 m or the unmanaged natural corridor width of 30 m. The existing crossing has a moderate erosion risk. This risk appears to have been partially mitigated by the constructed outlet pool and cobble riffle downstream of the existing crossing. The existing culvert is 27.4 m long. Downstream of the outlet, the creek is slightly skewed to the east in relation to the culvert alignment.

The proposed Serson Creek culvert will be a single-span open foot structure with an opening span of 11 m and a length of approximately 50 m. The proposed structure span will be 1 m wider than the existing span, and the structure will be 22.6 m longer than existing. The proposed culvert will extend 1.0 m upstream from the existing culvert inlet and 21.6 m downstream of the existing outlet, as measured along the centreline of the proposed culvert. The proposed Serson Creek culvert (11 m span) is larger than the bankfull channel width (average 3.3 m) and is approximately equivalent to three times the average bankfull width (3.3 m × 3 = 10 m), but does not span the existing urban corridor of 24 m or the unmanaged natural corridor width of 30 m. The proposed crossing will have a moderate erosion risk. Although under both existing and proposed scenarios the culverts have moderate erosion risk, under proposed conditions the risk of erosion may be slightly lower compared to existing conditions due to the increase in the culvert span which would reduce water velocities under higher return period flows. However, erosion mitigation due to the increase in span may be offset by the proposed increase in structure length. Review of detailed hydraulic modeling should be completed at detailed design to compare existing and proposed flow conditions, and to inform design of erosion mitigation works. Erosion mitigation works are recommended to protect the creek at the culvert tie-ins.

The proposed culvert will be skewed by approximately 6.3° compared to the existing culvert alignment; the proposed culvert outlet will shift to the east. The proposed outlet will tie into the existing channel planform downstream. The proposed culvert at the inlet will be slightly skewed to the angle of the channel centreline upstream; however, this will not impact the channel directly and can be accommodated with minor tie-in (see also comment from CVC regarding suggested extension of natural channel works upstream). The proposed culvert replacement will extend beyond the existing outlet pool (approximately 10 m long) and the downstream cobble-lined channel (approximately 15 m long). To provide space for flow dissipation, it is recommended that the outlet pool be reconstructed downstream of the culvert replacement. This will require grading of the channel banks and local tree removal, and confirmation of grading limits along the west bank which requires a stable slope setback. The cobble-lined channel which backwaters and provides grade control to the outlet pool should also be replicated to maintain existing channel processes through the culvert and upstream. The specific channel restoration lengths and areas recommended above are to be confirmed at the detailed design stage.

Based on comments received January 31, 2022, CVC recommends that natural channel works extend upstream of the proposed culvert to enhance aquatic habitat and fish

passage. The feasibility, type, and extent of these works will be determined at detailed design. Should such works go forward, they may extend outside the future road right-of-way which would require consideration of land acquisition or easement requirements at detailed design.

Any channel tie in works should be coordinated with the Lakeview Village development to ensure the future culvert extension is tied into the Lakeview Village proposed channel improvements.

6.3.4 Mitigation Measures

To mitigate potential impacts of the proposed works, the following considerations should be made at detailed design:

- Ensure hydraulic conveyance is met under all flood conditions for proposed culvert extensions, and confirm any geomorphic impacts of the proposed conditions hydraulics when detailed modelling information is available
- Confirm that the Applewood Creek culvert extension will be open foot (the Serson Creek culvert GA indicates that the Serson Culvert replacement will be open foot) and identify the scour hazard limit through completion of a scour assessment to determine appropriate culvert footing depths for both the Applewood Creek culvert extension and Serson Creek replacement. If the scour hazard limit does not match the existing/proposed culvert footing depths, the proposed footing design will require additional approval from CVC with respect to scour hazard mitigation
- Confirm the skew and final extent of the proposed Applewood culvert extension and Serson Creek culvert replacement, and associated structures such as wingwalls and stormwater outfalls
- Complete the design of the low-flow channel and substrate gradations within the Serson Creek and Applewood Creek culvert crossings to enhance channel stability and fish passage
- Confirm the extent and type of channel tie-in works at Applewood Creek and Serson Creek through a detailed geomorphic assessment and detailed channel design
- Following confirmation of the channel tie-in works, confirm the disturbance limits of construction at Serson and Applewood Creeks and land acquisition or easement requirements, if any, at Applewood Creek
- Proposed culvert works may, where feasible, incorporate ecological requirements (i.e., wildlife passage)
- Coordinate Serson Creek tie-in works with the Lakeview Village proposed channel improvements

6.4 Drainage and Stormwater Management

The Lakeshore Road East corridor between Etobicoke Creek and East Avenue is proposed to be widened, with addition of exclusive transit median, and in-boulevard cycle tracks and sidewalks on both sides of the road.

Majority of the study corridor is within the area regulated by CVC, except for the east portion of the corridor being within the TRCA jurisdiction. There are two (2) watercourse crossings within the Lakeshore Road East Part A project limits, which are located at Serson Creek and Applewood Creek. Hydraulic assessment of these two crossings using available CVC models indicated that the 100 year and Regional Storm events do not overtop the road at those crossings. Hydraulic assessment of the proposed culverts has been carried out to quantify the impacts to the upstream areas. The results of these analysis indicated a small transient increase in the upstream water surface elevations at Applewood Creek crossing and a small transient decrease in upstream water surface elevations at Serson Creek crossing. However, a flood hazard analysis indicated that the changes would remain confined within the channel valley and would not result in any additional adverse flooding impacts to adjacent properties or infrastructure.

Stormwater best management practices, including catchbasin inserts bioretention systems, and online storage pipes are proposed to provide storm water quality treatment, water balance, erosion control, and quantity control of the increased runoff from the roadway right-of-way. The proposed road improvements will result in an additional pavement area of 2.52 ha. As part of the SWM strategy and in accordance with MECP requirements, a total of 2.52 ha of pavement area is considered to receive quality treatment through the proposed bioretention cells. The water balance and water quality and erosion control storage volumes provided within the proposed bioretention cells exceed the required volumes determined by TRCA and CVC criteria. Quantity control will be provided through the proposed online storage pipes. Due to the limited area available within the Lakeshore Road right-of-way, the storage required to meet the CVC criteria for Serson Creek and Applewood Creek cannot be provided. Therefore, as a best effort approach, the proposed peak flows will be controlled to their existing levels at these locations. Opportunities to implement supplemental BMP measures to support a treatment train approach can be considered during the next phases of design in series with the proposed measures to enhance the overall water quality objectives.

6.4.1 Proposed Drainage Conditions

Roadway Drainage System

The preferred alternative design concept for Lakeshore Road East from Etobicoke Creek to East Avenue recommends widening the road, as well as the addition of exclusive transit median, and in-boulevard cycle tracks and sidewalks on both sides of the road. The design concept also includes intersection improvements at all signalized intersections and streetscaping opportunities along the corridor. As part of the proposed roadway design, localized high points and low points are introduced in the roadway profile.

Overall, the existing drainage patterns will not be altered as per the proposed roadway improvements, except for minor localized changes as a result of the proposed roadway profile and widening. However, some existing discharge locations will be redirected as the result of replacing the existing drainage swales located south of Lakeshore Road with underground storm sewers.

Minor Drainage System

The overall drainage pattern will generally be consistent with the existing conditions. To accommodate the proposed roadway widening, storm sewer upsizing and catchbasin relocations are anticipated. The existing drainage swales located south of Lakeshore Road will be replaced by underground storm sewers.

The storm sewer system for the ultimate roadway configuration is to be designed for a 10-year storm event as per the City of Mississauga Storm Drainage Design Requirements. Proposed roadway drainage will be collected by a series of catchbasins and will be conveyed by storm sewers to the existing storm outlet locations. There are several existing outlets for the runoff from Lakeshore Road East within the project limits. For the existing storm sewer discharge locations, refer to the Drainage Plans in the Draft Drainage and Stormwater Management Report in **Appendix D**.

Major Drainage System

The roadway design should ensure that the major system runoff up to the 100-year storm event can be safely conveyed to outlet locations, and the depth of water shall not exceed the crown of the road, as per City of Mississauga Storm Drainage Design Requirements. At these locations, major system inlets will capture the 100-year flow and direct it to the appropriate outlet. A spread analysis should be completed at the detailed design stage to ensure that the ponding at low points does not exceed the crown of the road. For major system flow directions, refer to the Drainage Plans in the Draft Drainage and Stormwater Management Report in **Appendix D**.

6.4.2 Transverse Crossings

Extension of the culvert at Applewood Creek and replacement of the culvert at Serson Creek crossing is required to accommodate the proposed roadway modifications. The objective of this assessment is to evaluate the potential impact of the proposed extensions on the hydraulic capacity of the culverts. Under proposed conditions, the drainage boundary and design peak flow values for the transverse crossings are considered to remain unchanged compared to the existing conditions. The increase in the pavement area as a result of the corridor improvements is very small in comparison to the large external drainage areas contributing to the watercourse crossing location.

Serson Creek Crossing

Under proposed conditions, the existing concrete box culvert is recommended to be replaced to accommodate the proposed roadway widening. The hydraulic modeling results show that replacing and upsizing the culvert will result in a decrease of 0.03 m in the immediate upstream 100-year and Regional flood levels. Under existing and proposed conditions, the 100 year and Regional Storm events do not overtop Lakeshore Road at the Serson Creek crossing. The proposed culvert extension will result in an increase in channel velocities immediately upstream of the crossing. Adequate erosion protection measures should be designed in the detailed design stage to mitigate the increased erosion hazard.

Applewood Creek Crossing

Under proposed conditions, the existing twin concrete box culvert is recommended to be extended to accommodate the proposed roadway widening. The hydraulic modeling results show that extending the length of the culvert to accommodate the proposed road widening will result in an increase of 0.07 m in the immediate upstream 100 year and Regional flood level. This increase in water surface elevation is transient and entirely contained by the channel valley banks, resulting in no additional flooding impact to adjacent properties. Under existing and proposed conditions, the 100 year and Regional Storm events do not overtop Lakeshore Road at Applewood Creek crossing.

6.4.3 Stormwater Management Strategy

Stormwater Management Criteria

The stormwater management plan for the Project Area shall be developed to comply with the policies, regulations, and standards of the CVC, TRCA, MECP, and City of Mississauga. Watercourses within the CVC and TRCA's jurisdiction are classified as requiring an "Enhanced" level of protection, which equates to 80% Total Suspended Solids (TSS) removal. Water quality management measures within the study limits will be

designed to provide “Enhanced” water quality treatment, as a minimum, for the increased pavement area as a result of roadway widening/improvements, as per the MECP Response to Notice of Commencement Letter dated October 12, 2021.

Storm Sewer Systems: Within the project limits, the stormwater runoff from Lakeshore Road East discharges either into the existing storm sewer systems or outlets at the watercourse crossings. For locations where the runoff discharges into an existing system, the minor system design storm (10-year storm) peak flows must be controlled to the existing peak flows, for which the receiving system was designed. The receiving storm sewer systems within the project limits are City of Mississauga municipal systems, which would have been designed based on a 10-year design storm.

Watercourse Crossings: CVC and TRCA has established quantity control targets for the watersheds under their jurisdiction. For the storm outlets at Serson Creek and Applewood Creek, CVC requires 100-year post-development peak flows to be controlled to 2-year pre-development levels. For the storm outlets at Etobicoke Creek at Lakeshore Road, quantity control is not required according to the TRCA Stormwater Management Criteria (2012).

The CVC and TRCA criteria for water balance and erosion control requires retention of 5 mm of rainfall. This criterion is applicable to increased pavement area as a result of roadway widening/improvements.

Hydrologic Modeling

A hydrologic analysis was conducted using the Rational Method to calculate the surface runoff under the 2-to-100-year storm events for both the existing and proposed condition scenarios. The Modified Rational Method will then be used to calculate the storage volumes required to control the post-development peak flows for the design storm events to the allowable release rates.

City of Mississauga Intensity Duration Frequency (IDF) curves will be applied to calculate the peak flows under both existing and proposed conditions, using a minimum inlet time (Tc) of 15 minutes.

Pavement Area Analysis

A pavement area analysis was performed to determine the increase in impervious surface, which will result from the roadway widening, the addition of exclusive transit median, and construction of new cycle tracks and sidewalks.

As a Low Impact Development measure, it is recommended that the boulevard and median areas outside of the transit and active transportation facilities be covered with permeable material (e.g. grass, permeable pavement, etc.) to minimize the overall increase in impervious area along the Lakeshore Road corridor. Since these are not load bearing surfaces, the use of permeable material will not impact the functionality of the proposed design but will provide water quality and quantity control benefits through runoff reduction. Therefore, the proposed stormwater strategy was developed considering the boulevard and median areas outside of the transit and active transportation facilities as pervious. Additional details and specifications for the permeable material are to be included in the detailed design stage.

It was determined that the proposed roadway improvements will result in an additional 2.52 hectare (34%) increase in pavement area within the Lakeshore Road project corridor. The results are documented in **Appendix D**.

Stormwater Best Management Practice Options

Various Best Management Practices (BMPs) for stormwater management were reviewed and assessed for their applicability on this project. Due to the nature of this facility (i.e. linear transportation corridor) and the limited space within the roadway right-of-way, a series of bioretention cells integrated with the proposed streetscaping are proposed to provide quality treatment, erosion control, and water balance. To provide quantity control throughout the Lakeshore Road corridor, online storage pipes are proposed.

Through the proposed water quality treatment strategy, a total of 2.52 ha of pavement area, which is the increase in pavement area across the Lakeshore Road study corridor, is considered to receive water quality control using the bioretention facilities. A total of 166 m^3 and 610 m^3 of water balance and water quality/erosion control storage volumes are respectively provided using the facilities, which exceeds the required storage volumes based on MECP and CVC/TRCA criteria. During detailed design, the location and performance characteristics of the bioretention facilities will need to be confirmed to ensure that all bioretention cell design criteria can be met.

Through the proposed water quantity control strategy, a total of 328 m3 of storage volume will need to be provided to attenuate minor peak flows and a total of 577 m3 will need to be provided to attenuate major peak flows to existing levels. During detailed design, the location, pipe sizing, and orifice sizing of the online storage pipes will need to be determined to ensure that the water quantity control criteria can be met.

Through discussions with MNRF, CVC and TRCA, opportunities to implement supplemental stormwater BMP measures to augment the treatment proposed by the bioretention cells using a treatment train approach, including measures to mitigate water temperature impacts, can be considered.

The supplemental BMP measures shall be designed based on the site conditions and further geotechnical and hydrogeological investigations are to be undertaken during the

next phase of design. Any low impact development measures shall meet the design criteria as per the CVC/TRCA Low Impact Development Stormwater Management Planning and Design Guide (2010). A list of potential LID measures to support the treatment train approach that may be considered for implementation within the project corridor during the detailed design is provided as follows:

- Infiltration Trenches
- Vegetated Filter Strips and Plunge Pool
- Oil-Grit Separator Units

See **Table 6-5** for a summary of the stormwater management plan

Table 6-5: Stormwater Management Summary

Existing Pavement Area (ha)	Additional Pavement Area (ha)	Pavement Area Considered to Received Quality Treatment (ha)	Quality Storage Volume Provided (m^3)	Required Storage to Control Minor Flows (m^3)	Required Storage to Control Major Flows (m^3)
7.07	2.52	2.52	610	328	577

6.4.4 Erosion and Sediment Control during Construction

Erosion and sediment control (ESC) measures should be implemented and monitored through the construction period in accordance with the TRCA ESC Guide for Urban Construction (2019). Construction activities should be conducted during periods that are least likely to result in in-stream impacts to fish habitat.

Detailed erosion and sediment control plans will be required as part of the detailed design component for all phases of the construction. The erosion and sediment control plans will be subject to review and approval by the various external agencies involved in the project, including the Conservation Authorities.

During construction, disturbances to watercourse riparian vegetation should be minimized. If riparian vegetation is removed or disturbed, erosion and sediment control measures such as silt fences, rock flow check dams and sedimentation ponds should be utilized to provide a maximum protection of local and downstream aquatic resources. These measures should be maintained during construction and until disturbed areas have been stabilized with seed and mulch. Additionally, topsoil should not be stockpiled close to the watercourses and water should not be withdrawn from these sensitive streams for construction purposes.

The site engineer and contractor will be responsible for delineating work areas and ensuring that erosion and sediment control measures are functional. In addition, the engineer will ensure that provisions related to fisheries and watercourse protection is met and that any required fish habitat compensation measures are implemented in accordance with the terms and conditions of the Fisheries Act Authorization.

6.5 Environmental Site Assessment

The Limited Phase 1 ESA for the Project Area identified high potential for contaminated soils in the corridor. It is anticipated that these will be impacted as the roadway is widened (primarily to the south) in order to accommodate the additional BRT infrastructure, sidewalks, cycle tracks, and multi-use pathways, or associated grading works.

Based on the review of available historical information and observations made during the site visit, 69 properties and/or areas within the Phase I Project Area have been identified as having a “high” potential for soil and groundwater contamination, including gas stations or service centres, dry-cleaning facilities, vehicle repair garages, and industrial or manufacturing sites. Sixteen properties and/or areas within the Project Area have been identified as having a “medium” potential for soil and groundwater contamination, including light industrial, commercial and/or institutional facilities. The remaining properties in the Project Area, which were never developed or were developed but only used for agricultural (excluding orchards, nurseries, tree farms, and golf courses), residential, or parkland uses, were rated as having a “low” potential for contamination. In addition, 30 significant spill incidents, representing 11 spill locations, and 2 historical fill areas are also considered as having a “high” potential for soil and/or groundwater contamination.

The properties or areas rated “high” and “medium” potentials for contamination, significant spill, and historical fill locations represent APECs in the Project Area. In addition to the APECs, potential impacts from de-icing salt applications during the winter season and unrecorded spill incidents on the site and other municipal roadways are also considered as potential environmental concerns to impact the nearby soil and groundwater quality.

Mitigation Measures

For properties designated as APECs that may be directly impacted by the footprint of project, further environmental studies/investigations (site-specific Phase 1 ESAs) should be undertaken to confirm the specific environmental conditions of the soils to support property acquisition due diligence and road construction excess material management for

soil and groundwater. Mitigation measures will need to be developed, should contamination be confirmed, which may include environmental site clean-up / remediation, and / or risk assessment.

It is recommended that property requirements be reviewed at the detailed design stage of the project to re-confirm or update the property requirements for the project. If proposed property acquisitions differ those identified in this report, the extent of property impacts must be re-assessed and further environmental studies / investigations may be required for newly-impacted properties.

A Soils and Excavated Materials Management Plan will have to be developed to define the handling, management, and disposal of materials excavated as part of the project. The plan shall identify the process for management of excess soils contaminated materials, including handling, testing, transportation, documentation, reuse, and disposal requirements. Development of the plan will have to be overseen by a Qualified Person, in accordance with Ontario Regulation 153 under the Environmental Protection Act and Ontario Regulation 406/19 (On-Site and Excess Soil Management), the MOECC's Management of Excess Soils: A Guide for Best Management Practices, and all applicable laws.

No additional environmental investigations are recommended for APECs with a low potential for environmental impacts.

6.6 Cultural Heritage Environment

6.6.1 Built Heritage Resources and Cultural Heritage Landscapes

The Project Area involves the evolving infrastructure and transportation needs of the Lakeshore Road corridor. The proposed undertaking for the Project Area involves two km of BRT infrastructure along Lakeshore Road East from Etobicoke Creek to West Avenue and includes two km of median running BRT with three BRT stops along with cycle tracks, sidewalks, and associated streetscape.

Direct impacts to two identified BHRs and one CHL are anticipated as a result of the proposed undertaking. BHR 2 (Corner of Lakeshore Road East and Hydro Road), BHR 6 (Small Arms Building at 1352 Lakeshore Road East), and CHL 1 (Arsenal Lands CHL, including 1352 Lakeshore Road East, 1300 Lakeshore Road East and 1300A Lakeshore Road East) are anticipated to be directly impacted by the proposed alignment.

Direct impacts to BHR 2 (Corner of Lakeshore Road East and Hydro Road) are anticipated to involve the removal of the plaque at this location due to the proposed reconfiguration of the roadway and sidewalk. If reconfiguration of the roadway and sidewalk will require removal of this commemorative feature, the plaque should be removed prior to construction for safe-keeping, and returned to the same general location once work has been completed. Consultation with heritage staff or other appropriate staff should be undertaken to determine an appropriate storage and relocation strategy for this commemorative feature.

