City of Mississauga
Agenda

MISSISSAUGA

Revised 2019/12/02

General Committee

Date: December 4, 2019

Time: IMMEDIATELY FOLLOWING SPECIAL COUNCIL

Location: Civic Centre, Council Chamber
300 City Centre Drive, Mississauga, Ontario, L5B 3C1

Members

Mayor Bonnie Crombie	
Councillor Stephen Dasko	Ward 1
Councillor Karen Ras	Ward 2 (Chair)
Councillor Chris Fonseca	Ward 3
Councillor John Kovac	Ward 4
Councillor Carolyn Parrish	Ward 5
Councillor Ron Starr	Ward 6
Councillor Dipika Damerla	Ward 7
Councillor Matt Mahoney	Ward 8
Councillor Sue McFadden	Ward 10
Councillor George Carlson	Ward 11

Contact
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1. CALL TO ORDER

2. APPROVAL OF AGENDA

3. DECLARATION OF CONFLICT OF INTEREST

4. PRESENTATIONS

5. DEPUTATIONS

5.1 Item 8.1 Leya Barry, Climate Change Specialist and Jodi Robillos, Director of Parks and Forestry

5.2 Item 8.1 Gerry Ruygrok, Acting Chair, Mississauga Action Group

5.3 Item 8.1 Bryan Purcell, Vice President, Policy and Programs, The Atmospheric Fund

5.4 Item 8.2 Bonnie Brown, Director, Economic Development and Simon Hootan, Consultant, Hatch

5.5 Sue Shanly, Chair, MIRANET regarding Airbnb

5.6 Item 8.3 Daniela Paraschiv, Manager, Energy Management Sumeet Jhingan, Project Leader Sr Capital Projects

5.7 Item 8.4 Lin Rogers, Project Manager Transportation

6. PUBLIC QUESTION PERIOD

Pursuant to Section 42 of the Council Procedure By-law 0139-2013, as amended:

General Committee may grant permission to a member of the public to ask a question of General Committee, with the following provisions:

1. The question must pertain to a specific item on the current agenda and the speaker will state which item the question is related to.
2. A person asking a question shall limit any background explanation to two (2) statements, followed by the question.
3. The total speaking time shall be five (5) minutes maximum, per speaker.

7. CONSENT AGENDA

8. MATTERS TO BE CONSIDERED

8.1 Final Climate Change Action Plan for approval

8.2 The Mississauga Economic Development Strategy 2020-2025

8.3 Corporate Green Building Standard for New Construction and Major Renovations Building Projects

8.4 Burnhamthorpe Road West from Ninth Line to Loyalist Drive – Municipal Class Environmental Assessment Study (Ward 8)

8.5 Lower Driveway Boulevard Parking Greybrook Crescent (Ward 3)

8.6 Lower Driveway Boulevard Parking Pintail Circle (Ward 10)

8.7 Lower Driveway Boulevard Parking Candlelight Drive (Ward 10)

8.8 Parking Prohibition Rosemere Road (Ward 1)

8.9 Wesley Avenue - All-way Stop Reviews (Ward 1)

8.10 All-Way Stop Gazette Gate and Inuit Trail (Ward 11)

8.11 All-way Stop - Southampton Drive and Aquinas Avenue/Half Moon Grove (Ward 8)

8.12 Amendments to Transit (rules and regulations) By-law 425-03, as amended

8.13 Designated Accessible On Street Parking on Tucana Court (Ward 4)

8.14 Additional Funding for Corrugated Metal Pipe Rehab - Various Locations, PN 19-137 (Ward 7)

8.15 Servicing Agreement Assumption – Industrial Subdivision Servicing Agreement, City File M-2001 Prologis Canada LLC; Crownvetch Developments Inc. and the Erin Mills Development Corporation (Ward 9)

8.16 School Bus Loading Zone - Corliss Crescent (Ward 5)

8.17 Mississauga City Entrance Signs

8.18 MiWay University of Toronto at Mississauga (UTM) Universal Transit Pass Program 2020/2021-2023 Agreement

8.19 Mississauga Digital Gateway Signage Community Partnership Program with Van Horne Outdoor LP - Proposed Extended Signage Inventory

8.20 Renaming of Fallingbrook Community Park (P-347) to Fr. Angelos Saad Park (Ward 6)

8.21 2019 Third Quarter Financial Update

8.22 Cessation of Collection Activities for Defaulted Provincial Offences Act (POA) Fines Deemed Uncollectable

8.23 2018 Annual Report for Access Requests under the Municipal Freedom of Information and Protection of Privacy Act

8.24 Single Source for Online Services Development with eSolutions Group

8.25 Amendments to Agreement with Teranet Inc. for the Provision of Municipal Assessment and Property Data

8.26 City Standards for Information Technology (IT) Systems Requiring Maintenance and Support Services and Subscription Renewals in 2020

8.27 Surplus Declaration - City-owned lands south of Vesta Drive (Ward 1)

9. ADVISORY COMMITTEE REPORTS

9.1 Environmental Advisory Committee Report 8 - 2019 - November 12, 2019

9.2 Traffic Safety Council Report 7 - 2019 - November 27, 2019

10. MATTERS PERTAINING TO REGION OF PEEL COUNCIL

11. COUNCILLORS' ENQUIRIES

12. OTHER BUSINESS/ANNOUNCEMENTS

13. CLOSED SESSION

(Pursuant to Subsection 239 (2) of the Municipal Act, 2001)

13.1 A proposed or pending acquisition or disposition of land by the municipality or local board: Authority to Negotiate for the Acquisition of Property Located in Ward 9, Z Area 46W (Ward 9)

13.2 A proposed or pending acquisition or disposition of land by the municipality or local board: Authority to Negotiate for the Acquisition of Property Located in Ward 5, Z Area 49E (Ward 5)

13.3 The security of the property of the municipality or local Board: Enersource Shareholdings (Verbal Update)

14. ADJOURNMENT

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 11/22/2019

To: Chair and Members of General Committee

From: Paul Mitcham, P. Eng, MBA, Commissioner of Community Services

Originator's files:

Meeting date: 12/4/2019

Subject
Final Climate Change Action Plan for Approval

Recommendation
That the Climate Change Action Plan (CCAP), and its supporting vision, goals, and actions, attached as Appendix 1 to the Corporate Report dated November 22, 2019 entitled "Climate Change Action Plan" from the Commissioner of Community Services be approved, subject to the City of Mississauga's annual budget process.

Report Highlights
- The City of Mississauga declared a state of climate emergency on June 19, 2019.
- The first comprehensive Climate Change Action Plan (CCAP) is hereby presented for consideration and approval; it proposes a Community and Corporate (City of Mississauga) greenhouse gas (GHG) emission reduction target of 80% by 2050 (80 x 50), with the long term goal of becoming a net zero community, and provides a path forward for climate action in the City of Mississauga over the next ten years.
- The CCAP includes two goals and 21 key Actions to help Mississauga achieve the longer term target for 2050. Each of the Actions includes a series of supporting actions.
- Recommendations in the plan focus on both Corporate and Community Actions.
- Endorsement of the CCAP will signal the City's commitment to reducing greenhouse gas emissions and preparing for the impacts of climate change.
- The attached Resource Plan includes cost estimates for the next ten years to implement the actions identified in the CCAP (Appendix 2). The implementation and funding of initiatives will be subject to approval of the annual budget and business plan.
- The CCAP is meant to be a living document. Progress will be reported on annually, with a formal update to the CCAP in five years. As studies identified in the CCAP are conducted and new technologies emerge, staff will be better able to determine when net zero can be achieved.

Background

The CCAP comes as the impacts of climate change on people's health, our economy, and our infrastructure in Mississauga are clear and climate scientists widely agree on the need to rapidly reduce global GHG emissions. Governments around the world, including the City of Mississauga, have declared a state of climate emergency (June 2019). The CCAP is the City's response to the climate crisis and is built around the central vision that Mississauga will be a low carbon and resilient community. This vision is a long-term outcome that the City aims to achieve over the next 30+ years. The CCAP is a comprehensive plan that focuses on mitigation and adaptation and recommends actions for the Corporation and the community over the next ten years.

Comments

The CCAP represents a significant step towards achieving meaningful emission reductions and the long-term goal of becoming a net zero community. It presents a way forward over the next ten years, providing an incremental process to take action, measure progress, adjust to changing conditions, and continue to build towards the 30+year vision of becoming a net zero community.

City leadership on climate action is essential to creating momentum for broad uptake and action in the community. Therefore, the CCAP takes a holistic approach to climate action and includes actions to be taken by the Corporation and in the community. The Final CCAP is attached as Appendix 1.

The two goals set out in the CCAP are as follows.

Goal: Mitigation
Reduce Corporate and community GHG emissions 80% by 2050, as compared to 1990 levels, with a long term goal of becoming a net zero community, and position the City competitively in the emerging low carbon economy. As this is a ten year plan, an interim GHG reduction milestone of 40% by 2030 has also been set.

Goal: Adaptation
Increase resilience and the capacity of the corporation and community to withstand and respond to future climate events by taking action on the highest climate-related risks.

Targets

One of the key goals of the Strategic Plan is to promote a green culture and "transform Mississauga into a net-zero carbon city to become a leader in green initiatives by reducing greenhouse gas emissions".

The CCAP has set an ambitious yet achievable greenhouse gas reduction target of 80% by 2050, with a long term goal of becoming a net zero community. The CCAP represents a significant step towards achieving meaningful emission reductions and this long-term goal of becoming net zero.

To ensure the City is on track to achieving our climate goals and targets, staff will provide annual progress and implementation reports which will include the outcomes and recommendations (including identified costs) of the studies and pilots that will be conducted as part of the CCAP including:

- A district energy feasibility study in the downtown;
- GHG Reduction and Solar Feasibility Study for Corporate Buildings; and
- Charging infrastructure assessment for future electrification of transit and corporate fleet vehicles and equipment.

A formal review and update of the plan and our GHG targets will also take place every five years and will be based on the results of implementation and progress over the given time period as well as advancements in technology to determine when we can achieve net zero.

Corporate Actions

Corporate actions are those that the City of Mississauga has direct control over. The Corporation of the City of Mississauga accounts for approximately 72,100 tonnes of GHGs or ~1% of all GHG emissions in the overall community. Although the Corporation contributes a relatively small amount of total GHG emissions, it is imperative that we take leadership in this area. In order for us to reach our 80x50 target the following commitments will need to be made:

- Convert the entire Corporate and transit fleet (and equipment) to zero emissions (e.g. electric and/or hydrogen technology);
- Invest in electric vehicle charging infrastructure for the Corporate and transit fleets;
- Install renewable energy (e.g. solar panels) at municipal buildings;
- Retrofit all municipal buildings to be net zero or near net zero; and
- Ensure that all new Corporate buildings are built to net zero or near net zero standards.

Community Actions

Community actions in the CCAP focus on areas where the City can lead or support, influence or encourage change in the community. Large-scale community change will require significant contribution from both the provincial and federal governments. The following are actions the City will need to undertake to achieve the 80x50 target in the community:

- Transition to sustainable modes of transport (those other than driving a car, such as walking, cycling, and transit) for 50% of trips to, from, and within Mississauga, with transit used for 23% of trips; (50% modal split by 2041);
- Expand pedestrian and cycling infrastructure;
- Increase the amount of rooftop solar PV in the City;

- Support the shift to zero emissions transportation (e.g. electrical vehicles) by providing publicly accessible electric vehicle charging infrastructure throughout the City;
- Convert natural gas to electricity for space and water heating in at least 50% of residential and non-residential buildings (e.g. electric heat pumps); and
- Ensure that all future development in the City is near net zero.

Areas of Focus for the Next Ten Years

The CCAP includes 21 key Corporate and community Actions to be implemented within the next ten years, with additional supporting actions identified. The Actions are divided into five categories called "pathways": Buildings & Clean Energy; Resilient & Green Infrastructure; Accelerating Discovery & Innovation; Low Emissions Mobility; and Engagement & Partnerships. Below is an overview of each pathway.

Buildings and Clean Energy

Buildings account for over 50% of GHG emissions in the community. Corporately, they account for over 25% of emissions. Buildings of all types require energy for cooling and heating, lighting, and operating equipment and appliances. By transitioning towards more energy efficient and climate resilient materials, the GHG emissions from the built environment can be reduced and the risks associated with climate change mitigated. In order to achieve the interim target of 40% below 1990 levels by 2030, the following actions have been identified:

- Reduce energy consumption in Corporate buildings;
- Increase renewable energy capacity (e.g. Solar PV) in Corporate buildings;
- Build all new Corporate buildings to be more energy efficient and near net zero; and
- Lead by example and retrofit Corporate buildings to reduce natural gas and energy consumption.

Additional supporting actions for the community include:

- Reduce GHG emissions from existing and newly developed buildings, both municipally owned and private developments, through energy conservation and green energy solutions;
- Encourage developer-led efforts to include low carbon energy systems in new developments (e.g. district energy) and explore the feasibility of a district energy system for the downtown;
- Introduce new legal and policy tools, including by-laws and updating the Green Development Standard, to require climate change measures in new developments (e.g. green roofs); and
- Encouraging building occupants and owners to implement energy conservation and resilience measures (e.g. heat pumps).

Resilient & Green Infrastructure

Climate change impacts, such as extreme weather events, can cause damage to physical infrastructure and disrupt municipal services which pose a multitude of challenges. By enhancing the resiliency of the built environment and reducing risk to some of the City's most critical services now, Mississauga will be better positioned to cope with the impacts of climate change into the future. In order to achieve the interim target of 40% below 1990 levels by 2030, the following actions have been identified:

- Increase total tree canopy cover to 22% (of total area); and
- Plant One Million Trees (by 2032).

Additional supporting actions for the community include:

- Identify and mitigate climate-related risks and enhance community-level resilience;
- Enhance flood resilience and stormwater management in the context of climate change;
- Develop an urban agriculture and food strategy;
- Develop a community tree monitoring program;
- Develop and implement invasive species monitoring and control within the context of climate change;
- Monitor and implement improvements to local air quality;
- Work with regional partners to enhance existing programs and services to address the health impacts from climate change;
- Increase the urban tree canopy and the diversity of tree species being planted; and
- Support the development of green infrastructure and naturalized areas to improve resilience.

Accelerating Discovery & Innovation

New technologies and innovative ways of doing business are essential to reaching the goals under the CCAP. The City will need to take steps to help accelerate discovery and innovation both Corporately and in the community. The main areas of focus in this pathway are:

- Lead by example by creating policies and procedures that will result in climate considerations being routinely taken into account in municipal decision-making;
- Provide strategic direction on the management and improve diversion of Corporate waste and litter;
- Work with industry partners and other levels of government to promote innovative technologies and pursue alternative fuels in the goods movement sector;

- Monitor innovation and change in low carbon and resilient technologies for potential implementation at the City level; and
- Support growth of the green economy and the cleantech sector in Mississauga through partnerships with local businesses and industry leaders.

Low Emissions Mobility

In the community, emissions from transportation account for over 30% of total GHG emissions. Corporately, emissions from transit, fleet, and fire fleet vehicles account for over 70% of emissions – making them the largest source of emissions in the Corporation. There is significant potential to decrease emissions from this sector. In order to achieve the interim target of 40% below 1990 levels by 2030, the following actions have been identified:

- Electrify the light duty Corporate fleet (including non-revenue transit vehicles) and equipment;
- Replace the transit fleet with low or zero emission vehicles;
- Reduce GHG's per transit rider by 20%;
- Reduce Corporate idling by 10%;
- Reduce GHG's per kilometer travelled (by Corporate fleet vehicles) by 15%; and
- Reduce the overall corporate fleet by 2%.

Additional supporting actions for the community include:

- Develop a Zero Emissions Vehicle Strategy to accelerate the adoption of electric vehicles in Mississauga;
- Work with industry partners and other levels of government to pursue alternative fuels and the integration of clean technologies in the goods movement sector;
- Install publicly accessible electric vehicle charging stations throughout the City; and
- Upgrade and expand cycling, transit, and pedestrian infrastructure and networks.

Engagement & Partnerships – Mitigation and Adaptation

For the CCAP to be successful, the City will need to engage and mobilize all residents and stakeholders. Key supporting actions for this pathway are:

- Encourage and incentivize residents and business to take climate action;
- Inspire and showcase climate action at the City and in the community; and
- Work with partners to advocate to the provincial and federal governments to advance climate action.

Public Input

The City has focused on engaging staff, residents, invited stakeholders, and members of Indigenous communities throughout the development of the CCAP. The intention of the engagement ranged from "inform" to "collaborate" based on the Engagement Framework in the City's Engagement Strategy.

Community representatives were consulted through the creation of a Climate Change Stakeholder Panel at the outset of the Climate Change Project. Members from a range of organizations participated in the Panel including; utility companies, developers, conservation authorities, academic organizations, school boards, the Mississauga Board of Trade, Metrolinx, and other community organizations. The Panel met on a regular basis at key decision-points and milestones throughout the development of the CCAP, including the visioning, climate risk assessment, and action planning stages. Letters of support from Stakeholder Panel members has been included as Appendix 2.

In addition to the Stakeholder Panel, a series of public open houses and workshops were held in September-October 2019 to provide residents with the opportunity to comment and provide feedback on the draft CCAP. Workshops and open houses were held in the following wards: Ward 1, Ward 2, Ward 4, Ward 8, and Ward 9.

The Draft CCAP and a feedback survey were also posted online at www.theclimatechangeproject.ca. Over 500 residents attended our open houses and workshops and we received over 400 responses to the online survey. Through the online survey we heard resounding support for the City taking action and being a leader on climate change (~90%), with some (~40%) indicating a desire for the City to be more ambitious, particularly with respect to the GHG reduction targets.

Revisions to the CCAP

Based on the feedback from public consultation the following changes have been made to the CCAP:

- The addition of a longer-term net zero target has been added to the Goals section;
- Acknowledgement of the declaration of the climate emergency in June 2019 has been added throughout the narrative;
- Additional actions regarding corporate waste diversion, goods movement, and public health have been added;
- Additional information on the GHG footprint for the Corporation and the community (e.g. consumption data) has been added as an appendix of the plan;
- Additional information on the Corporate and community climate risk assessments has been added as an appendix of the plan;

- Strengthened several action items to be more directive and outcome oriented (where feasible);
- A new section on target audiences has been added;
- Youth, as a key target audience, has been identified and listed as a stakeholder for specific actions – see Actions 20 and 21.

Next Steps

It is the aspiration of the City of Mississauga to become a net zero community, recognizing the need to further accelerate climate action and limit global temperature rise to 1.5 degrees Celsius. As studies identified in the CCAP are conducted and new technologies emerge, staff will be better able to determine when net zero can be realistically and financially achieved.

The CCAP includes a series of practical and foundational actions to advance low carbon resilience in Mississauga. Beginning in 2020, Parks Forestry and Environment staff will be working with our internal teams and key external stakeholders to implement the CCAP, including community groups, conservation authorities, school boards, and utilities. This will include social media strategies (e.g. quick facts campaigns), speakers and video series, opportunities for youth engagement, including National Youth Week and sports and climate change themed events, and engagement on additional strategy development (e.g. Zero Emissions Vehicle Strategy, Urban Agriculture and Food Security Strategy, and a Corporate Waste Reduction Strategy).

Strategic Plan

The CCAP supports four pillars of the City's Strategic Plan:

- Move: the CCAP supports the strategic goal to Develop Environmental Responsibility.
- Connect: the CCAP supports the strategic goal to Provide Mobility Choices.
- Prosper: the CCAP supports the strategic goal to Create Partnerships for Innovation.
- Green: the CCAP supports the strategic goals to Lead and Encourage Environmentally Responsible Approaches; Conserve, Enhance and Connect Natural Environments; and Promote a Green Culture.

Financial Impact

Staff has developed an "order of magnitude" cost estimate for the next ten years as outlined in Appendix 3: Final Resource Plan. According to estimates, which are based on current technology and cost premiums, at least $458 million in capital funding will be required over the next decade to implement the CCAP. There will be additional FTs that will also be required to support the implementation of the CCAP; these will be requested through the annual budget process. Virtually the entire bus fleet will reach end of life during the next 10-year period and can therefore be converted to low or zero emissions technology.

The Resource Plan includes cost estimates for hybrid buses and electric buses to be purchased by 2030. A significant portion of this conversion would be funded through the Investing in Canada Infrastructure Program (ICIP) if the city's applications are approved. Approximately $100 million in resources will be needed to advance the construction of charging infrastructure in order to charge and accommodate over-height electric buses.

The Resource Plan also provides for the electrification of the light duty fleet vehicles and equipment such as mowers, blowers, chainsaws, etc. Additional study will be required to confirm the electrical charging capacity at yards and depots and the associated infrastructure upgrades that may be required.

Please refer to Appendix 3: Final Resource Plan for additional information and listing of items.

Implementation and funding of CCAP Actions, including any additional staff requests, will be subject to the annual budget process, as per our normal practice.

Conclusion

With Council's endorsement, the CCAP will provide a roadmap for climate change action in the City of Mississauga over the next 10 years. Dedicating appropriate resources to the implementation of the CCAP will ensure that climate change is integrated into municipal decision making, the actions outlined in the CCAP are advanced, and that the City of Mississauga achieves its climate change targets.

It is the aspiration of the City of Mississauga to become net zero, recognizing the need to further accelerate climate action and limit global temperature rise to 1.5 degrees Celsius. As studies identified in the CCAP are conducted and new technologies emerge, staff will be better able to determine when net zero can be realistically and financially achieved.

Attachments

Appendix 1: Final Climate Change Action Plan
Appendix 2: Letters of Support
Appendix 3: Final Resource Plan

Paul Mitcham, P. Eng, MBA, Commissioner of Community Services

Prepared by: Leya Barry, Climate Change Specialist

MISSISSAUGA

CLIMATE CHANGE action plan

The preparation of this plan was carried out with assistance from the Government of Canada, the Federation of Canadian Municipalities, and the Province of Ontario. Notwithstanding this support, the views expressed are the personal views of the authors, and the Province of Ontario, the Federation of Canadian Municipalities, and the Government of Canada accept no responsibility for them.

TABLE OF CONTENTS

Mayors Message

Note: This page has been intentionally left blank – the Mayor's Message will be added once Council endorses this Climate Change Action Plan.

Acknowledgements

We would like to acknowledge the many individuals and organizations who participated in the development of this Plan. We truly appreciate your time and commitment. Your contributions added tremendous value and helped to shape and improve the final Climate Change Action Plan. Thank you.

City of Mississauga

Leadership Team

Janice Baker, City Manager

Andrew Whittemore, Commissioner, Planning & Building

Gary Kent, Commissioner, Corporate Services

Geoff Wright, Commissioner, Transportation & Works

Paul Mitcham, Commissioner, Community Services

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Sumeet Jhingan
Tim Lindsay
Walter Garrison

Committees & Panels

Environmental Action Committee
Partnership Panel
Stakeholder Panel (see Appendix C)

Consulting Groups

A Kennedy Consulting
Dillon Consulting
Siemens

Project Steering Committee

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We would also like to thank the following:

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Dianne Zimmerman
Edward Nicolucci
Environment Summer Students
Heliya Babazadeh-Oleghi
John MacKinnon
Katherine Culbert
Lisa Urbani
Michelle Charbonneau
Tim Lai

*Now with a different organization

Executive Summary

The City of Mississauga is committed to decreasing our carbon footprint and to preparing the community for the effects of a changing climate. We know there are practical and proven steps that we can take to help create a low carbon and resilient Mississauga. This Climate Change Action Plan contains our ambitious, yet practical, plan.

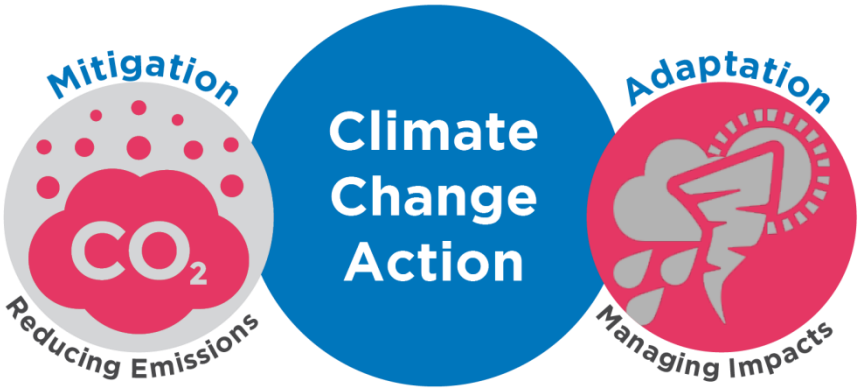
Around the world, there is scientific consensus that our climate is changing. A recent report on climate change, from Natural Resources Canada (2019), shows that Canada is warming at twice the rate of the rest of the world. The City of Mississauga has already felt the effects of climate change, signalled by an increase in the frequency of extreme weather events including seasonal flooding, extreme rainfall, ice storms, and some of the hottest summers on record.

Events of this nature have become "the new normal," creating new pressures around infrastructure planning and management, property damage, service disruption, human injury, and economic setbacks, human injury, and economic setbacks.

The cost implications of not taking action on climate change are significant, and the City is committed to working with the community across all levels to address the risks climate change presents.

We know we all have a role to play. As Ontario's third largest city, Mississauga recognizes the important role that cities play in fighting climate change.

As residents, corporations, and organizations, we can all make a difference. There are two types of actions we can take to combat climate change:



The Climate Change Action Plan includes actions to both mitigate and adapt to climate change.

The Climate Change Action Plan contains the following guiding elements:

VISION

The Climate Change Action Plan is built around the central vision the Mississauga will be a low carbon and resilient community. This vision is the long-term outcome and end-state that the City aims to achieve over the next 30+ years.

GOALS

Goal: Mitigation

Reduce greenhouse gas emissions 80% by 2050 below 1990 levels and position the City competitively in the emerging low carbon economy, with a long-term goal of becoming a net zero community.

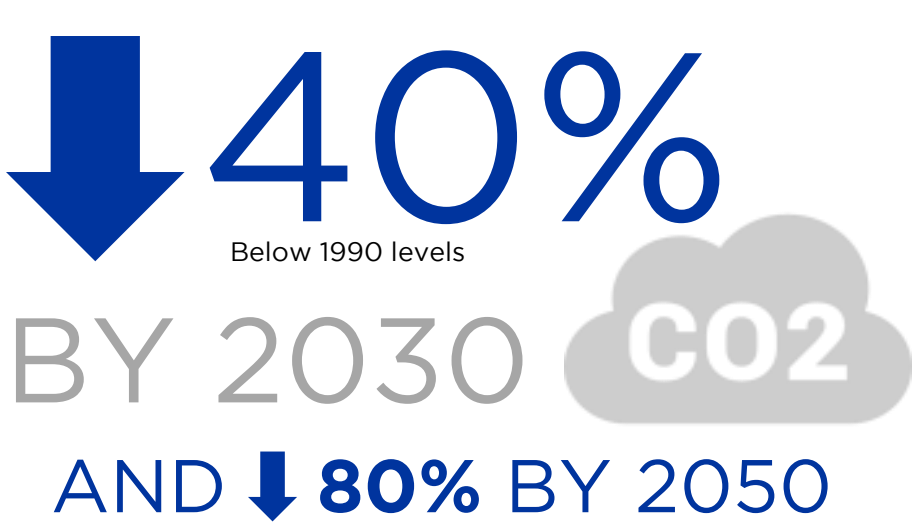
Goal: Adaptation

Increase resilience and the capacity of the city to withstand and respond to current and future climate events by taking action on the highest climate-related risks.

ACTION PATHWAYS

Action Pathways are specific areas of focus with supporting actions that the City plans to accomplish within the next 10 years. They are the mechanisms for working towards the Goals.

1. Buildings and Clean Energy;
2. Resilient and Green Infrastructure;
3. Accelerating Discovery and Innovation;
4. Low Emissions Mobility; and
5. Engagement and Partnerships.



Introduction

Climate change is real, and everyone has a role to play.

Around the world, there is scientific consensus that our climate is changing, signalled by rising temperatures, increased precipitation, and an increase in the frequency of extreme weather events. A recent report from Environment and Climate Change Canada, Fisheries and Oceans Canada, and Natural Resources Canada notes that Canada is warming at twice the rate as the rest of the world (Bush, E. and Flato, G. 2018). More than half of the world's carbon emissions originate in cities and urban areas are facing the increasing costs of adapting to the impacts of a changing climate.

The City of Mississauga has already begun to feel the impacts of climate change, including increased seasonal flooding, extreme rainfall, ice storms, and some of the hottest summers on record.

By 2050, Mississauga is expected to be hotter at all times of the year, with changes to seasonal precipitation patterns, more rainstorms and more heat waves. Winter, spring, and fall will likely be wetter, while summer will be hotter and drier on average, with an increase in storm activity (Tu, C., Milner, G., Lawrie, D., Shrestha, N., Hazen, S. 2017).

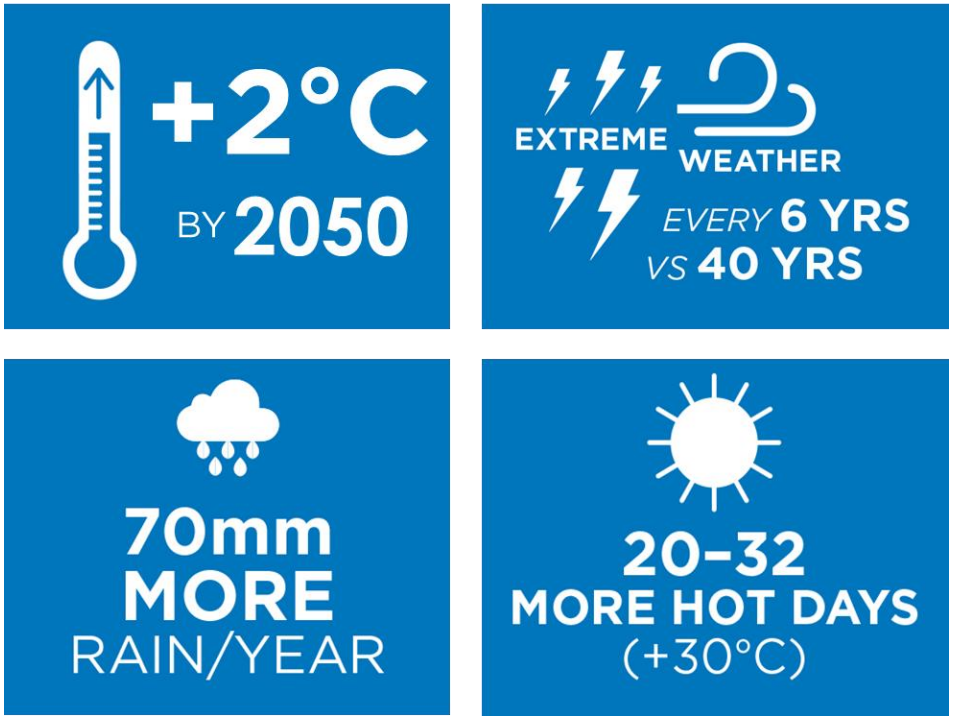


Figure 1 City of Mississauga's climate projections for 2050 (2010 Baseline)

Mississauga has experienced a number of extreme weather events to date (Figure 2). The ice storm of 2013 left thousands without power and resulted in over $25 million in damages, cleanup and recovery costs for the City and its residents (Caledon Enterprise, 2014). Flooding was again experienced by Mississauga residents and businesses in 2017 when high-water levels exceeded the capacity of the local stormwater systems.

Events of this nature have become the new normal, creating new pressures around infrastructure planning and management, property maintenance, service delivery, human health and safety, and economic prosperity.

In 2015, a study was completed by the Insurance Bureau of Canada (IBC) to examine the financial impacts of two types of severe weather events in Mississauga – ice storms and flooding. The report notes that, if current trends continue, the average ice storm will cost approximately $9 million per year (Figure 3).

With a moderate increase in greenhouse gas emissions, this number can jump to $12 million a year. The study also found that a single ice storm of severe magnitude could cost the city anywhere between $23 and $38 million (IBC, 2015).

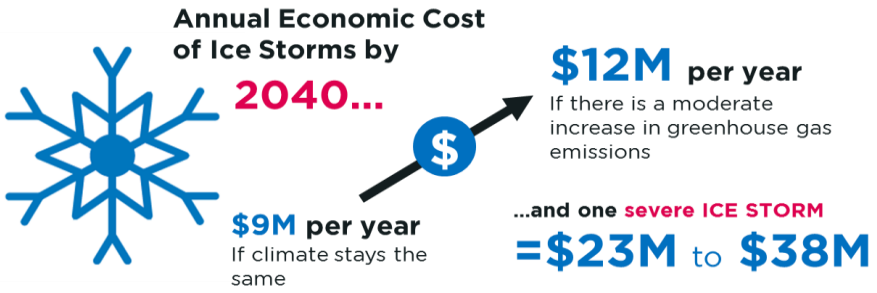


Figure 3 Annual economic cost of ice storms by 2040 (IBC, 2015)

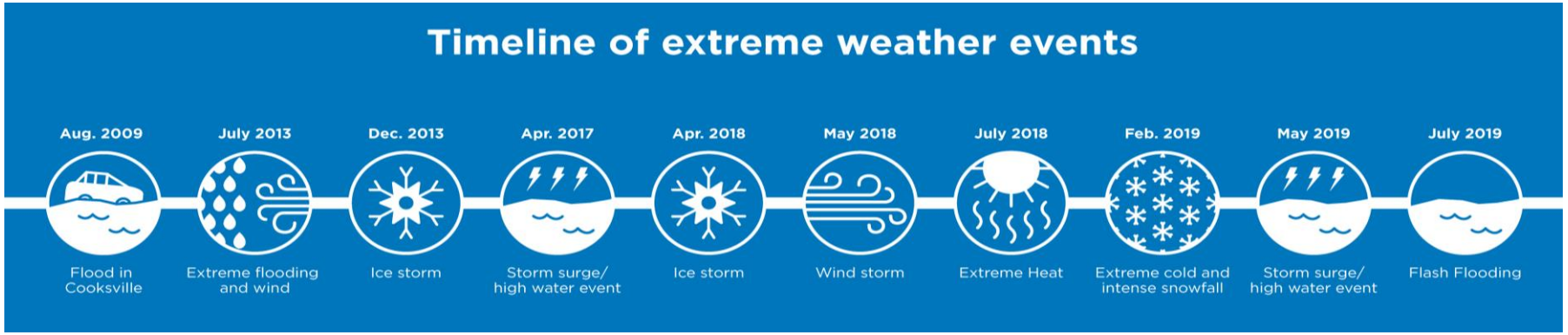


Figure 2 Recent history of extreme weather events in Mississauga: 2009 - 2018

Mississauga's Vision

As a City, Mississauga is committed to doing its part towards securing a better future by transforming into a low carbon and resilient city. Taking steps towards this goal will be achieved through actions taken by the wider community including residents, business owners, and visitors, as well as actions taken by the City of Mississauga as an organization to reduce the carbon footprint of its operations and services.

This Climate Change Action Plan (CCAP) is built around the central vision that **Mississauga will be a low carbon and resilient community**. The CCAP presents a way forward over the next ten years, providing an incremental process to take action, measure progress, adjust to changing technologies and conditions, and continue to build towards the ultimate 30-year vision.

Strong Goals

Supporting the Vision are the Goals, which further define how progress on the Vision will be measured.

Goal: Mitigation

Reduce greenhouse gas emissions 40% by 2030 and 80% by 2050 below 1990 levels and position the City competitively in the emerging low carbon economy, with a long-term goal of becoming a net-zero community.

Goal: Adaptation

Increase resilience and the capacity of the Corporation and the community to withstand and respond to current and future climate events by taking action on the highest climate-related risks.

Figure 4 The Climate Change Action Plan Framework

Imagine 2050 Photo Contest Submission. Photo Credit: David Coulson (2018)

The Role of Cities

Climate change is a local, national and global issue affecting individuals and systems around the world. Although the responsibility to act is collective, cities in particular play a significant role in minimizing their carbon footprint and making their communities more resilient.

Currently, over half of the world's population resides in cities and this number is forecasted to increase in the years to come (Figure 5). In Canada, over 80% of the population lives in urban areas. Cities are major contributors to the production of greenhouse gas emissions. They consume large amounts of energy to heat and cool homes and buildings and experience larger traffic volumes than their rural counterparts. **While municipalities are directly responsible for 5-10% of greenhouse gas emissions as a result of municipal operations, they indirectly control over 40% of greenhouse gas emissions in the community.**

Urban populations are 'ground zero' for the impacts of climate change such as temperature changes, extreme weather events, and precipitation. The systems, infrastructure, and population characteristics that contribute to a functioning city are dynamic and often interconnected; failure of one system can have a cascading effect on the failure of other systems. For example, localized flooding can saturate and exceed the capacity of local stormwater infrastructure leading to disruptions in the road network - such as road closures, washout conditions, road blockages (e.g. downed trees), and slippery road conditions – which in turn can impact local emergency services. These impacts, if not mitigated or planned for in advance, can have substantial economic, environmental, and social consequences.

Municipalities can also educate and empower residents to take action and can implement a wide range of measures to directly and indirectly influence behaviours and decision-making. As a growing and prosperous city Mississauga is a prime example of a municipality with the potential to lead the way in creating a more resilient future.

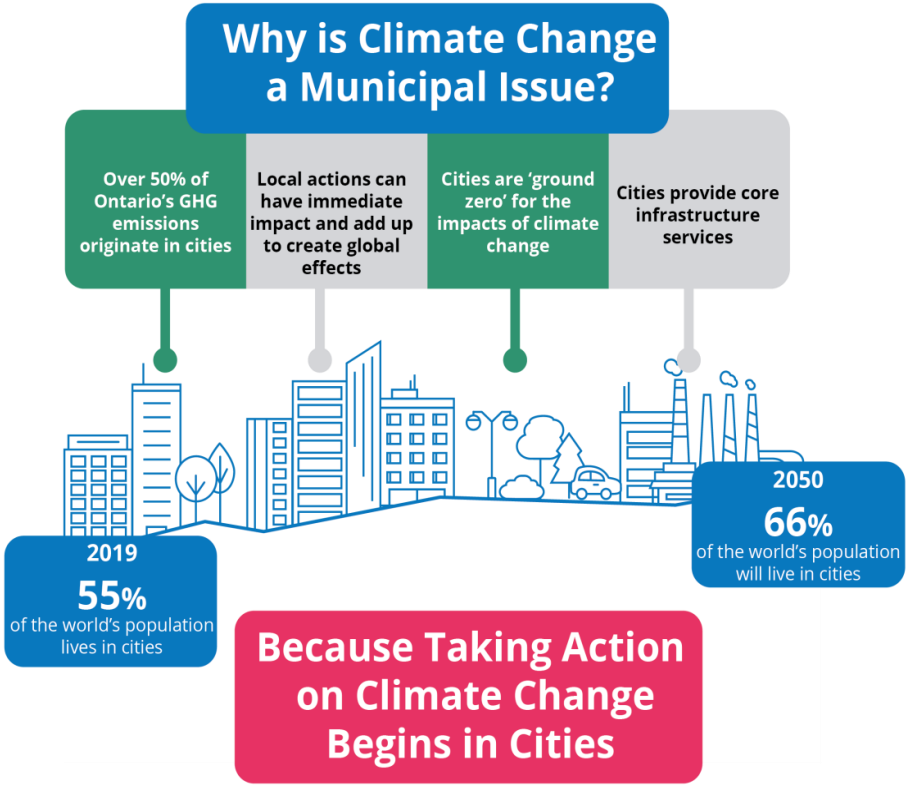


Figure 5 Climate Change Imperative for Cities

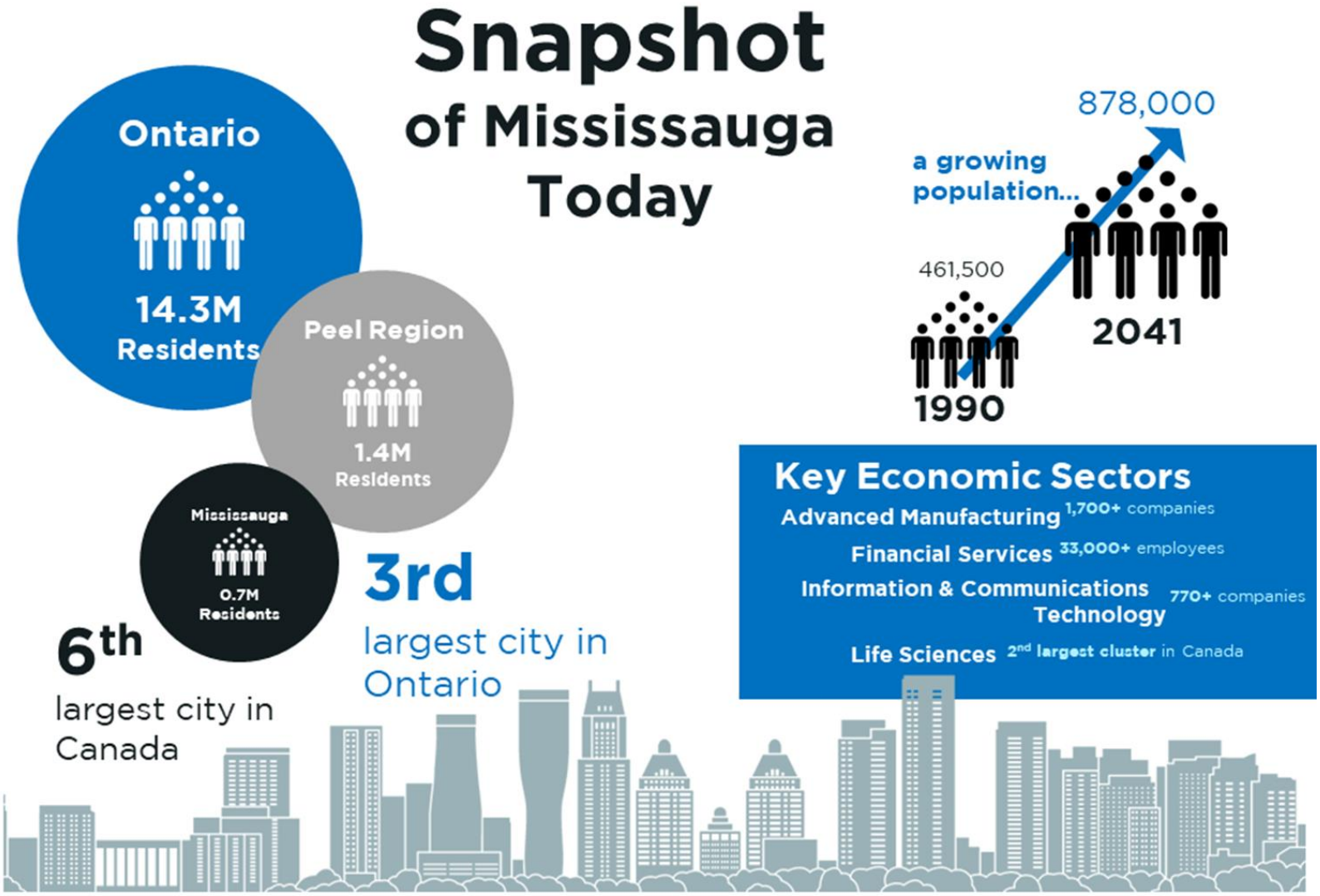


Figure 6 Snapshot of Mississauga Today and into the Future (based on Long-Range Forecasts for the City of Mississauga)

Building on the pillars of change towards a sustainable future...

Mississauga's Strategic Plan (2009) identifies five key Pillars for Change, and the CCAP builds on all of these:

Move
developing a transit-oriented City

Belong
ensuring youth, older adults and new immigrants thrive

Connect
completing our neighbourhoods

Prosper
cultivating creative and innovative businesses

Green
living green

One of the key goals of the Strategic Plan is to promote a green culture and **"...transform Mississauga into a "net-zero" carbon city to become a leader in green initiatives by reducing greenhouse gas emissions..."** The CCAP represents a significant step towards achieving meaningful emission reductions and the long-term goal of becoming a net-zero city.

...with clear Council leadership

1999: The City joined the Partners for Climate Protection program, a joint initiative with ICLEI-Local Governments for Sustainability and the Federation of Canadian Municipalities (FCM)

2009: Passed a resolution supporting an "ambitious, fair and binding international climate agreement."

2017: Became a signatory to the Global Covenant of Mayors for Climate and Energy

2019: City of Mississauga declared a climate emergency

A Strong Foundation

Mississauga has been proactive in sustainability and climate change governance for over two decades. Council has been consistently committed to making progress on climate action, integrating climate change and environmental considerations into the City's Strategic Plan in 2009.

In 2017, the City became a signatory to the Global Covenant of Mayors for Climate and Energy, joining an international coalition of over 9,000 cities and governments with a shared long-term vision of advancing voluntary action to combat climate change and create resilient and low-carbon communities.

There is a growing understanding of the impacts of climate change in Canada and the planning framework around climate change action has expanded to include guidance and support from Federal, Provincial, and Regional bodies, including the Region of Peel's Climate Change Strategy (2011), the Federal Pan-Canadian Framework on Climate Change (2016), amendments to the Provincial Growth Plan (2017, 2019), and the Provincial Made in Ontario Environment Plan (2018), among other legislative and policy guidance (Figure 7). There is collective recognition of the need for improved collaboration and partnerships towards the achievement of climate change goals and targets across all levels of government.

At the local policy level, the City has developed and implemented its Living Green Master Plan, Green Development Standards, and the Stormwater Charge to enhance local sustainability and resilience to flooding.

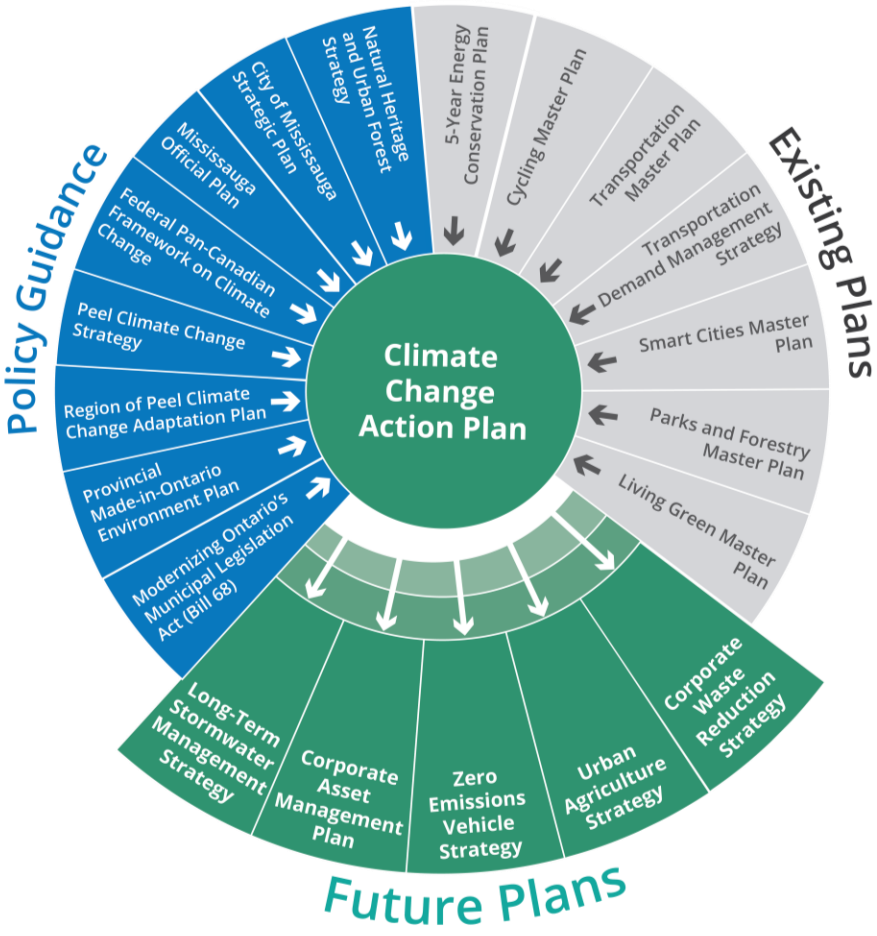


Figure 7 The Planning and Policy Framework for the Climate Change Action Plan

Mississauga's Carbon Footprint

This section provides an overview of greenhouse gas (GHG) emissions in Mississauga. This includes emissions for the city as a whole (also referred to as "community emissions"), as well as emissions related to municipal operations and services (also referred to as "corporate emissions"). See Appendix B for a more detailed description of GHGs, including trends and how the CCAP targets fit into this picture.

Community Profile

Total GHG emissions for the community are 6.2 million tonnes of CO_2 equivalent (eCO_2). The majority of GHG emissions in Mississauga come from buildings (see Figure 8). This includes residential, commercial, and industrial buildings, with emissions coming primarily from the burning of natural gas to heat indoor spaces and water. Over 30% of GHGs come from transportation.

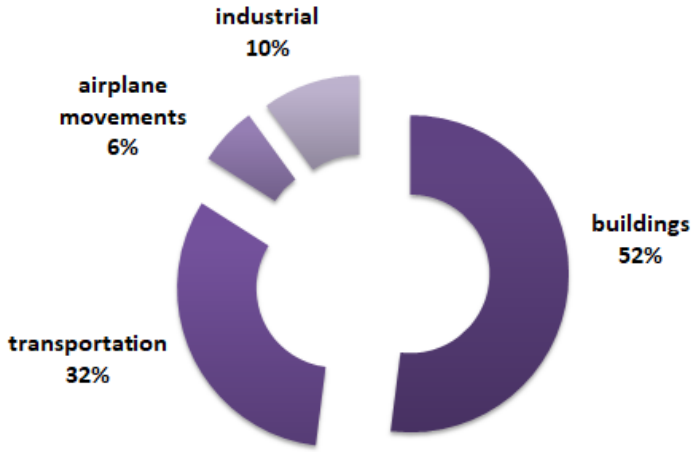


Figure 8 Community Greenhouse Gas Emissions Profile (2015)

Profile of the City as a Corporation

There are five main sources of GHG emissions from the City's municipal operations: (1) municipal buildings; (2) corporate fleet; (3) transit fleet; (4) fire fleet; and (5) street lighting. While single-tier municipal inventories also include solid waste and water and wastewater, these are within the Region of Peel's jurisdiction and are therefore excluded. Total emissions for municipal operations are 72,000 tonnes of eCO_2.

As Figure 9 shows, the vast majority of emissions from municipal operations are the result of operating the transit fleet, which accounts for nearly 70% of total emissions. Municipally-owned and operated buildings account for almost 30% of emissions, with the City's corporate vehicle fleet, fire services trucks and vehicles, and street lighting accounting for the rest.

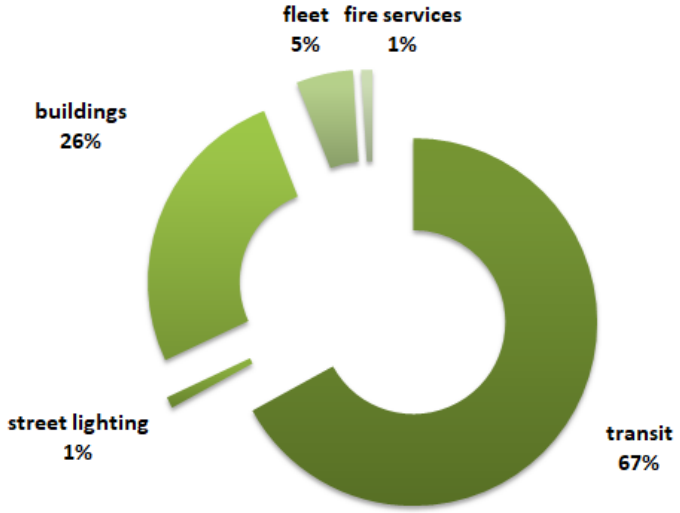


Figure 9 Corporate Greenhouse Gas Emissions Profile (2015)

Setting a Greenhouse Gas Reduction Target

Mississauga is the sixth largest city in Canada and is growing quickly. With the population projected to be over 900,000 by 2050, the city will remain one of the biggest economic centres in the Greater Toronto Area (GTA).

In 2018, the City undertook a study to evaluate technology pathways for deep carbon reductions using Siemens' City Performance Tool (CyPT). Over 350 data points from Mississauga's transportation, building, and energy sectors were collected to establish an emissions baseline for 2016 and a projected baseline for 2050 using the *Global Protocol for Community-Scale Greenhouse Gas Emission Inventories.* More general characteristics, such as population growth, the supply mix of electricity generation, transportation modalities and travel patterns, building energy use, and the built environment footprint, were then layered on to the analysis.

The CyPT then quantified the performance of over 70 policies and technologies against five key performance indicators: GHG emissions, nitrogen oxides (NOx), particulate matter (PM10), gross full-time equivalents (FTE), and capital and operating expenses.

Based on this analysis, it is clear that the City of Mississauga can achieve ambitious emission reductions and lower emissions **80% by 2050** relative to 1990, with a long-term goal of becoming net-zero while creating a greener, smarter, and more prosperous city.

The path forward will require significant commitments from residents, local government, as well as all private and public stakeholders. By investing in renewable energy (such as solar), electrifying heating (with air-sourced heat pumps), and shifting our modes of travel, the City can have a significant impact on emissions, while improving air quality and creating jobs.

The City is committed to reducing its greenhouse gas emissions and has set an ambitious and achievable greenhouse gas reduction target of **80% below 1990 levels by 2050 with a long-term goal of becoming net-zero**.

Charting the Course: The Climate Change Action Plan

The process to develop the Climate Change Action Plan (CCAP) has been extensive and has involved thousands of people and dozens of studies.

In the fall of 2017, Mississauga initiated its Climate Change Project to create a framework to reduce greenhouse gases and manage risks related to climate change over the coming decades.

This **Climate Change Action Plan (CCAP)** is the City's first comprehensive climate change plan, and lays out a clear course for Mississauga over the next ten years to tackle climate change. By integrating mitigation and adaptation mechanisms into social, economic, and environmental systems now, the City will increase its capacity to prepare for and respond to the impacts of climate change.

The CCAP includes actions for both the City of Mississauga and the community at large, and takes a critical step in the ongoing journey towards a low carbon and resilient Mississauga.

The need to act quickly and with purpose is recognized throughout the Climate Change Action Plan, both for the City and its residents.

An Informed Approach

Recognizing the complexity of climate change, the CCAP is the result of an in-depth, systematic process. This includes a technical review of current conditions, gap analysis to identify critical climate change risks and information needs, visioning on progress over the next 30+ years, and creating an outcome-oriented Action Plan for Mississauga for the next ten years.

A number of key steps were involved in the planning process, including the following:

Technical Studies were undertaken to answer key questions about the City's current energy consumption, as well as infrastructure risks and innovation opportunities. These included:

- Energy Mapping to identify the patterns in energy consumption (including electricity and natural gas consumption) in residential buildings;
- Fleet Analysis of the City's corporate vehicle and transit fleet emissions;
- Park Infrastructure Assessments of Jack Darling Memorial Park, Streetsville Memorial Park, and Saint Lawrence Park to assess climate risks and vulnerabilities;
- A Cleantech Sector Assessment, to analyze the opportunities for growth and innovation; and
- Risk and Vulnerability Assessments to understand where the highest priority areas are for adaptation action (see Appendix B for more details on the corporate and community climate risk assessments).

Supporting Initiatives developed by the City of Mississauga and the Region of Peel were reviewed to provide guidance and insight into the planning process including the Transportation Master Plan, Cycling Master Plan, and Smart City Master Plan. Additional strategies by the Insurance Bureau of Canada (IBC), the Toronto and Region Conservation Authority (TRCA), and Credit Valley Conservation (CVC) were also reviewed.

Benchmarking and Gap Analysis provided an in-depth look at current practices and policies at the City, and best practices from leading cities facing similar climate change challenges.

The CCAP integrated the results of all these preceding steps and was informed by in-depth action planning workshops with key stakeholders from across the community as well as within City departments (see Figure 10).

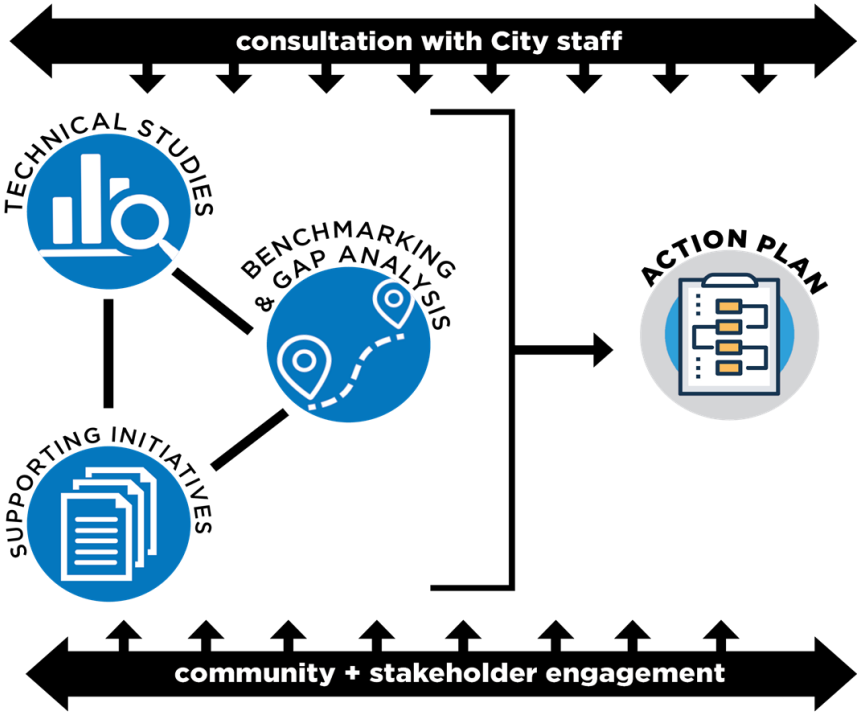


Figure 10 Key Steps in the Development of the Climate Change Action Plan

Spotlight on Engagement

The City worked closely with community partners, stakeholders, and residents to develop an Action Plan that reflects the ideas, interests, and strong partnerships of the community.

Early on in the planning process, stakeholder engagement was recognized as a central tenet for the development of a successful Action Plan. As shown in Figure 10, there were a number of inputs into this Action Plan. Feedback was sought in two main ways: consultation with City staff; and engagement with community stakeholders (e.g., representatives from the business, academic and not-for-profit sectors).

Community representatives were consulted through the creation of a Climate Change Stakeholder Panel. The Panel met on a regular basis at key decision-points and milestones throughout the project process and development of the Action Plan, including the visioning, climate risk assessment, and action planning stages. Members from a range of organizations participated in the Panel, including utility companies, conservation authorities, academic organizations, school boards, the Mississauga Board of Trade, Metrolinx, and other community organizations.

Photos of Engagement Activities from the Climate Change Project

Fun, creative, and engaging tactics were also deployed at a range of public events to get the community talking about climate change and the ways that residents and business owners could make a difference through individual and collective action (see Appendix C for more information on public engagement including a full list of Stakeholder Panel members).

Throughout September and October 2019, City staff engaged the public more broadly through a public consultation process. Throughout this period, the City received 100s of responses to the online survey, and spoke to over 500 residents at a series of workshops and public open houses.

Including social media impressions, **the Climate Change Project reached over 165,000 community members.** The Climate Change Action Plan aims to harness the energy and passion expressed by the community to create a more resilient future for Mississauga.

Action Pathways

Action pathways are specific areas of focus with supporting actions that the City plans to accomplish within the next five to ten years.

The action pathways are categorized into the following categories:

Buildings & Clean Energy

Resilient & Green Infrastructure

Accelerating Discovery & Innovation

Low Emissions Mobility & Transportation

Engagement & Partnerships

Action Characterization

Supporting actions are categorized based on the following action types:

- **Plans and Studies:** Conduct research or strategic planning projects to establish direction on new or emerging areas of interest.
- **Policies, Guidelines, and Standards:** Establish or update rules and regulations to provide direction for projects, initiatives, or programs.
- **Procedures:** Develop and implement new ways of doing business or adapt existing practices and procedures to enhance low carbon resilience.
- **Programs and Projects:** Develop new programs or projects to advance climate action, with proof-of-concept pilot projects as needed.
- **Partnerships and Engagement:** Collaborate with stakeholders (both internal and external) to advance climate action for the Corporation and in the community and advocate on behalf of the City to other levels of government to advance and support local climate action.

Cost

The estimated cost of implementing each action has been characterized based on a relative scale as follows:

- N/A - Cost is covered by existing staff capacity or operating budgets
- Low Cost - **$** ($0-$100,000)
- Medium Cost - **$$** ($100,000 - $500,000)
- High Cost - **$$$** ($500,000+)

Timeline

The supporting actions provide a roadmap for the next ten years. In the tables below, the timing of actions is identified as short-, medium-, or long-term as follows:

- Short Term (1-3 years): ▬▭▭
- Medium Term (4-7 years): ▬▬▭
- Long Term (7+ years): ▬▬▬
- Recurring: Actions which happen on an ongoing basis

Status

The status of each action is included for each supporting action and will continue to be updated as the Climate Change Action Plan is implemented. The status of an action is defined as follows:

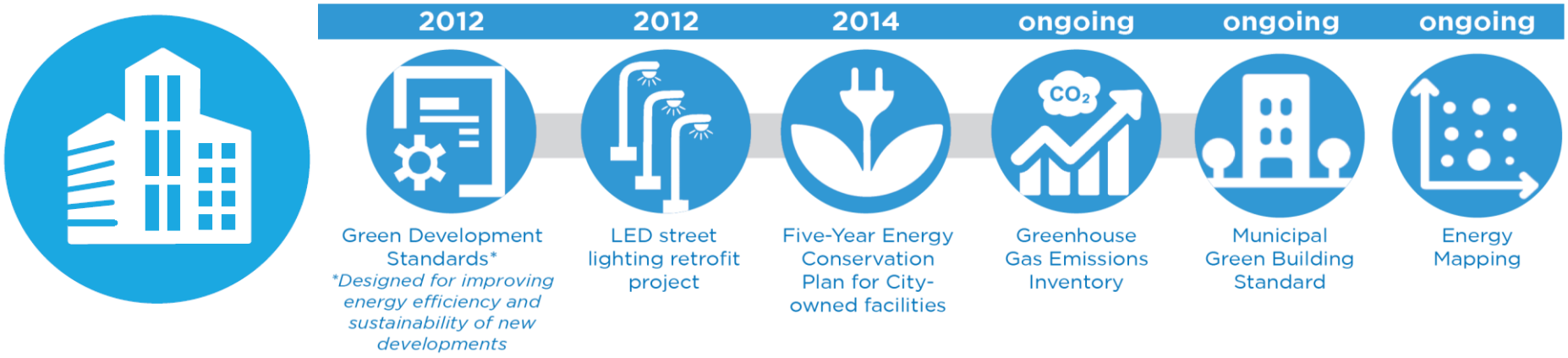
- Not Initiated – not begun yet
- Planned – the intention to complete the action is part of current or future work plans and/or budgets
- Underway – includes actions which have been initiated, are already funded, and/or are part of the business-as-usual operations of a team or division within the City.
- Complete

Roles and Responsibilities

Roles and responsibilities are identified, to provide greater ownership and oversight through the implementation process. Additional stakeholders, whose partnership is central to the implementation of each action, are also noted.

Community members engaging with the Climate Change Project at the Erin Mills Town Centre

Figure 11 Building on Progress to Date: Buildings and Clean Energy



1.0 Buildings and Clean Energy

Overview

As a rapidly growing city, sustainable building design and the incorporation of clean energy solutions to meet building energy demands are key considerations in the effort to minimize the impacts of climate change in Mississauga.

Buildings of all types (residential, commercial and industrial) require energy for cooling and heating, lighting, and operating equipment and appliances. The amount of energy consumed is influenced by the number of occupants, the activities taking place within the building, the age or construction of the building itself, and the materials within them.

By transitioning towards more energy-efficient and climate resilient materials, for new and existing buildings, the GHG emissions from the built environment can be reduced and the risks associated with climate change mitigated. Diversification of building energy supply through the use of renewable resources (wind, solar, etc.) will also reduce the City's carbon footprint, and improve air quality.

This chapter provides a roadmap for addressing climate change in the area of Buildings and Clean Energy and identifies actions that will guide progress over the next ten years. The main focus areas are:

- Reduction of GHG emissions from existing and newly developed buildings;
- Increasing the use and supply of renewable energy;
- Advancement of low carbon community energy systems; and
- Encouraging building occupants and owners to implement energy conservation measures.

Connecting to the Future

Today

To date, the City has implemented a number of actions to address the reduction of carbon emissions within the built environment (Figure 11). In 2010, the Green Development Strategy was adopted by City Council which focused on environmental responsibility and incorporating sustainable mechanisms into proposed building development initiatives. As part of the Strategy, new development applicants are encouraged to achieve Leadership in Energy and Environmental Design (LEED) certification, which encourages developers to use sustainable green building and development practices in the design and construction of their buildings.

In addition, Mississauga has integrated renewable energy retrofits (primarily solar-based) into many of its City-owned facilities including the Paramount Fine Foods Centre, and Huron Park and Burnhamthorpe Community Centres. The City has also been developing and executing Energy Conservation Plans since 2001, which includes both capital-intensive projects, such as energy upgrades for lifecycle replacements, lighting upgrades, and controls upgrades, as well as low- or no-cost improvements such as operation optimization in City-owned facilities.

By 2030

Progress towards a more prosperous and sustainable future will mean that, by 2030, all new buildings are energy-efficient and resilient and significant reductions in the carbon footprint of existing buildings and facilities across Mississauga has been achieved.

By 2030, Mississauga's buildings and energy sector will be more reliant on low-carbon energy sources, making strides towards energy security through distributed energy (i.e. renewables). The City will be a leader in integrating renewable energy into the city's energy profile.

As more energy efficient and climate resilient building designs are implemented, community and City-owned properties will have stronger safeguards against climate change impacts. This means greater protection from the economic, social, and psychological costs of property damage from severe weather events.

The outcomes of key initiatives will mean advanced community and district energy planning programs, a stronger and more directive policy and regulatory framework for new and existing development, a larger stock of buildings that can withstand climate change impacts, and a more empowered network of residents and building owners taking action towards achieving a net zero city with a built environment that is protected and secure in the face of climate change impacts.

Action #1: Advance Renewable Energy and Low Carbon Energy Systems

The City will work with partners towards supplying 75% of community energy needs through renewable or low-carbon sources (e.g., geothermal, district energy) by 2050.

Goals Supported	
Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
1-1	Support and encourage developer-led efforts to include low carbon energy systems in new development	Partnerships and Engagement	Recurring	N/A	Underway	Parks, Forestry & Environment (Environment)	City Planning Strategies, Development and Design	Utilities, Property Owners/ Management/ Developers
1-2	Conduct a district energy feasibility study in the downtown for community and municipal buildings to advance low carbon energy systems in Mississauga	Plan/Study	▬▭▭	$	Planned	Parks, Forestry & Environment (Environment)	City Planning Strategies	Utilities, Property Owners/ Management/ Developers
1-3	Conduct a study to identify mechanisms to enhance community energy planning through the Official Plan or other planning tools (i.e. Development Master Plan) particularly in growth areas and areas for major redevelopment	Plan/Study	▬▭▭	$	Not initiated	Parks, Forestry & Environment (Environment)	City Planning Strategies	Utilities, Property Owners/ Management/ Developers

Action #2: Update Mississauga's Official Plan to Strengthen Existing Climate Change Imperative

The City's commitment to a low-carbon future will be strengthened in the City's Official Plan and will create the supporting land-use planning framework to advance climate action in Mississauga.

Goals Supported

Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
2-1	Include policy direction in the City's Official Plan to support the Climate Change Action Plan	Policy	▬▭▭	$	Underway	City Planning Strategies	Parks, Forestry & Environment (Environment), Development and Design, Infrastructure Planning and Engineering Services	
2-2	Incorporate a climate impact lens in to streetscape design in the Downtown Public Realm Strategy and, once complete, consider applicability city-wide	Plan/Study	▬▬▭	N/A	Underway	Development and Design	Parks, Forestry & Environment (Environment)	Utilities, Property Owners/ Management/ Developers
2-3	Revise the development application requirements and update the complete application criteria in the Official Plan to align with the updated Green Development Standards (See Action 3-1)	Procedure	▬▬▭	$	Not initiated	City Planning Strategies/ Development and Design* *Co-Lead	Parks, Forestry & Environment (Environment), Legal Services, Infrastructure Planning and Engineering Services	

Action #3: Improve the Energy Efficiency and Climate Resilience of New Buildings

The City will work to advance the sustainability and resilience of new private developments to encourage the use of renewable and district energy, reduce stormwater runoff, protect and enhance ecological functions, and reduce urban heat island.

Goals Supported

Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
3-1	Update the Green Development Standard to include energy and resilience considerations within building, site features, and boulevard design	Plan/Study	▬▬▭	$$	Planned	Development and Design/ Parks, Forestry & Environment (Environment)* *Co-Lead	Legal, Infrastructure Planning and Engineering Services	Utilities, Property Owners/ Management / Developers
3-2	Identify opportunities to introduce new legal and/or policy tools, including by-laws, to require implementation of climate resilience measures (e.g., green roof by-law) in new buildings	Plan/Study	▬▭▭	N/A	Not initiated	Parks, Forestry & Environment (Environment)	Legal Services, City Planning Strategies	

Action #4: Increase the Use and Supply of Renewable Energy at Municipally-Owned Facilities

All new municipal buildings will be designed to accommodate future connections to solar energy sources and have on-site renewable energy devices. Solutions that move towards low carbon energy sources such as solar, wind, or district energy will be investigated and installed where possible.

Goals Supported	
Adaptation	Mitigation
	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
4-1	Conduct a GHG Reduction and Solar Feasibility Study for Corporate Buildings	Plan/Study	▬▭▭	$$	Planned	Facilities & Property Management (Energy)/ Parks, Forestry & Environment (Environment)* *Co-Lead		
4-2	Explore models to finance investment in renewable capacity to meet City facility needs	Plan/Study	▬▭▭	N/A	Not initiated	Parks, Forestry & Environment (Environment)	Facilities & Property Management (Energy), Finance	
4-3	Identify and advance opportunities for renewable energy generation and storage at City-owned facilities to supply the needs of existing and future City-owned facilities and buildings	Partnerships and Engagement	▬▭▭	N/A	Not initiated	Facilities & Property Management (Energy)	Parks, Forestry & Environment (Environment)	Utilities

Action #5: Advance Energy Efficiency and Climate Resilience of Municipally-Owned Buildings

The City will lead by example by implementing low carbon and resilient technologies and processes in municipally-owned buildings to reduce energy consumption in corporate buildings by 25% below 2008 levels by 2030. Emerging technologies that work towards affordable and highly efficient solutions will also be encouraged, particularly those which reduce natural gas consumption.

Goals Supported

Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
5-1	Build all new municipally-owned buildings to be more energy efficient and near net-zero	Policy	Recurring	N/A	Underway	Facilities & Property Management (Energy)	Parks, Forestry & Environment (Environment)	
5-2	Retrofit municipally-owned buildings to reduce natural gas and electricity consumption	Procedure	Recurring	$$	Not initiated	Facilities & Property Management (Energy)	Parks, Forestry & Environment (Environment)	Utilities
5-3	Develop municipal resilient design guidelines to complement existing Energy Design Guidelines to apply to retrofits and lifecycle replacements of municipal buildings	Policy	▬▬▭	$$	Not initiated	Parks, Forestry & Environment (Environment)/ Facilities & Property Management* *Co-Lead	Fire and Emergency Services (Office of Emergency Management)	

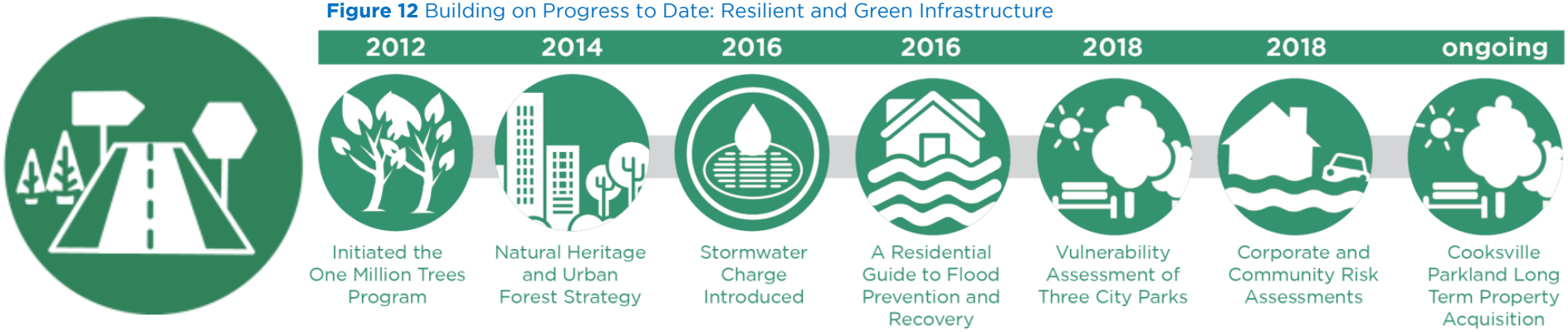
Action #6: Develop a Low Carbon and Resilient Retrofits Program

The City will pursue opportunities to educate land owners and promote the retrofitting of existing buildings (including residential and commercial) with low carbon and resilient technologies to support improved energy efficiency (e.g., through heat pumps, wall insulation, etc.) and resilience while extending the life of existing structures.

Goals Supported	
Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
6-1	Support new Sustainable Neighbourhood Retrofit Action Plans or other neighbourhood level action planning that focuses on retrofitting multi-unit residential buildings to be more energy efficient and resilient	Program/ Project	▬▭▭	$	Underway	Parks, Forestry & Environment (Environment)		Conservation Authorities
6-2	Develop energy and resilience retrofit programs for homeowners and landlords to promote opportunities, existing programs, incentives, and technologies that improve resilience, drive energy efficiency, and reduce greenhouse gas emissions	Program/ Project	▬▭▭	N/A	Planned	City Planning Strategies/ Parks , Forestry & Environment (Environment)* *Co-Lead		The Atmospheric Fund, Utilities
6-3	Develop targeted programming based on energy maps and community greenhouse gas emissions inventories and continue to update data sets on regular cycles (e.g., annually/every five years)	Program/ Project	▬▭▭	$	Not initiated	Parks, Forestry & Environment (Environment)	Strategic Communications	Utilities, Partners in Project Green, Conservation Authorities
6-4	Encourage the use of low carbon heating and cooling technologies (e.g., heat pumps) for space and water heating and cooling	Procedure	▬▭▭	$	Not initiated	Parks, Forestry & Environment (Environment)	Information Technology (Geospatial Solutions)	Utilities
6-5	Promote building envelope upgrades (e.g. wall insulation, energy efficient windows) in residential, commercial, and industrial buildings	Program/ Project	▬▭▭	N/A	Not initiated	Parks, Forestry & Environment (Environment)		Utilities

Figure 12 Building on Progress to Date: Resilient and Green Infrastructure



2.0 Resilient & Green Infrastructure

Overview

Climate change impacts, such as extreme weather events, can cause damage to both physical infrastructure and natural systems and can disrupt municipal services, which poses a multitude of challenges.

Natural systems also provide a wide range of goods and services that benefit humans, such as drinkable water, pollination, flood regulation, and clean air. These ecosystem services support us in many ways, by enriching our health and well-being, offering recreational, aesthetic and spiritual opportunities, and strengthening our economy (Tu, C., Milner, G., Lawrie, D., Shrestha, N., Hazen, S. 2017). Protecting and enhancing Mississauga's Natural Heritage System builds resilience and can allow for natural and built resources to better cope with the impacts of climate change and help to minimize disruptions to municipal services.

By enhancing the resiliency of the built environment, protecting ecosystem services, and reducing risk to some of the City's most critical services now, Mississauga will be better positioned to cope with the impacts of climate change into the future.

The main focus areas for this Action Pathway are to:

- Enhance community level resilience and preparedness for known climate risks, including flooding, extreme heat, wind, and ice storms;
- Monitor and implement improvements to local air quality; and
- Support the development of green infrastructure and naturalized areas to improve resilience.

Connecting to the Future

Today

Residents, workers, and visitors to Mississauga all rely on the ecosystem and infrastructure services that are provided by the City's Natural Heritage System, infrastructure, and assets. Recognizing the importance of improving the resilience of the Natural Heritage System, infrastructure assets, and services, Mississauga has taken steps to better understand and plan for disruptions and damage caused by severe weather events, while also expanding green infrastructure across the city (Figure 12).

Additionally, the City has recognized the importance of managing its stormwater drainage system due to the risk of flooding and implemented a Stormwater Charge to generate funding for ongoing stormwater system management and investment.

By 2030

Resilience is a cornerstone of infrastructure management and planning in Mississauga and the municipality has taken proactive measures to mitigate, prepare for, and respond to a range of climate change scenarios.

The City has a robust climate risk management program in place that takes into account all members of the community including the city's most vulnerable populations. The practices in place have decreased exposure to the impacts of climate change and increased the adaptive capacity of the entire community.

Policies, programs, and investments in green infrastructure, ecosystem services, and natural heritage have built resilience in Mississauga, and climate considerations are routinely taken into account in decision-making processes. Existing datasets for tree canopy, habitats, and other natural systems have been expanded to guide actions and decision-making. Progress has been made towards establishing a long-term stormwater management strategy, and a plan for urban agriculture has been established.

Imagine 2050 Photo Contest Submission. Photo Credit: Jojo Santa Ana (2018)

Action #7: Create a Municipal Green Infrastructure Management Program

Create a City-wide green infrastructure program which will include the development of an inventory, management plan, and performance tracking mechanisms, and will establish and drive service levels in a coordinated and holistic way.

Goals Supported

Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
7-1	Create a targeted municipal green infrastructure program, which includes developing a Geographic Information System (GIS) based inventory, and monitoring assets with a particular focus on the impact of climate change over time	Program/ Project	▬▬▭	$	Not initiated	Parks, Forestry & Environment (Environment)	Information Technology (Geospatial Solutions), Smart City/Information Technology, Infrastructure Planning and Engineering Services (Environmental Services)	Conservation Authorities
7-2	Develop an Asset Management Plan for all municipally-owned and/or managed natural assets	Procedure	▬▬▭	$	Not initiated	Parks, Forestry & Environment (Environment)	Finance. Infrastructure Planning and Engineering Services	Conservation Authorities
7-3	Develop a mechanism to valuate green infrastructure assets and the benefits of these assets to the community	Procedure	▬▬▭	$	Planned	Parks, Forestry & Environment (Environment)	Infrastructure Planning and Engineering Services (Environmental Services)	Conservation Authorities

Action #8: Integrate Climate Change Considerations into the Municipal Park Standards

The ongoing development of parks and parks facilities will include measures to address climate change risk and resiliency. These may include: increasing permeability of surfaces; increasing vegetation around stormwater management areas and adjacent areas that have low permeability; hardy species lists; and targets for tree canopy/soft landscape areas and naturalization.

Goals Supported	
Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
8-1	Explore options to enhance resilience in City-owned spaces and parks (e.g., walking pathways in parks) as opportunities arise on a site-by-site basis	Procedure	▬▭▭	N/A	Underway	Parks, Forestry & Environment		
8-2	Develop and continuously update City design and maintenance standards for trees, shrubs, and perennials in urban locations to include considerations of advanced technology, species selection, and climate impacts (e.g., drought) in line with Recommendation 12 from the City's Parks and Forestry Master Plan	Procedure	▬▭▭	N/A	Planned	Parks, Forestry & Environment		
8-3	Create design guidelines to consider alternative adaptive materials (e.g., more resilient to heat, freeze/thaw, wind) in the engineering and design of public spaces	Policy	▬▬▭	$	Planned	Parks, Forestry & Environment		

Action #9: Continue to Identify and Mitigate Climate-Related Risks and Enhance Community-Level Resilience and Preparedness

Climate-related risks to the community, including extreme heat, wind, ice storms, health related vulnerabilities, and food security, particularly to vulnerable populations, will be identified and mitigated.

Goals Supported	
Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
9-1	Continue to create response plans for climate-related risks (e.g., heat) to ensure suitable warning systems and response procedures are in place during extreme weather events	Plan/Study	▬▬▭	N/A	Underway	Fire and Emergency Services (Office of Emergency Management)	Parks, Forestry & Environment (Environment)	
9-2	Update and expand climate-related risk and vulnerability assessments for the community and the Corporation, with a specific focus on vulnerable populations, and develop targeted adaptation plans	Plan/Study	▬▭▭	N/A	Planned	Parks, Forestry & Environment (Environment)	Fire and Emergency Services (Office of Emergency Management)	
9-3	Conduct a climate vulnerability assessment of all existing municipal assets as part of the development of asset management plans	Plan/Study	▬▬▭	$$	Planned	Parks, Forestry & Environment (Environment)	Finance, Facilities & Property Management, Infrastructure Planning and Engineering Services (Environmental Services)	
9-4	Develop an urban agriculture and food security strategy	Plan/Study	▬▬▭	$	Planned	Parks, Forestry & Environment (Environment)	City Planning Strategies, Legal Services	Conservation Authorities, Ecosource

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
9-5	Work with regional partners to enhance existing programs and services to address health impacts from climate change, increase awareness and responsiveness, and identify effective interventions and partnerships	Partnerships and Engagement	Recurring	N/A	Not initiated	Parks, Forestry & Environment (Environment)		Other levels of government

Action #10: Maintain and Enhance the Urban Forest to Improve Air Quality, Reduce Greenhouse Gas Emissions, and Improve Resilience

Climate change considerations will be integrated into existing habitat and tree monitoring and maintenance to ensure thriving natural areas and native species, and a robust tree canopy and proactively prepare for future impacts from pests and disease, changing watering requirements for trees, and other climate change impacts (e.g., extreme heat, wind).

Goals Supported	
Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
10-1	Increase the urban tree canopy and the diversity of tree species being planted on public and private lands	Program/ Project	Recurring	$$	Underway	Parks, Forestry & Environment	Development and Design	Conservation Authorities
10-2	Finalize and implement invasive species monitoring and control within the context of climate change, as per the Invasive Species Management Plan (2019)	Plan/Study	▬▬▭	$$	Underway	Parks, Forestry & Environment		Conservation Authorities
10-3	Review existing watering programs based on changing climate conditions and consider alternative sources of water, including potential rain capture or irrigation systems	Procedure	▬▭▭	$	Not initiated	Parks, Forestry & Environment (Forestry)		
10-4	Create a community tree monitoring program to involve residents in the upkeep and maintenance of trees in their neighbourhoods	Program/ Project	▬▭▭	$	Not initiated	Parks, Forestry & Environment	Strategic Communications (311)	Conservation Authorities
10-5	Continue to diversify vegetation community types, including meadow, wetlands, and forests, in public spaces	Policy	▬▬▭	$$	Not initiated	Parks, Forestry and Environment		Conservation Authorities

Action #11: Monitor and Implement Improvements to Local Air Quality

In addition to greenhouse gas emissions, air pollutants, in the form of particulate matter and chemicals, are also released into the atmosphere from industrial processes and combustion engines and have implications for human health, the environment, and the economy. Air quality policies will be updated and a monitoring and modelling program will be developed (with partners).

Goals Supported

Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
11-1	Work with partners to monitor and model air quality	Partnerships and Engagement	Recurring	N/A	Underway	Parks, Forestry & Environment (Environment)	Information Technology (IT)	Other levels of government
11-2	Update Idling Control By Law and corporate policy (09-00-02 – Unnecessary Vehicle Idling) and explore enhanced enforcement models for personal, municipal, and freight vehicles	Policy	▬▭▭	N/A	Not initiated	Parks, Forestry & Environment (Environment)	Enforcement, Legal Services, Corporate Performance and Innovation, Works Operations and Maintenance (Fleet)	
11-3	Work with other levels of government within the goods movement sector to explore pilot projects in Mississauga that improve local air quality	Program/ Project	▬▬▭	$	Not initiated	Parks, Forestry & Environment (Environment)		Other levels of government, Neighbouring municipalities
11-4	Update the Corporate Smog and Air Health Advisory Response Plan	Plan/Study	▬▬▭	$	Not initiated	Parks, Forestry & Environment (Environment)		

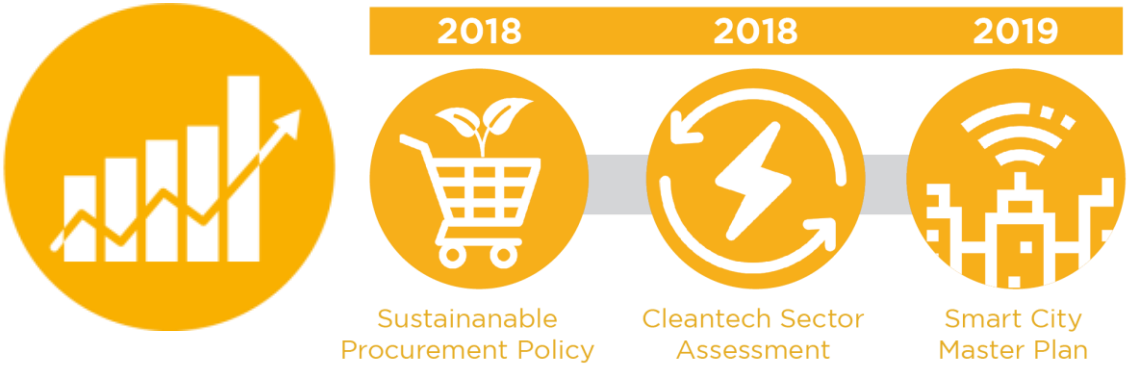
Action #12: Continue to Enhance Flood Resilience and Stormwater Management in the Context of Changing Climate Conditions

Immediate and long-term actions will be developed to enhance flood resilience and the City's approach to stormwater management to address climate change issues and flood risks.

Goals Supported	
Adaptation	Mitigation
●	

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
12-1	Assess the condition of the existing stormwater system as part of the Stormwater Asset Management Plan	Plan/ Study	▬▭▭	$	Underway	Infrastructure Planning and Engineering Services (Environmental Services)		
12-2	Develop a comprehensive long-term stormwater management strategy to reduce surface runoff and enhance flood resilience	Plan/ Study	▬▭▭	$$	Underway	Infrastructure Planning and Engineering Services (Environmental Services)		Conservation Authorities
12-3	Explore the use of green infrastructure to manage stormwater on publicly and privately owned properties (e.g., permeable paving, blue roofs)	Plan/ Study	Recurring	$	Planned	Infrastructure Planning and Engineering Services (Environmental Services)	Parks, Forestry & Environment (Environment)	Conservation Authorities, Mississauga Board of Trade
12-4	Develop neighbourhood-based flood mitigation plans (for urban overland and sanitary flooding) to identify opportunities to decrease flood risk	Plan/ Study	▬▭▭	$$	Planned	Infrastructure Planning and Engineering Services (Environmental Services)		Conservation Authorities

Figure 13 Building on Progress to Date: Accelerating Discovery and Innovation



3.0 Accelerating Discovery & Innovation

Overview

New technologies and innovative ways of doing business are essential for Mississauga to reach the goals set out in this Action Plan. In recent years, cleantech has emerged as a driving force behind many of the world's leading climate change solutions, making strides in significantly improving efficiencies in energy production and resource management, and preventing and reducing degradation to the environment.

Recognizing that progress to achieve the benefits of a more diverse research, development, and technology sector will take both time and resources, the City will need to take steps to help accelerate discovery and innovation in Mississauga.

The main focus areas for this Action Pathway are to:

- Increase access to funding and resources for climate action and related projects;
- Support growth of the green economy and the cleantech sector in Mississauga through partnerships with local businesses and industry leaders;
- Create policies and procedures that will result in climate considerations being routinely taken into account in decision-making processes within the City; and
- Monitor innovation and change in low carbon and resilient technologies

Connecting to the Future

Today

Mississauga is a Canadian leader in cleantech, with more advanced clusters than any other major comparative city (Mississauga Cleantech Cluster Assessment, MDB Insight, 2018). Mississauga's cleantech sector supports a strong balance between research, development, and manufacturing; suggesting a mix of creative and critical thinking and advanced manufacturing, in addition to leadership in green transit. Mississauga's location, situated between Toronto and Hamilton, has allowed the City to tap into a talent pipeline from 12 publicly funded post-secondary institutions, including the local University of Toronto campus and Sheridan College.

Mississauga's Sustainable Procurement Policy addresses sustainable procurement at all levels of local government and across a variety of roles and levels of seniority. The result is a precedent-setting, comprehensive policy framework to guide sustainable purchasing. In addition, Mississauga's Economic Development Office is one of only three that has developed a strategic focus on the cleantech sector, providing a valuable signal to existing businesses and investors in the sector.

Partnerships, capacity building, and improved sharing of resources and knowledge are needed to remove some of the persistent barriers to system-wide progress and to enable the scaling-up of technologies to meet the needs of a growing population.

By 2030

With strides made in relationship-building with the cleantech sector, Mississauga will continue to be a leader in discovery, innovation, and technological development. Local government, industries, businesses, not-for-profit organizations, and academic institutions will all be working together to create a stronger, more connected, and coordinated system that accelerates discovery and innovation in Mississauga.

The City's policy framework will provide the support for innovation in areas related to climate change, supporting a paradigm shift in the way that mitigation and adaptation are considered in decision-making across all City departments. Mississauga will be a nationally-recognized hub that fosters innovation and nurtures discovery in the arena of clean technology, making it easier for businesses and industries to transition to and adopt new technologies and develop synergies across economic sectors that are geared towards climate change resilience.

Action #13: Encourage Growth and Uptake of Low Carbon and Resilient Technologies **Goals Supported**

Networks to support the shift towards a green economy will be created and pilot projects to apply innovative ideas and technologies will be explored.

Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
13-1	Develop a clean energy and innovation network to support cleantech sector growth, facilitate business-to-business connections, and identify top priorities for the sector and the City	Partnerships and Engagement	▬▬▭	N/A	Not initiated	Parks, Forestry & Environment (Environment), Economic Development Office* *Co-Lead		Mississauga Board of Trade, Partners in Project Green, Conservation Authorities
13-2	Explore partnership opportunities to deploy clean energy technology solutions in Mississauga	Partnerships and Engagement	▬▬▭	$	Not initiated	Parks, Forestry & Environment (Environment)	Economic Development Office, Smart City/IT	Partners in Project Green
13-3	Develop innovation challenges to provide opportunities for the public to co-problem solve local issues or problems (e.g., localized flooding), test out new ideas, and connect with the City	Program/ Project	▬▭▭	N/A	Planned	Smart City/IT	Parks, Forestry & Environment (Environment), Economic Development Office	
13-4	Explore innovative pilot projects and opportunities to enhance resilience and reduce greenhouse gas emissions (e.g., heat pump retrofits)	Program/ Project	Recurring	$	Not initiated	Parks, Forestry & Environment (Environment)		The Atmospheric Fund
13-5	Work with industry and businesses to support initiatives to decrease emissions and enhance resilience	Partnerships and Engagement	▬▬▭	$	Not initiated	Parks, Forestry & Environment (Environment)	Economic Development Office	Airport, Climate Smart, Partners in Project Green, Conservation Authorities, Mississauga Board of Trade

Action #14: Incorporate Climate Change into Municipal Decision-Making

Climate change will be incorporated into municipal decision-making, including procurement, business planning, and asset management.

Goals Supported

Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
14-1	Develop a lifecycle cost analysis framework to apply to all lifecycle replacements, equipment, and new buildings	Plan/Study	▬▬▭	$	Planned	Materiel Management	Parks, Forestry & Environment, (Environment), Facilities & Property Management (Energy), Finance	Ontario Climate Consortium
14-2	Apply a climate lens to Corporate business continuity plans for critical infrastructure sectors to ensure climate impacts are considered	Policy	▬▭▭	N/A	Planned	Fire and Emergency Services (Office of Emergency Management)	Parks, Forestry & Environment (Environment)	
14-3	Develop a climate change decision-making framework or policy to guide municipal decision making	Policy	▬▭▭	$	Not initiated	Parks, Forestry & Environment (Environment)	Corporate Performance & Innovation	

Action #15: Monitor and Promote Innovation in Low Carbon and Resilient Technologies

Stay up-to-date with available technologies and work with industry and businesses to identify long-term equipment needs and low carbon technologies for the City and its service areas.

Goals Supported

Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
15-1	Work with partners to provide input to industry on emerging low carbon technologies for specific applications to deliver City services	Partnerships and Engagement	Recurring	N/A	Underway	Parks, Forestry & Environment (Environment)	Works Operations & Maintenance (Fleet), Fire & Emergency Services (Fire Capital Assets)	Partners in Project Green, Conservation Authorities
15-2	Research changes and innovation in the transportation and energy sectors to identify low-carbon opportunities for the Corporate fleet	Plan/Study	Recurring	N/A	Planned	Parks, Forestry & Environment (Environment)	Corporate Fleet, Fire & Emergency Services (Fire Capital Assets), Facilities & Property Management (Energy Management)	Partners in Project Green

Action #16: Provide Strategic Direction on the Management and Diversion of Municipal Waste and Litter

Goals Supported	
Adaptation	Mitigation
	●

The Region of Peel currently provides waste, recycling and organics collection services to the residents of the Region of Peel, which includes single family homes and multi-residential households (rental and condominiums). The City of Mississauga currently manages waste and litter generated by municipal facilities, parks, and on city roads. Policies which promote waste diversion and litter mitigation will continue to be developed and implemented, helping the City achieve a 75% waste diversion goal for City-created waste or bi-products of City business.

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
16-1	Develop a Corporate waste reduction strategy	Plan/Study	▬▭▭	$$	Underway	Parks, Forestry & Environment (Environment)	Recreation, Facilities & Property Management, Works Operations and Maintenance	Other levels of government
16-2	Develop and maintain industry and community partnerships to provide consistency, control operational costs, and improve waste diversion rates	Partnerships and Engagement	▬▭▭	N/A	Underway	Parks, Forestry & Environment (Environment)		Partners in Project Green, Conservation Authorities
16-3	Explore opportunities to implement the circular economy to reduce waste	Programs/ Projects	▬▭▭	$	Planned	Parks, Forestry & Environment (Environment)		Other levels of government

Figure 14 Building on Progress to Date: Low Emissions Mobility

4.0 Low Emissions Mobility

Overview

In Mississauga, emissions from transportation account for over 30% of greenhouse gas emissions, second to buildings. Vehicles rely heavily on fossil fuels, which in turn contributes to the release of carbon dioxide emissions into the atmosphere.

There is significant potential to decrease emissions from transportation, particularly with advancements in technology and through encouraging more sustainable forms of transportation (e.g., transit, cycling, walking). The impacts of modern transportation and driving can be reduced starting with the diversification of the types of cars on the road, integrating fuel efficient technologies into existing vehicles and transit fleets, reducing vehicle idling, and expanding existing cycling and walking networks. As a centre for goods movement, there is also a growing interest in the use of clean technologies in freight to reduce transportation related emissions throughout the region.

As transportation technology advances and new forms of mobility emerge, the way Mississauga moves both in terms of people and goods will evolve. Driverless cars, electric vehicles and trucks, car sharing, ridehailing, and e-bikes are but a few examples of some of the ways that traditional vehicle-based transportation is shifting towards a more low carbon future.

The main goals for this Action Pathway are to:

- Support the shift towards lower-emission modes of transportation, such as transit, cycling;
- Accelerate the adoption of zero emissions vehicles (light and heavy duty); and
- Decrease greenhouse gas emissions from the City's corporate and transit fleet and equipment (including light-, medium-, and heavy-duty vehicles).

Connecting to the Future

Today

The City of Mississauga's Transportation Master Plan (2019) notes that in 2016, 71% of trips into, out of, and around Mississauga were completed by drivers, with another 14% of trips taken by a passenger in a personal vehicle, taxi or ride-share. Public transit accounted for 11% of trips with the remaining 4% taken by active transportation modes (e.g., walking and cycling).

The City's MiWay transit service is currently Ontario's third largest municipal transit service provider. In 2015, through expanded bus transit, MiWay replaced up to 11,000 car trips with transit trips. MiWay ridership grew by more than 15% in the five year period from 2011 to 2016, with the second highest ridership per capita of any local transit system in the Greater Toronto Hamilton Area (GTHA), after Toronto.

While the majority of Mississauga residents still use an automobile as their primary mode of transportation, the city is showing signs of lower automobile dependence, particularly in relation to other major urban centres in the GTHA, with fewer cars per household and a vocal desire for high quality transit. With more investments in public transit, cycling infrastructure, pedestrian networks, and zero-emission vehicles, the City will continue to make important strides in reducing the GHG emissions from the transportation sector.

By 2030

The greenhouse gas emissions from the transportation sector in Mississauga are being curbed through advanced efforts and investments in low-emissions transportation options. This includes increased and improved cycling infrastructure (e.g., protected bike lanes), better and more connected pedestrian networks, increased adoption of zero-emission vehicles and trucks, and more public transit options. Expanded transit service with more fuel-efficient vehicles has also reduced emissions per rider.

With these investments in place, a much greater proportion of residents are choosing to take alternative modes of transportation, reducing their dependency on private vehicles. Mississauga is a city where close to half of trips to, from, and within its boundaries are taken by sustainable modes, which include walking, cycling, and transit. Residents are making the choice to take active modes for short trips, and public transportation or zero emission vehicles for long trips. Lower-emissions trucks are delivering our goods and services to our homes and businesses.

The City Centre Transit Terminal is Mississauga's transit hub and a key component of the city's mobility network. Photo Credit: Automazul Sight & Sound Photography (2014)

Action #17: Reduce Emissions from the City's Corporate and Transit Fleet

The City will lead by example by investing in low carbon and fuel efficient technologies and infrastructure, including electric vehicle charging infrastructure, for the City's corporate and transit fleets and equipment.

Goals Supported

Adaptation	Mitigation
	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
17-1	Use improved analytical platforms (e.g., telematics) to monitor driver behaviour and develop a driver training program to reduce fuel consumption and Corporate idling	Procedure	▬▭▭	$	Underway	Works Operations and Maintenance (Fleet)	Smart City/IT, MiWay-Transit, Parks, Forestry & Environment	
17-2	Develop a green fleet policy to (1) prioritize electrification opportunities for all City fleets and equipment; and (2) continue to identify opportunities for proper vehicle allocation, route optimization, and right-sizing fleet	Policy	▬▬▭	$$	Underway	Parks, Forestry & Environment (Environment/ Works Operations and Maintenance (Fleet)* *Co-Lead	MiWay-Transit, Fire and Emergency Services (Capital Assets), Materiel Management, Facilities & Property Management	
17-3	Electrify the light duty transit vehicles and Corporate fleet and equipment and expand use of renewable fuels	Program/ Project	▬▬▭	$$	Planned	Works Operations and Maintenance (Fleet)/ MiWay-Transit* *Co-Lead	Parks, Forestry & Environment (Environment, Facilities & Property Management	
17-4	Assess charging infrastructure options for future electrification of transit (e.g., depot vs. on-route charging)	Plan/Study	▬▭▭	$	Planned	Works Operations and Maintenance (Fleet)/ MiWay-Transit* *Co-Lead	Facilities & Property Management (Energy), Parks, Forestry & Environment (Environment)	

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
17-5	Replace the transit bus fleet with low or zero emission vehicles	Program/ Project	▬▬▬	$$$	Planned	MiWay-Transit	Facilities & Property Management (Energy)	
17-6	Pursue innovative low or zero emissions pilot and partnership opportunities (e.g., hydrogen or electric bus pilots)	Partnerships and Engagement and Program/ Project	Recurring	N/A	Not initiated	MiWay – Transit/Parks, Forestry & Environment (Environment)* *Co-Lead	Facilities & Property Management (Energy), Works Operations and Maintenance (Fleet)	The Atmospheric Fund
17-7	Assess infrastructure readiness for electric vehicle charging infrastructure in Corporate and municipal parking facilities to accommodate the electrification of the Corporate and transit fleets	Plan/Study	▬▭▭	$$	Not initiated	Facilities & Property Management	Works Operations and Maintenance (Fleet), MiWay-Transit, Parks, Forestry & Environment (Environment)	Partners in Project Green

Action #18: Empower Low Carbon and Alternative Modes of Transportation in the Community

Efforts that enable and encourage travellers to choose transit, low carbon, and people-powered transportation alternatives will be advanced. Enhancements to the walkability of the community will also assist in improving air quality and public health. As a centre for goods movement, the City will also work with industry partners and other levels of government to pursue alternative fuels and the integration of clean technologies in the goods movement sector.

Goals Supported

Adaptation	Mitigation
	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
18-1	Encourage and enable micro-mobility systems and establish a policy framework for shared micro-mobility systems (e.g., bike share) in Mississauga	Plan/Study	▬▭▭	$	Underway	Infrastructure Planning and Engineering Services (Transportation Infrastructure Management)	Parks, Forestry & Environment (Environment), Enforcement	
18-2	Include climate change considerations (e.g., extreme weather, tree canopy) in the development of the Complete Streets Design Guidelines as per Action 1 of the City's Transportation Master Plan	Policy	▬▭▭	N/A	Underway	Infrastructure Planning and Engineering Services (Transportation Planning)	Parks, Forestry & Environment (Environment)	
18-3	Develop a zero emissions vehicle strategy to accelerate the adoption of zero emissions vehicles	Plan/Study	▬▭▭	$	Underway	Parks, Forestry & Environment (Environment)	Facilities & Property Management, Infrastructure Planning and Engineering Services (Transportation Infrastructure Management and Transportation Planning)	Peel Climate Change Partnership, Utilities, The Atmospheric Fund, Partners in Project Green

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
18-4	Prioritize active transportation improvements in roadway development and re-development	Program/ Project	Recurring	$$	Underway	Infrastructure Planning and Engineering Services (Transportation Infrastructure Management)		
18-5	Install electric vehicle charging infrastructure at City-owned properties (e.g. city hall) for use by employees and the general public	Program/ Project	▬▭	$	Underway	Parks, Forestry & Environment (Environment)/ Traffic Management and Municipal Parking* *Co-Lead	Facilities & Property Management	Utilities
18-6	Work with industry partners and other levels of government to promote innovative technologies and pursue alternative fuels initiatives in the goods movement sector	Partnerships and Engagement	Recurring	-	Underway	Parks, Forestry & Environment (Environment)	Economic Development Office	Other levels of government, Mississauga Board of Trade
18-7	Develop transportation demand management requirements for new developments in line with Recommendation #4 in the City's Transportation Demand Management Strategy and Implementation Plan	Policy	▬▭	$$	Planned	Infrastructure Planning and Engineering Services (Transportation Infrastructure Management)		
18-8	Identify and address gaps and inconsistencies in the pedestrian network, consistent with Action 14 of the City's Transportation Master Plan	Program/ Project	▬▭▭	$	Planned	Infrastructure Planning and Engineering Services (Transportation Planning)		

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
18-9	Expand the City's bicycle parking supply, including short-term and long-term facilities on commercial, residential, and City-owned properties, consistent with Action 1.4 in the Cycling Master Plan Update (2018)	Program/ Project	▬▬▭	$$	Planned	Infrastructure Planning and Engineering Services (Transportation Infrastructure Management)		

Figure 15 Building on Progress to Date: Engagement and Partnerships

5.0 Engagement & Partnerships

Overview

The impacts of climate change are evident across many aspects of society, including where people live, work and play. In order to prepare for the complex issue of climate change it is important to take action with a whole-society approach. This can be achieved through continuous engagement with the public, informing them on the issues, changing attitudes and perceptions and through inciting a social change that focuses on a collective response to climate change. For the Climate Change Action Plan to be successful, the City will need to engage and mobilize all residents and stakeholders to garner extensive community support.

To facilitate the participation of a range of groups, it will be important to provide useful and relevant information. This includes information about climate change and its potential effects on Mississauga as set out in the Climate Change Action Plan, and reporting on progress as the Action Plan is implemented.

Building on existing partnerships will expand and strengthen collaboration at all levels of society. This collaboration must happen internally within organizations and communities, but also across sectors, breaking down barriers to information sharing and making it easier for partners from across the community to leverage one another's successes and build momentum.

The main focus areas for this Action Pathway are to:

- Increase education and awareness of climate change;
- Support attitude and behavioural change by providing meaningful engagement opportunities; and
- Encourage action by providing financial and non-financial incentives.

Connecting to the Future

Today

The establishment of outreach teams and a dedicated Community Relations Section at the City in 2017 is part of the ongoing effort to foster an open dialogue with residents and make information and opportunities for participation and collaboration more accessible.

On an annual basis, the City hosts stewardship programs through celebrations such as Earth Days and Bike to Work Day. The After Dark Earth Market, which featured local artists, vendors, and exhibitors, was optimized to inform the public about the actions the City has taken and will be taking to address climate change, how it is striving towards resilience and how citizens can get involved.

Mississauga has also launched One Million Trees, a tree planting program to enhance the City's forested areas and preserve them well into the future. As part of this program, trees continue to be planted by City staff, partners, residents and volunteers on both public and private property. Over 300,000 trees have been planted to date.

Through the development of the Climate Change Action Plan, the City has collaborated with a variety of key stakeholders from a broad range of fields, providing education, insight and project implementation.

By 2030

Mississauga will have strengthened networks across the City to partner on climate action, and is able to leverage the skills, expertise, and efforts of its population to achieve meaningful results. Residents feel empowered to take individual action as well as seek out opportunities to lend their support to collaborative ventures to reduce emissions and enhance local resilience. Businesses will lead in climate efforts that showcase best practices in their own facilities and service offerings.

A number of opportunities for meaningful engagement on climate change issues and solutions are available. This has allowed for a greater understanding of climate change and low-carbon, and environmentally-friendly practices.

The implementation of the actions proposed in this Action Plan have been monitored and evaluated over time enabling the City to identify successes and areas in which improvement and action are needed. By sharing in the successes of all groups, a new energy and drive towards higher achievement and leadership in addressing climate change is being cultivated. The wider Mississauga community realizes that everyone has a role to play in addressing climate change and is taking action.

Hillside Community Garden. Photo Credit: City of Mississauga (2018)

Action #19: Raise Awareness about Climate Change

Information and education will be provided to residents, staff, elected officials, businesses and community groups through outreach activities and campaigns and the City will work with community partners to advocate to other levels of government to support and help accelerate local climate action.

Goals Supported

Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
19-1	Work with partners to support industry and all levels of government in promoting and developing low carbon and resilient standards, policies, and programs	Partnerships and Engagement	▬▬▭	N/A	Underway	Parks, Forestry & Environment (Environment)	City Planning Services, Development and Design	Clean Air Council
19-2	Pursue opportunities to collaborate with community groups and organizations to accelerate climate action	Partnerships and Engagement	Recurring	$	Underway	Parks, Forestry & Environment (Environment)		Community Groups
19-3	Develop an education program on climate and emergency preparedness	Program/ Project	▬▬▭	$$	Planned	Fire and Emergency Services (Office of Emergency Management)	Parks, Forestry & Environment (Environment)	Credit Valley Conservation, Community Groups, Peel Climate Change Partnership
19-4	Assess the public's familiarity with and views on climate change and develop a behaviour change strategy to inform current and future engagement work	Program/ Project	▬▭▭	$	Not initiated	Parks, Forestry & Environment (Environment)		Peel Climate Change Partnership
19-5	Develop climate hubs to establish a centre for climate-related training programs, information, tools, and networks	Program/ Project	▬▬▭	$$	Not initiated	Parks, Forestry & Environment (Environment)	Strategic Communications, Fire and Emergency Services (Office of Emergency Management)	Conservation Authorities, ACER, Ecosource

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
19-6	Create targeted programming based on energy usage in residential, commercial, and industrial buildings to promote energy efficiency retrofits	Procedure	Recurring	$	Not initiated	Parks, Forestry & Environment (Environment)	Facilities & Property Management (Energy)	Utilities
19-7	Work with partners to advocate to the provincial and federal governments for funding to improve low-carbon transit	Partnerships and Engagement	▬▬▭	N/A	Not initiated	Parks, Forestry & Environment (Environment)	MiWay–Transit, Works Operations and Maintenance (Fleet)	Airport

Action #20: Inspire and Showcase Climate Action

Programs and actions that can be taken to reduce greenhouse gas emissions and improve resilience will be developed and highlighted (e.g., use of clean technologies locally, installation of solar panels, etc) throughout the community.

Goals Supported

Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibilities		Additional Stakeholders
						Lead	Support	
20-1	Showcase new and existing climate actions throughout the city through signage, promotional materials, case studies, awards, etc.	Program/ Project	▬▭▭	$	Underway	Parks, Forestry & Environment (Environment)	Strategic Communications	Youth groups, Community groups, Partners in Project Green, Mississauga Board of Trade
20-2	Promote and engage community groups, businesses, and municipal staff in workplace transportation demand management (TDM) programs across Mississauga	Program/ Project	Recurring	$	Underway	Infrastructure Planning and Engineering Services	Parks, Forestry & Environment (Environment), Economic Development Office	Smart Commute, Other levels of government Partners in Project Green, Mississauga Board of Trade
20-3	Develop targeted outreach and engagement opportunities for youth in Mississauga	Program/ Project	▬▭▭	$	Planned	Parks, Forestry & Environment (Environment)	Recreation, MiWay - Transit	Ecosource - Peel Environmental Youth Alliance, School Boards, Youth groups
20-4	Develop and deliver training to 311 staff to connect residents and businesses with new and existing programs to promote and support rebates, incentives, products, and services	Program/ Project	▬▭▭	$$	Not initiated	Parks, Forestry & Environment (Environment)	Strategic Communications	Environmental Action Committee
20-5	Work with partners to deploy programs to drive climate action in the business sector	Partnerships and Engagement	▬▭▭	$	Not initiated	Parks, Forestry & Environment (Environment)	Economic Development Office	Environmental Action Committee, Partners in Project Green, Mississauga Board of Trade

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibilities		Additional Stakeholders
						Lead	Support	
20-6	Conduct community action campaigns to promote individual action on climate change	Program/ Project	▬▬▭	**$$**	Not initiated	Parks, Forestry & Environment (Environment)	Strategic Communications	Ecosource - Peel Environmental Youth Alliance, Youth groups, Community groups

Action #21: Support and Drive Behaviour Changes to Advance Climate Action

Monitoring and evaluation programs and metrics to identify how Mississauga can enhance climate action over time will be developed along with a platform for sharing successes and motivating continued action and achievement.

Goals Supported

Adaptation	Mitigation
●	●

Supporting Actions		Action Type	Timeline	Cost	Status	Responsibility		Additional Stakeholders
						Lead	Support	
21-1	Develop a climate-themed event as part of the Smart City Centre for Civic Curiosity	Program/ Project	▬▬▭	N/A	Planned	Parks, Forestry & Environment (Environment/ Smart City/IT* *Co-Lead		
21-2	Develop tools and technologies (e.g., surveys, apps) to support and drive behaviour changes in the community	Program/ Project	▬▭▭	$	Not initiated	Parks, Forestry & Environment (Environment)		Ecosource - Peel Environmental Youth Alliance, Youth Groups, Community and Youth Groups
21-3	Develop a community climate leaders program to encourage, support, and empower key target audiences (e.g., youth, businesses) in Mississauga to take action	Program/ Project	▬▭▭	$	Planned	Parks, Forestry & Environment (Environment)	Strategic Communications, Economic Development Office	Ecosource - Peel Environmental Youth Alliance, Youth Groups, Partners in Project Green, Mississauga Board of Trade
21-4	Explore opportunities to provide information about financial and non-financial incentives for home energy and resilience retrofits (e.g., energy efficiency upgrades, renewable installations)	Program/ Project	▬▬▭	$	Not initiated	Parks, Forestry & Environment (Environment)		Utilities

Implementation Considerations

The Climate Change Action Plan includes a series of practical and foundational actions. The City of Mississauga is committed to achieving its vision of a low-carbon and resilient city through sustained implementation of these actions.

Monitoring, Evaluation & Reporting

The City will report annually on progress. The annual report (or "report card") will:

- Provide a snapshot of progress on action pathways, with direct reference to the indicators mentioned in this section
- Share success stories
- Share areas for improvement or future work/study
- Report on progress towards the goals and targets

Measuring Progress

The City is committed to tangible results. The City will monitor progress towards its climate change goals by reporting annually on key indicators (identified in Figure 16). These indicators are aligned with each of the action pathways.

Figure 16 Suggested Indicators for Measuring Progress on the Climate Change Action Plan

Action Pathway	Suggested Indicators
Buildings & Clean Energy	• Change in greenhouse gas emissions from the City's buildings • Decrease in building and services downtime after major climate events • Renewable energy generated at municipal facilities (in mega watt hours) • Percentage of adoption of heat pumps in Mississauga
Resilient & Green Infrastructure	• Percentage change in Mississauga's tree canopy • Staff time spent on disaster recovery/clean up (e.g., tree damage) • Number of trees planted (total and annual) • Cost to the City of responding to extreme weather events
Accelerating Discovery & Innovation	• Number of cleantech businesses within Mississauga • Number of Smart City challenges held • Inclusion of climate change as a driver in key strategic documents (e.g., Official Plan, Future Directions) • Waste diversion rate in City facilities
Low Emissions Mobility and Transportation (Fleet)	• Change in greenhouse gas emissions from the City's fleet • Percentage of trips taken by sustainable modes • Greenhouse gas emissions (GHGs) per transit rider • Percentage of corporate and transit fleets that are low emission vehicles • Greenhouse gas emissions (GHGs) per kilometre travelled in a corporate fleet vehicle/fuel efficiency • Number of electric vehicle charging stations on public and/or private land • Low emissions vehicle sales in Mississauga
Engagement & Partnerships	• Climate change awareness levels of city staff • Number of participants in climate-related campaigns • Number of participants engaging in climate change hubs

Renewal

The City is committed to updating the Climate Change Action Plan every five years.

The renewal of the Action Plan will:

- Demonstrate achievement/progress towards the targets and goals and revise as appropriate;
- Integrate new climate science and risks;
- Align with other important policy and guidance documents at the City, including:
    - The Official Plan
    - The Strategic Plan
    - Other Master Plans
- Encompass ideas and work from partners and the community.

Staff Time

The majority of actions outlined above will require staff time to implement. This time could be spent implementing the action, overseeing its implementation by a third party, or working in partnership with other organizations to complete the action. Each action has been assigned to a Division within the City that will be responsible for its implementation. Additional staff resources may be required for items that cannot be integrated into annual work plans.

Mississauga Business Plan and Budget

A Council-approved Climate Change Action Plan will have the authorization and approval to implement the actions outlined in order to achieve the City's climate change goals and targets. The Climate Change Action Plan provides the rationale and motivation for the required resources to be allocated as part of the City's annual Business Plan and Budget.

Target Audiences

In order to be successful, the CCAP will require support and buy-in from all stakeholders in Mississauga. Below is a list of possible target audiences, which includes both internal and external stakeholders.

- Residents and homeowners;
- Academic institutions and school boards;
- Youth (under 25);
- Local businesses;
- Industry;
- Developers;
- Community groups and local organizations;
- Indigenous communities;
- Other levels of government;
- Conservation authorities;
- Neighbouring municipalities;
- City staff; and
- Elected officials.

Glossary

Adaptation

Actions in response to actual or projected climate change impacts which reduce the vulnerability of social, environmental, physical and economic systems.

Air Quality

The degree to which the air in a particular area or geography is suitable for inhabitants including humans, animals, or plants to remain healthy.

Asset Management

According to the City of Mississauga's Asset Management Policy, Asset Management is the coordinated activities of an organization to realize optimal value from its assets. It involves balancing costs, opportunities and risks against the desired performance of assets to achieve the City's objectives.

Circular Economy

An alternative to the traditional linear "make-use-dispose" process. The circular economy model aims to minimize the use of raw materials, maximize the useful life of a product, and create value for the product to be used again once it reaches end of life.

Cleantech

Any process, product, or service that reduces environmental impacts through: (1) environmental protection activities that prevent, reduce, or eliminate pollution or any other degradation of the environment; (2) resource management activities that result in a more efficient use of natural resources; or (3) the use of goods that have been modified or adapted to be significantly less energy or resource intensive than the industry standard.

Climate

The prevailing weather conditions including temperature, precipitation, and wind patterns in an area over a long period of time.

Climate Change

Climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity. Climate change is any systematic change in the long-term statistics of climate elements (such as temperature, sea level, precipitation, humidity, or winds) sustained over several decades or longer.

Environment Community of Practice

An internal group within the City of Mississauga that provides a forum where a variety of environmental practitioners and other interested City staff can come together to learn, share, connect, and innovate to help green the Corporation and the community.

Extreme Weather

Extreme weather events refer to meteorological conditions that are rare for a particular place and/or time, such as an intense storm or heat wave and are beyond the normal range of activity. They can be the result of sudden and drastic changes in temperature, precipitation and sea-level or they may be the result of a more gradual, but prolonged, shift in temperature or precipitation that is beyond the normal range.

Greenhouse Gas (GHG)

Greenhouse gases are a set of gases that absorb infrared radiation that can trap in heat from the sun's rays, which contributes to warming of the earth. Greenhouse gases are naturally occurring and are created by the burning of fossil fuels: gasoline, diesel fuel, natural gas, or propane. The key GHGs of concern are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.

Green Infrastructure

An infrastructure asset consisting of natural or human-made elements that provide ecological and hydrological functions and processes and includes natural heritage features and systems, parklands, stormwater management systems, street trees, urban forests, natural channels, permeable surfaces and green roofs (Per Ontario Regulation 588/17).

Green Leaders

A group of City of Mississauga staff who promote environmental awareness in the corporation, with the aim of achieving environmental sustainability in the workplace.

Lifecycle

Describes the sequential stages connecting a product system, from material extraction or generation to final disposal.

Micro-Transit

A category of transport that refers to modes carrying one or two passengers. Examples can include bicycles, electric scooters, skateboards.

Mitigation

Measures that contribute to the stabilization or reduction of greenhouse gas emissions.

Net Zero

Net zero refers to the balance of either energy consumption or emissions production in a community or building. For energy consumption it is achieved when the consumption of energy is balanced by renewable energy production. For the production of emissions, it is achieved when total production equals zero or greenhouse gas emissions are removed or offset.

Resilience

The ability of systems and communities to absorb the impacts of climate change and maintain an acceptable level of functionality and service.

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Appendix A – Mississauga's Carbon Footprint

Community Profile

This section provides an overview of greenhouse gas (GHG) emissions in Mississauga (also referred to as "community emissions"). The majority of GHG emissions in Mississauga come from buildings (see Figure A1). This includes residential, commercial, and industrial buildings, with emissions coming primarily from the burning of natural gas to heat indoor spaces and water. Over 30% of GHGs come from transportation. Total GHG emissions for the community are approximately 6.2 million tonnes of carbon dioxide equivalent (eCO_2).

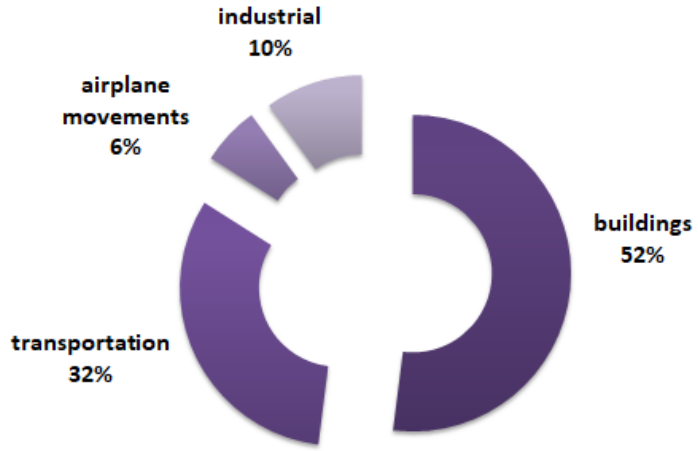


Figure A1: Community GHG Emissions Profile (2015)

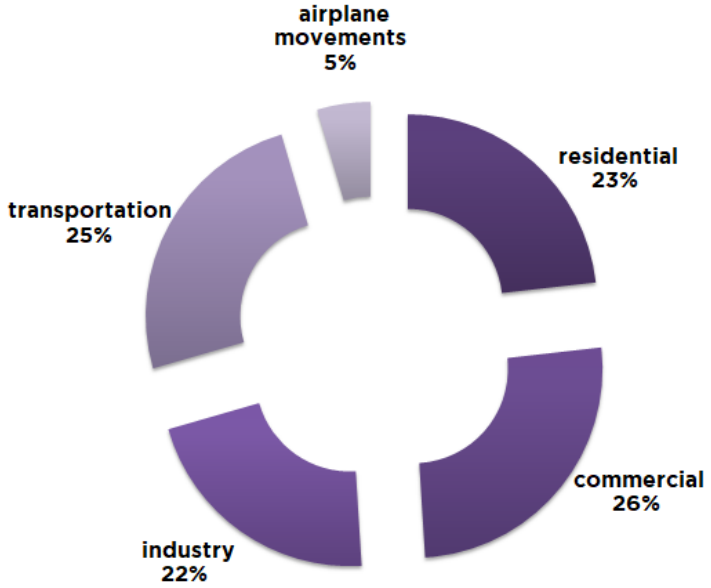


Figure A2: Community Energy Consumption by Sector (2015)

In considering how to decrease GHG emissions, it is useful to consider how energy is consumed in the city. Figure A2 shows energy consumption by sector. As this figure shows, there is a fairly even split among the top four sectors (residential, commercial, industrial, and transportation), with each responsible for approximately a quarter of energy consumption in the city. Considering energy consumption by fuel type (see Figure A3), natural gas is responsible for almost 40% of consumption, with gasoline and electricity around 20% each.

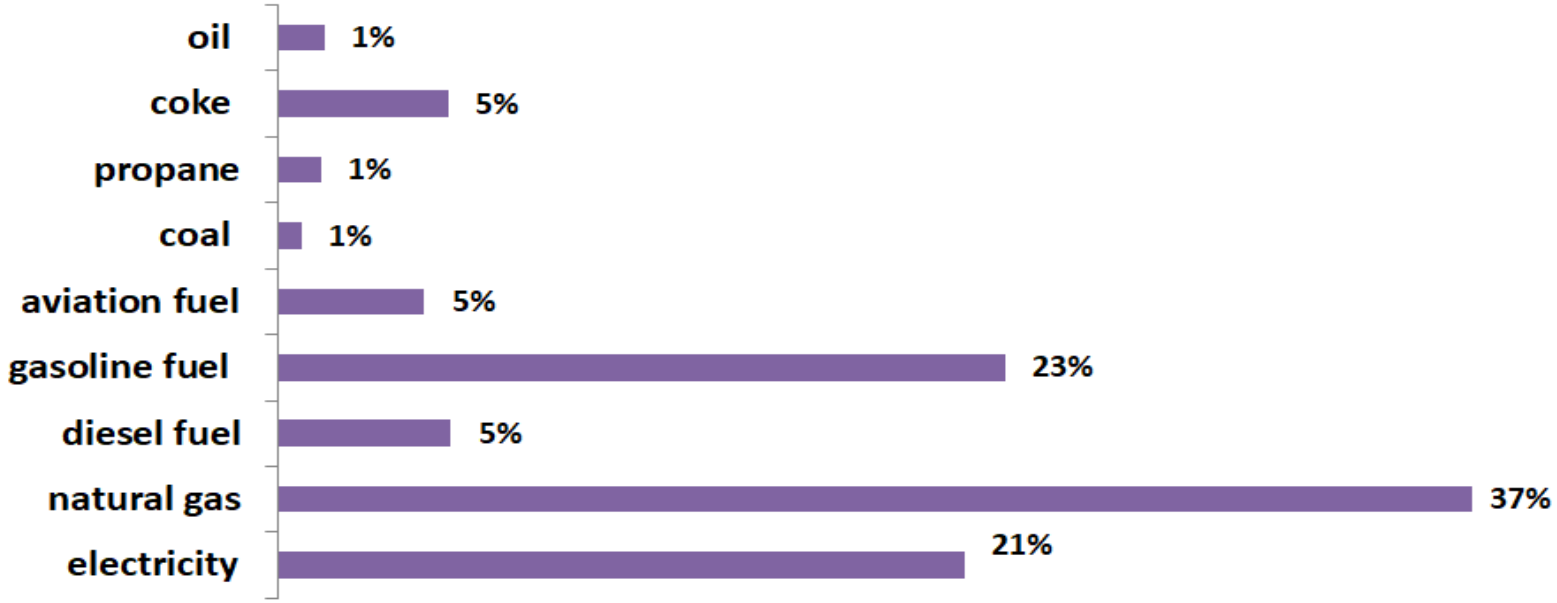


Figure A3: Community Energy Consumption by Fuel (2015)

Trends in Emissions

The amount of GHG emissions in the City have changed over time. Looking back to Mississauga's baseline year of 1990, GHG emissions have decreased (see Figure A4), however it has not been a straight line path. Increases in population growth between 1990 and 2006 led to an increase in emissions during that time, whereas the phase-out of coal-fired power plants between 2003 and 2014 led to a cleaner electricity grid. This phase-out is largely responsible for the 13% reduction in GHG emissions from 1990 to today (see Figure A5).

An examination of the trends in carbon-related emissions over the past three decades also shows that the population of Mississauga has been able to reduce its 'per capita' (or per person) emissions by 45%. This means that residents now use almost half the amount of energy from fossil fuels than they did in 1990 (Figure A5). The progress made to date creates a solid foundation to build on in reducing the City's overall emissions.

Achieving our Climate Change Action Plan Targets

The Climate Change Action Plan (CCAP) sets a goal of reducing community emissions 80% from 1990 levels by 2050, with a long-term goal of becoming net-zero and an interim goal of reducing emissions 40% by 2030. Figure A6 provides an overview of the community GHG reduction targets for 2030 and 2050 and the progress that has been made towards those targets since 1990.

As the figure shows, while there has been a 13% decrease in GHG emissions from 1990, there is still significant progress that needs to be made in order to reach both our 2030 and 2050 targets and ultimate goal of net zero.

This includes meaningful actions in the buildings and transportation sectors. Indeed, as Figure A7 shows, if we are to continue on a business-as-usual path, community emissions from buildings and transportation will increase 14% by 2050. That means that not only will we need to reverse this upward trend, but we will also need focused and sustained actions to reach our interim 2030 target (which requires a further reduction of almost 30% in GHGs from today's levels), as well as our 2050 target.

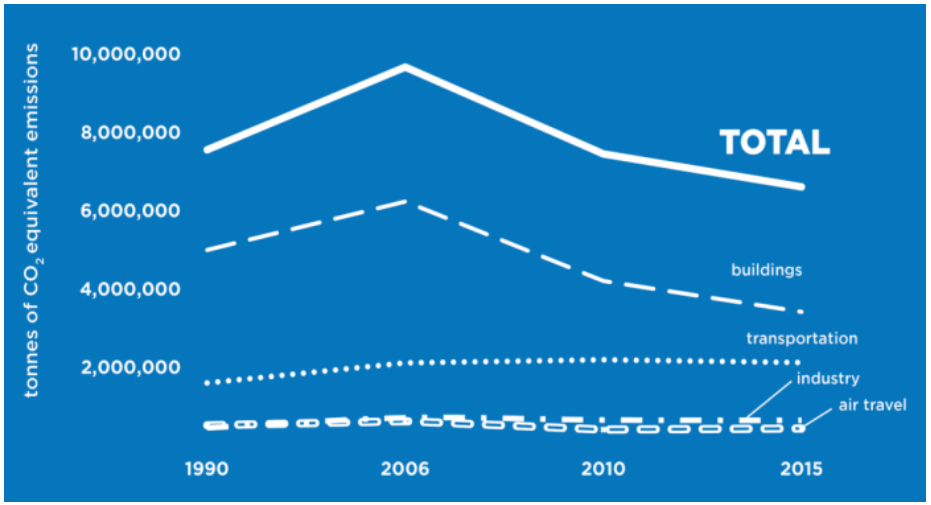


Figure A4: Trends in Emissions from 1990 to 2015

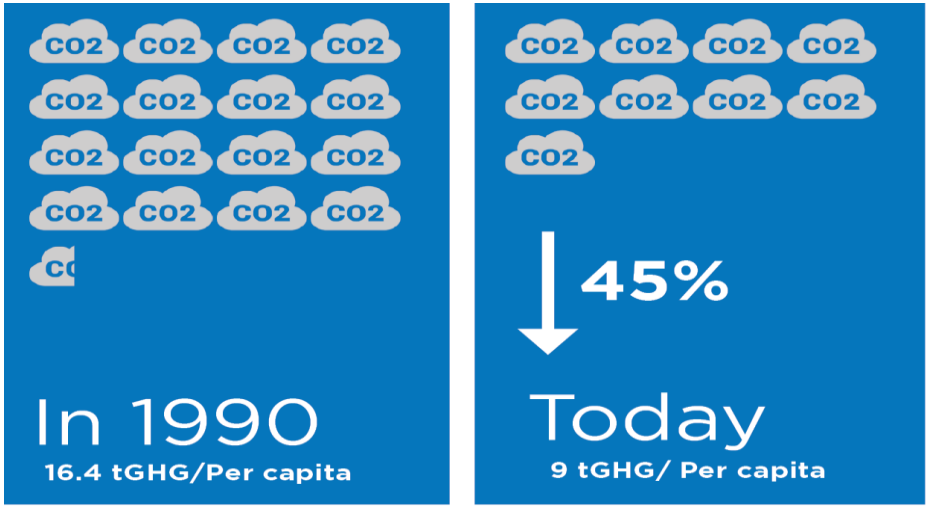


Figure A5: Per Capita Emissions in Mississauga in 1990 and 2015

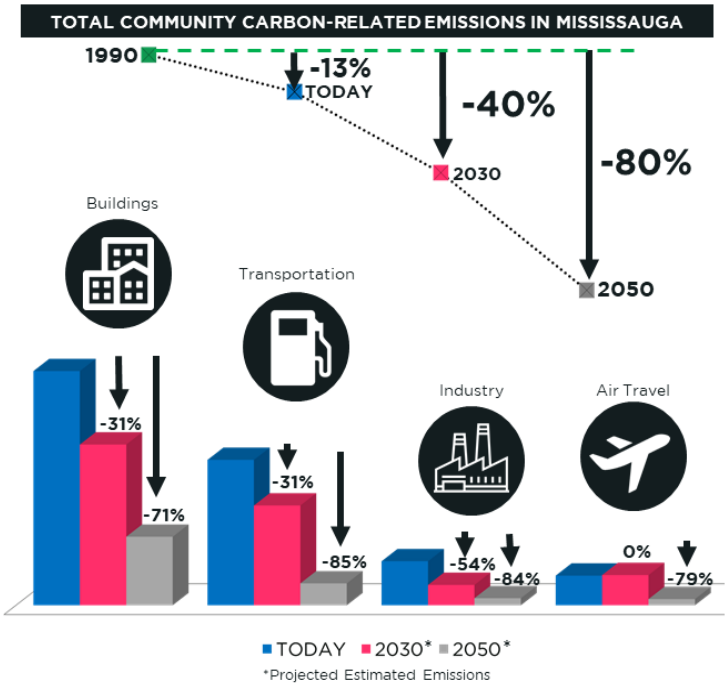


Figure A6: Progress Made and Needed to Reach 2030 and 2050 Targets

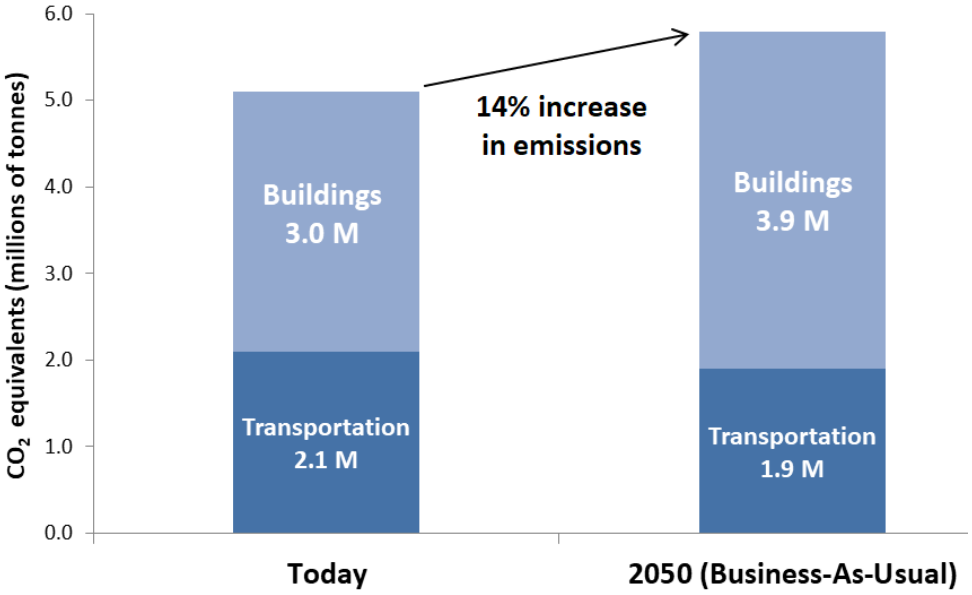


Figure A7: Increase in emissions from 2015 to 2050 under a "business-as-usual" scenario (data from Siemens study)

Profile of Municipal Operations and Services

Today

This section describes the GHG emissions of the City's municipal operations and services (also referred to as "Corporate emissions"). There are five main sources of Corporate emissions: (1) municipal buildings; (2) Corporate fleet; (3) transit fleet; (4) fire fleet; and (5) street lighting. While single-tier municipal inventories also include solid waste and water and wastewater, these are within the Region of Peel's jurisdiction and are therefore excluded from the Corporate GHG inventory. Total emissions for municipal operations are approximately 72,000 tonnes of eCO_2.

As is clear from Figure A8, the vast majority of emissions from municipal operations are the result of operating the transit fleet, which accounts for nearly 70% of total emissions. Municipally-owned and operated buildings account for almost 30% of emissions, with the City's corporate vehicle fleet, fire services trucks and vehicles, and street lighting accounting for the rest.

Another way to look at the impact of municipal operations is to examine energy consumption. Figure A9 shows energy consumption by municipal source. As this figure shows, transit consumes the most amount of energy, and is responsible for almost 50% of energy consumed. Buildings are a close second, accounting for approximately 40% of the City's energy footprint. The total amount of energy consumed through municipal operations is approximately 1,475 terajoules (TJ).

Considering energy consumption by fuel source (see Figure A10), diesel is responsible for over 50% of energy consumption. While the entire municipal fleet (i.e., corporate, fire, and transit) uses diesel fuel, transit consumes the vast majority of this fuel. Both electricity and natural gas are responsible for about 25% of energy consumption, with oil and gasoline contributing a small portion.

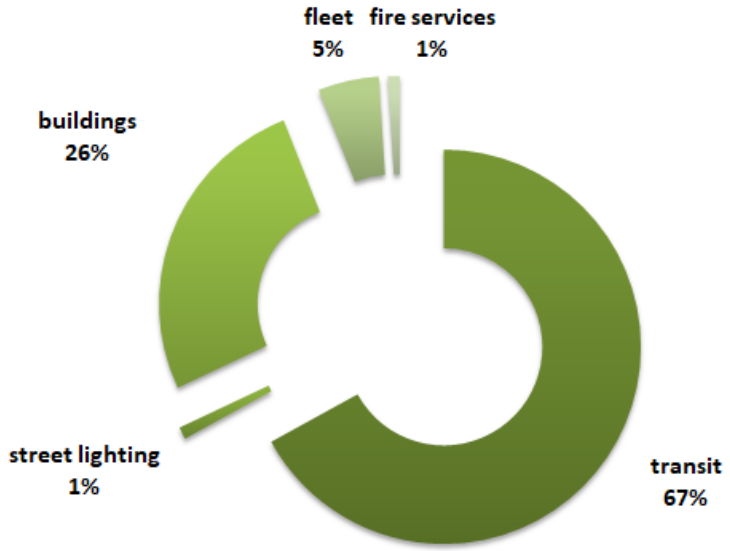


Figure A8: Corporate Greenhouse Gas Emissions Profile (2015)

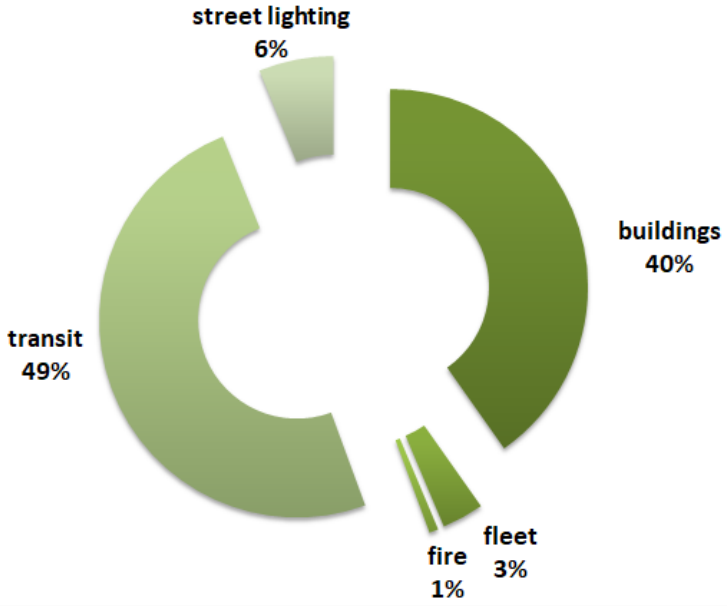


Figure A9: Corporate Energy Consumption by Municipal Operation (2015)

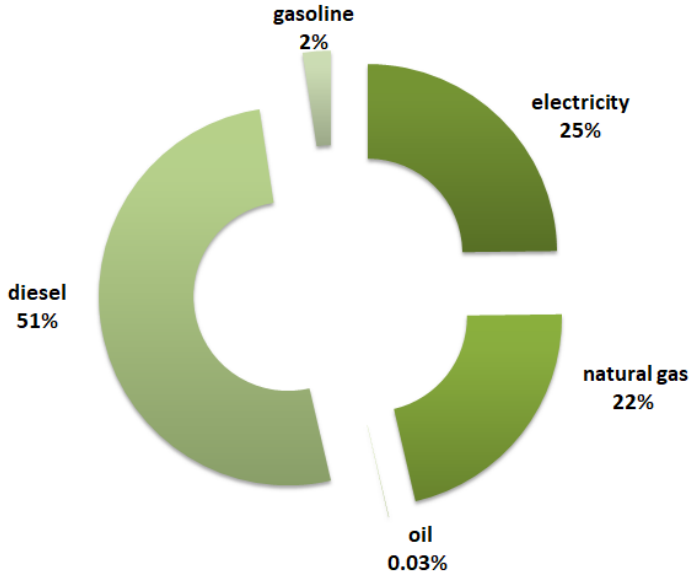
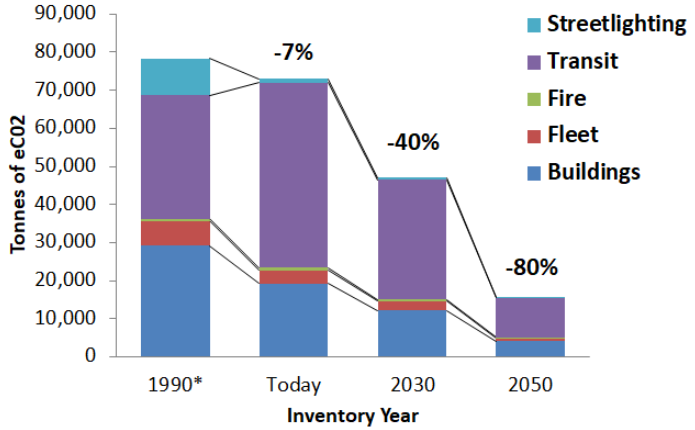


Figure A10: Corporate Energy Consumption by Fuel (2015)

Where We Need to Go

The City has set a goal of reducing its Corporate emissions 80% from 1990 levels by 2050, with a long-term goal of becoming net-zero and an interim goal of reducing emissions 40% by 2030. Figure A11 shows the potential pathway to reaching the targets. To date, the Corporation has reduced its GHG emissions by 7% compared with 1990 levels. That means that the City will need to take significant actions, particularly in regards to its transit fleet and buildings, in order to reach the 2030 and 2050 targets.



* 1990 baseline data was taken from *2010 City of Mississauga Corporate Greenhouse Gas and Criteria Air Contaminant Inventory* using scaling metrics to estimate 1990

Figure A11: Progress Made and Needed to Reach 2030 and 2050 Targets (2015)

The Climate Change Action Plan sets out the actions that the City will take to move us towards these targets.

Appendix B – Climate Change Risk Assessment

As part of the development of the Climate Change Action Plan, the City of Mississauga commissioned a series of technical baseline studies and assessments along with stakeholder and community engagement, to understand the City's current initiatives and progress with respect to climate change adaptation and mitigation and to chart a course for climate change action to 2030.

One of the core components of the process to develop the CCAP was the completion of a Climate Change Risk Assessment (CCRA), in order to identify and prioritize the climate-related hazards that pose the greatest risk to the City. The CCRA identified current and future mitigation and adaptation strategies to help the City proactively plan for, and act, according to a changing climate.

Below describes the steps that Mississauga took to complete a CCRA.

Climate Trends and Future Projections

Mississauga has experienced a number of climate change-related weather events over the past decade, including flooding as a result of heavy rainfall events and severe ice and wind storms, leading to property and infrastructure damage across the city.

The climate projections for Peel Region indicate a continued trend in such extreme weather events, with potential for an increase in high-intensity thunderstorms and rainfall, strong wind events, ice storms, and rain events in winter (rain-on-snow and rain-on-frozen ground), as well as an increase in drought events and freezing rain events. Snowfall is likely to continue with similar frequency to present-day conditions in the future, while freeze-thaw cycles could occur occasionally in the future (PIEVC Assessment of Three Parks – City of Mississauga, RSI, 2018).

Identifying and Assessing Climate Risk

The process of identifying the climate risks for Mississauga included three main components:

1. Drawing on previous studies and planning exercises;
2. A Corporate Risk Assessment, focusing on the City's municipal assets and services; and
3. A Community Risk Assessment, casting a net across Mississauga to include all areas of the community.

The results of each of these components is summarised in the following sections.

PREVIOUS STUDIES

Staff from the City participated in the Train the Trainer Initiative of the Great Lakes Climate Change Adaptation Project in 2016, along with other municipalities across southern Ontario. The intent of this exercise was to build capacity and prepare municipal staff for climate adaptation planning and stakeholder engagement within their own communities. Building upon this project, the City of Mississauga conducted local workshops with the support of the International Council for Local Environmental Initiatives (ICLEI) to gain the community's perspective on the vulnerability and risks posed by climate change, with the goal of using those results towards adaptation planning.

These previous studies and planning exercises provided the basis for an initial compilation of potential climate change impacts in Mississauga. Additional information was drawn from the Cooksville Creek Vulnerability Assessment (Credit Valley Conservation, 2016) and the Economic Impacts of the Weather Effects of Climate Change on the City of Mississauga report (Insurance Bureau of Canada, 2015).

Corporate Risk Assessment

Approach and Methodology

A risk assessment was undertaken for each division within the City, beginning with an identification of applicable climate drivers and the impacts to divisional assets and services, followed by a risk calculation based on the following formula:

Risk = Likelihood X Consequence

The Corporate Risk Assessment included reports for each of the following divisions:

- Works, Operations and Maintenance
- Transit
- Transportation Infrastructure Planning
- Revenue and Materiel Management
- Recreation
- Parks and Forestry
- Planning and Building
- Library
- Legislative Services
- Legal Services
- Information Technology

- Human Resources
- Facilities & Property Management
- Fire
- Finance
- Environment
- Enforcement
- Engineering and Construction
- Economic Development
- Culture
- Communications

Outcome

The Corporate Risk Assessment generated outcomes for current and future risk which were incorporated into divisional risk assessment reports. These reports are internal documents that provide a preliminary overview of the impacts that climate change might have on each division by 2050.

These reports and the results of the assessment were utilized to inform the development of adaptation actions identified in the Climate Change Action Plan as well as short-term business plans for each department.

Community Risk Assessment

Approach and Methodology

A Community Risk Assessment was undertaken through a combination of technical steps and a multi-stakeholder approach, with the participation of the Climate Change Stakeholder Panel. The Stakeholder Panel included representatives from a range of sectors. See Appendix C for a full list of organizations.

The steps of the Community Risk Assessment included:

1. Identifying climate change impacts and generating impact statements;
2. A Risk Assessment Workshop, to assign likelihood and consequence levels for each impact, and generating an initial risk level; and
3. Validating the workshop output and risk calculation with technical experts.

STEP ONE: GENERATING IMPACT STATEMENTS

The first step in the community risk assessment process begins with identifying the existing and future impacts of climate change. A list of 26 impacts were generated from a series of background reports and research studies conducted by the City between 2015 and 2018. A total of 26 impact statements were developed and included in the Risk Assessment Workshop.