Direct impacts to BHR 6 (Small Arms Building at 1352 Lakeshore Road East) are anticipated to involve significant encroachment on to the property due to grading, property acquisitions, and relocation of the sidewalks. The proposed grading will also impact the stand of Vimy oak trees north of the Small Arms Building, the grass lawn, driveway, and parking lot. Further, the generous setback from Lakeshore Road East and row of deciduous trees to the west of the building, both noted as a heritage attributes, are anticipated to be directly and adversely impacted encroachment. As there are direct impacts anticipated to BHR 6 (Small Arms Building at 1352 Lakeshore Road East) which is a designated property under Part IV of the OHA and within CHL 1, a resource-specific HIA is required in fulfillment of TPAP obligations under Ontario Regulation 231/08 and as per the City of Mississauga Official Plan clause 7.4.1.10. The HIA should follow the City of Mississauga Heritage Impact Statement Terms of Reference (2012).

Direct impacts to CHL 1 (Arsenal Lands CHL) are anticipated to involve encroachment on to the property due to grading, property acquisitions, and relocation of the sidewalks. The proposed limits of impact will result in significant encroachment onto the frontage of the Small Arms Building property at 1352 Lakeshore Road East, which is a designated property under Part IV of the OHA. The proposed grading will also impact the stand of Vimy oak trees north of the Small Arms Building, the grass lawn, driveway, and parking lot.

As there are direct impacts anticipated to CHL 1 (Arsenal Lands CHL), which is identified in the Cultural Landscape Inventory (2005) and within CHL 1, the Small Arms Building property at 1352 Lakeshore Road East, which is a designated property under Part IV of the OHA, a resource-specific HIA is required in fulfillment of TPAP obligations under Ontario Regulation 231/08 and as per the City of Mississauga Official Plan clause 7.4.1.10. The HIA should follow the City of Mississauga Heritage Impact Statement Terms of Reference (2012).

Where feasible, the proposed alignment should be designed to avoid indirect impacts to these BHRs and CHL. To ensure the features on these properties are not adversely impacted, construction and staging in the Lakeshore Road East right-of-way should be suitably planned to avoid all impacts to these properties. Suitable mitigation measures could include the establishment of no-go zones with fencing and issuing instructions to construction crews to avoid the BHRs and CHL.

Construction Impacts

Vibration impacts during construction activities may affect BHR 1, BHR 3 - BHR 6, and CHL 1 as a result of their location in close proximity to the proposed alignment. To ensure the structures on the properties at 1239 Lakeshore Road East (BHR 1), 999 Lakeshore Road East (BHR 3), 940 First Street (BHR 4), 811 Lakeshore Road East (BHR 5), 1352 Lakeshore road East (BHR 6) and the Arsenal Lands (CHL 1) containing 1352, 1300, and 1300A Lakeshore Road East are not adversely impacted during construction, baseline vibration monitoring should be undertaken in advance of construction. Should this advance monitoring assessment conclude that the structures on these properties will be subject to vibration impacts: (1) plan construction activities to avoid adverse vibration impacts; and where potential adverse vibration impacts cannot be avoided (2) a qualified engineer should include these properties in the condition assessment of structures within the vibration zone of influence for this project.

Summary

Based on the results of the assessment, the following recommendations have been developed:

- Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to identified BHRs and CHL. Avoidance measures may include, but are not limited to: erecting temporary fencing, establishing buffer zones, issuing instructions to construction crews to avoid identified BHRs and CHL, et.

- All of the identified BHRs and the CHL will potentially be affected by short-term disruption resulting from construction activities (i.e., introduction of construction related physical, visual, noise-related, and atmospheric elements). To mitigate short-term disruption to identified BHRs and the CHL resulting from construction activities, the following measures are recommended:
  i. Staging areas should be selected so that they are non-invasive and avoid heritage attributes; and
  ii. Post-construction landscape treatments carried out to restore pre-construction conditions.
- Indirect impacts to identified BHRs and the CHL within 50 m of the proposed limited of impact are possible due to construction activities which may result in limited and temporary adverse vibration impacts to five known and potential BHRs and one known CHLs: 1239 Lakeshore Road East (BHR 1), 999 Lakeshore Road East (BHR 3), 940 First Street (BHR 4), 811 Lakeshore Road East (BHR 5), 1352 Lakeshore Road East (BHR 6), and the Arsenal Lands (CHL 1 containing 1352, 1300, and 1300A Lakeshore Road East). To ensure that identified BHRs and the CHL are not adversely impacted during construction, baseline vibration monitoring should be undertaken in advance of construction. Should this advance monitoring assessment conclude that any features on these properties be subject to vibration impacts: (1) plan construction activities to avoid adverse vibration impacts; and where potential adverse vibration impacts cannot be avoided (2) a qualified engineer should include these properties in the condition assessment of structures within the vibration zone of influence for this project. Further, the Contractor must make a commitment to repair any damages caused by vibrations.
- Should future work require an expansion of the Project Area then a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on potential heritage resources.
- A summary of additional cultural heritage studies required during Detailed Design to address direct or indirect adverse impacts are identified in Table 6-4.
- The Cultural Heritage Report should be submitted to the City of Mississauga and the MHSTCI 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 Mississauga for their records.

Required Cultural Heritage Studies Following TPAP

Table 6-6 is a summary of additional cultural heritage studies recommended by this cultural heritage assessment that are required following the TPAP.

Table 6-6: Required Cultural Heritage Studies Following TPAP

Feature ID	Location / Name	Required Assessment or Next Step
BHR 2	Corner of Lakeshore Road East and Hydro Road	The plaque should be removed prior to construction for safe-keeping and returned to the same general location once work has been completed. Consultation with heritage staff or appropriate municipal department should be undertaken during detail design to determine an appropriate storage and relocation strategy.
BH6	1352 Lakeshore Road East	A Heritage Impact Assessment (HIA) will be undertaken by a qualified person as early as possible in the detailed design phase following the TPAP. It will be developed in consultation with, and submitted for review to, MHSTCI and the municipal heritage planner and/or municipal heritage committee and Indigenous communities, as appropriate. The HIA will discuss the alternatives considered and recommend the alternative to minimize or

Feature ID	Location / Name	Required Assessment or Next Step
		mitigate adverse effects on the property and the HIA should follow the City of Mississauga Heritage Impact Statement Terms of Reference (2012).
CHL 1	Arsenal Lands CHL	A HIA will be undertaken by a qualified person as early as possible in the detailed design phase following the TPAP. It will be developed in consultation with, and submitted for review to, MHSTCI and the municipal heritage planner and/or municipal heritage committee and Indigenous communities, as appropriate. The HIA will discuss the alternatives considered and recommend the alternative to minimize or mitigate adverse effects on the property and the HIA should follow the City of Mississauga Heritage Impact Statement Terms of Reference (2012).

6.6.2 Archaeological Resources

The Stage 1-2 property survey was conducted on November 12, 2012 in accordance with the Ontario Heritage Act and the S & G. Approximately 4.7 percent of the Project Area (0.6 hectares) was previously assessed as having no further archaeological potential due to previous assessment and was not subject to the Stage 2 assessment (TRCA, 2012, 2013b, 2013a, 2016, 2017b). An additional 94.3 percent of the Project Area (11.8 hectares) was determined to have been previously disturbed during the construction of the Lakeshore East right-of-way and the adjacent industrial and commercial properties on its south side, in addition to the channelized watercourses of Applewood Creek and Serson Creek (Figures 9-12; Images 1-18). The Stage 1-2 property survey did not identify any lands with archaeological potential and test pit survey was not conducted.

The remaining portions of the Project Area require further assessment.

Approximately 0.2 percent of the Project Area (0.02 hectares) has been previously recommended for construction monitoring due to the potential for deeply buried deposits (TRCA, 2017b) (Figure 6-1 to Figure 6-3). While there are currently no impacts anticipated for these lands, should any impacts be proposed for these lands through any changes identified during the detailed design phase of the project, all land disturbing activities should be monitoring by a licensed archaeologist. If any intact deposits are identified during the monitoring program, additional Stage 2 survey will be required.

Approximately 0.8 percent of the Project Area (0.1 hectares) comprises a portion of Etobicoke Creek. While no impacts have been proposed for Etobicoke Creek, its archaeological potential must be evaluated following the MHSTCI's Criteria for Evaluating Marine Archaeological Potential checklist if impacts to the creek bed is proposed during the detailed design phase of the project (Figure 6-1 to Figure 6-3).

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

- A portion of the Project Area has been previously recommended for construction monitoring due to the potential for deeply buried deposits (TRCA, 2017b). Should any impacts be proposed for these lands, all land disturbing activities should be monitoring by a licensed archaeologist. If any intact deposits are identified during the monitoring program, additional Stage 2 survey will be required.
- The marine archaeological potential of Etobicoke Creek is to be evaluated following the MHSTCI's Criteria for Evaluating Marine Archaeological Potential checklist if impacts to the river or creek beds are proposed (**Figure 6-1** to **Figure 6-3**).
- The remainder of the Project Area does not require further archaeological assessment; and
- Should the proposed work extend beyond the current Project Area, or should changes to the project design or temporary workspace requirements result in the inclusion of previously un-surveyed lands, these lands should be subject to a Stage 2 archaeological assessment.

Construction Impacts

Notwithstanding the results and recommendations presented in this project, the Project Team notes that no archaeological assessment, no matter how thorough or carefully completed, can necessarily predict, account for, or identify every form of isolated or deeply buried archaeological deposit. In the event that archaeological remains are found during subsequent construction activities, the consultant archaeologist, approval authority, and the Cultural Programs Unit of the Ministry of Heritage, Sport, Tourism and Culture Industries should be immediately notified. The above recommendations are subject to Ministry approval and it is an offence to alter any archaeological site without Ministry of Heritage, Sport, Tourism and Culture Industries concurrence. No grading or other activities that may result in the destruction or disturbance of any archaeological sites are permitted until notice of MHSTCI approval has been received.

Monitoring

It is an offence under Sections 48 and 69 of the Ontario Heritage Act for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological field work on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the Ontario Heritage Act.

Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act.

The Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33, requires that any person discovering or having knowledge of a burial site shall immediately notify the police or coroner. It is recommended that the Registrar of Cemeteries at the Ministry of Consumer Services is also immediately notified.

Archaeological sites recommended for further archaeological field work or protection remain subject to Section 48(1) of the Ontario Heritage Act and may not be altered, nor may artifacts be removed from them, except by a person holding an archaeological license.

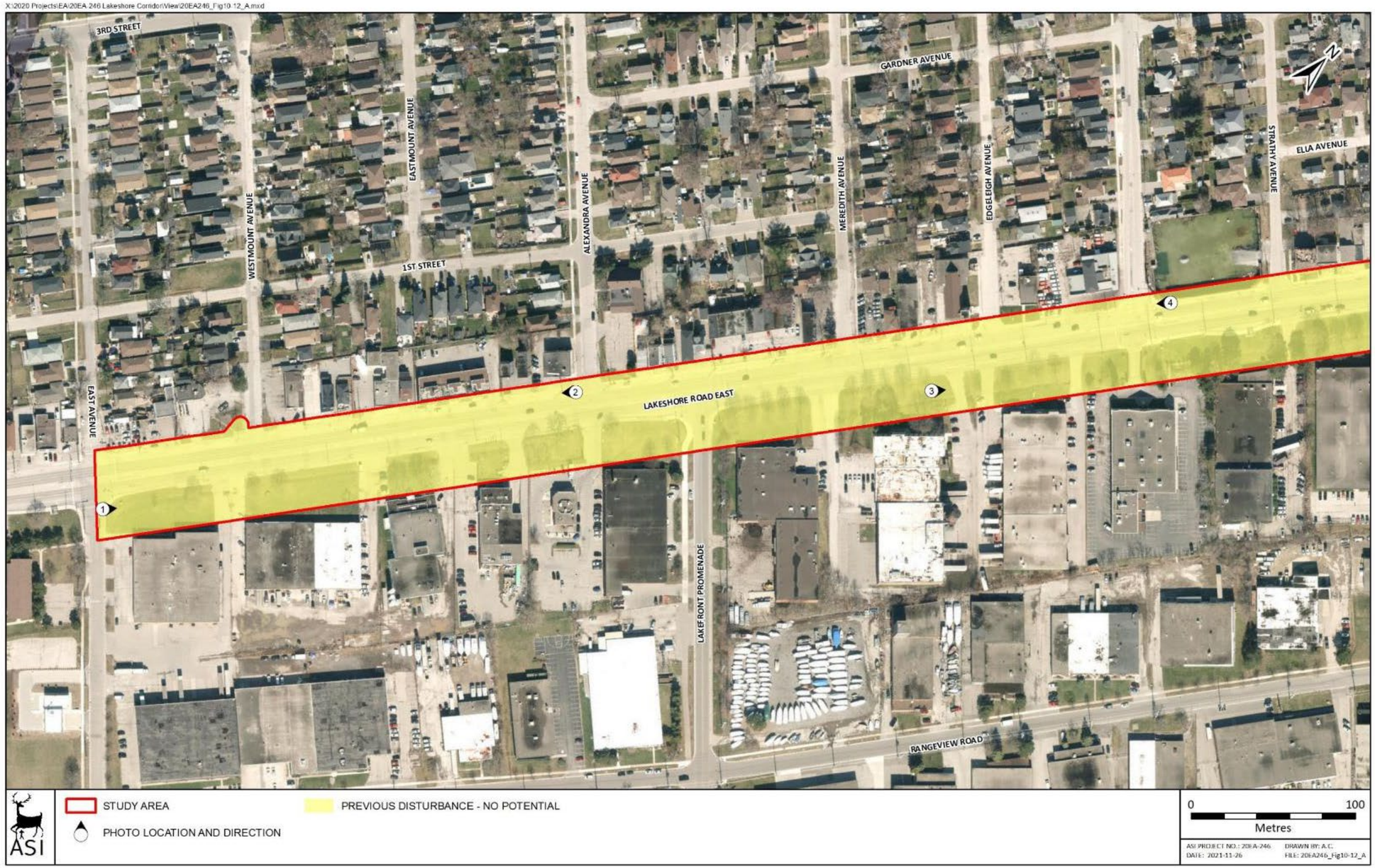


Figure 6-1: Stage 1 Archaeological Assessment (1 of 3)

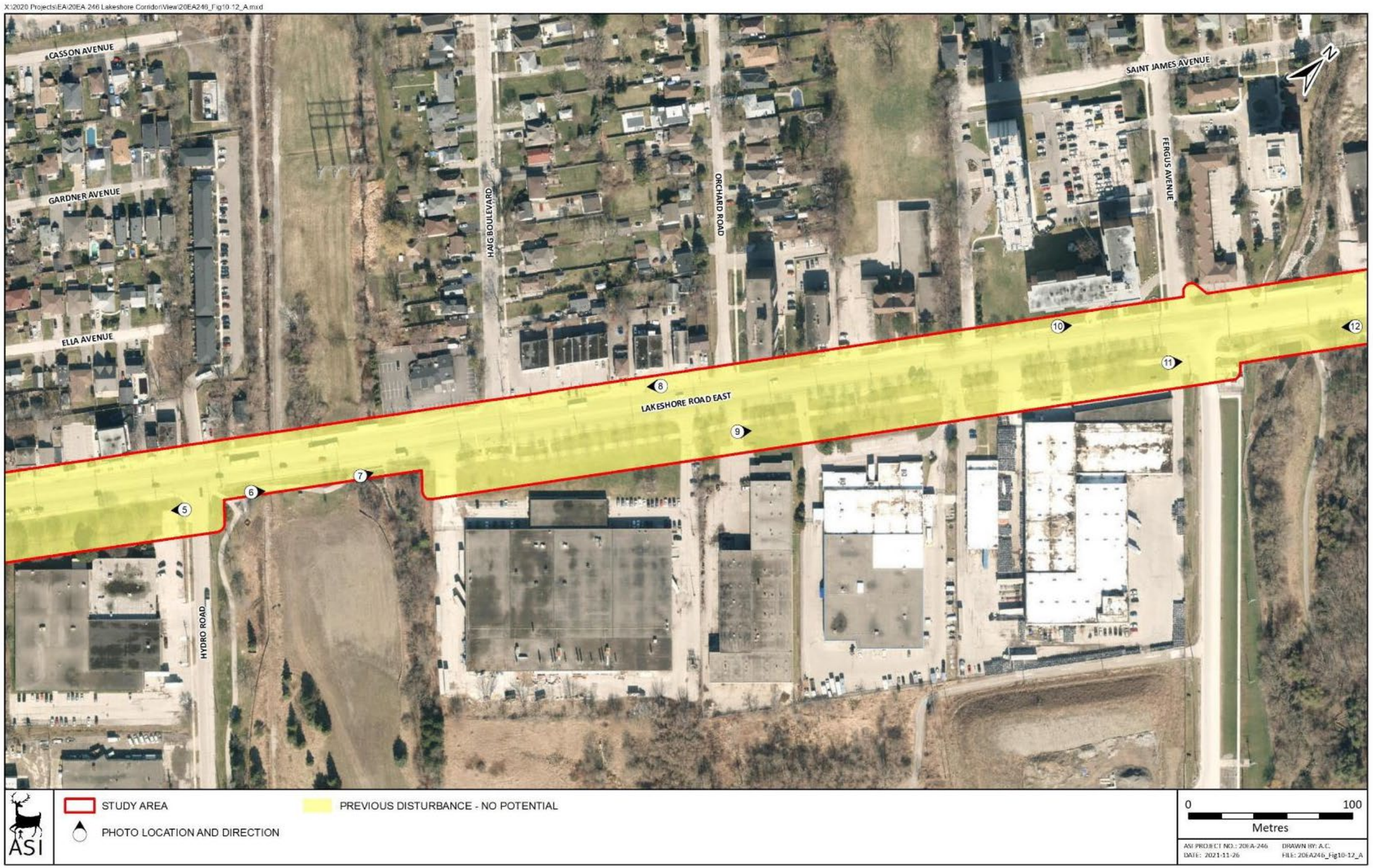


Figure 6-2: Stage 1 Archaeological Assessment (2 of 3)

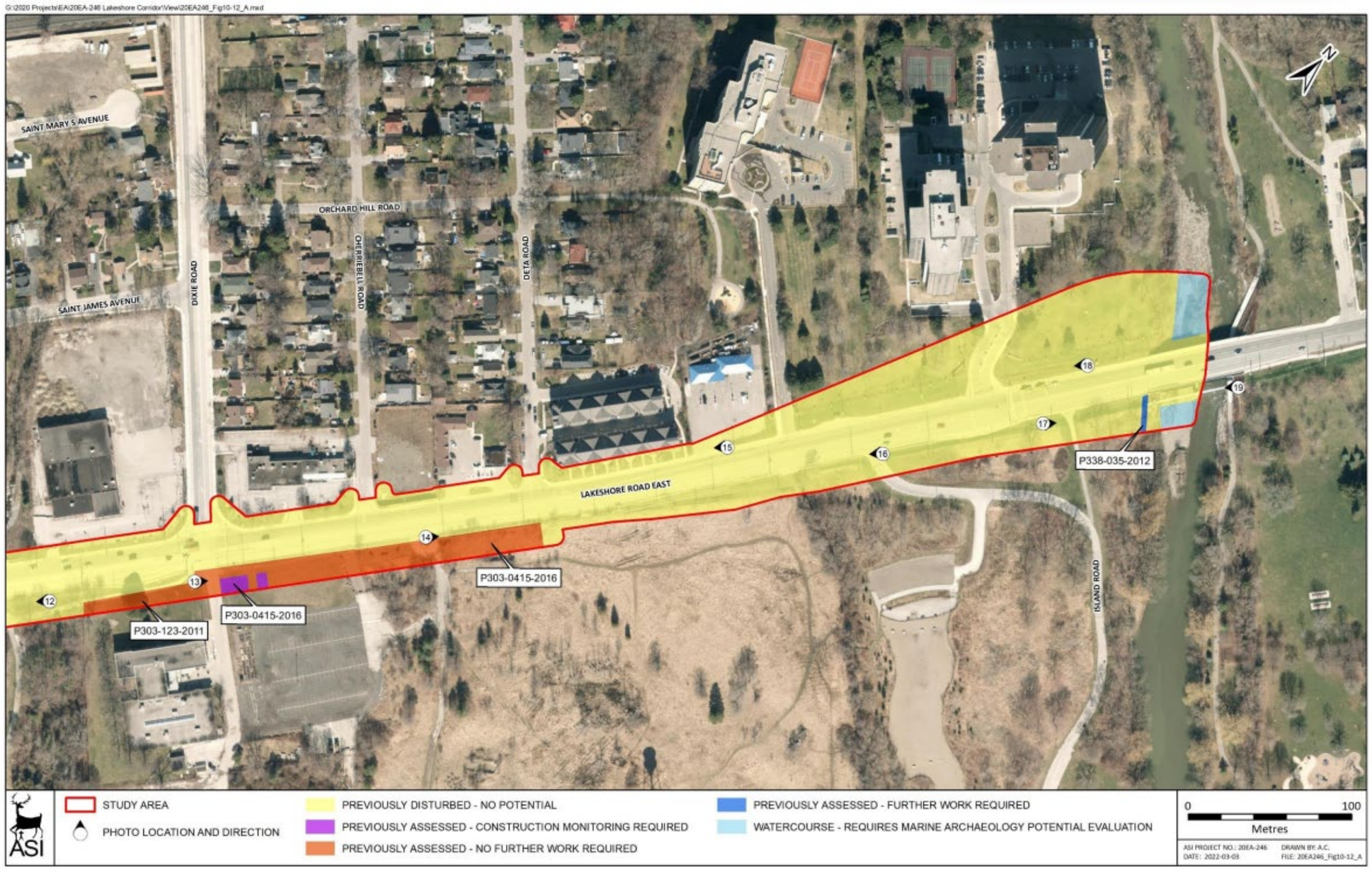


Figure 6-3: Stage 1 Archaeological Assessment (3 of 3)

6.7 Socio-Economic Environment

6.7.1 Land Uses

The proposed Lakeshore BRT project will contribute to guiding and managing growth in the corridor and the City in accordance with the City's, Region's, and Province's objectives identified in Section 2. Through the provision of an efficient and effective sustainable transportation mode of travel in the corridor, the project will support and enable increased opportunities for development, intensification, and revitalization along the corridor, and improve the socio-economic environment overall.