Climate Change Impact Statements:

1. Changes in precipitation will cause more frequent and severe rainfall, leading to community level flooding;
2. Changes in river/creek temperature, affecting water quality;
3. Decreased summer precipitation will increase the probability of summer drought, leading to increasingly higher tree mortality, affecting urban forest cover;
4. Changes in seasonal temperature will lead to shifting eco-regions for flora and fauna

communities and can lead to increased spread of invasive species, as well as local extinctions;
5. High winds (including tornadoes, microbursts, etc.), ice storms, and lightning, leading to infrastructure and property damage;
6. More extreme heat days leading to stress on urban flora and fauna;
7. Increased extreme weather leading to urban forestry damages;
8. Increased quantity of rain may cause flooding of electrical infrastructure leading to blackouts;
9. Increased intensity of rainfall in the summer may damage personal property;
10. Increased winter precipitation leads to ice storms that cause power failures;
11. Increased incidence of summer storms leading to increased incidences of flooding leading to exposure to illness and pathogens;
12. Increase in winter snowfall may cause a decrease in the availability of transportation systems (e.g., reduced transit routes, sidewalk clearing delayed);
13. Increased ice storms can lead to damage to trees and forests;
14. Change in winter snowfall patterns, leading to increasingly hazardous road conditions;
15. More hot days over 30 degrees Celsius will increase heat related illnesses and result in ecosystem impacts;
16. Extreme precipitation leading to disruption in public transportation services;
17. Increased frequency and duration of rain storms will lead to increased stormwater and storm runoff leading to localized overland flooding, flooding or washing out roads and basements in low lying areas, with resulting economic impacts;
18. Changes in lake temperature affecting water intake facilities, considered near surface
19. Freezing rain resulting in property and infrastructure damage as well as road hazards, leading to airport, transportation and business disruptions;
20. Increase in fall/spring temperatures may cause quick thaw, which will lead to strain on infrastructure, washouts, flooding, heavy runoff, and property impacts;
21. Increased incidence of summer storms leading to tree impacts on public property;
22. Increased winter rainfall resulting in impacts to natural systems such as groundwater and aquatic ecology;
23. Heavier rainfall over a shorter time will increase stress on built infrastructure and natural systems;
24. Greater frost depth (affecting below grade infrastructure), causing freezing in near-surface pipes;
25. Changes to near-shore flow patterns affecting water quality (through dispersion of pollutants, excess runoff, sewage treatment plant effluent); and
26. Increased incidence of hail storms blocking drainage infrastructure leading to localized flooding.

STEP TWO: COMMUNITY RISK ASSESSMENT WORKSHOP

Stakeholder engagement was a key component of the approach taken towards the development of the community risk assessment. On June 1, 2018, the City hosted a stakeholder workshop which brought together representatives of key stakeholder groups and the public and incorporated their input into the risk assessment process. This event was attended by a total of 45 participants from the City and Region of Peel, community-based organizations, private sector groups and business owners. See Appendix C for a full list of representatives.

During the workshop, participants were assigned to a table and given a set of impact statements to discuss, with some impacts assigned to multiple tables to allow for a cross-check and validation of results across groups.

Effective consultation with community stakeholders was essential to the overall risk assessment process because it was informed by local knowledge, and provided a reciprocal opportunity to obtain valuable input from stakeholders as well as to educate them on climate-related risks. Most importantly, it ensured that those responsible for implementing climate action understood the basis upon which the Climate Change Action Plan would be formed and why certain actions would be required.

The intent of the workshop was to review the local climate impacts identified through previous studies and, through the results of collaborative work, assign a risk level to each impact. Participants were divided across a number of tables to provide a cross-representation of subject matter familiarity and expertise, with a facilitated discussion to determine the likelihood and consequence level of each of the 26 impacts.

The first step in identifying risk level is assigning likelihood. Likelihood refers to the probability of an impact taking place or how often a climate event may occur. It takes into account historical frequency and potential or projected future trends as well as input from subject matter experts. For example, if a climate hazard has historically occurred more than once per year, then that event is almost certain to occur in subsequent years if current conditions remain the same.

Within the context of this risk assessment, the values of likelihood spanned a scale from 1 to 7 with 1 considered negligible and 7 considered highly probable.

Figure B1 below shows the historical, future 2030, and future 2050 likelihood values that were assigned to community level flooding.

The second step in determining risk level is to assign a consequence value. Consequences refer to the potential losses (e.g., human, social, environmental, financial, etc.) or negative outcomes of a given incident. For the Climate Change Risk Assessment, total consequence was determined based on the sum of values assigned to each of the following five categories:

- **Public Health & Safety** – Public health and safety consequences refer to human impacts involving injuries and fatalities or illness.
- **Local Economy & Growth** – Local economy and growth consequences refer to the financial impacts and dollar losses experienced as a result of a given event.
- **Community & Lifestyle** – Community and lifestyle consequences refer to the potential impacts on the quality of life of the community which may encompass a decline in services, social networks, and community support.
- **Environment & Sustainability** – Environmental and sustainability consequences refer to negative impacts of a hazard on the environment which may include contamination, ecosystem impacts, or physical damage.
- **Public Administration** – Public administration consequences refer to damages incurred to corporate functioning, reputation and the ability to provide public services and continue normal operations.

As shown in Figure B2, consequence values ranging from 1 (Negligible) to 5 (Catastrophic) were assigned to each of five consequence categories.

Impact Statements	Likelihood			
	Climate Hazard/Indicator	Historical Probability	Future Probability 2030	Future Probability 2050
Changes in precipitation will cause more **frequent** and **severe rainfall**, leading to **community level flooding**	Precipitation - Rain [50 mm w/in 1 h (summer)]	5	6	6
	Precipitation - Rain [40 mm w/in 1 hr (winter)]	6	6	6

Figure B1 Sample of Stakeholder Workshop Likelihood Assignment

Consequence Rating	Criteria				
	Public Health & Safety	Local Economy & Growth	Community & Lifestyle	Environment & Sustainability	Public Administration
Catastrophic	Large number of serious injuries or loss of lives	Regional decline leading to wide-spread business failure, loss of employment and hardship	The region would be seen as very unattractive, moribund and unable to support its community	Major widespread loss of environmental amenity and progressive irrecoverable environmental damage	Public administration would fall into decay and cease to be effective
	5	5	5	5	5
Major	Isolated instances of serious injuries of loss of life	Regional stagnation such that business are unable to thrive and employment does not keep pace with population growth	Severe and widespread decline in services and quality of life within the community	Severe loss of environmental amenity and a danger of continuing environmental damage	Public administration would struggle to remain effective and would be seen to be in danger of failing completely
	4	4	4	4	4
Moderate	Small number of injuries	significant general reduction in economic performance relative to current forecasts	General appreciable decline in services	Isolated but significant instances of environmental damage that might be reversed with intensive efforts	Public administration would be under severe pressure on several fronts
	3	3	3	3	3
Minor	Serious near misses or minor injuries	Individually significant but isolated areas of reduction in economic performance relative to current forecasts	Isolated but noticeable examples of decline in services	Minor instances of environmental damage that could be reversed	Isolated instances of public administration being under severe pressure
	2	2	2	2	2
Negligible	Appearance of a threat but no actual harm	Minor shortfall relative to current forecasts	There would be minor areas in which the region was unable to maintain its current services	No environmental damage	There would be minor instances of public administration being under more than usual stress but it could be managed
	1	1	1	1	1

Figure B2 Consequence Categories

This exercise resulted in a total aggregate consequence value for each of the ten break-out discussion tables. Average consequence and maximum consequence were then generated for each impact based on the collective table results.

The relationship between likelihood and consequence as it pertains to risk is represented in the following risk equation:

Risk = Likelihood X Sum of Consequence across Categories

A risk outcome or risk level is the product of the multiplication of likelihood and consequence. This was the final step in the risk assessment process.

Risk scores were generated by multiplying historical, future 2030, and future 2050 likelihood values by both average and maximum consequence for each impact. If a risk score was greater than 100 for historical, future 2030, or future 2050 risk for both average and maximum risk, then the risk level was high. For impacts with a combined score of greater than 100 in the maximum category only, then the risk score was also high. If any of the impacts met these criteria they were considered to represent the highest priority risks in the City of Mississauga.

STEP THREE: VALIDATION AND RISK CALCULATION

The results of the workshop were reviewed in conjunction with City staff and climate change specialists to develop a completed risk assessment matrix. This was then used to inform the prioritization of impacts that would need to be addressed in the future through the Climate Change Action Plan. Impact statements represent the priority risks identified within studies completed to date, thus no individual risk is considered to be low risk.

The analysis looked at the relative scores between impact statements, rather than the absolute scores generated by each break-out discussion table. This helps to normalize differences in scoring between discussion groups, and helps to create further prioritization among the higher priority list of impacts.

RISK OUTCOMES: HISTORIC, FUTURE 2030, AND FUTURE 2050

As a result of this analysis, the highest priority risks that were identified included:

- Changes in precipitation will cause more frequent and severe rainfall, leading to community level flooding;
- Increased quantity of rain may cause flooding of electrical infrastructure leading to blackouts;
- Increased intensity of rainfall in the summer may damage personal property;
- Increased winter precipitation leads to ice storms that cause power failures;
- High winds (tornadoes, microbursts, etc.), ice storms, and lightning, leading to infrastructure and property damage;
- More extreme heat days leading to stress on urban flora and fauna;
- Increased extreme weather leading to urban forestry damages;
- Changes in river/creek temperature, affecting water quality;
- Decreased summer precipitation will increase the probability of summer drought, leading to increasingly higher tree mortality, affecting urban forest cover; and
- Changes in seasonal temperature will lead to shifting eco-regions for flora and fauna communities and can lead to increased spread of invasive species, as well as local extinctions.

Climate Change Risk and Action Planning

The Corporate and Community Risk Assessments were used as a key reference in the development of the CCAP. The CCAP integrated the results of the Corporate and community risk assessments (in addition to other studies and gap analyses), into an extensive action planning process which generated discussion and actions in response to the highest climate-related risks for Mississauga.

Appendix C – Public

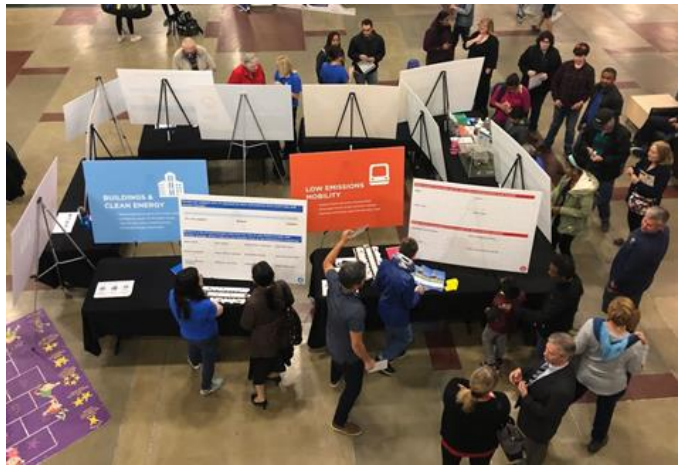
Consultation Summary

In order to holistically develop the Climate Change Action Plan (CCAP), engaging with staff, our external stakeholder panel (see Figure C1) and the public was fundamental to ensuring the CCAP was made in Mississauga. As the CCAP was developed, feedback was continuously analyzed and integrated into the Plan, resulting in a refined and improved final product. The engagement process was designed to achieve the following outcomes:

- Collect feedback, commentary and input from various stakeholders;
- Raise awareness and understanding about the impacts of climate change;
- Generate excitement and buy-in among city staff and the community; and
- Empower action and involvement in the development and future implementation of the CCAP.

Additionally, three guiding messages were communicated throughout the engagement process:

- Climate change is real
- The City is taking action
- Everyone has a role to play



Community Engagement 2018

Throughout the development of the CCAP, the City participated in over 60 events and reached over 10,000 residents. Some examples of education and outreach activities included:

- **Imagine2050 Escape Room:** In partnership with Escape From The 6, the City created the Escape Room which provided an immersive and interactive experience for residents to learn about climate change impacts and local action.

- **The After Dark Earth Market:** In partnership with Many Feathers, the City hosted a climate-themed market. The event brought together local businesses, vendors, food trucks and exhibitors, and provided opportunities for residents to learn about the City's Climate Change Action Plan.

- **Imagine 2050 Photo Contest:** In partnership with Visual Arts Mississauga and The Atmospheric Fund, the City asked residents to imagine what a low-carbon and resilient future could look like using photography.

- **Work of Wind: Air, Land, Sea:** The City partnered with the Blackwood Gallery out of the University of Toronto Mississauga to produce a ten-day public art exhibit. The Southdown Industrial Area was transformed into a contemporary art exhibition focusing on the theme of climate change.

- **Online Survey:** An online survey was available throughout June- September, 2018, which provided residents with the opportunity to identify their understanding of and experiences to date with climate change.

Including social media impressions, **the Climate Change Project reached over 165,000 community members.** Some of the key messages heard through the engagement process included:

- The impacts of climate change are affecting the community at a range of scales and residents are keen to get involved in taking action;

- The success of the Climate Change Action Plan is closely linked to working with partners across a range of sectors; and

- Information and data on climate risks and vulnerabilities are crucial to decision-making and sharing information across internal City departments and more widely with stakeholders is a crucial step in resiliency planning and preparedness.

Community representatives were consulted through the creation of a Climate Change Stakeholder Panel at the outset of the Climate Change Project. The Panel met on a regular basis at key decision-points and milestones throughout the project process and development of the Action Plan, including the visioning, climate risk assessment, and action planning stages. Members from a range of organizations participated in the Panel (see Figure C1 for a list of Panel members).

Figure C1 - Climate Change Stakeholder Panel Membership

Name	Organization	Role
Adam Molson	Daniels	Manager of Project Implementation
Ahmed Azhari	University of Toronto Mississauga	Director, Utilities and Sustainability
Brad Bass	City of Mississauga Environmental Action Committee	Citizen Member
Brad Butt	Mississauga Board of Trade	Director, Government Relations
Britt McKee	Ecosource	Executive Director
Bryan Purcell	Toronto Atmospheric Fund	Vice President, Policy and Programs
Carmela Liggio	Daniels	Development Manager
Chandra Sharma	Toronto and Region Conservation Authority	Director, Watershed Strategies
Christine Tu	Region of Peel	Director, Climate Change
Christine Zimmer	Credit Valley Conservation	Senior Manager
Daniel Carr	Alectra Utilities	Head, Smart Cities
David Bangma	CRH Canada Group Inc.	Manager, Technical Services
David Wawrychuk	Orlando	Vice President, Engineering
Erika Lontoc	Enbridge	DSM Collaboration Expert, Market Development
Ersoy Gulecoglu	Metrolinx	Senior Advisor, Sustainability, Enterprise Asset Management
Frank Giannone	FRAM Group	President
Fred Serrafero	FRAM Group	Vice President, Development
Gayle SooChan	Credit Valley Conservation	Director of Watershed Knowledge
Herbert Sinnock	Sheridan College	Manager, Sustainability
Ian Macpherson	Enbridge	Director, Market Solutions and DSM

Name	Organization	Role
Jen Wynne	Trillium Health Partners	Senior Analyst, Facilities
Jeremy Schembri	Region of Peel	Manager, Office of Climate Change and Energy Management
John Haylock	Oxford Properties Group	Manager Operations, Square One
Lachlan MacQuarrie	Oxford Properties Group	Vice President, Operations
Liviu Craiu-Botan	Oxford Properties Group	Manager, Energy & Technical Services
Louise Aubin	Peel Public Health	Manager, Environment Health
Lucy Casacia	Siemens	Vice President
Matt Mahoney	City of Mississauga	Councillor, Ward 8
Phil James	Credit Valley Conservation	Manager, Integrated Water Management
Quentin Chiotti	Metrolinx	Senior Advisor, Sustainability, Regional Planning, Planning and Policy
Richard Lalonde	CRH Canada Group Inc.	Environment Manager
Ron Starr	City of Mississauga	Councillor, Ward 6
Saher Fazilat	University of Toronto Mississauga	Chief Administrative Officer
Shahid Naeem	Peel District School Board	Manager of Energy and Sustainability
Steven Thomas	Greater Toronto Airports Authority	Manager, Environmental Services
Susan Senese	University of Toronto Mississauga	Chief Financial Officer
Tamar Heisler	Alectra	Director, Government and Industry Relations
Tammy-Lynne Peel	Dufferin-Peel Catholic District School Board	Superintendent of Education
Tenley Conway	University of Toronto Mississauga	Professor & Associate Chair, Research, Geography
Todd Ernst	Greater Toronto Airports Authority	Director, Aviation Infrastructure, Energy and Environment
Tracy Appleton	Peel District School Board	Sustainability Specialist

In addition to the Stakeholder Panel, a series of public open houses and workshops were held in September and October 2019 to provide residents with the opportunity to comment and provide feedback on the draft CCAP. Workshops and open houses were held in the following wards: Ward 1, Ward 2, Ward 4, Ward 8, and Ward 9.

The draft CCAP and a feedback survey were also posted online at www.theclimatechangeproject.ca. Over 500 residents attended our open houses and workshops and we received over 400 responses to the online survey. Through the online survey we heard resounding support for the City taking action and being a leader on climate change (~90%), with some (~40%) indicating a desire for the City to be more ambitious, particularly with respect to the GHG reduction targets.

Below are some highlights from the resident feedback that was received through public consultations.

Stakeholder Panel Members Participated in Visioning Exercises for the Climate Change Action Plan

Public Consultation 2019

What We Heard - A selection of ideas, questions and comments from Mississauga residents

Buildings & Clean Energy

- Need to incentivize retrofits and renewable energy
- Need mandatory green building standards
- Should require retrofits in existing buildings

Resilient & Green Infrastructure

- More tree planting programs for residents
- More gardens and green/natural spaces and utilize existing spaces more effectively
- Need to raise more awareness about existing programs (e.g., One Million Trees)
- Increase support for food security and air quality actions

Accelerating Discovery & Innovation

- The City needs to be a leader in this space
- Use innovative financing mechanisms
- Need senior leadership buy-in
- Need to communicate to residents what the City is doing corporately and what the business community is doing

Low Emissions Mobility

- Use incentives and disincentives to influence decisions and behaviours
- Need affordable, safe, clean and smart transit
- Need to accommodate mixed mode transportation – creation of apps to help with trips
- Need low-speed corridors for bikes, mopeds, low-speed electric vehicles (EVs)
- Need education for drivers, cyclists and pedestrians

Engagement & Partnerships

- Need to empower residents on what they can do to take action (e.g., education, mentorship)
- Promote positive climate action stories to increase awareness
- Reward those leading the way
- Create and leverage community partnerships

General Comments

- The City needs to be a leader
- Urgent action is required: The City needs to work on climate change now and not delay
- Let's keep investing in climate change initiatives
- Mississauga is not yet a leader [in climate action] - but COULD BE

Appendix 2

Letters of Support from:

1) Credit Valley Conservation Authority
2) The Atmospheric Fund
3) Enbridge
4) Ecosource

Credit Valley Conservation
inspired by nature

November 15, 2019

Councillors of the City of Mississauga
300 City Centre Drive,
Mississauga Ontario, L5B C31

Re: Support for the City of Mississauga Climate Change Action Plan

Dear Madam Mayor and Members of Council,

At Credit Valley Conservation (CVC) our vision is for a thriving environment that protects, connects and sustains us. It is why I am pleased to be writing on behalf of the Credit Valley Conservation in to express our support of for the City of Mississauga's Climate Change Action Plan (CCAP).

The City of Mississauga has demonstrated leadership in declaring a climate change emergency and sustained commitment to reducing greenhouse gas emissions 40 per cent by 2030 and 80 per cent by 2050. CVC shares your goal for increasing resilience and the capacity to withstand and respond to current and future climate events by taking action on the highest climate-related risks.

Our organizations have been collaborating on climate change action together since 2007, and jointly helping to protect and restore the natural environment for decades before that. As longstanding partners in climate change action, we've worked together planted trees, restored and protected streams and wetlands, developed flood mitigation plans, implemented green infrastructure, and much more.

The synergies between Mississauga's CCAP and CVC's 2019 Climate Change Strategy provide opportunities for continued and greater collaboration -- from leading local science, to on-the-ground actions that are increasing public awareness and behavioural change.

We're excited to continue our strong partnership with Mississauga, working together to tackle this climate emergency.

Sincerely,

G. SooChan.

Gayle SooChan
Director Watershed Knowledge
Credit Valley Conservation Authority

November 21, 2019

General Committee
Mississauga City Hall
300 City Centre Drive
Mississauga, ON L5B 3C1

Re: Mississauga's Climate Change Action Plan

Dear General Committee Members,

TAF commends the City of Mississauga for its strong leadership in making climate action an immediate priority through the development of the City's first Climate Change Action Plan.

TAF strongly supports the actions and commitments that are being proposed in the new Plan. The Plan will ensure that Mississauga is working towards ambitious and bold climate action. These efforts will not only support emissions reductions, but also present multiple economic and social benefits for the broader community.

Climate change is a global issue requiring large-scale solutions. As such, there is a strong need to share successful solutions and work in collaboration with other municipalities to ensure the success of this important Plan. Mississauga was one of the many cities in the GTHA, and across the world, to declare a climate change emergency in 2019. We encourage the City to continue leading and working alongside municipalities and key stakeholders to accelerate meaningful climate action.

We are pleased to have worked with the City to support the development of this critical Plan and we look forward to continuing to work together to reduce carbon emissions and build a healthy, resilient region.

Sincerely yours,

Bryan Purcell
VP Policy & Programs, The Atmospheric Fund

The Atmospheric Fund (TAF) is a regional climate agency that invests in low-carbon solutions for the Greater Toronto and Hamilton Area (GTHA) and helps scale them up for broad implementation. Please note that the views expressed in this submission do not necessarily represent those of the City of Toronto or other GTHA stakeholders. We are experienced leaders and collaborate with stakeholders in the private, public and non-profit sectors who have ideas and opportunities for reducing carbon emissions. Supported by endowment funds, we advance the most promising concepts by investing, providing grants, influencing policies and running programs. We're particularly interested in ideas that offer benefits in addition to carbon reduction such as improving people's health, creating local jobs, boosting urban resiliency, and contributing to a fair society.

Enbridge Gas Inc.
500 Consumers Road
North York, Ontario M2J 1P8
Canada

October 18, 2019

City of Mississauga | Community Services Department
Parks, Forestry and Environment Division
201 City Centre Drive, 9th floor, Mississauga ON, L5B 2T4

Attention: Ms. Leya Barry, Climate Change Specialist

Dear Ms. Berry:

Re: Climate Change Action Plan, July 2019 Draft

As a long standing energy utility for the City of MIssissauga, Enbridge Gas Inc. is pleased to provide its support for Mississauga's Climate Change Action Plan (the "Plan"). We look forward to playing a key role in helping the City's transition towards a lower carbon future through innovative, economic and effective solutions.

Enbridge Gas is a recognized leader with significant experience in energy efficiency and conservation in North America. Since 1995, our energy efficiency and conservation programs have saved residential, commercial and industrial customers about 20 billion cubic meters of natural gas and reduced CO2 emissions by about 40 million tonnes, lowering energy costs at the same time.

Through its natural gas ratepayer-funded energy conservation programs, Enbridge Gas has been providing its customers with information and programs to help them better manage their energy consumption. We provide advice to residential, municipal, institutional, commercial and industrial customers on how best to optimize energy use; leverage available incentives through our ratepayer funded programs to help defray project costs; and promote behavior changes that lead to a culture of conservation. The Enbridge Gas team of energy advisors and technical experts are available to provide guidance in retrofitting the built environment; designing or redeveloping energy-efficient communities; planning district energy systems; or transitioning to lower-emissions transportation technology.

Enbridge Gas has been actively participating as a member of the Climate Change Project's stakeholder advisory committee since its inception in 2017. As a named stakeholder for several of the Action items within the Plan, we hope to continue our collaborative partnership with the City as we jointly develop actionable energy conservation and carbon reduction projects and initiatives for a low carbon future for the City of Mississauga.

Sincerely,

for Craig Fernandes
Manager, Energy Conservation Policy and Strategy

Cc: Mark Wilson, Enbridge Municipal Relations

ecosource
Growing a Green Community

City of Mississauga
Community Services Department
Parks, Forestry and Environment Division
201 City Centre Drive, 9th Floor
Mississauga, ON
L5B 2T4

November 21, 2019

Re: City of Mississauga's Climate Change Action Plan

To Whom It May Concern,

I am writing on behalf of Ecosource Mississauga in support of the City of Mississauga's Climate Change Action Plan. This plan is a vital step toward addressing the impacts of climate change in our community, including increased seasonal flooding, extreme rainfall, ice storms, and hotter summers.

Founded in 1979 by former Mayor Hazel McCallion as the Mississauga Clean City Campaign, Ecosource is one of the leading environmental education charities in the Region of Peel. Over the past four decades, we have delivered creative education that inspires individuals to take personal action for the environment, engaging over 34,000 residents in 2018 alone. As Mississauga has already begun to experience the effects of climate change, we see an increased need for cooperation and action on the environment through our work every day.

Given its strong alignment with our mission, we are pleased to support the Climate Change Action Plan and are committed to working collaboratively with the City of Mississauga and other stakeholders to build a more sustainable future.

Sincerely,

Britt McKee, *OCT, MES*
Executive Director
Ecosource

CCAP Estimated Capital Cost 2020-2029

Action Area	Components	Capital (2020-2029) New Actions	Capital (2020-2029) Not Committed	Capital (2020-2029) Committed	Capital Budget Estimates	Service Area
CORPORATE BUILDINGS						
Retrofit corporate buildings to reduce natural gas and electricity consumption	Retrofit corporate buildings to reduce electricity and natural gas consumption (e.g. heat pumps for space and water heating, mechanical and building envelop upgrades). Calculations are based on the development of Resilient Design Guidelines for Corporate Buildings, and current estimates to retrofit existing buildings as per the 5 Year Energy Conservation Plan.	$30,800,000			$30,800,000	F&PM
All new corporate buildings are built more energy efficient with a lower carbon footprint*	Apply the Corporate Green Building Standard to all new buildings. Level 1(2020-2025) and Level 2 (2025-2030) phased in approach.	$15,400,000			$15,400,000	F&PM
Install renewable energy at corporate facilities	Cost to install solar PV at corporate facilities is currently unknown. Estimates are in the $40million range. Study in 2021will identify cost.	TBD			TBD	F&PM
Upgrade corporate and transit facilities to provide charging infrastructure	Charging infrastructure and facility upgrades and any re-design is currently unknown. Studies in 2021-2022 will identify costs.	TBD			TBD	F&PM
TRANSIT						
Conversion of bus fleet to hybrid and electric**	$159M Not Committed includes the hybrid premium to the existing fleet plus growth which is included in the ICIP transit application. $30M New Actions includes the electrification premium in starting in 2027.	$36,000,000	$159,200,000		$195,200,000	Miway**
Charging Infrastructure and Facility/Depot Upgrades for Hybrid Buses	Potential cost of retrofitting existing buildings to accommodate housing of buses	TBD			TBD	T&W
Charging Infrastructure and Facility/Depot Upgrades for Electric Buses***	Any new depots will need to be built to accommodate charging needs and overall height requirements of electric buses.	$100,000,000			$100,000,000	T&W
CORPORATE FLEET						
Convert the transit fleet to electric	Includes full electrification of non-revenue MiWay fleet. Does not include charging infrastructure cost.	$300,000			$300,000	MiWay
Convert the light-duty corporate and transit fleet and equipment to electric	Based on anticipated technology availability, 50% of the light duty corporate fleet has opportunities for electrification within the next 10 year. Calculations are based on a 15% premium. Does not include charging infrastructure cost.	$2,700,000			$2,700,000	WOM
OTHER						
Modal Split Target: 50% of trips to, from, and within Mississauga are taken by sustainable modes (by 2041)	Active transportation (2020-2029 capital plan). Committed includes cycling program scenario C,		$55,700,000	$41,500,000	$97,200,000	IP&E
Other Studies	DE Feasibility Study, Energy Maps, Update to Green Development Standards, Community awareness/education campaigns, Corporate Buildings and Solar PV Study,Assess infrastructure readiness for corporate fleet (2023 and beyond), assess charging infrastructure options for transit, 2021-2023 Immediate upgrades only. Also includes ZEV strategy.	$1,400,000		$7,900,000	$9,300,000	PF&E, MiWay, WOM, F&PM
Increase urban tree canopy and enhance corporate green infrastructure assets	One Million Trees Program, Green infrastructure program, vulnerability assessments of corporate assets, complete streets design guidelines	$1,500,000		$5,200,000	$6,700,000	PF&E
	Totals	$188,100,000	$214,900,000	$54,600,000	$457,600,000	

*In order to meet Corporate targets, an accelerated timeframe to build net-zero or near-net-zero Corporate buildings may be required, which could add an additional $17 million to the estimated cost for Carmen Corbasson CC, Burnhamthorpe CC and Fire Stations 123, 125, 126, 127. (e.g. building to Level 3 in the Corporate Green Building Standard)

**Subject to approval, the conversion of the bus fleet could be partially offset with the support of federal funding (e.g. Invest in Canada Infrastructure Program) (approximately $160 million)

***Potential option is to advance the design and construction of the Meadowvale West Garage to accommodate the electric buses that will be purchased starting in 2027, as current facilities are not able to accommodate the height of electric buses.

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 11/18/2019

To: Chair and Members of General Committee

From: Janice Baker, FCPA, FCA, City Manager and Chief Administrative Officer

Originator's files:

Meeting date: 12/4/2019

Subject
The Mississauga Economic Development Strategy 2020-2025

Recommendation
That the recommendations as outlined in Appendix 1 and 2 in the Corporate Report entitled "The Mississauga Economic Development Strategy 2020-2025" dated November 18, 2019 from the City Manager & CAO be approved.

Report Highlights
- The Mississauga Economic Development Strategy 2020-2025 was undertaken to build on the success of the previous 10-year economic development strategy.
- The Study's consultation included engagement with key stakeholders: entrepreneurs; business leaders; education representatives; public; staff; City's Departmental Leadership Teams and; members of Council on the City's Economic Development Advisory Board.
- Staff received input and support, in principle, for the draft economic development priorities and accompanying actions by stakeholders and partners.
- The implementation of the actions with financial implications will be validated through the budget and business planning processes, and are subject to ongoing validation and funding.

Background
In 2010, the City of Mississauga's Economic Development Office (EDO) adopted a 10-year Economic Development Strategy that outlined three overarching goals that guided EDO's strategic initiatives and actions:

1. Become a Global Business Magnet;
2. Embrace a Culture of Innovation; and
3. Build a Knowledge Economy.

Throughout the course of the 10-year strategy, EDO has achieved a number of transformative strategic actions aligned with these goals that include, but are not limited to:

- **Global Investment:** developed international marketing strategy for Mississauga to become Canada's Global Investment Destination;
- **Enhancing Sector Development Specialization**: Formalized sector development programs in Life Sciences and Advanced Manufacturing with dedicated sector specialist that have successfully developed strategies and initiatives that require active engagement and commitment from industry leaders, academia, and industry organizations;
- **Focus on Talent and Workforce Development**: Led a number of talent and workforce development events bringing together local manufacturers and regional education, training and support leaders to collaboratively create solutions to bridge the skilled labour gap;
- **Expansion of the Innovation and Entrepreneurship Program:** Implemented the Entrepreneurship and Innovation Study to advance service delivery to the start up and scale up business communities.

As EDO approaches the end of the current 10-year Economic Development Strategy, it will be important to plan for new priorities that continue to bring high value service to our existing business community and attract new investment.

To address this, EDO retained a team of consultants from Hatch, (the "Consultants") to undertake the development of the 2020-2025 Mississauga Economic Development Strategy (the "Strategy"). The new Strategy will lead Mississauga into a new era of local economic growth and prosperity in a highly innovative, competitive and connected global economy.

The Consultants provided extensive research that included environmental scan and benchmarking, comprehensive local economic profiling, and identification of factors effecting Mississauga's economic trajectory now and into the future. The Consultants also engaged the following key stakeholders: entrepreneurs; business leaders; education representatives; the City's Extended Leadership Team and their Departmental Leadership Team's; members of Council on the City's Economic Development Advisory Board and the public through an online survey.

Draft economic development priorities and accompanying actions were presented to the Economic Development Advisory Board (EDAB) for input on October 8, 2019 and will be presented to EDAB for approval on November 21, 2019.

Project Key Milestones

Timeframe	**Project Phase**

Apr – May 2019	Project Start Up
Apr 2019	Presentation to Economic Development Advisory Board #1
Jun – Jul 2019	Preliminary Stakeholder Consultations
Jul 2019	Thematic Workshops
Jul 2019	Draft Economic Development Framework #1
Aug – Sep 2019	Presentations for input to City's Departmental Leadership Teams
Oct 2019	Presentation to Economic Development Advisory Board #2
Oct 2019	Public Consultation through an online survey
Oct 2019	Draft Economic Development Framework #2
Nov 2019	Presentation to Economic Development Advisory Board #3

Comments

The research and engagement conducted as part of the Strategy, resulted in three economic development priorities for Mississauga EDO to play a direct role in, and areas where EDO needs to engage community partners to support the ongoing growth and the success of Mississauga's economy:

Core Economic Priorities

1. Support Globally Minded Business;
2. Develop Distinctive Places; and
3. Deliver Durable Infrastructure.

The Strategy's research and engagement also identified that the City must target its efforts on places where growth can make the greatest contribution to its strategic ambitions, and on those business sectors that have the longest-term potential to safeguard competitiveness. For places of focus, the Strategy grouped Mississauga into the following areas:

- **Economic Growth Centres:** Places with the greatest potential to drive forward the next phase of Mississauga's economic growth, and that require a collaborative strategic approach that draws on the insight, investment and energy of City departments, organizations and businesses, i.e.) Pearson 401 Aerotropolis; Downtown and Port Credit;
- **Knowledge Intensive Districts**: Smaller locations outside the growth centres, but which have scope to accommodate more employment and new business activity in priority sectors, i.e.) Meadowvale Park; Sheridan Research Park and University of Toronto Mississauga Campus; and
- **Economic Connections**: A set of critical transportation links across the City that are vital for interconnectivity, travel and distribution of people and goods. i.e. Go Network; Dundas Connects, Lakeshore Connects; Hurontario LRT; 401/403/QEW Highways and Airport Connections.

The Strategy recommends focusing on four key sectors that have globally minded businesses that trade internationally; recruit people from other countries, and that address the three global challenges: digital, environmental and talent.

- **Advanced Manufacturing:** With an existing base of automotive, aerospace, food and beverage, and cleantech businesses, Mississauga has a strong presence of globally minded elements within the manufacturing sector that trade internationally, compete on the basis of knowledge assets, embrace technology and remain competitive in the global market;
- **Smart Logistics**: The sector is rapidly changing and faces new opportunities to embrace more efficient and lower carbon modes of transportation powered by electricity and that rely on autonomous route planning;
- **Life Sciences**: The industry has significant global growth potential that relies heavily on creating the right business environment to attract the talent needed to generate new solutions and sustain new business models; and
- **Higher Value Business Services**: Mississauga and the wider Toronto economy has an established base of higher value business services, which provide essential support to a wide range of sectors around the globe.

The highest priority actions outlined in the Economic Development Strategic Framework (the "Strategic Framework" - Appendix 1) are set within the context of the three economic priorities that reflect the most immediate actions EDO has identified to advance its economic development agenda for 2020-2025. Accompanying the Strategic Framework, is a detailed Action Plan (Appendix 2) that outlines all actions with set performance indicators that will be used to measure progress and achievements. These actions are designed to show the progress Mississauga is making locally, nationally and globally within the context of United Nations Sustainable Development Goals.

Strategic Plan

The Mississauga Economic Development Strategy 2020-2025 supports all five strategic pillars for change in the City of Mississauga Strategic Plan (2009). The Economic Development Strategy recognizes the following areas of alignment and focus:

- **Developing Transit-Oriented City:** EDO efforts need to focus on working with its partners to deliver durable infrastructure, which includes transit driven growth;
- **Ensuring Youth, Older Adults and New Immigrants Thrive:** EDO efforts need to focus on working with its partners to develop distinct places to engage its communities and develop a stronger identity for the City based on its diverse community of residents.
- **Cultivating Creative and Innovative Businesses:** EDO efforts need to focus on supporting globally minded businesses which includes harnessing innovation potential within priority sectors;
- **Completing our Neighbourhoods:** EDO efforts need to focus on working with its partners to develop distinct places to attract people and businesses as it moves into its next phase of growth;

- **Living Green:** EDO efforts need to focus on working with its partners to develop distinct places and that can transition into sustainable and accessible transit modes.

Financial Impact

The Economic Development Strategy Action Plan (Appendix 2) outlines a set of actions that will help the City begin to achieve the objectives set out in the Strategy and will become EDO's foundation to base departmental priorities and work plans for the EDO Team. The resource requirements for delivering the Action Plan demand an increase in capacity and EDO will allocate them within the set of existing EDO portfolios: Director Led Initiatives; Business Investment/Sector Development; Innovation/Entrepreneurship, and Strategic Initiatives/Planning.

Financial impacts resulting from the Action Plan that have additional resource implications, other operating implications; and capital implications, will be further validated through a detailed analysis of a business model. If required, the business case will be submitted through the budget and business planning processes.

Conclusion

The Economic Development Strategy for 2020-2025 sets out the city's priorities for growth. The City of Mississauga Economic Development Office has developed this Strategy with stakeholders in the business, education and wider community. Through this Strategy, EDO will work with partners and investors to secure investment, deliver change, and animate action. Partnership and collaboration will be at the heart of this collective approach.

The Strategy also reflects the City's commitment to deliver in support of globally important priorities, orienting the City's ambitions around a more inclusive and sustainable economic development agenda that aligns with the United Nations' Global Sustainable Development Goals.

Attachments

Appendix 1: Economic Development Framework

Appendix 2: Economic Development Action Plan

Janice Baker, FCPA, FCA, ICD.D City Manager and Chief Administrative Officer

Prepared by: Bonnie Brown, Director, Economic Development

Appendix 1:
Economic Development Strategic Framework

Mississauga Economic Development Strategy 2020-2025

City of Mississauga Consultation Draft with support from Hatch

November 2019

MISSISSAUGA HATCH

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Acknowledgments

Mississauga Economic Development Advisory Board

- Mayor Bonnie Crombie, City of Mississauga
- Councillor Pat Saito, Ward 9, City of Mississauga
- Councillor Dipika Damerla, Ward 7, City of Mississauga
- Councillor Stephen Dasko, Ward 1, City of Mississauga
- Robert Trewartha, Mayor's Office, City of Mississauga
- Rahul Petkar, Intellect Design – CHAIR
- Avanindra Utukuri, Nytric Ltd
- David Wojcik, Mississauga Board of Trade
- Ellen McGregor, Fielding Environmental
- Geoff Evans, Eurofins Alphora Research Inc.
- Jake Dheer, Rogers Media Inc.
- Gil Moore, Metalworks Studios
- Michele McKenzie, McKenzie Strategies
- Jaspal Gill, Peel District School Board
- Lorrie McKee, Greater Toronto Airport Authority
- Janet Morrison, Sheridan College
- Ian Orchard, University of Toronto at Mississauga

City Leadership Team

- Janice Baker, City Manager
- Andrew Whittemore, Commissioner, Planning and Building Department
- Gary Kent, Commissioner, Corporate Services Department
- Geoff Wright, Commissioner, Transportation and Works Department
- Paul Mitcham, Commissioner, Community Services Department

City Project Core Group

- Bonnie Brown, Director, Economic Development Office
- Harold Dremin, Manager Business Investment & Sector Development, Economic Development Office
- Heidi Brown, Manager Small Business & Innovation, Economic Development Office
- Aleksandra Allen, Project Leader, Economic Development Office
- Bethany Dompaul, Project Support, Economic Development Office
- John Barber, Research, Economic Development Office

Project Resource Staff

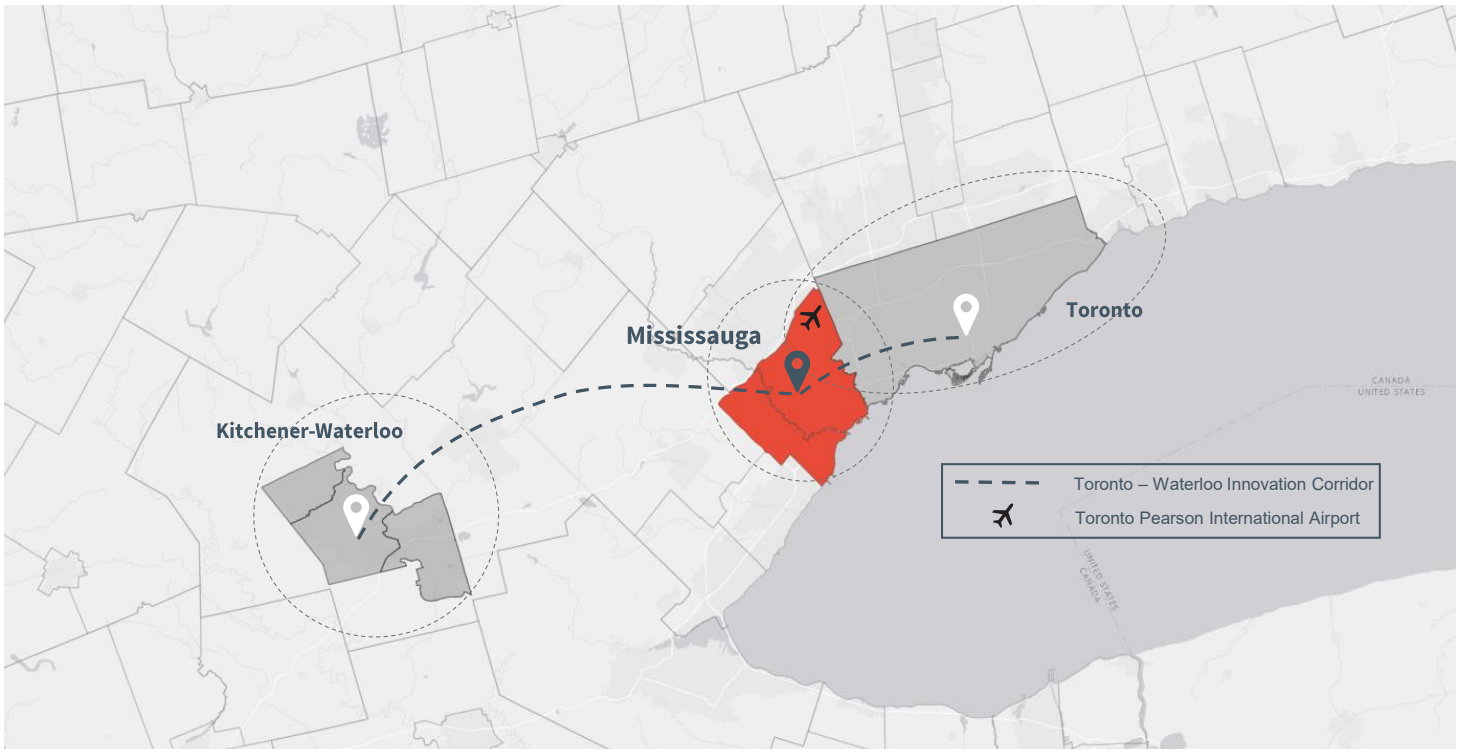
- Amanpreet Bains, Web Specialist, Economic Development Office
- Jordan DoRego, Marketing Consultant, Economic Development Office

Project Consultants

- Hatch

We would like to thank all Members of Council, businesses, city leadership, residents, stakeholders and organizations that participated by providing input through our surveys and various consultation events. We truly appreciate your time and input. We would also like to thank City staff who contributed directly and indirectly to the completion of this Strategy. This Strategy would not have been possible without your assistance.

Contents



A Vision for Mississauga

Mississauga will secure balanced growth by:

- supporting globally minded businesses
- developing distinctive places
- and delivering durable infrastructure

In its next phase of growth, the city will:

- strengthen its role in the Greater Toronto economy
- inspire businesses to innovate
- and build a resilient talent pool which can adapt to change

Mississauga has successfully grown over recent decades and has clear scope to further expand its economic contribution to the Greater Toronto economy. Mississauga has substantial assets which will be harnessed to drive the next generation of economic growth and prosperity.

We are part of one of the world's fastest growing major city economies and have one of the best-connected international airports on our doorstep. We have a huge talent pool which is highly skilled and extremely diverse, with strong connections to global markets and opportunities.

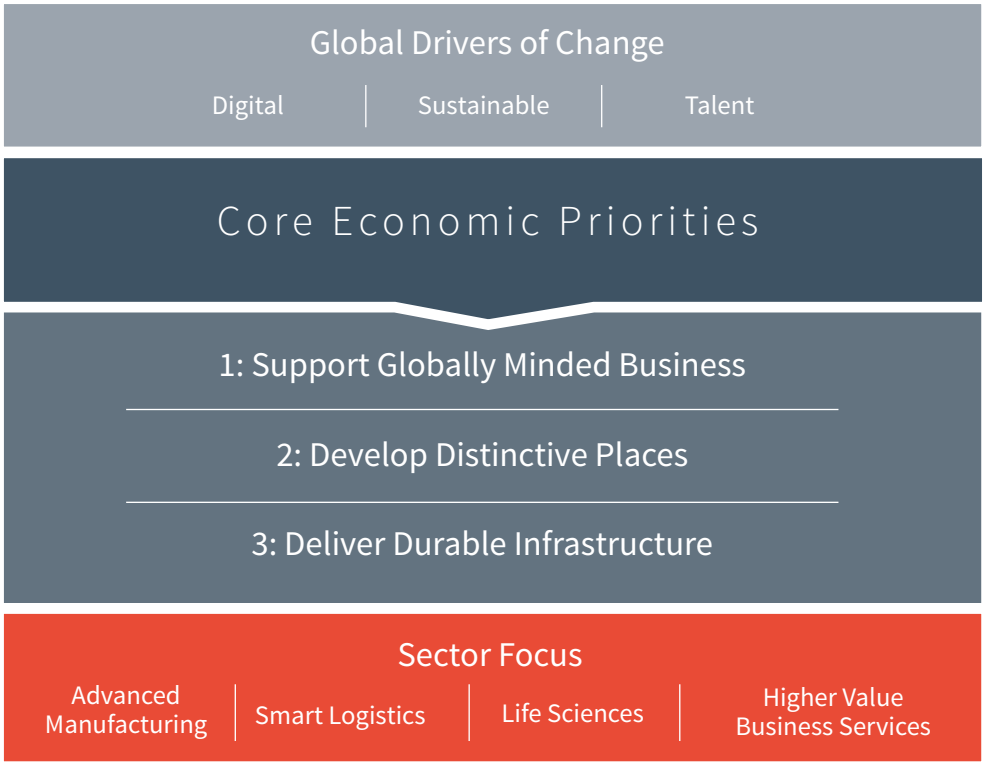
Mississauga generates $55 billion per annum of economic output. That is $77k per person, against $56k for the province.

We are home to a thriving business base with a significant number of international and Fortune 500 companies operating in sectors with significant growth potential. Our small and medium sized businesses also generate vital jobs and are the bedrock of our economy. Mississauga has scope to grow by nurturing more new start-ups, embedding innovation in its companies, and attracting investment for its established larger businesses and its smaller enterprises. We will work with our residents, workforce and businesses to ensure we maintain our competitive edge and continually refresh our offer.

We are not complacent and do recognize the challenges we face. Mississauga cannot continue to grow on a business as usual trajectory. We are running out of land and in many places our infrastructure is operating at capacity. We know that there are global challenges coming our way and we need to capitalize on key drivers of change (digital disruption, environmental pressures and the competitive search for talent). Mississauga is well-placed to rise to these challenges, but we will need to upgrade our infrastructure and create more attractive places for people to live and work in if we are to succeed. The city's growth focus needs to shift from developing land and drawing in new businesses to making best use of the assets we have and encouraging greater levels of innovation and entrepreneurship among our existing businesses. We have the talent and ambition to make this happen.

The Economic Development Strategy for 2020-2025 sets out the city's priorities for growth. The City of Mississauga has developed this strategy with stakeholders in the business, education and wider community. The city will work with partners and investors to secure investment, deliver change and animate action. Partnership and collaboration will be at the heart of this collective approach. Our strategy also reflects the city's commitment to deliver against globally important priorities. We have orientated our ambitions around a more inclusive and sustainable economic development agenda that more closely aligns with the United Nations' global Sustainable Development Goals.

The Mississauga Economic Development Strategy 2020-2025: Our Priorities



Global Drivers of Change Impacting on Mississauga

All cities around the world face a common set of global challenges which will shape opportunities for sustainable growth and the solutions they can deploy. Mississauga will embrace these challenges and our strategic plans will capitalize on the opportunities they will create.

Digital | Sustainable | Talent

Driver 1: Exploiting Digital Technology Solutions

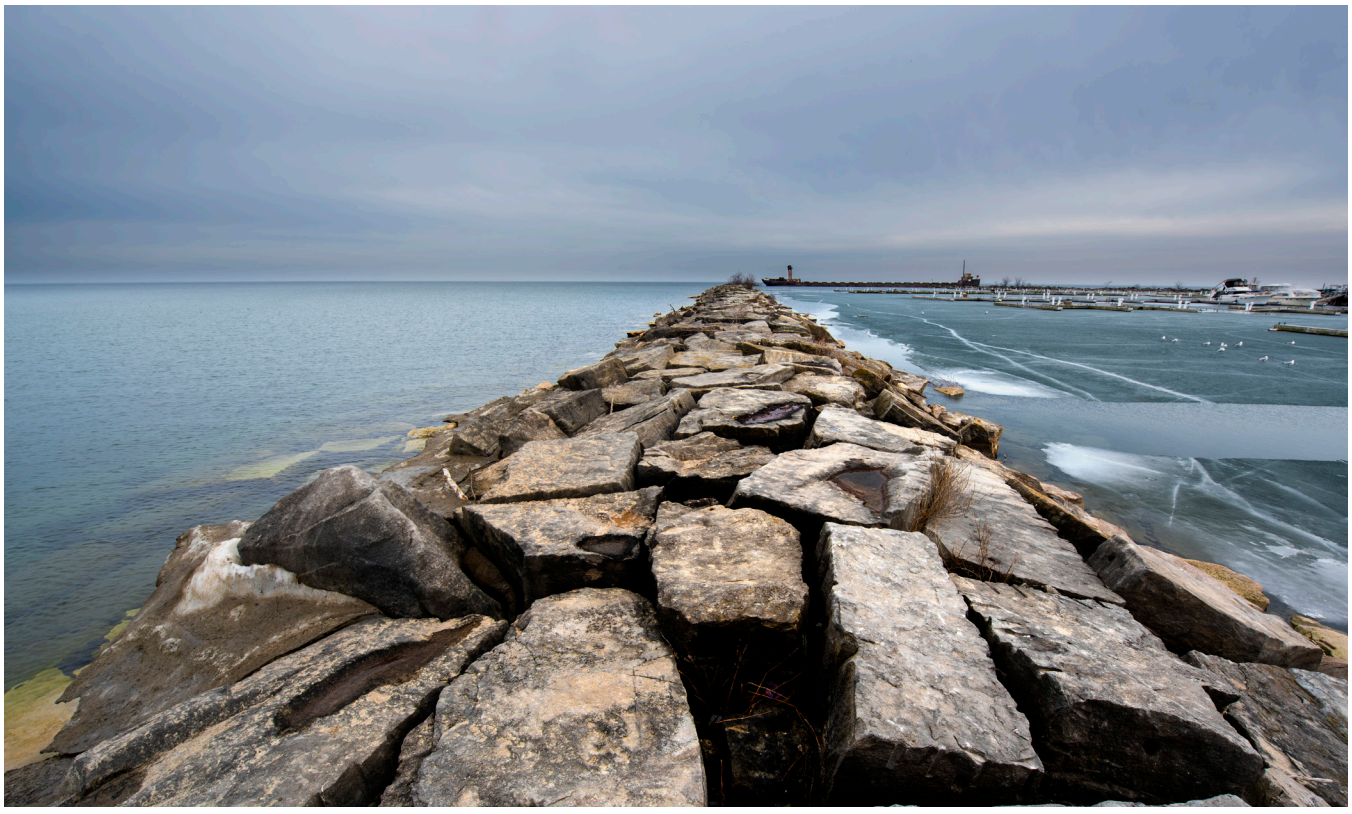
The global economy is deeply immersed in the fourth industrial revolution, driven by the latest wave of digital technologies which are permeating into every aspect of our lives. The profound changes taking place will continue into the foreseeable future as escalating processing power unlocks new possibilities and stimulates a new generation of products and services which could transform the business landscape and people's lives. The Mississauga economy already has a flourishing business base that is well-placed to capitalize on opportunities driven by:

- **Big Open Data**: new sources of data that are increasingly being collected and accessed in real time, allowing businesses and communities to make better informed decisions about the choices they face. Big open data will allow businesses to operate more efficiently, allow organizations to deliver more targeted and tailored services to clients, and help transform the choices people make in their everyday lives.
- **Artificial Intelligence**: new digital processing power that increasingly allows computers to emulate human judgement and behaviour, which are reshaping patterns of employment and business processes right across the economy. New solutions and opportunities are emerging for agile and innovative businesses and talent.
- **Automation**: emerging digital technologies are transforming how we engage with the physical world at work and in our leisure time. Machines are disrupting established employment and business models. They pose a threat to established practices for our businesses, and at the same time present fresh opportunities for entrepreneurs.

Driver 2: Innovating for Sustainable Solutions

It is becoming commonplace in Canada, and across the world, to embrace a wider appreciation of what economic progress and success look like. Increasingly, we need to look at the impact we are having on the world's resources, habitats and environment. The life chances of local people and businesses are a clear indicator of underlying economic resilience. Expectations for the places in which people live, work and play are being shaped by:

- **Resource Management**: economic development has driven a massive upsurge in demand for raw materials and put pressure on our shared resources. The next generation of economic growth must be underpinned by a clearer commitment to better use of scarce assets in order to avert a climate catastrophe and ensure sustainable ways of living. Businesses and places which act first will secure advantage by generating new sustainable products and services.
- **Public Space**: forward looking cities are increasingly aware of the importance of local surroundings on the welfare of the people who live and work there. Successful places provide opportunities for more sustainable active leisure and engagement among friends, family and neighbours. Local people and visitors underpin economic change and increasingly expect to be able to live and work in attractive places. Businesses too are increasingly drawn to compelling places where they can attract talent and establish long-term roots.
- **Value Shift**: progressive businesses and organizations are increasingly focused on leaving a positive lasting legacy. Leaders recognize they have a responsible stewardship role and are focused on securing change that reduces long-term environmental harm, creates durable assets and stimulates positive inter-generational progress. Successful places and businesses increasingly adopt a rounded view of success which goes beyond simple economic measure to embrace well-being and equity over a longer-term horizon.



Driver 3: The Competition for Talent

The world is increasingly mobile and digital technologies increasingly allow us to live and work wherever we choose. Economic growth is becoming rapidly dependent upon the knowledge and skills of its workforce. Successful places and businesses need to compete hard to attract and retain the talent to sustain their growth, animate the next generation of agile change and ensure they remain affordable for people across the earnings scale. The competition for talent has four factors:

- **Knowledge**: the economy relies increasingly on people with the right balance of technical and softer skills. The education system is under pressure to ensure people have the right mix of technical and creative skills as they emerge into the workforce and businesses need to invest in securing, refreshing and retaining the essential know-how needed in knowledge intensive, innovation focused workplaces of the future.
- **Movement**: the competition for talent means that people have an increasing array of choices about where to live and work. Whilst the workforce is more mobile, individuals and companies are more discerning when it comes to meeting and collaborating. Successful places have to provide an affordable mix of housing, services, cultures and lifestyles in order to attract and retain residents and businesses.
- **Aging**: developed economies like Canada have an aging workforce and population. This drives demand for businesses to create new opportunities which extend working lives and harness the accumulated wisdom of older workers at risk of leaving the labour market. The next generation's workforce needs to be better equipped with technical skills to maintain business processes and have the chance to engage in life-long learning to ensure their skills stay relevant over the course of their working lives.
- **Culture**: successful places and businesses harness the talent and reflect the true diversity of all their people. Success goes beyond simple economics and reflects the need for people to have a sense of belonging to the places in which they live and work. This puts a real emphasis on cities and businesses to make assertive steps to ensure they have an inclusive sense of identity which holds people together.

Our Focus on Place & Sectors

As Mississauga responds to the global drivers of change, the city must target its efforts on the places where growth can make the greatest contribution to our overall strategic ambitions and on those business sectors which have the long-term potential to safeguard our competitiveness.

Place Focus

Mississauga is historically an amalgam of different townships that have grown into distinct character areas with different functions, many of which align with the municipality's approach to city management. This includes the Downtown, Major and Community Nodes, Corporate Centres, Employment Areas, Neighbourhoods and Special Purpose Areas. Each of the city's distinct character areas has a unique set of assets and functions that jointly create the economic geography for the next wave of the city's economic growth.

Mississauga will continue to capture economic growth opportunities for the benefit of the whole city but will prioritize its focus around those places with greatest scope to support the three strategic priorities at the heart of the Economic Development Strategy. These are best reflected by being grouped into the following areas:

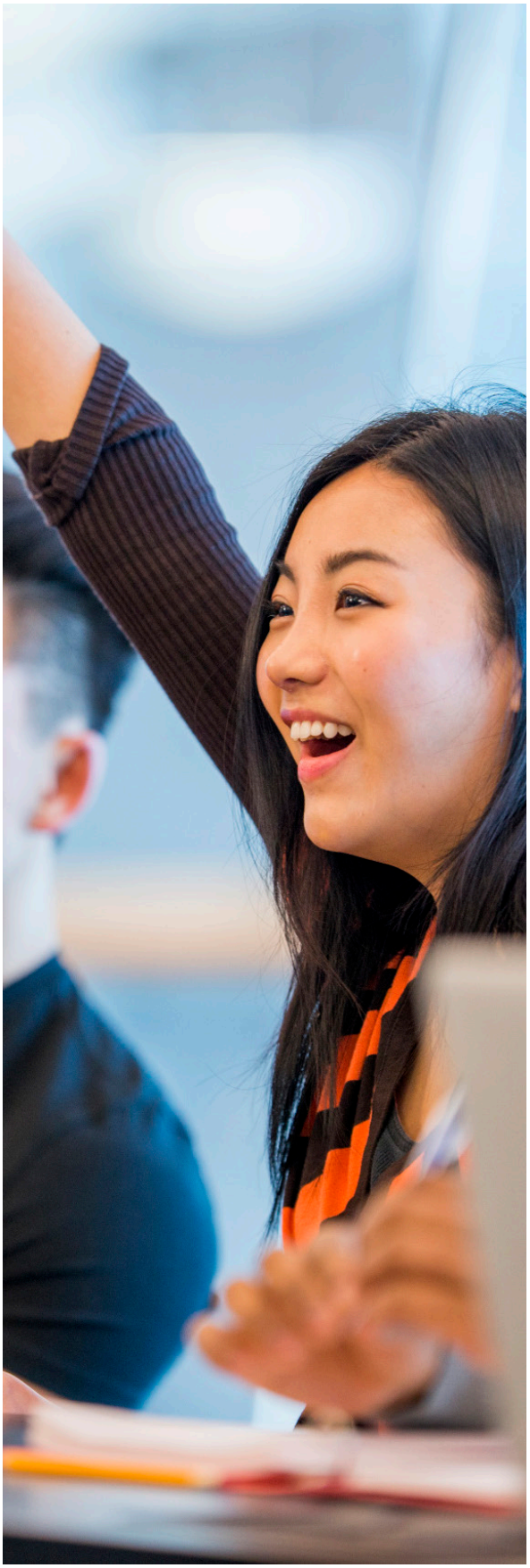
- **Economic Growth Centres:** places with the greatest potential to drive forward the next phase of Mississauga's economic growth and which require a collaborative strategic approach that draws on the insight, investment and energy of all the city's departments, organizations and businesses.
- **Knowledge Intensive Districts**: smaller locations outside the growth centres but which have scope to accommodate more employment and new business activity in our priority sectors.
- A set of critical **Economic Connections**: transportation links across the city that are vital for interconnectivity, travel and distribution of people and goods.

Economic Growth Centres

Mississauga has three distinct economic growth centres, which each have clear potential to accommodate economic growth to benefit all of the city, and in a way that shapes Mississauga's offer right across the Greater Toronto Area. The future economic growth of these centres requires a long-term, strategic and comprehensive approach which looks at all the factors driving their performance and develops a clear plan for balanced growth to harness their full potential. These economic growth centres are:

- **Pearson 401 Aerotropolis**: a large commercial area expanding beyond the boundary of Mississauga along the 401 corridor which serves the whole GTA and has real potential to become a globally significant economic hub underpinned by growth in logistics, life sciences and advanced manufacturing sectors. The airport is also a critical meeting point for business traveller and tourists, and a gateway for new immigrants coming to Canada, with plans to build a major transit hub that will improve connectivity to the airport and across the West GTA region. The city must work with the Greater Toronto Airport Authority and neighbouring municipalities to align strategic growth priorities and unlock the private and public investment needed. **Aim**: Ensure long-term airport related development is properly aligned around a growth plan that harnesses the full potential of the airport's connectivity.

- **Downtown**: the Mississauga downtown area has all the elements of a conventional city core i.e. civic buildings, cultural facilities, Sheridan College, a transit interchange and a retail heart. The current centre of Mississauga has recently had an injection of high-density residential development, but the area lacks a thriving office market and other leisure destinations that would bring a steady flow of people onto the streets. The city will prioritize investments that bring people and employment to the Downtown and help capitalize on the Hurontario Light Rail Transit (LRT) investment in the pipeline. **Aim**: Foster a thriving Downtown with commercial, cultural and civic functions at its heart.
- **Port Credit**: along the lakeshore, large residential developments with retail/leisure elements are in the pipeline at Lakeview Village and Port Credit West. Nestled in between is the traditional centre of Port Credit which has a vibrant night time economy right beside leisure trails along the lake and offering good access to downtown Toronto via the GO Train station. In the coming years, Port Credit will be connected to the Downtown area via the LRT. **Aim**: Draw more people in to live, work and spend time and money in Port Credit by maintaining its accessibility, reducing traffic through its heart, offering affordable housing, securing low-cost start-up workspace, supporting more independent outlets and hosting cultural activities.



Knowledge Intensive Districts

In addition to the three Growth Centres, Mississauga will also channel economic growth opportunities to its Knowledge Intensive Districts. These are locations that have attracted significant core employment growth[1] and/or significant research & development activity which can play an important role in securing our strategic ambitions. They are already home to important businesses, research facilities and knowledge-based activities that the city needs to consolidate and build upon. Outside our Growth Centres, there are two already recognized Knowledge Intensive Districts in the city (Meadowvale and Sheridan Science Park). A third location, the University of Toronto Mississauga Campus will also be prioritized. Each of these Districts has growth opportunities for spin out, scale-up and inward investment, but each of them requires better connections to transit, more walkable public realm and a wider set of local amenities if they are to fulfil their growth potential. **Aim**: Promote these destinations more assertively and work closely with the university, developers and business park operators to ensure a joined-up approach to economic growth.

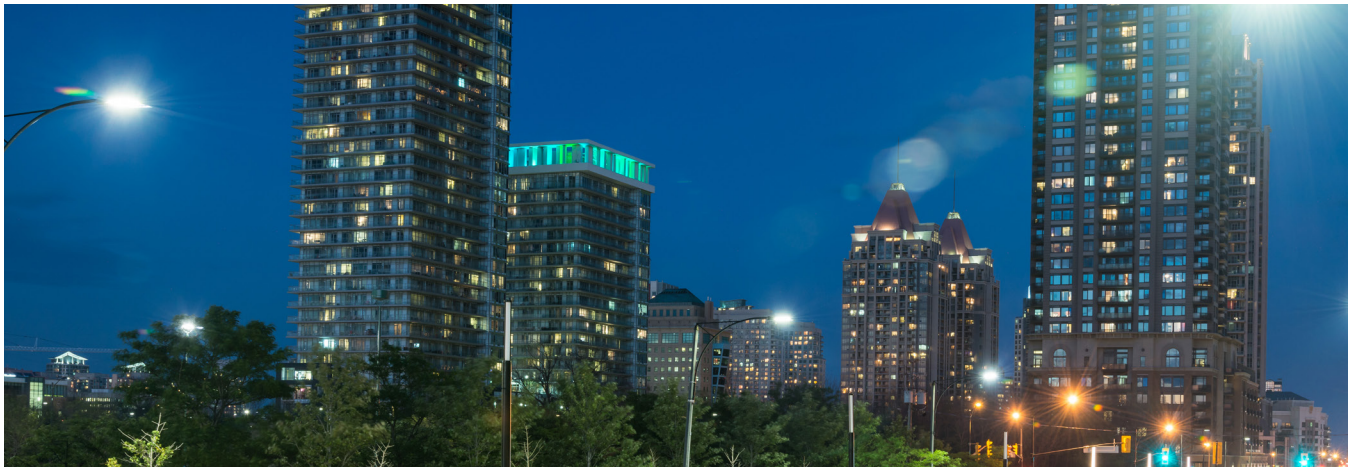
1 "Planning the next GGH" Pamela Blais, Metropole Consultants, and The Neptis Foundation. November 30, 2018

Corridor Connections

To unlock the full potential of our Economic Growth Centres and Knowledge Intensive Districts, Mississauga needs to continuously strengthen its travel connections to ensure local residents, workers and visitors can sustainably connect to future economic opportunities. The city's strategic priority will be on developing a transit-focused network that can sustain Mississauga's growth ambitions. The key corridor connections critical to the city's further sustainable growth are:

- **GO Network**: continuously extending the frequency, efficiency and reach of bus and rail connections across the city and into downtown Toronto to allow businesses to draw on a larger and more flexible pool of labour.
- **Dundas Connects**: a key route passing across the city which is central to securing a more integrated network that better connects the places where people work, live and relax.
- **Lakeshore Connecting Communities:** the Lakeshore Corridor, as defined by the Lakeshore Road Transportation Master Plan and Implementation Strategy, is 13km long east-west, and includes Lakeshore Road between Southdown Road and the east City limit and Royal Windsor Drive between the west City limit and Southdown Road. The corridor is an important arterial route which intersects other important transit routes, including the Hurontario Spine.
- **Hurontario Spine**: as the LRT establishes this important north-south link from Port Credit up through and extending to Downtown, the opportunities which it unlocks need to be carefully coordinated to ensure an appropriate balance between residential and commercial development and the creation of more walkable, human scale development along the route.
- **401/403/QEW Highways**: these major road arteries through the city are already running at close to capacity and risk becoming a drag on growth unless steps are taken to encourage more transit development closer to where people live and work. We need to focus efforts on using technology to increase ride sharing, reduce peak flows and cut the number of single occupant car journeys.
- **Airport Connections**: better connections linking the airport and its planned Transit Hub through to Port Credit and the Downtown area are vital if Mississauga is to fully capitalize on the international gateway opportunities tied up in the aerotropolis concept that sits on its doorstep.

Mississauga's economic place priorities provide a broad guide to where each of the opportunities and challenges are located and help demonstrate how Mississauga can develop a stronger sense of its places and secure more effective economic growth across the city. The broad functional economic areas that make up our city need to be further refined around the city's planning and service delivery frameworks to ensure alignment and concentrate development ambitions around these priority areas. This will allow the city to use the appropriate policies in each location.



Sector Focus

Mississauga has a diverse business base and will continue to support all businesses with growth prospects. We will focus most effort on our globally-minded businesses. These are businesses which:

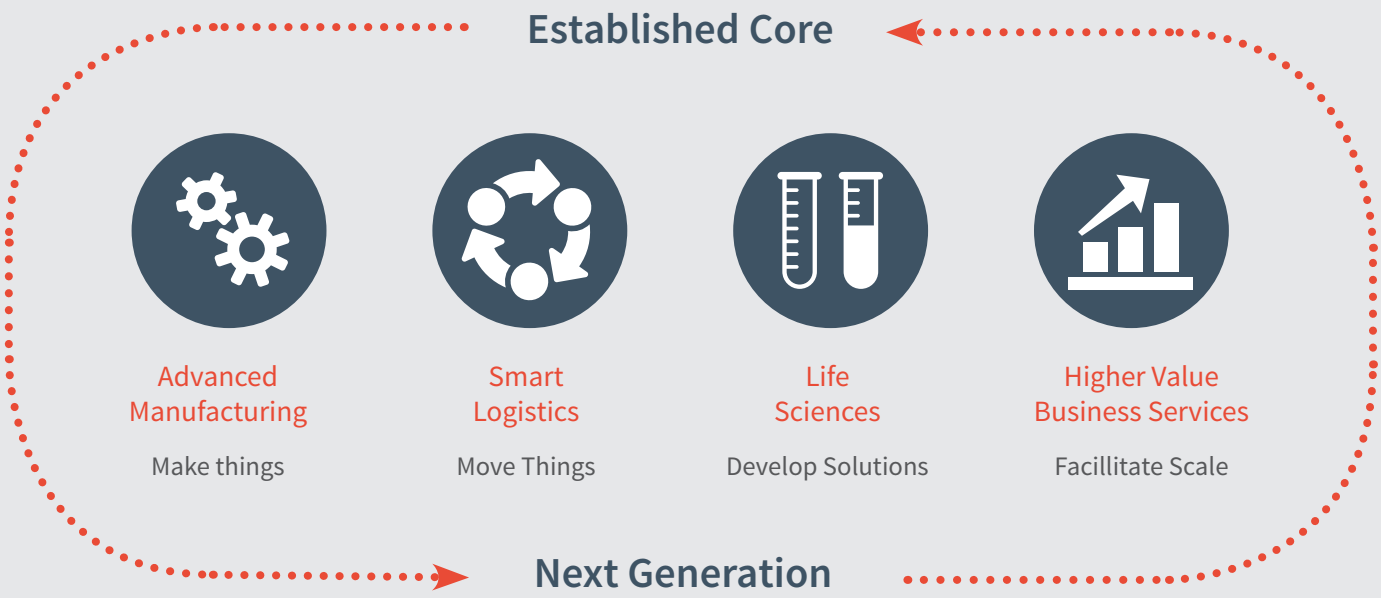
- **trade internationally**
- **recruit people from other countries**
- **or which address one of the three global challenges i.e. digital, environmental and talent.**

Mississauga needs to continue to attract new businesses in established and emerging sectors, however the focus of our strategic economic development efforts will increasingly focus on encouraging innovation and entrepreneurship from within:

- **those elements of the economy on which we already rely most for jobs and economic output and**
- **those growing sectors with further growth prospects going forward.**

This points to four broad sector groupings as the focus for strategic growth.

Established Core



Advanced Manufacturing

Despite global competitive pressures from lower cost countries, Mississauga continues to have a strong base of manufacturing businesses which sustain a significant number of local jobs. It is home to a set of globally minded companies which trade internationally, compete on the basis of their knowledge assets, embrace technology, are focused on cleaner-tech solutions and which have a bright future in global markets. Mississauga will nurture its existing base and secure a growing competitive advantage among a new generation of advanced manufacturing businesses.

Prominent Sub Sectors

- Aerospace
- Automotive
- Food & Beverage
- Cleantech

Smart Logistics

Movement and storage of goods has traditionally been a lower value sector which consumes significant land in patterns of low-density employment. But the sector is rapidly changing and globally minded businesses are emerging from within Mississauga's logistics sector, increasingly relying on digital technology to trace, manage and move goods. Logistics businesses also face new opportunities to embrace more efficient and lower carbon modes of transport powered by electricity and which rely on autonomous route planning. The city will focus on being a strong location for smart logistics to ensure its established base stays competitive and a new generation of enterprises emerges at the cutting edge of sector practice.

Prominent Sub Sectors

- Transportation
- Distribution & Delivery
- Warehousing & Storage

Life Sciences

Despite growing competitive challenges, the city is committed to supporting its existing base of life sciences firms and securing a new generation of complementary businesses which will strengthen its status as Canada's second largest life sciences sector. The industry has significant global growth potential which relies heavily on creating the right sort of business environment and attracting the talent to generate new solutions and sustain new business models. The city will maintain its focus on supporting commercialization in BioPharma & Rare Disease, Diagnostics & Molecular Genetics, Medical Devices and Digital Health to secure its competitive position and identify the next generation of life science businesses in areas such as Informatics.

Prominent Sub Sectors

- Pharmaceuticals
- Biotechnology
- Diagnostics
- Medical Devices
- Digital Health

Higher Value Business Services

Mississauga and the wider Toronto economy has a recognized base of information technology and financial services businesses which provide essential support to a wide range of sectors around the globe. Mississauga is also home to a large concentration of corporate head offices. The city will continue to support its existing base and help secure a new generation of globally-minded companies that use digital technology to provide new solutions, such as fintech and media production, and which rely on global talent to maintain their competitive innovation edge.

Prominent Sub Sectors

- Finance & Insurance
- Business Technology
- Financial Technology
- Business, Management, Scientific & Technical Support Services

The four sector priorities will guide the city's investment and focus. The city will continue to support businesses outside these sectors, particularly in fast emerging areas and where there is a wider crossover contribution to the city's strategic priorities, for example around the cultural sector which has an important role to play in building a stronger identity for Mississauga and stimulating a wider set of community benefits.

The Mississauga Economic Development Framework is built around the three global drivers of change, our critical places and essential sectors. Our strategy has three priorities:

- Priority 1: Support Globally Minded Business
- Priority 2: Develop Distinctive Places
- Priority 3: Deliver Durable Infrastructure

Each Priority contains a set of Strategic Themes and a series of proposed Actions which the city will take forward to deliver change. The Themes and their rationale are set out below with a selection of associated Priority Actions. A fuller overview of all the Actions can be found in the accompanying Action Plan.

Mississauga's Economic Priorities

Priority 1: Support Globally Minded Business

Mississauga will maintain its established base of businesses and aim to secure the next generation of growth from its existing sector strengths. The city has a strong track record of growth from which to build and adapt. We will prioritize support for our four established sectors and work with their leaders to understand how best to draw out the enterprise opportunities and innovation potential among our businesses and institutions to ensure they successfully adapt to the global drivers of change. The city will adopt a rounded approach to driving competitiveness which complements the focus on places and infrastructure.

The Evidence

- Mississauga is home to nearly 95,000 businesses, ranging from small and medium-sized businesses to global multinationals. There are over 1,400 multinational corporations and 75 Fortune 500 companies and many small businesses providing a strong source of employment in the area. Mississauga generated $55bn of economic output in 2015, nearly 10% of Ontario's total, and local productivity is $77k per capita, compared to $56k for the province.
- The city has an established core of sectors with a significant and growing economic footprint. Established activity is strongest within manufacturing, logistics, life sciences, financial & business services, Mississauga has double the Canadian level of specialization in some of these sub-sectors. The next generation of priority sectors will be heavily reliant on securing globally excellent knowledge and skills among their employees.
- The labour market is highly qualified and diverse – 70% of the working age population have a postsecondary certificate, diploma or degree and a similar proportion of immigrants were granted permission to work in Canada because their skills help address national labour market needs. But Mississauga's stagnating workforce and aging population could still impact on businesses' ability to replace retiring skilled staff with young talent.
- Mississauga is ranked second lowest across Canada's major urban centres for creating start-up businesses and has the third lowest rate of scaling companies (i.e. firms with over $10M of capital) of its rivals. Firms in Mississauga also lag competitor cities in Canada in securing major public funds for innovation, commercialization and talent.

Our Support for Globally Minded Businesses distils into four Strategic Themes:

A Creative Innovation

Mississauga will harness the significant innovation potential within its priority sectors and its research institutions to drive up the city's competitiveness.

Our focus will be on:

- Driving up investment (government and private) in formal R&D within our established base of businesses and research institutions.
- Facilitating innovation focused start-ups and spin-out businesses from large companies and universities.
- Ensuring effective workspaces to enable creative innovation to take root across the city.
- Developing a strong innovation reputation for the city through a network of innovation leaders.

Rationale

- Canada invests less in R&D than its international rivals.[1]
- Canada generates fewer patents than competitor countries like Sweden and Korea.[2]
- Mississauga firms lag competitor cities in Canada in securing major public funds for innovation, commercialization and talent.

Priority Actions

- **Innovation Hubs Program:** ensure a network of workspaces across the city offering attractive and affordable places for innovation start-ups and scale-up businesses to establish themselves and grow. The innovation hubs should offer easy access to other entrepreneurs and the support businesses need to realize their potential. The hubs program should better coordinate existing facilities such as RICs, Edge and ICube and work with developers and operators to bring forward new facilities in all parts of the city.
- **Applied Research Hubs:** Support University Toronto Mississauga , Sheridan College and big business to establish new facilities to drive R&D around the University Toronto Mississauga campus, Sheridan Research Park, Downtown and Port Credit. Work should be undertaken to bring potential entrepreneurs together through networking opportunities and peer support to stimulate collaboration and provide inspiring learning sessions to cultivate demand for new research hubs. The city should stimulate demand and encourage partners to better understand the requirements of emerging entrepreneurs.
- **Scale Up Network**: establish a membership organization for entrepreneurs to offer peer support, networking opportunities to stimulate collaboration and inspiring learning sessions to help entrepreneurs to boost their ambition and confidence. The network would help champion Mississauga's start-up and innovation credentials, contribute to a stronger level of interest in entrepreneurship and provide ready access points to investors, collaborators and suppliers who want to meet businesses with scale-up potential.
- **Civic Engagement**: engage local businesses in helping the city solve critical economic, social and technological issues through a series of competitive challenge/hackathon type events where businesses, researchers, students and entrepreneurs are invited to come up with novel solutions that help the city perform better and which could generate a future business. Corporate sponsorship should be sought to facilitate the events and offer small amounts of seed / start up prize funding for ideas with merit and the city should provide piloting opportunities to test ideas in the local environment, grow the green economy and help deliver the city's Climate Change Master Plan.

1 https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm#indicator-chart
2 https://data.oecd.org/rd/triadic-patent-families.htm#indicator-chart
3 Innovation & Entrepreneurship Study 2019

B Enterprising Growth

Mississauga will rejuvenate its business base by boosting start up and scale up performance.

Our focus will be on:

- Developing a stronger reputation for Mississauga as a base for business start-ups.
- Attracting more investment (public and private) to support the acceleration of scale-up growth.
- Ensuring a vibrant workspace scene offering affordable, attractive landing spots in each of our priority places.
- Offer expert support and insight to help more start-ups transition into successful scale-ups.

Rationale

- Mississauga is ranked second lowest across Canada's major urban centres for creating start-up businesses[5].
- Mississauga has the third lowest rate of scaling companies (i.e. firms with over $10M of capital) of its rivals.

Priority Actions

- **Mississauga Boost:** a reimagined Mississauga Business Enterprise Centre (MBEC) transitioning to be a proactive hub where entrepreneurs, innovators and small businesses can access support and advice, in a refreshed and dynamic space. The newly-branded offer would relocate to a more prominent and business friendly location alongside other agencies and businesses offering support to small businesses. It should offer front of house/promotional space to the major innovation facilities in the city and desk space for large businesses committed to supporting innovative start-ups through mentoring, collaboration or investment. It should look to become a central market-place where entrepreneurs can meet each other and where the city's reputation for enterprise and innovation can be anchored.
- **Angels & Mentors for Scale-Ups:** create an identifiable network of private sector angels and mentors to help local entrepreneurs with scale-up potential to develop rigorous business plans and navigate investment options. The network of volunteer angels and mentors should be drawn from the investor community and people with first-hand experience of setting up and scaling-up their own businesses. They should be encouraged to help nascent enterprises develop credible business plans and navigate their businesses towards scale-up, guiding their preparation and engagement with external investors along the way.
- **Accelerator Program**: an intensive 3-month support offer to local entrepreneurs to develop a business plan and present an investable proposition to investors. The Accelerator would, by invite only, offer on-site mentoring, business planning, marketing and technical support to entrepreneurs. Entry offers would be made to entrepreneurs following a Shark Tank/Dragons Den type competition. The competition would be open widely including to people based outside Mississauga with an interest in launching their business in the city.

5 Mississauga Entrepreneurship and Innovation Study, 2019

C People with Talent

Mississauga will attract, develop and retain the talent its priority sector businesses need to drive and sustain their growth.

Our focus will be on:

- Producing a stronger flow of higher skills from our educational institutions.
- Responsive learning programs to match the ever-evolving requirements of employers.
- Novel learning methods to offer world-class modern teaching.
- Lifelong flexibility matching people's ongoing learning needs through the different stages of their working life.

Rationale

- Mississauga faces a combined challenge of a stagnating workforce and an aging population which will impact on businesses' ability to replace retiring skilled staff with young talent.
- The city has a relatively strong talent pool and a very successful record in bringing in new talent from around the globe, but local unemployment continues to be high compared to neighbouring areas.
- The next generation of priority sectors will be heavily reliant on securing globally excellent knowledge and skills among their employees.

Priority Actions

- **Enhanced Work Opportunities Program:** initiate a more strategic approach to work-based opportunities for learners by targeting businesses in priority sectors to provide opportunities for students to better understand career opportunities in their sector and to better link college provision to business needs. A more strategic approach to student co-ops would see more students being encouraged to explore work in emerging careers and sectors, to develop their softer creative and communication skills in a work environment and to help young people develop better contacts with business leaders. The program would also help students develop their resumes and make more informed future learning choices, and would be underpinned by a commitment to learning and improvement to find out what works best for students and employers.
- **Future Skills Insight:** as the local economy evolves and diversifies in response to the global drivers of change, the city should work with Sheridan College and UTM to better understand the emerging skills needs of Mississauga's priority sectors. Work should be undertaken to develop an improved sense of the profile of emerging skills gaps as new technologies are adopted and older members of the workforce head towards retirement. The insights of business should be better harnessed alongside a regular program of foresighting and workforce mapping/planning for major sectors, to ensure learning programs offered locally remain relevant to employer requirements.
- **Next Gen Management & Leadership**: a program of learning, offered to mid-tier employees in existing companies across Mississauga, to prepare workers for the next career stage and ensure they have the skills and insight needed to become the next generation of local business leaders. The focus of learning should be on leadership to drive innovation and diversification responding to the global drivers of change. This initiative should aim to build on and bring together existing training/learning opportunities available at Sheridan and UTM, plus incorporate online modules delivered by institutions around the world. The program should create cohorts of future business leaders, nominated by their employers who would also be ambassadors for Mississauga's commitment to its economic ambitions.

D Civic Engagement

Mississauga will work closely with its established business base to harness their insights and boost their profile to help secure more investment into the city.

Our focus will be on:

- Local business leadership to generate a high-powered, shared public-private voice working for Mississauga.
- Investment promotion to better draw on the relationships and financial potential among the city's major employers.
- GTA engagement to confidently partner with and shape the shared growth agenda across neighbouring jurisdictions.

Rationale

- Mississauga is home to over 1,400 multinational corporations and 75 Fortune 500 companies whose supply chain linkages, profile and investment potential could be better harnessed to help drive the next wave of growth in the city.
- Mississauga makes a substantial economic contribution to the Ontario and GTA economy and has above average levels of productivity.
- The city must work with neighbours to plan for infrastructure investment and create a shared plan for business and residential development.

Priority Actions

- **Specialist Sector Support & Councils:** building on the existing councils for Life Sciences and Advanced Manufacturing, the city should create counter-part councils for Smart Logistics and Higher Value Business Services. These councils should each bring a range of relevant business voices together to articulate priorities, identify shared challenges and initiate collaborative action. The focus of the councils should be on advising the city on investments and support needed to secure the next generation of growth in our four priority sectors. The councils should be business-led but animated by the EDO team in the city and tasked with mapping local businesses, establishing stronger networks across the sector, identifying local growth barriers, promoting the case for innovation and diversification in response to the global drivers of change and creating action plan ideas to better drive growth in their sector.
- **Confident Engagement:** senior city corporation staff should work together to agree how best to engage confidently with the business community, public sector agencies and neighbouring municipal partners as well as provincial and national government. The city needs to make its case confidently to partners so that it can build on the major contribution it already makes and demonstrate how it could deliver more for the GTA economy with the right long-term investment profile. A series of Actions are needed from the EDO to harness the influence of larger businesses based in Mississauga, engage with transit agencies, collaborate with neighbours and align priorities among local delivery partners such as UTM, Sheridan College and Trillium Health Partners – Mississauga Hospital.

Priority 2: Develop Distinctive Places

Mississauga is historically an amalgam of different townships that have grown into distinct character areas. In that time, the global competition for talent has sharpened and businesses are now embracing a wider appreciation of place in their choices about where to locate. Mississauga has much to offer people and businesses, but it needs to continue to be attractive as it moves into the next phase of its growth. The city needs to respond to the rapid pace of global change and focus on making its existing places work better so they can sustain further growth.

The evidence

- Although 95% of residents rate their quality of life in Mississauga as excellent or good, the city lacks a clear identity around which to promote itself.
- The city has a series of character areas which together lack pulling power and do not help improve active lifestyles, streetscape viability or visitor perceptions.
- Many of our centres are dominated by cars and passing traffic; more than 4 in 5 trips are made by car and single occupant commuter car use is high.
- Although Mississauga has a large mid-range office market, the traditional downtown core does not provide ready access to work for the large local residential base, despite growing trends towards more central locations with flexible workspace solutions.
- The city also faces a growing housing affordability challenge which makes it difficult for new younger residents to establish themselves locally.
- Over half of Mississauga's residents were born outside Canada and the city has a great platform to celebrate and harness its cultural diversity to help further drive economic growth.

This requires the city to drive forward a program of place-based change focused on three Strategic Themes:

A Connected Working Places

Mississauga will ensure new and growing businesses can find appropriate and accessible workspace for each stage of their growth journey.

This will involve:

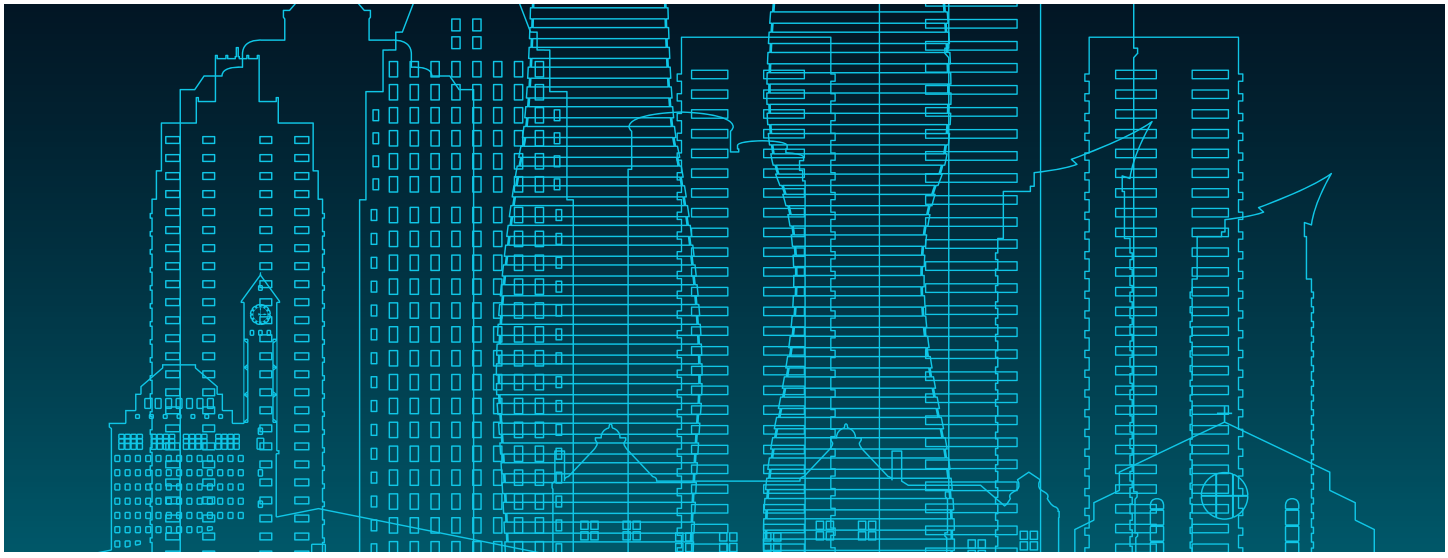
- Planning powers to guide relevant developments into appropriate destinations.
- Incentive schemes to draw in new developments to fill market gaps.
- Economic-led strategic planning to align land use policy with our long-term growth ambitions.

Rationale

- Mississauga has grown rapidly around car dominated employment sites. The road network is running at capacity, limiting the city's scope to attract more in-commuters.
- The office market is increasingly moving towards central locations and flexible solutions which allow businesses to distribute teams connected by technology and reduce travel to hard-to-reach work places.

Priority Actions

- **Downtown Community Improvement Program:** continue to promote the Community Improvement Program for at least two more years, but review performance to adjust the approach to capitalise on the starting success it is now beginning to generate. Continue Downtown Community Improvement Plan for office uses and examine if any other areas would benefit from a similar program. Continue to advocate for Regional participation.
- **Retention Strategy**: examine land-use planning tools to encourage retention and improvement of office space in the Downtown. Opportunities to de-risk the costs of upgrading older office / marginal property (or converting other premises) into modern attractive workspace should be explored.
- **Boost Hotel Offer:** in line with its Tourism Masterplan, the city should engage with hotel developers to nurture a stronger flow of investment in new accommodation around the Lakeside, in the Downtown area and at Toronto Pearson Airport. Work is needed to ensure business and leisure visitors can find a range of attractive places to stay which complement residential areas, create new trade for businesses and align with emerging office developments. Levers such as the municipality's Accommodation Tax could be used to help accelerate development.



B People–Centred Spaces

Mississauga will implement planning and investment policies to create more shared public spaces for local residents and visitors to enjoy.

This will require a focus on:

- Investment in new leisure and culture facilities for local people and residents to interact with.
- Making our streets and squares more welcoming for walking to boost activity levels.
- Stronger program of cultural events to attract local people and visitors to public spaces.

Rationale

- Mississauga has few focal points for people to enjoy shared spaces which impacts poorly on active lifestyles, streetscape viability and visitor perceptions.
- Mississauga is overly car dependent for access to work and leisure. Too few of our places are designed around people.
- Existing assets, such as the lakeshore, have significant potential to be reimagined with an increased role in activating visitor, cultural and leisure pursuits.

Priority Actions

- **Port Credit Creative Innovation District:** the city should commit to an innovation/culture masterplan for Port Credit to secure development investment which builds an identity for the creative arts, digital innovation, cultural economy and leisure activities. The area around Port Credit including the marina should prioritize investment in initiatives aimed at retaining and attracting young creative people with innovation and enterprise potential, and should include new lowl cost flexible workspace, performance spaces, and maker-labs as well as leisure opportunities. The lakeside location and transit connections make this a unique place asset which requires clear and agreed strategic parameters placed around its development.
- **Cultural Anchors:** the city should be ambitious about building new cultural facilities which can generate new visitors from outside Mississauga and boost its image across Canada. In line with the Mississauga Culture Master Plan, work is needed to explore the scope for year-round destinations which can better animate the Downtown in particular. Ideas include a Canadian People's Museum to reflect the culture and contribution of immigrants and indigenous people to the growth of the country, with accompanying food and events in the centre of Mississauga. Other avenues to explore should include a stronger art gallery offering, river/lakeshore revitalization and rapid action to build on the findings of the on-going Stadium scoping study.
- **Tactical Urbanism:** the city should extend the initial experiments undertaken in Summer 2019 to redirect traffic around public spaces in the Downtown area. The policy should move from piloting to more permanent and regular actions to reduce traffic, particularly in the city's strategic priority growth nodes in Downtown and Lakeside, and also look at other potentially high footfall locations for further piloting. For example, in the summer of 2020, the city should aim to experiment with single lane in traffic on Lakeshore Road (under the Lakeshore Connecting Communities Master Plan) through Port Credit to strengthen the night and day time economies and encourage more walking. This should be accompanied by a program of weekend events to draw in visitors and help drive trade for local business.

C Engaged Communities

Mississauga will work hard to develop a stronger identity for the city, based on its diverse community of residents.

Our focus will be on:

- Developing space for distinct home country-themed activities to celebrate our diversity.
- Events to bring the community into public spaces to engage people across our character areas.
- Neighbourhood consultations and engagement to harness local insights into our plans.

Rationale

- Mississauga lacks a clear sense of identity which could hold back our growth aspirations as we promote the area to investors and potential in-movers.
- Mississauga has a highly international resident base with over half of local residents born overseas and many different languages spoken at home.
- Mississauga needs to continue attracting talent from around the country and the globe to sustain its workforce and drive the next phase of our growth.

Priority Actions

- **Welcome Offer:** the city should establish a service to help new arrivers to Mississauga to quickly engage with opportunities for work and life in the city. This should include sign-posting to English language learning, training and accreditation in Canadian professions, start-up advice for entrepreneurs and job search support to help speed up new arriver's integration into working life.
- **Park Clean Up:** a city-led program to get local companies to sponsor park clean up and maintenance and help improve the public realm across the city. This initiative should be used as a platform to better engage local businesses in the life of the city and encourage a stronger climate of commitment among leaders and workers across Mississauga to help it better develop community capacity.
- **Culture Program:** as the city takes control of programming at the Living Arts Centre and further develops its program for Celebration Square, opportunities to showcase the city and engage local businesses in the opportunities which arise from festivals should be seized and lessons for how the Downtown area can be brought more to life with more walking and exploration should be harnessed.

Priority 3: Deliver Durable Infrastructure

The economic expansion of Mississauga has out-grown the transport, digital and place infrastructure upon which our city relies. We have extended our use of land assets around our road network which is now operating at close to capacity and our transit systems need to continue being upgraded to accommodate the next wave of economic growth. New technology-driven solutions have also emerged which can be deployed to help increase the city's productive capacity and ensure we play our part in tackling the global climate change challenge. We need substantial investment in our infrastructure to ensure we have a durable set of assets which can sustain our long-term growth and achieve our strategic ambitions.

The evidence

- Residents of Mississauga already highlight traffic, road congestion and inadequate public transit as problems in the city. Expected population and employment growth will increase travel to, from, and within the city. By 2041, Mississauga's transportation system could have to accommodate an extra 254,000 trips per day, which would mean an extra 165,000 car trips on the road. To meet the city's First Transportation Master Plan objective of a 50% sustainable mode split, more than 430,000 daily trips will need to switch from the car to transit or a more active mode of travel.
- Transport is a major source of greenhouse gas emissions in Mississauga, accounting for 32% of the city's overall footprint and contributing to air pollutants. Traffic-related emissions in the Greater Toronto and Hamilton Area are estimated to be responsible for up to 1,000 premature deaths each year.
- Housing affordability is becoming more stark and housing choices for many households are being narrowed. More than a quarter of middle income households and 70% of all low income households in Mississauga now face affordability challenges. The city has an increasing proportion of residents living on a low income and more people are struggling with the essentials. This will affect businesses' ability to attract and retain critical staff in lower and mid-range paying roles.
- Mississauga's fixed and mobile connectivity compares well to national coverage. The city is an attractive commercial investment proposition for the fast-moving market in digital connectivity, yet Mississauga must work to accelerate gigabit capable connections ie full fibre and 5G to more commercial locations in order to remain competitive.
- Despite positive perceptions of good health, active lifestyles are a challenge and nearly a quarter of residents are obese, with a further 35% overweight. Only a quarter of residents are active during their leisure time and our built environment is not conducive to active lifestyles. We risk storing up real health problems that could adversely affect our economic growth prospects unless action is taken.

This requires the city to drive forward a program of durable infrastructure investments that will focus on three Strategic Themes:

A Transit Driven Growth

Mississauga will assertively pursue a massive increase in transit accessibility to ensure the next generation of our economic growth is fuelled by workers using accessible, sustainable, integrated and affordable public transport.

Our focus will be on:

- Securing investment to extend existing transit networks to drive major modal shift change.
- Implementing novel solutions to make better use of existing capacity (i.e. smart tech).
- Supporting transit-oriented development around stations to better embed investment and drive ridership.

Rationale

- Expected job growth will generate extra commuter demand over coming years. The road network around the city is running at capacity and further expansion will likely induce more cars and further increase the city's carbon footprint.

Priority Actions

- Much of our transit related effort requires leadership from transit agencies supported with case making and advocacy from the city . The city has an identified list of high priority transit related actions that should be advanced over the coming years. These are all long-term and complex initiatives but each of them could unlock further growth for the Mississauga economy by opening up new sites and helping businesses access a wider pool of workers to fuel their growth.
    - **Pearson Transit Hub:** work with the Airport Authority to develop upgraded surface public transport access to the airport from Mississauga and other parts of the GTA.
    - **Higher Order Transit Oriented Development:** review of opportunities to anchor development at GO stations and LRT stops to deliver accessible employment and de-risk network extension.
    - **Kitchener-Malton GO Extension:** promote extension of GO to provide better transit connections along to the Kitchener Waterloo Innovation Corridor.
    - **Milton GO Two-way:** promote a rapid all-day service through to Milton from downtown Toronto and through the centre of Mississauga.
    - **Aerotropolis Masterplan:** work with GTAA and other municipalities to develop a land use vision and economic plan to deliver growth around the airport which capitalizes on the wider opportunity for transport, city building and sector competitiveness. The masterplan vision should align wider priorities for growth along an agreed aerotropolis corridor and also ensure Pearson can extend its international air hub offer with good ground access by road and transit while securing growing air side capacity.

B Smart Digital Solutions

Mississauga will aim to harness investment in new smart solutions to deliver a sustainable, prosperous and inclusive future for its residents and businesses.

This will involve a focus on:

- Positioning Mississauga as a test bed for smart solutions to pressing urban challenges.
- Next Generation Digital Connectivity to ensure every home and workplace is connected to cutting edge services and global markets.
- Deploying Smart Grids Technologies for our future energy resilience and lowering of our carbon footprint.

Rationale

- There has been a rapid escalation in demand for digital connectivity and our next generation of economic growth will be even more dependent on widespread access to reliable and affordable, fixed and mobile digital connectivity.
- New technologies to better manage traffic, offer customers higher quality services and better manage our use of scarce resources could improve efficiency in our economy, boost the resilience of our infrastructure and help better attract the latest wave of innovators to operate from our city.

Priority Actions

- **Urban Innovation Test Bed:** building on our SMRTCTY strategy, Mississauga should aim to position itself as North America's capital for urban innovation by offering the city test bed where new technological solutions to the global challenges facing cities (talent, digital technology and climate change) can be deployed for first mover advantage. This should explore piloting of new technologies such as autonomous vehicles, innovative local energy generation/storage and distribution, mass electrification of vehicle fleets for delivery and capitalizing on the city's nascent clean tech sector to reduce the city's carbon footprint.
- **Connected Spaces:** the city should ensure all places where people work operate as world class digital connectivity hotspots which give entrepreneurs and creatives ready access to people and tools which can open up new markets, stimulate collaborative innovation and help drive footfall for other local businesses. The city should work with telecoms operators to explore how it can use its own assets and leverage with workspace developers/operators to ensure Mississauga has comprehensive digital coverage (i.e. gigabit fibre/5G).
- **Lakeside Net-Zero Energy Showcase:** as the major investments arrive along the lakeshore in Mississauga, the city should engage with developers to promote and support zero carbon energy solutions for generation, storage and waste reduction/loss. The city should aim for these landmark developments to be test pilots for positive environmental change, proving the case for new ways of heating buildings, which could generate spin off growth opportunities for local business and be rolled out on new developments and retro fits across the city. This will capitalize on the city's emerging status as a clean-tech hub.

C Human Centred Development

Mississauga will place people at the centre of future physical development and explore opportunities to repurpose existing infrastructure for more people-oriented activities, further enabling a shift to sustainable and accessible transit modes.

Our focus will be on:

- Open spaces connected to nature to better harness our green and blue assets.
- Walkable spaces accessible by foot to encourage more active leisure.
- Bike access to boost cycling for pleasure and commuting.

Rationale

- Physical activity levels in Mississauga point to a growing health and obesity challenge which will impact on the competitiveness of our economy and labour force.
- Mississauga needs to ensure its residents have good levels of well-being and are able to navigate the challenges of modern life.
- Mississauga's economic growth has created an affordability problem for lower income workers who cannot readily afford to have their families live locally.

Priority Actions

- **Walkable Place Design:** the city should implement its Complete Streets Design Guidelines which would introduce new standards for master-planning approval that tilts the focus of development towards pedestrian and cycling access and helps reduce car dependency in local neighbourhoods and for short journeys. The city should aggressively adopt best practice in design standards and urban traffic management to progressively create more active travel options and encourage more vibrant street level activity.
- **Electric Connect Network:** Mississauga should proactively establish a regulatory framework for electric cycle/scooters, and secure private sector investment to fast track new low impact travel solutions which can help bridge the gaps between existing transit opportunities and better connect people to work without relying on car travel. This action should aim to ensure low cost, low carbon connections are increasingly the norm for first/last mile and short trips across the city. There are opportunities to link this to Mississauga's Smart City initiatives and effective integration with digital infrastructure assets.
- **Integrated Cycle Highway Network:** the city should implement an assertive program of investment to ensure all human-centred modes of movement are properly sign-posted, connected and maintained across Mississauga aiming for a complete network of walking and cycling routes that safely connect places for living, earning and working as well as leisure. The network should extend across the streets of the city and into its natural ravines to create a fully integrated web of safe routes which can provide a low-cost, active alternative to car journeys and fully expose the city's natural assets.

Driving Change and Capturing Our Achievements

The Economic Development Strategy for Mississauga sets out our three strategic priorities for growth and a series of high priority actions for which the city's Economic Development Office will spearhead delivery. The Economic Development Strategy reinforces and complements the strategic plans and commitments already adopted by the city. This includes:

Mississauga City Wide Strategies

- Official Plan
- SMRTCTY Mississauga
- Tourism Master Plan
- Transit Priorities
- Culture Master Plan
- Building Transportation
- Parks and Forestry Master Plan
- Cycling Master Plan
- Climate Change Master Plan

Local Plans

- Dundas Connects
- Vision Cooksville
- Inspiration Lakeview
- Inspiration Port Credit

The Mississauga Economic Development Office will continue to work in collaboration with colleagues in other departments of the city corporation and engage with partner agencies such as University of Toronto Mississauga, Sheridan College and the Mississauga Board of Trade (MBoT), as well as neighbouring municipalities and regional bodies operating across the GTA and Peel.

This strategic framework sets out a long-term route map for action by the Economic Development team. This strategic framework document is complemented by:

- Two baseline data digest documents that provide the supporting evidence underpinning the priorities in the strategic framework:
  - A Baseline Community Profile
  - An Environmental Scan
- EDO Delivery Plan: which sets out the sequencing, resources, skill-sets and behaviors needed for the EDO to meet its responsibilities
- Action Plan: a longer list of projects that align with the strategic priorities of this Economic Development Strategy which will be regularly updated as new initiatives come forward and planned actions evolve

These documents reflect extensive the consultation that has been undertaken to fully understand Mississauga's economic potential and the barriers to the city realizing its growth potential. This consultation included city departments, provincial representatives, business leaders, developers, educators and members of the start-up and innovation ecosystem. Citizens have also shaped the strategy via an online survey.

Performance Indicators to Capture Our Achievements

The city is determined to drive forward economic growth priorities in this strategy and is committed to capturing the evolving performance of the city economy and the actions it supports. An early next step for the EDO is to develop a detailed monitoring plan and evaluation framework for each project to ensure achievements are captured and oversight intelligence is available to help steer delivery. This will also support the prioritization of initiatives, help to assess the value of investments made by the city and demonstrate the city's contribution to wider strategic priorities in the GTA, Ontario, nationally and globally, including to the UN Sustainable Development Goals.

Each action will require its own set of performance indicators which should consist of:

- Outputs: key performance indicators that capture the timely roll-out of projects and reflect the day to day actions of the delivery team. Examples could include workshop events delivered or businesses supported.
- Results: intermediate benefits generated in the medium time frame which should be drawn from a menu of strategically important indicators, based around:
    - New Jobs Created (by priority sector)
    - New Businesses Started (by priority sector)
    - New Scale-Ups Assisted (by priority sector)
    - Office Floorspace Developed (sqm in Strategic Economic Growth Nodes and by Major Transit Station Areas)
    - New Intellectual Property Registered (by priority sector)
    - Premises with Improved Digital Connectivity (fixed and mobile)
    - New Investment Secured (number/value of investment in site/premises/ start-ups)
    - Development Planning Consents Approved (focusing on key growth locations)
    - Transit Ridership Uplift
    - College/University Admissions on Priority Sector Relevant Courses (by priority sector)
- Outcomes: which reflect the overall impacts our actions have on headline strategic priorities and which allow us to assess the efficiency, efficacy, and effectiveness of the actions that we support.
    - Overall Growth: GDP
    - Competitiveness: GDP per capita
    - Overall Quality of Life: City Satisfaction Survey result
    - Increases in Working Age Population
    - Transportation mode shift from Car to Transit/ Cycle/Walk

Strategy Implementation Oversight

A refreshed Mississauga Economic Development Advisory Board (EDAB) will provide the city EDO with ongoing strategic guidance on the implementation of the Economic Development Strategy. The EDAB will be refreshed to ensure it has the right membership and representation to perform three important roles:

- **Action Sign Off**: EDAB will review all Actions before going into delivery.
- **Oversight of Implementation**: EDAB will assess regular monitoring and evaluation intelligence on impact and progress towards the city's economic strategic priorities.
- **Strategy Refresh**: EDAB will provide the EDO with independent advice as the Action Plan and Strategic Framework priorities need to be refreshed in the coming months and years.

The EDO team will undertake a quick review of EDAB membership to ensure it provides the right balance of representation and skills to provide the independent and objective economic advice needed for effective strategic oversight.

MISSISSAUGA HATCH

Mississauga Economic Development Strategy: Action Plan

A Final Report by Hatch Regeneris
6 November 2019

City of Mississauga's Economic Development Office

Mississauga Economic Development Strategy: Action Plan

6 November 2019

www.hatchregeneris.com

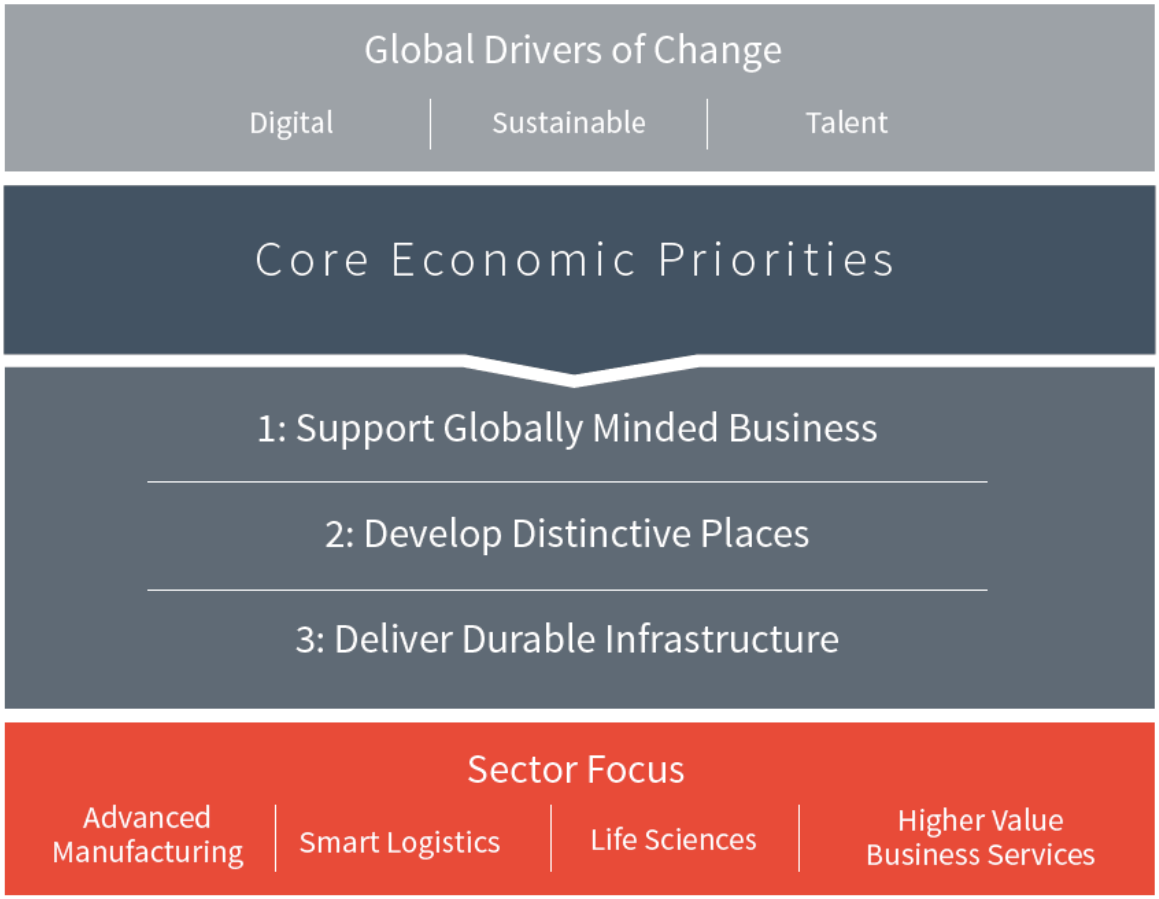
Contents Page

Purpose of Report: This report forms part of the Mississauga Economic Development Strategy. It is aimed at economic development partners and stakeholders across the city with a potential role and interest in delivering the strategic aims of the Strategy. It sets out the range of actions that need to be delivered. The EDO will focus and actively work on the high and medium priorities and that actions identified as low priority will be more opportunity driven.

Strategic Priorities

The Economic Development Strategy framework focuses the city's economic development agenda on the following priorities.

Economic Development Strategic Framework



Core Economic Priorities

All actions progressed by the EDO should align with one of the three Core Priorities and Priority Pillar:

Priorities & Themes

Core Priorities	Priority Pillar
Priority 1: Support Globally Minded Business	• A Creative Innovation • B Enterprising Growth • C People with Talent • D Civic Engagement
Priority 2: Develop Distinctive Places	• A Connected Working Places • B People-Centred Spaces • C Engaged Communities
Priority 3: Deliver Durable Infrastructure	• A Transit Driven Growth • B Smart Digital Solutions • C Human Centred Development

To guide economic development actions and investments, three areas of added focus have been agreed in order to help prioritize actions and investments:

Sector Focus

Place Focus

Global Drivers of Change

1) Sector Focus

The strategic framework commits the city to aim to focus its business-related actions on a Globally Minded Businesses. This is defined as businesses which either:

- trade internationally
- recruit people from other countries
- or which address the three global challenges i.e. digital, environmental and talent.

To help guide decision-making about the types of businesses that should be prioritized and to concentrate attention on integrated supply-chains, the strategy focuses on a set of sectors (with accompanying example prominent sub sectors) which contain large numbers of globally-minded businesses and which:

- the city already relies upon most for jobs and economic output
- and which have further growth prospects going forward.

While a sector focus is important for concentrating actions on the city's most important businesses, it should not be restrictive, and the EDO should apply a degree of flexibility to when deciding which types of business to focus its attention upon.

Sector Focus	
Priority Sector	**Prominent Sub Sector**
Advanced Manufacturing	• Aerospace • Automotive • Food & Beverage • Cleantech
Smart Logistics	• Transportation • Distribution & Delivery • Warehousing & Storage
Life Sciences	• Pharmaceuticals • Biotechnology • Diagnostics • Medical Devices • Digital Health
Higher Value Business Services	• Finance & Insurance • Business Technology • Financial Technology • Business, Management, Scientific & Technical Support Services

2) Place Focus

Priority should be given to actions with a place focus on:

- **Economic Growth Centres**: places with the greatest potential to drive forward the next phase of the Mississauga's economic growth and which require a collaborative strategic approach that draws on the insight, investment and energy of all the city's departments, organizations and businesses. These are:
  - **Pearson 401 Aerotropolis**
  - **Downtown**
  - **Port Credit**
- **Knowledge Intensive Districts**: smaller locations outside the growth centres which have scope to accommodate more employment and new business activity in our priority sectors. These are:
  - **Meadowvale**
  - **Sheridan Science Park**
  - **University of Toronto Mississauga Campus**
- **Economic Connections**: transportation links across the city that are vital for interconnectivity, travel and distribution of people and goods. These are:
  - **GO Network**
  - **Dundas Connects**
  - **Lakeshore Connecting Communities**
  - **Hurontario Spine**
  - **401/403/QEW Highways**
  - **Airport Connections**

The place focus of the strategy is not a planning commitment and all approved planning strategies of the city take precedence over the place focus in the Economic Development Strategy. The place elements of the prioritization focus is intentionally broad in scope to allow flexibility to the city to support initiatives that benefit the whole city and collaborative initiatives that reach beyond the city boundaries, plus smaller scale initiatives that deliver important elements of the strategy.

3) Global Drivers of Change

The final element of prioritization to help guide action and in investments should be held in reserve to help decide between any competing options where a clear choice needs to be made. Actions which can clearly demonstrate that they are aimed at tackling one or more of the agreed global drivers of change which will impact upon our future prospects:

- **Driver 1: Exploiting Digital Technology Solutions**
- **Driver 2: Innovating for Sustainable Solutions**
- **Driver 3: The Competition for Talent**

Performance Indicators

1.1 It is vital that each action supported in the Action Plan has a set of agreed performance indictors against which its progress and achievements can be measured. These should be set out in the Business Case and Logic Model (see above) and each of them should align with overall objectives of the strategy.

1.2 Each of the supported actions should have:

1) **Specific Output Indicators**: which should be carefully selected to reflect the specific activities the action has been tasked with delivering

2) **Target Strategic Results**: a quantified target for one or more of the following result indicators which should be monitored by the project delivery lead and reporting quarterly to the EDO:

- New Jobs Created (by priority sector)
- New Businesses Started (by priority sector)
- New Scale-Ups Assisted (by priority sector)
- Office Floorspace Developed (sqm in Strategic Economic Growth Nodes and by Major Transit Station Areas)
- New Intellectual Popery Registered (by priority sector)
- Premises With Improved Digital Connectivity (fixed and mobile)
- New Investment Secured (number/value of investment in site/premises/ start-ups)
- Development Planning Consents Approved (focusing on key growth locations)
- Transit Ridership Uplift
- College/University Admissions on Priority Sector Relevant Courses (by priority sector)

3) **Target Strategic Outcomes**: projects should not be given quantified targets for Outcomes but should at approval stage demonstrate a logic link to shifting one of these three indicators in a positive direction. Project evaluations should aim to estimate the attributable change that each action has made toward these indicators, and the overall strategy evaluation should provide an overview of the total scale of impact the program has had on these indicators (as well as the Results and Outputs).

- Overall Growth: GDP
- Competitiveness: GDP per capita
- Overall Quality of Life: City Satisfaction Survey result
- Increases in Working Age Population
- Transportation mode shift from Car to Transit/Cycle/Walk

The framework of Results and Outcome indicators has been developed to reflect the priorities agreed for Mississauga and to allow the city to track its performance as it implements its Action Plan. The city's achievement will not stand in isolation and evidence of the progress Mississauga makes should be used to show neighbours and the wider world the contribution the city is making to wider goals. This should include priorities across Peel, the wider GTA, Ontario and for Canada, but also international goals such as the United Nation's (UN) Sustainable Development Goals.

Action Plan Structure

The Action Plan accompanying the Economic Development Strategic Framework is a living document owned by the City of Mississauga Economic Development Office that will get continually maintain and updated to reflect developments in delivery, availability of funding, new ideas contributing to strategic objectives and changes to the focus of any priority actions.

Mississauga Economic Development Action Plan Structure	
Action Plan Element	**Description**
Overview	
Action Title	A very short title for the action
Idea Description	A short summary description of the action.
Pillar	• 1: Support Globally Minded Business: A: Creative Innovation • 1: Support Globally Minded Business: B: Enterprising Growth • 1: Support Globally Minded Business: C: People With Talent • 1: Support Globally Minded Business: D: Civic Engagement • 2: Develop Distinctive Places: A: Connected Working Places • 2: Develop Distinctive Places: B: People–Centred Spaces • 2: Develop Distinctive Places: C: Engaged Communities • 3: Deliver Durable Infrastructure: A: Transit Driven Growth • 3: Deliver Durable Infrastructure: B: Smart Digital Solutions • 3: Deliver Durable Infrastructure: C: Human Centred Development
Theme	A keyword descriptor of the focus of the action to allow quick identification of projects by theme. Options are Buses; Business Support; Business Engagement; Colleges; Community Engagement; Culture/Leisure; Digital Infrastructure; Employment Sites; Energy; Housing; Innovation/ Knowledge Transfer; Investment Finance; Inward Investment/ Promotion; Light Rail; Place Promotion; Place-Making; Roads; Scale Ups; Schools; Sectors; Start-Ups; Strategic Engagement; Transit; Transport; Universities; Workforce Training and Workspace.
Beneficiaries	
Priority Sectors	• Indication of which sectors/ business types the action will primarily support • Advanced Manufacturing • Smart Logistics • Life Sciences

	• Higher Value Business Services Or, • Globally Minded Business: to indicate if the businesses do not fit to a priority sector but still meet the agreed definition of being globally minded. • Estd/ Next Gen: To indicate if the action is focused on Established business already trading in Mississauga, or upon stimulating our Next Generation of start-ups (or both)
Places	A tick box indictor to demonstrate which places the action will impact upon 1) All Mississauga 2) Economic Growth Centres: • Pearson 401 Aerotropolis • Downtown • Port Credit 3) Knowledge Intensive Districts: • Meadowvale • Sheridan Science Park • University of Toronto Mississauga Campus 4) Economic Connections • GO Network • Dundas Connects • Lakeshore Connecting Communities • Hurontario Spine • 401/403/QEW Highways • Airport Connections
Type	
Overall Cost	A quick High, Medium, Low indication of the overall costs of implementing the action. The costs provide an overall indication of total implementation costs and not just the costs to the city corporation. In some actions a large amount of the costs should be met by other public sector agencies or private sector investors.
Status	An indication of whether this is a new action or buildings on activities which are already underway in Mississauga. Options are: • Brand New • Build on Pilot • Extend Current Provision • Enhance Current Provision

	• Repackage • Existing/ Underway
Nature	An indication of the type of intervention required to see the action happen. Options are: • Direct Capital • Direct Operating • Influence Agenda/Policy • Draw in Private Investment
Delivery	
Priority	An indication of whether the project is currently deemed to be High, Medium or Low Priority
EDO FTEs By Year	The number of staff posts (measured by full time equivalents, estimated to be needed to deliver the action).
EDO Portfolio	Which of the teams within the EDO should lead the action? Options are: • Director Led • Business Investment/Sector Development • Innovation/Entrepreneurship • Strategic Initiatives/Planning
EDO Role	An indication of the EDO's role in the initiatives. Options are • Deliver • Participate • Encourage • Indirect • Initiate
Lead Team/Organization	An indication of which division of the city municipality or partner agency should take the lead in delivering the action. Options include: EDO Led, Private Sector, CMS, CPS, P&B, T&W, GTAA, Sheridan and UTM.
Partners/ Stakeholders	Indication of which partner organizations should be involved in delivering the action.
Alignment with other strategies	A quick indication of which other City of Mississauga strategies the actions aligns with or potentially impacts upon.

Action Plan Contents

This section provides a quick overview of the action identified in the Action Plan. Full details are available in the spreadsheet version and details on how the role for the EDO in delivering the actions can be found in the Delivery Plan.
The Action Plan will be owned by the EDO and will be updated regularly. The base Action Plan contains [x] proposed actions across the pillars of the strategy.

Number of Actions By Pillar

Pillar	High	Med	Low
1: Support Globally Minded Business: A: Creative Innovation	1	3	2
1: Support Globally Minded Business: B: Enterprising Growth	4	1	1
1: Support Globally Minded Business: C: People With Talent	2		2
1: Support Globally Minded Business: D: Civic Engagement	5	1	1
2: Develop Distinctive Places: A: Connected Working Places	2	1	3
2: Develop Distinctive Places: B: People–Centred Spaces	2	1	
2: Develop Distinctive Places: C: Engaged Communities	1	2	
3: Deliver Durable Infrastructure: A: Transit Driven Growth	5	1	2
3: Deliver Durable Infrastructure: B: Smart Digital Solutions		3	1
3: Deliver Durable Infrastructure: C: Human Centred Development	2	2	2
Grand Total	**24**	**15**	**14**

The Action Plan has also sequenced the Actions to ensure resources are in place at each of the next five years. As the Action Plan gets updated the Start Years will get amended and new Actions (starting in later years) will be added.

Number of Actions By Start Year				
Pillar	**2020**	**2021**	**2022**	**2023**
1: Support Globally Minded Business: A: Creative Innovation	4	2		
1: Support Globally Minded Business: B: Enterprising Growth	4	1	1	
1: Support Globally Minded Business: C: People With Talent	1	1	2	
1: Support Globally Minded Business: D: Civic Engagement	5	2		
2: Develop Distinctive Places: A: Connected Working Places	2	2	1	1
2: Develop Distinctive Places: B: People–Centred Spaces	2	1		
2: Develop Distinctive Places: C: Engaged Communities	3			
3: Deliver Durable Infrastructure: A: Transit Driven Growth	6	2		
3: Deliver Durable Infrastructure: B: Smart Digital Solutions	1	2	1	
3: Deliver Durable Infrastructure: C: Human Centred Development	3	2	1	
Grand Total	**31**	**15**	**6**	**1**

Putting the Plan into Action

The Mississauga City EDO team will be responsible for updating and driving forward the Economic Development Strategy Action Plan. The EDO will focus and actively work on the high and medium priorities and that actions identified as low priority will be more opportunity driven.

Actions By Priority & Start Year				
Priority	**2020**	**2021**	**2022**	**2023**
High	19	4	1	
Med	7	7	1	
Low	5	4	4	1
Total	**31**	**15**	**6**	**1**

The city EDO will adopt a range of different roles in taking forward actions:

- **Initiate**: the EDO will convene initial meetings to identify a lead partner and work with stakeholders to ensure an Action is taken forward.
- **Deliver**: the EDO will assemble detailed operating plans and resources needed to deliver, and will take lead responsibility for implementing the action
- **Encourage**: the EDO team will engage with lead partners to support them taking the action forward and helping identify any barriers that need to be addressed for successful implementation
- or **Participate**: the EDO will get more involved in existing initiatives to ensure the priorities of the Economic Development Strategy are properly embedded in the priority it is given and the way that it is delivered.

Number of Actions by EDO Role	
EDO Role	**# Actions**
Initiate	7
Deliver	10
Encourage	11
Participate	26
Total	**54**

Those actions where the EDO role is to Encourage or Participate, will be led by either another department in the City Corporation or by an external partner organization.

More details on the approach and resources needed for the EDO to deliver the Action Plan can be found in the Delivery Plan.

Summary List of All Actions

Start Year	Priority	Pillar	Action Title	Idea Description
2020	High	1: Support Globally Minded Business: A: Creative Innovation	Innovation Hubs Program	Ensure a network of workspaces across the city offering attractive and affordable places for innovation start-ups and scale up businesses to establish themselves and grow. The innovation hubs should offer easy access to other entrepreneurs and the support businesses need to realize their potential. The hubs program should better coordinate existing facilities like such as RICs, Edge and ICube and work with developers and operators to bring forward new facilities in all parts of the city.
		1: Support Globally Minded Business: B: Enterprising Growth	[CORE SERVICES] MBEC	Business centre supporting all small businesses and start ups in Mississauga, with a focus on Priority Sectors (but not exclusively), offering information and services to help businesses start and grow and identifying entrepreneurs and start ups with scale up potential.
			Angels & Mentors for Scale Ups	Create an identifiable network of private sector angels and mentors to help local entrepreneurs with scale-up potential to develop rigorous business plans and navigate investment options. The network of volunteer angels and mentors should be drawn from the investor community and people with first-hand experience of seating up and scaling-up their own businesses. They should be encouraged to help nascent enterprises develop credible business plans and navigate their businesses towards scale-up, and guiding their preparation and engagement with external investors along the way.
			Mississauga Boost	A reimagined Mississauga Business Enterprise Centre (MBEC) transitioning to be a proactive hub where entrepreneurs, innovators and small businesses can access support and advice, in a refreshed and dynamic space. The newly- branded offer would relocate to a more prominent and business friendly location alongside other agencies and businesses offering support to small businesses. It should offer front of house/promotional space to the major innovation facilities in the city and desk space for the large businesses committed to supporting innovative start-ups through mentoring, collaboration or investment. It should look to become a central market-place where entrepreneurs can meet each other and where the city's reputation for enterprise and innovation can be anchored.
		1: Support Globally Minded Business: C:	Future Skills Insight	As the local economy evolves and diversifies in response to the global drivers of change, the city should work with Sheridan College and UTM to better understand the emerging skills needs of Mississauga's priority sectors. Work should be undertaken develop an improved sense of the profile of emerging skills gaps as new technologies are adopted and older members of the workforce head towards retirement. The insights of business should be better harnessed alongside a regular

People With Talent		program of fore sighting and workforce mapping/planning for major sectors, to ensure learning programs offered locally remain relevant to employer requirements.
1: Support Globally Minded Business: D: Civic Engagement	[CORE SERVICES] Business Development and Investment	Align inward investment and key account management support from the EDO to the four priority sectors and draw on the resources of major businesses in each sector and the sector councils to drive forward promotion of Mississauga to outside investors and local enterprises and investors.
	[CORE SERVICES] Marketing Data & Intelligence	Develop and deliver an economic development marketing strategy to deliver compelling messages to investors, businesses and residents on the opportunities and priorities of the city economy. Oversee digital and physical collateral generation and message dissemination with regular reviews on impact and lessons from competitor cities.
	[CORE SERVICES] Research Data & Intelligence	Support city priority setting and decision-making by providing an ongoing resource of data and intelligence on economic trends, business conditions, growth opportunities. Report on delivery progress with the Economic Development Strategy and oversee a program of Evaluation of supported Actions
	[CORE SERVICES] Specialist Sector Support & Councils	Building on the existing councils for Life Science and Manufacturing, the city should create counter-part councils for Smart Logistics and Higher Value Professional Services. These councils should each bring a range of relevant business voices together to articulate priorities, identify shared challenges and initiate collaborative action. The focus of the councils should be on advising the city on investments and support needed to secure the next generation of growth in our four priority sectors. The councils should be business-led but animated by the EDO team in the city and tasked with mapping local businesses, establishing stronger networks across the sector, identifying local growth barriers, promoting the case for innovation and diversification in response to the global drivers of change and creating action plans ideas to better drive growth in their sector.
	Confident Greater Toronto Engagement	Senior city corporation staff should work together to agree how best to engage confidently with neighbouring agencies to articulate Mississauga's economic priorities and constructively influence transport and economic development investment in the GTA. The city needs to make its case confidently from a confident its understanding that it is a major contributor to wider prosperity and could deliver more for the GTA economy with the right long-term investment around the airport and transit in particular.

2: Develop Distinctive Places: A: Connected Working Places	Downtown Community Improvement Program	Continue to promote the Community Improvement Program for at least two more years but review performance to adjust the approach to capitalise on the starting success it is now beginning to generate. Continue Downtown Community Improvement Plan for office uses and examine if any other areas would benefit from a similar program. Continue to advocate for Regional participation.
2: Develop Distinctive Places: B: People–Centred Spaces	Port Credit Creative Innovation District	The city should commit to an innovation/culture masterplan for Port Credit to secure development investment which builds an identity for the creative arts, digital innovation, cultural economy and leisure activities. The area around Port Credit including the marina should prioritize investment in initiatives aimed at retaining and attracting young creative people with innovation and enterprise potential which has to should include new local cost flexible workspace, performance spaces, maker-labs as well as leisure opportunities. The lakeside location and transit connections make this a unique place asset which requires clear and agreed strategic parameters placed around its development.
2: Develop Distinctive Places: C: Engaged Communities	Welcome Offer	The city should establish a service to help new arrivers to Mississauga quickly engage with the opportunities for work and life in the city. This should include sign-posting to the English language learning, training and accreditation in Canadian professions, start-up.
3: Deliver Durable Infrastructure : A: Transit Driven Growth	Aerotropolis Masterplan	Work with GTAA and other municipalities to develop a land use vision and economic plan to deliver growth around the airport which capitalizes on the wider opportunity for transport, city building and sector competitiveness. The masterplan vision should align wider priorities for growth along an agreed aerotropolis corridor and also ensure Pearson can extend its international air hub offer with good ground access by road and transit while securing growing air side capacity. As part of this initiative scope should eb explored to establish a council of business leaders for the Pearson 401 Corridor which provides a business voice to help drive economic growth in priority sectors reliant on the airport.
	Higher Order Transit Oriented Development	As part of the Provincially required Major Transit Station Area plans, identify locations suitable to anchor development at GO stations and LRT stops to deliver accessible employment and de-risk network extension.
	Kitchener-Malton GO Extension	Use advocacy to promote extension of GO to provide better transit connections along to the Kitchener Waterloo Innovation Corridor.

		Milton GO Two-way	Use advocacy to promote a rapid all-day service through to Milton from downtown Toronto and through the centre of Mississauga.
	3: Deliver Durable Infrastructure : C: Human Centred Development	Electric Connect Network	Mississauga should proactively establish a regulatory framework for electric cycle/scooters, secure private sector investment to fast track new low impact travel solutions which can help bridge the gaps between existing transit opportunities and better connect people to work without relying on car travel. This action should aim to ensure low cost, low carbon connections are increasingly the norm for first/last mile and short trips across the city. There are opportunities to link this to Mississauga's Smart City initiatives and effective integration with digital infrastructure assets.
		Walkable Place Design	The city should implement its Complete Streets Design Guidelines which would introduce new standards for master-planning approval that tilts the focus of development towards pedestrian and cycling access and helps reduce car dependency in local neighbourhoods and for short journeys. The city should aggressively adopt best practice in design standards and urban traffic management to progressively create more active travel options and encourage more vibrant street level activity.
Med	1: Support Globally Minded Business: A: Creative Innovation	Applied Research Hubs	Support UTM, Sheridan College and big business to establish new facilities to drive R&D around the UTM campus, Sheridan Research Park, Downtown and Port Credit. Work should be undertaken to bring potential entrepreneurs together through networking opportunities and peer support to stimulate collaboration and provide inspiring learning sessions to cultivate demand for new research hubs. The city should stimulate demand and encourage partners to better understand the requirements of emerging entrepreneurs.
		Scale Up Network	Establish a membership organization for entrepreneurs to offer peer support, networking opportunities to stimulate collaboration and provide inspiring learning sessions to help entrepreneurs to boost their ambition and confidence. The network would help champion Mississauga's start-up and innovation credentials, contribute to a stronger level of interest in entrepreneurship and provide a ready access points to investors, collaborators and suppliers who want to meet businesses with scale-up potential.
	1: Support Globally Minded Business: B: Enterprising Growth	Mississauga VC & Loan Fund	The city explore scope to establish a local investment fund which draws in the untapped resources of existing large employers and high net worth individuals with links to Mississauga, to establish an investment fund for new start-ups in in the city. The city should look to de-risk the fund by building on the capacity of existing operators and as it engages with large local businesses across Mississauga should explore their potential to create new spin-outs and collaborative innovation initiatives with investment potential.
	2: Develop Distinctive Places: B:	Tactical Urbanism	The city should extend the initial experiments undertaken in Summer 2019 to redirect traffic around public spaces Downtown. The policy should move from piloting to more permanent and regular actions to reduce traffic, particularly in the city's strategic priority growth nodes Downtown and at

	People–Centred Spaces		Lakeside, and also look at other potentially high footfall locations for further piloting. For example, in the summer of 2020, the city should aim to experiment with single lane in traffic on Lakeshore Road (under the Lakeshore Connecting Communities Master Plan) through Port Credit to strengthen the night and day time economies and encourage more walking. This should be accompanied by a program of weekend events to draw in visitors and help drive trade for local business.
	2: Develop Distinctive Places: C: Engaged Communities	Culture Program	As the city takes control of programming at the Living Arts Centre and further develops its program for Celebration Square, opportunities to showcase the city and engage local businesses in the opportunities which arise from festivals should be seized and lessons for how the Downtown area can be brought more to life with more walking and exploration should be harnessed. Options should includes a set of restaurants accessible on foot, celebrating adjacent to Square One, and innovative approaches to allow warm indoor access during winter and outdoor feel during the summer to allow year round relevance, and providing a platform to harness untapped business opportunities among new /recent arrivers to Mississauga.
		Park Clean Up	A city-led program to get local companies to sponsor park clean up and maintenance and help improve the public realm across the city. This initiative should be used as a platform to better engage local businesses in the life of the city and encourage a stronger climate of commitment among leaders and workers across Mississauga to help it better develop community capacity.
	3: Deliver Durable Infrastructure: C: Human Centred Development	Integrated Cycle Highway Network (inc Connected Active Ravines)	The city should implement an assertive program of investment to ensure all human-centred modes of movement are properly sign-posted, connected and maintained across Mississauga aiming for a complete network of walking and cycling routes that safely connect up places for living, earning and working as well as leisure. The network should extend across the streets of the city and into its natural ravines to create a fully integrated web of safe routes which can provide a low cost, active alternative to car journeys and fully expose the city's natural assets.
Low	1: Support Globally Minded Business: A: Creative Innovation	Big Business Spinout	Engage with large local businesses across Mississauga to generate corporate commitment to spin out and collaborative innovation. A commercially minded person with innovation know-how credentials should build relationships with the Fortune 500 and other large operators to identify how the city can nurture and support existing large employers to better harness stranded innovation ideas and help scout for untapped opportunities which could help business diversify and create new spin outs.
	2: Develop Distinctive Places: A: Connected	Warehouse Studios	Develop a strategic program of support to ensure Mississauga's nascent film production sector has space to operate (and potentially grow) from the warehouse facilities in the city (particularly congregated around Malton).

		Working Places		
		3: Deliver Durable Infrastructure: A: Transit Driven Growth	Hurontario LRT Extensions	Develop plans to extend the planned LRT to reach further across Mississauga and boost ridership.
			MiWay & TTC Integration	The city and MiWay should develop commercial arrangements with the TTC to realize integrated routes and fares to better extend easy travel for people commuting into and out of Mississauga.
		3: Deliver Durable Infrastructure: B: Smart Digital Solutions	Off Peak Delivery Program	Develop policy to encourage commercial deliveries to businesses during non peak hours in order to reduce congestion and peak traffic flows on the city's highway network.
2021	High	1: Support Globally Minded Business: B: Enterprising Growth	Accelerator Program	An intensive 3-month support offer to local entrepreneurs to develop a business plan and present an investable proposition to investors. The Accelerator would, by invite only, offer on-site mentoring, business planning, marketing and technical support to entrepreneurs. Entry offers would be made to entrepreneurs following a Shark Tank/Dragons Den type competition. The competition would be open widely including to people based outside Mississauga with an interest in launching their business in the city.
		2: Develop Distinctive Places: A: Connected Working Places	Retention Strategy	Examine land-use planning tools to encourage retention and improvement of office space in the Downtown. Opportuntities to de-risk the costs of upgrading older office / marginal property (or converting other premises) into modern attractive workspace should be explored.
		2: Develop Distinctive Places: B: People–Centred Spaces	Cultural Anchors	Mississauga should be ambitious about building new cultural facilities to support the Culture Masterplan which can generate new visitors from outside Mississauga and boost the city's image across Canada. In line with the city Culture Master Plan, work is needed to explore the scope for year-round destinations which can better animate the Downtown area of Mississauga in particular. Ideas include a Canadian People's Museum to reflect the culture and contribution of immigrants and indigenous people to the growth of the country, with accompanying food and events in the centre of Mississauga. Other avenues to explore should include a stronger art gallery offering, river/lakeshore revitalization and rapid action to build on the findings of the on-going Stadium scoping study.

	3: Deliver Durable Infrastructure: A: Transit Driven Growth	Pearson Transit Hub	Work with the Airport Authority to develop upgraded surface public transport access to the airport from Mississauga and other parts of the GTA.
Med	1: Support Globally Minded Business: A: Creative Innovation	Logistics & Movement Innovation Hub/Academy	A learning and innovation test bed facility based around Pearson to support the next generation of smart logistics businesses including demonstration facilities, advice on new solutions and training for key staff in the sector. The Hub/Academy would host innovative new solutions to improve productivity in the logistics sector and provide tailored programs of training to employees and school-leavers looking to develop a career in the sector. The academy/hub concept should be further tested and developed by the Logistics Sector Council as an early action.
	1: Support Globally Minded Business: D: Civic Engagement	Mayoral Key Agencies Star Chamber	A delivery orientated body of the City of Mississauga, UTM, Sheridan College and the Trillium Health Partners Mississauga Hospital to ensure the strategic priorities of the key agencies working in the city are aligned, to provide a forum for major delivery problems to be quickly sorted out at a senior level and to better co-ordinate the city's progress with its economic development objectives.
	2: Develop Distinctive Places: A: Connected Working Places	Boost Hotel Offer	In line with its Tourism Masterplan, the city should engage with hotel developers to nurture a stronger flow of investment in new accommodation around the Lakeside, in the Downtown and at Toronto Pearson Airport. Work is needed to ensure business and leisure visitors can find a range of attractive places to stay which complement residential areas, create new trade for businesses and align with emerging office developments. Levers such as the municipality's Accommodation Tax are tools which the city has at its disposal to accelerate development.
	3: Deliver Durable Infrastructure: A: Transit Driven Growth	Expand MiWay Express Network	Drive forward further investment in the MiWay Express Network to provide better access to more employment sites along the 401.
	3: Deliver Durable Infrastructure: B: Smart	Connected Spaces	The city should ensure all places where people work operate as world class digital connectivity hotspots which give entrepreneurs and creatives ready access to people and tools which can open-up new markets, stimulate collaborative innovation and help drive footfall for other local businesses. The city should work with telecoms operators to explore how it can use its own assets and leverage with workspaces developers/operators to ensure Mississauga has comprehensive digital coverage

	Digital Solutions		(i.e. gigabit fibre/5G). This action should cover formal and informal places of work such as libraries, malls, coffee shops and on the transit network.
		Mississauga Urban Innovation Test Bed	Building on our SMRTCTY strategy, Mississauga should aim to position itself as North America's capital for urban innovation by offering the city test bed where new technological solutions to the global challenges facing cities (talent, digital technology and climate change) can be deployed for first mover advantage. This should explore piloting of new technologies such as autonomous vehicles, innovative local energy generation/storage and distribution, mass electrification of vehicle fleets for delivery and capitalizing on the city's nascent clean tech sector to reduce the city's carbon footprint.
	3: Deliver Durable Infrastructure : C: Human Centred Development	Volunteer-Led Active Programs	Create an activity strategy working with third sector organizations to harness volunteer drive for events and Programs such as park runs, mall walks and group cycling.
Low	1: Support Globally Minded Business: A: Creative Innovation	Civic Challenge [Make high]	To engage local businesses in helping the city solve critical economic, social and technological issues through a series of competitive challenge/hackathon type events where businesses, researchers, students and entrepreneurs are invited to come up with novel solutions that help the city perform better and which could generate a future business. Corporate sponsorship should be sought to facilitate the events and offer small amounts of seed / start up prize funding for ideas with merit and the city should provide piloting opportunities to test ideas in the local environment, grow the green economy and help deliver the city's Climate Change Master Plan.
	1: Support Globally Minded Business: C: People With Talent	Next Gen Management & Leadership	A program of learning offered to mid-tier employees in existing companies across to Mississauga to prepare workers for the next career stage and ensure they have the skills and insight needed to become the next generation of local business leaders. The focus of learning should be on leadership to drive innovation and diversification responding to the global drivers of change. This initiative should aim to build on and bring together existing training/learning opportunities available at Sheridan and UTM, plus incorporate online modules delivered by institutions around the world. The program should create cohorts of future business leaders, nominated by their employers who would also be ambassadors for Mississauga's commitment to its economic ambitions.
	1: Support Globally Minded Business: D:	Mayoral Business Leadership Council	The Mayor should take a lead in establishing a new invite-only forum of selected local business leaders, drawn from our Fortune 500 and strategically important large local employers. Membership would be limited to chief executive level to ensure it commands the necessary status and authority across the city. The council should articulate city-wide economic priorities around strategic assets such as the airport, major road network, essential transit investments and core growth nodes. The

		Civic Engagement		Council should provide the Mayor with extra weight in making the case for public and private investment for the city both overseas and within Canada.
		3: Deliver Durable Infrastructure : C: Human Centred Development	Green & Car Free Spaces	Put in place new green and car free space in all new developments and levered into existing places across the city.
2022	High	1: Support Globally Minded Business: C: People With Talent	Enhanced Work Opportunities Program	Initiate a more strategic approach to work-based opportunities for learners by targeting businesses in priority sectors to provide opportunities for students to better understand career opportunities in their sector and to better link college provision to business needs. A more strategic approach to student Co-ops would see more students being encouraged to explore work in emerging careers and sectors, to develop their softer creative and communication skills in a work environment and to help young people develop better contacts with business leaders. The program would also help students develop their resumes and make more informed future learning choices, and would be underpinned by a commitment to learning and improvement to find out what works best for students and employers.
	Med	3: Deliver Durable Infrastructure : B: Smart Digital Solutions	Lakeside Net-Zero Energy Showcase	As the major investments arrive along the lakeshore in Mississauga, the city should engage with developers to promote and support zero carbon energy solutions for generation, storage and waste reduction/loss. The city should aim for these landmark developments to be test pilots for positive environmental change, proving the case for new ways of heating buildings, which could generate spin off growth opportunities for local business and be rolled out on new developments and retro fits across the city. This will capitalize on the city's emerging status as a Clean-tech hub.
	Low	1: Support Globally Minded Business: B: Enterprising Growth	Enterprise Degrees	A collaborative new degree program offered by UTM and Sheridan, working with local businesses to provide undergraduate students with a program of accredited learning alongside support to develop a business idea into a trading entity. The program would provide a rounded business enterprise degree complemented with practical support and space to test a business model. Students would get a recognized certificate of learning and be ready to enter into trading upon graduation.
		1: Support Globally Minded Business: C: People With Talent	Third Age & New Arriver Talent Sharing	A study to explore and resolve the barriers to lifelong for non-traditional learners to training and development opportunities. Ideas to explore should include old workers mentoring to apprentices, meet & greet with new immigrants to signpost to training and start up support.

		2: Develop Distinctive Places: A: Connected Working Places	International Conference & Exhibition Facility	A reinvigorated international conference and exhibition offer located near to Pearson serving the Grater Toronto area which can host global conventions which attract business visitors and provide a platform to showcase Mississauga's offer to the outside world.
		3: Deliver Durable Infrastructure : C: Human Centred Development	Affordable Pocket Living	Policy to promote small scale affordable rented property across Mississauga's residential neighbourhoods to allow younger people to get on the housing ladder and to reinforce the city's commitment to revitalizing its economic base with new talent.
2023	Low	2: Develop Distinctive Places: A: Connected Working Places	Office of the Future Masterplan	A study and associated strategy to help guide and prepare for work places of the future and the demands they place on the built environment.

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City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/10/17	Originator's files:
To: Chair and Members of General Committee	
From: Gary Kent, CPA, CGA, ICD.D, Commissioner of Corporate Services and Chief Financial Officer	Meeting date: 2019/12/04

Subject

Corporate Green Building Standard for New Construction and Major Renovations Building Projects

Recommendation

1. That the Corporate Report entitled, "Corporate Green Building Standard for New Construction and Major Renovations[1] Building Projects", dated October 17th, 2019 from the Commissioner of Corporate Services and Chief Financial Officer, be received for information.
2. That an additional 2.6% - 5.0% project cost premium to implement the Corporate Green Building Standard for New Construction and Major Renovation projects starting in 2021 be considered through the yearly budget process.
3. That the roadmap to increase the levels of performance and revise the project cost premiums at every five (5) years for the Corporate Green Building Standard be considered through the yearly budget process.

Report Highlights

- In line with the Green Pillar of the Strategic Plan, the Chair and Members of General Committee approved the existing Green Building Standard of constructing new and renovated City-owned buildings to LEED® Silver certification in January 2010.
- The need to update our existing Green Building Standard for City-owned buildings was driven by a number of reasons including the City's forthcoming Climate Change Action Plan, the need to build low carbon and resilient buildings, the need to mitigate rising utility costs, and the evolving market place for design and construction of high performance buildings.

[1] For the purposes of the CGB Standard, "major renovation" refers to extensive alteration work to an existing building to the extent such that the primary function of the space cannot be used for its intended purpose while the work is in progress and where a new certificate of occupancy is required before the work area can be reoccupied

- Various standards, including LEED®, ASHRAE® 189.1, Living Building Challenge, PassivHaus®, and Net Zero Energy Buildings, were reviewed in order to develop the new Corporate Green Building standard, with a mandate to improve environmental performance, reduce costs, and position Mississauga as a leader in green buildings for new corporate buildings and major renovation.
- Similar to the Toronto Green Standard and BC-Step Code, a tier-based Corporate Green Building Standard was developed with a roadmap of Level 1 becoming mandatory in 2020, Level 2 in 2025, and Level 3 in 2030; this roadmap will help the City work towards achieving its climate change goals and targets.
- It is estimated that a project budget premium of 2.6% - 5.0% for Level 1, 7.6% - 12.5% for Level 2, and 20.0% - 30.0% for Level 3 is required in order to implement the respective levels of compliance for all new construction and major renovation projects.
- The Corporate Green Building Standard was presented to the Environmental Action Committee (EAC) on September 9, 2019. The standard was recommended by EAC to General Committee for endorsement and was approved on September 18, 2019.

Background

In January 2010, the Chair and Members of General Committee approved and adopted a LEED® Silver standard of performance for all new construction and major renovations of the City buildings larger than 10,000 ft2. The City required mandatory achievement in the following categories:

Erosion and sediment control
Alternative transportation: Bicycle storage and changing rooms
Stormwater management
Construction waste management
Fundamental building systems commissioning
Minimum energy performance
Ozone protection
Water efficient landscaping
Water use reduction
Low emitting materials

Present Status

In its forthcoming Climate Change Action Plan, the City has proposed targets of reducing greenhouse gas (GHG) emissions by 40% compared to 1990 levels by 2030 and 80% by 2050, with a long-term goal of becoming net zero carbon. Further, the visionary action in the City's Strategic Plan to support a net-zero carbon city, and the City's Sustainable Procurement Policy, as well as the need to mitigate rising utility costs require a strong approach to the energy requirements of the Corporate Green Building Standard. While the LEED® Silver standard was a comprehensive sustainability standard at the time of its adoption, it falls short compared to the

federal goal of requiring provinces and territories to adopt a "net-zero energy ready" model building code by 2030[2].