Direct negative impacts of the project on adjacent land uses are discussed under the following sections.

6.7.2 Air Quality

Land uses which are defined as sensitive receptors for evaluating potential air quality effects are:

- Health care facilities;
- Senior citizens' residences or long-term care facilities;
- Childcare facilities;
- Educational facilities;
- Places of worship; and
- Residential dwellings.

Fifteen (15) sensitive receptor locations were selected to be representative of potential impacts within the Project Area. They are mostly residential houses around 50m north of Lakeshore Road, and thus the most likely impacted by the new BRT implementation shown in **Figure 6-4**.

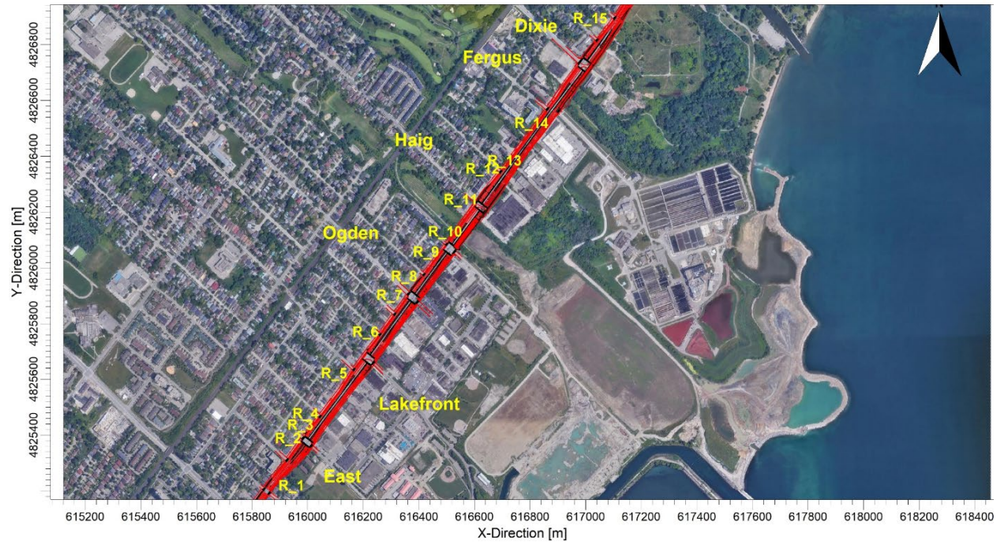


Figure 6-4: Location of Sensitive Receptors

Presented below on a contaminant-by-contaminant basis are the modelling results for the selected No Build (NB) and Future Build (FB) scenarios, based on 5-years of meteorological data. For each contaminant, combined concentrations are presented along with the relevant contribution due to the background and roadway. Results in this section are presented for the worst-case sensitive receptors for each contaminant, averaging period, and modelling scenario (see **Table 6-7**). Results for all modelled receptors can be provided upon request. It should be noted that the maximum combined concentration at any sensitive receptor often occurs infrequently and may only occur for one hour or day over the five-year period.

Table 6-7: Worst-Case Sensitive Receptors for Each Scenario

Contaminant	Averaging Period	Sensitive Receptor	
		2021 NB	2041 FB
CAAQ NO_2	1-hour	14	7
	Annual	13	13
NO_2	1-hour	13	14
	24-hour	13	14
CO	1-hour	13	14
	8-hour	13	14

Contaminant	Averaging Period	Sensitive Receptor	
		2021 NB	2041 FB
$PM_{2.5}$	24-hour	13	8
	Annual	13	8
PM_{10}	24-hour	13	13
TSP	24-hour	13	14
1,3-Butadiene	24-hour	3	2
	Annual	2	2
Formaldehyde	24-hour	2	3
Benzene	24-hour	3	2
	Annual	13	13
Acrolein	1-hour	2	2
	24-hour	2	2
Acetaldehyde	24-hour	3	13
Benzo(a)Pyrene	24-hour	3	3
	Annual	13	13

Greenhouse Gas Assessment

In addition to the contaminants of interest assessed in the local air quality assessment, greenhouse gas (GHG) emissions were predicted from the project. Potential impacts were assessed by calculating the relative change in total emissions between the 2021 No Build and 2041 Future Build scenarios as well the total emission to the 2030 provincial and Canada-wide GHG targets. Total GHG emissions from the roadway were determined based on the length of the roadway, traffic volumes, and predicted emission rates.

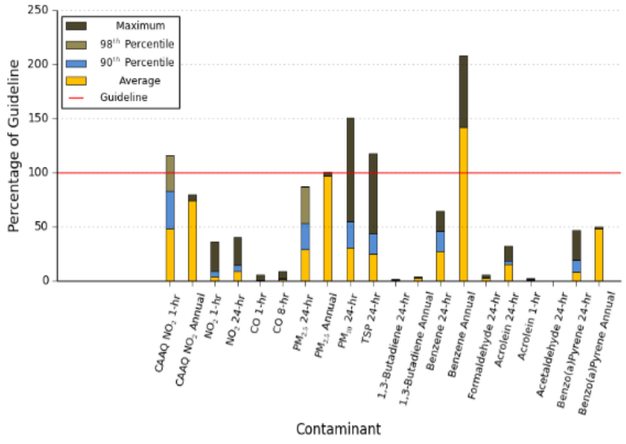
From a GHG perspective, the contaminants of concern from motor vehicle emissions are carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O).

These GHGs can be further classified according to their Global Warming Potential. The Global Warming Potential is a multiplier developed for each GHG, which allows comparison of the ability of each GHG to trap heat in the atmosphere, relative to carbon dioxide. Using these multipliers, total GHG emissions can be classified as CO2 equivalent emissions. For this assessment, the MOVES model was used to determine total CO2 equivalent emission rates for the posted speed and heavy-duty vehicle percentage in the Project Area.

The total predicted annual GHG emissions shows the GHG emissions from the project represent 0.005% of the provincial target and 0.001% of the Canada-wide target. The contribution of GHG emissions from the project is small in comparison to these provincial and national targets.

Results

Presented in **Figure 6-5** is a summary of the worst-case modelling results for the 2041 Future Build scenario based on 5-years of meteorological data. For each contaminant, combined concentrations are presented as a percentage of the applicable guideline. The maximum combined concentrations for the 2041 Future Build were all below their respective MECP guidelines or CAAQS, except for the 1-hr NO2 CAAQ, 24-hr PM10, 24-hr TSP, and annual benzene. Note that background concentrations exceeded the guideline for all of these contaminant averaging periods. The roadway contributions to the total concentrations were found to be small.



5 Year Statistical Summary	% of Guideline
	2041 FB
CAAQ NO_2 (1-hr)	117%
CAAQ NO_2 (Annual)	80%
NO_2 (1-hr)	36%
NO_2 (24-hr)	41%
CO (1-hr)	6%
CO (8-hr)	10%
$PM_{2.5}$ (24-hr See Note)	88%
$PM_{2.5}$ (Annual)	97%
PM_{10}	151%
TSP	118%
Acetaldehyde	<1%
Acrolein (1-hr)	3%
Acrolein (24-hr)	33%
Benzene (24-hr)	68%
Benzene (Annual)	208%
1,3-Butadiene (24-hr)	2%
1,3-Butadiene (Annual)	4%
Formaldehyde	6%
Benzo(a)Pyrene (24-hr)	48%
Benzo(a)Pyrene (Annual)	51%

Notes: The $PM_{2.5}$ results are in compliance with the CAAQS; the highest 3 year rolling average of the yearly 98th percentile combined concentrations were calculated to be 23.91 µg/m³ or 89% of the CAAQS. Background concentrations not included for benzo(a)pyrene.

Figure 6-5: Worst-Case Summary of Predicted Combined Contaminant Concentrations

Air Quality Impacts During Construction

During construction of the roadway, dust is the primary contaminant of concern. Other contaminants including NOx and VOC's may be emitted from equipment used during construction activities. Due to the temporary nature of construction activities, there are no air quality criteria specific to construction activities. However, the Environment Canada "Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities" document provides several mitigation measures for reducing emissions during construction activities. Mitigation techniques discussed in the document include material wetting or use of non-chloride dust suppressants to reduce dust, use of wind barriers and limiting exposed areas which may be a source of dust, and equipment washing. It is recommended that these best management practices be followed during construction of the roadway to reduce any air quality impacts that may occur.

6.7.3 Noise and Vibration

The noise and vibration impact analysis process is described in Section 4.7.3. The results of the noise analysis show that changes in sound levels resulting from the proposed project are expected to range from plus 0.3 to minus 1.2 dBA.

This is considered a very small change in sound level. It takes approximately a 3 dBA change in sound levels before most persons perceive a change, therefore the slight increases or decreased in sound levels are expected to be imperceptible.

The loudest predicted sound levels are at Receptors 13 and 14 with are at apartment buildings located close to Lakeshore Road East that are more directly exposed to noise from both the current and future Lakeshore Road East which is the dominant noise source for these homes. The future sound levels will be in the approximate 63 to 67 dBA range. Most of the homes are in the second row of buildings behind a row of commercial buildings fronting on Lakeshore Road East. Due to the new location of Lakeshore Road East moving southerly, the sound levels for most of the homes will decrease slightly in the future.

The noise impact of the BRT running along the centre of the future right-of-way will be insignificant because of the relatively high road traffic volumes on Lakeshore Road East.

Table 4-19 presents a comparison of predicted 2041 "no-build" versus 2041 "build" sound levels at receptors in the Project Area during the 16-hour daytime period. The "no-build" assumes that there are no roadway improvements, and the "build" assumes that the roadway improvements are in place including the proposed BRT on Lakeshore Road East.

Mitigation

There was no quantitative examination of placing new noise barriers to mitigate any changes in noise levels. Noise impacts are extremely minor and below the 5 dBA impact criteria in the Noise Protocol. The 'as-built' sound levels are less than the 60 dBA criteria for all the homes except for Receptors 13 and 14.

It is not possible to construct noise barriers for these two receptor locations because of existing building entrances and roadways in the vicinity of the NSA's. No noise mitigation is recommended for this project.

Construction Noise

Construction noise impacts are temporary in nature, and largely unavoidable. Although for some periods and types of work, construction noise may be noticeable, with adequate controls, impacts can be minimized. To minimize the potential for construction noise

impacts, it is recommended that provisions be written into the contract documentation for the contractor, as outlined below:

- Where possible construction should be carried out during the normally allowed hours specified in the by-law found in **Appendix I**. If construction activities are required outside of these hours, the Contractor should minimize the amount of noise being generated to not be clearly audible in any noise sensitive areas.
- There should be explicit indication that the Contractor is expected to comply with all applicable requirements of the contract.

All equipment should be properly maintained to limit noise emissions. As such, all construction equipment should be operated with effective muffling devices that are in good working order. This is also a requirement of the local noise control by-laws.

6.7.4 Property

Property takings will be required where the design of the BRT extends beyond the existing right-of-way (ROW). Based on the functional design, a total of 7 properties are anticipated to be impacted to accommodate road widening for the proposed BRT and associated public realm improvements (including local transit stops). Of the impacted properties, no full property acquisitions are anticipated; impacts are limited to property frontage and, in some cases, parking. The list of property impacts is summarized in **Table 6-8**.

The final number of property takings will be confirmed during a future design phase and property owners will be contacted to discuss the project and proposed acquisitions.

Mitigation

Consultation with property owners regarding property acquisition will be initiated closer to the time of construction. The City will work with property owners to negotiate fair market value of the land and address the project impacts (e.g., repairing or replacing landscaping, fencing, or paving). The City will work to acquire property on a willing buyer/willing seller basis. If such an agreement cannot be reached, the process set out in the Ontario Expropriations Act will be followed to ensure the rights of property owners provided under the Act are protected.

Construction

While the overall impacts of the proposed BRT to the community are expected to be positive, there will be impacts that cannot be avoided during construction. These include temporary lane closures, access modification, and temporary construction easements.

In order to best mitigate those impacts on properties, the following measures will be employed:

- Construction along Lakeshore Road will be staged to minimize adverse effects on businesses and residents along the corridor, to the extent feasible while maintaining a reasonable construction schedule. Prior to construction, a traffic management plan will be required to be developed by the contractor to ensure impacts to traffic and access to properties are minimized. Input from adjacent property owners should be sought and considered in the development of the plan.
- Traffic detouring will be implemented during construction to minimize community effects.

Table 6-8: Preliminary Property Impacts

PIN number	Address	Ownership	Permanent Acquisition (m^2)
P.I.N. 13485-0758(LT)	1082 lakeshore Rd. East	Lakeview Community Partners Limited	2376
P.I.N. 13485-0758(LT)	1082 lakeshore Rd. East	Lakeview Community Partners Limited	286
P.I.N. 13485-0729(LT)	N/A	The Region of Peel	40
P.I.N. 13485-0729(LT)	N/A	The Region of Peel	920
P.I.N. 13482-0470(LT)	1381 lakeshore rd. East	City Park (Lakeshore) Inc.	134
P.I.N. 13485-0749(LT)	1352 lakeshore rd. East	City of Mississauga	2350
P.I.N. 13485-0750(LT)	1440 lakeshore rd. East	TRCA	405
Total			**6511**

Property impacts listed in table are preliminary and are subjected to change.

A Property Requirements Plan is enclosed in **Appendix J.**

6.8 Transportation

Based on the City's travel demand modelling outputs, (Emme Link Volumes) future traffic growth rate was estimated using the existing (2016) and future (2041) models. TIS reports received from the City were also reviewed to ensure accurate traffic growth within the Project Area. The following developments were reviewed:

- Lakeview development
- 857 & 859 Lakeshore Road East
- 1345 Lakeshore Road East
- 1381 Lakeshore Road East
- Stonebrook Condos
- 70 Mississauga Road South and 181 Lakeshore Road West
- 958-960 East Avenue

The estimated traffic growth rates along Lakeshore Road within the TPAP Project Area are presented in **Table 6-9**.

Table 6-9: Annual Traffic Growth Rate Summary (2016 to 2041)

Lakeshore Road Intersection at	AM Peak Hour		PM Peak Hour	
	EB	WB	EB	WB
East Ave	0.2%	2.5%	2.1%	0.5%
Alexandra Ave	0.1%	3.4%	2.4%	0.6%
Ogden Ave	0.4%	0.0%	2.9%	1.5%
Haig Blvd	1.7%	-0.6%	1.3%	1.9%
Dixie Rd	1.6%	-1.0%	1.1%	0.9%
Brow Dr /Forty First St	0.6%	-0.6%	-0.1%	0.8%

A negative traffic growth rates are observed for the westbound direction east of Haig Boulevard during the morning peak hour. Considering a conservative traffic condition without underestimating future traffic volumes, no traffic growth was assumed in this project for the westbound direction east of Haig Boulevard during the morning peak hour.

Future (2041) Traffic Volumes

Using the estimated traffic growth rates, future (2041) traffic movements volumes was estimated at all intersections within the TPAP. The estimated volumes are presented in **Figure 6-6,** for both AM and PM peak hour conditions.

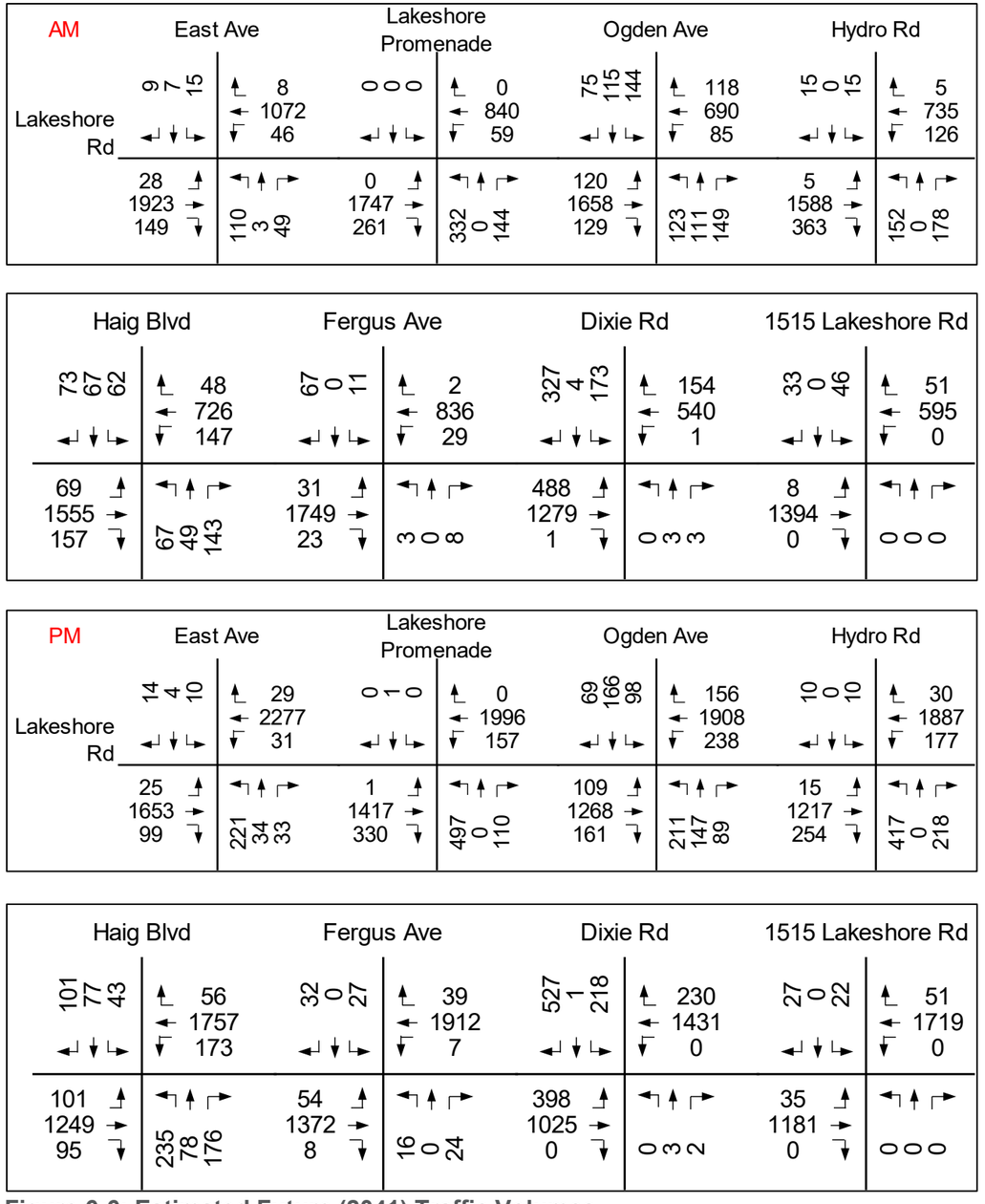


Figure 6-6: Estimated Future (2041) Traffic Volumes

As reported within the TIS reports, it is assumed Hydro Road will be a signalized intersection and a new south leg of Haig Boulevard will be constructed to provide access to new developments south of Lakeshore Road.

Future (2041) Traffic Operational Analysis

The traffic operational analysis for the intersections within the TPAP Project Area was performed using Vissim micro-simulation model with the proposed center median BRT. Mid-block left turns are banned and left turns at signalized intersection are to be operated in a protected phase only. To accommodate future BRT operation, transit signal priority (TSP) was employed for the east-west through movements assuming 10 seconds of early/extend green time.

Preliminary lane configurations derived from the Lakeshore TMP design plan for the TPAP segment (between East Avenue and City boundary) was considered in the analysis. Additionally, new dedicated turning lanes at minor approaches recommended by the Lakeview Developments TIS was also considered. These include, dedicated westbound right turn lane at Cawthra Road and at Dixie Road, dedicated eastbound right turn lane at Lakefront Promenade, and dedicated northbound left and right turn lanes at East Avenue, Lakefront Promenade, Ogden Avenue, Hydro Road, and Haig Boulevard.

A summary of future 2041 traffic conditions for both AM and PM traffic peak hours is presented in **Figure 6-7** and **Figure 6-8** respectively.

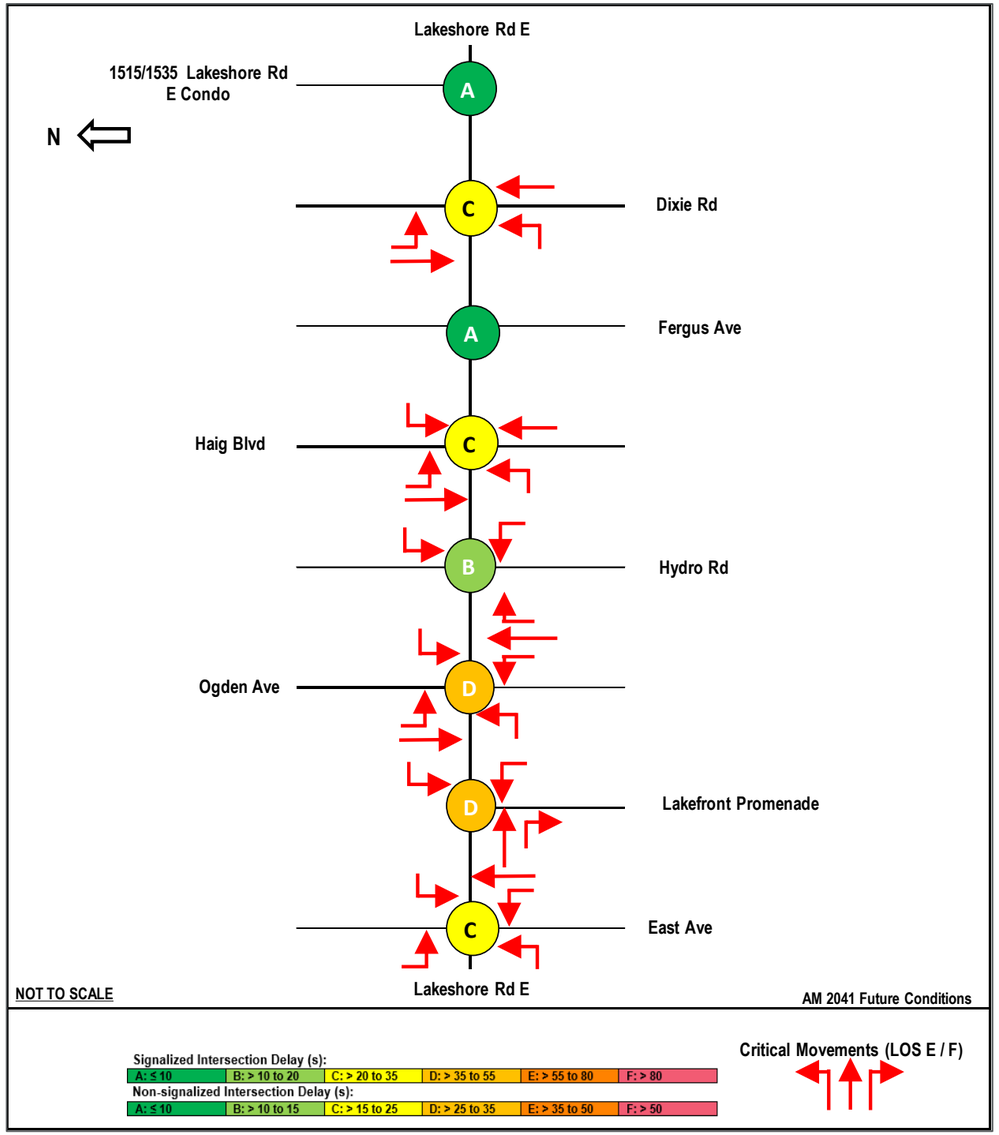


Figure 6-7: AM Future 2041 Traffic Condition

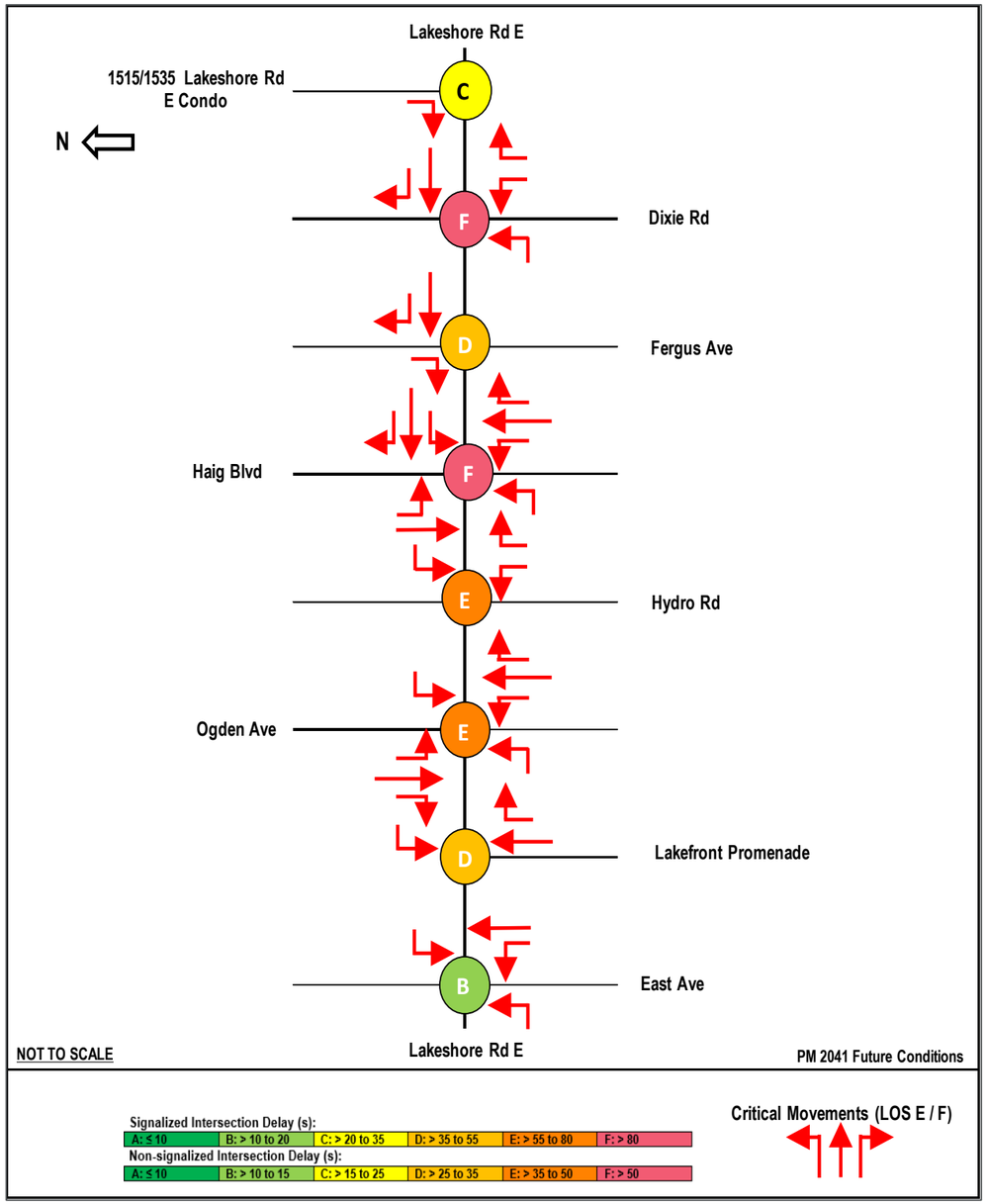


Figure 6-8: PM Future 2041 Traffic Conditions

The results from the models during the future weekday AM peak hours showed:

- All intersection within the TPAP Project Area is operating at LOS D or better.
- Critical movements along Lakeshore Road consist of all left turns except eastbound left at Hydro Road and westbound left at Dixie Rd. This is due to operational nature of protected lefts and reduction in splits during TSP calls reducing left turning capacity.
- Most critical movements are limited to minor intersection approaches. As significant developments are expected to occur south of Lakeshore, volumes from the minor intersection are significantly higher than what the corridor is expected to experience currently. In addition, TSP calls from the BRT reduced available green time to minor approach. This results in high vehicle delays for minor intersection movements.

The results from the models during the future weekday PM peak hours showed:

- Intersections are operating poorly within the TPAP Project Area with most signalized intersections operating at LOS D or worse.
- Most intersection movements within the median BRT are operating at LOS E or F. Future growth, reduction in left turning capacity and TSP calls for BRT contribute significant delays within the corridor.
- Queuing was observed along the entire corridor with major issues at the southbound direction at Dixie Road and westbound direction at Haig Blvd.

Transportation Mitigation Measures

Based on the preliminary analysis results, additional lane configuration improvements were identified to reduce delays and improve traffic operations along Lakeshore Road. Considering the property constrains within the ROW, dedicated right turn lanes were recommended for selected shared through/right lane with high volume to capacity (v/c) ratio over 1.0 in the preliminary analysis. The identified movements and their associated v/c ratios with and without the dedicated right turn lane are presented in **Table 6-10**.

Table 6-10: Identified Movements for Dedicated Right Turn Lane

Movements	Peak Hour	V/C Ratios		
		Shared Through/Right	Through and Dedicated Right	
East Ave-EB	AM	1.00	0.97	0.16
Ogden Ave-EB	AM	1.12	1.04	0.16

Movements	Peak Hour	V/C Ratios		
		Shared Through/Right	Through and Dedicated Right	
Ogden Ave-WB	PM	1.24	1.13	0.19
Haig Blvd-EB	AM	1.00	0.91	0.17
Haig Blvd-WB	PM	1.11	1.06	0.09

6.8.1 Transit

The existing local route 23 will continue to operate in this corridor. Since the proposed BRT improvements are for the express route, the local route would be travelling in mixed traffic. However, sharing the demand with a parallel express route reduces the passenger load, which is expected to result in improved crowding and dwell times, shown in **Figure 6-9** and **Figure 6-10**.

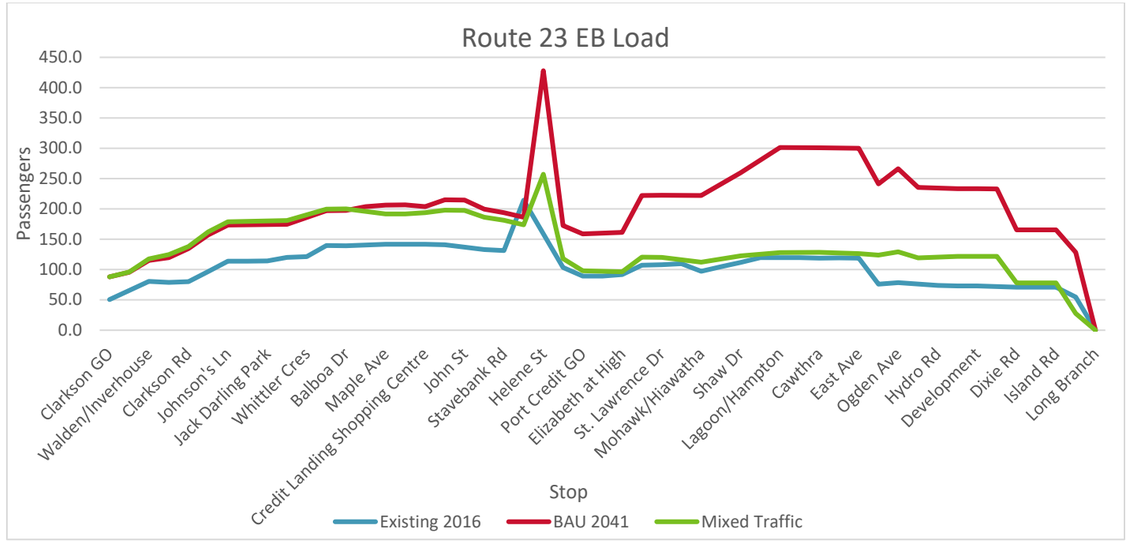


Figure 6-9: AM Peak Period Ridership for Route 23 EB

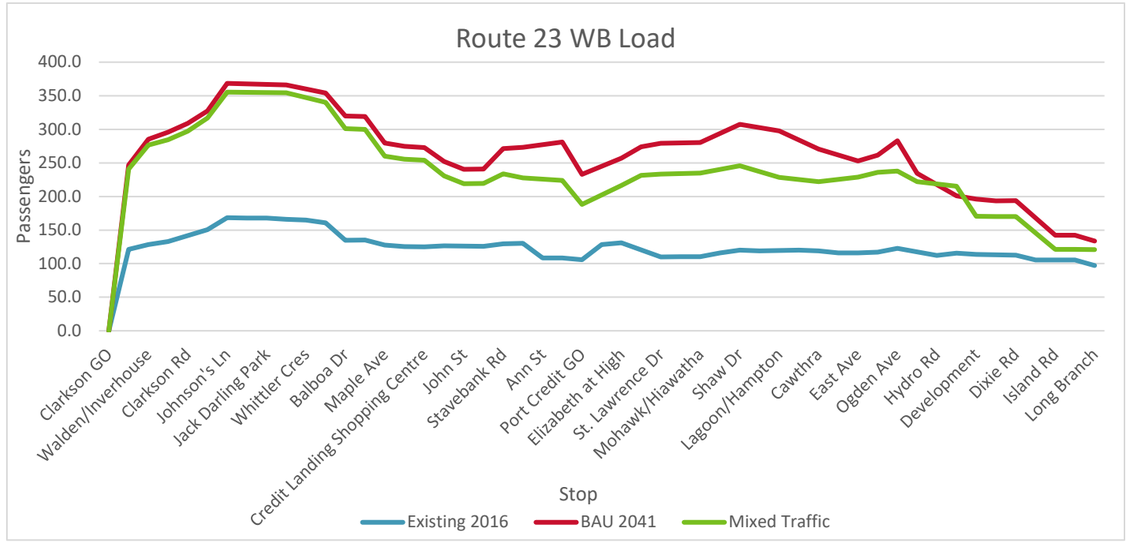


Figure 6-10: AM Peak Period Ridership for Route 23 WB

6.8.2 Active Transportation

The project will result in an overall improvement in Active Transportation levels-of-service, through the introduction of continuous and enhanced cycling infrastructure throughout the corridor. The provision of separated, dedicated cycling infrastructure is anticipated to improve the comfort level and safety for cyclists in the Project Area. Pedestrian operations will be separated from cyclists with the provision of dedicated sidewalks throughout the entire corridor as well.

The project will result in impacts to the existing Lakefront Trail system between (approximately) Hydro Road and west of Dixie Road, as the expanded roadway will encroach on the trail. In order to mitigate this impact, the project includes the construction of a new, two-way cycle track and separate sidewalk through that section, ensuring that the trail can continue to function as a two-way, active transportation link in the broader trail network.

The project may result in minor Impacts to the Region's on-street cycle lanes at Dixie Road associated with the general intersection works at the Lakeshore Road East/Dixie Road intersection. The cycle lanes at the intersection will be maintained to the extent feasible during construction, and reinstated as-is following construction. During construction, alternate cycling paths/detours will be identified and signed to guide cyclists safely around areas of construction while maintaining a reasonable degree of access.

In addition, new north-south cross-rides will be provided at the Dixie Road intersection to connect the north-south cycle lanes on Dixie Road with the east-west cycle tracks on Lakeshore Road East.

6.8.3 Streetscape and Landscaping

Widening of the roadway and reconstruction of the sidewalk/boulevard area within the right of way will impact existing street trees and pedestrian/cyclist infrastructure. The impacted trees are discussed in detail in **Section 6.2.**

Opportunities to incorporate new landscaping throughout the corridor are indicated on the corridor plan in **Appendix J**. Generally, landscaping (street trees) will be confined to plantings in soil cells within the boulevard. Plantings will have to be coordinated with the needs of illumination and utility poles also placed within the boulevard throughout the corridor. Roadway sections that can accommodate such plantings are generally:

- Greaves Avenue to Lakefront Promenade;
- Lakefront Promenade to Haig Boulevard (south side only); and
- Orchard Road to Etobicoke Creek.

On the approaches to signalized intersections throughout the corridor, however, due to the widening of the roadway to accommodate auxiliary turning lanes, there remains no space to accommodate plantings.

Municipal services, including watermains, storm sewers, and sanitary sewers in the Project Area are generally located under the roadway or under the boulevard on the south side of Lakeshore Road. Underground utilities will be impacted throughout the corridor, particularly at BRT stops and in landscaped boulevard areas, and have to be relocated. Underground municipal service crossings under planned BRT stop locations should be considered for relocation under the detailed design phase of this project in order to address future challenges in accessing the services in the event of a maintenance requirement. Where service crossings cannot be relocated away from the stops, they should have a protective sleeve and additional isolation valves or maintenance hole structures. The specific utility impacts are discussed in further detail in **Section 6.9.**

The City will work with utility owners throughout the detailed design phase to identify a mutually-agreeable scheme for relocation of utilities, including consideration of a joint use utility bank (per City standard 2211.280). The specific utility relocation treatment will be defined as part of the detailed design phase of the project, limiting the ability to quantify the number of plantings achievable at present.

6.8.4 Parking and Access

Access

As discussed in **Section 5.7**, access to developments in the corridor will be maintained upon implementation of the project. The implementation of the proposed BRT will, however, result in the restriction of mid-block left-turns throughout the corridor. All mid-block accesses will be restricted to right-in/right-out operation upon the implementation of the median BRT facility. The impacts to such access are mitigated through the introduction of protected U-turn movements at all signalized intersections.

Parking

While every effort has been made to minimize the impacts of the project on area parking, there are localized areas where impacts are unavoidable give the constraints of the corridor and competing objectives for limited space. Most of these impacts are associated with the introduction of auxiliary lanes at selected intersections.

Of note are the following anticipated parking impacts (**Table 6-11**):

Table 6-11: Estimated Impacted Parking Facilities

ID	Address	Ownership	Estimated Parking Spaces Impacted	Reason
1	825 Lakeshore Road East	Private	3	Local Bus Stop
2	797 Lakeshore Road East (Municipal Parking Lot #16)	Municipal	8	Roadway widening
3	939-B Lakeshore Road East	Private	2	Local Bus Stop
4	941-A Lakeshore Road East	Private	2	Local Bus Stop
5	1165 Lakeshore Road East	Private	4	Local Bus Stop / Auxiliary Lane
6	1167/1169 Lakeshore Road East	Private	2	Local Bus Stop / Auxiliary Lane
7	1171/1173 Lakeshore Road East	Private	2	Auxiliary Lane
8	1177 Lakeshore Road East	Private	3	Auxiliary Lane
9	1179/1181 Lakeshore Road East	Private	4	Auxiliary Lane
		TOTAL	**22 Private 8 Municipal**	

Throughout the detailed design process, the City will work with affected property owners to discuss the necessary measures needed for project implementation.