The current standard now represents a relatively low baseline from which more ambitious and indeed necessary energy and environmental performance achievements should be set. The City isn't alone in this ambition. First introduced in 2006 and now in Version 3, the Toronto Green Standard includes four tiers of energy efficiency and emissions performance for new private and their City-owned developments (community and corporate). The City of Vancouver has similar levels of ambition, having released its Zero Emissions Building Plan that aims to eliminate emissions from new buildings by 2030. These and other jurisdictions have put themselves on the map as leaders in sustainability and climate change, and have helped pave the way for cities like Mississauga by doing a lot of work to raise standards, build industry awareness and capacity, and set new expectations.

Comments

To address these gaps, staff retained a consultant to develop a new Corporate Green Building (CGB) Standard for new construction and major renovation[3] building projects containing a comprehensive set of environmental performance requirements that will establish the City as a leader in sustainable and low carbon buildings in Canada. The consultant reviewed various standards, including LEED®, ASHRAE® 189.1, Living Building Challenge, PassivHaus®, and Net Zero Energy Buildings, against our mandate to improve environmental performance, reduce costs, and place Mississauga as a leader in green buildings for new corporate buildings and major renovations. Ultimately, it was found that no single certification/standard met all of the City's sustainable priorities in a financially sustainable manner. Hence, a "Made for Mississauga" CGB Standard was developed.

The City's CGB Standard is a set of performance requirements that applies to new construction and major renovation in City-owned buildings of the following archetypes:

Office	Fire Hall	Library	Recreation Centre
Ice Rink	Swimming Pool	Transit Station	Transit Repair Station

It has been designed to allow flexibility to project teams with respect to the level of energy and environmental performance that can be achieved on a given project. It sets three (3) increasing levels of performance that teams can elect to pursue according to a specific project's characteristics and constraints:

[2] Natural Resources Canada, 2017, Build Smart Canada's Buildings Strategy: A key driver of the Pan-Canadian Framework on Clean Growth and Climate Change 2017

[3] For the purposes of the CGB Standard, "major renovation" refers to extensive alteration work to an existing building to the extent such that the primary function of the space cannot be used for its intended purpose while the work is in progress and where a new certificate of occupancy is required before the work area can be reoccupied.

- Level 1: This level sets the base performance targets that are required to be achieved in all new and major renovation City-owned buildings of the above archetypes i.e. projects must achieve this minimum level of performance.
- Level 2: This level represents a set of performance targets that have been identified as moderately more ambitious than Level 1, and that should be considered as highly desirable.
- Level 3: This level outlines a set of environmental performance targets that are considered "superior" and that should be pursued wherever parameters allow.

Targets have been set for 17 key environmental performance areas (Table 1), and project teams will be encouraged to achieve the highest level of performance while remaining within a given budget and schedule. The performance targets and deliverables for all the environmental performance areas have been provided in Appendix 1.

<table>
<tr><th>Energy and Climate Change</th><th>Natural Heritage</th><th>Materials</th></tr>
<tr><td rowspan="4">• Energy and emissions performance
• Building commissioning
• On-site renewables
• Air tightness testing
• Metering and benchmarking
• Resilient structures</td><td>• Erosion and sediment control
• Light pollution
• Biodiversity</td><td>• Low-impact materials
• Embodied carbon Footprint
• Ozone depleting compounds</td></tr>
<tr><th>Water</th><th>Waste</th></tr>
<tr><td>• Stormwater management
• Water use intensity</td><td>• Construction waste management</td></tr>
<tr><th colspan="2">Transportation</th></tr>
<tr><td colspan="2">• Electric vehicle infrastructure
• Bicycle infrastructure</td></tr>
</table>

Table 1: Key Environmental Performance Areas in the Corporate Green Building Standard

In order to reach the City's long-term goal of becoming a net-zero carbon city, a roadmap for the CGB Standard has been developed that increases the performance level every five (5) years. As an example, Figure 1: Corporate Green Building Standard Roadmap shows the roadmap for a typical new Recreation Centre building. The other building types will follow a similar implementation schedule. The Standard and the roadmap satisfy one of the actions proposed in the City's forthcoming Climate Change Action Plan. Such a roadmap is also similar to the approach taken by the Toronto Green Standard and the British Columbia (BC) Energy Step-Code.

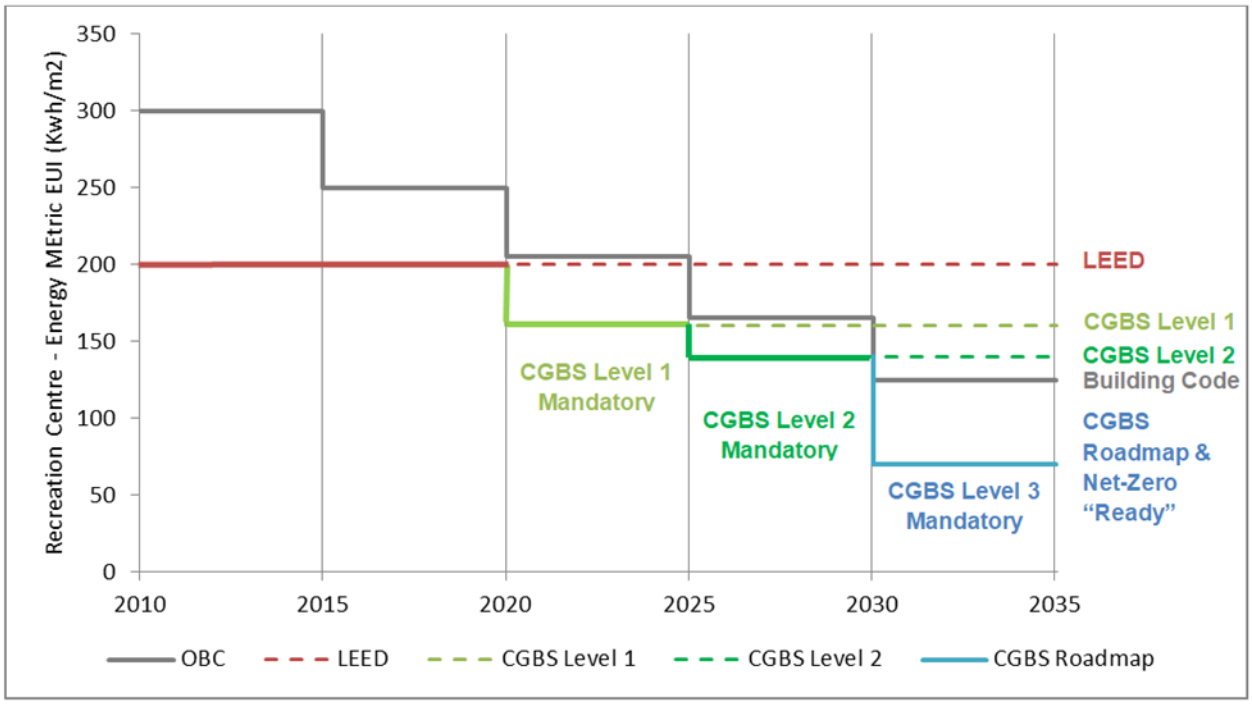


Figure 1: Corporate Green Building Standard Roadmap (Recreation Centre)

Strategic Plan

The endorsement of constructing future buildings to meet the CGB Standard would be an important step in achieving some of the City's environmental goals as outlined in the Green Pillar of the Strategic Plan. The standard also supports the visionary action of transforming Mississauga into a "net-zero" carbon city in the Strategic Action Plan.

Financial Impact

Cost premiums associated with "building green" depend on a variety of factors, including the approach to design, experience of design team members, increased time and effort from architects and engineers, construction time spent implementing green building features, and the need for specialized equipment and less-common materials.

While project teams can mitigate cost premiums by incorporating green building solutions early in the design process, it is prudent to account for the total project cost premiums depending on the project (see Table 2). Therefore, it is recommended that, starting 2021, all new construction and major renovation building projects include a cost premium of 2.6% - 5.0% to implement Level 1 of the CGB Standard. It is also recommended that the performance requirements be increased per the roadmap in Figure 1, and that staff be directed to revise the project cost premiums every five (5) years.

The financial impact of implementing the Corporate Green Building Standard on new construction and major renovations building projects will be calculated with proposed funding sources identified during the yearly budget process.

Note that the total project cost premiums have been developed by a consultant and are compared to the current City LEED® Silver standard construction. The range represents the cost premium over the different archetypes of buildings that the City builds and operates.

SN #	Performance Area	Project Cost Premiums		
		Level 1	Level 2	Level 3
1	Energy and emissions performance	0.5% - 2.9%	1.5% - 6.4%	6% - 14%
2	Building commissioning	0.75%	0.85%	1.1%
3	On-site renewables	0.25%	1%	2% - 4%
4	Air tightness testing	0.25%	0.25%	0.25%
5	Metering and benchmarking	0.5%	0.5%	0.5%
6	Resilient structures	0%	0.25%	0.25%
7	Erosion and sediment control	0%	0.15%	0.15%
8	Light pollution	0%	0.5%	0.5%
9	Biodiversity	0%	0.25%	0.5%
10	Stormwater management	0%	0.5%	1%
11	Water use intensity	0%	0.5%	1%
12	Electric vehicle infrastructure	0.25%	0.5%	1%
13	Bicycle infrastructure	0%	0.25%	0.5%
14	Low-impact materials	0%	0.25%	2.5%
15	Embodied carbon footprint	0.1%	0.25%	1.5%
16	Ozone protection	0%	0%	1%
17	Construction waste management	0%	0.1%	0.25%
TOTAL		**2.6% - 5%**	**7.6% - 12.5%**	**20% - 30%**

Table 2: Project Cost Premiums over current City LEED® Silver standard construction

Conclusion

While the LEED® Silver standard was a comprehensive sustainability standard and played a significant role in promoting our sustainability priorities at the time of its adoption, it will soon fall short compared to the increasing levels of energy requirements being introduced at both the provincial and federal levels. New construction and major renovation presents a clean slate, allowing the City to achieve its climate and energy goals in an environmentally and financially sound way.

A low-to-zero carbon approach to new construction and major renovation building projects will play an important role in contributing to the greenhouse gas reduction goals of 40% by 2030 and 80% by 2050 as set by the City's forthcoming Climate Change Action Plan. The City's actions in its own buildings will position itself as a leader in the city and among municipalities.

The new Corporate Green Building Standard was presented to the Environmental Action Committee on September 9, 2019. The following recommendations were approved by General Committee on September 18, 2019 and adopted by Council on September 25, 2019.

1. That the Corporate Report entitled, "Corporate Green Building Standard", dated July 31st, 2019 from the Commissioner of Corporate Services and Chief Financial Officer, be recommended by the Environmental Action Committee to General Committee for endorsement.
2. That the Corporate Green Building Standard be submitted to Chair and Members of General Committee prior to the end of the year for endorsement, along with the Climate Change Action Plan.
3. That the documentation package for the Corporate Green Building Standard be received.

Attachments

Appendix 1: City of Mississauga Corporate Green Building Standard for New Construction and Major Renovations Building Projects

G. Kent.

Gary Kent, CPA, CGA, ICD.D, Commissioner of Corporate Services and Chief Financial Officer

Prepared by: Sumeet Jhingan, P.Eng., CEM, LEED® AP BD+C, Energy Management Section, Facilities & Property Management

Appendix 1: 8.3
The City of Mississauga's Corporate Green Building Standard for New Construction and Major Renovations Building Projects

City of Mississauga

Corporate Green Building Standard

Prepared on: May 7, 2019
Corporate Services
Facilities & Property Management
Energy Management

MISSISSAUGA

1. Introduction

1.1. Scope

The City of Mississauga's (the City) Corporate Green Building (CGB) Standard is a set of performance requirements that applies to new construction and major renovation in City-owned and operated buildings of the following archetypes:

- Office
- Fire Hall
- Library
- Recreation Centre
- Ice Rink
- Swimming Pool
- Transit Station
- Transit Repair Station

For the purposes of this standard, "major renovation" refers to extensive alteration work to an existing building to the extent such that the primary function of the space cannot be used for its intended purpose while the work is in progress and where a new certificate of occupancy is required before the work area can be reoccupied.

1.2. Intent

The intent is to promote environmentally, financially, and socially responsible practices in building design and construction. It is intended to be a standard and a guide for the City, design, and construction teams to deliver high-performance buildings with market-leading design, construction, and operations practices.

1.3. Environmental Performance Areas

The CGB Standard Is organized into the following environmental performance areas:

Energy and Climate Change	**Materials**	**Transportation**
• Energy and emissions performance • Building commissioning • On-Site renewables • Air tightness • Metering and benchmarking • Resilience performance requirements	• Low-impact materials • Embodied carbon footprint • Ozone depleting compounds	• Electric vehicle infrastructure • Bicycle infrastructure
Waste	**Water**	**Natural Heritage**
• Construction waste management	• Stormwater management • Water use intensity	• Erosion and sediment control • Light pollution • Biodiversity

1.4. Structure

The following documentation forms the CGB Standard:

- Corporate Green Building Standard Reference Guide: Provides an overview of the requirements and deliverables for each environmental performance area under the CGB Standard
- Corporate Green Building Standard Program Manual: Provides additional details regarding each environmental performance area under the CGB Standard, including the intent, background, requirements, deliverables, guidance, additional resources, and the energy modelling guidelines
- Archetype Energy Modelling Report for Corporate Green Building Standard: Energy modelling study for the eight (8) City building archetypes used to develop energy and greenhouse gas emissions targets in the CGB Standard
- Corporate Green Building Standard Checklist: Is a Microsoft Excel-based checklist to be utilized by project teams to confirm compliance

Corporate Green Building Standard Reference Guide

1. Energy and Climate Change

1.1. Energy and Emissions Performance

Requirements		
Office Building		
Level 1	**Level 2**	**Level 3**
EUI: 110 kWh/m^2/year **TEDI:** 55 kWh/m^2/year **GHGI:** 15 kgCO2e/m^2/year	**EUI:** 90 kWh/m^2/year **TEDI:** 35 kWh/m^2/year **GHGI:** 10 kgCO2e/m^2/year	**EUI:** 60 kWh/m^2/year **TEDI:** 15 kWh/m^2/year **GHGI:** 5 kgCO2e/m^2/year
Fire Hall		
Level 1	**Level 2**	**Level 3**
EUI: 105 kWh/m2/year **TEDI:** 75 kWh/m2/year **GHGI:** 11 kgCO2e/m2/year	**EUI:** 80 kWh/m2/year **TEDI:** 60 kWh/m2/year **GHGI:** 5 kgCO2e/m2/year	**EUI:** 60 kWh/m2/year **TEDI:** 30 kWh/m2/year **GHGI:** 5 kgCO2e/m2/year
Library		
Level 1	**Level 2**	**Level 3**
EUI: 140 kWh/m2/year **TEDI:** 50 kWh/m2/year **GHGI:** 15 kgCO2e/m2/year	**EUI:** 110 kWh/m2/year **TEDI:** 40 kWh/m2/year **GHGI:** 10 kgCO2e/m2/year	**EUI:** 60 kWh/m2/year **TEDI:** 25 kWh/m2/year **GHGI:** 5 kgCO2e/m2/year
Rec Centre		
Level 1	**Level 2**	**Level 3**
EUI: 160 kWh/m2/year **TEDI:** 45 kWh/m2/year **GHGI:** 20 kgCO2e/m2/year	**EUI:** 140 kWh/m2/year **TEDI:** 35 kWh/m2/year **GHGI:** 15 kgCO2e/m2/year	**EUI:** 70 kWh/m2/year **TEDI:** 15 kWh/m2/year **GHGI:** 5 kgCO2e/m2/year
Transit Station		
Level 1	**Level 2**	**Level 3**
EUI: 230 kWh/m2/year **TEDI:** 100 kWh/m2/year **GHGI:** 25 kgCO2e/m2/year	**EUI:** 180 kWh/m2/year **TEDI:** 50 kWh/m2/year **GHGI:** 15 kgCO2e/m2/year	**EUI:** 150 kWh/m2/year **TEDI:** 15 kWh/m2/year **GHGI:** 10 kgCO2e/m2/year
Transit Repair Station		
Level 1	**Level 2**	**Level 3**
EUI: 300 kWh/m2/year **TEDI:** 120 kWh/m2/year **GHGI:** 38 kgCO2e/m2/year	**EUI:** 280 kWh/m2/year **TEDI:** 100 kWh/m2/year **GHGI:** 35 kgCO2e/m2/year	**EUI:** 130 kWh/m2/year **TEDI:** 20 kWh/m2/year **GHGI:** 10 kgCO2e/m2/year
Ice Rink		
Level 1	**Level 2**	**Level 3**
EUI: 380 kWh/m2/year **GHGI:** 46 kgCO2e/m2/year	**EUI:** 335 kWh/m2/year **GHGI:** 38 kgCO2e/m2/year	**EUI:** 200 kWh/m2/year **GHGI:** 17 kgCO2e/m2/year
Swimming Pool[1]		
Level 1	**Level 2**	**Level 3**
EUI: 3,700 kWh/m2/year **GHGI:** 560 kgCO2e/m2/year	**EUI:** 2700 kWh/m2/year **GHGI:** 350 kgCO2e/m2/year	**EUI:** 1800 kWh/m2/year **GHGI:** 90 kgCO2e/m2/year

[1] All target metrics for swimming pools are normalized on the basis of pool water surface area and not gross floor area.

Deliverables		
Level 1	**Level 2**	**Level 3**
Site Plan Approval (SPA) Energy Model Documentation Requirements: • Energy Model Report summarizing key modelling inputs, outputs and assumptions • Working Energy Model Simulation Files • Mechanical and Electrical Design Brief • Related supporting drawings and calculations done external from the energy modelling software (for example, thermal bridging calculations) As-Built Energy Model Documentation Requirements: • Updated Energy Model Report • Working Energy Model Simulation Files • Mechanical and Electrical Design Brief • Modelling Notes: General, Building Level, Plant Level, System Level, Occupancy and Minimum Outdoor Air Rates, Warnings and Errors • Take-off Calculations (Modeller's external calculations to support the model inputs). If applicable, calculation for model work-arounds, exceptions, process energy savings, renewable energy systems, district energy systems, or other required calculations. • Zoning Diagrams • Outdoor Air Calculation Spreadsheets • Architectural Drawings and Specifications (issued for construction/as-built) • Mechanical Drawings and Specifications (issued for construction/as-built) • Electrical Drawings and Specifications (issued for construction/as-built)		

1.2. Building Commissioning

Level 1 – Requirements	Level 2 – Requirements
Monitoring-based Commissioning: Develop monitoring-based procedures and identify points to be measured and evaluated to assess performance of the major energy-consuming systems representing more than 10% of the building's total energy use (at a minimum heating, cooling, lighting, fans, and pumps). • Commissioning Plan that includes the following: - Roles and responsibilities - Design Drawings - Measurement requirements (BAS points, sub-meters, testing devices - Points to be tracked with frequency and duration - Key performance metric used to evaluate performance - Frequency of analyses after substantial completion and in the warranty period (at least quarterly) - Performance requirements (i.e. compared to design/specification requirements) • Commissioning Report that includes the following: - Owner's Project Requirements - Basis of Design - Reviewed design documents and specifications at various stages - As-Built drawings - Reviewed equipment shop drawings - As-Built control drawings	**Level 1 +** • Systems Operation Manual that can used for the purposes of informing facilities staff, current or potential service contractors, and facility occupants for operating and maintaining a facility's systems. It shall include the following: - A general facility description and plot plan with the location of major use areas and equipment identified - A description of each major energy-consuming system, including location, pictures (as needed), key performance metrics/benchmarks to evaluate performance, and follow-up requirements - Control settings for each major energy-consuming system, including setpoints, schedules, energy efficiency features, and seasonal changeover procedures - Best practice maintenance requirements - An on-going commissioning plan **Level 2 – Deliverables** **Level 1 +** • System Operation Manual **Level 3 – Requirements**

- Contractor/manufacturer start-up reports and test procedures/execution - Reviewed test, adjust, and balance (TAB) reports - Analysed data and confirmation of performance - Issues and deficiencies log - Repairs (if needed) to maintain performance • Incorporation of commissioning requirements into the construction tender documents must be confirmed • A current facilities requirements and operations and maintenance plan that contains the information necessary to operate the building efficiently must be prepared and maintained	**Level 2 +** LEED BC+C v4 credit Envelope Commissioning (Option 2). Fulfill the requirements in EA Prerequisite Fundamental Commissioning and Verification as they apply to the building's thermal envelope, in addition to reporting the mechanical and electrical systems and assemblies in accordance with ASHRAE Guideline 0–2005 and the National Institute of Building Sciences (NIBS) Guideline 3–2012, Exterior Enclosure Technical Requirements for the Commissioning Process, as they relate to energy, water, indoor environmental quality, and durability.
Level 1 – Deliverables	**Level 3 – Deliverables**
• Commissioning Plan • Commissioning Report • Current Facilities Requirements and Operations and Maintenance Plan • Construction Checklists • Functional Test Scripts	**Level 2 +** • Incorporation of building envelope commissioning documentation for the deliverables identified in Levels 1 and 2 • Requirements as per LEED BC+C v4 credit Envelope Commissioning (Option 2)

1.3. On-Site Renewables

Level 1	Level 2	Level 3
Requirements		
Designed to accommodate future installations of rooftop PV, including but not limited to structural capability to support rooftop PV, space available for future electrical equipment in electrical room, etc.	**Level 1 +** On-site renewable energy devices to offset 5% of building annual energy consumption	**Level 1 +** On-site renewable energy devices to offset 100% of building annual energy consumption
Deliverables		
• Solar-ready provisions clearly identified in all applicable design documentation, and co-ordinated between the various design disciplines (electrical, structural, etc.)	• All applicable documentation to facilitate the design, installation, operation and maintenance of the renewable energy system (drawings, specifications, maintenance manuals, etc.) • Supporting renewable energy analysis calculations to demonstrate that the 5% requirement has been met	• All applicable documentation to facilitate the design, installation, operation and maintenance of the renewable energy system (drawings, specifications, maintenance manuals, etc.) • Supporting renewable energy analysis calculations to demonstrate that net zero energy has been met

1.4. Air Tightness

Levels 1, 2 and 3
Requirements
Conduct a whole-building air leakage test to improve the quality and air tightness of the building envelope.
Deliverables

At 50% Construction Documents stage: • Executed contract with an airtightness testing provider • Line of air barrier system shown on drawings and indicative details • Airtightness testing plan describing the project's approach to achieving the air tightness target, proposed testing procedure, and related quality assurance and quality control activities At project completion: • Completed airtightness testing report • If results are below target, report shall include practical steps to identify areas of significant air leakage and improve air tightness for the project, as well as documentation of potential strategies can be used to improve airtightness on future projects

1.5. Metering and Benchmarking

Levels 1, 2 and 3	
Requirements	
Metering	Install electricity and/or thermal sub-meters for all energy end-uses that represent more than 10% of the building's total energy consumption. All major process loads such as pools and ice rinks shall be sub-metered separately.
Benchmarking	Register the building on ENERGY STAR Portfolio Manager and co-ordinate with the City of Mississauga Energy Management Team to establish the process for ongoing reporting and benchmarking.
Deliverables	
Metering	• Provision of electricity and thermal sub-meters clearly indicated on electrical and mechanical single-line diagrams • A metering plan listing all meters along with type, energy source metered, diagrams, and/or references to design documentation
Benchmarking	• Create an account on ENERGY STAR Portfolio Manager for the building, including provision of key building input characteristics such as gross floor area, identification of multiple space uses, etc. and turn over access to the City upon project completion

1.6. Resilience Performance Requirements

Level 1	**Level 2**	**Level 3**
Requirements		
Provide 72 hours of back-up power and thermal energy to a central refuge area and to essential building systems as per the City of Toronto's Minimum Backup Power Guidelines for MURBs. Combustion-based or battery-based systems both permitted.	**Level 1 +** Only a non-combustion-based system using battery storage or other non-combustion forms of back-up generation is permitted.	N/A
Deliverables		
• A narrative describing the project's approach to resilience, with the back-up power source/quantity of fuel to be verified post construction.	Same as Level 1	N/A

Note: *The application of Resilience Performance Requirements may be waived for select building types. Applicants should confer with City of Mississauga staff to confirm if requirements apply to their project.*

2. Materials

2.1. Low-impact Materials

Level 1	Level 2	Level 3
Requirements		
• Minimum 20% cement replacement in concrete (pre-consumer recycled content using waste fly ash or slag) and/or minimum 20% GHG reductions in concrete using low-emissions alternatives • Min. 50% post consumer recycled content in rebar • Min. 50% post consumer recycled content in structural steel, metal decks • All flooring products must meet FloorScore • Meet SCAQMD Low/No VOCs for all interior paints, coatings, adhesives, and sealants, as per ASHRAE 189.1 • Min. 25% FSC Wood • No urea-formaldehyde	**Level 1 +** • Min. 75% post consumer recycled content in rebar • Min. 80% post consumer recycled content in structural steel, metal decks • Min. of 20 Environmental Product Declarations (EPDs), as per LEED MR: Building Product Disclosure and Optimization • Min. 75% FSC Wood	Meet the Materials Petal of the Living Building Challenge.
Deliverables		
• A materials tracking table must be completed and provided in sortable Excel format (a template will be available) • Product documentation demonstrating that requirements have been met, including manufacturer's data, Material Safety Data Sheets (MSDS), third-party certification, or screenshots from relevant programs	**Level 1 +** • Verified EPDs that conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle-to-gate scope, • The EPD must also identify the declaration holder, EPD program operator, and third-party reviewers	• Documentation of compliance with the Living Building Challenge's Materials Petal

2.2. Embodied Carbon Footprint

Level 1	Level 2	Level 3
Requirements		
Conduct a Life Cycle Assessment (LCA) and report carbon footprint as the LCA impact measure 'global warming potential' (GWP) in kilograms of carbon dioxide equivalent (CO_2e). The LCA report must also identify: • The LCA software that was used to make the calculation • The components of the building that are included in the calculation All suppliers used for the project must comply with the City of Mississauga Supplier Code of Conduct.	**Level 1 +** Conduct a Triple Bottom Line (TBL) Cost Benefit Analysis for the building that looks at the impacts of the building including Financial, Environmental, and Social impacts.	**Levels 1 and 2 +** Offset 100% of all embodied carbon using a one-time purchase of carbon offsets as eligible by the CaGBC ZCB standard.

Deliverables		
• A description of LCA assumptions, scope, and analysis process for baseline building and proposed building, as per LEED NC-v4 MR: Building Life-Cycle Impact Reduction • An LCA report showing outputs of proposed building with percentage change from baseline building for all impact indicators, and highlighting GWP • A narrative addressing specific strategies employed by the project team to reduce carbon footprint • A declaration that all suppliers used for the project must complied with the City of Mississauga Supplier Code of Conduct	**Level 1 +** • TBL Cost Benefit Analysis report	**Level 2 +** • Draft calculation showing target carbon offset threshold, as per LEED NC-v4 EA: Green Power and Carbon Offsets • Purchase contract or letter of commitment from a CaGBC eligible carbon offset program for targeted carbon offset threshold

2.3. Ozone Depleting Compounds

Level 1	Level 2	Level 3
Requirements		
Calculate and report HVAC&R equipment refrigerant emissions associated with project. The combination of all new and existing building HVAC&R equipment that serves the project must comply with the following formula: LCGWP + LCODP × 10^5 ≤ 13.	**Level 1 +** • Zero HCFCs • Zero halons • Report GWP and ODP as part of the Carbon Footprint requirement	**Levels 1 and 2 +** Zero refrigerants, or only naturally occurring/synthetic refrigerants that have an ozone depletion potential (ODP) of zero and a global warming potential (GWP) of less than 50 are permitted.
Deliverables		
• Draft calculations for LEED NC-v4 EA: Enhanced Refrigerant Management	**Level 1 +** • A declaration that no HCFCs were used on the project • A declaration that no halons were used on the project • An LCA report indicating GWP and ODP	**Same as Levels 1 and 2**

3. Transportation Performance Requirements

3.1. Electric Vehicle Infrastructure

Level 1	Level 2	Level 3
Requirements		
Design the building to provide 20% of parking spaces with electric vehicle supply equipment (EVSE) of Level 2 or higher. The remaining parking spaces must be designed to permit future EVSE installation (i.e. EV-ready). Include at least two regular electrical outlets for electric bicycle charging in bike storage area(s).	Design the building to provide 25% of parking spaces with electric vehicle supply equipment (EVSE) of Level 2 or higher. The remaining parking spaces must be designed to permit future EVSE installation (i.e. EV-ready). Include at least two regular electrical outlets for electric bicycle charging in bike storage area(s).	Design the building to provide 30% of parking spaces with electric vehicle supply equipment (EVSE) of Level 2 or higher. The remaining parking spaces must be designed to permit future EVSE installation (i.e. EV-ready). Include one regular electrical outlet for every four bike spaces for electric bicycle charging in bike storage area(s).
Deliverables		
• Project parking statistics including number of current and future EVSE spaces • Parking or site plan notations indicating location of current and future EVSE spaces • Photos of EVSE signage or pavement markings • Site plan notations indicating location of outlets for electric bicycles	Same as Level 1	Same as Levels 1 and 2

3.2. Bicycle Infrastructure

Level 1	Level 2	Level 3
Requirements		
Short-term bicycle parking for 5% of all peak visitors and/or 10% of occupants, no fewer than 8 spaces per building. Provide one (1) on-site shower with changing facility for the first 100 regular occupants and 1 additional shower for every 150 regular occupants thereafter.	Short-term bicycle parking for 7% of all peak visitors and/or 15% of occupants, no fewer than 8 spaces per building. Provide one (1) on-site shower with changing facility for the first 100 regular occupants and 1 additional shower for every 150 regular occupants thereafter.	Short-term bicycle storage for 10% of all peak visitors and/or 20% occupants, no fewer than 12 storage spaces per building. Provide one (1) on-site shower with changing facility for the first 100 regular occupants and 1 additional shower for every 150 regular occupants thereafter. Provide public bicycle repair station at-grade with tools including tire levers, screwdrivers and spanners.
Deliverables		
• Project statistics including number and type of bicycle parking spaces per building • Site plan notations indicating location, number, and type of bicycle parking spaces per building • Site plan notations indicating location and number of shower and change facilities	Same as Level 1	**Levels 1 and 2 +** • Site plan notations indicating location and type of bicycle maintenance facilities

4. Waste Management Performance Requirements

Level 1	Level 2	Level 3
Requirements		

A minimum diversion rate of 75% of the total construction and demolition material must be achieved. Diverted materials must include at least three material streams, e.g. metals, concrete, drywall, wood, plastics, etc.	A minimum diversion rate of 90% of the total construction and demolition material must be achieved. Diverted materials must include at least three or four material streams, e.g. metals, concrete, drywall, wood, plastics, etc.	**Level 2 +** Minimum diversion rates must be achieved as follows: • Metals 99% • Paper and cardboard 99% • Soil and biomass 100% • Rigid foam, carpet, and insulation 95% • All others – combined weighted average 90%
Deliverables		
• Construction and demolition waste management plan • Construction and demolition waste declaration to be provided post construction	Same as Level 1	Same as Levels 1 and 2

5. Water Performance Requirements

5.1. Stormwater Management

Level 1	Level 2	Level 3
Requirements		
Peak Flow Reduction: Achieve 85% reduction of the 100-year post-development flow to pre-development conditions of the site. Runoff Volume Reduction: Retain 80% runoff generated from a minimum of 15 mm depth of a single rainfall event from all site surfaces through infiltration, evapotranspiration, water harvesting and reuse.	Peak Flow Reduction: Achieve 100% reduction of the 100-year post-development flow to pre-development conditions of the site. Runoff Volume Reduction: Retain 100% runoff generated from a minimum of 15 mm depth of rainfall from all site surfaces through infiltration, evapotranspiration, water harvesting and reuse.	**Level 2 +** Incorporate green roof for the remaining roof area (excluding HVAC equipment, service pathways, and rooftop PV).
Deliverables		
• A stormwater management report including rainfall data and volume calculations • Stormwater management plans, details, or cross-sections consistent with report and including topography, landscaping, grading, etc. • A stormwater runoff declaration to be provided post construction	Same as Level 1	**Levels 1 and 2 +** • Site plan notations showing green roof details, including coverage area calculations

5.3. Water Use Intensity

Level 1	Level 2	Level 3
Requirements		
Achieve at least a 20% reduction in potable water consumption for the building (not including irrigation) over the baseline. Achieve at least a 60% reduction in in all outdoor potable water consumption (irrigation). Where potable water is used for irrigation, provide native, drought-tolerant plants for at least 50% of the landscaped site area (including at-grade landscapes, green roofs and walls).	Achieve at least a 40% reduction in potable water consumption for the building (not including irrigation) over the baseline. Achieve a 100% reduction in in all outdoor potable water consumption (irrigation). Provide native, drought-tolerant plants for at least 60% of the landscaped site area (including at-grade landscapes, green roofs and walls).	Achieve at least a 60% reduction in potable water consumption for the building (not including irrigation) over the baseline. Achieve a 100% reduction in indoor non-potable water consumption (toilets). Achieve a 100% reduction in in all outdoor potable water consumption (irrigation). Provide native, drought-tolerant plants for 100% of the landscaped site area (including at-grade landscapes, green roofs and walls).
Deliverables		
• Water efficiency declaration to be provided post construction • Landscaping plan showing vegetated areas and potable or non-potable irrigation system • Plant list including common and scientific names, highlighting native, drought-tolerant species	Same as Level 1	**Levels 1 and 2 +** • Record that the Province has been lobbied to allow for the capture and recycling of rainwater and wastewater for use in toilets

6. Natural Heritage Performance Requirements

6.1. Erosion and Sediment Control

Level 1	Level 2	Level 3
Requirements		
Follow the Erosion and Sediment Control Guideline for Urban Construction during construction and demolition activities.	Follow the Erosion and Sediment Control Guideline for Urban Construction during construction and demolition activities. Remove 80% of total suspended solids (TSS) on an annual loading basis from all runoff leaving the site based on the post-development level of imperviousness.	N/A
Deliverables		
Notations on plans and drawings • Description of compliance with the Erosion and Sediment Control Guideline for Urban Construction • Erosion and sediment control plan • Site plan notations indicating erosion and sediment control measures implemented	**Level 1 +** • Stormwater runoff declaration to be provided post construction	N/A

6.3. Light Pollution

Level 1	Level 2	Level 3
Requirements		
All exterior fixtures must be Dark Sky compliant, as per the International Dark-Sky Association (IDA). Any rooftop and facade architectural illumination must be directed downward and turned off after facility operating hours. Install an automatic device that reduces the outward spillage of internal light by: a) Reducing the input power to non-emergency lighting fixtures by at least 50 per cent outside of facility operating hours. OR b) Shielding all non-emergency light fixtures outside of facility operating hours.	**Level 1 +** Ensure that any lighting not physically attached to the building is connected to solar PV as a primary source of power.	N/A
Deliverables		
• A lighting list highlighting Dark Sky compliant fixtures • A lighting plan showing boundaries, location of fixtures, and lighting control measures • A lighting controls declaration to be provided post construction	**Level 1 +** • Lighting plan showing solar PV connections	N/A

6.4. Biodiversity

Level 1	Level 2	Level 3
Requirements – Planting		
Provide trees planted in both softscape and hardscape with a minimum soil volume of 15 m^3, 30 m^3, 45 m^3 for small, medium and large-sized trees, respectively. Plant 'shade trees' approximately 6-8 m (20- 27 ft) apart along all street frontages, open space frontages and public walkways, and 8-10m apart for all street frontages, open space frontages and public walkways.	Same as Level 1	Same as Levels 1 and 2
Deliverables – Planting		
• Landscaping plan indicating soil volume, species, and quantity for each planting area	Same as Level 1	Same as Levels 1 and 2

Requirements – Native species		
Provide pollinator-friendly species for at least 10% of the landscaped site area. Ensure that 25% of all proposed plantings are native species. Avoid the use of all invasive species in landscape design as per the Ontario Invasive Plant Council guidelines.	Provide pollinator-friendly species for at least 25% of the landscaped site area. Ensure that 50% of all proposed plantings are native species. Avoid the use of all invasive species in landscape design as per the Ontario Invasive Plant Council guidelines.	Provide pollinator-friendly species for at least 50% of the landscaped site area. Ensure that 100% of all proposed plantings are native species. Avoid the use of all invasive species in landscape design as per the Ontario Invasive Plant Council guidelines.
Deliverables – Native species		
• Plant list including common and scientific names, highlighting native and pollinator-friendly species • Description of compliance with the Ontario Invasive Plant Council guidelines	Same as Level 1	Same as Levels 1 and 2
Requirements – Bird friendly development		
Consult the City of Toronto's Bird Friendly Development Guidelines and provide a summary report demonstrating that the proposed project has considered bird safety.	Level 1 + Treat glass on buildings with a density pattern between 10-28 cm (4 to 11 in) apart for a minimum of the first 10 to 12 m (33-40 ft) above grade. **OR** Mute reflections for a minimum of the first 10-12 m (33-40 ft) portion of a building above grade. Where a green roof is constructed adjacent to glass surfaces, ensure that the glass is treated to a height of at least 12 m (40 ft) above the level of the green roof, to prevent potentially fatal collisions with windows. Where exhaust/ventilation grates cannot be avoided at ground level, design the grates to have a porosity of less than 2 centimetres x 2 centimetres (1inches x 1inches).	Same as Level 2
Deliverables – Bird friendly development		
• Narrative describing the project's consideration of bird safety	Level 1 + • Site plan notations showing treated area required, type of treatment, and density/colour of visual markers • Summary table of bird friendly glass treatments for each elevation • Site plan notations highlighting bird friendly grates, where applicable	Same as Level 2

The City of Mississauga's Corporate Green Building Standard

Program Manual

MISSISSAUGA

INTEGRAL GROUP

MORRISON HERSHFIELD

Table of Contents

1. A New Standard for Mississauga

In 2010, the City of Mississauga Council approved and adopted a LEED Silver standard of performance for all new construction and major renovations of City buildings. Requirements were adjusted according to building size: large projects with a gross floor area of 10,000 ft^2 were required to achieve LEED Silver certification, while smaller projects with a gross floor area of less than 10,000 ft^2 were required to be designed to achieve LEED Silver certification wherever possible. All projects were additionally required to achieve 15 specific credits deemed of particular importance by the City of Mississauga[1], when practical.

While the LEED Silver standard has been successful in addressing a range of environmental performance areas, it now lags behind the more ambitious targets that many cities and provinces have now set, particularly with respect to energy and emissions (Table 1).

Table 1: Federal, Provincial, Regional and Local Climate Change Targets

GHG Reduction Goals	
Government of Canada	• 17% reduction in GHG emissions below 2005 levels by 2020 • 30% reduction in GHG emissions below 2005 levels by 2030
Province of Ontario	• 30% reduction in GHG emissions below 2005 levels by 2030
Peel Region	• 80% reduction in corporate GHG emissions below 1990 levels by 2050
City of Mississauga	• 40% reduction in community and corporate GHG emissions below 1990 levels b 2030 • 80% reduction in community and corporate GHG emissions below 1990 levels by 2050

To address this gap, the City of Mississauga has adopted a more ambitious approach to environmental performance in its own buildings and facilities. **The Corporate Green Building Standard (CGB) represents a comprehensive set of environmental performance requirements that establish the City of Mississauga as a leader in sustainable buildings in Canada**, and that complement existing policies such as the *Green Building Standard for New Construction and Major Renovation*. The development of the Standard was guided by drawing on six core principles, which together ensure that the Standard will:

1. Move from a prescriptive to a performance-based approach to environmental performance that focuses on performance outcomes rather than requiring specific measures or technologies;
2. Establish targets that are technically and financially feasible for the market, considering current trends in the availability of sustainable services and technologies;
3. Outline varying levels of potential performance to allow flexibility in compliance and acknowledge the constraints and opportunities of different project sites;
4. Make use of measured data to verify compliance, given the municipal ownership of relevant projects;
5. Avoid the need for complex documentation that increases complexity for both compliance and enforcement; and
6. Align with existing regional and provincial requirements to enhance consistency across the industry and take advantage of opportunities for incentivize procurement.

1.1. Taking a Performance-Based Approach

In using the principles outlined above, the City of Mississauga's Corporate Green Building Standard has been designed to allow flexibility to design teams with respect to the level of environmental performance that can be

[1] City of Mississauga. (2010). *Green Development Standards.*

achieved on a given project. The Standard sets three increasing levels of performance that design teams can elect to pursue according to a specific project's characteristics and constraints:

- **LEVEL 1:** This level sets the base performance targets that are required to be achieved in all new municipal buildings and facilities. New construction projects must achieve this minimum level of performance in all environmental performance areas. It should be noted that Level 1 represents a rough approximation of the Toronto Green Standard's Tier 2 performance, which is a base requirement for all City of Toronto-owned buildings and facilities.
- **LEVEL 2:** This level represents a set of performance targets that have been identified as moderately more ambitious than Level 1, and that should be considered as highly desirable by the City of Mississauga. They represent a higher level of performance than Level 1 that should be considered in design.
- **LEVEL 3:** This level outlines a set of environmental performance targets that are considered "best in class" and that should be pursued wherever project parameters allow. Applicants should note that the achievement of the International Living Future Institute's Living Building Challenge and/or any relevant petals should be considered an alternative compliance pathway for Level 3.

Targets have been set for 17 key environmental performance areas (Table 2). Applicants should strive to meet the highest level of performance while remaining within a given budget and schedule.

Table 2: Key Environmental Performance Areas

Energy and Climate Change	Materials	Transportation
• Energy and emissions performance • Building commissioning • On-Site renewables • Air tightness • Metering and benchmarking • Resilience performance requirements	• Low-impact materials • Carbon footprint • Ozone depleting compounds	• EV infrastructure • Bicycle infrastructure
Waste	**Water**	**Natural Heritage**
• Construction waste management	• Stormwater management • Water use intensity	• Erosion and sediment control • Light pollution • Biodiversity

In addition to achieving one of these three levels of performance, design teams should also strive to achieve the following key design principles:

1. **Ensure specific spatial programming and psychological needs of building occupants and visitors are addressed.** This means ensuring that buildings achieve higher levels of environmental performance while maintaining the core function, aesthetic, and health of the building or facility.
2. **Design building systems, materials, and technologies to be mutually supportive.** This represents the need to ensure that design and cost efficiencies are harnessed wherever possible.
3. **Meet environmental performance targets in a financially sustainable manner.** While cost premiums can be a factor in higher environmental performance buildings, design teams should seek to minimize added costs wherever possible by taking an integrated approach to design.
4. **Make use of "simple" systems that are designed for long operational life and lower maintenance costs.** This means design teams should focus on well-known technologies, locally sourced materials, and passive design strategies as much as possible to reduce the need for expensive maintenance and challenges to daily operations.

1.2. Marrying Performance with Procurement

The purpose of the new Standard is to ensure that each new City-owned building or facility constructed in the City of Mississauga will achieve the highest possible levels of environmental performance within the City's set budget. This *performance-based* approach to procurement is an area of growing interest across North America, particularly among public institutions such as municipalities, universities and colleges, and provincial or federal agencies. It allows institutions with owner-occupied buildings to achieve higher performance goals in new construction and major renovation projects without fear of exceeding maximum budgets.

In a performance-based procurement model, owners can:

- Provide input into preliminary design
- Assign a firm fixed price for project design
- Bestow contractual responsibility for meeting or exceeding performance expectations to the design team

The use of performance-based procurement models has additionally been found to:

- Encourage innovation and creativity among design teams
- Create significant reductions in design and construction costs
- Reduce or eliminate claims, controversies, and change orders
- Achieve higher overall building performance

By using this performance-based procurement approach, the Standard requires applicants to identify the level of performance (i.e. Level 1, 2 or 3) they can commit to for *each* environmental performance area.

For example, a design team with greater experience in designing and constructing highly energy efficient buildings may be confident in their ability to pursue higher levels of energy and emissions performance with minimal added effort or cost. The same team may have less experience in waste management strategies or deem higher levels of performance unattainable for this particular project. As such, the applicant may elect to pursue a Level 3 performance in energy and emissions reductions, but only a Level 1 performance in Construction Waste Management.

Using the process of performance-based procurement, the City of Mississauga will take the following steps for each new construction project:

- Identify the appropriate project delivery method (e.g. design-build, design-bid-build)
- Develops any specific performance goals for the project (i.e. Levels 1, 2 or 3)
- Include these performance goals into the RFP/Contract
- Participate in ongoing design and construction processes to ensure goals are met
- Verify that performance goals have been met post-occupancy

The City of Mississauga's *Sustainable Procurement Policy* commits the City to considering a range of sustainability aspects in procurement – including for services and technologies for new building and facility construction. It requires the City to purchase goods and services from suppliers that:

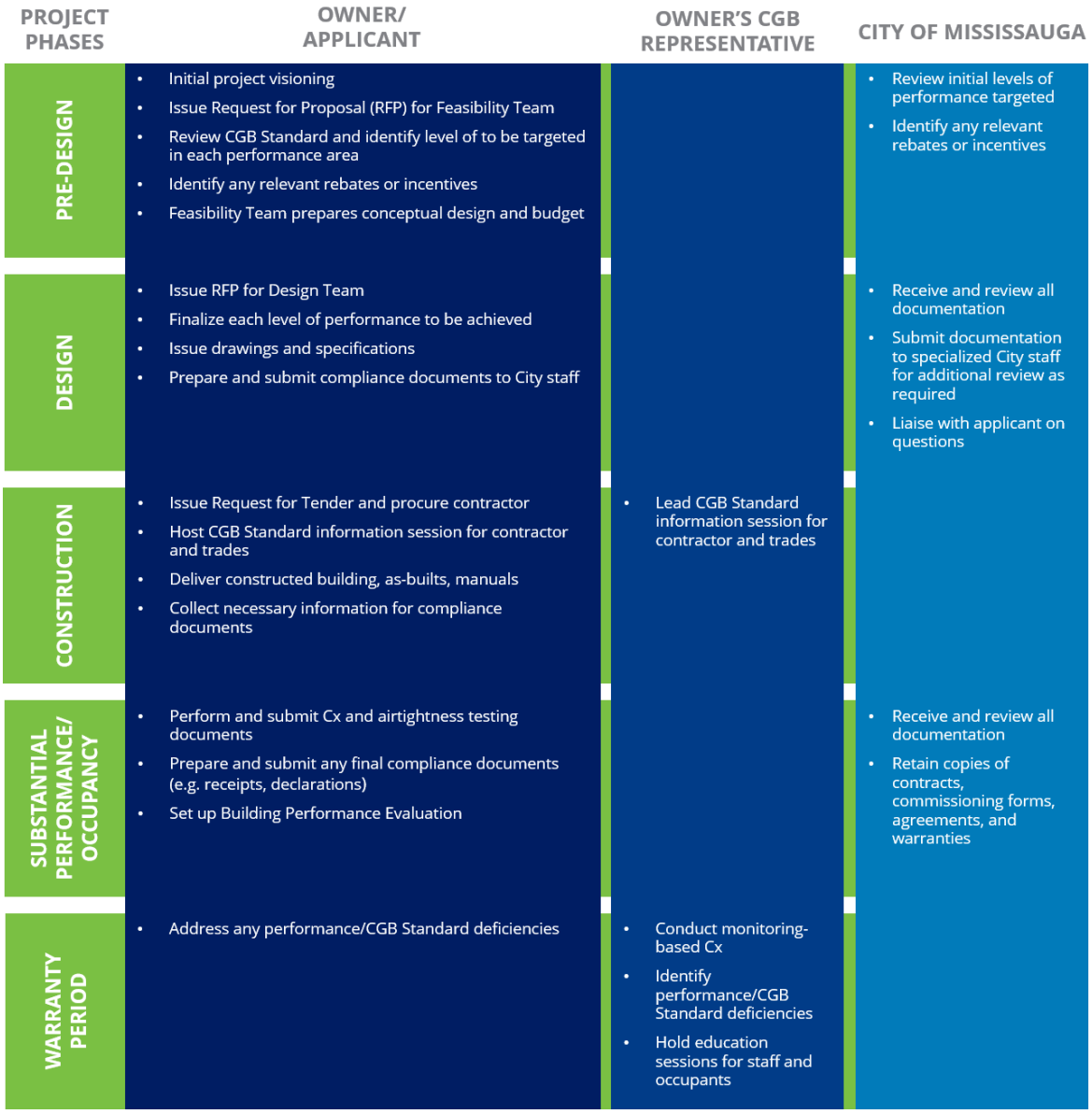
- Reduce material use, waste and packaging and promote reuse, recycled content, recyclability, reparability, upgradability, durability, biodegradability and renewable products
- Maximize energy efficiency
- Reduce greenhouse gas (GHG) emissions and air pollution, mitigate climate change and support climate change adaptation
- Conserve water and/or improve water quality
- Reduce or eliminate the use of toxins and hazardous chemicals, and
- Contribute to biodiversity preservation and habitat restoration

1.3. How to Use this Guide

This program guide has been created to provide both City staff and applicants with the information necessary to understand and conform to the Corporate Green Building Standard. It outlines the new requirements that buildings are to meet and proposes key strategies for how to achieve those targets. Applicants should use this guide together with the Standard's compliance documentation to understand all requirements.

Figure 1 below shows the key steps involved in applying for the Standard with a Design-Bid-Build approach commonly used in City of Mississauga projects. It outlines tasks for applicants, the owner's Corporate Green Building representative, and City staff. Applicants should liaise with City staff as appropriate to review requirements and ensure all documentation is submitted correctly. **APPENDIX A**: provides further details on how to integrate the Corporate Green Building Standard into the design process, including suggestions for the use of an Integrated Design Process (IDP) to enhance building performance outcomes.

Figure 1: Process of Applying to the Mississauga CGB Standard (assumes Design-Bid-Build Approach)



2. Minimizing Costs

Applicants are expected to target and achieve the highest levels of environmental performance possible, while staying within a reasonable budget. Applicants should note that high-performance green buildings do not necessarily incur greater costs than those constructed using more traditional approaches. Indeed, cost premiums associated with "building green" depend on a variety of factors, including the approach to design, the experience of design team members, and others. Research on the costs of high-performance buildings has shown that cost premiums can vary

considerably and can even result in cost savings. However, cost premiums have generally been found to fall between 0% and 4%, indicating that higher environmental performance can be achieved at little additional cost[2,3,4,5].

Where cost premiums do exist, these are generally derived from 1) increased time and effort from architects and engineers, modelling exercises and reporting, 2) construction time spent implementing green building features, and 3) the need for specialized equipment and less-common materials. While some of these costs are out of the direct control of the project team, there are many opportunities for teams to capitalize on savings opportunities and to limit cost overruns. These opportunities are best managed by employing an integrated design approach and making the most of available incentives. Utilizing an IDP can lower costs by bringing together stakeholders early in the process, reducing wasted time and materials, and maximizing resource efficiency through the design and construction periods. Project teams can also avoid unnecessary design draft iterations, shortening delivery times, and gain valuable insight into what materials will eventually be needed, allowing time to order specialty products and minimize waste.

In general, the earlier green building solutions are incorporated into the design process, the lower the cost premium. Projects that set goals early in the design process are often those that achieve their intended outcomes at little to no added cost. Introducing green building features as an afterthought is more likely to result in cost overruns and suboptimal systems. While some products and technologies remain cost prohibitive, the cost premium of building green is generally diminishing over time as specialized products become more widely available. In the interim, project teams should make use of available incentives wherever possible.

Overall, it is important to recall that green building projects also offer reductions in operational costs and increases to health and productivity which, though sometimes difficult to quantify, are universally valued and contribute to cost savings to the community at large. By including these factors, building green can be considered an investment in the value of a project, instead of an additional cost.

[2] US Green Building Council. (2007). *Cost of Green Revisited: Re-examining the Feasibility and Cost Impact of Sustainable Design in the Light of Increased Market Adoption.*
[3] Houghton, A., Vittori, G., & Guenther, R. (2009). *Demystifying First-Cost Green Building Premiums in Healthcare.*
[4] Kats, G. (2010). *Greening Our Built World: Costs, Benefits, and Strategies.*
[5] Department of Energy and Environment (DOEE) & Sustainability DC. (2013). *Net Zero and Living Building Challenge Financial Study: A Cost Comparison Report for Buildings in the District of Columbia.*

3. Energy and Climate Change

3.1. Energy and Emissions Performance

Intent

To promote buildings that are designed to be energy-efficient with reduced operating costs and greenhouse gas emissions associated with building operations, while improving thermal comfort of occupants and enhancing building resilience.

Background

Buildings account for as much as half of the emissions released in Canada's major cities. As such, improving the energy efficiency of buildings and switching to low-carbon energy sources are key factors in reducing the built environment's impact on the climate. Improving energy efficiency also has the added benefits of lowering operating and maintenance costs and increasing occupant comfort. By encouraging low-carbon, energy efficient design, the City of Mississauga will move closer to its emission reduction targets.

The City of Mississauga has adopted a targets-based approach to new building performance by setting thresholds for key city building types in three overarching metrics: energy use intensity, thermal energy demand intensity, and greenhouse gas emissions intensity. Together, the achievement of these three thresholds help to improve building energy efficiency while reducing emissions.

- **Energy Use Intensity** (EUI) is sum of all energy utilities (i.e. electricity, natural gas, district heating) used on site by the project, divided by modelled floor area. EUI is reported in kWh/m^2/year. Setting an EUI target ensures that overall energy demand is reduced, as well as a building's peak demand. EUI targets can be met by designing the building to reduce overall energy needs and selecting energy efficient systems and appliances.
- **Thermal Energy Demand Intensity** (TEDI) is the amount of heating energy delivered to the project that is outputted from any and all types of heating equipment, per unit of modelled floor area. Setting a TEDI target ensures that buildings are designed to reduce overall heating demand using passive design measures, including higher quality envelopes, careful window placement, and thoughtful massing. A building with an improved TEDI improves occupant comfort, increases building resilience, and lowers replacement costs over time.
- **Greenhouse Gas Intensity** (GHGI) is the total greenhouse gas emissions associated with the use of all energy utilities on site. Setting and achieving GHGI targets ensure that building systems make use of lower carbon sources that help to meet the City's GHG reduction targets.

Requirements & Deliverables

Specific targets for key building types subject to the Standard are outlined in the table below. To demonstrate compliance, applicants need to perform and submit an energy model at key stages of the design process or wherever the design has substantially changed. The Energy Modelling Guidelines that applicants are to follow are detailed in APPENDIX B: Energy Modelling Guidelines.

In addition to the specific targets for each archetype, requirements have also been set for building commissioning, airtightness testing, sub-metering, energy reporting and benchmarking, and solar readiness/ on-site renewable energy generation.

Requirements		
Office Building		
Level 1	**Level 2**	**Level 3**
EUI: 110 kWh/m^2/year **TEDI:** 55 kWh/m^2/year **GHGI:** 15 kgCO2e/m^2/year	**EUI:** 90 kWh/m^2/year **TEDI:** 35 kWh/m^2/year **GHGI:** 10 kgCO2e/m^2/year	**EUI:** 60 kWh/m^2/year **TEDI:** 15 kWh/m^2/year **GHGI:** 5 kgCO2e/m^2/year
Fire Hall		
Level 1	**Level 2**	**Level 3**
EUI: 105 kWh/m2/year **TEDI:** 75 kWh/m2/year **GHGI:** 11 kgCO2e/m2/year	**EUI:** 80 kWh/m2/year **TEDI:** 60 kWh/m2/year **GHGI:** 5 kgCO2e/m2/year	**EUI:** 60 kWh/m2/year **TEDI:** 30 kWh/m2/year **GHGI:** 5 kgCO2e/m2/year
Library		
Level 1	**Level 2**	**Level 3**
EUI: 140 kWh/m2/year **TEDI:** 50 kWh/m2/year **GHGI:** 15 kgCO2e/m2/year	**EUI:** 110 kWh/m2/year **TEDI:** 40 kWh/m2/year **GHGI:** 10 kgCO2e/m2/year	**EUI:** 60 kWh/m2/year **TEDI:** 25 kWh/m2/year **GHGI:** 5 kgCO2e/m2/year
Rec Centre		
Level 1	**Level 2**	**Level 3**
EUI: 160 kWh/m2/year **TEDI:** 45 kWh/m2/year **GHGI:** 20 kgCO2e/m2/year	**EUI:** 140 kWh/m2/year **TEDI:** 35 kWh/m2/year **GHGI:** 15 kgCO2e/m2/year	**EUI:** 70 kWh/m2/year **TEDI:** 15 kWh/m2/year **GHGI:** 5 kgCO2e/m2/year
Transit Station		
Level 1	**Level 2**	**Level 3**
EUI: 230 kWh/m2/year **TEDI:** 100 kWh/m2/year **GHGI:** 25 kgCO2e/m2/year	**EUI:** 180 kWh/m2/year **TEDI:** 50 kWh/m2/year **GHGI:** 15 kgCO2e/m2/year	**EUI:** 150 kWh/m2/year **TEDI:** 15 kWh/m2/year **GHGI:** 10 kgCO2e/m2/year
Transit Repair Station		
Level 1	**Level 2**	**Level 3**
EUI: 300 kWh/m2/year **TEDI:** 120 kWh/m2/year **GHGI:** 38 kgCO2e/m2/year	**EUI:** 280 kWh/m2/year **TEDI:** 100 kWh/m2/year **GHGI:** 35 kgCO2e/m2/year	**EUI:** 130 kWh/m2/year **TEDI:** 20 kWh/m2/year **GHGI:** 10 kgCO2e/m2/year
Ice Rink		
Level 1	**Level 2**	**Level 3**
EUI: 380 kWh/m2/year **GHGI:** 46 kgCO2e/m2/year	**EUI:** 335 kWh/m2/year **GHGI:** 38 kgCO2e/m2/year	**EUI:** 200 kWh/m2/year **GHGI:** 17 kgCO2e/m2/year
Swimming Pool[6]		
Level 1	**Level 2**	**Level 3**
EUI: 3,700 kWh/m2/year **GHGI:** 560 kgCO2e/m2/year	**EUI:** 2700 kWh/m2/year **GHGI:** 350 kgCO2e/m2/year	**EUI:** 1800 kWh/m2/year **GHGI:** 90 kgCO2e/m2/year
Deliverables		
Level 1	**Level 2**	**Level 3**
Site Plan Approval (SPA) Energy Model Documentation Requirements: • Energy Model Report summarizing key modelling inputs, outputs and assumptions • Working Energy Model Simulation Files • Mechanical and Electrical Design Brief • Related supporting drawings and calculations done external from the energy modelling software (for example, thermal bridging calculations) As-Built Energy Model Documentation Requirements: • Updated Energy Model Report • Working Energy Model Simulation Files • Mechanical and Electrical Design Brief • Modelling Notes: General, Building Level, Plant Level, System Level, Occupancy and Minimum Outdoor Air Rates,		

[6] All target metrics for swimming pools are normalized on the basis of pool water surface area and not gross floor area.

Warnings and Errors
- Take-off Calculations (Modeller's external calculations to support the model inputs). If applicable, calculation for model work-arounds, exceptions, process energy savings, renewable energy systems, district energy systems, or other required calculations.
- Zoning Diagrams
- Outdoor Air Calculation Spreadsheets
- Architectural Drawings and Specifications (issued for construction/as-built)
- Mechanical Drawings and Specifications (issued for construction/as-built)
- Electrical Drawings and Specifications (issued for construction/as-built)

Guidance for Applicants

For the purposes of demonstrating compliance with the performance requirements outlined in **Error! Reference ource not found.,** whole-building energy models shall be developed in accordance with the energy modelling guidelines provided in APPENDIX B: Energy Modelling Guidelines of this document. Applicants are encouraged to develop energy models early in the design process to assist in making key design-related decisions, and to conduct numerous iterative simulations to determine the most cost-effective strategy that meets the project's overall performance targets.

The energy model should be treated as a 'living' document that is updated at major milestones as the project progresses through the various stages of design and construction, to ensure that the project is on track to meet its performance targets. A final 'as-built' energy model update can then be used as the basis for which actual building performance is compared against to determine whether the performance targets have been met in actual operation, and to help identify opportunities for improvement in building energy efficiency.

It should be noted that, in addition to energy modelling documentation required to demonstrate compliance with the City's Corporate Green Building Standard, applicants are expected to ensure that the project also meets the provincial energy efficiency requirements outlined in the Ontario Building Code Supplementary Standard SB-10. The applicant will also need to submit any documentation required for additional green building certification or incentive programs that the project may elect to pursue, including providing the necessary compliance documentation to the authority having jurisdiction.

Additional Resources

For helpful examples of how to design energy-efficient low-carbon buildings, visit the following links:

- *Canada Green Building Council (CaGBC). (2015). Guidance for Energy Modelling Compliance Documentation in LEED® Canada.*
    - Energy Model Reports must contain, at a minimum, the information listed in Part 1 of this document.
- Canada Mortgage and Housing Corporation. (2017). *Parametric Simulations in Support of Integrated Design Processes.*
- BC Hydro. (2018). *Building Envelope Thermal Bridging Guide.*
- BC Housing. (2018). *Guide to Low Thermal Energy Demand for Large Buildings.*
- Ontario Building Code. (2016). *Supplementary Standard SB-10 "Energy Efficiency Requirements".*

3.2. Building Commissioning

Intent

To ensure that all systems and components of a building are designed, installed, tested, operated and maintained according to its operational requirements in an optimized manner.

Background

The commissioning process is critical to ensuring that building systems operate as designed. It typically includes a review of the design intent for the building (as set out in the Owner's Project Requirements) and an evaluation of how that has been met. More extensive commissioning can also ensure that: major building systems are tested, adjusted, and balanced; maintenance and operational materials are adequate; and/or building staff have received adequate training on the operations and maintenance of building systems. Commissioning is increasingly important in higher performance buildings, as newer systems and technologies can require finer tuning to ensure their proper function.

Requirements & Deliverables

<table>
<tr><th>Level 1 – Requirements</th><th>Level 2 – Requirements</th></tr>
<tr><td>Monitoring-based Commissioning:
Develop monitoring-based procedures and identify points to be measured and evaluated to assess performance of the major energy-consuming systems representing more than 10% of the building's total energy use (at a minimum heating, cooling, lighting, fans, and pumps).

• Commissioning Plan that includes the following:
- Roles and responsibilities
- Design Drawings
- Measurement requirements (BAS points, sub-meters, testing devices
- Points to be tracked with frequency and duration
- Key performance metric used to evaluate performance
- Frequency of analyses after substantial completion and in the warranty period (at least quarterly)
- Performance requirements (i.e. compared to design/specification requirements)

• Commissioning Report that includes the following:
- Owner's Project Requirements
- Basis of Design
- Reviewed design documents and specifications at various stages
- As-Built drawings
- Reviewed equipment shop drawings
- As-Built control drawings
- Contractor/manufacturer start-up reports and test procedures/execution
- Reviewed test, adjust, and balance (TAB) reports
- Analysed data and confirmation of performance
- Issues and deficiencies log
- Repairs (if needed) to maintain performance

• Incorporation of commissioning requirements into the construction tender documents must be confirmed

• A current facilities requirements and operations and maintenance plan that contains the information necessary to operate the building efficiently must be prepared and maintained</td><td>Level 1 +

• Systems Operation Manual that can used for the purposes of informing facilities staff, current or potential service contractors, and facility occupants for operating and maintaining a facility's systems. It shall include the following:
- A general facility description and plot plan with the location of major use areas and equipment identified
- A description of each major energy-consuming system, including location, pictures (as needed), key performance metrics/benchmarks to evaluate performance, and follow-up requirements
- Control settings for each major energy-consuming system, including setpoints, schedules, energy efficiency features, and seasonal changeover procedures
- Best practice maintenance requirements
- An on-going commissioning plan</td></tr>
<tr><td></td><td>Level 2 – Deliverables</td></tr>
<tr><td></td><td>Level 1 +

• System Operation Manual</td></tr>
<tr><td></td><td>Level 3 – Requirements</td></tr>
<tr><td></td><td>Level 2 +

LEED BC+C v4 credit Envelope Commissioning (Option 2).

Fulfill the requirements in EA Prerequisite Fundamental Commissioning and Verification as they apply to the building's thermal envelope, in addition to reporting the mechanical and electrical systems and assemblies in accordance with ASHRAE Guideline 0–2005 and the National Institute of Building Sciences (NIBS) Guideline 3–2012, Exterior Enclosure Technical Requirements for the Commissioning Process, as they relate to energy, water, indoor environmental quality, and durability.</td></tr>
<tr><td>Level 1 – Deliverables</td><td>Level 3 – Deliverables</td></tr>
</table>

• Commissioning Plan • Commissioning Report • Current Facilities Requirements and Operations and Maintenance Plan • Construction Checklists • Functional Test Scripts	**Level 2 +** • Incorporation of building envelope commissioning documentation for the deliverables identified in Levels 1 and 2 • Requirements as per LEED BC+C v4 credit Envelope Commissioning (Option 2)

Guidance for Applicants

In general, applicants should follow the requirements outlined in the LEED v4 Reference Guide for the following pre-requisites and/or credits as they relate to each of the performance tiers in the Mississauga CGB Standard:

- Level 1: Enhanced and Monitoring-Based Commissioning

  Enhanced commissioning complements the fundamental commissioning requirements by providing the owner (via the commissioning authority) further oversight and verification to ensure that the building will meet its operational requirements. This includes in-depth reviews of the basis of design, design documents, construction submittals, operator training, post-construction verification, and development of an on-going commissioning plan.

  In addition, given the strong desire that buildings meet their energy efficiency targets during building operation, Level 1 should also include a monitoring-based commissioning plan. This includes the implementation of an energy management and information system (EMIS) that continuously tracks building energy use and operational data to identify anomalies, with the end goal of rectifying inefficiencies as they occur to help reduce energy use, GHG emissions and utility costs over the lifecycle of the building.

- Level 2: This includes all the requirements under Level 1, as well as the development of a comprehensive systems manual that that can used for the purposes of informing facilities staff, current or potential service contractors, and facility occupants how to be operate and maintain the facility's systems.

- Level 3: This includes all the requirements under Levels 1 and 2, as well as those listed under LEED v4 Envelope Commissioning credit.

  Adding envelope commissioning ensures not only that active energy-consuming systems are considered but also that passive load-defining envelope systems are understood and verified. Such actions can help prevent problems with envelope design and construction that would be costly or impossible to address after construction. Additional benefits of BECx include improving occupants' comfort through glare control, infiltration testing, and reduced solar heat gain.

Additional Resources

For additional resources related to best practices for building commissioning, visit the following links:

- US Green Building Council (USGBC). (2018). *LEED v4 Reference Guide – Building Design and Construction.*
- CSA Group. (2016). *CSA Standard Z320-11 (R2016) – Building Commissioning.*
- ASHRAE Standards Committee. (2010). *ASHRAE Guideline 0-2005 – The Commissioning Process.*
- ASHRAE Standards Committee. (2007). *ASHRAE Guideline 1.1-2007 – HVAC&R Technical Requirements for the Commissioning Process.*
- National Institute of Building Sciences (NIBS). (2012). *NIBS Guideline 3-2012 – Exterior Enclosure Technical Requirements for the Commissioning Process.*
- Lawrence Berkeley National Laboratory. (2017). *Monitoring-Based Commissioning Plan – Sample Template.*

3.3. On-Site Renewables

Intent

To encourage on-site energy generation using renewable energy sources to reduce GHG emissions associated with building operation, as well as to reduce stresses imposed on the local electricity grid and further improve building resilience in the wake of power outages.

Background

Green buildings can incorporate a variety of renewable energy sources on-site, including solar photovoltaic (PV), solar hot water, small-scale wind turbines, and biomass combustion, among others. These systems can help a building to meet its energy needs and to lower its carbon emissions. They can also serve to protect the project from energy price volatility and reliance on the power grid, while reducing the energy that is wasted in transmission. Some factors that influence the viability of on-site renewables are building location, size, and structure, along with daily and seasonal load variations. Applicants will therefore be required to design their projects to accommodate future PV at a minimum for Level 1, increasing to a system designed to provide a minimum of 5% of the building's total annual energy needs for Level 2. Level 3 requires on-site renewable energy to be supplied for 100% of the building's annual energy demand by on-site systems, resulting in a net-zero energy building.

Requirements & Deliverables

Level 1	Level 2	Level 3
Requirements		
Designed to accommodate future installations of rooftop PV, including but not limited to structural capability to support rooftop PV, space available for future electrical equipment in electrical room, etc.	**Level 1 +** On-site renewable energy devices to offset 5% of building annual energy consumption	**Level 1 +** On-site renewable energy devices to offset 100% of building annual energy consumption
Deliverables		
• Solar-ready provisions clearly identified in all applicable design documentation, and co-ordinated between the various design disciplines (electrical, structural, etc.)	• All applicable documentation to facilitate the design, installation, operation and maintenance of the renewable energy system (drawings, specifications, maintenance manuals, etc.) • Supporting renewable energy analysis calculations to demonstrate that the 5% requirement has been met	• All applicable documentation to facilitate the design, installation, operation and maintenance of the renewable energy system (drawings, specifications, maintenance manuals, etc.) • Supporting renewable energy analysis calculations to demonstrate that net zero energy has been met

Guidance for Applicants

For the purpose of providing PV-ready provisions to meet Level 1, applicants may assume a system size that supplies at least 5% of the building's annual energy consumption. PV-ready requirements include the following:

- Designate an area of the roof for future solar PV;
- Provide adequate structural capacity for the roof structure;
- Install one or two conduits from the roof to the main electrical or mechanical room, sized based on potential solar PV system size;
- Designate a 2m x 2m wall area in the electrical and mechanical rooms for future solar PV equipment controls and connections (e.g. meters, monitors); and
- Where possible, place HVAC equipment on north side of the roof to prevent future shading.

Applicants are encouraged to consult the National Renewable Energy Laboratory's Solar Ready Buildings Planning Guide for additional considerations for PV-ready provisions.

The renewable energy calculations can be conducted either within the whole-building energy modelling software, or through recognized third-party energy modeling tools such as RETScreen Expert or PVsyst. The 5% and 100%

threshold levels corresponding to Levels 2 and 3, respectively, must be determined based on the outputs of the whole-building energy model.

It should be noted that off-site solutions such as renewable energy certificates (RECs), carbon offsets, or power purchasing agreements (PPA) with renewable energy generators are not permitted to satisfy this measure, unless otherwise approved by the City.

Allowable forms of renewable energy systems to meet Level 2 and 3 requirements include the following:

- Solar photovoltaics (PV);
- Solar thermal;
- Biogas and biofuel; and
- Wind-based systems.

For greater clarity, note that geo-exchange systems (i.e. ground-source heat pumps) are considered a building energy efficiency measure, as opposed to a form of renewable energy generation. As such, these systems cannot be used for the purposes of meeting the on-site renewable energy requirement but can instead be utilized to meet the EUI and GHGI targets outlined in Section 4.1.

Applicants are encouraged to pursue a renewable strategy that considers the unique characteristics of their particular building. For example, high ventilation requirements coupled with the lack of extensive glazing on transit maintenance facilities may make solar air heating systems a particularly attractive opportunity.

Additional Resources

For additional guidance on solar-PV provisions, visit the following link:

- National Renewable Energy Laboratory's Solar Ready Buildings Planning Guide
- National Resources Canada. (2019). *RETScreen.*
- PVSyst. (2019). PVsyst Photovoltaic Software.

3.4. Air Tightness

Intent

To ensure that the air barrier systems of building envelope systems are constructed and performing as per design intent, given its significant influence on the overall energy and thermal performance of the building.

Background

Whole-building air tightness tests evaluate the leakiness of a building's envelope by measuring the pressure difference across the enclosure, with gaps leading to heat loss, condensation, and increased costs. These tests are typically conducted using a piece of equipment called a blower door and are often referred to as blower door tests. For smaller buildings, the test may only need one blower door, while a large building requires a coordinated effort with multiple blower doors running at the same time. The information gathered can highlight the location of imperfect seals and large holes, which operators can address for improved building performance. Ensuring a building's airtightness is a key step in ensuring energy efficiency targets are met; as such, applicants are required to perform and submit the results of an airtightness test for all levels of the Standard.

Requirements & Deliverables

Levels 1, 2 and 3
Requirements
Conduct a whole-building air leakage test to improve the quality and air tightness of the building envelope.
Deliverables
At 50% Construction Documents stage: • Executed contract with an airtightness testing provider • Line of air barrier system shown on drawings and indicative details • Airtightness testing plan describing the project's approach to achieving the air tightness target, proposed testing procedure, and related quality assurance and quality control activities At project completion: • Completed airtightness testing report • If results are below target, report shall include practical steps to identify areas of significant air leakage and improve air tightness for the project, as well as documentation of potential strategies can be used to improve airtightness on future projects

Guidance for Applicants

It is recommended that applicants follow ASTM WK35913 Standard Test Method for Determining the Air Leakage Rate of Large or Multi-zone Buildings or US Army Corps of Engineers (USACE) Air Leakage Test Protocol.

Projects shall conduct an operational envelope air tightness test under negative pressure producing a multi-point regression. However, projects are also permitted to pursue negative and positive pressure testing and produce a building envelope test where HVAC-related openings are excluded, as in the Passive House standard.

Projects shall target a test pressure of 75Pa. Projects unable to achieve 75Pa must follow either ASTM W35913 alternative test methods, a Repeated Single-Point Test, or a Repeated Two-Point test and demonstrate compliance using projected curves for air tightness at 75Pa.