Regarding the City-owned parking lot (ID 2), the existing lot serves as short-term (15-hour) parking for the adjacent development, which is being redeveloped in the near term as part of the approved Region of Peel housing project at 958-960 East Avenue. The proposed development includes a mix of both underground and surface parking for residents, and surface parking for visitors.

6.9 Utilities and Municipal Services

6.9.1 Potential Impacts

While effort has been made in the development of the design concept to minimize impacts on utilities, given the constrained right-of-way and resulting inflexibility in placement of desirable physical infrastructure, there is limited ability to avoid impacts to some existing utilities in the Project Area. The proposed Lakeshore BRT corridor plan is anticipated to impact both utilities and municipal services.

The preliminary design presented herein was reviewed against the SUE mapping discussed in **Section 4.9** to identify potential conflicts between the proposed works and existing utilities in the Project Area. The following list summarizes the anticipated utility and municipal service conflicts, and in the preliminary utility conflict plan illustrated in **Appendix K.1** and as discussed in the Construction Staging and Implementation Report enclosed in **Appendix N.**

Alectra Utilities (Hydro)

Currently the hydro (electrical) transmission and associated servicing lines fall on the north side of Lakeshore Road from the west limit of Part A to Meredith Avenue, where they transition to the south side of the road and continue on the south side to the east limit of Part A. There are several attachments to each pole, generally consisting of nine (9) primary attachments, 2-3 third party attachments, transformers (at select locations), overhead lighting (including associated power supplies), and pole anchors (at select locations). In addition, there are a variety of underground connections to adjacent developments that are currently in place.

All existing hydro poles and a portion of the underground service connections conflict with the proposed work and will need to be relocated. As the relocation needs to be completed before construction commences, It is recommended that the entire hydro pole network be relocated to the south side of the road where there is sufficient available property between the existing road and the adjacent development to relocate while the existing network remains in service. The existing lighting should remain until the reconstruction begins by ‘cutting off’ the tops of the poles after the new hydro line has been constructed. This will permit lighting levels of the existing road to remain until the new lighting has been installed and activated. Clearing of trees will be needed in advance of the installation of the hydro poles to provide the work zone necessary for the hydro relocation work. Additional coordination with Alectra will be required to confirm the specifics of the relocation works, including cost sharing agreements and relocation schedule. Construction duration for the hydro relocation works is expected to take a minimum of 6-8 months.

Bell and Rogers

Both Bell and Rogers are largely expected to remain at their existing locations, however relocation of several above ground facilities (such as pedestals and boxes) will be required. In addition, any maintenance holes or similar that fall within the proposed travelled way will need to be reviewed to determine if they can withstand traffic loading.

Similar to Alectra, relocation should be scheduled to occur prior to commencement of construction. Additionally, a joint use corridor has been identified under the cycle track / sidewalk on the south side of the road for any future expansion of either Bell or Rogers. The specifics of the joint use corridor should be confirmed as early as possible in the next phase of design. Additional details specific to the Bell/Rogers relocation works (such as site preparation, cost sharing, and schedule) should be confirmed. Construction duration for Bell/Rogers is expected to take a minimum of 4-6 months.

Enbridge Gas

There are several Enbridge gas lines located within the study area, which generally follow the north and south property lines. It is anticipated that, except for a few isolated locations, the existing Enbridge lines on the north side will not be in conflict with the proposed works. The existing gas line on the south side will need to be relocated to permit space for the proposed tree planting as per the landscaping plan. Exact elevations of the gas lines in relation to the proposed work (in particular the proposed storm sewer) should be evaluated in detail as part of the next phase of design.

Watermain

There are a variety of existing watermain and servicing throughout the study corridor. Relocation of watermain is not anticipated as part of this project. However, there are several conflicts identified with the access points to the various underground chambers. Access points will need to be adjusted to accommodate any grade changes. Additionally, there are several hydrants that conflict with the proposed widening which will need to be relocated. Peel Region has jurisdiction over the watermain network and will need to be consulted on the specifics of the proposed access point adjustments and hydrant relocation as part of the next phase of design.

Sanitary Sewers

Similar to the watermain, there are several sanitary sewers that run along Lakeshore Road. The existing sanitary sewer network is not in conflict with the proposed work and will remain in place. However, several of the existing maintenance holes are in conflict with the proposed work and adjustments will be needed to accommodate the proposed grade changes. Peel Region has jurisdiction over the sanitary sewer system and will need to be consulted on the specifics of the proposed adjustments as part of the next phase of design.

Overhead Lighting

The overhead lighting in the study area is largely provided by luminaires attached to the hydro poles and is further supplemented by stand-alone lighting. The portions of the existing hydro poles that support the overhead lighting should be maintained after the relocation of the existing poles is completed as existing lighting levels will need to be maintained at all times during construction. The proposed improvements shall be phased such that the new lighting can be installed while the existing lighting fixtures remain in operation. For situations where the existing lighting cannot be maintained until the new fixtures are installed and operating, temporary lighting will be required and should be factored into the design and associated contract package.

6.9.2 Mitigation Measures

The preliminary utility conflicts identified in the list above will be reviewed and confirmed or updated as appropriate during the detailed design phase of the project. All affected private utility owners shall be engaged to coordinate the specific design of required relocations (both interim and permanent) during the detailed design phase of the project. Utilities crossing the corridor to be relocated should not be placed under the proposed BRT stop platforms, as access to these areas for maintenance or repairs will not be feasible given the presence of transit stop infrastructure.

The process of revising, relocating, and reconstructing utilities will be designed and managed by the respective utility owner, to reflect the Lakeshore BRT design requirements, at the detailed design stage of the project.

Utility relocation will be the first step in establish a clear zone for construction. Aerial lines are normally first to be shifted, followed by buried infrastructure. Where possible, utilities should be relocated to their ultimate position to avoid multiple shifts during the construction period. Multiple utility contractors will not be permitted to work at the same time simultaneously; the sequencing and timing of their work will have to be carefully scheduled to avoid conflicts.

Any relocation of municipal services will have to be undertaken in accordance with the City of Mississauga and Region of Peel standards. City of Mississauga and Region of Peel staff will be engaged at the onset of detailed design to ensure that relocation of Municipal Services is completed in accordance with the owner’s requirements and in coordination with other planned works.

The impacts of utility relocations on customers should be minimized by scheduling utility relocations and associated service shutdowns to low usage periods, to the extent feasible. Ample notification should be provided to customers, in accordance with each specific utility owner's requirements, as far in advance of the proposed work as possible to enable customers' planning around the temporary outages.

The construction of relocated utilities should apply best-practice measures and methods to reduce the impact of dust, noise, and detours.

Given the significant number of utilities located within the existing sidewalks and boulevards, particular consideration will have to be given to ensuring continued access (as much as feasible) and/or convenient detours for pedestrians and cyclists through/around the proposed work. A Utility Relocation Plan is enclosed in **Appendix K.2.**

6.10 Source Water Protection

Potential threats associated with the BRT Project as identified in the CTC Source Protection Plan (2019) include:

- The establishment, operation, or maintenance of a system that collects, stores, transmits, treats, or disposes of sewage (limited to stormwater runoff)
- The application of road salt
- The storage of snow (limited to roadway clearing operations only)

Table 6-12 lists HDR staff's preliminary findings regarding applicable regulatory policies prescribed by the CTC Source Protection Plan (2019) and potential mitigation measures for each of the three threats identified above.

A meeting with CTC Source Protection staff was held on April 26. 2022. to present the project team's understanding of the existing conditions, potential threats, applicable policies as well as proposed mitigation measures as part of this Project. CTC staff confirmed the project team's understanding regarding source water protection and approved of the proposed mitigation measures. Minutes from this meeting can be found in **Appendix L.3.**

Table 6-12: Source Water Protection Policies and Mitigation Measures

Threat	Policy	Mitigation Measure
The establishment, operation, or maintenance of a system that collects, stores, transmits, treats, or disposes of sewage (limited to stormwater runoff)	No policies apply to the Project Area	Stormwater management measures within the project limits will be designed to provide enhanced water quality treatment, as a minimum, for the increased pavement area as a result of roadway widening/improvements. The recommended low impact development (LID)/ best management practice (BMP) options for stormwater management include: • Bioretention cells to provide quality control, which could be tree planters or landscaping with a trench filled with lightly compacted soil underneath within the roadway boulevard areas • Online storage pipes to provide quantity control such as oversized storage pipes with flow control devices upstream of the discharge location to provide peak flow control in combination with allowable surface ponding for major flows Other potential BMP measures to support the treatment train approach to be considered during detailed design: • Infiltration trenches • Vegetated filter strips • Oil-grit separator units Detailed mitigation measures can be found in **Appendix D**.
The application of road salt	**SAL-10** *Non legally binding* Where the application of road salt would be a moderate or low drinking water threat, the planning approval authority is encouraged to require a salt management plan, which includes a reduction in the future use of salt, as part of a complete application for development which includes new roads and parking lots in any of the following areas: Such plans should include, but not be limited to, mitigation measures regarding design of parking lots, roadways and sidewalks to minimize the need for repeat application of road salt such as reducing ponding in parking areas, directing stormwater discharge outside of vulnerable areas where possible, and provisions to hire certified contractors. **SAL-13** *Non legally binding* Where the application, handling and storage of road salt is, or would be, a moderate or low drinking water threat, the municipality is requested to report the results of its sodium and chloride monitoring conducted under the Safe Drinking Water Act and any other monitoring programs annually to the Source Protection Authority. The Source Protection Authority shall assess the information for any increasing trends and advise the Source Protection Committee on the need for new source protection plan policies to be developed to prevent future drinking water Issues, in any of the following areas: WHPA-A (VS = 10) (existing, future); or WHPA-B (VS ≤ 10) (existing, future); or WHPA-C (existing, future); or WHPA-D (existing, future); or WHPA-E (VS ≥ 4.5 and <9) (existing, future) HVA (existing, future); or SGRA (VS ≥ 6) (existing, future).	
The storage of snow (limited to roadway clearing operations only)	No policies apply to the Project Area	

6.11 Summary of Impacts, Mitigation Measures, and Impact Monitoring

Table 6-13 summarizes the impacts, mitigation measures, and monitoring requirements associated with the Lakeshore BRT project

Table 6-13: Impact Assessment Summary

Assessment Factor	Potential Impact	Mitigation Measures	Monitoring Requirements
Natural Environment			
Fish and Fish Habitat	**Intermediate** • In-water works will result in temporary and permanent alteration/loss of fish habitat (especially within the Serson and Applewood Creek culvert extension areas) **Construction** Fugitive dust accidental spills (e.g., fuel) • Erosion and sedimentation • Temporary impacts to fish passage and fish habitat • Increased noise and human presence • Incidental intake of fish species while performing in water works	• Coordinate the timing of project activities to mitigate the impacts on the aquatic environment. Recommended measures **1A to 4A** are detailed in **Section 6.1.2** • Implement construction best practices to reduce the potential of spills or other materials/equipment entering the aquatic environment. Recommended measures **1B to 6B** are detailed in **Section 6.1.2** • Preventative measures during construction will reduce the potential mortality and disturbance of wildlife within the Project Area. Recommended measure **7C** is detailed in **Section 6.1.2** • The potential for fish mortality will be mitigated through following the DFO measures to protect fish and fish habitat (DFO 2021). Recommended measures 1E to 7E are detailed in **Section 6.1.2** • The constructor will be required to employ effective erosion and sediment control (ESC) throughout the project and maintenance of control works throughout their operational life. Recommend ESC measures **1F to 10F** are detailed in **Section 6.1.1**	**Erosion and Sediment Control** • **3F**: Erosion and sedimentation will be monitored and maintained using ESC measures as per specifications • **9F**: ESC measures to be checked weekly and after major rain events. Daily monitoring to be completed by the contractor and a construction monitoring log is to be maintained. **Prevention of Habitat Disturbance** **4B**: Enlist an environmental monitor onsite to provide advice and ensure that activities will not have any negative effects. Information for site-specific SAR should be posted in construction trailer
Designated Natural Areas	**Intermediate** • Removal of vegetation within the significant woodlands and valleylands of Etobicoke Applewood Creek, and Serson Creek • Changes to the structure and composition of	• Coordinate the timing of project activities to mitigate the impacts on significant woodlands and valley lands. Recommended measures **1A, 2A, and 4A** are detailed in **Section 6.1.2** • Implement construction best practices to reduce the potential of spills or other materials/equipment entering	**Prevention of Habitat Disturbance** • **4B**: Enlist an environmental monitor onsite to provide advice and ensure that activities will not have any negative effects. Information for site-specific SAR should be posted in construction

Assessment Factor	Potential Impact	Mitigation Measures	Monitoring Requirements
	vegetation communities • Changes to soil structure due to disturbance **Construction** • Fugitive dust and accidental spills (e.g., fuel) • Erosion and sedimentation	the natural environment. Recommended measures **2B, 4B, 6B, and 7B** are detailed in **Section 6.1.2** • Preventative measures during construction will reduce the likelihood of disturbance and destruction to terrestrial features. Recommended measures **1D to 7D** are detailed in **Section 6.1.2** • The constructor will be required to employ effective erosion and sediment control (ESC) throughout the project and maintenance of control works throughout their operational life. Recommend ESC measures **1F to 5F, 7F, 9F, and 10F** are detailed in **Section 6.1.1**	trailer • **5D**: Ensure that temporarily disturbed areas are restored with native vegetation and monitored during construction and post construction based on TRCA/CVC and the cities specifications. **Erosion and Sediment Control** • **3F**: Erosion and sedimentation will be monitored and maintained using ESC measures as per specifications • **9F**: ESC measures to be checked weekly and after major rain events. Daily monitoring to be completed by the contractor and a construction monitoring log is to be maintained
Wildlife and Wildlife Habitat	**Intermediate** • The widening of Lakeshore Road will result in the loss of edge vegetation. • Changes to structure and composition of vegetation communities • Vegetation and tree removal in forests adjacent to Etobicoke, Applewood, and Serson Creeks has the potential to reduce the availability of suitable cavity trees for SAR bats • Vegetation removals within the large CUM1 habitat between Applewood and Etobicoke creeks has the potential to impact Bobolink and Eastern Meadowlarks during the breeding season • Changes to soil structure due to disturbance **Construction** • Fugitive dust and accidental spills (e.g., fuel)	• Coordinate the timing of project activities to mitigate the impacts on wildlife and wildlife habitats. Recommended measures **1A, 2A, and 4A** are detailed in **Section 6.1.2** • Implement construction best practices to reduce the potential of spills or other materials/equipment entering the natural environment. Recommended measures **1B to 7B** are detailed in **Section 6.1.2** • Preventative measures during construction will reduce the likelihood of disturbance and destruction to terrestrial features. Recommended measures **1D to 7D** are detailed in **Section 6.1.2** • The constructor will be required to employ effective erosion and sediment control (ESC) throughout the project and maintenance of control works throughout their operational life. Recommend ESC measures **1F to 5F, 7F, 9F, and 10F** are detailed in **Section 6.1.1** • Preventative measures during construction will reduce the potential mortality and disturbance of wildlife within	**Prevention of Habitat Disturbance** • **4B**: Enlist an environmental monitor onsite to provide advice and ensure that activities will not have any negative effects. Information for site-specific SAR should be posted in construction trailer • **5D:** Ensure that temporarily disturbed areas are restored with native vegetation and monitored during construction and post construction based on TRCA/CVC and the cities specifications. **Prevention of wildlife mortality and disturbance** **3C**: Install exclusionary fencing to prevent wildlife from entering the construction site. Exclusionary fencing should not prohibit access to nearby habitats. Where required, redirect wildlife to areas where they can avoid the potential for incidental take, and still have access to habitats. Exclusionary fencing should be monitored daily

Assessment Factor	Potential Impact	Mitigation Measures	Monitoring Requirements
	• Erosion and sedimentation • Increased noise and human presence • Increased potential of wildlife collision with machinery • Removal of nests and eggs • Smothering hibernacula or nesting sites	the Project Area. Recommended measures **1C to 7C** are detailed in **Section 6.1.2**	throughout construction. **Erosion and Sediment Control** • **3F**: Erosion and sedimentation will be monitored and maintained using ESC measures as per specifications • **9F:** ESC measures to be checked weekly and after major rain events. Daily monitoring to be completed by the contractor and a construction monitoring log is to be maintained
Trees	Of the 298 trees that were inventoried, an estimate of 229 trees will require removal and 12 trees will be potentially injured, while the remaining 57 trees will not be impacted. These impacts will need to be reassessed during the detailed phase to evaluate the potential for lessened impact.	• A tree preservation plan has been created showing the recommended placement of tree protection fencing for the BRT study area • Following standard tree compensation ratios, a total of roughly 3201 new trees will be required for the BRT Project Area as compensation.	
Fluvial Geomorphology	No alterations are proposed to the existing Etobicoke Creek bridge. However, the grading limits of the proposed path on the south side of Lakeshore Road should be confirmed to ensure there will be minimal encroachment by the road embankment into the floodplain. The proposed extension of the Applewood Creek and Serson Creek culverts to the south will require channel tie-in works which are recommended to include re-instatement of the existing outlet pools and cobble-lined channels. The extent of required channel tie-ins and associated grading limits and tree removals to be determined at detailed design.	Erosion mitigation works are recommended as part of the Lakeshore Road widening and culvert extensions through recommendations 1F to 10F in **Section 6.1.1**	Monitoring is recommended for Etobicoke Creek to ensure the bed scour in the east span does not impact the stability of the pedestrian crossing. **Erosion and Sediment Control** • **3F**: Erosion and sedimentation will be monitored and maintained using ESC measures as per specifications • **9F**: ESC measures to be checked weekly and after major rain events. Daily monitoring to be completed by the contractor and a construction monitoring log is to be maintained.
Drainage and Stormwater Management	The proposed road improvements will result in increased storm runoff due to additional pavement areas. To accommodate the proposed roadway widening, storm	• The stormwater management plan for the Project Area shall was developed to comply with the policies, regulations, and standards of Credit Valley Conservation (CVC), Toronto and Region	

Assessment Factor	Potential Impact	Mitigation Measures	Monitoring Requirements
	sewer upsizing and catchbasin relocations are anticipated. The existing drainage swales located south of Lakeshore Road will be replaced by underground storm sewers.	Conservation Authority (TRCA), Ministry of Environment, Conservation and Parks (MECP), and City of Mississauga. • Stormwater management measures within the project limits will be designed to provide enhanced water quality treatment, as a minimum, for the increased pavement area as a result of roadway widening/improvements. • To provide quantity control throughout the project corridor, consideration will be given to providing over-sized storage pipes with flow control devices (e.g., orifice plate) upstream of the discharge location to provide peak flow control in combination with allowable surface ponding for major flows. • For drainage areas that discharge to an existing storm sewer system, a combination of catchbasin inserts (e.g., Goss trap, CB Shield) for pre-treatment and OGS units is recommended, to achieve the required quality control. Oil-grit separator (OGS) units combine a storage chamber for sediment trapping and oil separation with drainage inlets for intercepting or receiving roadway stormwater runoff. • For drainage areas discharging directly to a watercourse, a treatment train approach using catchbasin inserts (e.g., Goss trap, CB Shield) for pre-treatment and low impact development (LID) practices, such as bioretention cells and exfiltration trenches, will be considered.	
Environmental Site Assessment	Proposed roadway widening is anticipated to impact properties with potentially contaminated soil and groundwater identified in the Project Area.	• ***Property Acquisitions Environmental Due Diligence*:** For properties designated as APECs that may be directly impacted by the footprint of project, further environmental studies/investigations (site-specific Phase 1 ESAs) should be undertaken to confirm the specific environmental conditions of the soils to support property	

Assessment Factor	Potential Impact	Mitigation Measures	Monitoring Requirements
		acquisition due diligence and road construction excess material management for soil and groundwater. Mitigation measures will need to be developed, should contamination be confirmed, which may include environmental site clean-up / remediation, and / or risk assessment. • ***Road Construction and Management of Surplus/Excess Soil***: A Soils and Excavated Materials Management Plan will have to be developed to define the handling, management, and disposal of materials excavated as part of the project. The plan shall identify the process for management of excess soils contaminated materials, including handling, testing, transportation, documentation, reuse, and disposal requirements.	
Cultural Heritage Environment			
Built Heritage Resources and Cultural Heritage Landscapes	Direct impacts to BHR 2 (Corner of Lakeshore Road East and Hydro Road) are anticipated to involve the removal of the plaque at this location due to the proposed reconfiguration of the roadway and sidewalk. Direct impacts to BHR 6 (Small Arms Building at 1352 Lakeshore Road East) are anticipated to involve significant encroachment on to the property due to grading, property acquisitions, and relocation of the sidewalks. Direct impacts to CHL 1 (Arsenal Lands CHL) are anticipated to involve encroachment on to the property due to grading, property acquisitions, and relocation of the sidewalks. Indirect impacts to identified BHRs and the CHL within 50 m of the proposed limited of impact are possible due to construction activities which may result in limited and temporary adverse vibration impacts to five known and potential BHRs and one known CHLs: 1239 Lakeshore	**BHR 2** If reconfiguration of the roadway and sidewalk will require removal of the plaque at BHR 2, it should be removed prior to construction for safe-keeping, and returned to the same general location once work has been completed. Consultation with heritage staff or other appropriate staff should be undertaken to determine an appropriate storage and relocation strategy for this commemorative feature. **BHR 6** *Preferred Option*: Avoid removal of the Vimy oak trees to the north and row of deciduous trees to west of structure, and avoid encroachment on to this property. *Alternative Option:* Should it be determined that there is no other technically feasible option other than to remove the trees and to significantly encroach on to this property, an HIA will be undertaken by a qualified person as early as possible in the detailed design phase following the TPAP. It	

Assessment Factor	Potential Impact	Mitigation Measures	Monitoring Requirements
	Road East (BHR 1), 999 Lakeshore Road East (BHR 3), 940 First Street (BHR 4), 811 Lakeshore Road East (BHR 5), 1352 Lakeshore Road East (BHR 6), and the Arsenal Lands (CHL 1 containing 1352, 1300, and 1300A Lakeshore Road East).	will be developed in consultation with, and submitted for review to, MHSTCI and interested parties including the municipal heritage planner and/or municipal heritage committee and Indigenous communities, as appropriate. A heritage permit may be required and further consultation with heritage staff at the municipality is recommended. If tree removal is determined to be required, consideration should be given to retaining a qualified arborist to advise on the feasibility of transplanting the Vimy oaks and retaining cuttings of the deciduous trees for propagation and replanting on site following construction. **CHL 1** *Preferred Option*: Avoid removal of the Vimy oak trees and deciduous trees on 1352 Lakeshore Road East, and avoid significant encroachment on to this property. Avoid removal of perimeter fence and avoid significant encroachment on 1300 and 1300A Lakeshore Road East. *Alternative Option*: Should it be determined that there is no other technically feasible option other than to remove the trees and perimeter fence and to significantly encroach on to this property, an HIA will be undertaken by a qualified person as early as possible in the detailed design phase following the TPAP. It will be developed in consultation with, and submitted for review to, MHSTCI and interested parties including the municipal heritage planner and/or municipal heritage committee and Indigenous communities, as appropriate. A heritage permit may be required and further consultation with heritage staff at the municipality is recommended. If tree removal is determined to be required, consideration should be given to retaining a qualified arborist to advise on the feasibility of transplanting the Vimy oaks and retaining cuttings of the deciduous trees for propagation and replanting on site following construction. The perimeter fence within CHL 1 should be replaced following construction.	

Assessment Factor	Potential Impact	Mitigation Measures	Monitoring Requirements

		Construction
		• Construction activities and staging should be suitably planned and undertaken to avoid unintended negative impacts to identified BHRs and CHL. Avoidance measures may include, but are not limited to erecting temporary fencing, establishing buffer zones, issuing instructions to construction crews to avoid identified BHRs and CHLs, et.
		• To mitigate short-term disruption to identified BHRs and CHLs resulting from construction activities, the following measures are recommended:
		  ○ Staging areas should be selected so that they are non-invasive and avoid heritage attributes; and
		  ○ Post-construction landscape treatments carried out to restore pre-construction conditions.
		• To ensure that identified BHRs and CHL are not adversely impacted during construction, baseline vibration monitoring should be undertaken in advance of construction. Should this advance monitoring assessment conclude that any features on these properties be subject to vibration impacts: (1) plan construction activities to avoid adverse vibration impacts; and where potential adverse vibration impacts cannot be avoided (2) a qualified engineer should include these properties in the condition assessment of structures within the vibration zone of influence for this project. Further, the Contractor must make a commitment to repair any damages caused by vibrations.	

Archaeological Resources	The Stage 1-2 property survey did not identify any lands with archaeological potential and test pit survey was not conducted.	In the event that archaeological remains are found during subsequent construction activities, the consultant archaeologist, approval authority, and the Cultural Archaeology Programs Unit of the MHSTCI should be immediately notified.	• Approximately 0.2 percent of the Project Area (0.02 hectares) has been previously recommended for construction monitoring due to the potential for deeply buried deposits (TRCA., 2017b). While there are currently no impacts anticipated for these lands, should any impacts be proposed for these lands through

Assessment Factor	Potential Impact	Mitigation Measures	Monitoring Requirements
			any changes identified during the detailed design phase of the project, all land disturbing activities should be monitoring by a licensed archaeologist. If any intact deposits are identified during the monitoring program, additional Stage 2 survey will be required. • Approximately 0.8 percent of the Project Area (0.1 hectares) comprises a portion of Etobicoke Creek. While no impacts have been proposed for Etobicoke Creek at this time, it's archaeological potential must be evaluated following the MHSTCI's Criteria for Evaluating Marine Archaeological Potential checklist if impacts to the creek bed is proposed during the detailed design phase of the project. • Should the proposed work extend beyond the current Project Area, or should changes to the project design or temporary workspace requirements result in the inclusion of previously un-surveyed lands, these lands should be subject to a Stage 2 archaeological assessment • Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act. • The Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33, requires that any person discovering or having knowledge of a burial site shall immediately notify the police or coroner. It is recommended that the Registrar of

Assessment Factor	Potential Impact	Mitigation Measures	Monitoring Requirements
			Cemeteries at the Ministry of Consumer Services is also immediately notified.
Socio-Economic Environment			
Land Uses	Through the provision of an efficient and effective sustainable transportation mode of travel in the corridor, the project will support and enable increased opportunities for development, intensification, and revitalization along the corridor, and improve the socio-economic environment overall.	N/A	N/A
Air Quality	The maximum combined contaminant concentrations for the 2041 Future Build scenario were all below their respective MECP guidelines or CAAQS, except for the 1-hr NO_2 CAAQ, 24-hr PM10, 24-hr TSP, and annual benzene. The roadway contributions to the total concentrations were found to be small. During construction of the roadway, dust is the primary contaminant of concern. Other contaminants including NOx and VOC's may be emitted from equipment used during construction activities.	The Environment Canada "Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities" document provides several mitigation measures for reducing emissions during construction activities, including material wetting or use of non-chloride dust suppressants to reduce dust, use of wind barriers and limiting exposed areas which may be a source of dust, and equipment washing. It is recommended that these best management practices be followed during construction of the roadway to reduce any air quality impacts that may occur.	
Noise and Vibration	The change in sound levels from the proposed project is expected to range from plus 0.3 to minus 1.2 dBA, which is considered a negligible change. Construction noise impacts are temporary in nature, and largely unavoidable.	No noise mitigation is required for this project. **Construction** • Where possible construction should be carried out during the normally allowed hours specified in the by-law found in **Appendix I**. If construction activities are required outside of these hours, the Contractor should minimize the amount of noise being generated to not be clearly audible in any noise sensitive areas. • All construction equipment should be operated with effective muffling devices that are in good working order.	

Assessment Factor	Potential Impact	Mitigation Measures	Monitoring Requirements
Property	A total of 14 properties are anticipated to be impacted to accommodate road widening for the proposed BRT and associated pedestrian realm improvements (including local transit stops). Of the impacted properties, no full property acquisitions are anticipated; impacts are limited to property frontage and, in some cases, parking. The final number of property takings will be confirmed during a future design phase and property owners will be contacted to discuss the project and proposed acquisitions. **Construction** Temporary lane closures, access modification, and temporary construction easements.	Consultation with property owners regarding property acquisition will be initiated closer to the time of construction. The City will work with property owners to negotiate fair market value of the land and address the project impacts (e.g., repairing or replacing landscaping, fencing, or paving). The City will work to acquire property on a willing buyer/willing seller basis. If such an agreement cannot be reached, the process set out in the Ontario Expropriations Act will be followed to ensure the rights of property owners provided under the Act are protected. **Construction** • Construction along Lakeshore Road will be staged to minimize adverse effects on businesses and residents along the corridor, to the extent feasible while maintaining a reasonable construction schedule. Prior to construction, a traffic management plan will be developed by the contractor to ensure impacts to traffic and access to properties are minimized. Input from adjacent property owners should be sought and considered in the development of the plan. • Traffic detouring will be implemented during construction to minimize community effects.	
Transportation			
Traffic and Transportation	The traffic operational analysis for the intersections within the TPAP Project Area was performed using Vissim micro-simulation model with the proposed center median BRT. The modelling results for 2041 traffic conditions for both AM and PM traffic peak hours indicate that the addition of the proposed center median BRT coupled with the anticipated growth in the area will result in significant delays within the corridor.	Dedicated right turn lanes were recommended for selected shared through/right lane with high volume to capacity (v/c) ratio over 1.0 in the preliminary analysis.	The City continually monitors traffic operations and the results of the monitoring process inform the implementation of future roadway improvements to address areas of critical levels of service.

Assessment Factor	Potential Impact	Mitigation Measures	Monitoring Requirements
Active Transportation	The project will result in an overall improvement in Active Transportation levels-of-service. The project will result in impacts to the existing Lakefront Trail system between (approximately) Hydro Road and west of Dixie Road, as the expanded roadway will encroach on the trail.	The project includes the construction of a new, two-way cycle track and separate sidewalk through the section of Lakefront Trail between Hydro Road and west of Dixie Road, ensuring that the trail can continue to function as a two-way, active transportation link in the broader trail network.	
Streetscape/Landscape	Widening of the roadway and reconstruction of the sidewalk/boulevard area within the right of way will impact existing street trees and pedestrian/cyclist infrastructure.	The updated corridor design includes new enhanced sidewalks and cycle tracks (as described above). Street trees will be planted within the proposed boulevards. Generally, landscaping (street trees) will be confined to plantings in soil cells within the boulevard. Plantings will have to be coordinated with the needs of illumination and utility poles also placed within the boulevard throughout the corridor. Roadway sections that can accommodate such plantings are generally: • Greaves Avenue to Lakefront Promenade; • Lakefront Promenade to Haig Boulevard (south side only); • Orchard Road to Etobicoke Creek. On the approaches to signalized intersections throughout the corridor, however, due to the widening of the roadway to accommodate auxiliary turning lanes, there remains no space to accommodate plantings.	
Parking and Access	The implementation of the proposed BRT will result in the restriction of mid-block left-turns throughout the corridor. All mid- block accesses will be restricted to right-in/right-out operation upon the implementation of the median BRT facility. A total of 22 private and 8 municipal parking spaces are	The impacts to mid-block access are mitigated through the introduction of protected U-turn movements at all signalized intersections. Throughout the detailed design process, the City will work with affected property owners to discuss the necessary measures needed for project implementation.	

Assessment Factor	Potential Impact	Mitigation Measures	Monitoring Requirements
	expected to be impacted.		
Utilities and Municipal Services	Preliminary utility conflicts are summarized in **Section 6.9**	• All affected private utility owners shall be engaged to coordinate the specific design of required relocations (both interim and permanent) during the detailed design phase of the project. • The impacts of utility relocations on customers should be minimized by scheduling utility relocations and associated service shutdowns to low usage periods, to the extent feasible. Ample notification should be provided to customers, in accordance with each specific utility owner's requirements, as far in advance of the proposed work as possible to enable customers' planning around the temporary outages. The construction of relocated utilities should apply best-practice measures and methods to reduce the impact of dust, noise, and detours.	

6.12 Climate Change Considerations

6.12.1 Background

A Climate and Sustainability Report was prepared to support the TPAP in considering climate change, and is provided in **Appendix M**. This report follows Ministry of the Environment, Conservation and Parks' (MECP) guide *Considering Climate Change in the Environmental Assessment Process* (MECP, 2017) and builds upon the assessments completed for the Climate Lens. This report is comprised of three parts:

- Part 1 describes how the TPAP incorporates the MECP's guidance for considering climate change in environmental assessments/TPAPs.
- Part 2 highlights the broader sustainability initiatives that the City has planned in relation to the construction and operation of the BRT with the goal of improving environmental and social outcomes.
- Part 3 summarizes the design considerations, mitigation measures, and other initiatives outlined in Parts 1 and 2 that are helping to meet the MECP's expectations and the sustainability goals.

6.12.2 Climate Change Mitigation and Adaptation

Infrastructure and transit projects can impact the atmosphere by altering emissions of GHGs and by changing the landscape altering the ecosystems ability to remove carbon dioxide (CO_2) from the atmosphere (carbon sinks). GHG emissions are quantified for the existing infrastructure (baseline scenario), construction, and the project duration. The GHGs quantified include carbon dioxide, methane, and nitrous oxide from the combustion of diesel fuel and gasoline and from offsite electricity production. Project construction will result in approximately 12,481 t of carbon dioxide equivalent (CO_2e) emissions. Once built, the project is estimated to result in ongoing reductions of GHG emissions, based primarily on lower vehicle fuel use relative to the baseline scenario. Cumulatively, GHG emissions are estimated to reduce by 968 t CO_2e emissions over the 60-year lifetime of the project as compared to the baseline scenario (**Figure 6-11**). The project impact on carbon sinks is relatively small compared to GHG emissions, as the area is already highly urbanized and road widening is offset with wide boulevards and tree planting.

The potential effects of climate change on the Lakeshore BRT project are evaluated through a Climate Risk Assessment, which focused on future climate conditions for the 2051-2080 period using an ensemble of climate models under the high-emissions representative concentration pathway (RCP) 8.5. The greatest risks identified through the climate risk assessment process relate to extreme heat, extreme rainfall, riverine flooding, and wind, as these have the greatest potential for injury or loss of life. High risks mitigated through the preliminary design include extreme high temperatures, extreme rainfall, and extreme flooding. Additional mitigation measures are identified for high-risk interactions, including remedial engineering actions outstanding for detailed design and future monitoring actions and management actions.

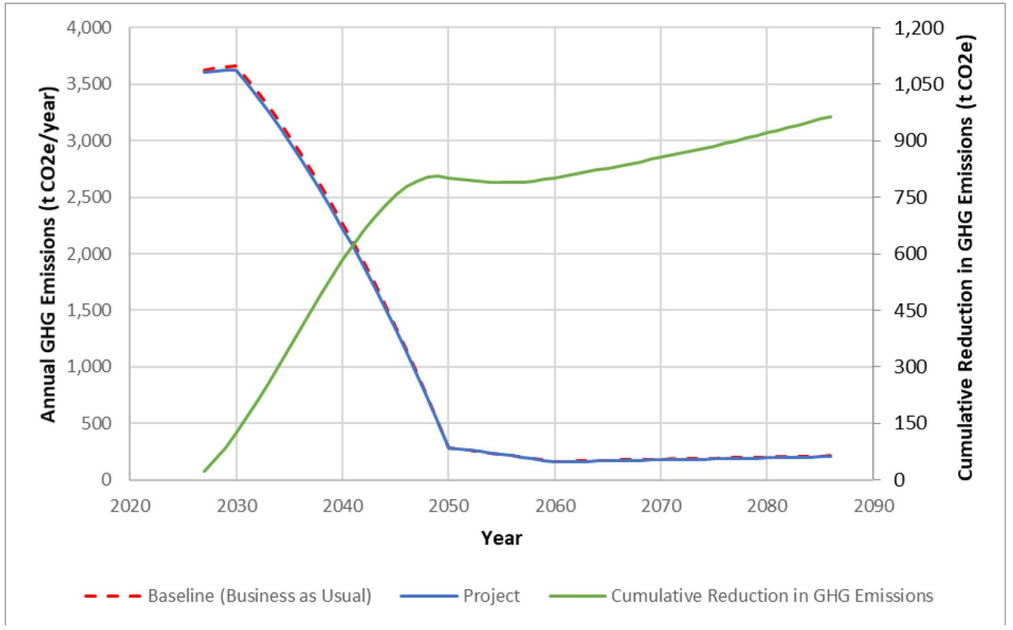


Figure 6-11: CO_2e Emissions Comparison

6.12.3 Sustainability Initiatives

Sustainability initiatives at various spatial scales/jurisdictions were reviewed, areas where the BRT project could contribute to advancing their respective environmental and social outcomes are highlighted in the paragraphs below:

Municipal initiatives include:

- Our Future Mississauga, Strategic Plan (City of Mississauga 2009)
- Living Green Master Plan (City of Mississauga 2012a)
- Green Development Standards, Going Green in Mississauga (City of Mississauga 2012b)
- Invasive Species Management Plan and Implementation Strategy (City of Mississauga 2021a)

- Cycling Master Plan (City of Mississauga 2018)
- Climate Change Action Plan (City of Mississauga 2019a)
- Mississauga Transportation Master Plan (City of Mississauga 2019b)
- Mississauga Official Plan (City of Mississauga 2021b)

External initiatives include:

- Credit Valley Conservation's (2019) Climate Change Strategy, Protecting Today for Resilience Tomorrow, 2019-2023
- Region of Peel's (2019) Climate Change Master Plan: Lead, Influence, Transform 2020-2030

In applying a sustainability lens on the Lakeshore BRT Study, the following common themes emerge:

- Actions to reduce GHG emissions, directed at Climate Change mitigation; and
- Reducing vulnerability of infrastructure assets to the physical impacts of climate change.

By extension, the interface between the BRT project and sustainability issues also includes the interrelationship between the transit line and the surrounding environment, such as the upstream and downstream ecosystems, and the connectivity and access to people, neighbourhoods, and communities that is served. The project per se will help reduce GHG emissions by supporting public transit and active commuting and will reduce vulnerability of the City's infrastructure assets by being designed and constructed to be more climate resilient. Further benefits can be achieved that go beyond the 2 km section that was assessed, depending upon the measures that are adopted into the final design, the impact of the longer transportation corridor, and how the corridor design helps people, ecosystems, and communities interact.

6.12.4 Project Outcomes in Relations to Sustainability Goals

Table 6-14 summarizes how the preliminary design is helping to meet the MECP's expectations in relation the City's sustainability goals and mitigation measures.

Table 6-14: Sustainability Goals

Strategic Planning Document	Sustainability Strategy Goal	Project Component / Environmental Feature	Measures to Mitigate Effects of the Transit Project on Climate Change	Measures to Mitigate Effects of Climate Change on the Transit Project	Outcomes
City of Mississauga's Strategic Plan (2009)	**Move**: developing a transit-oriented city, whereby people can get around without an automobile, and transit will be a desirable choice that connects people to destinations; **Connect**: completing our neighbourhoods, whereby communities are connected and residents can engage in active transportation	• Transit lanes • Bicycle lanes	The dedicated transit lanes and bike lanes are expected to result in a decrease in automobile usage and increase in bus and bike usage. GHG emission will reduce due to increased public transit capacity and bike travel accessibility.		Since vehicle fossil fuel consumption is the largest source of GHGs for Lakeshore Road, improvements in public transit and bike travel accessibility result in a reduction of GHG emissions.
	Green: living green, so that the city co-exists in harmony with its ecosystems, where forests and valleys are protected, and future generations enjoy a clean, healthy lifestyle.	• Green infrastructure • Waterfront trail • Creek crossings	The project impact on carbon sinks is relatively small as the Lakeshore corridor is already highly urbanized.	Climate resilient trees will be selected to withstand drought and road salt. Adequate spacing will ensure long-term canopy development. Species will be varied to minimize the spread of disease and pests.	Ecological resilience will be incorporated into the final project wherever technically or economically practical.
	Build a reliable and convenient system, by making transit that is frequent, safe, reliable and convenient; Build and maintain infrastructure, that is delivered in a sustainable way;	• Transit lanes • Bicycle lanes • Waterfront trail • Watercourse crossings • Stormwater infrastructure • Intersections • Bus • Green infrastructure	Reliable and convenient transit will encourage transit usage and reduce vehicle usage.	Intersection safety design considers poor weather conditions	This project contributes to the goal of having a reliable, convenient and sustainable transit system for the City.
	Provide mobility choices, such as walking, cycling, and use transit in all seasons;			Design and maintenance to consider extreme weather to encourage usability in all seasons.	This project provides for multiple choices of transportation.