If the whole building cannot be tested as one zone, it is acceptable to test a zone that can be partitioned temporarily, with adjacent zones 'guarded' as buffer zones using blower door equipment. Note that the air leakage rate should be normalised to the exterior surface area and not include the guarded surface areas.

All materials, assemblies and systems that form the continuous air barriers systems must be installed including any HVAC equipment, ducts and fittings included in the test boundary.

Additional Resources

For additional guidance on airtightness testing, visit the following links and resources:

- BC Housing. (2017). *Illustrated Guide to Achieving Airtight Buildings.*
- ASTM International. (2012). *ASTM WK35913 – Standard Test Method for Determining the Air Leakage Rate of Large or Multi-zone Buildings.*
- US Army Corps of Engineers (USACE). (2012). *Air Leakage Test Protocol for Building Envelopes.*
- Air Barrier Association of America (ABAA). (2012). *Air Leakage Test Protocol for Building Envelopes (Version 3) – Superseded by ASTM WK35913.*
- ASTM International. (2019). *ASTM E779-19* – Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
- ASTM International. (2017). *ASTM E1827-11 – Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door.*
- International Organization of Standardization (ISO). (2015). *ISO 9972:2015 Thermal performance of buildings - Determination of air permeability of buildings - Fan pressurization method.*
- The Air Tightness Testing and Measurement Association (ATTMA). (2015). *Technical Standard L2 – Measuring Air Permeability in the Envelopes of Buildings (Non-Dwellings).*

3.5. Metering and Benchmarking

Intent

To ensure that buildings are provided with an adequate level of metering and measurement systems to facilitate ongoing tracking of energy usage by the building systems.

Background

Comprehensive electricity and thermal metering allows building operators to track energy consumption over time, identify variations between uses, and precisely calibrate operational parameters in response. This process can show gaps between projected and actual efficiency performance, which is a vital component of energy management. By comparing the measurements from sub-meters to an established benchmark for that building type, operators can identify and remedy poorly performing buildings, reduce wasted energy, and decrease costs. Organizations can limit these findings to internal use or share them on a wider scale for competition with like buildings and participation in green building certification programs. All buildings subject to the Standard will be required to install sub-meters for all significant energy end-uses, and register the building on Energy Star Portfolio Manager.

Requirements & Deliverables

Levels 1, 2 and 3	
Requirements	
Metering	Install electricity and/or thermal sub-meters for all energy end-uses that represent more than 10% of the building's total energy consumption. All major process loads such as pools and ice rinks shall be sub-metered separately.
Benchmarking	Register the building on ENERGY STAR Portfolio Manager and co-ordinate with the City of Mississauga Energy Management Team to establish the process for ongoing reporting and benchmarking.
Deliverables	
Metering	• Provision of electricity and thermal sub-meters clearly indicated on electrical and mechanical single-line diagrams • A metering plan listing all meters along with type, energy source metered, diagrams, and/or references to design documentation
Benchmarking	• Create an account on ENERGY STAR Portfolio Manager for the building, including provision of key building input characteristics such as gross floor area, identification of multiple space uses, etc. and turn over access to the City upon project completion

Guidance for Applicants

Applicants should follow the metering requirements provided in the LEED v4 Reference Guide for the advanced energy metering credit, which includes the following requirements:

- Meters must be permanently installed, record at intervals of one hour or less, and transmit data to a remote location;
- Electricity meters must record both consumption and demand. Whole-building electricity meters should record the power factor, if appropriate;
- The data collection system must use a local area network, building automation system, wireless network, or comparable communication infrastructure;
- The system must be capable of storing all meter data for at least 36 months;
- The data must be remotely accessible; and
- All meters in the system must be capable of reporting hourly, daily, monthly, and annual energy use.

All energy-end uses that make up more than 10% of total building energy use, as determined through the whole-building energy model, must be sub-metered. All meters should be installed and calibrated per manufacturer recommendations.

For hydronic systems, all thermal energy meters must be 'true' energy meters capable of measuring flow rates as well as supply and return temperatures and computing energy consumption.

As part of the metering requirements, an International Performance Measurement and Verification Protocol (IPMVP) Measurement and Verification (M&V) Plan should be developed during the Design Development phase and provided to the City's representative for approval. The M&V Plan should be updated to as-built conditions prior to project completion, such that it can be used as a reliable basis for verifying building performance during the occupancy phase.

Additional Resources

For additional guidance on metering and benchmarking, visit the following links and resources:

- US Green Building Council (USGBC). (2018). *LEED v4 Reference Guide – Building Design and Construction.*
- Efficiency Valuation Organization (EVO). (2019). *International Performance Measurement and Verification Protocol (IPMVP).*
- US Environmental Protection Agency (EPA). (2018). *ENERGY STAR Portfolio Manager Technical Reference Manual.*
- Ministry of Energy, Northern Development and Mines. (2019). *Ontario Energy and Water Reporting and Benchmarking Requirements.*

3.6. Resilience Performance Requirements

Intent

To promote buildings that are designed to maintain critical operations and functions in the face of a shock or stress, and quickly return to normal operations to maintain healthy, liveable spaces for its occupants.

Background

Boosting building resilience to climate change impacts is becoming more important as projected changes in climate for the City of Mississauga include increases in the incidence of heat waves, ice storms, and other extreme weather events. Many of these events are accompanied by power outages, leaving the community without electricity. In particular, City-owned buildings can act as important centres for refuge for the community, including vulnerable populations, during these events. This is why new City buildings will be required to provide 72 hours of back-up power to key components of the building. Coupled with the energy efficiency requirements of the Standard (see Section 3.1), providing 70 hours back-up power over and above minimum building code requirements will ensure that facilities such as community centres and libraries will be able to provide a safe, comfortable place for people to take shelter, charge communication of medical equipment, and stay warm or cool, depending on the time of year.

Requirements & Deliverables

Level 1	Level 2	Level 3
Requirements		
Provide 72 hours of back-up power and thermal energy to a central refuge area and to essential building systems as per the City of Toronto's Minimum Backup Power Guidelines for MURBs. Combustion-based or battery-based systems both permitted.	**Level 1 +** Only a non-combustion-based system using battery storage or other non-combustion forms of back-up generation is permitted.	N/A
Deliverables		
• A narrative describing the project's approach to resilience, with the back-up power source/quantity of fuel to be verified post construction.	Same as Level 1	N/A

Note: *The application of Resilience Performance Requirements may be waived for select building types. Applicants should confer with City of Mississauga staff to confirm if requirements apply to their project.*

Guidance for Applicants

Providing extended back-up power is only one aspect of resilience, and applicants are encouraged to explore further solutions that are appropriate for their site. It should be noted that increasing the city's resilience to flooding and storm events can also be achieved using low-impact development and stormwater management practices, such as the use of permeable pavements, bio-retention techniques, and rainwater harvesting systems, discussed further in Section 7.1 on stormwater management.

Additional Resources

For helpful examples of how to design more resilient buildings, visit the following links:

- City of Toronto. (2016). *Minimum Backup Power Guidelines for MURBs.*
- City of Vancouver. (2019). *Resilient City.*
- City of Mississauga. (2010). *Green Development Standards.*
- Credit Valley Conservation (CVC) & Toronto and Region Conservation Authority (TRCA). (2010). *Low Impact Development Stormwater Management Planning and Design Guide.*

4. Materials

4.1. Low-impact Materials

Intent

To encourage the use of environmentally preferable building materials, including those that are reused, recycled, and locally-sourced.

Background

New, non-recyclable, and unsustainably sourced construction materials can consume large amounts of natural resources throughout their lifespan. Their production and distribution are responsible for both resource depletion and environmental impacts, while their eventual disposal after demolishment create significant quantities of waste. Low-impact materials, on the other hand, are those that require less energy for extraction, production, transport, and operation. These include materials with *recycled content* (e.g. concrete that incorporates crushed glass or wood chips), *reused content* (e.g. timber from existing structures), *locally-sourced products*, *bio-based materials* (e.g. hay for insulation), and *wood products* certified by the Forest Stewardship Council (FSC). Green building certification programs that encourage the use of low-impact materials include the International Living Future Institute's (ILFI) Living Building Challenge (through its Materials Petal) and LEED v4 (through its Materials & Resources credits), among others.

Requirements & Deliverables

Level 1	Level 2	Level 3
Requirements		
• Minimum 20% cement replacement in concrete (pre-consumer recycled content using waste fly ash or slag) and/or minimum 20% GHG reductions in concrete using low-emissions alternatives • Min. 50% post consumer recycled content in rebar • Min. 50% post consumer recycled content in structural steel, metal decks • All flooring products must meet FloorScore • Meet SCAQMD Low/No VOCs for all interior paints, coatings, adhesives, and sealants, as per ASHRAE 189.1 • Min. 25% FSC Wood • No urea-formaldehyde	**Level 1 +** • Min. 75% post consumer recycled content in rebar • Min. 80% post consumer recycled content in structural steel, metal decks • Min. of 20 Environmental Product Declarations (EPDs), as per LEED MR: Building Product Disclosure and Optimization • Min. 75% FSC Wood	Meet the Materials Petal of the Living Building Challenge.
Deliverables		
• A materials tracking table must be completed and provided in sortable Excel format (a template will be available) • Product documentation demonstrating that requirements have been met, including manufacturer's data, Material Safety Data Sheets (MSDS), third-party certification, or screenshots from relevant programs	**Level 1 +** • Verified EPDs that conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle-to-gate scope, • The EPD must also identify the declaration holder, EPD program operator, and third-party reviewers	• Documentation of compliance with the Living Building Challenge's Materials Petal

Guidance for Applicants

Meeting Level 1 will require applicants (often the project contractor) to track and document product specifications, which are provided by product suppliers. Level 2 and Level 3 will require greater coordination with the project team, increasingly careful selection of materials, involvement of the architect or interior designer, and possibly the guidance of a specialized sustainability consultant in materials selection. Meeting the Levels 2 and 3 will limit material choices overall, they are locally available and will have positive impacts for the health of building occupants in addition to their environmental benefits.

Additional Resources

For more information about selecting low-impact materials, visit the following links:

- American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE). (2017). *Standard 189.1-2017 - Standard for the Design of High-Performance Green Buildings.*
- British Columbia Ministry of Environment and Climate Change Strategy. (2017). *LEED v4 and Low Carbon Building Materials - A Comprehensive Guide.*
- SCS Global Services. (2019). *FloorScore - Indoor Air Quality Certification for Flooring.*
- International Living Future Institute (ILFI). (2019). *Living Building Challenge - Materials Petal Intent.*
- South Coast Air Quality Management District (SCAQMD). (2018). *VOC Rules.*
- Mindful MATERIALS. (2019). *Mindful MATERIALS Library.*
- Vertima. (2019). *Certified Products Directory.*
- UL Environment. (2019). *SPOT*
- International Living Future Institute. (2019). Declare Product Database.

4.2. Embodied Carbon Footprint

Intent

To reduce the embodied carbon footprint of projects, while promoting environmental and social sustainability.

Background

The comprehensive embodied carbon footprint of a building material considers the total impact of the greenhouse gas emissions associated with all phases of its life, including extraction, transport, refining, processing, assembly, installation, operations, decommissioning, and disposal. Our understanding of how to reduce operational emissions has improved in recent years, but many embodied carbon emissions (and their contribution to climate change) are still going unaccounted for. While these emissions currently represent a relatively low proportion of an average building's total carbon footprint, they will grow in importance as operational emissions for buildings continue to fall.

When considering the carbon footprint of a project, it makes sense to also employ a Triple Bottom Line (TBL) approach. This means measuring success beyond simple monetary returns by considering social and environmental sustainability alongside profit. For example, ensuring fair hiring standards at a building would contribute to social sustainability, while generating onsite renewable energy would contribute to environmental sustainability. This approach encourages buildings and initiatives that create value for all potential stakeholders, not just a select few.

Requirements & Deliverables

Level 1	Level 2	Level 3
Requirements		
Conduct a Life Cycle Assessment (LCA) and report carbon footprint as the LCA impact measure 'global warming potential' (GWP) in kilograms of carbon dioxide equivalent (CO_2e). The LCA report must also identify: • The LCA software that was used to make the calculation • The components of the building that are included in the calculation All suppliers used for the project must comply with the City of Mississauga Supplier Code of Conduct.	**Level 1 +** Conduct a Triple Bottom Line (TBL) Cost Benefit Analysis for the building that looks at the impacts of the building including Financial, Environmental, and Social impacts.	**Levels 1 and 2 +** Offset 100% of all embodied carbon using a one-time purchase of carbon offsets as eligible by the CaGBC ZCB standard.
Deliverables		
• A description of LCA assumptions, scope, and analysis process for baseline building and proposed building, as per LEED NC-v4 MR: Building Life-Cycle Impact Reduction • An LCA report showing outputs of proposed building with percentage change from baseline building for all impact indicators, and highlighting GWP • A narrative addressing specific strategies employed by the project team to reduce carbon footprint • A declaration that all suppliers used for the project must complied with the City of Mississauga Supplier Code of Conduct	**Level 1 +** • TBL Cost Benefit Analysis report	**Level 2 +** • Draft calculation showing target carbon offset threshold, as per LEED NC-v4 EA: Green Power and Carbon Offsets • Purchase contract or letter of commitment from a CaGBC eligible carbon offset program for targeted carbon offset threshold

Guidance for Applicants

Life Cycle Assessment (LCA) is the standardized method used to quantify the environmental impacts of a project, including material extraction, product manufacturing, decommissioning, and disposal. To meet Level 1 of the Green Building Standard, applicants will need to complete an LCA and report on the results. At the same time, all suppliers and subcontractors will need to comply with the City's *Supplier Code of Conduct*. On top of this, meeting Level 2 of the Standard involves completing a TBL Cost Benefit Analysis to quantify and attribute monetary values to the social, environmental, and economic impacts resulting from the project. Finally, to meet Level 3, applicants will need to make a one-time purchase of enough eligible carbon offsets to make the project carbon neutral. There are many software packages available to assist with these tasks, offering a range of prices and features, including openLCA, GabiSoftware, SimaPro, openTBL, and Autocase.

Additional Resources

For helpful resources and examples of how to consider embodied carbon, visit the following links:

- Canada Green Building Council (CaGBC). (2017). *Zero Carbon Building Standard.*
- BC Ministry of the Environment and Climate Change Strategy. (2017). *LEED v4 and Low Carbon Building Materials.*
- City of Mississauga. (2018). *Supplier Code of Conduct.*
- ASTM International. (2016). *ASTM E2921-16a, Standard Practice for Minimum Criteria for Comparing Whole Building Life Cycle Assessments for Use with Building Codes, Standards, and Rating Systems.*
- Green Building Certification Inc. (GBCI). (2017). *Whole building life cycle assessment through LEED v4.*

4.3. Ozone Depleting Compounds

Intent

To reduce stratospheric ozone depletion and limit human health impacts caused by refrigerant emissions.

Background

Harmful refrigerants such as CFCs, HCFCs, and halons have contributed to the degradation of the Earth's stratospheric ozone layer that absorbs most of the sun's ultraviolet radiation. The thinning of the ozone layer contributes to many human health problems, especially skin cancer, and to ecological impacts such as reduced ice and snow cover, altered precipitation, and reduced crop yields. In response, the United Nationals put forward the Montreal Protocol, which was finalized in 1987 and achieved universal ratification amongst member states. The Protocol set forth protections for the ozone layer by phasing out the production of many ozone depleting substances, with a focus on highly-damaging CFCs. Accordingly, the Province of Ontario already restricts CFC-based refrigeration, but green building designers can go a step further implementing more climate friendly alternatives.

Requirements & Deliverables

Level 1	Level 2	Level 3
Requirements		
Calculate and report HVAC&R equipment refrigerant emissions associated with project. The combination of all new and existing building HVAC&R equipment that serves the project must comply with the following formula: LCGWP + LCODP × 10^5 ≤ 13.	**Level 1 +** • Zero HCFCs • Zero halons • Report GWP and ODP as part of the Carbon Footprint requirement	**Levels 1 and 2 +** Zero refrigerants, or only naturally occurring/synthetic refrigerants that have an ozone depletion potential (ODP) of zero and a global warming potential (GWP) of less than 50 are permitted.
Deliverables		
• Draft calculations for LEED NC-v4 EA: Enhanced Refrigerant Management	**Level 1 +** • A declaration that no HCFCs were used on the project • A declaration that no halons were used on the project • An LCA report indicating GWP and ODP	**Same as Levels 1 and 2**

Guidance for Applicants

Meeting Levels 1 through 3 requires applicants to calculate and report the building's refrigerant emissions, with increasing restrictions at each level. For Level 1, applicants will need to assess the ozone depletion potential (ODP) and global warming potential (GWP) of HVAC&R systems prior to the selection of equipment to ensure they can meet the requirements for the given building design. At Level 2, the requirements will shape the selection of HVAC&R systems and equipment but will future proof ongoing building operations for the phase out of HCFCs from the HVAC industry. In this case, applicants might consider system options with lower volumes of refrigerants and/or refrigerants with lower GWP and ODP. Meeting Level 3 will require the strategies from Level 2 and may also some limit mechanical system types or reduce choice of suppliers for systems and equipment. Applicants could benefit from incorporating passive design measures (e.g. thicker building envelopes, higher performance windows) that reduce the need for cooling, with guidance available from Passive House Canada.

Additional Resources

For helpful resources and examples of how to limit ozone depleting compounds, visit the following links:

- Government of Canada. (2013). *Ozone-depleting substances.*
- Province of Ontario. (2010). *Ozone Depleting Substances and Other Halocarbons.*

- United States Environmental Protection Agency (EPA). (2018). *Ozone Layer Protection.*
- Passive House Canada. (2017). *A Developer's Guide to Passive House Buildings.*

5. Transportation Performance Requirements

5.1. Electric Vehicle Infrastructure

Intent

To reduce community-wide GHG emissions by promoting electric vehicle use.

Background

Fossil-fuel based passenger vehicles are a major source of greenhouse gas emissions in Canada and a contributor to global climate change. Electric vehicles (EVs) offer an effective means of replacing traditional vehicles and are growing in popularity with consumers, although they still represent a small portion of vehicles on the road. There are two types of EVs: 1) battery electric vehicles, which run entirely on electricity and 2) plug-in electric vehicles that combine the battery with a gasoline engine. Both types of EVs have lower fuel and maintenance costs than conventional models, produce far less greenhouse gas emissions over the lifetime of the vehicle, produce less air pollution, and are eligible to travel in designated high occupancy vehicle (HOV) lanes. Additionally, there are three types of charging stations (also known as electric vehicle supply equipment or EVSE) to consider: Level 1 is a standard outlet (120 volts) and takes between 8–20 hours to fully charge an EV; Level 2 uses a 240 volt system and can charge an EV from empty in around 4–6 hours; and Level 3 charges approximately eight times faster with a 480 volt system, bringing an EV to 80% in about 30 minutes. By promoting the installation of electric vehicle supply equipment, the City of Mississauga can help encourage residents to make the switch to EVs.

Requirements & Deliverables

Level 1	Level 2	Level 3
Requirements		
Design the building to provide 20% of parking spaces with electric vehicle supply equipment (EVSE) of Level 2 or higher. The remaining parking spaces must be designed to permit future EVSE installation (i.e. EV-ready). Include at least two regular electrical outlets for electric bicycle charging in bike storage area(s).	Design the building to provide 25% of parking spaces with electric vehicle supply equipment (EVSE) of Level 2 or higher. The remaining parking spaces must be designed to permit future EVSE installation (i.e. EV-ready). Include at least two regular electrical outlets for electric bicycle charging in bike storage area(s).	Design the building to provide 30% of parking spaces with electric vehicle supply equipment (EVSE) of Level 2 or higher. The remaining parking spaces must be designed to permit future EVSE installation (i.e. EV-ready). Include one regular electrical outlet for every four bike spaces for electric bicycle charging in bike storage area(s).
Deliverables		
• Project parking statistics including number of current and future EVSE spaces • Parking or site plan notations indicating location of current and future EVSE spaces • Photos of EVSE signage or pavement markings • Site plan notations indicating location of outlets for electric bicycles	Same as Level 1	Same as Levels 1 and 2

Guidance for Applicants

At all levels of the Green Building Standard, applicants will need to begin by determining the total vehicle parking capacity of their project. Next, they will need to calculate how many EV parking spaces are required, based on the targeted level of achievement, and incorporate these spaces into the design. At this stage, it is beneficial to distribute EVSE spaces proportionately between long-term and short-term parking sections. Applicants will then need to estimate and account for necessary sizing of electrical loads and transformer capacity, depending on the levels of EVSE they plan to incorporate, taking care to ensure that selected equipment and installation complies with the Ontario Electrical Safety Code and Electrical Safety Authority. Note that where capacity can be shared between spaces (e.g. by using a Level 2 charging station with multiple plugs), the cost and complexity of EV charging infrastructure can be greatly reduced. Finally, applicants will need to install clear and permanent signage and/or pavement markings to reserve these spaces for EVs. Considering parking design and programming early in the design process can help avoid complications and ensure that the project meets the Standard's EV infrastructure requirements.

Additional Resources

For more information on implementing EV infrastructure, visit the following links:

- Ontario Ministry of Transportation. (2018). *About electric and hydrogen vehicles.*
- Ontario Electrical Safety Authority. (2019). *Electrical Vehicle Charging Systems.*
- City of Toronto. (2019). *Electric Vehicles.*
- City of Vancouver. (2019). *Electric vehicles.*

5.2. Bicycle Infrastructure

Intent

To reduce community reliance on vehicles, lessen traffic congestion, and improve public health by promoting bicycles as a reliable mode of transportation.

Background

Bicycling offers benefits for individuals, communities, and the planet. It can be used for recreation, fitness, and daily transportation, offering health benefits and reducing traffic at the same time. In addition, every kilometre that is cycled instead of driven means fewer greenhouse gas emissions sent into the atmosphere. With its *Cycling Master Plan*, the City of Mississauga recognizes these benefits and envisions cycling as a way of life for its citizens. The Corporate Green Building Standard works to further these goals by promoting cycling infrastructure that can improve transportation network efficiency and convenience for all types of riders.

Requirements & Deliverables

Level 1	Level 2	Level 3
Requirements		
Short-term bicycle parking for 5% of all peak visitors and/or 10% of occupants, no fewer than 8 spaces per building. Provide one (1) on-site shower with changing facility for the first 100 regular occupants and 1 additional shower for every 150 regular occupants thereafter.	Short-term bicycle parking for 7% of all peak visitors and/or 15% of occupants, no fewer than 8 spaces per building. Provide one (1) on-site shower with changing facility for the first 100 regular occupants and 1 additional shower for every 150 regular occupants thereafter.	Short-term bicycle storage for 10% of all peak visitors and/or 20% occupants, no fewer than 12 storage spaces per building. Provide one (1) on-site shower with changing facility for the first 100 regular occupants and 1 additional shower for every 150 regular occupants thereafter. Provide public bicycle repair station at-grade with tools including tire levers, screwdrivers and spanners.
Deliverables		
• Project statistics including number and type of bicycle parking spaces per building • Site plan notations indicating location, number, and type of bicycle parking spaces per building • Site plan notations indicating location and number of shower and change facilities	Same as Level 1	**Levels 1 and 2 +** • Site plan notations indicating location and type of bicycle maintenance facilities

Guidance for Applicants

Meeting Levels 1 through 3 will require applicants provide increasing access to bicycle parking and facilities (e.g. changing rooms, showers, maintenance stations). Short-term bike parking stations may be constructed using canopy cover only, reducing the potential cost. However, bike parking should follow safety and accessibility standards as per the City of Mississauga Cycling Master Plan. Short-term bicycle parking should be located in a highly visible and publicly accessible location at-grade or on the first parking level of the building below grade. At Level 3, applicants are required to include a bike repair station, but may also wish to consider additional bike station programming such as a bike café.

Additional Resources

For more suggestions on creating a bike-friendly building, visit the following links:

- City of Mississauga. (2010). *Mississauga Cycling Master Plan.*
- City of Toronto. (2008). Guidelines for the Design and Management of Bicycle Parking Facilities.
- City of Vancouver. (2011). *Bicycle Parking Strategy.*

- HUB Cycling. (2016). *Not Just Bike Racks - Informing Design for End of Trip Cycling Amenities in Vancouver Real Estate.*

6. Waste Management Performance Requirements

Intent

To reduce the amount of construction and demolition waste that is sent to landfills or incinerated by promoting good waste management practices.

Background

Construction and demolition waste represent a sizable portion of the waste produced in the world, with much of it (e.g. wood, glass, plastics, and metals) being recyclable. By ensuring that these products are properly diverted instead of sent to the landfill or incinerator, green building design can prevent pollution, promote reuse and recycling, and keep valuable materials in active use longer. Planning for construction waste management early in the process allows time to identify components for reuse on site and coordinate with local handlers for different material streams. A well-designed and well-executed construction waste management plan can also decrease tipping fees and generate income by selling valuable scrap materials.

Requirements & Deliverables

Level 1	Level 2	Level 3
Requirements		
A minimum diversion rate of 75% of the total construction and demolition material must be achieved. Diverted materials must include at least three material streams, e.g. metals, concrete, drywall, wood, plastics, etc.	A minimum diversion rate of 90% of the total construction and demolition material must be achieved. Diverted materials must include at least three or four material streams, e.g. metals, concrete, drywall, wood, plastics, etc.	**Level 2 +** Minimum diversion rates must be achieved as follows: • Metals 99% • Paper and cardboard 99% • Soil and biomass 100% • Rigid foam, carpet, and insulation 95% • All others – combined weighted average 90%
Deliverables		
• Construction and demolition waste management plan • Construction and demolition waste declaration to be provided post construction	Same as Level 1	Same as Levels 1 and 2

Guidance for Applicants

Meeting Levels 1 through 3 will require increasing diversion rates of construction and demolition materials. While demolition waste from existing infrastructure does not need to meet the diversion rate requirements, a concerted effort to divert as much as possible is expected. Applicants will need to plan, manage, and track their construction materials, taking care not to over-order, and reach out to local waste receivers to coordinate their diversion needs. Once the building is constructed and operational, applicants can reinforce good waste management practices by implementing on-site waste sorting systems, organics collection and composting, and battery and electronics collection for occupants with distribution to appropriate handlers. Designers can help facilitate this by providing ample storage in the building for waste collection and storage, including space for bulky items. The continued sorting and diversion of multiple materials streams can help ensure that the building is green in practice as well as principle.

Additional Resources

For further guidance and examples on waste management practices, visit the following links:

- Region of Peel. (2019). *How to Sort Your Waste.*
- City of Toronto. (2019). *Long Term Waste Management Strategy.*
- Metro Vancouver. (2010). *Integrated Solid Waste and Resource Management.*

- Province of Manitoba. (2017). *Construction, Renovation and Demolition Waste Management Guideline.*

7. Water Performance Requirements

7.1. Stormwater Management

Intent

To reduce stormwater peak flow and runoff volume from the site by promoting the natural hydrological cycle.

Background

Urban development disrupts the natural hydrological cycle by compacting soil, removing vegetation, increasing impermeable surface area, and interrupting natural drainage. For most properties in Mississauga, this means that rain and melted snow is transported from the site as quickly as possible, through a complex network of pipes and directly into Lake Ontario. The City's population is growing, hard surface areas are increasing, and frequent and severe weather events are depositing more water than ever, so scaling up municipal infrastructure to match would be time-intensive and costly. Alternatively, designers can introduce green infrastructure and low-impact development strategies to recreate the site's natural hydrology. Such measures might include: minimizing the amount of area disturbed, limiting hardscaping, and implementing stormwater management tools like bioswales and green roofs. Introducing vegetated surface area through these steps has the added benefit of reducing the urban heat island effect.

Requirements & Deliverables

Level 1	Level 2	Level 3
Requirements		
Peak Flow Reduction: Achieve 85% reduction of the 100-year post-development flow to pre-development conditions of the site. Runoff Volume Reduction: Retain 80% runoff generated from a minimum of 15 mm depth of a single rainfall event from all site surfaces through infiltration, evapotranspiration, water harvesting and reuse.	Peak Flow Reduction: Achieve 100% reduction of the 100-year post-development flow to pre-development conditions of the site. Runoff Volume Reduction: Retain 100% runoff generated from a minimum of 15 mm depth of rainfall from all site surfaces through infiltration, evapotranspiration, water harvesting and reuse.	**Level 2 +** Incorporate green roof for the remaining roof area (excluding HVAC equipment, service pathways, and rooftop PV).
Deliverables		
• A stormwater management report including rainfall data and volume calculations • Stormwater management plans, details, or cross-sections consistent with report and including topography, landscaping, grading, etc. • A stormwater runoff declaration to be provided post construction	Same as Level 1	**Levels 1 and 2 +** • Site plan notations showing green roof details, including coverage area calculations

Guidance for Applicants

To meet the Green Building Standard, applicants will start by obtaining historic rainfall data for the project location. Ideally, this will comprise at least ten years of data collected from a consistent source such as the local airport, nearby universities, or water treatment plants. Next, the project team will need to calculate the runoff volume to be managed on site, which depends on post-development site conditions including the amount of paving, permeability of surfaces, roof area, and amount of vegetation. At this stage, the project's civil engineer or landscape architect can propose a combination of green infrastructure and low-impact development strategies to replicate the site's natural hydrological cycle and reduce the overall peak flow and runoff volume. Some examples include bioswales and rain gardens, which can be easy to implement at projects with generous green space and minimized hard surfacing. For a zero-lot lined project, where the building footprint reaches the site limits, or for heavily hardscaped areas, it may be

more appropriate to incorporate rainwater collection, storage, filtration, and reuse systems. In either case, applicants might also consider implementing infiltration planters, porous pavement, and/or a green roof, with the latter being mandatory for Level 3. It should be noted that the selected features will require regular maintenance to keep plants healthy and water flowing properly.

Additional Resources

For further guidance and examples of stormwater management techniques, visit the following links:

- City of Mississauga. (2016). *Stormwater Charge.*
- City of Toronto. (2019). *Stormwater Management Programs and Projects.*
- City of Vancouver. (2016). *Citywide Integrated Rainwater Management Plan.*
- International Living Future Institute (ILFI). (2019). *Living Building Challenge - Water Petal Intent.*

7.2. Water Use Intensity

Intent

To conserve potable water by reducing water used inside the building and for irrigation.

Background

On a global scale, clean drinking water is threatened by pollution, the impacts of climate change, and unsustainable water use patterns. Even with Canada's abundant water resources, we are witnessing continued drawdown of aquifers and lowered reservoir levels, issues that are only exacerbated by our steady population growth. The use of potable water for purposes other than drinking, such as showering and irrigation, represents a significant amount of our clean water consumption. By managing water use intensity both inside and outside buildings, the Mississauga Green Building Standard works to conserve this most precious resource.

Requirements & Deliverables

Level 1	Level 2	Level 3
Requirements		
Achieve at least a 20% reduction in potable water consumption for the building (not including irrigation) over the baseline. Achieve at least a 60% reduction in in all outdoor potable water consumption (irrigation). Where potable water is used for irrigation, provide native, drought-tolerant plants for at least 50% of the landscaped site area (including at-grade landscapes, green roofs and walls).	Achieve at least a 40% reduction in potable water consumption for the building (not including irrigation) over the baseline. Achieve a 100% reduction in in all outdoor potable water consumption (irrigation). Provide native, drought-tolerant plants for at least 60% of the landscaped site area (including at-grade landscapes, green roofs and walls).	Achieve at least a 60% reduction in potable water consumption for the building (not including irrigation) over the baseline. Achieve a 100% reduction in indoor non-potable water consumption (toilets). Achieve a 100% reduction in in all outdoor potable water consumption (irrigation). Provide native, drought-tolerant plants for 100% of the landscaped site area (including at-grade landscapes, green roofs and walls).
Deliverables		
• Water efficiency declaration to be provided post construction • Landscaping plan showing vegetated areas and potable or non-potable irrigation system • Plant list including common and scientific names, highlighting native, drought-tolerant species	Same as Level 1	**Levels 1 and 2 +** • Record that the Province has been lobbied to allow for the capture and recycling of rainwater and wastewater for use in toilets

Guidance for Applicants

Meeting each level of the Standard requires applicants to achieve increasingly ambitious targets for water use reduction. Inside buildings, applicants can lower consumption by incorporating efficient plumbing fittings, including faucets, toilets, sinks, and showerheads. Outside, applicants can reduce potable water used for landscaping by selecting plants that are native, well-adapted, and drought tolerant (i.e. xeriscaping). It may be appropriate to involve a horticulturalist or landscape architect to assist with plant selection, as future climate shifts could change what plants are best-suited to the site. At all levels, comprehensive water metering can help the project team to track water consumption and identify areas that may need improvement.

The capture and recycling of rainwater and wastewater for use in toilets and for irrigation can also help buildings to meet water use reduction targets, but this is not currently allowed in Mississauga. Those applicants wishing to pursue the ILFI's Living Building Challenge can achieve alternative credits for the Water Petal by demonstrating that they have lobbied the Province to revise these restrictions.

Additional Resources

For helpful resources and examples of how to reduce water use, visit the following links:

- City of Toronto. (2019). *Water Efficient Landscaping.*
- Halton Region. (2019). *Plant Selection & Design.*
- International Living Future Institute (ILFI). (2019). *Living Building Challenge - Water Petal Intent.*

8. Natural Heritage Performance Requirements

8.1. Erosion and Sediment Control

Intent

To reduce erosion and sediment control resulting from construction activities and changes to the site.

Background

Changes to the land resulting from urban development can decrease soil permeability and increase erosion. When trees and plants are removed and replaced with hard surfaces, natural drainage pathways are altered and stabilizing topsoil is stripped away, increasing water runoff and introducing harmful sediments, oils, chemicals, and fertilizers into downstream watercourses. These changes can lead to more severe and frequent flood events, habitat disruption and biodiversity loss. Construction activities are a major contributor of added sediment into watercourses, with much of this being avoidable.

Requirements & Deliverables

Level 1	Level 2	Level 3
Requirements		
Follow the Erosion and Sediment Control Guideline for Urban Construction during construction and demolition activities.	Follow the Erosion and Sediment Control Guideline for Urban Construction during construction and demolition activities. Remove 80% of total suspended solids (TSS) on an annual loading basis from all runoff leaving the site based on the post-development level of imperviousness.	N/A
Deliverables		
Notations on plans and drawings • Description of compliance with the Erosion and Sediment Control Guideline for Urban Construction • Erosion and sediment control plan • Site plan notations indicating erosion and sediment control measures implemented	**Level 1 +** • Stormwater runoff declaration to be provided post construction	N/A

Guidance for Applicants

The first step in meeting the Standard is to designate a party to initiate erosion and sediment control design well before construction begins. This role often falls to the civil engineer, but could also be fulfilled by the landscape architect, project hydrologist, or general contractor. This party will then review the *Erosion and Sediment Control Guideline for Urban Construction* before evaluating the site for its specific control needs. Construction projects vary greatly in type, size, and complexity, but some general points of consideration include: slope; total ground are that will be disturbed and for how long; neighbouring properties; existing stormwater management systems that need to be protected; project sequencing and phasing; construction entrances and equipment to be used; and local weather conditions. With this information, the responsible party will craft an appropriate erosion and sediment control plan to be followed throughout the project. At this stage, responsibility will likely transfer to the general contractor or builder, who will implement site-level erosion and sediment control measures (e.g. silt fences, protections for storm drains) to remove sediment for the runoff leaving the site. Throughout construction, the project team will need to monitor control measures and record their integrity through date-stamped photographs and field reports, resolving any issues in a timely manner.

Additional Resources

For more information about erosion and sediment control, visit the following links:

- Greater Golden Horseshoe Area (GGHA) Conservation Authorities. (2006). *Erosion and Sediment Control Guideline.*
- Erosion and Sediment Control Association of British Columbia (ESCA BC). (2019). *ESC Best Management Practices.*

8.2. Light Pollution

Intent

To reduce the negative impacts that a building's lighting can have while accentuating the benefits.

Background

Light pollution is misused light caused by glare, light trespass, over lighting, and sky glow. It generally results from exterior lighting designs that are inappropriate for the site context. While proper lighting is important for human safety and convenience, light pollution creates numerous environmental problems. It can interrupt wildlife species that hunt or forage at night and disrupt the movement patterns of others (e.g. migratory birds and bats). Misdirected light can also impact human health, with implications for our night vision, circadian rhythms, melatonin production, and sleep patterns. In addition, light pollution into areas that do not need illuminating is a waste of both energy and money.

Requirements & Deliverables

Level 1	Level 2	Level 3
Requirements		
All exterior fixtures must be Dark Sky compliant, as per the International Dark-Sky Association (IDA). Any rooftop and facade architectural illumination must be directed downward and turned off after facility operating hours. Install an automatic device that reduces the outward spillage of internal light by: a) Reducing the input power to non-emergency lighting fixtures by at least 50 per cent outside of facility operating hours. OR b) Shielding all non-emergency light fixtures outside of facility operating hours.	**Level 1 +** Ensure that any lighting not physically attached to the building is connected to solar PV as a primary source of power.	N/A
Deliverables		
• A lighting list highlighting Dark Sky compliant fixtures • A lighting plan showing boundaries, location of fixtures, and lighting control measures • A lighting controls declaration to be provided post construction	**Level 1 +** • Lighting plan showing solar PV connections	N/A

Guidance for Applicants

To meet the Standard, applicants will first need to establish their project goals for exterior lighting. This draft lighting plan will identify areas that need to be illuminated and to what level, along with the light boundary for the project (i.e. those portions on and off the site where illumination should be avoided). With these details in hand, the project team can populate the lighting plan with a fixture and luminaire schedule, making use of technologies designed to reduce light pollution (e.g. full cut-off luminaires, low-reflectance surfaces, low-angle spotlights) and lights that have been tested with the backlight-uplight-glare (BUG) method, both of which are becoming increasingly available. Once the lighting plan is established, the project team will want to consider each fixture for light trespass, glare, overlighting, and sky glow, making refinements as needed. To further reduce light pollution, applicants might also benefit from the use of motion sensor lighting as a means of addressing security concerns, and from lowering the colour temperature of lighting from cool (above 4000 Kelvin degrees) to warm (below 3000K) consistently across all areas. It should also be noted that, while implementing solar PV to meet the requirements of Level 2 may sound costly, the installation of solar lights can eliminate the need for extensive trenching and utility connections, moderating cost premiums when compared to traditional outdoor lights and potentially saving money over time.

Additional Resources

For helpful examples of how to reduce light pollution, visit the following links:

- City of Mississauga. (2013). *Nuisance Lighting By-law 262-12.*
- US Green Building Council. (2019). *BUG rating method.*
- City of Toronto. (2017). *Best Practices for Effective Lighting.*
- International Dark-Sky Association (IDA). (2019). *Outdoor Lighting Basics.*

8.3. Biodiversity

Intent

To conserve biodiversity by promoting planting while avoiding invasive species, in addition to protecting local bird species.

Background

Biodiversity generally refers to the variety and variability of life. It accounts for the interconnectedness of all living things and the way they interact with each other and their environment. Human beings depend on biodiversity for all aspects of our lives, from clean air and water to food and building materials. We also benefit from ecosystem services such as nutrient recycling, pollination, carbon sequestration, and reduction of the heat island effect provided by shade trees and planted areas. However, Earth's growing population is threatening biodiversity at an increasing rate, through pollution, climate change, habitat change, the introduction of invasive species, and unsustainable use of resources. To help mitigate the harmful contribution of conventional development, green buildings can consider and promote biodiversity in their designs.

Requirements & Deliverables

Level 1	Level 2	Level 3
Requirements – Planting		
Provide trees planted in both softscape and hardscape with a minimum soil volume of 15 m^3, 30 m^3, 45 m^3 for small, medium and large-sized trees, respectively. Plant 'shade trees' approximately 6-8 m (20- 27 ft) apart along all street frontages, open space frontages and public walkways, and 8-10m apart for all street frontages, open space frontages and public walkways.	Same as Level 1	Same as Levels 1 and 2
Deliverables – Planting		
• Landscaping plan indicating soil volume, species, and quantity for each planting area	Same as Level 1	Same as Levels 1 and 2
Requirements – Native species		
Provide pollinator-friendly species for at least 10% of the landscaped site area. Ensure that 25% of all proposed plantings are native species. Avoid the use of all invasive species in landscape design as per the Ontario Invasive Plant Council guidelines.	Provide pollinator-friendly species for at least 25% of the landscaped site area. Ensure that 50% of all proposed plantings are native species. Avoid the use of all invasive species in landscape design as per the Ontario Invasive Plant Council guidelines.	Provide pollinator-friendly species for at least 50% of the landscaped site area. Ensure that 100% of all proposed plantings are native species. Avoid the use of all invasive species in landscape design as per the Ontario Invasive Plant Council guidelines.
Deliverables – Native species		

• Plant list including common and scientific names, highlighting native and pollinator-friendly species • Description of compliance with the Ontario Invasive Plant Council guidelines	Same as Level 1	Same as Levels 1 and 2
Requirements – Bird friendly development		
Consult the City of Toronto's Bird Friendly Development Guidelines and provide a summary report demonstrating that the proposed project has considered bird safety.	Level 1 + Treat glass on buildings with a density pattern between 10-28 cm (4 to 11 in) apart for a minimum of the first 10 to 12 m (33-40 ft) above grade. **OR** Mute reflections for a minimum of the first 10-12 m (33-40 ft) portion of a building above grade. Where a green roof is constructed adjacent to glass surfaces, ensure that the glass is treated to a height of at least 12 m (40 ft) above the level of the green roof, to prevent potentially fatal collisions with windows. Where exhaust/ventilation grates cannot be avoided at ground level, design the grates to have a porosity of less than 2 centimetres x 2 centimetres (1inches x 1inches).	Same as Level 2
Deliverables – Bird friendly development		
• Narrative describing the project's consideration of bird safety	Level 1 + • Site plan notations showing treated area required, type of treatment, and density/colour of visual markers • Summary table of bird friendly glass treatments for each elevation • Site plan notations highlighting bird friendly grates, where applicable	Same as Level 2

Guidance for Applicants

Meeting Levels 1 through 3 of the Mississauga Green Building Standard will require applicants to incorporate increased planting into landscape designs, with a focus on increasing amounts of native and pollinator-friendly species. In addition, applicants will need to demonstrate what steps their project takes to reduce the building's harmful effect on birds, ranging from a short summary report for Level 1 to prescribed glazing and grates of a minimum size for Levels 2 and 3.

Additional Resources

For helpful guidance on using green buildings to promote biodiversity, visit the following links:

- City of Toronto. (2010). *Toronto Street Trees: Guide to Standard Planting Options.*
- City of Vancouver. (2011). *Street Tree Guidelines for the Public Realm.*
- Ontario Biodiversity Council. (2011). *Ontario's Biodiversity Strategy.*

- City of Mississauga. (2011). *Green Development Strategy.*
- Ontario Invasive Plant Council. (2019). *Invasive Plants.*
- City of Toronto. (2007). *Bird-friendly Development Guidelines.*

9. APPENDIX A: Integrating the CGB Standard into Procurement

When procuring municipal projects, the City of Mississauga traditionally employs either a Design-Bid-Build approach or a Design-Build approach, as appropriate. These processes are outlined in Figure 2 and Figure 3 below, including considerations for complying with the CGB Standard.

Figure 2: Design-Bid-Build Approach with Mississauga CGB Standard Key Steps and Roles

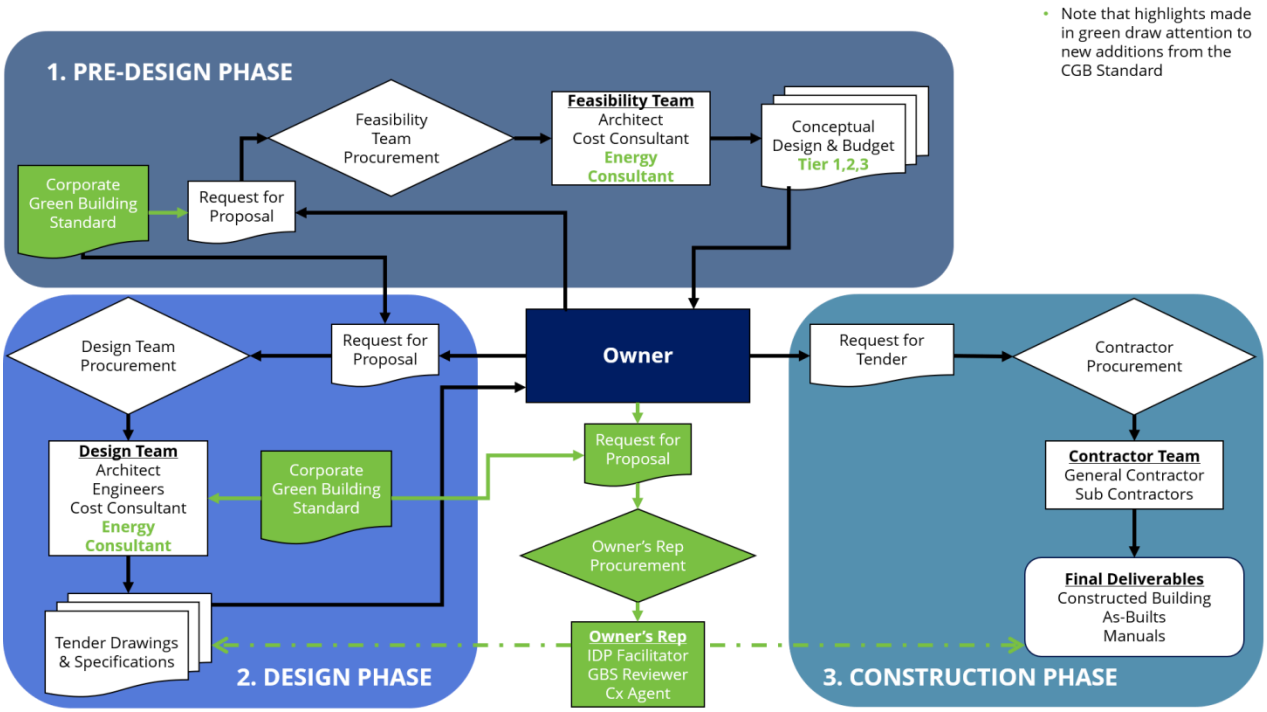
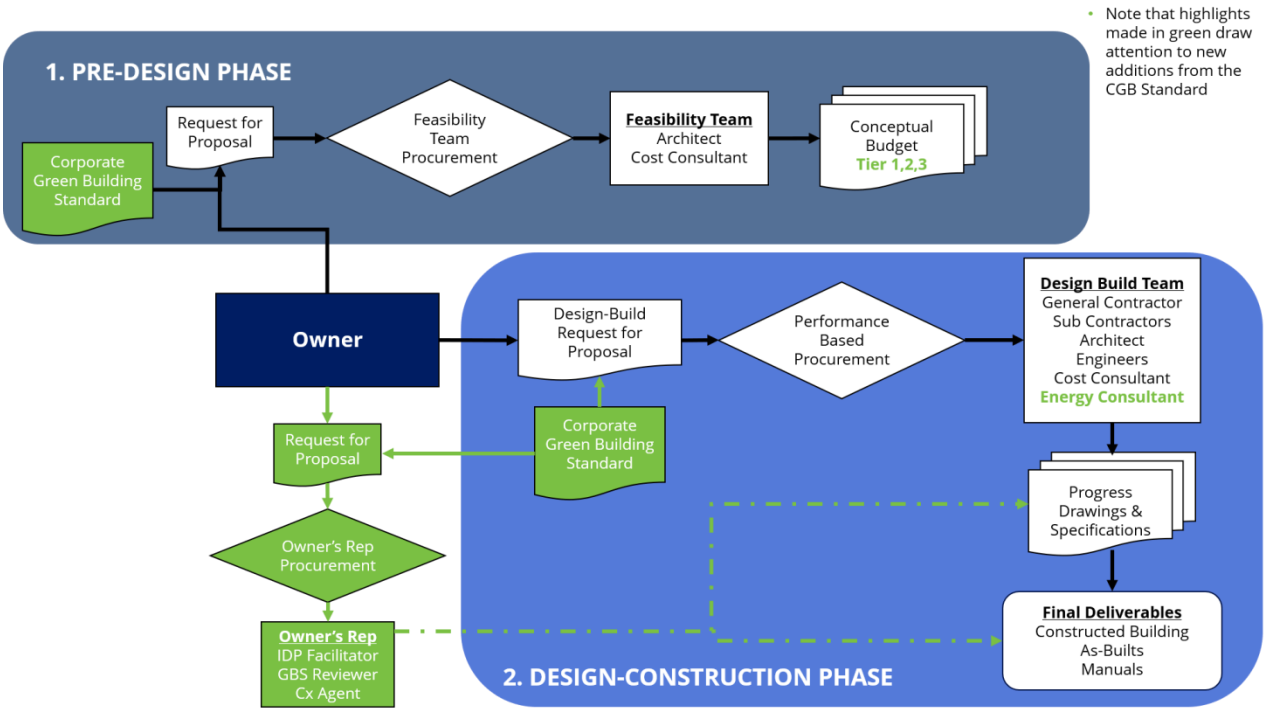


Figure 3: Design-Build Approach with Mississauga CGB Standard Key Steps and Roles



9.1. Using an Integrated Design Process (IDP)

Achieving high environmental performance for minimized added cost can be greatly facilitated thought the use of an integrated design process (IDP). IDP is a highly collaborative approach to building design that brings together all stakeholders who will be involved in various aspects of a building right from the start of the project. Under IDP, a comprehensive, integrative process is used to explore interactions between building and site systems through iterative cycle of analysis, charrettes, implementation, and performance evaluation.

9.2. How is IDP different from conventional design practices?

Conventional design proceeds in a linear manner with professional often making decisions without speaking to the other parties involved. Typically, an architect will decide what the building looks like, an engineer decides what the systems will be, and then a general contractor constructs the building, with operations then handed over to a separate party once construction is complete. Any changes to the design can impose heavy costs or scheduling setbacks.

In IDP, a building is approached holistically. At the outset of the project, the building's stakeholders form an interdisciplinary team that explores, tests, and evaluates design strategies to find those with the greatest potential. Through the process, members of the team actively communicate and offer differing viewpoints, looking for synergies and trade-offs in the preliminary stages of building design. For example, minimizing the windows on the side of a building might reduce the scale of heating, ventilation, and air conditioning (HVAC) equipment required, which could free up funds for other aspects of the project. Working separately, it is unlikely that the professionals would have identified these synergies.

The costs of employing an IDP are frontloaded but can more than offset the cost of requiring it. While a project team may spend more time in the design stage of a project, the identified synergies can result in:

- Lower initial capital costs;
- Fewer change orders;
- Fewer delays in construction; and
- Reduced long term operating costs

9.3. Who should be involved?

The owner and project consultant appoint team members to represent the range of specialities, disciplines and interest involved in a building project. Team members often include:

- Owners and/or the owner's representative
- Architects
- Construction managers
- Civil engineers
- Landscape architects
- Mechanical and electrical engineers
- Specialized consultants (acoustics, lighting, ecology)
- Building commissioning professionals
- Building occupant representatives
- Building maintenance and operation representatives
- IDP facilitators

9.4. Key Steps

The following steps represent the key components in the IDP process that should be taken:

1. **Formulate project goals and expectations.** Early in the process, the owner (and/or CGB Standard Representative), and project consultant identify measurable goals and expectations for the building. They then summarize the outcomes in an Owner's Project Requirements (OPR) document that the project team can reference throughout the build. At this point, the owner can also appoint an IDP facilitator to act on their behalf.

2. **Bring together an interdisciplinary project team.** Next, the owner (or IDP facilitator) and project consultant assemble a team of stakeholders from different professions (e.g. architect, civil engineer, acoustical engineer, future occupant), aiming to achieve broad representation. The makeup of the team will depend on owner's project expectations and site-specific conditions. If possible, it is beneficial to include a representative for the builder who can speak to construction costs and timelines early on. The team then holds an integrative design charrette, aiming to align stakeholders on: the OPR, budget, schedule, scope, quality and performance expectations, and occupant expectations. This is also an appropriate time to discuss risks, risk tolerance, and risk management strategies for the project.

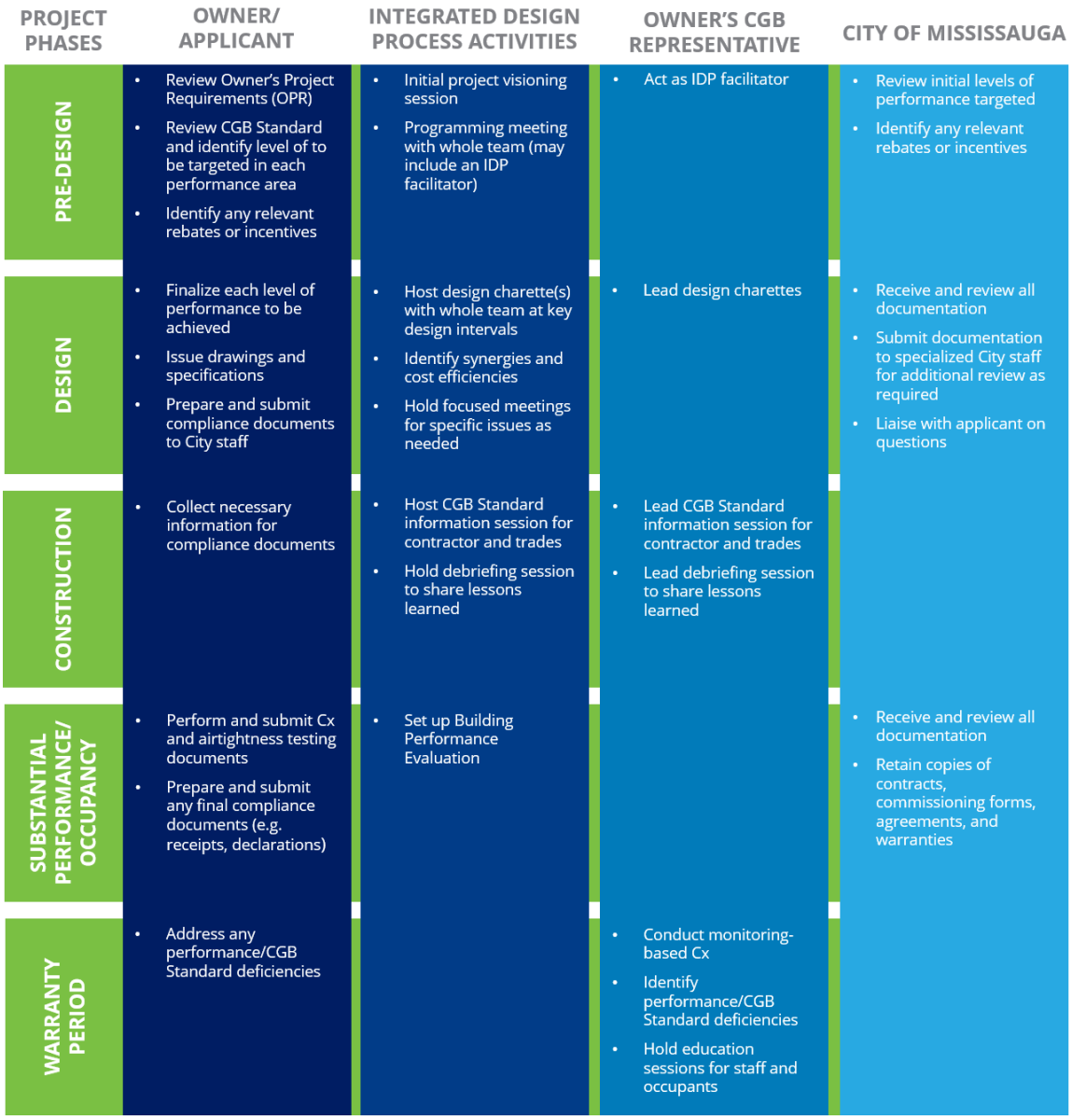
3. **Consult the interdisciplinary project team at key stages throughout the project.** Once the team is assembled and all parties have completed their initial research, the IDP facilitator convenes an integrative design charrette, aiming to align stakeholders on: the purpose of the project, OPR, budget, schedule, scope, quality and performance expectations, and occupant expectations. This is also an appropriate time to discuss risks, risk tolerance, and risk management strategies for the project. After the initial meeting, the IDP facilitator can hold additional charrettes with the entire team or select members at key points (e.g. pre-design, schematic design, design development, tendering/awarding, substantial completion, post occupancy).

4. **Apprize owner of progress and achievements at key stages of the project.** The IDP facilitator report to the project owner at key points of the project, highlighting significant decisions made by the team and keeping the owner appraised of implications for the OPR, budget, and timeline. The Integrative Design Process can continue well into the building's occupation and operation to ensure that the original goals are still being met.

9.5. Using this Guide with an IDP Approach

In contrast to Figure 1, Figure 4 below shows the key steps involved in applying for the CGB Standard with an Integrated Design Process approach. Notably, many responsibilities that would otherwise be assigned to the owner/applicant become IDP activities, or are made more robust, such as the initial project visioning session.

Figure 4: Complying with the Mississauga CGB Standard using an IDP Approach



9.6. Useful Resources

For further information about taking an integrated design approach, visit the following links:

- American National Standards Institute (ANSI). (2012). *Integrative Process (IP) ANSI Consensus Guide 2.0 for Design and Construction of Sustainable Buildings and Communities.*
- Public Services and Procurement Canada (PSPC). (2018). *Integrated Design Process.*
- BC Green Building Roundtable. (2007). *Roadmap for the Integrated Design Process.*
- Canada Mortgage and Housing Corporation (CMHC). (2004). *Integrated Design Process Guide.*

10.APPENDIX B: Energy Modelling Guidelines

This document is intended to provide clarity on energy modelling inputs for the purposes of showing compliance with the Corporate Green Building Standard ("the Standard"). This document is not intended to be an exhaustive set of technical and administrative requirements for energy modelling. Rather, it aims to dictate and/or clarify inputs to ensure that building performance, as shown in the energy models, is equitably rewarded across projects. It is also the hope that these guidelines facilitate closer agreement between energy models and actual operating performance of buildings and therefore, may be updated from time to time.

In general, this document dictates energy modelling inputs that may have a large impact on the Standard's performance targets but are not integral to building system performance (ex. Schedules) as well as clarifies inputs where current industry practice for those inputs does not support the Standard's intended outcomes (ex. Not properly accounting for total envelope heat loss).

Design related modelling inputs not specified in this document shall represent, to an appropriate degree of accuracy, the design of the facility. Software limitations shall not limit the accuracy of energy modelling to show compliance with the Standard; consultants are expected to overcome any software limitations with appropriate engineering calculations. All other modelling inputs not discussed in these guidelines shall be based on accepted industry practice.

Where elements of the design may vary from the assumptions outlined in the Energy Modelling Guidelines, these will be brought to the attention of the City of Mississauga's project manager, and a variance in targets or compliance demonstration methodology may be considered on a case by case basis.

10.1. Definitions

Modelled Floor Area – The total floor area of the building, as reported by the energy simulation software, and generally to within 5-10% of the gross floor area from the architectural drawings. The floor area specifically excludes any exterior spaces and parkades, but includes partially conditioned spaces such as apparatus bays in fire halls.

Energy Use Intensity (EUI) – The sum of **all** energy utilities (i.e. Electricity, natural gas, district heating) used on site by the project, divided by the *Modelled Floor Area*. EUI shall be reported in kWh/m^2/year.

$$EUI\ \left[\frac{kWh}{m^2 a}\right] = \frac{\sum Site\ Energy\ Use\ \left[\frac{kWh}{a}\right] - \sum Site\ Renewable\ Energy\ Generation\ \left[\frac{kWh}{a}\right]}{Modelled\ Floor\ Area\ [m^2]}$$

Site Energy Use – All energy used on site including all end-uses, such as heating, cooling, fans, pumps, elevators, parkade lighting and fans, and exterior lighting, among others. It incorporates all site efficiencies, including the use of heat pumps or re-use of waste heat. It does not include energy generated on site.

Site Renewable Energy Generation – Energy generated on site from renewable sources, such as solar photovoltaics, wind, and solar thermal. Where a site is not able to send energy off-site (e.g. connected to the electricity grid), only energy that can be consumed (or stored and then consumed) on site shall be counted as Site Renewable Energy Generation.

Greenhouse Gas Intensity (GHGI) – The **total** greenhouse gas emissions associated with the use of **all** energy utilities on site, according the following factors extracted from SB-10:

Natural Gas: 183 g/kWh
Electricity: 50 g/kWh
District Energy: As provided by utility[7],[8]
Purchased Renewable Energy: 0 g/kWh[9]

GHGI shall be reported in kg eCO_2/m^2/year.

Thermal Energy Demand Intensity (TEDI) – The amount of heating energy delivered to the project that is outputted from any and all types of heating equipment, per unit of modelled floor area. Heating equipment includes electric, gas, hot water, or DX heating coils of central air systems (ex. make-up air units, air handling units, etc.), terminal equipment (ex. baseboards, fan coils, heat pumps, reheat coils, etc.) or any other equipment used for the purposes of space conditioning and ventilation. Heating output of any heating equipment whose source of heat is not directly provided by a utility (electricity, gas or district) must still be counted towards the TEDI. For example, hot water or DX heating sources that are derived from a waste heat source or a renewable energy source do not contribute to a reduction in TEDI, as per the above definition.

Specific examples of heating energy that are not for space conditioning and ventilation, that would not be included in the TEDI, include domestic hot water, maintaining swimming pool water temperatures, outdoor comfort heating (ex. Patio heaters), gas fired appliances (stoves, dryers), heat tracing, etc.

TEDI shall be reported in kWh/m^2/year.

Clear Field – An opaque wall or roof assembly with uniformly distributed thermal bridges, which are not practical to account for on an individual basis for U-value calculations. Examples of thermal bridging included in the Clear Field are brick ties, girts supporting cladding, and structural studs. The heat loss associated with a Clear Field assembly is represented by a U-value (heat loss per unit area).

Interface Details - Thermal bridging related to the details at the intersection of building envelope assemblies and/or structural components. Interface details interrupt the uniformity of a clear field assembly and the additional heat loss associated with interface details can be accounted for by linear and point thermal transmittances (heat loss per unit length or heat loss per occurrence).

10.2. Acceptable Energy Modelling Software

The simulation program shall meet the requirements as set out in ASHRAE 90.1-2010, G2.2.

10.3. Weather File

Projects shall use the Pearson International Airport CWEC 2016 Weather File, available from http://climate.onebuilding.org/

[7] The emissions factor of a district energy system shall be as provided by the utility (and as agreed by the utility and the AHJ).
[8] Where a district energy utility agrees to provide a development with energy at a carbon intensity that varies from that of the overall system, documentation of that agreement (or intent to enter an agreement), and any other measures or agreements required to secure the supply of low-carbon energy, shall be provided to the authority having jurisdiction.
[9] Where renewable energy is purchased directly from utilities, and guarantees of long-term supply (in the proportions used to demonstrate compliance) are provided to the satisfaction of the authority having jurisdiction, an emissions factor of zero may be applied to the portion of the respective utility that is considered renewable.

10.4. Unmet Hours

Annual unmet hours for any zone in the energy simulation shall be limited to 100 hours or less, with the following exception: annual cooling unmet hours are allowed, provided that it the cooling capacity has been purposely undersized according to the design intent. Unmet heating or cooling hours does not apply to zones with no heating or cooling equipment.

10.5. District Energy

For buildings connecting to a district energy utility, the modeller may chose two options:

1. Model heating or cooling energy as delivered to site with 100% efficiency; or,

2. Model the building systems as including the total district energy system, and use the system efficiency as provided by the utility (and as agreed on by the utility and the AHJ) when calculating site energy use. Where district systems make use of biomass/biofuels to achieve low carbon supply, yet are limited in maximum efficiencies, consideration may be given in system efficiency agreed on with the AHJ.

10.6. Schedules, Internal, and DHW Loads

All occupancy, plug, and DHW loads shall be based on Table A-8.4.3.2.(2)-B of NECB 2015, except as specified in Tables F-1 and F-2 below for libraries and recreation centres, modified to reflect typical City of Mississauga facility operation hours. If additional modifications are required to other schedules in order to meet City of Mississauga operating parameters, the model shall be modified to account for the actual hours.

Lighting loads shall be modelled as per the design. Credit for lighting occupancy sensors may be applied as a reduction to the lighting schedule or modelled lighting power density as per the methodology in NECB 2015, Section 4.3.2.10. Daylight sensors shall be modelled directly in the software, where credit will be as per actual modelled results. Lighting schedules for spaces whose functions are not directly tied to the main building function (ex. Stairways, mechanical, and electrical rooms) may use recommended lighting hours as guidance, provided in Appendix B of BC Hydro's New Construction Program's Energy Modelling Guideline. Spaces which are normally light 24 hours a day, such a parkades and some circulation spaces, shall be modelled as such. Exterior lighting shall be scheduled on at night, using an astronomical clock.

Credit for DHW savings is permitted using industry standard methods for hot water use estimates (for example, LEED Canada NC 2009, Water Efficiency Prerequisite 1) with savings calculated to OBC requirements for maximum fixture flow rates. Reductions are also permitted for installations of passive drain water heat recovery systems to a maximum of 15%, and for heat pump systems, which shall be modelled as per the design. Savings shall be determined using good engineering practice and relative to the areas in which the system is installed (i.e. the 15% reduction is only allowed if drain water heat recovery was installed on all DHW fixtures). Models shall assume an average domestic cold water inlet temperature of 5°C.

All schedules shall be based on Table A-8.4.3.2.(2)-B of NECB 2015, except as specified in Tables F-1 and F-2 below for libraries and recreation centres, modified to reflect typical City of Mississauga facility operation hours. Space set points for temperature and humidity shall be as per design.

Table F-1 Library Schedules

Hour	Occupancy			Lighting			Receptacle			Fans			DHW		
	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun
1	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
2	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
3	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
4	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
5	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
6	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
7	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
8	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
9	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
10	0.2	0.5	0.5	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.3	0.3	0.3
11	0.5	0.6	0.6	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.4	0.5	0.5
12	0.5	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.8	0.9	0.9
13	0.7	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.8	0.9	0.9
14	0.7	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.8	0.9	0.9
15	0.7	0.7	0.7	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.8	0.7	0.7
16	0.8	0.7	0.7	0.9	0.6	0.6	0.9	0.6	0.6	1	1	1	0.6	0.5	0.5
17	0.7	0	0	0.9	0.05	0.05	0.9	0.05	0.05	1	0	0	0.4	0.3	0.3
18	0.5	0	0	0.9	0.05	0.05	0.9	0.05	0.05	1	0	0	0.3	0.05	0.05
19	0.3	0	0	0.6	0.05	0.05	0.6	0.05	0.05	1	0	0	0.2	0.05	0.05
20	0.3	0	0	0.5	0.05	0.05	0.5	0.05	0.05	1	0	0	0.2	0.05	0.05
21	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
22	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
23	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
24	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05

Table F-2 Recreation Centre Schedules

Hour	Occupancy			Lighting			Receptacle			Fans			DHW		
	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun
1	0	0.3	0.3	0.1	0.5	0.5	0.1	0.5	0.5	0	1	1	0.05	0.6	0.5
2	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0.05	0.05	0.05
3	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0.05	0.05	0.05
4	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0.05	0.05	0.05
5	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0.05	0.05	0.05
6	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0.05	0.05	0.05
7	0.1	0.1	0.1	0.5	0.5	0.5	0.5	0.5	0.5	1	1	1	0.7	0.7	0.7
8	0.2	0.2	0.2	0.7	0.7	0.7	0.7	0.7	0.7	1	1	1	0.7	0.7	0.7
9	0.5	0.5	0.5	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.7	0.7	0.7
10	0.5	0.5	0.5	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.7	0.7	0.7
11	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.4	0.4	0.4
12	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.5	0.5	0.5
13	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.6	0.6	0.6
14	0.5	0.5	0.5	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.6	0.6	0.6
15	0.2	0.2	0.2	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.4	0.4	0.4
16	0.2	0.2	0.2	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.3	0.3	0.3
17	0.3	0.3	0.3	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.3	0.3	0.3
18	0.6	0.6	0.6	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.4	0.4	0.4
19	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.5	0.5	0.5
20	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.8	0.8	0.8
21	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.8	0.8	0.8
22	0.6	0.6	0.6	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.9	0.9	0.5
23	0.4	0.4	0.4	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.9	0.9	0.5
24	0.3	0.3	0.3	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.6	0.7	0.5

10.7. Other Loads

Elevators

Elevators shall be modelled by using an electrical load of 3kW per elevator and the equipment schedule of the building type.

Other Process Loads

All process loads expected on the project site are to be included in the energy model. This includes but is not limited to: IT/data loads, exterior lighting, swimming pool heating, patio heaters, heat tracing, etc. All loads are to be estimated to reflect the actual design and using good engineering practice.

Note: Electric car charging is not included in the building process loads, as this is a growing load that is associated with transportation rather than buildings, and may include sub-metering and/or re-sale of electricity.

10.8. Infiltration

Infiltration shall be modelled as a fixed rate of 0.2 L/s/m^2 (0.0394 cfm/ft^2) at operating pressure, and is to be applied to the modelled above-ground wall area (i.e. walls and windows). Infiltration shall be scheduled on at all times.

Reduced air leakage rates may be modelled. If choosing to model a reduced infiltration rate, the project must commit to achieving the corresponding airtightness target, to be confirmed by mandatory airtightness testing.

Note: projects must provide all airtightness documentation required by the AHJ at each phase of project approval, and projects using reduced infiltration rates may have additional documentation requirements.

Envelope airtightness test results at a pressure of 75 Pa can be converted to ambient pressures for use in energy modelling software by multiplying the value by 0.112. Conversely, modelled infiltration rates may be converted to an airtightness target by dividing by 0.112. Note that airtightness results are often normalized by the total envelope surface area, which is different than the above ground wall area, due to the inclusion of floors and roofs. When converting from an airtightness test to modelled infiltration or vice-versa, the difference in surface areas must be accounted for.

$$I_{AGW} = 0.112 * q_{75Pa} * \frac{S}{A_{AGW}}$$

Where:

I_{AGW} = infiltration rate (L/s.m^2) to be used for energy modelling, and applied to the modelled above-ground wall area

q_{75Pa} = normalized envelope air leakage (L/s.m^2) as tested at 75 Pa

S = total surface area (m^2) of the building envelope included in the air tightness test (i.e. the pressure boundary), including ground floors and roofs, and possibly below-grade walls

A_{AGW} = modelled area (m^2) of the above-ground wall (including windows)

10.9. Ventilation

Ventilation rates are to be modelled as per design, including but not limited to ventilation for occupants according to building code requirements, make-up air for exhaust requirements, and pressurization make-up air, among others.

Credit may be taken for demand control ventilation systems that monitor CO_2 levels by zone and that have the ability to modulate ventilation at either the zone or system level in response to CO_2 levels. Reduction in outdoor air shall be modelled as closely as possible to reflect the actual operation of the designed ventilation system and controls. The occupancy schedule can be used as a surrogate for CO_2 control in the model. For example, if a zone has the ability to decrease ventilation in response to CO_2 levels in that zone, the occupancy-based ventilation for that zone at each time step shall be determined by multiplying the zone's design occupancy-based ventilation rate with the schedules occupancy fraction.

10.10. Other Considerations

Depending on the stage of the project that the energy model is developed, there may be the need to make a number of assumptions, of which many can have a significant impact on the performance of the building. While it is up to the design team and energy modeller to make reasonable assumptions based on past experience or engineering judgement, the items noted below are explicitly listed as they are often misrepresented in energy models.

Heat or Energy Recovery Ventilators

Heat or energy recovery ventilators shall be modelled according to design, even in instances where there exist software limitations. Appropriate workarounds or external engineering calculations are expected to be performed to accurately assess the performance of the as-designed systems. This includes the use of preheat coils and/or other frost control strategies.

When modelling a heat recovery system, the energy modeller must use Sensible Recovery Efficiency (SRE), and determine if an adjustment to efficiency is required to properly account for fan heat in the system. SRE is a measure of the heat exchanger's efficiency, i.e. removing the impact of case heat loss, air leakage, fan heat, etc., and is defined in CAN-CSA C439-2014. While the impact of such items do improve the heat exchanged to the supply air of the HRV, they do so at the expense of indoor air quality or heat from the space in which the HRV is located, with the exception of fans. The modeller must do one of the following:

a) Use SRE of the specified product and model fan location and power as per the HRV's design directly in the software

b) If the software cannot model exact fan placement and/or fan power as per the HRV's design, adjust the SRE efficiency so that it incorporates the benefit of fan heat directly in the SRE value for any fans that contribute heat to the supply air stream. Model the fans without power and account for their energy use elsewhere in the software or externally to the software.

Heat or energy recovery ventilators that use frost control strategies which limit the amount of ventilation supplied to the space (i.e. exhaust only defrost) shall be modelled to include an electric preheat coil before the heat or energy recovery ventilator that heats the air to the minimum temperature before frost control is employed, as indicated by the manufacturer. For example, if the minimum temperature prior to frost control being deployed is -5°C, then an electric preheat coil shall heat the incoming air to -5°C prior to it entering into the heat or energy recovery ventilator. The purpose of this approach is to not reward designs that reduce ventilation to the space due to their lack of efficiency.