Strategic Planning Document	Sustainability Strategy Goal	Project Component / Environmental Feature	Measures to Mitigate Effects of the Transit Project on Climate Change	Measures to Mitigate Effects of Climate Change on the Transit Project	Outcomes
	Promote a green culture, that leads to a change in behaviour to support a more sustainable approach to the environment, minimize our impact on the environment, and contribute to reversing climate change	• Transit lanes • Bicycle lanes • Waterfront trail •	Reliable and convenient transit will encourage transit usage and reduce vehicle usage. The dedicated bike lanes will encourage more bike usage. GHG emission will reduce due to increased public transit capacity and bike travel accessibility.		Expand transportation choice using lower carbon-emitting options and provide for friendly pedestrian and cycling alternatives. Green boulevards and enhances bus shelters help cultivate inviting public spaces
Living Green Master Plan (2012)	Promotes the positive long-term impact on the environment by modifying people's behaviours in respect to the way that the City moves people and goods	• Transit lanes • Bicycle lanes • Waterfront trail	Reliable and convenient transit will encourage transit usage and reduce vehicle usage. The dedicated bike lanes will encourage more bike usage. GHG emission will reduce due to increased public transit capacity and bike travel accessibility.		The Federally funded BRT project maximizes investment in the expansion of public transit, and for the regional transit system to be funded by higher groups of government.
Green Development Standards (2012)	The Green Development Standards indirectly applies to the BRT project as it promotes design that enhances local sustainability and is resilient to flooding. Stormwater retention through Low Impact Development measures and supporting pedestrian and cycling comfort are also indirectly addressed.	• Stormwater infrastructure • pedestrian and cycling infrastructure		New stormwater retention cells in boulevards provides additional runoff storage capacity and quality treatment Street tree plantings throughout, wherever possible, to provide shade for pedestrians/cyclists	
Cycling Master Plan (2018)	The four goals of the Cycling Master plan are to improve safety for cycling, build a connected, convenient and comfortable bicycle network, increase cycling trips in Mississauga, and reduce the exposure of cyclists to traffic stress and conflict. Cycling will become a way of life in the City of Mississauga.	• Bike lanes	The dedicated bike lanes will encourage more bike usage. GHG emission will reduce due to increased public transit capacity and bike travel accessibility.		The dedicated cycling lanes in the BRT project supports the Cycling Master Plan vision of cycling that is a way of life in the City of Mississauga, and is made more comfortable, convenient and fun. It addresses the goal of improving safety for cycling, building a connected, convenient and comfortable bicycle network, and reducing the exposure of cyclists to traffic stress and conflict.

Strategic Planning Document	Sustainability Strategy Goal	Project Component / Environmental Feature	Measures to Mitigate Effects of the Transit Project on Climate Change	Measures to Mitigate Effects of Climate Change on the Transit Project	Outcomes
City of Mississauga's Climate Change Action Plan (2019)	The Climate Change Action Plan has a vision for Mississauga to become a low carbon and resilient community	• All parts of the project	Transportation is a major contribution to the City's carbon footprint, and the pathway towards becoming net-zero includes shifting our modes of travel towards lower-emission modes of transportation, such as transit and cycling. We note however that the overall contribution of mode shifting will be influenced by the fuel source for public transit and privately owned vehicles. Nonetheless the BRT project should help increase and improve cycling infrastructure by 2030	If the next stage of the project involves evaluating flood mitigation alternatives to reduce flood damages, the combined work would contribute to the Climate Change Action Plan's goal to make resilience a cornerstone of infrastructure management and planning by 2030. This applies particularly to Action #12: continue to enhance flood resilience and stormwater management in the context of changing climate conditions	This project contributes to the City's vision for becoming a low carbon and resilient community.
Mississauga Transportation Master Plan (2019)	Minimize the effects of a changing climate and severe weather events on all parts of the transportation system, through appropriate infrastructure design and operational practices	• All parts of the project		Consideration for extreme temperatures and rainfall addressed in the preliminary design stage: drought resilient tree plantings for shade, A/C on busses, passenger shelters at all stops, stormwater management systems. Mitigations for extreme wind and winter precipitation will be addressed through detailed	The planning and design of this project has considered the effects of a changing climate and severe weather through the Climate Lens as well as the TPAP stages.
City of Mississauga's Official Plan (2021)	Mississauga will support a dynamic economy, expand housing and transportation choices, protect heritage and environmental features, increase resilience to climate change, cultivate inviting public spaces and prioritize design excellence.	• All parts of the project	The dedicated transit lanes and bike lanes are expected to result in a decrease in automobile usage and increase in bus and bike usage. GHG emission will reduce due to increased public transit capacity and bike travel accessibility.	Consideration for extreme temperatures and rainfall addressed in the preliminary design stage: drought resilient tree plantings for shade, A/C on busses, passenger shelters at all stops, resilient stormwater management. Mitigations for extreme wind and winter precipitation will be addressed through detailed design.	City of Mississauga's Official Plan (2021)

7 Consultation and Stakeholder Engagement

7.1 Overview

Consultation is a crucial and mandatory component of projects that are subject to O. Reg. 231/08, as the process requires meaningful consultation with persons and parties that are considered to have an interest in the transit project. Ongoing consultation throughout a transit project allows a Project Team to:

- Inform parties and individuals including who may potentially be affected by the transit project
- Identify and assess the range of potential impacts of the transit project through environmental, technical, and socio-economic lenses
- Respond to the concerns of interested persons and agencies

The BRT project team has been proactively involving the public, stakeholders, regulatory agencies, and Indigenous communities throughout the Project through the use of a wide array of communications and engagement methods.

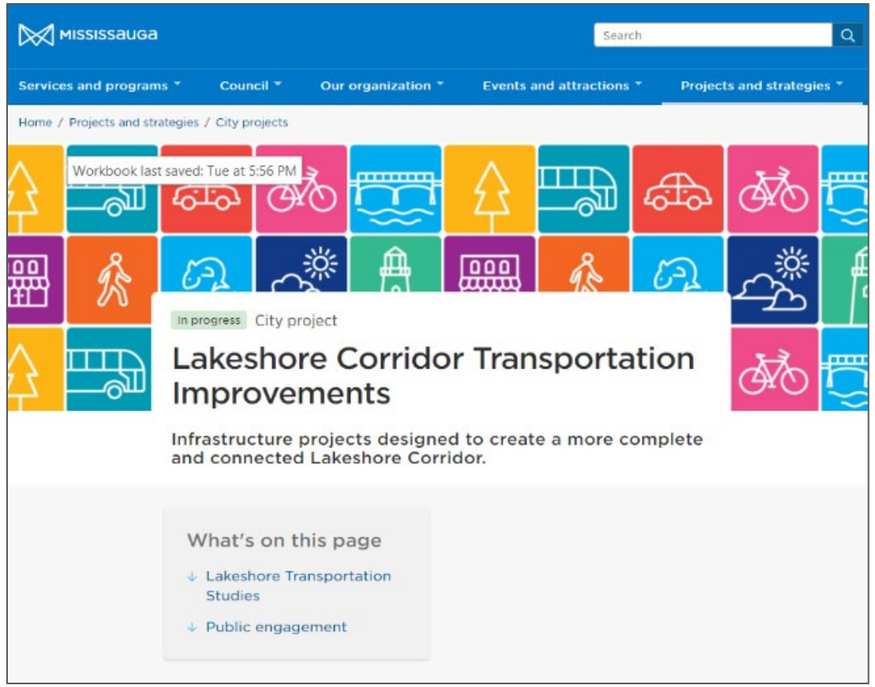
The consultation and stakeholder engagement activities carried out as part of this TPAP can be categorized into three phases: 2019 Master Plan, Pre-planning Consultation, and TPAP Consultation. The main methods of consultation undertaken in each of the three phases are outlined in the subsequent sections.

7.2 Project Website and Social Media

A project website was developed and regularly updated by the City of Mississauga for the overall Lakeshore Transportation Studies, with subsequent webpages for each of the three Studies featured (**Figure 7-1**). Key information to be found on the overall Studies website and BRT Project webpage include:

- Project background, area, and preliminary timelines
- Past and upcoming public engagement opportunities
- Key project deliverables and documents
- Project contact information

The City of Mississauga also used Twitter as a means of providing ongoing information about the Lakeshore Transportation Studies and informing the public on engagement activities available. Social media posts were shared via the City's Twitter account @citymississauga (**Figure 7-1**).



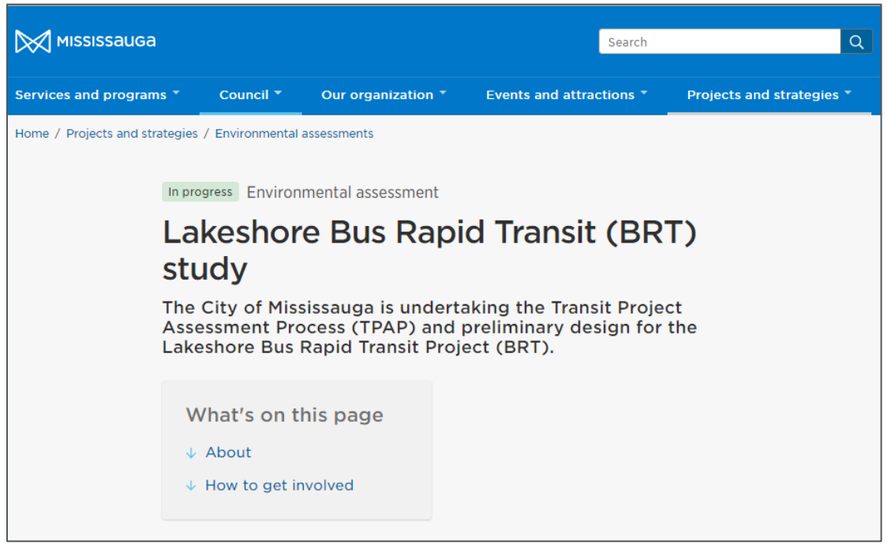


Figure 7-1: Project Website Screenshots

7.3 Master Plan Consultation

A series of public and stakeholder engagement activities were undertaken as part of the Lakeshore Transportation Master Plan study. Feedback from these activities were taken and incorporated into the actions and recommendations made in the 2019 TMP, which are currently further pursued through the Lakeshore Transportation Studies. Some of the key 2019 TMP public and stakeholder engagement methods included:

- 3 rounds of Public Open House
- 4 pop up workshops
- 2 walkability audits
- 3 technical advisory committee meetings
- Online website and survey
- Business community workshop

The general themes heard from the public throughout the 2019 TMP engagement process include:

- Create a more welcoming pedestrian environment
- Address concerns about speeding on Lakeshore Road and through neighborhoods, particularly those areas adjacent to GO Stations
- Develop some form of higher order rapid transit along Lakeshore Road
- Improve pedestrian connections and priority
- Coordinate or sync signal timing during peak hour to improve operations
- Improve intersection configurations and restrict turning movements during peak hours
- Improve conditions for walking and cycling along the Waterfront Trail
- Explore feasibility of additional crossing of the Credit River
- Dedicate and separate bike lanes along Lakeshore and create a continuous network along Lakeshore from Oakville to Toronto

Please review section 1.4 of the 2019 TMP for the complete and detailed public and stakeholder engagement processes undertaken.

7.4 Pre-Planning Consultation and Engagement

The pre-planning phase of a TPAP takes place before a formal Notice of Project Commencement is delivered to the public and stakeholder agencies, which subsequently triggers the formal TPAP time frame. The pre-planning phase consists of tasks such as investigating existing conditions and developing evaluation criteria for assessing alternative designs.

There were two key engagement activities undertaken during the pre-planning phase of the BRT Project, one being the issuing of the pre-TPAP notification and the other being the first Public Information Centre. The following sections outline these activities in further detail.

7.4.1 Notification of Pre-TPAP and Public Information Centre 1

A notification of Pre-TPAP and Public Information Centre (PIC) 1 was mailed to the following parties:

- Property owners and tenants within 300m of Lakeshore Road between Winston Churchill Boulevard and the east end of Etobicoke Creek (mailed on August 31. 2021)
- Indigenous communities listed in **Section 7.7** (mailed on September 9 and 14. 2021)

The notification was also emailed to the stakeholder agencies listed in **Section 7.6.1** on September 2. 2021 and posted as a newspaper ad in Mississauga News on September 2 and 9. 2021.

The notification was intended to notify members of the public in the vicinity of the Project Area as well as stakeholder agencies and indigenous communities of essential information regarding the Project including Project Area, scope, and timelines, as well as to inform recipients of ways to participate in Public Information Centre #1.

See **Appendix L.1** for the Pre-TPAP notification.

7.4.2 Public Information Centre 1

Public Information Centre (PIC) 1 ran from September 2 to September 30. 2021. Due to limitations of the COVID-19 pandemic, PIC 1 was conducted virtually and featured two methods of engagement. Participants could review the project information material and answer feedback questions or provide general comments on the PIC website (lakeshoretransportationstudies.ca) which was available to the public from September 2 to 30. 2021 and/or they could register to attend a live presentation and Q&A session held on the evening of September 28. 2021 via a virtual presentation.

The purpose of PIC 1 was to:

- Describe the problem and opportunity.
- Introduce the processes of a TPAP
- Introduce the preferred cross section carried forward from the Lakeshore Transportation Master Plan (2019)
- Summarize the technical work completed to date
- Receive feedback and answer questions
- Discuss next step

Various communication mediums were used to invite the public and interested stakeholders to PIC 1, including:

- Distribution of mail notices via Canada Post to all the properties between Winston Churchill Boulevard and Etobicoke Creek (August 31. 2021)
- Newspaper ad posted in Mississauga News (September 2 and 9. 2021)
- Notice of commencement emailed to stakeholder agencies (September 2. 2021)
- Notice of commencement mailed to Indigenous communities (September 9 and 14. 2021)
- Social media updates on the City of Mississauga's Twitter account (September 2 and 23. 2021)

Members of the City of Mississauga and HDR project team were in attendance at the virtual meeting to answer questions, record comments and discuss issues with the public. The PIC website had over 300 users over the duration that it was open to the public and the live meeting had 43 attendees.

Key findings from PIC 1 can be found in the "What We Heard Report" in **Appendix L.2**.

7.5 TPAP Public Consultation

7.5.1 Notification of Public Information Centre 2 and Notice of Commencement

An initial notice of commencement and notification for PIC 2 was mailed to the following parties:

- Property owners and tenants within 300m of Lakeshore Road between Winston Churchill Boulevard and the east end of Etobicoke Creek (mailed on March 11. 2022)
- Indigenous communities listed in **Section 7.7** (mailed on March 30. 2022)

The notification was also emailed to the stakeholder agencies listed in **Section 7.6.1** on March 3. 2022 and posted as a newspaper ad in Mississauga News on March 10 and 17. 2022.

The notification was intended to notify members of the public in the vicinity of the Project Area as well as stakeholder agencies and indigenous communities of essential information regarding the Project including Project Area, scope, and timelines, as well as to inform recipients of ways to participate in Public Information Centre #2.

Following conversations with the MECP, a second notice of commencement was issued June 30, 2022 as per MECP requirements. The second notice was mailed to:

- Property owners and tenants within 300m of Lakeshore Road between East Avenue and the east end of Etobicoke Creek (mailed on July 6, 2022)
- Indigenous communities listed in **Section 7.7** (mailed on July 6, 2022)

The re-issued notice was also emailed to the stakeholder agencies listed in **Sections 7.6.1** and **7.6.2** on June 30, 2022 and posted as a newspaper ad in Mississauga News on July 7 and 14, 2022.

See **Appendix L.1** for the notification for PIC 2 and the re-issued notice of commencement.

7.5.2 Public Information Centre 2

PIC 2 ran from March 21 to April 8. 2022. Due to limitations of the COVID-19 pandemic, PIC 2 was conducted virtually and featured two methods of engagement. Participants could review the project information material and answer feedback questions or provide general comments on the PIC website (lakeshoretransportationstudies.ca) which was available to the public from March 21 to April 8. 2022 and/or they could register to attend a live presentation and Q&A session held on the evening of March 30. 2022 via a virtual presentation.

The purpose of PIC 2 was to:

- Review feedback from PIC 1
- Introduce the preferred cross section carried forward from the Lakeshore Transportation Master Plan (2019)
- Introduce the preliminary design of Lakeshore Road in the Project Area
- Introduce the key impacts of the design and corresponding mitigation measures
- Receive feedback and answer questions
- Discuss next step

Various communication mediums were used to invite the public and interested stakeholders to PIC 2, including:

- Distribution of mail notices via Canada Post to all the properties between Winston Churchill Boulevard and Etobicoke Creek (March 11. 2022)
- Newspaper ad posted in Mississauga News (March 10 and 17. 2022)
- Notice of commencement emailed to stakeholder agencies (March 3. 2022)
- Notice of commencement mailed to Indigenous communities (March 30. 2022)
- Social media updates on the City of Mississauga's Twitter account (March. 2022)

Members of the City of Mississauga and HDR project team were in attendance at the virtual meeting to answer questions, record comments and discuss issues with the public. The PIC website had over 100 users over the duration that it was open to the public and the live meeting had 70 attendees.

Key findings from PIC 2 can be found in the "What We Heard Report" in **Appendix L.2**.

7.5.3 Notice of Issue and Notice of Resumption

The project team was directed by the MECP to issue a Notice of Issue on October 26, 2022 in order to pause the TPAP timeline and conduct further consultation activities as requested by the Haudenosaunee Confederacy (HDI). Once no further comments were received from the HDI, the project team resumed the TPAP timeline and issued a Notice of Resumption on July 26, 2023.

Both Notice of Issue and Notice of Resumption were addressed to the MECP, the Notices are enclosed in **Appendix L.1.**

7.5.4 Notice of Completion of Environmental Project Report

After the Notice of Resumption is submitted to the MECP on July 26, 2023, the Notice of Completion will be issued on July 27, 2023 and will be posted as a newspaper ad in Mississauga News on July 27 and August 3, 2023. Additionally, it will be mailed and emailed to the aforementioned parties under **Section 7.5.1.** The Notice of Completion will also be posted on the project website. See **Appendix L.1** for the Notice of Completion.

7.6 Agency Consultation

The agencies consulted in this project were the same agencies consulted during the completion of the Lakeshore Transportation Master Plan (2019).

7.6.1 Technical Advisory Committee

The Technical Advisory Committee (TAC) was formed in the early stages of the pre-planning phase to facilitate communication between the project team and key stakeholders. The following agencies received the Pre-TPAP Project notification and invitation to the first TAC meeting via email on July 14. 2021 and were requested to provide feedback or information that may support the project process:

- City of Toronto
- Toronto Transit Commission

- Peel Region
- City of Mississauga
- Town of Oakville
- Metrolinx
- Credit Valley Conservation (CVC)
- Toronto and Region Conservation Authority (TRCA)
- Alectra utilities
- Telus utilities
- Enbridge utilities
- Rogers
- Bell
- Hydro One

A total of two TAC meetings were included in the scope of the BRT project, the first one was held on July 22. 2021 via the online meeting tool WebEx, the second was held on March 16. 2022.

In addition to the general TAC meetings, separate introductory and technical meetings were held with the following agencies:

- City of Toronto (June 23, 2021)
- CVC (June 1, 2021)
- MECP (August 12, 2021)
- TRCA (June 14, 2021)
- Peel Region (May 12 and October 15, 2021)

Relevant agency feedback is summarized below. See **Appendix L.3** for a table with all agency comments, meeting minutes, and key correspondences.

- Utilities:
  - Bell Canada requested for preliminary designs that indicate the potential relocation of utilities
  - Telus does not have any infrastructure in the Project Area but does have structure on the railway north of Lakeshore Road
- MECP
  - A list of Indigenous communities was included in a letter provided by the MECP
- Peel Region
  - Peel Region had questions regarding property acquisition as well as the overall design of the roadway

7.6.2 Government Technical Review Team

Prior to triggering the formal TPAP Notice of Commencement, a copy of the draft Environmental Project Report was distributed to key review agencies and relevant members of the Government Review Team (per the MECP EA GRT Master Distribution List, April 2021), as identified below.