Terminal Equipment Fans

Terminal equipment fans shall be modelled according to design. Specifically, ensure that fan power and fan control (i.e. cycling, always on, multi or variable speed) of terminal equipment represent the design and design intent as accurately as possible.

VAV and Fan-Powered Boxes

Modellers must ensure that minimum flow rates and control sequences of VAV terminals and Fan Powered Boxes are modelled according to the design, and if not available at the time of modelling, according to expected operation based on maintaining ventilation and other air change requirements as appropriate. Note that default values for minimum flows of VAV terminals are often unreasonably low in most energy modelling software.

Exhaust Fans

Exhaust fans that are not part of the ventilation system (ex. kitchen exhaust or bathroom exhaust not connected to an HRV or similar), shall have a runtime of 2 hours/day. Enclosed parking garage ventilation fans shall be modelled as running 4 hours per day. All other exhaust fans, including heat recovery units, shall be modelled to reflect the design intent as accurately as possible.

10.11. Calculating Envelope Heat Loss

One of the Standard's key performance targets is based on TEDI, which is primarily a representation of the annual heating load required to offset envelope heat loss and ventilation loads. Choosing TEDI as a target supports the Policy's direction to encourage energy efficient building envelopes. However, building envelope heat loss has historically been simplified due to past difficulties in cost-effectively providing more accuracy. This has generally led to overly optimistic assessments of building envelope performance by way of ignoring or underestimating the impact of thermal bridging.

Typical building envelope thermal bridging elements that can have a significant impact on heat loss that have historically been underestimated or unaccounted for include: balcony slabs, cladding attachments, window wall slab by-pass and slab connection details, interior insulated assemblies with significant lateral heat flow paths such as interior insulated poured-in-place concrete or interior insulation inside of window wall or curtain wall systems, and others. With the recent addition of industry resources that support more efficient and accurate calculations of building envelope heat loss, assemblies and associated thermal bridging elements must be accurately quantified for the purposes of complying with the Standard, according the requirements below.

10.12. Opaque Assemblies

The overall thermal transmittance of opaque building assemblies shall account for the heat loss of both the Clear Field performance, as well as the heat loss from Interface Details. Additional heat loss from Interface Details are to be incorporated in the modelled assembly U-values, according to the provisions below.

Overall opaque assembly U-values must be determined using the Enhanced Thermal Performance Spreadsheet (available from BC Hydro New Construction Program), performance data for Clear Fields and Interface Details from the Building Envelope Thermal Bridging Guide (BETBG), and the calculation methodology as outlines in 3.4 of the BETBG. A detailed example is provided in Section 5 of the BETBG.

If clear fields or interface details matching the proposed opaque assemblies are not available in the BETBG, overall U-values may be determines using any of the following approaches:

a. Using the performance data for Clear Field and Interface Details from other reliable resources such as ASHRAE 90.1-2010, Appendix A, ISO 14683 Thermal bridges in building construction – Linear thermal transmittance – Simplified Methods and default values, with the methodology described above in BETBG. For spandrel panels, consider using the Reference Procedure for Simulating Spandrel U-Factors, developed for Fenestration BC

b. Calculations, carried out using the data and procedures described in the ASHRAE Handbook – Fundamentals

c. Two- or three-dimensional thermal modelling, or

d. Laboratory tests performed in accordance with ASTM C 1363, "Thermal Performance of Building materials and Envelope Assemblies by Means of a Hot Box Apparatus," using an average temperature of 24±1°C and a temperature difference of 22±1°C.

Except where it can be proven to be insignificant (see below), the calculation of the overall thermal transmittance of opaque building envelope assemblies shall include the following thermal bridging effect elements:

- Closely spaced repetitive structural members, such as studs and joists, and of ancillary members, such as lintels, sills and plates,
- Major structural penetrations, such as floor slabs, beams, girders, columns, curbs or structural penetrations on roofs and ornamentation or appendages that substantially or completely penetrate the insulation layer,
- The interface junctions between building envelope assembles such as: roof to wall junctions and glazing to wall or roof junctions,
- Cladding structural attachments including shelf angles, girts, clips, fasteners and brick ties
- The edge of walls or floors that intersect the building enclosure that substantially or completely penetrate the insulation layer.

The following items need not be taken into account in the calculation of the overall thermal transmittance of opaque building envelope assemblies:

- Mechanical penetrations such as pipes, ducts, equipment with through-the-wall venting, packaged terminal air conditioners or heat pumps.
- The impact of remaining small unaccounted for thermal bridges can be considered insignificant and ignored if the expected cumulative heat transfer though these thermal bridges is so low that the effect does not change the overall thermal transmittance of the above grade opaque building envelope by more than 10%.

10.13. Fenestration and Doors

The overall thermal transmittance of fenestration and doors shall be determined in accordance with NFRC 100, "Determining Fenestration Product U-factors", with the following limitations:

a. The thermal transmittance for fenestration shall be based on the actual area of the windows and not the standard NRFC 100 size for the applicable product type. It is acceptable to area-weight the modelled fenestration U-value based on the relative proportions of fixed and operable windows and window sizes. It is also acceptable to simplify the calculations by assuming the worst case by using the highest window U-value for all fenestration specified on the project.

b. If the fenestration or door product is not covered by NFRC 100, the overall thermal transmittance shall be based on calculations carried out using the pro procedures described in the ASHRAE Handbook – Fundamentals, or Laboratory tests performed in accordance with ASTM C 1363, "Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus," using an indoor air

temperature of 21±1°C and an outdoor air temperature of -18±1°C measured at the mid-height of the fenestration or door.

10.14. Mixed-Use Buildings

Buildings consisting of different occupancies with different EUI, TEDI, and GHGI targets shall create whole-building targets by area-weighting the EUI, TEDI, and GHGI requirements accordingly.

10.15. References and Resources

1. 2014 Building America House Simulation Protocols, NREL, 2014
2. ASHRAE Handbook of Fundamentals, ASHRAE, 2013
3. ASHRAE Standard 90.1-2010 – Energy Standard for Buildings Except Low-Rise Residential Buildings, ASHRAE 2010
4. Commercial Buildings Building Envelope Thermal Bridging Guide, Version 1.1, BC Hydro, 2016
5. Energy Modelling Guidelines and Procedures, CONMET, 2014
6. EnergyStar Multifamily High Rise Program, Simulation Guidelines, Version 1.0, Revision 03, January 2015
7. Infiltration Modelling Guidelines for Commercial Building Energy Analysis, PNNL, 2009
8. National Energy Code of Canada for Buildings, NRCan, 2011
9. New Construction Program's Energy Modelling Guideline, BC Hydro, March 2015
10. TM54 – Evaluating Operational Energy Performance of Buildings at the Design Stage, CIBSE, 2014
11. National Energy Code of Canada for Buildings, NRCan, 2015
12. Guide to Low Thermal Energy Demand in Large Buildings, BC Housing, March 2018
13. Reference Procedure for Simulating Spandrel U-Values, Fenestration BC, September 2017
14. Illustrated Guide to Achieving Airtight Buildings, BC Housing, September 2017

11.APPENDIX C: Glossary of Terms

Airtightness: The measure of a building envelope's resistance to air leakage in or out of the building

BOD: Basis of Design

Building envelope: The elements that make up the outer shell of a building and maintain a division between outside weather and the conditions inside the building's spaces

BUG: Backlight-Uplight-Glare (in reference to lighting)

CaGBC: Canada Green Building Council

Carbon offset: A credit for greenhouse gas reductions achieved by one party that can be purchased and used to compensate for the emissions of another party, typically measured in CO_2 equivalent

CFC: Chlorofluorocarbon

Charette: An interdisciplinary meeting in which all stakeholders on a project attempt to map solutions together

Cx: Commissioning

CxA: Commissioning Authority

Embodied carbon: The emissions associated with the production, transportation, assembly, use and eventual decommissioning of materials used in a building's construction

Energy efficiency: A measure of the effectiveness of energy use (when referring to buildings, one with high energy efficiency requires less energy to perform the same tasks as one with lower energy efficiency)

EUI: Energy Use Intensity, a representing all the energy required to power a building's operations

EV: Electric vehicle

EVSE: Electric Vehicle Supply Equipment

FSC: Forest Stewardship Council

GHG: Greenhouse Gas

GHGI: Greenhouse Gas Intensity

Glazing: Windows on a building

GWP: Global Warming Potential

HCFC: Hydrochlorofluorocarbon

HVAC&R: Heating, Ventilation, Air Conditioning, and Refrigeration (usually referring to equipment)

IDP: Integrated Design Process

ILFI: International Living Future Institute

LCA: Life Cycle Assessment

LEED: Leadership in Energy and Environmental Design

MURB: Multi-Unit Residential Building (or multi-family building)

ODP: Ozone Depletion Potential

OPR: Owner's Project Requirements

Permeability: The ability of a surface to transmit water and air

Potable water: Clean water that is safe to drink or use for food preparation

Pollinator-friendly: Plants that are beneficial to animals such as bees, butterflies, and hummingbirds

Renewable energy: A source of energy that is replenished through natural process or using sustainable management policies such that it is not depleted at current levels of consumption

Solar PV: Solar photovoltaic (referring to the technology that converts sunlight into direct current electricity)

TBL: Triple Bottom Line

TEDI: Thermal Energy Demand Intensity, a metric representing a building's demand for heat energy

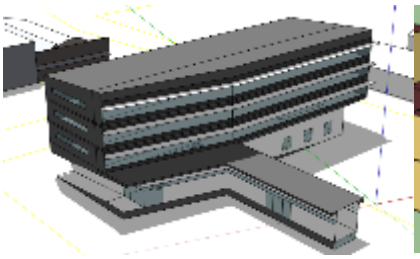
Ventilation: The process of intentionally exchanging air in a building to replace stale air with fresh air from outside

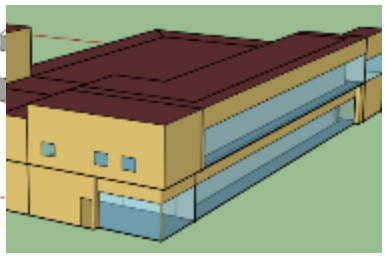
VOC: Volatile Organic Compound

FINAL REPORT

Municipal Green Building Standard Redevelopment – Energy Modelling Report

City of Mississauga





Report No. 1803395.00 March 27, 2019

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1. EXECUTIVE SUMMARY

The City of Mississauga is in the process of putting policies and actions in motion to place sustainability and climate change mitigation and adaptation as a priority, and has recognized the need to update its existing municipal green building standard (LEED® Silver) for new construction and major renovation projects. The new standard targets a low energy and carbon approach with infrastructure to easily transition to a net zero level of performance in the future.

To specifically address energy and emissions performance, there was a desire to shift from the prescriptive approach towards a performance-based approach for total energy use intensity (TEUI), thermal energy demand intensity (TEDI), and greenhouse gas emissions intensity (GHGI) for key building types, in line with the approach being recently adopted by other progressive municipal green building policies across Canada. Analysis for the inclusion of a cooling energy demand intensity (CEDI) metric was also conducted, but the metric was ultimately not recommended due to reasons outlined in Section 2.3.2 of the report.

In addition, the proposed policy also adopts an absolute targets-based approach, as opposed to a reference building-based approach currently used by the National Energy Code of Canada for Buildings (NECB) and the LEED certification program. A target-based approach focuses on absolute values, rather than a comparative value, and tends to lead to more appropriate design solutions for reducing energy and/or carbon rather than solutions selected for the purpose of outperforming a fictitious reference building. Furthermore, a target-based approach has been used successfully in high performance standards, such as Passive House, and has shown success in reducing actual energy use of operating buildings.

In order to better understand the energy, emissions and cost implications associated with various measures to attain a high performance building design, as well as to set appropriate absolute performance targets for the identified metrics at three discrete levels of performance, an energy modelling study was completed for the six of the most common City of Mississauga building types: administration building, fire hall, library, recreation centre (including pool and/or ice rink), transit station, and transit repair/maintenance facility. The objective of the analysis was to identify how much the City's current energy efficiency requirements could be improved upon while maintaining cost effectiveness, and to develop targets that could lead to reliable energy and greenhouse gas emissions reductions across the City's built environment.

The analysis indicates that there are a wide range of design options that can meet the proposed new performance targets for most archetypes, with varying levels of incremental capital cost and life cycle cost benefit depending on the performance level being targeted. Table 1 summarizes the typical expected energy, greenhouse gas (GHG) emissions, and cost impact over typical practice, based on achieving LEED Silver under the current municipal buildings green standard, on the analyzed building types if they were to comply with the various performance levels for the three new metrics identified.

In general, Level 1 targets represent an improvement in envelope compared with current typical practice, incorporating either triple glazing or higher effective wall performance. Level 2 targets incorporate improved windows and walls, reduced window to wall ratios, and reduced air leakage targets. Level 3 targets add a fuel switch to a lower-carbon fuel, additional lighting savings, additional domestic hot water savings, further improvements to envelope, and any additional available mechanical system savings. These measures are customized to

each building type, and targets do not require prescriptive measures so can be customized to individual projects, but the above principles generally were used to set targets for each building type.

Depending on the archetype, it is generally expected that the Level 1 targets will result in energy and GHG emissions savings that are between 2-10% better than current typical practice, Level 2 will result in 15-35% savings, and Level 3 would represent a net-zero ready level of performance with energy and GHG emissions savings ranging between 40-65%.

The incremental capital costs presented in Table 1 are associated the energy efficiency and emissions reduction measures required to attain the TEUI, TEDI and GHGI target for each performance level. In general, incremental capital costs are less than 1% at performance level 1, and range between 4.6% and 18.9% at the highest performance level (i.e. level 3) due to the requirement of more capital-intensive measures for improved building performance to meet the Level 3 targets.

The net present value (NPV) represents the net present value of cost savings over a 25-year lifecycle period, i.e., a positive value indicates that the present value of utility cost savings exceeds that of the incremental capital costs.

For certain archetypes such as the repair/maintenance facility and pool, the NPV increases at the higher performance levels as the lifecycle cost savings from reduced energy consumption outweigh the additional incremental capital costs, and suggests that achieving the higher tiers of performance is more attractive from a lifecycle perspective. For other archetypes such as the administration building, fire hall, recreation centre, and transit station, the economics are less favourable from a 25-year lifecycle period due to the incremental capital costs being greater than the utility cost savings, but pursuing the higher level of performance may still be desirable due to the ancillary benefits associated with GHG emissions reduction, thermal comfort, resiliency, and improved durability of a high-performing building envelope, which would typically provide for savings beyond a 25-year lifecycle period.

Table 1. Archetype Performance Outcomes

Archetype	Energy Savings (%)	GHG Emissions Savings (%)	Incremental Capital Cost (%)	NPV 25-Year Cost Savings ($/m²)
Admin	Level 1: 9.8 Level 2: 26.0 Level 3: 56.6	Level 1: 14.3 Level 2: 32.9 Level 3: 77.1	Level 1: 0.8 Level 2: 1.3 Level 3: 6.9	Level 1: -25.4 Level 2: -27.8 Level 3: -168.3
Fire Hall	Level 1: 2.8 Level 2: 25.4 Level 3: 46.2	Level 1: 1.6 Level 2: 61.2 Level 3: 71.5	Level 1: 0.5 Level 2: 4.8 Level 3: 7.0	Level 1: -18.1 Level 2: -240.1 Level 3: -290.7
Rec Centre	Level 1: 4.9 Level 2: 14.6 Level 3: 63.2	Level 1: 7.6 Level 2: 21.5 Level 3: 84.5	Level 1: 0.7 Level 2: 0.6 Level 3: 6.2	Level 1: -28.3 Level 2: -18.8 Level 3: -170.1
Pools	Level 1: 6.1 Level 2: 32.5	Level 1: 7.3 Level 2: 49.6	Level 1: 0 Level 2: 0	Level 1: 143.2 Level 2: -218.9

Archetype	Energy Savings (%)	GHG Emissions Savings (%)	Incremental Capital Cost (%)	NPV 25-Year Cost Savings ($/m²)
	Level 3: 56.2	Level 3: 85.8	Level 3: 12.2	Level 3: 1138.5
Ice Rinks	Level 1: 1.3 Level 2: 13 Level 3: 48.1	Level 1: 2.1 Level 2: 19.1 Level 3: 63.8	Level 1: 0.5 Level 2: 1.9 Level 3: 5.0	Level 1: -15.5 Level 2: -48.7 Level 3: -30.0
Library	Level 1: 6.9 Level 2: 26.8 Level 3: 67.8	Level 1: 13.1 Level 2: 30.0 Level 3: 78.7	Level 1: 0.8 Level 2: 0.9 Level 3: 4.7	Level 1: -39.9 Level 2: 33.7 Level 3: -54.5
Vehicle Maintenance	Level 1: 11.6 Level 2: 17.1 Level 3: 63.0	Level 1: 12.3 Level 2: 20.0 Level 3: 85.7	Level 1: 0.2 Level 2: 0.6 Level 3: 4.6	Level 1: 43.3 Level 2: 43.3 Level 3: 416.5
Transit Station	Level 1: 14.8 Level 2: 34.0 Level 3: 43.5	Level 1: 25.9 Level 2: 53.9 Level 3: 72.5	Level 1: 0.6 Level 2: 6.1 Level 3: 18.9	Level 1: 52.9 Level 2: -38.4 Level 3: -264.1

2. PROJECT OVERVIEW

2.1 Introduction

Morrison Hershfield has partnered with Integral Group to aid the City of Mississauga in updating its Municipal Green Building Standard as it relates to energy and emissions performance targets. A cost-benefit analysis has been completed for six common archetypes of city-owned buildings in order to make recommendations on the most suitable performance targets, based on energy and emissions savings, as well as technical and economic viability. The six archetype buildings that have been analyzed are an office/administration building, fire hall, library, recreation center, transit station, and transit repair and maintenance facility.

The building energy analysis in this report was completed using EnergyPlus, and costing information is based past projects and information available at the time of the analysis. The impact of a variety of parameters including envelope performance, HVAC system performance, building window-to-wall ratio, and lighting was assessed. The range of conditions analyzed generated a large data set, which was then analyzed using Morrison Hershfield's interactive Building Energy Performance Map to determine trends in the data and derive conclusions in terms of target recommendations. A detailed description of the methodology and analysis is provided in Section 3. Financial rates and assumptions are provided in section 4.1 and Appendices B and C. Detailed model inputs and assumptions for each archetype are summarized in Appendix A. List of Acronyms is provided in Appendix D.

2.2 Scope of Analysis

The objective of the energy modelling study was to better understand the impact of key design parameters on energy and emissions performance of City of Mississauga municipal facilities, and to develop absolute performance-based targets for identified archetype facilities across three discrete levels of performance. A parametric modelling study was completed for the six of the most common City of Mississauga building types: administration building, fire hall, library, recreation centre (including pool and/or ice rink), transit station, and transit repair/maintenance facility.

For each archetype, three levels of absolute performance-based targets were established to generally correspond to the following performance levels:

- Level 1: "Mission Critical" – Required for all new buildings and facilities as a mandatory minimum level of performance, and generally on par or better than the Toronto Green Standard Tier 2 level of performance.

- Level 2: "Highly Desirable" – Performance targets that represent a more ambitious level of performance overall, and serve as an intermediate bridging step between Tiers 1 and 3.

- Level 3: "If Possible" – Performance targets that are considered best in class and should be pursued when project constraints allow. The targets are generally with net zero-ready and net zero energy outcomes, as well as

performance levels typically aimed towards Passive House or the Living Building Challenge.

2.3 Energy Performance Approaches and Metrics

2.3.1 Reference Building Approach

Targeting a performance level relative to an energy code, such as the National Energy Code of Canada for Buildings (NECB), is known as a reference building approach. The key features of a reference building approach are:

- The “reference building” is a fictitious building that the design is compared to for assessing performance.
- The reference building predominantly has the same physical characteristics as the proposed design, such as program type, geometry, and orientation.
- The reference building approach normalizes certain assumptions about the building, thereby eliminating any performance biases related to building characteristics that are not typically under the control of the design team. This typically includes characteristics such as occupancy, hours of operation, receptacle and process loads, among others.
- The reference building approach typically uses a strict ruleset that dictates how performance is to be assessed using energy modeling, and how credit is rewarded for energy efficiency measures.
- The reference building approach typically results in a moving target, in that the performance of the reference building changes based on certain characteristics of the design (see below for examples in the NECB). This can sometimes result in situations where better relative performance does not equal better absolute performance.
- The reference building approach does not typically reward innovative strategies that minimize absolute energy use, such as night setback of temperatures, reductions in receptacle and process loads, and other types of measures that would be considered standardized assumptions.

The reference building approach is common throughout North America, with most states in the US, British Columbia, and Ontario referencing some version of ASHRAE 90.1 – Energy Standard for Buildings except Low-Rise Residential Buildings. The NECB is currently referenced in British Columbia, Alberta, Manitoba, Ontario and Nova Scotia. However, the reference building approach is less common in other parts of the world, such as Europe, where a target-based approach is used.

Reference building-based metrics that were considered in this analysis:

Energy and Emissions Savings over Ontario SB-10

This metric looks at the relative energy savings of a particular design over an NECB 2015 reference building (as modified by SB-10) that is minimally compliant with the energy efficiency requirements of Ontario SB-10, and as such provides a baseline that corresponds to the minimum energy performance required for new construction projects in the province. This metric does not rely on utility cost rates or GHG factors to weigh different fuel types and focuses strictly on percentage energy savings.

This metric has the same opportunities and challenges as discussed above for a reference building approach.

Number of LEED v4 Energy Points

This metric is based on the relative energy cost savings of a particular design over an NECB 2011 reference building. This metric relates to the current policy which references LEED (LEED energy points is calculated based on energy cost savings over a baseline).

The current Municipal Green Building Standard requires that large projects (gross floor area greater than 10,000 ft^2) achieve LEED Silver certification whereas small projects (gross floor area less than 10,000 ft^2) be designed to achieve LEED Silver certification, and that a minimum of four (4) energy points be targeted for LEED credit EAc1: Optimize Energy Performance, which translates to a 12% improvement in energy costs over the reference building.

Given that the metric is based on energy costs, it provides an inherent incentive for prioritizing electricity load reductions over reductions in natural gas use due to the higher utility rates for electricity, and may not necessarily be aligned with a low GHG emissions outcome due to the clean nature of Ontario's electricity grid.

This metric also has the same opportunities and challenges as discussed above for a reference building approach. In addition, this metric depends on the cost rates of different fuel type and may need to be updated periodically to account for fuel cost changes.

2.3.2 Target Based Approach

A target-based approach sets absolute targets for energy efficiency. A range of metrics have been used in this approach, such as Energy Use Intensity, Heating Demand Intensity, and Greenhouse Gas Emissions Intensity. These are defined in more detail below. The key features of a target-based approach are:

- It focuses on absolute values, rather than a comparative value. This tends to lead to more appropriate design solutions for reducing energy and/or carbon rather than solutions selected for the purpose of outperforming a fictitious reference building.

- A target-based approach has been used successfully in high performance standards, such as Passive House, and has shown success in reducing actual energy use of operating buildings.

- Targets and metrics can be chosen to achieve the specific outcomes desired by a particular policy (ex. energy, carbon, etc.)

- Targets often have to be set for different building types that inherently have different energy use characteristics; this can make it challenging to implement in a policy intended to capture all buildings.

Recently, some North American jurisdictions have moved from a reference building approach to a target-based approach. One example is the City of Vancouver, where City Council recently adopted a "Zero Emissions Building Plan" that set absolute targets for buildings city-wide. The advantage of such a policy is that it identifies a long-term goal, which in the City of Vancouver's case is carbon neutral new buildings by 2025, and then sets incremental improvements towards that goal that are transparent and can be planned for by industry.

Given the shift towards a target-based approach in some of the more progressive energy policies across Canada, the City of Mississauga has expressed desire to develop a set of absolute performance-based targets for key metrics that help drive to towards low energy and carbon outcomes. The following metrics have been proposed to be adopted in the redeveloped Municipal Green Building Standard:

Energy Use Intensity (EUI)

This metric looks at the absolute energy use of the building, and is typically varied depending on building type or climate. The metric focuses on lowering overall energy use without consideration of fuel source to improve building energy efficiency, reduce energy costs and stresses on the electrical grid.

Absolute EUI targets have been incorporated into several energy policies across Canada, such as the B.C. Energy Step Code, City of Vancouver's Zero Emissions Building Plan, and the Toronto Green Standard.

GHG Emissions Intensity

This metric is similar to EUI, but instead of focusing on absolute energy use, it focuses on absolute GHG emissions, with the intent of maximizing GHG reductions by prioritizing savings for high GHG fuels, encouraging low carbon fuel choices, and reducing building emissions.

The incorporation of the GHGI metric into the Municipal Green Building Standard will help for better alignment with City-wide environmental policies such as the Living Green Master Plan and the Green Pillar of the City's Strategic Plan, which aims to transform Mississauga into a net-zero carbon city as an end-goal.

Annual Heating Load Intensity or Thermal Energy Demand Intensity (TEDI)

This metric represents the amount of heating a building needs to offset building envelope losses and temper ventilation air, prior to any mechanical interventions (with the exception of ventilation heat recovery equipment). The intent of this metric is to maximize passive or near passive systems before looking at heating delivery methods and technology. This metric has been made popular by Passive House, an

international high-performance building standard, which promotes highly insulated buildings with exceptional ventilation heat recovery and otherwise simple mechanical systems.

This metric is agnostic to fuel source, with the primary intention of imposing efficient building envelope solutions. According to the Pembina Institute's report on "Accelerating Market Transformation for High-Performance Building Enclosures", in addition to providing energy savings, prioritizing building envelope solutions are also important for the following reasons:

- Building envelope solutions "are long lasting and costly to refurbish, unlike other systems that can be more easily replaced as better technologies become available"
- Building envelope solutions are simpler, "their performance does not depend on complex energy management systems and they are more tolerant to delayed maintenance"
- Reducing heating and cooling demand early in the design process allows for reduction of the size of space conditioning systems, reducing construction cost and ongoing energy demand.
- Better building envelopes "also offer significant non-energy benefits, such as thermal comfort, acoustic isolation, durability, and increased resiliency to power outages and extreme temperature events."

TEDI has attracted interest from policy makers in an effort to promote better building envelopes without being overly prescriptive on requirements. Under current energy codes like ASHRAE 90.1 (ASHRAE, 2007) or NECB (NRC, 2011), there is substantial room to trade-off mechanical and electrical efficiencies with lower performing envelopes. A metric like TEDI elevates the importance of the building envelope, which is viewed as one of the more robust energy saving measures in a building. Unlike mechanical and electrical systems, the building envelope is typically not prone to user or operator error, thereby more likely to realize its projected energy savings.

Moreover, many components of the building envelope typically last the service life of the building, making its initial make-up and performance critical for the building's long-term performance. Finally, efficient building envelopes can provide additional benefits to energy and greenhouse gas emissions reductions, as shown in the "Zero Emissions Building Framework" (City of Toronto, 2017). The analysis done to support this policy showed how improved building envelopes can perform substantially better in power outages and maintain livable space temperatures, even under extended cold periods.

In view of the benefits outlined above, as well as the potential for improvements in energy efficiency of the building envelope relative to current typical practice in the City's municipal buildings, it is recommended that the TEDI be adopted as a target metric in the City's redeveloped Municipal Green Building Standard.

Cooling Energy Demand Intensity (CEDI)

Similar to the TEDI metric, the cooling energy demand intensity metric represents the amount of cooling a building needs to offset heating gains through the building envelope (primarily windows) and to cool ventilation air, prior to any mechanical interventions (with the exception of ventilation heat exchange equipment).

It should be noted that some strategies that seek to reduce TEDI may have an adverse impact on CEDI, and vice versa. For example, passive solar heating through the placement of larger windows on the southern orientation would help reduce space heating demand, thereby reducing TEDI, but would result in increased cooling demand during the summer months, which would lead to an increase in CEDI.

However, given that space cooling does not represent a significant end-use in the Mississauga climate for most archetypes, that the GHG emissions associated with cooling are already low (since it is fuelled by electricity), and the potential for conflict with TEDI, imposing targets for CEDI would not have any significant impact towards driving for low energy and carbon outcomes, and as such is not recommended for inclusion in the redeveloped policy.

3. ARCHETYPE BUILDING DESCRIPTIONS AND CURRENT TYPICAL PRACTICE

Morrison Hershfield modelled building floor plans provided by City of Mississauga, as well as existing energy models from MH's internal database based on real building floor plans from buildings that best reflected the six building types that were to be analyzed.

The energy models were modified to form typical City of Mississauga archetypes, where the key performance criteria, such as building envelope performance, mechanical systems and efficiency, and lighting efficiency, reflected typical strategies that were used in recently built City of Mississauga facilities. The six archetype models were then analyzed in EnergyPlus whole building energy simulation software with properties outlined below. Energy end use break downs are provided for each baseline archetype. Detailed input tables are found in Appendix A.

3.1 Administration Building

The Administration archetype building is 3,800 m^2 office facility. Based on current practices, a City of Mississauga office building typically has effective R-10 walls, R-40 roof, 45% WWR, double-glazed windows with low-e coating (USI of approximately 2.2), window SHGC of 0.3, 70% efficiency heat recovery, typical air infiltration levels, and 50% lighting savings from the reference building (typically all LED lighting). The baseline HVAC system typically consists of a dedicated outdoor air system with heat recovery providing ventilation air, and fan coils which cycle to serve heating and cooling loads supplied by a high efficiency central boiler and chiller plant.

The baseline energy end-use breakdown is shown in Figure 1, and indicates natural gas use for space heating accounts for the majority of the energy consumption (i.e. more than 50%), followed by lighting and plug loads.

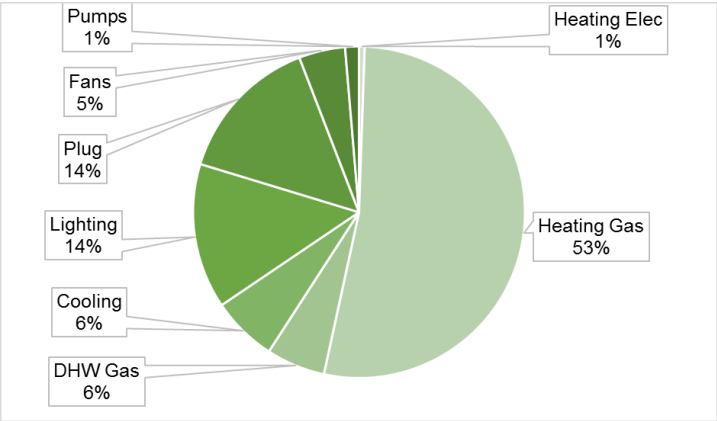


Figure 1: Administration Building - Baseline Energy End-Use Breakdown

Parameters varied include effective wall (R-5 to R-40), roof (R-20 to R-60), window thermal (USI 2.2 to 0.8) and air tightness performance, glazing ratio (15% to 45%), heat recovery efficiency (70% to 90%), lighting savings (50% to 70%), and two central plant types.

Table 2 shows the key performance metrics associated with the baseline condition. The baseline design performs well against the SB-10 building code-minimum (35% energy savings) as well as the LEED v4 baseline (39% cost savings), due to the presence of ventilation air heat recovery, high efficiency plant systems, electric load reductions from LED lighting, and DOAS system reducing airflows and eliminating reheat energy. However, more than 50% of the end-use breakdown is accounted for by space heating which is fueled by emissions-intensive natural gas, and as such represents the most significant opportunity from both an energy and carbon perspective.

Table 2: Office Archetype - Baseline Performance Characteristics

TEUI (kWh/m^2.yr)	119
TEDI (kWh/m^2.yr)	62
CEDI (kWh/m^2.yr)	22
GHGI (kg$CO_{2,eq}$/m^2.yr)	15
Electricity EUI (kWh/m^2.yr)	49
Gas EUI (kWh/m^2.yr)	70
Energy Cost ($/m^2.yr)	10
SB-10 Energy Savings (%)	35
SB-10 GHG Savings (%)	27
LEED Cost Savings (%)	39
LEED v4 Points	15

3.2 Fire Hall

The Fire Hall archetype building is 1,500 m^2 facility including a 570 m^2 partially conditioned apparatus bay. The facility also included dorms, offices, and a kitchen. The baseline HVAC system consists of a dedicated outdoor air system with 60% effective heat recovery providing ventilation air to the main building, and terminal units which cycle to serve heating and cooling loads supplied by a variable refrigerant flow (VRF) system. The apparatus bay is heated by gas-fired infrared unit heaters. Kitchen and apparatus bay exhaust requirements are provided by dedicated make-up air units. Both make-up air units are assumed to operate 4 hours per day.

Parameters varied include effective wall, roof, and window thermal and air tightness performance, glazing ratio, domestic hot water load savings, heat recovery efficiency, lighting savings, option of hydronic radiant slab heating for the apparatus bay, and option of heat recovery for the apparatus bay and kitchen make-up air units. The typical City of Mississauga building has effective R-10 walls (including wall separating apparatus bay and conditioned space), R-40 roof, 15% Window to Wall Ratio (WWR), double-glazed windows with low-e coating and Solar Heat Gain Coefficient (SHGC) of 0.3, 60% efficiency heat recovery on the main building, dedicated outdoor air system (DOAS), typical air infiltration levels, 50% lighting savings from the reference building, 20% domestic hot water savings from low-flow fixtures, and a VRF system.

The baseline energy end-use breakdown is shown in Figure 2, and indicates natural gas use for domestic hot water heating accounts for 30% of total energy consumption, whereas space heating energy from a combination of electric-based heating from the VRF system and gas-fired infrared heaters accounts for 37% of energy consumption in total.

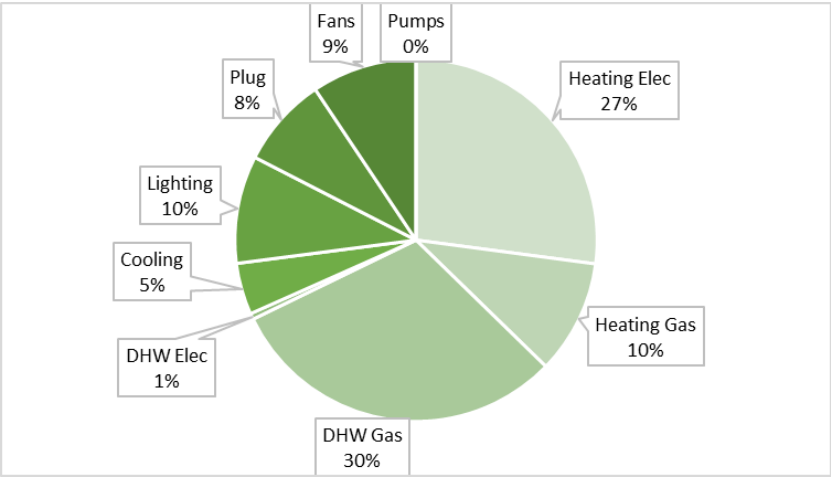


Figure 2: Fire Hall - Baseline Energy End-Use Breakdown

Table 3 shows the key performance metrics associated with the baseline condition. The baseline design performs well against the SB-10 building code-minimum (34% energy savings) as well as the LEED v4 baseline (47% cost savings), due to the presence of ventilation air heat recovery, high efficiency VRF with DOAS system for the HVAC, and electric load reductions from LED lighting.

Table 3: Fire Hall Archetype - Baseline Performance Characteristics

TEUI (kWh/m^2.yr)	109
TEDI (kWh/m^2.yr)	84
CEDI (kWh/m^2.yr)	14
GHGI (kg$CO_{2,eq}$/m^2.yr)	11
Electricity EUI (kWh/m^2.yr)	65
Gas EUI (kWh/m^2.yr)	44
Energy Cost ($/m^2.yr)	9
SB-10 Energy Savings (%)	34
SB-10 GHG Savings (%)	31
LEED Cost Savings (%)	47
LEED v4 Points	17

3.3 Recreation Centre

The Recreation Centre archetype building is 8,420 m^2 facility excluding the pool and ice rinks. The facility includes a fitness facility, gym, change rooms, multipurpose space, and offices. The base HVAC system consists of single-zone constant volume unitary systems for the fitness centre, multipurpose room and gym, with variable air volume (VAV) air handlers with baseboard heaters at the zone level for the remainder of the building, supplied by a high efficiency central boiler and magnetic bearing chiller plant.

The results are presented below for the recreation centre excluding the pool and ice rinks. Pool energy use is both very large, and highly dependent on pool water set point temperature, room air temperature and relative humidity set points, and hygiene related water turn-over rates, which are dictated by the specific type of pool and intended end user. Similar to pool, ice rink energy use is both large and highly dependent on rink size and set points. The large loads of the pool and/or ice rinks also make it difficult to assess the impact of each parameter on the rest of the building.

Parameters varied include effective wall, roof, and window thermal performance, glazing ratio, heat recovery efficiency, lighting savings, domestic hot water (DHW) savings and option of VRF with dedicated outdoor air system for the HVAC.

The typical City of Mississauga archetype building has R-10 effective walls, R-40 roof, 30% WWR, double-glazed windows with low-e coating and SHGC 0.3, 60% efficiency heat recovery on the main building ventilation unit, 50% lighting savings from the reference building, and a high efficiency condensing central boiler and magnetic bearing chiller plant to serve the VAV systems.

The baseline energy end-use breakdown is shown in Figure 3, and indicates natural gas use for space heating accounts for 38% of total energy consumption, followed by lighting (20%), and domestic hot water (16%). These results exclude pool and ice rink use, which are presented separately below.

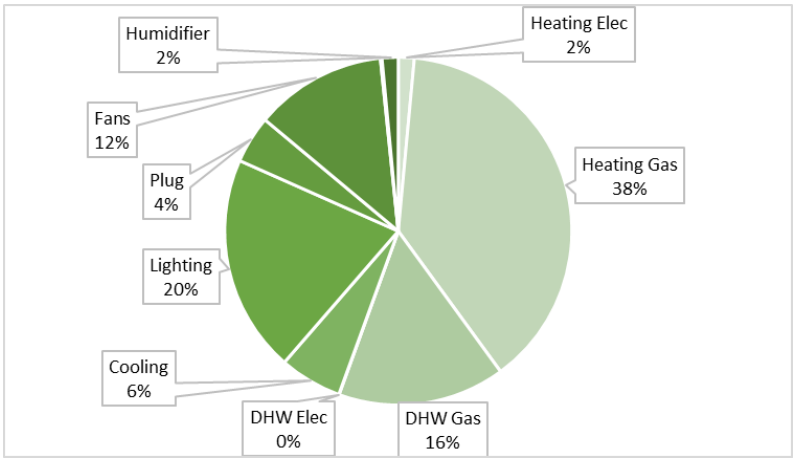


Figure 3: Recreation Centre - Baseline Energy End-Use Breakdown

Table 4 shows the key performance metrics associated with the baseline condition. The baseline design performs well against the SB-10 building code-minimum (27% energy savings) as well as the LEED v4 baseline (54% cost savings), due to the presence of ventilation air heat recovery, high efficiency condensing boilers and magnetic bearing chillers, and significant electric load reductions from LED lighting.

Table 4: Recreation Centre Archetype – Baseline Performance Characteristics

TEUI (kWh/m^2.yr)	167
TEDI (kWh/m^2.yr)	48
CEDI (kWh/m^2.yr)	37
GHGI (kg$CO_{2,eq}$/m^2.yr)	20
Electricity EUI (kWh/m^2.yr)	81
Gas EUI (kWh/m^2.yr)	86
Energy Cost ($/m^2.yr)	12
SB-10 Energy Savings (%)	27
SB-10 GHG Savings (%)	26
LEED Cost Savings (%)	54
LEED v4 Points	18

3.3.1 Recreation Centre Pools

The pool complex in the Rec centre was modelled separately in order to assess the impacts of the pool's energy conservative measures separately. Several different design parameters were explored to determine the energy and cost savings of the Rec centre pool complex.

The main factors that affect energy use are pool water set point temperature, HVAC system, use of outdoor air economizing and heat recovery efficiency. Building envelope and lighting have little effect on overall pool energy use, and climate has a minor effect. The pool cover (assumed to be liquid cover) has a fixed effect, which becomes more significant once other methods are employed to reduce loads.

Heat recovery is effective in reducing total energy use of the building, and it has a significant effect on TEDI, as heat recovery combined with an outdoor air economizer allows more warm, dry outdoor air to be supplied, reducing the need to cool and reheat recirculated air.

The following options were considered for the parametric modelling analysis:

- Room Air Temperature: Option of 27C or 29C
- Pool Type: Leisure Pool at 34C, Main Pool at Main Pool at 30C, and Whirlpool at 40C
- Window Performance: High-performance double-glazed (USI 2.2) or Passive-House level triple-glazed (USI 0.8)

- Window Solar Heat Gain Co-efficient of 0.3 or 0.5
- Heat Recovery Effectiveness: None, 70% or 90%
- HVAC: Option of air-source heat pump, condensing boiler with mechanical DX cooling, heat recovery dehumidification unit with heat recovery to air, or heat recovery dehumidification unit with heat recovery to plant (i.e. able to offset both pool water heating and ventilation air heating loads).
- Infiltration ranging between code and Passive House levels of airtightness
- Lighting savings between 0% and 50% relative to code
- Window-to-wall ratio ranging between 15% and 80%
- Option of liquid pool cover
- Option of outdoor air economizer
- Pool changeover rate ranging between 2 and 4 hours
- Domestic hot water load savings ranging between 20% (low-flow fixtures) and 40% (drain water heat recovery)

The typical City of Mississauga pool is assumed to have a pool water temperature of 30C, room air temperature of 29C, heat recovery dehumidification unit with 70% effective heat recovery to offset both ventilation and pool water heating loads, double-glazed windows, 50% lighting savings from LED lighting, 80% window-to-wall ratio, no liquid pool cover, outdoor air economizer, pool changeover rate of 4 hours, and 20% DHW load savings from low-flow fixtures.

The baseline energy end-use breakdown is shown in Figure 4, and indicates natural gas use for pool water and ventilation air heating accounts for 73% of the total energy consumption, followed by fans (12%), and pumps 7%).

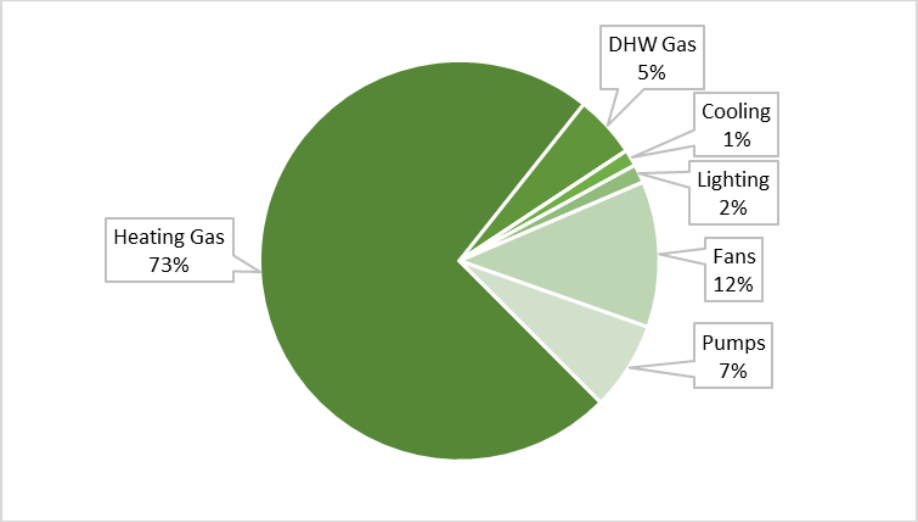


Figure 4: Pool - Baseline Energy End-Use Breakdown

Table 5 shows the key performance metrics associated with the baseline condition. It should be noted that the metrics are normalized by pool surface area, and not room area. The baseline design performs relatively well against the SB-10 building code-minimum (29% energy savings) as well as the LEED v4 baseline (17% cost savings), due to the presence of pool water heat recovery and LED lighting, but savings are

limited compared to the other archetypes due to the intensive nature of the pool water process load.

Table 5: Pool Archetype – Baseline Performance Characteristics

TEUI (kWh/m^2.yr)	3,902
TEDI (kWh/m^2.yr)	904
GHGI (kg$CO_{2,eq}$/m^2.yr)	602
CEDI (kWh/m^2.yr)	186
Electricity EUI (kWh/m^2.yr)	849
Gas EUI (kWh/m^2.yr)	3,053
Energy Cost ($/m^2.yr)	182
SB-10 Energy Savings (%)	29
SB-10 GHG Savings (%)	33
LEED Cost Savings (%)	17
LEED v4 Points	6

*__Note:__ All metrics are reported on the basis of pool surface area.

3.3.2 Recreation Centre Ice Rinks

Similar to the pool, the ice rink was also modelled separately from the recreation centre archetype due to the atypical nature of the ice rink refrigeration loads, and in order to better assess the energy efficiency measures specific to ice rinks.

The typical City of Mississauga ice rink is assumed to have the following characteristics:

- Low-emissivity ceiling
- Reciprocating refrigeration compressors equipped with variable frequency drives (VFDs) and refrigeration heat recovery serving subfloor and DHW pre-heat.
- Ventilation air heat recovery with 60% effectiveness
- Brine loop with modulating flow and VFDs on all pumps
- Ice surface temperature of 22F, air temperature of 45F and relative humidity of approximately 50%
- Hot water resurfacing temperature of 120F
- Opaque wall performance of effective R-10, roof R-30, double-glazed thermally broken windows, and window-to-wall ratio of approximately 10%
- LED lighting with controls, typically 50% better than code

The baseline energy end-use breakdown is shown in Figure 5, and indicates that the ice rink refrigeration loads account for the most significant portion of the facility (38%), followed by heating energy associated with space heating and ice resurfacing (34%).

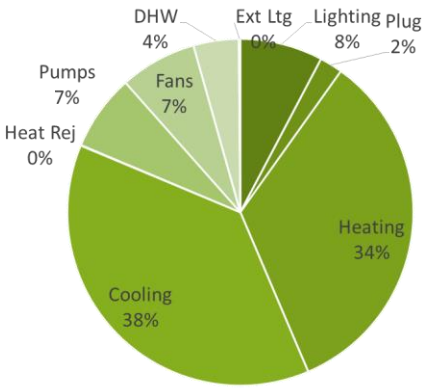


Figure 5: Ice Rink – Baseline Energy End-Use Breakdown

Table 6 shows the key performance metrics associated with the baseline condition.

Table 6: Ice Rink Archetype – Baseline Performance Characteristics

TEUI (kWh/m^2.yr)	385
TEDI (kWh/m^2.yr)	150
CEDI (kWh/m^2.yr)	185
GHGI (kg$CO_{2,eq}$/m^2.yr)	47
Electricity EUI (kWh/m^2.yr)	239
Gas EUI (kWh/m^2.yr)	146

3.4 Library

The Library archetype building is 1,280 m^2 facility including shelf areas, study areas, office and meeting spaces. The baseline HVAC system consists of packaged single zone rooftop units with DX cooling coils, condensing gas coil, ventilation air heat recovery and electric steam humidification providing ventilation air.

Parameters varied include effective wall, roof, and window thermal and air tightness performance, glazing ratio, heat recovery efficiency, lighting savings, and the option of a VRF with DOAS HVAC system.

The typical City of Mississauga library has effective R-10 walls, R-40 roof, 30% WWR, higher performance double-glazed windows with low-e coating and SHGC 0.3, 60% efficiency heat recovery on the main building ventilation unit, typical air infiltration levels, and LED lighting with 50% savings relative to code.

The baseline energy end-use breakdown is shown in Figure 6, and indicates that natural gas usage for space heating accounts for the largest energy-end use (45%), followed by fans (28%) due to the usage of constant volume rooftop units.

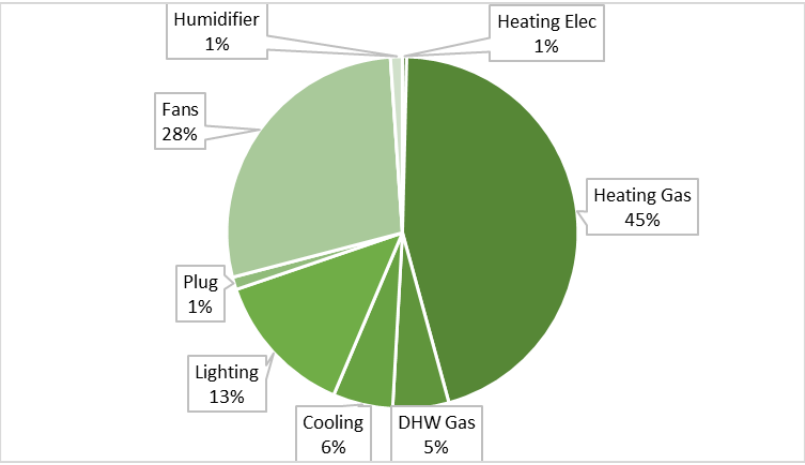


Figure 6: Library – Baseline Energy End-Use Breakdown

Figure 6 shows the key performance metrics associated with the baseline condition. Despite the presence of ventilation air heat recovery and efficient lighting, the baseline design performs only marginally better relative than the SB-10 baseline (8% improvement in energy efficiency) due to the usage of constant volume rooftop units and inferior thermal performance of the building envelope. However, the LEED cost savings are much higher (40%) due to the electrical cost savings from LED lighting.

Table 7: Library Archetype – Baseline Performance Characteristics

TEUI (kWh/m^2.yr)	147
TEDI (kWh/m^2.yr)	55
GHGI (kg$CO_{2,eq}$/m^2.yr)	16
CEDI (kWh/m^2.yr)	31
Electricity EUI (kWh/m^2.yr)	60
Gas EUI (kWh/m^2.yr)	67
Energy Cost ($/m^2.yr)	15
SB-10 Energy Savings (%)	8
SB-10 GHG Savings (%)	-1
LEED Cost Savings (%)	40
LEED v4 Points	15

3.5 Transit Repair and Maintenance Facility

The Transit Repair and Maintenance Facility is a one-storey 21,400 m^2 facility that includes bus storage, fueling bays, repair garage, wash bay, parts storage and workshop, as well as admin areas, and is modelled based on the Edwards J Dowling facility. The base HVAC for the admin space includes VAV rooftop units with heat recovery, DX cooling, gas heating and

perimeter hydronic radiators, whereas the repair and storage spaces are served by gas-fired makeup air units with heat recovery, and supplemented with gas-fired infrared unit heaters.

Parameters varied include effective wall, roof, window and overhead door thermal and air tightness performance, heat recovery efficiency and pre-heat setpoint temperature, lighting savings, option of air-source heat pumps with DOAS, and option of demand-controlled ventilation with up to 50% reduction in outdoor air.

The typical City of Mississauga facility has R-10 walls, R-40 roof, negligible glazing area, R-4 overhead door, 70% efficiency heat recovery on DOAS, high efficiency condensing boiler, gas-fired infrared unit heaters for the storage and repair areas, typical air infiltration levels, and LED lighting resulting in 50% savings relative to code lighting power densities.

The baseline energy end-use breakdown is shown in Figure 7, and indicates that natural gas usage for space heating accounts for the largest energy-end use (56%), followed by fans (26%), due to the large quantities of outdoor makeup air that are required to be brought into the facility.

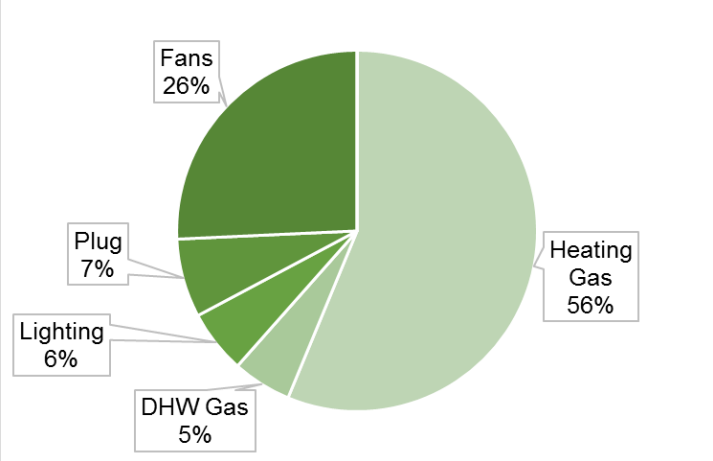


Figure 7: Transit Repair and Maintenance Facility – Baseline Energy End-Use Breakdown

Table 8 shows the key performance metrics associated with the baseline condition. The baseline design performs well against the SB-10 minimum performance (24% energy savings) as well as LEED (30% cost savings) due to the incorporation of ventilation air heat recovery in all makeup air units as well as electrical load reduction from LED lighting. The magnitude of the absolute performance metrics (TEUI, TEDI and GHGI) are higher than the other archetype facilities due to the continuous 24x7 operation of the facility.

Table 8: Transit Repair and Maintenance Archetype – Baseline Performance Characteristics

TEUI (kWh/m^2.yr)	332
TEDI (kWh/m^2.yr)	135
CEDI (kWh/m^2.yr)	0.2
GHGI (kg$CO_{2,eq}$/m^2.yr)	43
Electricity EUI (kWh/m^2.yr)	134
Gas EUI (kWh/m^2.yr)	199
Energy Cost ($/m^2.yr)	19
SB-10 Energy Savings (%)	24
SB-10 GHG Savings (%)	30
LEED Cost Savings (%)	30
LEED v4 Points	12

3.6 Transit Station

The transit station is a two storey 265 m^2 facility that includes a passenger waiting area, elevator shaft with associated machine room, janitor's closet and mechanical and electrical service rooms. The baseline HVAC system consists of radiant heaters in the waiting area served by a high efficiency condensing boiler, unit heaters in the mechanical room, DX split A/C unit in electrical and elevator machine rooms. Outdoor ventilation air for the passenger area is provided through an energy recovery ventilator (ERV).

Parameters varied include effective wall, roof, and window thermal and air tightness performance, window solar heat gain co-efficient, glazing ratio, heat recovery efficiency, lighting savings, and option of VRF with DOAS HVAC system.

The typical City of Mississauga building currently has R-10 walls, R-40 roof, 70% WWR, double-glazed windows with low-e coating and SHGC 0.3, 70% efficiency heat recovery, typical air infiltration levels, and LED lighting resulting in 50% lighting savings from code lighting power densities.

The baseline energy end-use breakdown is shown in Figure 8, and indicates that natural gas usage for space heating accounts for the largest energy-end use (54%), followed by plug loads (17%) which includes the electrical energy associated with operation of the elevators.

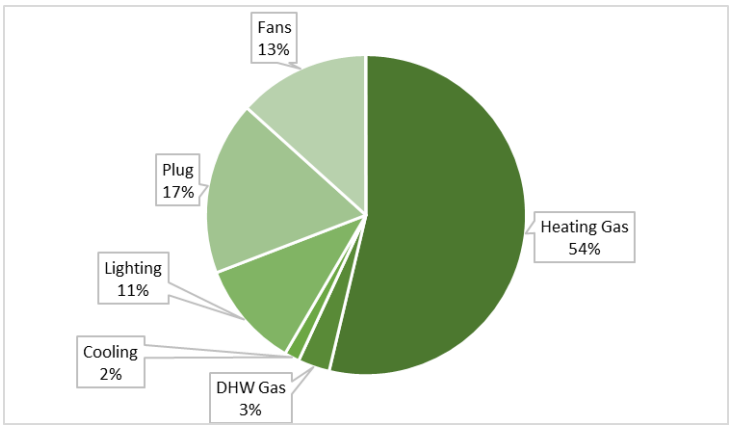


Figure 8: Transit Station – Baseline Energy End-Use Breakdown

Table 8 shows the key performance metrics associated with the baseline condition. Despite the high proportion of glazing area, the baseline design performs well against the SB-10 minimum performance (32% energy savings) as well as LEED (39% cost savings) due to the incorporation of ventilation air heat recovery for the outdoor air system serving the waiting area, condensing boilers and electrical load reduction from LED lighting. The magnitude of the absolute performance metrics (TEUI, TEDI and GHGI) are higher than the other archetype facilities due to the longer operating hours of the facility.

Table 9: Transit Repair and Maintenance Archetype – Baseline Performance Characteristics

TEUI (kWh/m^2.yr)	267
TEDI (kWh/m^2.yr)	152
CEDI (kWh/m^2.yr)	15
GHGI (kg$CO_{2,eq}$/m^2.yr)	34
Electricity EUI (kWh/m^2.yr)	112
Gas EUI (kWh/m^2.yr)	155
Energy Cost ($/m^2.yr)	21
SB-10 Energy Savings (%)	32
SB-10 GHG Savings (%)	21
LEED Cost Savings (%)	39
LEED v4 Points	15

4. PARAMETRIC ANALYSIS OF ENERGY, COST, AND CARBON OUTCOMES

The energy models described above and in Appendix A were run through an optimization process to identify the intersections of critical metrics so that a robust energy performance policy could be developed. The optimization process involves running a large-scale parametric analysis of each archetype, where various combinations of energy efficiency measures are run, with the number of options in the thousands or tens of thousands per building. For each option, energy, carbon and financial metrics are extracted. The variations in inputs vary by building, but typically involve the following:

- Wall and Roof Effective R-Values
- Window U-values and SHGC
- Window Area / Window to Wall Ratio (WWR)
- Infiltration (Code: 2.03 L/s/m^2 @ 75 Pa, Improved: 0.8 L/s/m^2 @ 75 Pa)
- Ventilation Heat recovery efficiency and pre-heat set-point temperature
- Heating fuel source (condensing boiler, air-source heat pump or VRF)
- Lighting Savings

The measures required to attain the effective wall and window performance modelled is detailed in the capital cost data in Appendix B.

The metrics that were extracted for each run included:

- Electricity and Gas Use of building (per m^2 of floor area)
- Total energy use, GHG emissions and thermal energy demand intensities (EUI, GHGI and TEDI) (per m^2 of floor area)
- Energy, and GHG savings over Building Code (Ontario SB-10)
- Incremental Capital Cost, expressed as a percentage of total construction cost
- Annual Utilities cost of building (per m^2 of floor area)
- NPV Savings over typical design– This is the present value of the financial benefit over the 20-year study period.
- Peak demand for electricity, heating and cooling
- Breakdown of energy consumption by end-use and fuel type

4.1 Economic Information

Table 10 summarizes the economic parameters used in the energy cost benefit analysis, including utility and carbon rates, escalation rates, and GHG emission factors.

Table 10. Utility Rates, GHG Emissions Factors, and Financial Parameters

Parameter	Value
Electricity Utility Cost	**Time of Use Rate Structure Provided by the City (Refer to Appendix C)**
Electricity Utility Cost Escalation Rate (conventional and renewable)	**3.0%**
Natural Gas Utility Cost	**Rate Structure Provided by the City (includes carbon tax) (Refer to Appendix C)**
Natural Gas Utility Cost Escalation Rate	**2.4%**
Discount Rate	**3%**
Current Grid Electricity GHG Emissions Factor (Based on Regional Factor for Ontario)	**0.040 kgCO2/kWh**
Natural Gas GHG Emissions Factor	**0.183 kgCO2/kWh**
Capital Costs for Modeled Energy Efficiency Measures	**See Appendix B**
Solar PV capital cost	**$3.0/Watt**
Solar PV annual production factor	**1,128 kWh/kW**

Capital costs for each of the energy efficiency measures are approximated and based on past MH projects and relevant experience, as well as input provided by an external cost consultant. The incremental capital cost assumptions are detailed in Appendix B. Operations and maintenance costs were not included in the analysis.

4.2 Optimization Analysis

The results of the options analysis were viewed through an interactive data visualization tool developed at Morrison Hershfield. The tool allows one to analyze the relationships between energy efficiency measures and the various energy, carbon and financial outputs, as well as identify any trends or patterns in the data that would point to obvious recommendations for the policy.

The data visualization tool is dynamic and is best viewed live. The tool was used by MH to select and present likely targets and identify natural break points in the data. The screenshots that follow summarize the findings in addition to follow-up analysis conducted by Morrison Hershfield. When viewing the screenshots, note that each vertical line or axis is either an energy model input (right side of screen) or an energy model output (left side of screen). Each wavy line is one, discrete energy simulation. Where the wavy line crosses a particular axis indicates that inputs and outputs that

were used or have resulted from that particular simulation. A screenshot with only one wavy line is shown in Figure to illustrate this concept. All screenshots in the body of the report are recreated in full, landscape pages, provided in Appendix C.

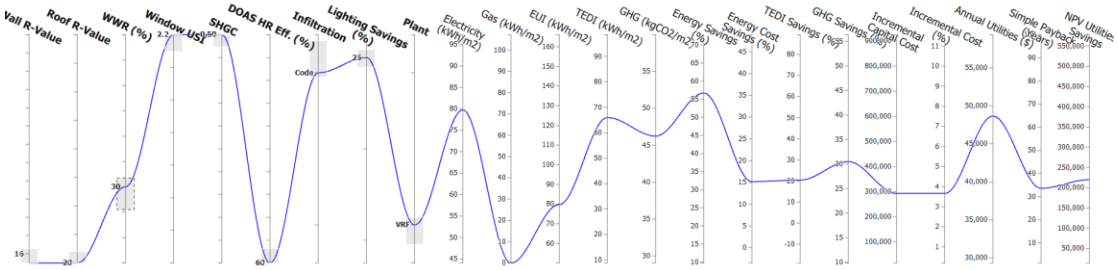


Figure 9. Data Visualization Example

4.3 Administration Building Targets

Table 11 shows the absolute performance targets for TEUI, TEDI and GHGI that have been proposed for the administration building archetype.

Table 11: Administration Building Targets

	Level 1	Level 2	Level 3
EUI	110	90	60
TEDI	55	35	15
GHGI	15	10	5

The Level 1 target for EUI is approximately 8% better than the modelled performance of the typical City of Mississauga administration building built according to current practices, whereas Level 3, which targets the performance level of a net-zero ready building working towards the Living Building Challenge, provides for 50% savings relative to the baseline level.

Typical strategies to achieve the three levels of performance are detailed below:

<u>Level 1</u>

Achieving this level requires the inclusion of many of the energy efficiency measures that are already typical of City's current design practices, which include:

- High efficiency HVAC system which decouples ventilation from heating and cooling function (e.g. DOAS with fan coils)
- Central plant consisting of condensing boilers and magnetic bearing chillers
- LED lighting throughout, typically resulting in 50% savings over code
- 70% effective ventilation air heat recovery on DOAS systems

However, envelope performance is required to be a step up compared to current typical practice, and requires improved opaque wall thermal performance and/or triple glazed IGUs to meet the TEDI target. Furthermore, effective R-values used for the

purposes of energy modelling will be required to be inclusive of all thermal bridging, which should result in improved actual performance by addressing the performance gap typically associated with building envelope components.

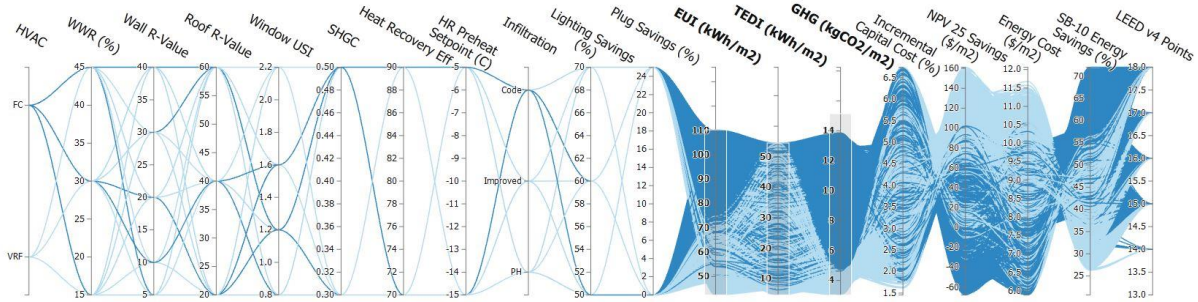


Figure 10: Administration Building Archetype - Level 1 Target Solutions

Level 2

The Level 2 targets see a significant drop in TEDI, which necessitate improved envelope performance through better opaque wall thermal performance, triple-glazed IGUs, reduced window-to-wall ratio, and improved airtightness relative to the code baseline.

A switch-over to electric-based heating is not required at this level in order to meet the TEUI and GHGI targets.

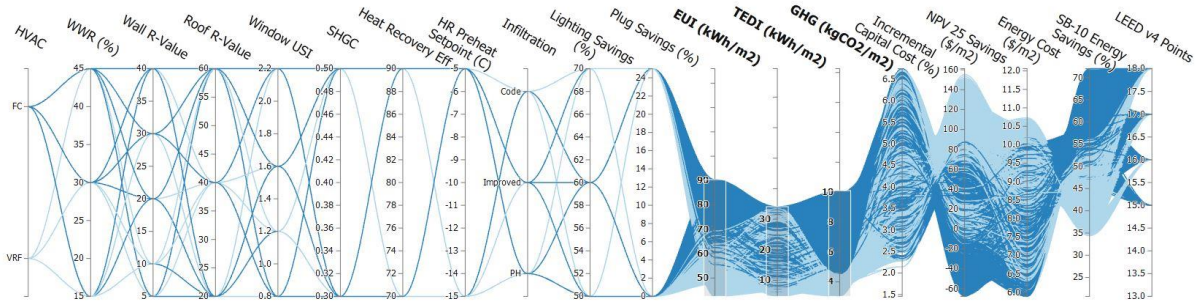


Figure 11: Administration Building Archetype - Level 2 Target Solutions

Level 3

The Level 3 targets ratchet up the building envelope requirements, resulting in the use of high performance (i.e. Passive House level) windows, reduced window-to-wall ratio, typically R-20 effective walls, increased lighting savings through improved design strategies (i.e. general and localized lighting), higher performance heat recovery with minimal preheat for frost control, demand control ventilation strategies, and a fuel switch from natural gas to electricity through the use of a heat recovery VRF system.

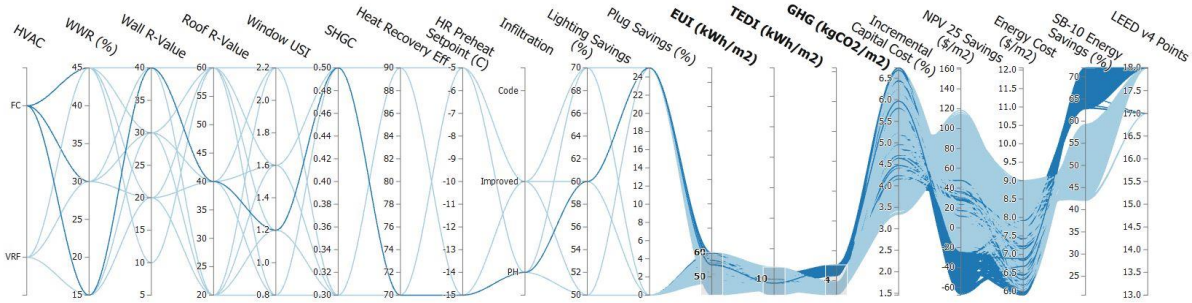


Figure 12: Administration Building Archetype - Level 3 Target Solutions

Table 12 provides the key characteristics of target solutions for the three proposed levels of performance. It should be noted that these are not cost-optimized solutions, but rather based on typical performance packages that are expected to be required to meet the three performance levels, as described above.

Table 12: Administration Building - Target Solution Characteristics

	Level 1	Level 2	Level 3
EUI (kWh/m2)	107	88	52
TEDI (kWh/m2)	50	37	11
GHGI ($kgCO_{2,eq}$/m2)	13	10	3
Incremental Capital Cost (%)	0.8	1.3	6.9
NPV 25 Savings ($/m2)	-25	-28	-168
SB-10 Energy Savings (%)	41	51	53
LEED Cost Savings (%)	41	47	60
LEED v4 Points	15	17	18

4.4 Fire Hall Targets

Table 13 shows the absolute performance targets for TEUI, TEDI and GHGI that have been proposed for the fire hall archetype.

Table 13: Fire Hall Targets

	Level 1	Level 2	Level 3
EUI	105	80	60
TEDI	75	60	30
GHGI	11	5	5

While the Level 1 target for EUI is within the same range of modelled EUI as the typical City of Mississauga fire hall built according to current best practices, the Level 1 TEDI target represents a 9% improvement relative to the baseline level of performance.

Level 3, which targets the performance level of a net-zero ready building working towards the Living Building Challenge, provides for 46% savings relative to the baseline level.

Typical strategies to achieve the three levels of performance are detailed below:

Level 1

Achieving this level requires the Inclusion of many of the energy efficiency measures that are already typical of City's current design practices, which include:

- Gas-fired infrared heaters in the apparatus bay, and VRF-based systems elsewhere
- LED lighting throughout, typically resulting in 50% savings over code
- 70% effective ventilation air heat recovery on DOAS systems
- Low-flow plumbing fixtures

However, envelope performance is required to be a step-up from compared to current typical practice, and requires improved opaque wall thermal performance and/or triple glazed IGUs to meet the TEDI target. Furthermore, effective R-values used for the purposes of energy modelling will be required to be inclusive of all thermal bridging, which should result in improved actual performance by addressing the performance gap typically associated with building envelope components.

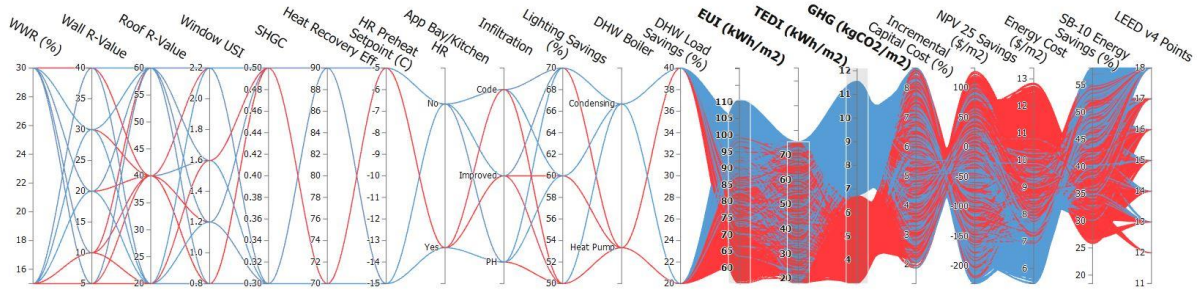


Figure 13: Fire Hall Archetype - Level 1 Target Solutions

Level 2

The Level 2 targets see a significant drop in TEDI, which necessitate improved envelope performance through better opaque wall thermal performance, triple-glazed IGUs, reduced window-to-wall ratio, and improved airtightness relative to the code baseline.

While not absolutely necessary, switchover of DHW heating from condensing boilers to heat-pump based heating may be also contemplated at this point, as well as addition of heat recovery to the apparatus bay and kitchen, in order to achieve the TEUI and GHGI targets.

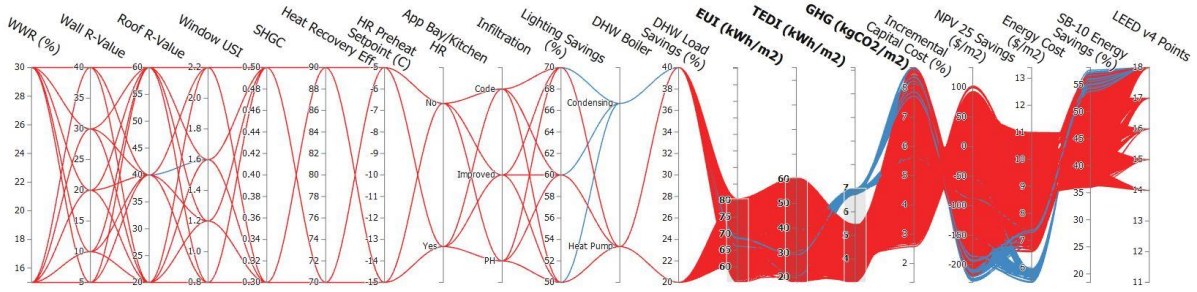


Figure 14: Fire Hall Archetype - Level 2 Target Solutions

Level 3

The Level 3 targets are based on a superior building envelope, resulting in the use of high performance (i.e. Passive House level) windows, reduced window-to-wall ratio, R-20 effective walls, increased lighting savings through improved design strategies (i.e. general and localized lighting), higher performance heat recovery with minimal preheat for frost control, demand control ventilation strategies, increased DHW load savings through more efficient water-use equipment (e.g. drain water heat recovery) and operating best practices. At this level, heat recovery for the apparatus bay and kitchen makeup air units, as well as heat pumps for domestic hot water heating will be required to meet the targets, as shown in the Figure below.