Government Review Team

- Conservation Authorities:
  - CVC
  - TRCA
- GO Transit/Metrolinx
- Office of the Fire Marshall (Local Fire Department)
- Ministry of Heritage, Sport, Tourism and Culture Industries, Heritage Planning Unit
- Ministry of Municipal Affairs and Housing:
  - Ontario Growth Secretariat
  - Community Planning and Development (West), Central Municipal Services Office
- Ministry of Natural Resources and Forestry, Aurora District
- Ministry of the Solicitor General
- Ministry of Transportation, Engineering Program Delivery-Central

The documentation was first distributed in January 2022 and again in July 2022 for review. Comments received from review agencies are incorporated into the appropriate sections of this Environmental Project Report. All review agencies that provided comments have confirmed that their comments have been resolved. A copy of all comments and associated responses is provided in **Appendix L.3**.

7.6.3 Utility Owners

As part of a broader, City-wide coordination program with utility owners in Mississauga to address impacts of a number of City projects, the City has established a Utility Stakeholders Group. The group includes representatives from the following stakeholders:

- Alectra Utilities;
- Enbridge Natural Gas;
- Beanfield;
- Bell Canada;
- Hydro One;
- Rogers;
- Telus
- Zayo;
- Peel Region

The first meeting of the group occurred on November 23, 2021. The meeting included an introduction of both the Dundas Street BRT TPAP[1] (under the proponency of the City of Mississauga/Metrolinx, currently ongoing) and Lakeshore Road TPAP/EA studies. Representatives from both Project Teams presented their respective projects, project status, and high-level schedule of key project implementation activities. Utility owners advised of challenges in designing and coordinating the anticipated scope of utility relocations required for both projects on the aggressive implementation schedule. A copy of the minutes of the meeting are provided in **Appendix L.3**.

7.7 Indigenous Engagement

The project team connected with the Ministry of Environment, Conservation and Parks (MECP) to introduce the project, work plan, and seek direction regarding the consultation of Indigenous communities for this TPAP. The Project Team and subsequently received an official letter from the MECP confirming that the Indigenous communities to be consulted are:

- Huron-Wendat Nation
- Six Nations of the Grand River
- Mississaugas of the Credit First nation (MCFN)
- Haudenosaunee Confederacy (HDI)

The pre-TPAP and PIC 1 notification was mailed to all Indigenous groups and follow up emails were sent two weeks after the pre-TPAP notification was mailed.

The project team has had contact with all four Indigenous groups. All groups indicated an interest in participating in archeological field work, MCFN and the Haudenosaunee Confederacy also indicated an interest in participating in any field work to be completed for the natural environment assessment.

Project staff responded that all the natural environment and cultural heritage field work had been completed prior to receiving a response from the Indigenous groups and that no archeological field work had been planned at the time this report was drafted. A meeting was held between the City of Mississauga and HDR project staff as well as representatives of the HDI regarding the Confederacy's involvement in conducting field work. Project staff circulated all available draft cultural heritage, archaeological, and natural environment reports to all Indigenous groups for review. Comments were received from the MCFN and Six Nations on the cultural heritage and archaeological reports; they were reviewed and addressed. Project staff confirmed with all other Indigenous groups that they had further comments on the reports circulated. HDI had circulated a list of questions regarding the BRT Study and requested a copy of a letter from the MECP to the project team in October 2022. The project team provided the information requested in February 2023 and did not receive any further comments from HDI.

All Indigenous groups received an email with a TPAP notice of commencement and invitation to PIC 2, the same message was also circulated to them via mail. All indigenous groups will receive a mail and email copy of the Notice of Completion in June, 2023.

All communications with the Indigenous groups throughout the project were tracked and addressed in a comments table (See **Appendix L.4**).

7.8 Future Commitments to Consultation and Engagement

The City of Mississauga is committed to facilitating ongoing consultation and engagement with regulatory agencies, the public, Indigenous communities, and other interested parties will continue throughout future design phases, prior to construction as well as during construction and operational phases.

[1] https://www.metrolinxengage.com/en/engagement-initiatives/dundasbrt

8 Permits, Approvals, and Commitments to Future Work

8.1 Permits and Approvals

8.1.1 Utilities and Municipal Services

The project team will continue to coordinate with the City of Mississauga and Region of Peel throughout detailed design and construction of the new Region of Peel sanitary sewer line planned for 2023.

8.1.2 Environmental Approvals

At the detailed design stage, permits and approvals from various agencies will need to be obtained prior to commencing works within the Project Area. Specifically:

- TRCA Permit: any works with the regulation limit (under Ontario Regulation 166/06) will require a permit through the TRCA.
- CVC Permit: any works with the regulation limit (under Ontario Regulation 160/06) will require a permit through the CVC.
- City of Mississauga Tree Removal Permit: A Tree Removal Application will need to be completed and provided to the City with an arborist report.
- DFO Self-assessment: The determination of risk for death of fish or HADD to fish habitat is typically done through a self-assessment process. The self-assessment lists a number of criteria which identify whether or not the project may result in death of fish or HADD of fish habitat (DFO 2021). If the self-assessment indicates that the project cannot avoid death of fish or HADD of fish habitat, then a formal request for review must be submitted to DFO.
- ESA Permit: It is recommended that an Information Gathering Form (IGF) be completed and submitted to MECP to formally assess potential impacts to SAR, including SAR bats and open-area bird species (Bobolink, Eastern Meadowlark). Depending on the outcome of the IGF and additional surveys for SAR an Overall Benefit permit under Section 17 (2) (c) of the ESA may be required to avoid contravention of the ESA. it identifies permits for activities which may contravene the ESA. An application package for an Overall Benefit permit will require the completion of an IGF, an Avoidance Alternatives Form (AAF) and a Permit Application Form. It is recommended that MECP be consulted during detailed design, approximately one year prior to initiation of site preparation and construction activities at the site to confirm that work to obtain the necessary permits and approvals is understood, and that changes to species listings, or applicable legislation/regulations have been addressed. The extent and nature of the proposed disturbance, as depicted on detailed design drawings, must be evaluated by the MECP before a decision can be made regarding permit requirements. Additional field work or screening may be necessary to confirm the proposed works will not have an impact on SAR.
- Permit To Take Water (PTTW): There is potential for excavation works associated with the construction of culvert extensions to expose groundwater, and potential contamination. It is recommended that, prior to construction, any dewatering requirements be identified, and a plan to manage, handle, and dispose of groundwater encountered in accordance with Ontario Regulation 406/19 (On-Site and Excess Soil Management), 64/16, and 387/04. Dewatering may trigger the need to apply for a Permit to Take Water (PTTW) or register for an Environmental Activity Sector Registry (EASR). The need for such approvals will be identified during the detailed design phase of the project.

8.2 Future Commitments

The impact assessment detailed within this report is based on preliminary design details. Potential impacts and recommended mitigation should be revisited at the detailed design stage of the project as designs are finalized to ensure that negative impacts are minimized or eliminated through implementation of appropriate mitigation or compensation measures.

It is recommended that the following be completed in advance of finalizing construction documents to ensure requirements under the ESA are appropriately addressed and sufficient time is available to obtain the necessary permits. At the detailed design stage, the following additional studies are recommended:

8.2.1 Natural Environment

- An IGF will be submitted to MECP to formally assess potential impacts to SAR during the detailed design phase of the project.
- A snag survey within any treed habitat where tree removal is anticipated should be completed to identify if there are any candidate snag trees which may be utilized by bats and may support SWH. Those trees identified as high-quality snag habitat should be protected where feasible.
- If impacts to candidate or confirmed SWH cannot reasonably be avoided, impact mitigation strategies specific to impacted SWH should be addressed as guided by the Significant Wildlife Habitat Mitigation Support Tool (MNRF 2014).

- If impacts are anticipated to suitable habitat that may support arboreal-roosting SAR bats (Little Brown Myotis, Northern Myotis, Tricoloured Bat), species-specific surveys will be required to determine presence/absence. Suitable survey protocols and scope are to be determined through consultation with MECP. If impacts to confirmed Bobolink or Eastern Meadowlark habitat are anticipated, an Overall Benefit permit application will need to be completed in consultation with MECP to ensure no contravention of the ESA.
- If impacts are anticipated to suitable habitat that may support open-area SAR birds (Bobolink, Eastern Meadowlark), species-specific surveys will be required to determine presence/absence. Suitable survey protocols and scope are to be determined through consultation with MECP. If impacts to confirmed Bobolink or Eastern Meadowlark habitat are anticipated, an Overall Benefit permit application will need to be completed in consultation with MECP to ensure no contravention of the ESA.
- Consultation with MECP with regards to the candidate SAR bat maternity roost habitat, if present. MECP will confirm if additional bat acoustic surveys should be completed to confirm the presence or absence of potential SAR bats in an individual tree or forested area identified as potential maternity roosting habitat that will be impacted or removed. If SAR bats are present, approval for SAR bat habitat removal from the MECP will be required. Overall benefit permitting for SAR bats may include installation of compensation measures (i.e., bat boxes) to enhance bat roosting habitat adjacent to where habitat is removed.
- Additional screening as required based on the future changes to species' listings or habitat regulations of the ESA.
- Wildlife crossing opportunities will be explored during the detailed design phase to improve wildlife passage and linkages using the CVC's Fish and Wildlife Crossing Guidelines for recommendations and guidance.
- Should portions of significant woodland are determined to be removed through detailed design, the following requirements will be met:
    - Identify the full extent of the edge management zone on the site plan, measured as a given distance from the canopy dripline of the trees to be retained.
    - Provide a complete planting plan for the full extent of the edge management zone. In order to meet naturalization goals and contribute to the form and function of the natural areas, plant material is to be calculated based on shrubs planted 0.75-1.0 on centre and trees 2.4-2.7m for the entire zone.
        - Planting plan is to include plants of a larger stocking size to increase survivability and afford some immediate level of protection to the adjacent woodlands. Trees and shrubs should be of the following sizes: Whips: 1.5-2.5m in height, caliper 40-60mm, conifers 1.5-2.0m in height, and shrubs 40-100cm in height.
    - If feasible, stumps within 5 m of the new edge should not be grubbed to allow groundcover regeneration from the undisturbed seedbank.
    - Grading should be designed to meet existing grades a minimum of 3 m away from the tree dripline in order to prevent suffocation of tree roots. All efforts to maintain pre-construction soils and seed bank should be employed.
- All disturbed areas to be re-naturalized to original (or better) condition through the use of an appropriate seed mix approved by the CVC. The composition of the seed mix (e.g., species, broadcast rate, cover crop etc.) is to be included on the detailed design drawings.
- CVC's guideline on healthy soils will be consulted for recommendations on soil requirements for the terrestrial habitat and buffer zones
- The EA identifies the potential removal of vegetation within the large cultural meadow habitat between Applewood and Etobicoke creeks, with the potential to impact Bobolink and Eastern Meadowlarks during the breeding season. The MECP will continue to be consulted during the detailed design phase of the project once impacts are better understood.

8.2.2 Tree Inventory

- The construction site supervisor shall be familiar with City by-laws and understand the purpose and function of TPZ.
- Prior to commencement of any construction or site activity, all tree protection measures specified on the plan will be installed to the satisfaction of City Forestry Department.
- Tree protection measures, once installed, will be inspected and approved by the City Forestry Department.
- No construction activities are permitted within the TPZ as displayed on the plans. Altering of grade, excavating, trenching, dumping, disturbances of any kind, or storage of equipment/soil is prohibited within the TPZ
- Areas of a TPZ that may be encroached upon will receive a layer of wood chips (6 to 10 inches), unless already disturbed by pavement, to aid in mitigating the

potential for soil compaction. Plywood will be placed on top to help dissipate compressive forces. Once the encroachment is eliminated, the plywood will be removed, and the wood chips should be spread around so the layer is 2 to 4 inches thick.

- All tree protection measures will remain in place for the entire duration of the project, including demolition, construction, and restoration phases. They will not be removed or altered until authorization is given by the City Development and Design Division.
- Should any additional, incidental, or accidental tree injuries occur throughout the duration of the construction activity, a qualified arborist or City Forestry Department employee will be consulted to determine if further protective measures should be put in place.
- All pruning of branches and roots will be completed in accordance with good arboricultural practices and be completed by a qualified arborist or City Forestry Department employee.

8.2.3 Fluvial Geomorphology

- Ensure hydraulic conveyance is met under all flood conditions for proposed culvert extensions, and
- Confirm any geomorphic impacts of the proposed conditions hydraulics when detailed modelling information is available
- Confirm that culvert extensions will be open foot and identify the scour hazard limit at the proposed culvert extensions through completion of a scour assessment to determine appropriate culvert footing depths. If the scour hazard limit does not match the existing/proposed culvert footing depths, the proposed footing design will require additional approval from CVC with respect to scour hazard mitigation
- Confirm the skew and final extent of the proposed culvert extensions, and associated structures such as wingwalls and stormwater outfalls
- Complete the design of the low flow channel and substrate gradations within the Serson Creek and Applewood Creek culvert crossings to enhance channel stability and fish passage
- Confirm the extent and type of channel tie-in works at Applewood Creek and Serson Creek through a detailed geomorphic assessment and detailed channel design
- Confirm the engineering and geomorphic feasibility of extending channel works upstream of the Applewood Creek culvert to remove existing stone to enhance aquatic habitat and improve fish passage
- Following confirmation of the channel tie-in works, confirm the disturbance limits of construction at Serson and Applewood Creeks, and land acquisition or easement requirements, if any, at Applewood Creek
- Proposed culvert works may, where feasible, incorporate ecological requirements (i.e., wildlife passage)
- Coordinate Serson Creek tie-in works with the Lakeview Village proposed channel improvements.

8.2.4 Built Heritage Resources and Cultural Heritage Landscapes

- City of Mississauga Heritage Permit - Impacts/alterations to designated properties e.g., 1352 Lakeshore Rd East (Small Arms Building) will require a City of Mississauga Heritage Permit
- Heritage Impact Assessment - Heritage Impact Assessment(s) to be complete as early as possible and prior to the completion of detail design (NOTE: the HIA may be required to inform/support the Heritage permit).

8.2.5 Stormwater Management

- In regard to the CVC HEC-RAS model for Applewood Creek – the Lakeshore Road bridge crossing for Applewood Creek as coded in the model was based on design drawings. The City will update the Applewood Creek model based on as-built conditions/survey of the Lakeshore Road bridge crossing at the detailed design stage.
- Detail construction staging and Erosion and Sediment Control (ESC) measures related to the in-water works at both crossing shall be prepared during the detailed design phase of the project. All standard CVC notes are to be included on the ESC drawings, per the following link: https://cvc.ca/document/standard-notes-for-drawings-submitted-for-cvc-review/.
- A stand-alone ESC plan/drawing shall be prepared during detailed design summarizing all control measures for the various stages of the in-water works.
- Detailed design to include the requirements of the MECP’s guidance for hydrogeological assessment and surface water studies in support of Category 3 PTTW applications. Much of this information can be gathered during the geotechnical/hydrogeological assessment of the route.

- Detailed design to consider options for the disposal of excess soil and water from construction dewatering.
- A “spread analysis” is to be completed at the detailed design stage to ensure that the ponding at low points does not exceed the crown of the road.
- A hydraulic capacity analysis of the existing storm sewers (for both existing and proposed conditions) will be undertaken as part of the detailed design stage for the project.
- Engagement with the City of Mississauga’s Stormwater Assets department will be initiated at the beginning of the detailed design phase.

8.2.6 Roadway, Landscaping, and Utilities

- City of Mississauga and Region of Peel staff will be engaged at the onset of detailed design to ensure that relocation of Municipal Services are completed in accordance with the owner’s requirements and in coordination with other planned works.
- In the detailed design phase of the project, an operations & maintenance manual for the proposed stormwater best management practices (e.g. CB-inserts, bioretention, online storage pipes, etc.) will be prepared.
- The City of Mississauga will coordinate with the City of Toronto in the detailed design phase of the project as the planned redevelopment of the TTC Long Branch bus loop progresses to identify opportunities to mitigate the impacts of additional MiWay services to the terminal.
- The City of Mississauga’s Urban Forestry staff will be consulted on the proposed street tree locations and species.
- Proposed tree locations will be coordinated with street lighting, site furnishing, transit facilities, and above/below grade utilities.
- Tree hoarding details to reduce construction impacts are expected to meet or exceed the City standard hoarding details. Installed hoarding to be approved by appropriate city staff prior to and during construction. Updated arborist reports to be completed during the design stage.

8.3 Project Implementation and Construction Staging

8.3.1 Construction Approach

The construction approach is envisioned to occur similar to a typical road widening project. Construction staging will likely proceed as follows:

- Relocate underground and surface utilities as required. This will include relocation of illumination poles and above ground utility poles, relocation of traffic signals and provision for temporary traffic signals where required. Relocation of underground utilities that fall on property to be acquired by the City will need to occur after the agreements have been signed for the proposed transfer of property.
- Reconstruct the curb line on the south side of the roadway and provide continuous traffic lanes on the existing roadway. The reconstruction will include rebuilding the curb lines, gutters, catch basins, etc. It should be noted that the reconstruction of the curb line may potentially occur simultaneously during utility relocations.
- Reconstruct the north side of the roadway after the south side is completed. Traffic lanes in each direction will be maintained where feasible. A minimum of one lane in each direction will be provided at all times. Access to adjacent developments will also be maintained at all times.
- Construct new bus facilities, including bus laybys, stops, shelters, lane markings, signage, and other finishes.
- Construct streetscaping and urban design elements and provide active transportation improvements on both sides of the roadway where applicable.

The Utility Relocation Plan submitted under separate cover under **Appendix K.1** outlines the strategy as it pertains to changes and updates to utility infrastructure. The proposed improvements shall be phased such that the new lighting can be installed while the existing lighting fixtures remain in operation. For situations where the existing lighting cannot be maintained until the new fixtures are installed and operating, temporary lighting will be required and should be factored into the design and associated contract package.

A phasing plan will need to be completed in consultation with MiWay representatives to determine if the existing transit stops can be shifted temporarily to alternate locations on a short-term basis, or alternatively, if service can be shifted to a nearby parallel road for the duration of construction. The existing traffic signals and associated controls are in conflict with the proposed work and will need to be removed to facilitate construction. It is anticipated that temporary traffic signals will be needed at all intersections where an existing traffic signal is in place.

Construction should be staged in such a way as to facilitate pedestrian and cyclist movements at all times through the construction zone. Signage should be placed to identify crossing points at signalized intersections well in advance of where the existing sidewalk is closed for construction. These elements should be identified for installation after all other major construction activities have been completed. A monitoring program should be included in the design for a minimum of one year after construction to ensure all elements of the landscaping have taken root and are in active growth.

8.3.2 Access Management

Frontages of concern are more frequently located on the north side of Lakeshore Road where the smaller lot sizes result in less coordination between properties and an overall uncontrolled approach to access and parking. Conversely, properties on the south side are consolidated into large retail warehouses, manufacturing centres and storage depots, with limited and well-defined driveways per block. Buildings on the south side are set back behind wide grass boulevards with each building's surface parking tending to be situated behind or to the side, away from the street.

Frontages along Lakeshore Road where access management improvements are to be considered have been identified in **Figure 8-1.**

The ideal scenario to address the lack of driveway definition, continuous curb cuts, and closely spaced driveways would be to make access improvements through redevelopment. Through site plan review and land use controls, the City of Mississauga can ensure that future development of parcels meets its Complete Street objectives on Lakeshore Road. Site development best practices which improve access management, reduce intermodal conflicts and enhance the active transportation experience are outlined as follows:

1. Considering the block and lot layout
2. Designing and locating parking
3. Designing and locating driveways
4. Designing and locating pedestrian and cycling connections

Figure 8-1: Frontages with Potential for Access Management Improvements

Understanding that many of the locations of concern identified in **Figure 8-1** are not planned to be redeveloped in time for the construction of the BRT, alternative phasing and implementation options have been identified for the City to consider during future phases of design (i.e., detail design). Where limited change can be instigated to private property access, the design of boulevards along Lakeshore Road will need to agree with the adjacent continuous access conditions. Different strategies for mitigating the existing condition have been outlined below that could be explored individually or together to address the areas of concern.

- Strategy 1: Install planned cycling facilities and mitigate via pavement markings, signage, and flexible bollards
- Strategy 2: Multi-use path – shared boulevard facilities
- Strategy 3: No dedicated cycling facilities – accept the gap in network

A detailed Construction Staging and Implementation Report is enclosed in **Appendix N.**