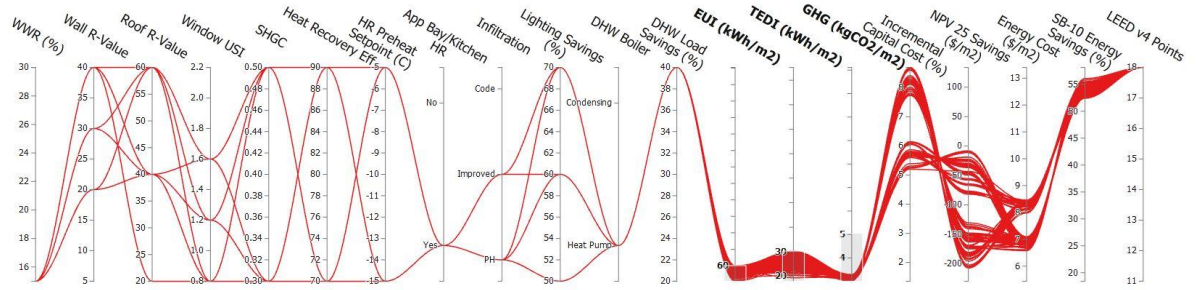


Figure 15: Fire Hall Archetype - Level 3 Target Solutions

Table 12 provides the key characteristics of target solutions for the three proposed levels of performance. It should be noted that these are not cost-optimized solutions, but rather based on typical the performance packages that are expected to be required to meet the three performance levels, as described above.

Table 14: Fire Hall - Target Solution Characteristics

	Level 1	Level 2	Level 3
EUI (kWh/m2)	106	81	59
TEDI (kWh/m2)	74	59	31
GHGI ($kgCO_{2,eq}$/m2)	11	4	3
Incremental Capital Cost (%)	0.5	4.8	7.0
NPV 25 Savings ($/m2)	-18	-240	-291

SB-10 Energy Savings (%)	36	42	53
LEED Cost Savings (%)	49	42	60
LEED v4 Points	17	15	18

4.5 Recreation Centre Targets

Table 15 shows the absolute performance targets for TEUI, TEDI and GHGI that have been proposed for the recreation centre archetype.

Table 15: Recreation Centre Targets

	Level 1	Level 2	Level 3
EUI	160	140	70
TEDI	45	35	15
GHGI	20	15	5

The Level 1 target for EUI is approximately 7% better than the modelled performance of the typical City of Mississauga administration building built according to current practices, whereas Level 3, which targets the performance level of a net-zero ready building working towards the Living Building Challenge, provides for 59% savings relative to the baseline level.

Typical strategies to achieve the three levels of performance are detailed below:

Level 1

Achieving this level requires the Inclusion of many of the energy efficiency measures that are already typical of City's current design practices, which include:

- LED lighting throughout, typically resulting in 50% savings over code
- 70% effective ventilation air heat recovery on DOAS systems
- Low-flow plumbing fixtures

However, envelope performance is required to be a step up compared to current typical practice, and requires improved opaque wall thermal performance and/or triple glazed IGUs to meet the TEDI target. Furthermore, effective R-values used for the purposes of energy modelling will be required to be inclusive of all thermal bridging, which should result in improved actual performance by addressing the performance gap typically associated with building envelope components.

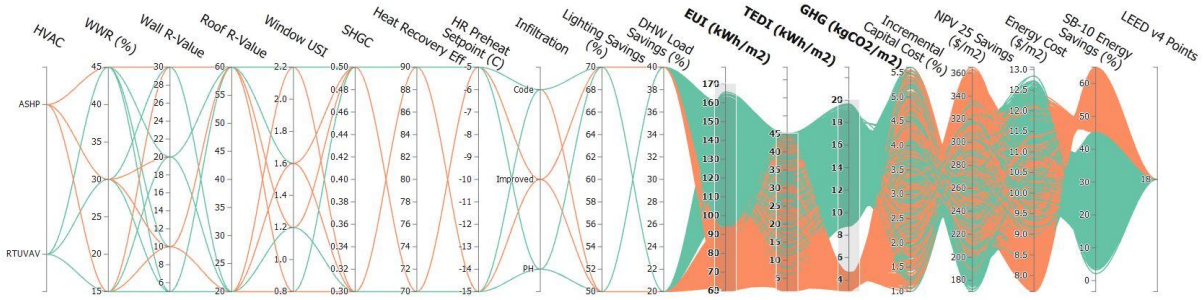


Figure 16: Recreation Centre Archetype - Level 1 Target Solutions

Level 2

The Level 2 targets see a significant drop in TEDI, which necessitate improved envelope performance through better opaque wall thermal performance, triple-glazed IGUs, reduced window-to-wall ratio (i.e. reducing from 45% to 30%), improved airtightness relative to the code baseline, and further reductions in domestic hot water usage through measures such as drain water heat recovery.

A switch-over to electric-based heating is not required at this level in order to meet the TEUI and GHGI targets.

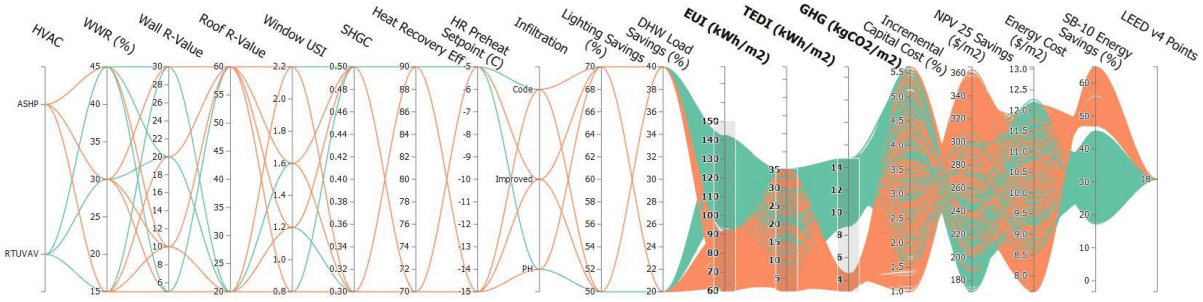


Figure 17: Recreation Centre Archetype - Level 2 Target Solutions

Level 3

The Level 3 targets are based on a superior building envelope, resulting in the use of high performance (i.e. Passive House level) windows, reduced window-to-wall ratio, R-20 effective walls, R-60 roof, increased lighting savings (70% relative to code) through improved design strategies (i.e. general and localized lighting), and higher performance heat recovery (90% effective) with minimal preheat for frost control. At this level, switchover of the HVAC system from gas-fired VAV rooftop units to air-source heat pumps will be required to meet the TEUI and GHGI targets, as shown in the Figure below.

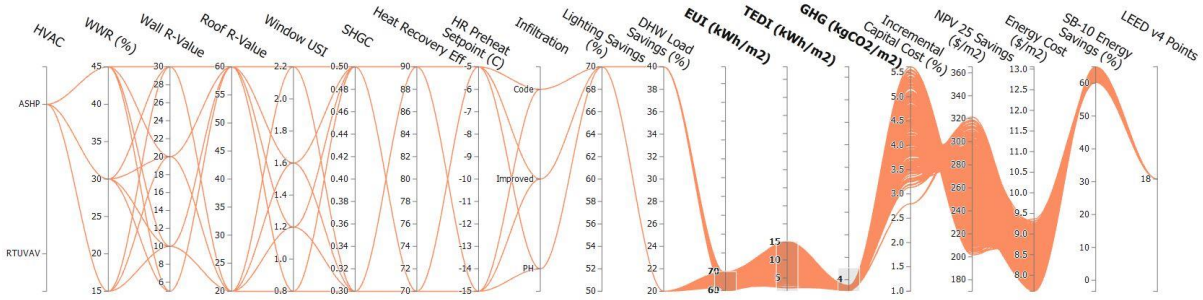


Figure 18: Recreation Centre Archetype - Level 3 Target Solutions

Figure 18 provides the key characteristics of target solutions for the three proposed levels of performance. It should be noted that these are not cost-optimized solutions, but rather based on typical the performance packages that are expected to be required to meet the three performance levels, as described above.

Table 16: Recreation Centre - Target Solution Characteristics

	Level 1	Level 2	Level 3
TEUI (kWh/m2)	159	143	62
TEDI (kWh/m2)	42	36	5
GHGI ($kgCO_{2,eq}$/m2)	18	16	3
Incremental Capital Cost (%)	0.7	0.6	6.2
NPV 25 Savings ($/m2)	-28	-19	-170
SB-10 Energy Savings (%)	10	18	64
LEED Cost Savings (%)	55	56	71
LEED v4 Points	18	18	18

4.5.1 Recreation Centre Pool Targets

Table 17 shows the absolute performance targets for TEUI and GHGI that have been proposed for the pool archetype.

Table 17: Recreation Centre Pool Targets

	Level 1	Level 2	Level 3
EUI	3,700	2,700	1,800
GHGI	560	350	90
TEDI	N/A	N/A	N/A

*__Note__: All targets metrics are normalized on the basis of pool water surface area

Given the process-load heavy nature of the swimming pool due to the loads associated with pool water heating, a TEDI metric is not recommended as it would not serve to drive significant energy or carbon reductions for the archetype.

Typical strategies to achieve the three levels of performance are detailed below:

Level 1

Achieving this level requires the inclusion of several energy efficiency measures, which may typically include:

- Pool dehumidification unit with integrated heat recovery (70% effective) for pool water and ventilation air
- LED lighting throughout, typically resulting in 50% savings over code
- Low-flow plumbing fixtures
- Liquid pool covers to reduce evaporative losses

Due to the significant simultaneous heating and cooling (dehumidification) loads in the pool area, a heat recovery dehumidification unit is provided to recover heat from the dehumidification process. This solution is only one of several to minimize energy use for pools and is not intended to signal a requirement to achieving similar levels of performance.

Overall, the targets at Level 1 represent an 8% reduction in EUI and 7% reduction in GHGI relative to the baseline scenario.

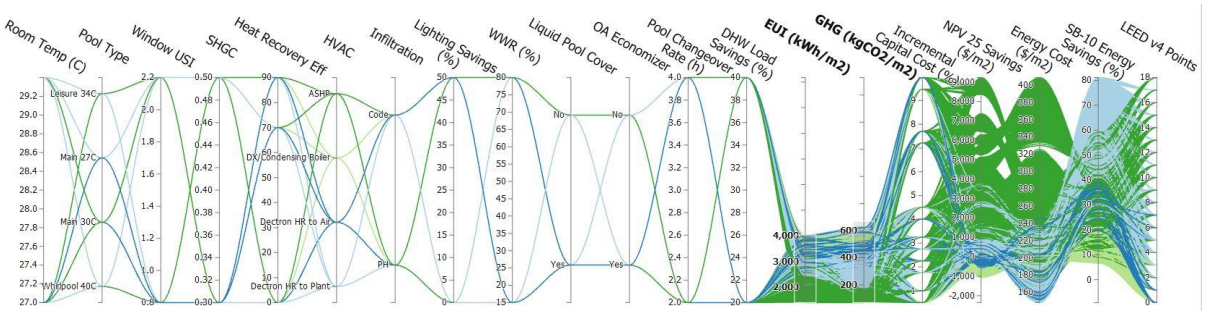


Figure 19: Pool Archetype - Level 1 Target Solutions

Level 2

The Level 2 targets represent a 33% decrease in TEUI and 46% drop in GHGI. One of the approaches to achieving the Level 2 target is to eliminate the usage of the outdoor air economizer.

Outdoor air economizing is usually beneficial, but in some cases depending on pool set point and climate, the air-side economizer is a detriment because the heat recovered from dehumidification is significant in reducing overall energy use, outweighing the electricity used to mechanically cool and dehumidify. The parametric map can be used to assess the benefits of the using outdoor air to dehumidify, compared to using a heat recovery dehumidification unit to mechanically cool the air to dehumidify and recover the waste heat and water during dehumidification.

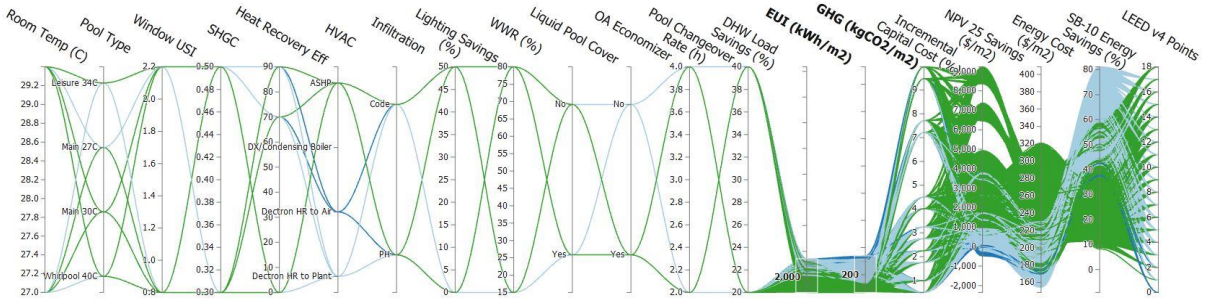


Figure 20: Pool Archetype - Level 2 Target Solutions

Level 3

The Level 3 targets are based on a superior building envelope, resulting in the use of high performance (i.e. Passive House) windows, increased lighting savings through improved design strategies and controls, increased DHW load savings through more efficient water-use equipment (e.g. drain water heat recovery), and usage of liquid pool covers to minimize evaporative losses.

At this level, pool water and ventilation air heating will be required to be provided an electric-based heating system such as air-source heat pumps, as indicated in the Figure below.

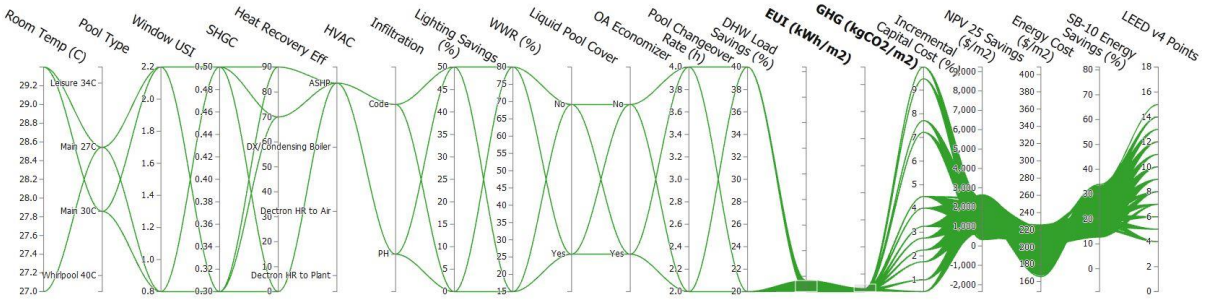


Figure 21: Pool Archetype - Level 3 Target Solutions

Table 18 provides the key characteristics of target solutions for the three proposed levels of performance. It should be noted that these are not cost-optimized solutions, but rather based on typical the performance packages that are expected to be required to meet the three performance levels, as described above.

Table 18: Pool - Target Solution Characteristics

	Level 1	Level 2	Level 3
EUI (kWh/m2)	3,661	2,636	1,710
GHGI ($kgCO_{2,eq}$/m2)	558	303	86
Incremental Capital Cost (%)	0	0	12.2
NPV 25 Savings ($/m2)	143	-219	1,139
SB-10 Energy Savings (%)	33	52	34

LEED Cost Savings (%)	20	14	35
LEED v4 Points	7	5	13

4.5.2 Recreation Centre Ice Rink Targets

Table 19 shows the absolute performance targets for TEUI and GHGI that have been proposed for the pool archetype.

Table 19: Ice Rink Targets

	Level 1	Level 2	Level 3
EUI	380	335	200
GHGI	46	38	17
TEDI	N/A	N/A	N/A

Given the process-load heavy nature of the ice rink due to the loads associated with rink refrigeration, as well as considering that the majority of the rink energy consumption is associated with cooling, as opposed to space heating, the TEDI metric is not recommended as it would not serve to drive significant energy or carbon reductions for this archetype.

It should be noted that since the ice rink archetype was modelled in eQuest, as opposed to EnergyPlus, a full parametric analysis was not conducted due to software limitations. However, appropriate targets for each level have been set based on performance packages that align with the approach applied for the other archetypes, i.e., focusing on load reductions first through improved envelope and heat recovery, followed by improvements in mechanical system efficiency and fuel switching to drive towards net zero-ready and low carbon outcomes at Level 3.

Typical strategies to achieve the three levels of performance are detailed below:

<u>Level 1</u>

Achieving this level requires the inclusion of several energy efficiency measures that are considered best practice for the City's ice rink facilities, which may typically include:

- Low-emissivity ceiling
- Refrigeration compressors and brine loop pumps equipped with VFDs
- Refrigeration heat recovery serving subfloor and DHW preheat
- 60% effective ventilation air heat recovery
- LED lighting throughout, typically resulting in 50% savings over code
- 20% reduction in DHW loads through low-flow fixtures

However, envelope performance is required to be a step-up from compared to current typical practice, and requires improved opaque wall thermal performance and/or triple glazed insulated glazing units (IGUs) to meet the TEDI target. Furthermore, effective

R-values used for the purposes of energy modelling will be required to be inclusive of all thermal bridging, which should result in improved actual performance by addressing the performance gap typically associated with building envelope components.

Level 2

The Level 2 targets represent a 13% decrease in TEUI and 20% drop in GHGI, and will typically require improved opaque wall performance (effective R-20 wall, R-40 roof), triple-glazed IGUs, improved heat recovery effectiveness (up to 80%), and improved levels of whole building airtightness.

Level 3

The Level 3 targets are based on extensive refrigeration ice plant heat recovery to serve building heating loads in addition to subfloor heating and DHW pre-heat, coupled with electric-based heating such as ground-source heat pumps to offset residual loads. Additionally, up to 70% lighting savings would typically be required through improved lighting design and advanced controls, 40% DHW savings through drain water heat recovery, and improved ice plant efficiency (seasonal COP of 4.0) through measures such as floating head and suction pressure controls.

Table 20 provides the key characteristics of target solutions for the three proposed levels of performance. It should be noted that these are not cost-optimized solutions, but rather based on typical the performance packages that are expected to be required to meet the three performance levels, as described above. The results associated with the TEDI and CEDI metric are provided for information purposes only.

Table 20: Ice Rink - Target Solution Characteristics

	Level 1	Level 2	Level 3
EUI (kWh/m2)	380	335	200
GHGI ($kgCO_{2,eq}$/m2)	46	38	17
Incremental Capital Cost (%)	0.5	1.9	5.0
NPV 25 Savings ($/m2)	-16	-49	-30
TEDI (kWh/m2)	150	140	140
CEDI (kWh/m2)	183	183	180

4.6 Library Targets

Table 21 shows the absolute performance targets for TEUI, TEDI and GHGI that have been proposed for the library building archetype.

Table 21: Library Building Targets

	Level 1	Level 2	Level 3
EUI	140	110	60
TEDI	50	40	25
GHGI	15	10	5

The Level 1 target for EUI is approximately 7% better than the modelled performance of the typical City of Mississauga library built according to current best practices, whereas Level 3, which targets the performance level of a net-zero ready building working towards the Living Building Challenge, provides for 60% savings relative to the baseline level.

Typical strategies to achieve the three levels of performance are detailed below:

Level 1

Achieving this level requires the Inclusion of many of the energy efficiency measures that are already typical of City's current design practices, which include:

- Central plant consisting of condensing boilers and magnetic bearing chillers
- LED lighting throughout, typically resulting in 50% savings over code
- 70% effective ventilation air heat recovery on rooftop units

However, envelope performance is required to be a step up compared to current typical practice, and requires improved opaque wall thermal performance and/or triple glazed IGUs to meet the TEDI target. Furthermore, effective R-values used for the purposes of energy modelling will be required to be inclusive of all thermal bridging, which should result in improved actual performance by addressing the performance gap typically associated with building envelope components.

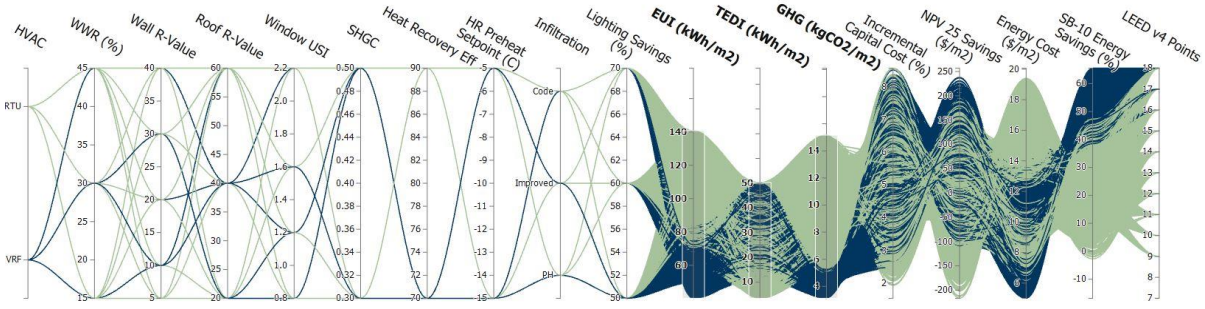


Figure 22: Library Archetype - Level 1 Target Solutions

Level 2

The Level 2 targets see a significant drop in TEDI, which necessitate improved envelope performance through better opaque wall thermal performance, triple-glazed IGUs, reduced window-to-wall ratio, and improved airtightness relative to the code baseline.

A switch-over to electric-based heating is not required at this Level in order to meet the TEUI and GHGI targets.

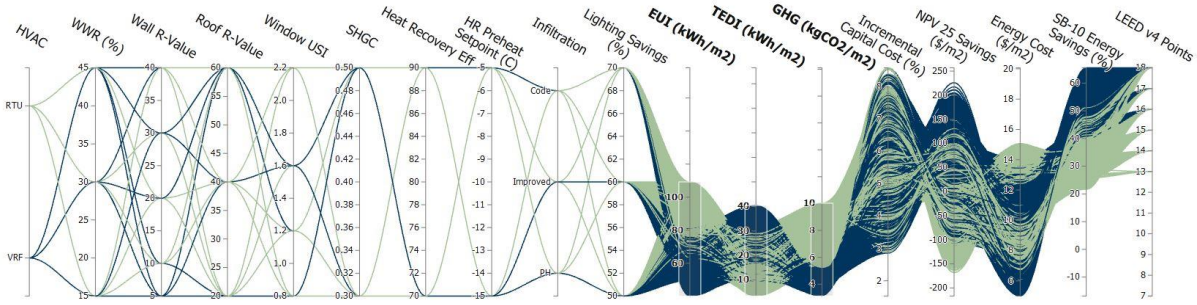


Figure 23: Library Building Archetype - Level 2 Target Solutions

Level 3

The Level 3 targets ratchet up the building envelope requirements, resulting in the use of high performance (i.e. Passive House level) windows, reduced window-to-wall ratio, typically R-20 effective walls, increased lighting savings through improved design strategies (i.e. general and localized lighting), higher performance heat recovery with minimal preheat for frost control, demand control ventilation strategies, and a fuel switch from natural gas to electricity through the use of a heat recovery VRF system.

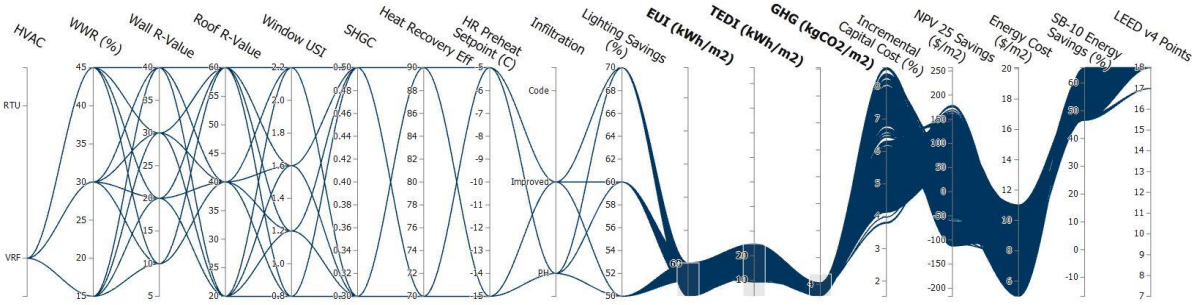


Figure 24: Library Building Archetype - Level 3 Target Solutions

Table 22 provides the key characteristics of target solutions for the three proposed levels of performance. It should be noted that these are not cost-optimized solutions, but rather based on typical the performance packages that are expected to be required to meet the three performance levels, as described above.

Table 22: Library Building - Target Solution Characteristics

	Level 1	Level 2	Level 3
EUI (kWh/m2)	137	107	47
TEDI (kWh/m2)	43	35	20
GHGI ($kgCO_{2,eq}$/m2)	14	11	3
Incremental Capital Cost (%)	0.8	0.9	4.7
NPV 25 Savings ($/m2)	-40	34	-55

SB-10 Energy Savings (%)	14	27	64
LEED Cost Savings (%)	40	57	74
LEED v4 Points	15	18	18

4.7 Transit Repair and Maintenance Facility Targets

Table 23 shows the absolute performance targets for TEUI, TEDI and GHGI that have been proposed for the transit repair and maintenance facility archetype.

Table 23: Transit Repair and Maintenance Facility Targets

	Level 1	Level 2	Level 3
EUI	300	280	130
TEDI	120	100	20
GHGI	38	35	10

The Level 1 target for EUI is approximately 12% better than the modelled performance of the typical City of Mississauga transit repair and maintenance facility built according to current practices, whereas Level 3, which targets the performance level of a net-zero ready building working towards the Living Building Challenge, provides for 60% savings relative to the baseline level.

Typical strategies to achieve the three levels of performance are detailed below:

Level 1

Achieving this level requires the Inclusion of many of the energy efficiency measures that are already typical of City's current design practices, which include:

- High efficiency direct-fired gas-heated makeup air units interlocked with exhaust fans, and gas-IR heaters at the zone level
- LED lighting throughout, typically resulting in 50% savings over code
- 70% effective ventilation air heat recovery on DOAS systems
- Demand-controlled ventilation resulting on average, a 25% reduction in outdoor airflow compared to the baseline level

Envelope performance is required to be a step-up from compared to current typical practice, and requires improved opaque wall thermal performance to meet the TEDI target. Furthermore, effective R-values used for the purposes of energy modelling will be required to be inclusive of all thermal bridging, which should result in improved actual performance by addressing the performance gap typically associated with building envelope components.

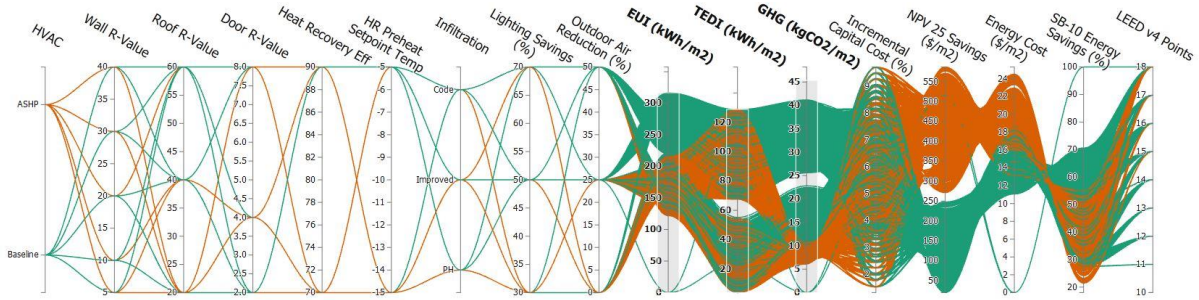


Figure 25: Transit Repair Archetype - Level 1 Target Solutions

Level 2

The Level 2 targets see a significant drop in TEDI, which necessitate improved envelope performance through better opaque wall thermal performance, improved frost control strategies for heat recovery devices which require minimal preheat energy, and improved airtightness relative to the code baseline.

A switch-over to electric-based heating is not required at this Level in order to meet the TEUI and GHGI targets.

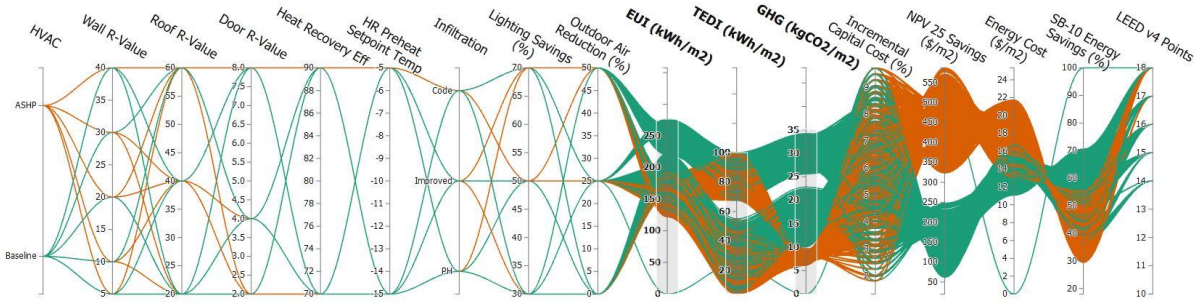


Figure 26: Transit Repair Archetype - Level 2 Target Solutions

Level 3

The Level 3 targets ratchet up the building envelope requirements, typically resulting in the use of R-20 effective walls, increased lighting savings through improved design strategies (i.e. general and localized lighting), well-insulated overhead doors with improved details to minimize thermal bridging at the door-to-wall transition, aggressive demand control ventilation strategies resulting in 50% reduction in outdoor airflow compared to the baseline scenario, and a fuel switch from natural gas to electricity through the use of air-source heat pumps.

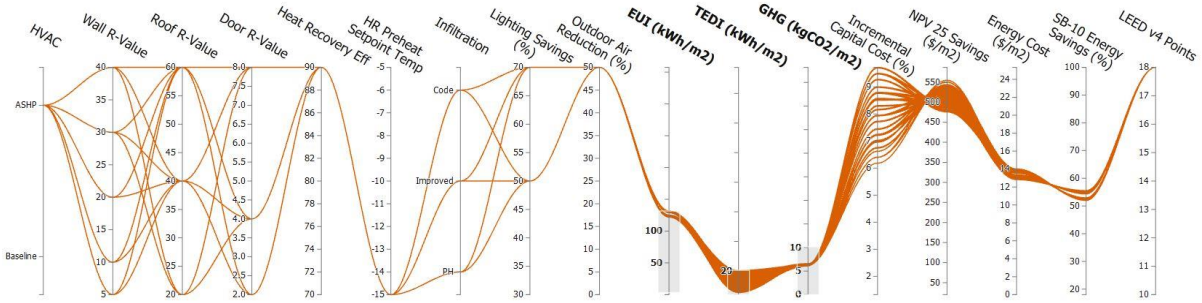


Figure 27: Transit Repair Archetype - Level 3 Target Solutions

Table 24 provides the key characteristics of target solutions for the three proposed levels of performance. It should be noted that these are not cost-optimized solutions, but rather based on typical the performance packages that are expected to be required to meet the three performance levels, as described above.

Table 24: Transit Repair Building - Target Solution Characteristics

	Level 1	Level 2	Level 3
EUI (kWh/m2)	294	275	123
TEDI (kWh/m2)	116	101	12
GHGI ($kgCO_{2,eq}$/m2)	38	34	6
Incremental Capital Cost (%)	0.2	0.6	4.6
NPV 25 Savings ($/m2)	43	43	417
SB-10 Energy Savings (%)	33	37	55
LEED Cost Savings (%)	37	39	68
LEED v4 Points	14	15	18

4.8 Transit Station Targets

Table 25 shows the absolute performance targets for TEUI, TEDI and GHGI that have been proposed for the transit station archetype.

Table 25: Transit Station Targets

	Level 1	Level 2	Level 3
EUI	230	180	150
TEDI	100	50	15
GHGI	25	15	10

The Level 1 target for EUI is approximately 15% better than the modelled performance of the typical City of Mississauga transit station built according to current practices, whereas Level 3, which targets the performance level of a net-zero ready building

working towards the Living Building Challenge, provides for 44% savings relative to the baseline level.

Typical strategies to achieve the three levels of performance are detailed below:

Level 1

Achieving this level requires the Inclusion of many of the energy efficiency measures that are already typical of City's current design practices, which include:

- High efficiency condensing boilers serving a radiant heating system in the waiting area
- LED lighting throughout, typically resulting in 50% savings over code
- Separate energy recovery ventilator with 70% effective heat recovery serving the waiting area

Envelope performance is also required to be a step up compared to current typical practice, and requires improved opaque wall thermal performance and/or triple glazed IGUs to meet the TEDI target. Furthermore, effective R-values used for the purposes of energy modelling will be required to be inclusive of all thermal bridging, which should result in improved actual performance by addressing the performance gap typically associated with building envelope components.

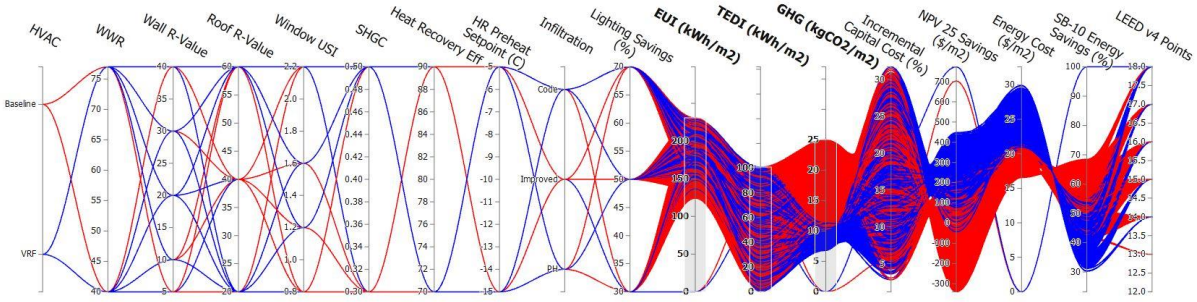


Figure 28: Transit Station Archetype - Level 1 Target Solutions

Level 2

The Level 2 targets see a significant drop in TEDI, which necessitate improved envelope performance through better opaque wall thermal performance, reduced window-to-wall ratio, triple-glazed IGUs, and improved airtightness relative to the code baseline.

A switch-over to electric-based heating is not required at this level in order to meet the TEUI and GHGI targets.

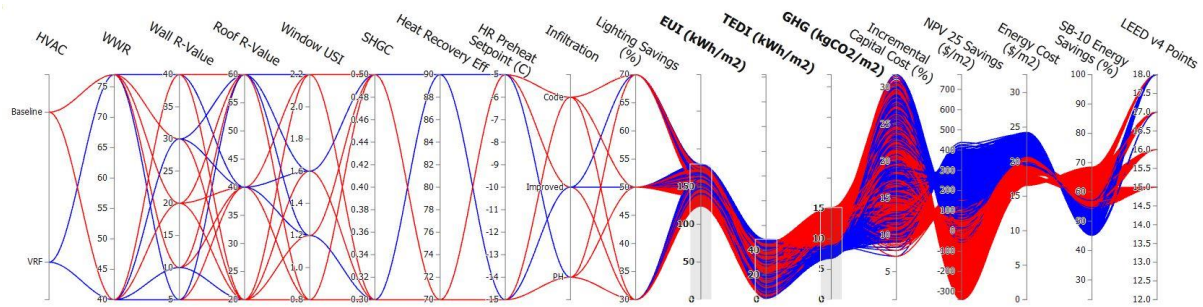


Figure 29: Transit Station Archetype - Level 2 Target Solutions

Level 3

The Level 3 targets ratchet up the building envelope requirements, resulting in the use of high performance (i.e. Passive House) windows, reduced window-to-wall ratio, typically R-20 effective walls, increased lighting savings through improved design strategies (i.e. general and localized lighting), higher performance heat recovery with minimal preheat for frost control, and demand control ventilation strategies.

In terms of HVAC system choice, the energy modelling analysis suggests at this level of performance (i.e. when heating loads are significantly reduced), both a hydronic radiant heating system and a VRF-based system offer equivalent performance in terms of energy and carbon outcomes.

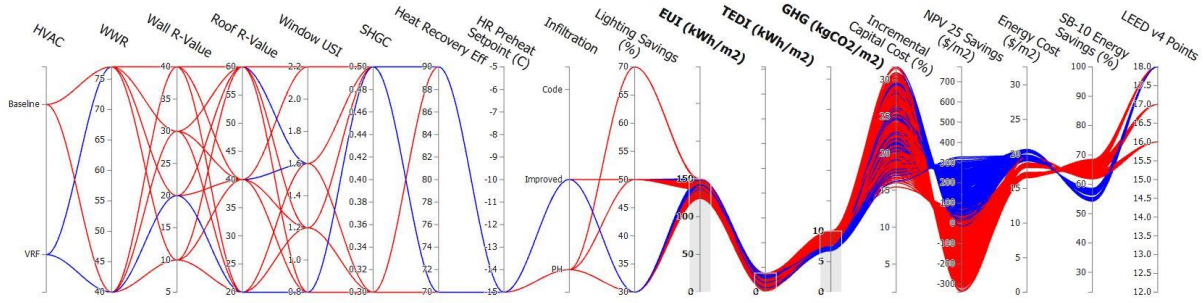


Figure 30: Transit Station Archetype - Level 3 Target Solutions

Table 26 provides the key characteristics of target solutions for the three proposed levels of performance. It should be noted that these are not cost-optimized solutions, but rather based on typical the performance packages that are expected to be required to meet the three performance levels, as described above.

Table 26: Transit Station - Target Solution Characteristics

	Level 1	Level 2	Level 3
EUI (kWh/m2)	228	176	151
TEDI (kWh/m2)	97	42	4
GHGI ($kgCO_{2,eq}$/m2)	25	16	9
Incremental Capital Cost (%)	0.6	6.1	18.9

NPV 25 Savings ($/m2)	53	-38	-264
SB-10 Energy Savings (%)	42	55	62
LEED Cost Savings (%)	39	43	42
LEED v4 Points	15	16	16

5. ACHIEVING NET ZERO

In order to achieve Level 3, a building should drive towards a net zero energy level of performance such as the Living Building Challenge, which requires the achievement of net zero site energy using on-site renewable energy.

Table 27 indicates the incremental capital cost premium associated with on-site photovoltaics (PV) for archetype facilities that meet the Level 3 targets for TEUI, TEDI and GHGI, under a typical scenario, to also achieve a net-zero energy level of performance.

While being dependent on the specifics of building geometry and available roof area, it can be seen that achieving net zero without significantly expanding the building footprint to accommodate additional on-site PV can be more challenging for certain archetypes. For example, pools and ice rinks in particular are energy-use intensive relative to their floorplate due to the pool water heating and refrigeration loads, respectively, whereas the transit archetypes have higher energy use intensities due to the longer hours of operation.

However, for other archetypes such as the fire hall, library and recreation centre (without pool or ice rink), achievement of a net zero energy outcome, which is in line with the desired level of performance at Level 3, appears to be feasible from the perspective of both project economics and rooftop space constraints.

Table 27: Typical Economic Impact and Roof Area Required to Achieve Net Zero Energy

Archetype	Expected Typical Economic Impact	
	Incremental Capital Cost (%) for PV	% Roof Coverage Required for PV
Administration	1.4	191
Fire Hall	3.3	93
Library	3.1	82
Recreation Centre	4.1	92
Pool	7.6	937
Ice Rink	5.1	274
Transit Station	8.3	214
Transit Repair and Service	10.7	135

6. IMPLEMENTATION CONSIDERATIONS

In order to ensure that the proposed performance metrics translate to real GHG emissions reductions and energy and energy cost savings, consideration should be given to implementation strategies and tools to support the policy. Some items of implementation to consider when rolling out the revised policy include:

- Commissioning: In order to reduce the performance gap between modelled performance based on design intent and actual performance during operations, it is essential that requirements for best practices in building commissioning are integrated into the Standard. The following commissioning requirements are suggested for the three levels:
    - Level 1: Conduct best practice commissioning, per the requirements referenced in LEED BD+C v4 Fundamental Commissioning and Verification pre-requisite.
    - Level 2: In addition to Level 1, meet the requirements of LEED BC+C v4 credit Envelope Commissioning (Option 2).
    - Level 3: In addition to Level 2, meet the requirements of LEED BC+C v4 credit Enhanced and monitoring-based Commissioning
- Sub-metering: In order to facilitate ongoing energy management, as well as to support post-occupancy calibration of the energy model in cases of significant discrepancy, it is suggested that electricity and/or thermal sub-meters be required to be installed for all energy end-uses that represent more than 10% of the building's total energy consumption. In addition, all major process loads such as pools and ice rinks should be sub-metered separately.
- On-Site Renewables: The following on-site renewable energy requirements are suggested at each level, to provide added benefits from on-site renewable energy generation in terms of reducing stress on the electrical grid, resiliency, and GHG emissions reduction.
    - Level 1: Designed to accommodate future connections to PV that can offset 5% of the building annual energy consumption
    - Level 2: On-site renewable energy devices to offset 5% of building annual energy consumption
    - Level 3: On-site renewable energy devices to offset 100% of building annual energy consumption
- Standard scope of work document for energy modeling professionals or energy consultants bidding on City of Mississauga work that will need to comply with these recommendations. A draft scope of work has been provided in Appendix E.
- Energy modeling guidelines to clarify standard schedules, assumptions and methodologies around energy models so that projects are meeting the proposed

performance criteria as intended. Draft modelling guidelines have been provided in Appendix F.

- Air tightness testing – The results of the energy analysis have indicated that improved air tightness over "typical" values can have significant energy savings. This can only be verified using whole building air leakage testing. This is an added expense to a project if mandated, but would likely result in actual air leakage reductions and related energy savings.

- Verification of as-designed and built energy savings – In order to close the gap between design and operational performance of buildings, it is recommended that the City include post-occupancy verification of as designed and as-built energy savings. Older versions of LEED (i.e. LEED 2009) included a credit for verifying energy savings post-occupancy (EAc5 – Measurement and Verification). This credit no longer exists under LEED v4, although portions of the credit are dealt with through other commissioning and metering credits. A process similar to that required for EAc5 under LEED 2009 is recommended for future projects; with a focus on identifying major discrepancies between the as-designed model and the operating energy, and developing corrective action plans. The process would differ from EAc5 in that intent would be to focus on corrective action for operations, rather than on verifying savings of specific ECMs. The level of effort for such a process may be somewhat variable, however the intent would be an outcomes-based investigation to ensure building operational energy savings are as designed. In order to focus effort where it is most needed, we suggest requiring this only on projects operating outside a certain range, say 15% overall EUI difference from the modeled energy use. A specific protocol has been provided for consideration as part of the suggested energy consultant scope of work in Appendix E.

- While the proposed policy and energy modeling guidelines generally do not contradict industry practice for code compliance or other ratings systems, there are some deviations that are expected to improve the accuracy of models and the quality of designs, in particular the full evaluation of effective R-values. The added effort to incorporate these into models, which may lead to two versions of energy models on projects, is minimal and should not be a reason to endorse practices that do not support the City's overall objectives.

Table 28. Summary of Target Recommendations for Each Archetype

Archetype	Total Energy Use Intensity (kWh/m^2.yr)	Thermal Energy Demand Intensity (kWh/m^2.yr)	Greenhouse Gas Emissions Intensity (kg$CO_{2,eq}$/m^2.yr)
Admin	Level 1: 110 Level 2: 90 Level 3: 60	Level 1: 55 Level 2: 35 Level 3: 15	Level 1: 15 Level 2: 10 Level 3: 5
Fire Hall	Level 1: 105 Level 2: 80 Level 3: 60	Level 1: 75 Level 2: 60 Level 3: 30	Level 1: 11 Level 2: 5 Level 3: 5
Rec Centre without Pools	Level 1: 160 Level 2: 140 Level 3: 70	Level 1: 45 Level 2: 35 Level 3: 15	Level 1: 20 Level 2: 15 Level 3: 5

Archetype	Total Energy Use Intensity (kWh/m².yr)	Thermal Energy Demand Intensity (kWh/m².yr)	Greenhouse Gas Emissions Intensity ($kgCO_{2,eq}/m^2.yr$)
Pools	Level 1: 3,700 Level 2: 2,700 Level 3: 1,800	N/A	Level 1: 560 Level 2: 350 Level 3: 90
Ice Rinks	Level 1: 380 Level 2: 335 Level 3: 200	N/A	Level 1: 46 Level 2: 38 Level 3: 17
Library	Level 1: 140 Level 2: 110 Level 3: 60	Level 1: 50 Level 2: 40 Level 3: 25	Level 1: 15 Level 2: 10 Level 3: 5
Vehicle Maintenance	Level 1: 300 Level 2: 280 Level 3: 130	Level 1: 120 Level 2: 100 Level 3: 20	Level 1: 38 Level 2: 35 Level 3: 10
Transit Station	Level 1: 230 Level 2: 180 Level 3: 150	Level 1: 100 Level 2: 50 Level 3: 15	Level 1: 25 Level 2: 15 Level 3: 10

APPENDIX A: ENERGY SIMULATION DETAILS

Table A-1. Library Simulation Input Summary

Characteristic	Library
Weather	Pearson Int'l CWEC 2016
Software	EnergyPlus v8.9
Climate Zone	5
Building Area	1,283 m^2
Operating Hours	Modified NECB Schedule C occupancy, lighting and plug loads to match typical hours of operation: Weekdays: 10 AM to 9 PM Weekends: 10 AM to 5 PM
Occupancy	200 m^2/person Stairs, Mechanical 100 m^2/person Corridor, Storage 30 m^2/person Washroom 20 m^2/person Office, Shelf Area, Cataloguing 10 m^2/person Lounge 5 m^2/person Conference
Plug & Process Loads	7.5 W/m^2 Office 1 W/m^2 Lounge, Conference, Mechanical, Washroom, Storage 2.5 W/m^2 Cataloguing
Outdoor Air	Minimum ventilation/exhaust flow-rates as per ASHRAE 62.1-2010 DOAS: 1,570 cfm
Infiltration	0.25 L/s/m^2 Exterior Wall Area, Code Options: 0.1 L/s/m^2 Exterior Area, Improved 0.01 L/s/m^2 Exterior Area, Passive house
Wall R-Value	Options: R-10 to R-30
Roof R-Value	Options: R-20 to R-60
Window U-Value	Options: 2.2 USI to 0.8 USI
Window SHGC	Options: 0.3 or 0.5
Window Area %	Options: 15% to 60%
Interior Lighting	18 W/m^2 Shelf Area 13.4 W/m^2 Mechanical 13.2 W/m^2 Conference 11.9 W/m^2 Office 11 W/m^2 Cataloguing 10.5 W/m^2 Washrooms 9.4 W/m^2 Lounge 7.4 W/m^2 Stairs 7.1 W/m^2 Corridor 6.8 W/m^2 Storage Options: 50% to 70% Savings
HVAC Systems	Options: Packed Single Zone Roof-Top Units

Characteristic	Library
	or VRF and Dedicated Outdoor Air System (DOAS)
Supply and Ventilation Air	Constant ventilation air supplied directly to zones through DOAS. Fan coil fans cycle to meet heating and cooling loads.
Heat Recovery	Options: 60% to 90% effective HR
Fans	1 W/cfm DOAS 0.3 W/cfm Fan Coils
Cooling	RTU Option: DX Coil, 3.8 nominal COP VRF Option: 3.3 nominal COP
Heating	RTU Option: Condensing Gas Coil, 90% eff. VRF Option: 3.4 nominal COP
Pumps	60 ft head, variable speed
Humidification	Electric Steam Humidification to 20% RH
DHW	4,650 W Peak Load Condensing Gas boiler, 96% eff.

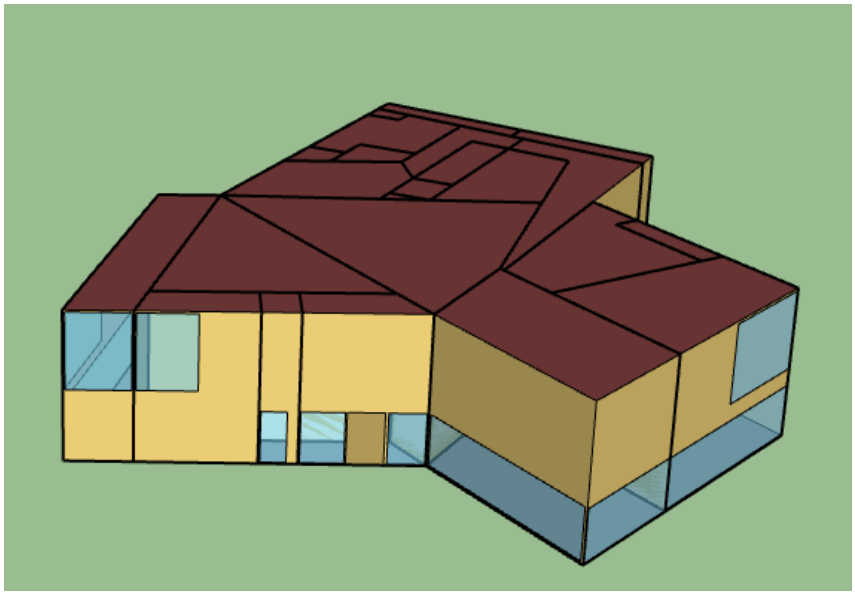


Table A-2. Rec Centre Building Simulation Input Summary

Characteristic	Rec Centre
Weather	Pearson Int'l CWEC 2016
Software	EnergyPlus v8.9
Climate Zone	5
Building Area	9,794 m^2
Operating Hours	Modified NECB Schedule B occupancy, lighting and plug loads to match typical operating hours: Friday and Saturday: 5:30 AM to 1:00 AM All Other Days: 6:00 AM to 12:00 AM
Occupancy	20 m^2/person Office 10 m^2/person Lobby, Change Rooms 5 m^2/person Gym, Meeting, Multipurpose, Pool 4 m^2/person Gym
Plug & Process Loads	7.5 W/m^2 Office 1 W/m^2 Gym, Fitness, Meeting, Multipurpose, Lobby 2.5 W/m^2 Change Rooms plus 80 kW Pool Filtration and Makeup Water pumps 109.4 kW peak Pool Latent Load 132.7 kW peak Pool Heating Load
Outdoor Air	As per ASHRAE 62.1-2010: DOAS: 10,420 cfm Pool: 12,460 cfm Fitness: 4,030 cfm Gym: 6,290 cfm
Infiltration	0.25 L/s/m^2 Exterior Wall Area, Code Options: 0.1 L/s/m^2 Exterior Area, Improved 0.01 L/s/m^2 Exterior Area, Passive house
Wall R-Value	Options: R-10 to R-30
Roof R-Value	Options: R-20 to R-60
Window U-Value	Options: 2.2 USI to 0.8 USI
Window SHGC	Typical: SHGC 0.3
Window Area %	Typical: 30% Varied 15% to 30%
Interior Lighting	13.4 W/m^2 Mechanical 13.2 W/m^2 Meeting, Multipurpose 11.9 W/m^2 Office 9.8 W/m^2 Pool, Change Rooms, Fitness, Gym 9.7 W/m^2 Lobby 7.1 W/m^2 Corridor Options: 50% to 70% Savings
Exterior Lighting	11.54 kW
HVAC Systems	Pool: Dehumidification Unit with Heat Recovery to Pool Water

Characteristic	Rec Centre
	Option: Single-Zone Constant Unitary Systems for Fitness, Multipurpose, and Gym VAV with baseboards for remainder of building Or Air-source heat pumps with DOAS throughout (except pool)
Supply and Ventilation Air	OA per ASHRAE 62.1-2010 Constant ventilation air supplied directly to zones through DOAS. Fan coil fans cycle to meet heating and cooling loads. Unitary Systems provide constant ventilation when occupied and variable volume for conditioning
Heat Recovery	Typical: 60% Heat Recovery Varied: 60% to 80% HR
Fans	0.93 W/cfm Pool Unitary 0.6 W/cfm Gym Unitary 0.5 W/cfm Fitness Unitary 0.9 W/cfm DOAS 0.2 W/cfm VRF
Cooling	VAV Option: Chiller, 8 seasonal COP (mag-bearing) Pool DX Coil, 3 seasonal COP VRF Option: 3.3 nominal COP
Heating	VAV Option: Condensing Boiler, 96% seasonal eff. ASHP Option: 4.15 nominal COP
Pumps	60 ft head, variable speed
DHW	96.7 kW Peak Load 90 W/person Fitness, Gym, Pool, Office, Meeting 45 W/person Multipurpose Condensing Boiler, 96% seasonal eff.

Table A-3. Fire Hall Simulation Input Summary

Characteristic	Fire Hall
Weather	Pearson Int'l CWEC 2016
Software	EnergyPlus v8.9
Climate Zone	5
Building Area	1,508 m^2 of which 566 m^2 Apparatus Bay Conditioned to 4°C
Operating Hours	NECB Schedule F occupancy, lighting and plug loads. Apparatus Bay and Kitchen exhaust 4h/day
Occupancy	25 m^2/person
Plug & Process Loads	2.5 W/m^2
Outdoor Air	DOAS: 1865 cfm, 1.06 L/s/m2 average App. Bay: 3,800 cfm exhaust Kitchen: 2,100 cfm exhaust
Infiltration	0.25 $L/s/m^2$ Exterior Wall Area, Code Options: 0.1 $L/s/m^2$ Exterior Area, Improved 0.01 $L/s/m^2$ Exterior Area, Passive house
Wall R-Value	Options: R-10 to R-30
Roof R-Value	Options: R-20 to R-60
Window U-Value	Options: 2.2 USI to 0.8 USI
Window SHGC	0.3
Window Area %	Typical: 15% Options: 15% to 30%
Interior Lighting	7.6 W/m^2 Options: 50% to 60% Savings
Exterior Lighting	None
HVAC Systems	App Bay MUA and gas-fired infrared heaters Options: HW Radiant Slab VRF and Dedicated Outdoor Air System (DOAS) elsewhere
Supply and Ventilation Air	Per ASHRAE 62.1-2010 Constant ventilation air supplied directly to zones through DOAS. VRF fans cycle to meet heating and cooling loads.
Heat Recovery	Typical: 60% DOAS Heat Recovery, No App Bay or Kitchen Exhaust HR Varied: 60% to 90% DOAS HR
Fans	0.75 W/cfm App Bay Exhaust 0.5 W/cfm Kitchen Exhaust 0.9 W/cfm DOAS 0.2 W/cfm VRF
Cooling	VRF 3.3 nominal COP
Heating	Gas-fired MUA and Infrared heater option: 80% eff. Radiant Floor Option: Condensing Boiler, 96% seasonal eff.

	VRF 3.4 nominal COP
Pumps	60 ft head, variable speed
DHW	400 W/person Options: 20% to 40% Load Savings Condensing Boiler, 96% seasonal eff. Option: Air Source Heat Pump

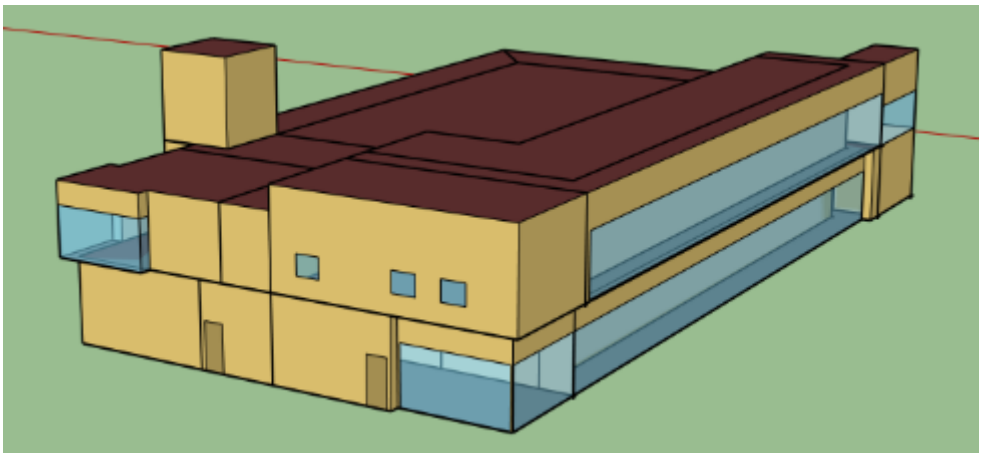


Table A-4. Administration Building Simulation Input Summary

Characteristic	Administration Building
Weather	Pearson Int'l CWEC 2016
Software	EnergyPlus v8.9
Climate Zone	5
Building Area	3,804 m^2
Operating Hours	NECB Schedule A occupancy, lighting and plug loads.
Occupancy	20 m^2/person Office 2 m^2/person Meeting 3.33 m^2/person Reception 10 m^2/person Lobby
Plug & Process Loads	7.5 W/m^2 Office 1 W/m^2 Meeting, Reception, Lobby, Storage/Mechanical Options: 0% to 25% Savings
Outdoor Air	Per ASHRAE 62.1-2010 DOAS: 5360 cfm, 0.664 L/s/m2 average
Infiltration	0.25 L/s/m^2 Exterior Wall Area, Code Options: 0.1 L/s/m^2 Exterior Area, Improved 0.01 L/s/m^2 Exterior Area, Passive house
Wall R-Value	Options: R-10 to R-40
Roof R-Value	Options: R-20 to R-60
Window U-Value	Options: 2.2 USI to 0.8 USI
Window SHGC	0.3
Window Area %	Typical: 15% Options: 15% to 45%
Interior Lighting	11.9 W/m^2 Office 13.2 W/m^2 Meeting 7.1 W/m^2 Corridor 9.7 W/m^2 Reception, Lobby 13.4 W/m^2 Storage/Mechanical Options: 0% to 50% Savings
Exterior Lighting	1000 W Options: 0% to 50% Savings
HVAC Systems	Hydronic Fan Coils and Dedicated Outdoor Air System (DOAS) Option: Ground-source variable refrigerant flow (VRF)
Supply and Ventilation Air	Constant ventilation air supplied directly to zones through DOAS. Fan coil fans cycle to meet heating and cooling loads.
Heat Recovery	Typical: 60% DOAS Heat Recovery Varied: 60% to 90% DOAS HR
Fans	1.0 W/cfm DOAS 0.2 W/cfm Fan Coils

Cooling	Boiler/Chiller Option: Screw Chiller, 2.9 seasonal COP GSVRF Option: Ground-source VRF, 5 seasonal COP
Heating	Boiler/Chiller Option : Condensing Boiler, 96% seasonal eff. GSVRF Option: Ground-source VRF, 3 seasonal COP Serves 100% of load
Pumps	60 ft head, variable speed
DHW	90W/person in Offices Same source as heating

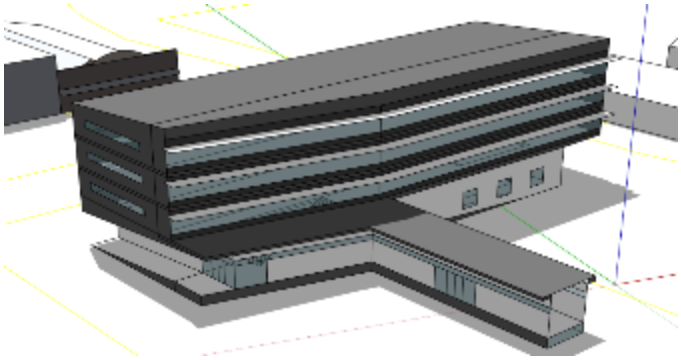


Table A-5. Transit Station Simulation Input Summary

Characteristic	Administration Building
Weather	Pearson Int'l CWEC 2016
Software	EnergyPlus v8.9
Climate Zone	5
Building Area	265 m^2
Operating Hours	NECB Schedule H (Transportation) for occupancy, lighting and plug loads.
Occupancy	200 m^2/person Electrical Room, Elevator Machine Room, Janitor Closet, Mechanical Room 1 m^2/person Waiting Area
Plug & Process Loads	1 W/m^2 Electrical Room, Janitor Closet, Mechanical Room 400W Elevator Machine Room 450W for Waiting Area
Outdoor Air	Per ASHRAE 62.1-2010 DOAS: 1,560 cfm
Infiltration	0.25 L/s/m^2 Exterior Wall Area, Code Options: 0.1 L/s/m^2 Exterior Area, Improved 0.01 L/s/m^2 Exterior Area, Passive house
Wall R-Value	Options: R-5 to R-40
Roof R-Value	Options: R-20 to R-60
Window U-Value	Options: 2.2 USI to 0.8 USI
Window SHGC	0.3 or 0.5
Window Area %	Typical: 70% Option: 40%
Interior Lighting	Average LPD of 8.3 W/m^2 Options: 30% to 70% Savings
Exterior Lighting	1000 W Options: 0% to 50% Savings
HVAC Systems	Radiant heaters in waiting area, unit heater in mechanical room, DX split A/C unit in electrical and elevator machine room. Outdoor air provided through DOAS with HRV. Option: VRF and Dedicated Outdoor Air System (DOAS)
Supply and Ventilation Air	Constant ventilation air supplied directly to zones through DOAS.
Heat Recovery	Typical: 70% DOAS Heat Recovery Varied: 70% to 90% DOAS HR
Fans	0.7 W/cfm DOAS 0.5 W/cfm DX cooling fans
Cooling	No cooling provided

Heating	Boiler Option : Condensing Boiler, 96% seasonal eff. VRF Option: 3.4 nominal COP
Pumps	40 ft head, variable speed
DHW	300W/person in Janitor Closet Same energy source as heating (Gas-fired condensing or electric resistance heater)

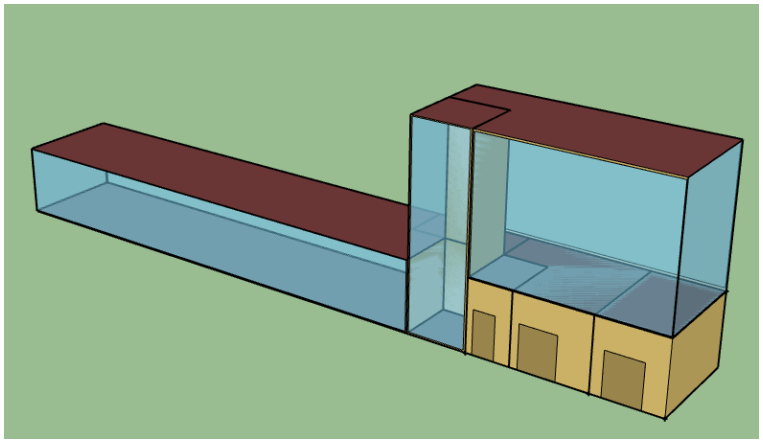


Table A-6. Transit Repair and Service Simulation Input Summary

Characteristic	Administration Building
Weather	Pearson Int'l CWEC 2016
Software	EnergyPlus v8.9
Climate Zone	5
Building Area	21,390 m^2
Operating Hours	NECB Schedule H (Transportation) for occupancy, lighting and plug loads in bus storage, fueling bay, parts storage, repair garage, wash bay and workshop NECB Schedule A for occupancy, lighting and plug loads in office area
Occupancy	1,000 m^2/person Bus Storage 20 m^2/person Fueling Bay, Office, Repair Garage, Wash Bay 30 m^2/person Workshop 100 m^2/person Parts Storage
Plug & Process Loads	1 W/m^2 Parts Storage 5 W/m^2 Fueling Bay, Repair Garage, Wash Bay 7.5 W/m^2 Office 10 W/m^2 Workshop Air Compressor: 2 x 100 hp air compressors (duty-standby), 50% average load factor Pressure Washer: 6 gpm flow, 25% load factor
Outdoor Air	Per ASHRAE 62.1-2010 Bus Storage: 0.75 cfm/ft^2 exhaust Fueling Bay, Repair Garage, Wash Bay, Workshop: 1.5 cfm/ft^2 exhaust Office: 5 cfm/person and 0.06 cfm/ft^2 Parts Storage: 10 cfm/person and 0.06 cfm/ft^2
Infiltration	0.25 L/s/m^2 Exterior Wall Area, Code Options: 0.1 L/s/m^2 Exterior Area, Improved 0.01 L/s/m^2 Exterior Area, Passive house
Wall R-Value	Options: R-5 to R-40
Roof R-Value	Options: R-20 to R-60
Window U-Value	Options: 2.2 USI to 0.8 USI
Overhead Door R-Value	Options: R-2 to R-8
Window Area %	Negligible
Interior Lighting	3.75 W/m^2 Bus Storage 6 W/m^2 Fueling Bay, Repair Garage, Wash Bay 7.4 W/m^2 Parts Storage 8.75 W/m^2 Office 12.3 W/m^2 Workshop Options: 30% to 70% Savings
Exterior Lighting	10,400 W
HVAC Systems	Admin Space: VAV Rooftop units with heat recovery/DX cooling/gas heating and perimeter hydronic radiators

	Repair and Storage Spaces: Gas-fired make-up air units with heat recovery, infrared unit heaters Option: Air-Source Heat Pumps with DOAS
Supply and Ventilation Air	Constant ventilation air supplied directly to zones through DOAS.
Heat Recovery	Typical: 70% DOAS Heat Recovery Varied: 70% to 90% DOAS HR
Fans	1.0 W/cfm DOAS 0.3 W/cfm ASHP terminal unit fans
Cooling	No cooling provided
Heating	Boiler Option: Condensing Boiler, 96% seasonal eff. ASHP Option: 4.15 nominal COP
Pumps	60 ft head, variable speed
DHW	90W/person in Fueling Bay, Office, Repair Garage, Wash Bay, Workshop 300 W/person Parts Storage Same energy source as heating (Gas-fired condensing heater or ASHP)

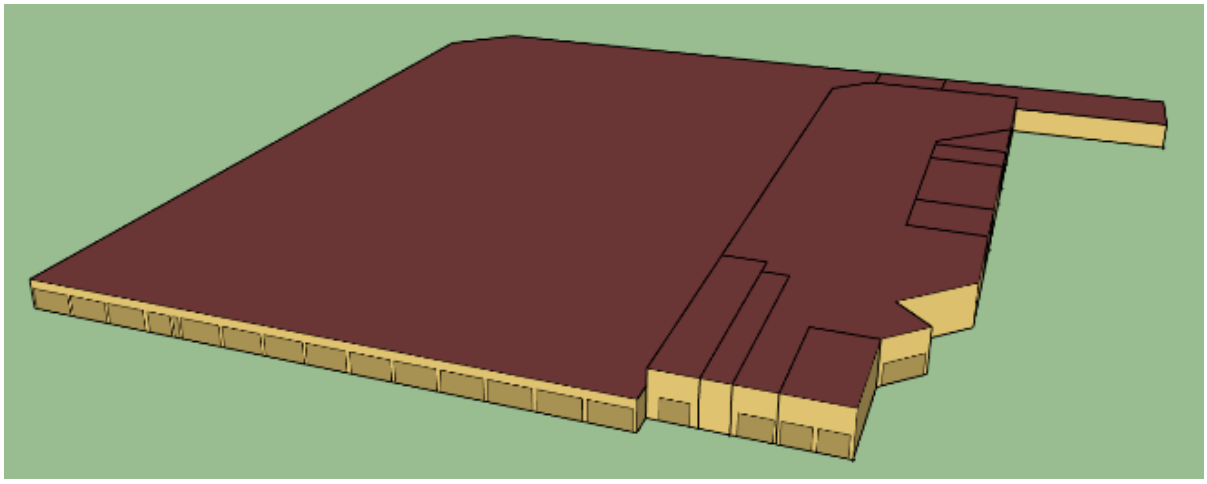


Table A-7. Ice Rink Simulation Input Summary

Characteristic	Arena
Weather	Toronto CWEC
Software	DOE2.2
Climate Zone	5
Building Area	11,832 m^2
# Rinks	3 ice surfaces
Operating Hours	NECB Schedule B occupancy, lighting and plug loads Operating 12 months/year
Occupancy	10 m^2/person Lobby, Change Rooms 5 m^2/person Arena, Seating Area
Plug & Process Loads	1 W/m^2 Rink, Meeting, Multipurpose, Lobby, Dining 2.5 W/m^2 Change Rooms 7.5 W/m^2 Office 10 W/m^2 Kitchen plus 3 x 25 HP Brine Pump (with VSD) Under slab heating, with 3.75 HP pump Resurfacing load Ice cooling load
Outdoor Air	RTUs and changeroom MUAs: 22,200 cfm Arena: ~6,700 cfm/rink (20,000 cfm total)
Infiltration	0.25 L/s/m^2 Exterior Wall Area, Code Options: 0.1 L/s/m^2 Exterior Area, Improved 0.01 L/s/m^2 Exterior Area, Passive house
Wall R-Value	Options: R-10 to R-30
Roof R-Value	Options: R-30 to R-60
Window U-Value	Options: 2.2 USI to 0.8 USI
Window SHGC	Typical: SHGC 0.3
Window Area %	8.5%
Interior Lighting	13.4 W/m^2 Mechanical 12.9 W/m^2 Arenas 9.8 W/m^2 Arena Change Rooms 9.7 W/m^2 Lobby 7.1 W/m^2 Corridor Options: 50% to 70% Savings
Exterior Lighting	2 kW
HVAC Systems	Arena: Unitary system with HRV, radiant heating under seats in seating area Other areas: RTUs with HRV

Supply and Ventilation Air	Arenas: 20,000 cfm (100% OA) (~6,700 each arena) Other areas: 31,250 cfm (43% OA) Change room MUAs: 8,750 cfm (100% OA)
Heat Recovery	Typical: 60% Heat Recovery Varied: 60% to 80% HR
Fans	RTUs 0.6 W/cfm (most areas) MUAs 0.9 W/cfm (changerooms) Kitchen MUA 0.5 W/cfm Ice rink system 1.1 W/cfm
Cooling	Ice cooling system: COP 2.4 (seasonal, varied) Loop head setpoint control has valve reset pressure control, with two-way valves on loop, with variable speed flow
Heating	Base option: Condensing Boiler, 95% seasonal eff. With refrigeration heat recovery
Pumps	Brine pump: 760 gpm/25 HP VSD (each rink) HW pump: 110 ft head, VSD
DHW	426 kW Peak Load 90 W/person Arena, Office, Meeting 45 W/person Multipurpose Condensing Boiler, 96% seasonal eff.

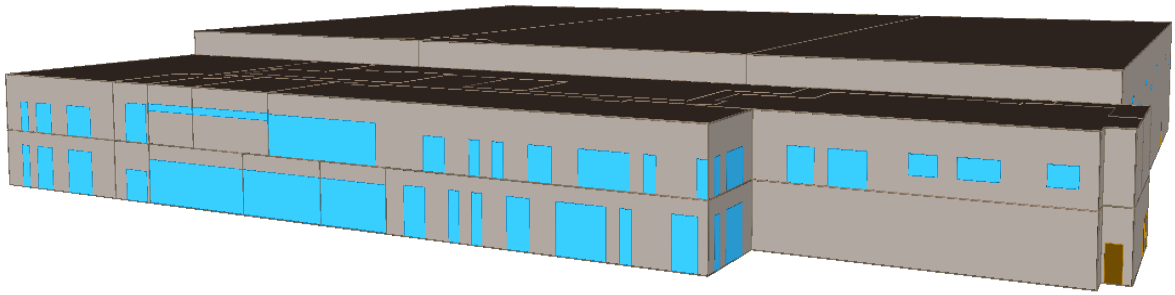


Table A-8. Pool Simulation Input Summary

Characteristic	Pool
Weather	Pearson Int'l CWEC 2016
Software	EnergyPlus v8.9
Climate Zone	5
Building Area	Main Pool: 795 m^2, of which 50% pool surface area. Leisure Pool: 600 m^2, of which 50% pool surface area. Whirlpool: 73.4 m^2, of which 50% pool surface area. All metrics reported per m^2 pool water surface area.
Operating Hours	Modified NECB Schedule B occupancy, lighting and plug loads to match typical operating hours: Friday and Saturday: 5:30 AM to 1:00 AM All Other Days: 6:00 AM to 12:00 AM
Pool Parameters	Average Pool depth: Main Pool: 2.7m Leisure Pool: 1.25 m Whirlpool: 7.2 m Pool Water Set Point Temperature Options: Main Pool: 27°C Main Pool: 30°C Leisure Pool: 34°C Whirlpool: 40°C Room Temperature Set Point Options: 27°C or 29.4°C Room RH Limit: 60% Pool Activity Factor: 1 Day, 0.6 Night Pool Cover Options: None, or liquid pool cover 50% convection and evaporation reduction at night
Occupancy	5 m^2/person
Plug & Process Loads	Recirculation Pumps: 310 kW/m^3/s Options: 2h or 4h pool volume turnover rate Filtration Tank Regeneration Makeup Water: Filtration tank volume, every 2 months Main Pool Tank Volume: 2.3 m^3 Leisure Pool Tank Volume: 1.7 m^3 Whirlpool Tank Volume: 0.6 m^3 Hygiene/Splashing Makeup Water: Pool volume, every 2 months

	Losses due to evaporation, convection and conduction modelled directly by Indoor Pool object in EnergyPlus, and change based on multiple factors including room air conditions, and pool water set point
Outdoor Air	Per ASHRAE 62.1-2010 2.5 L/s/m^2 room floor area
Infiltration	0.25 L/s/m^2 Exterior Wall Area, Code Options: 0.1 L/s/m^2 Exterior Area, Improved 0.01 L/s/m^2 Exterior Area, Passive house
Wall R-Value	R-5, model not sensitive to opaque envelope performance
Roof R-Value	R-20, model not sensitive to opaque envelope performance
Window U-Value	Options: 2.2 USI or 0.8 USI
Window Area %	Options: 15% or 80%
Interior Lighting	9.8 W/m^2 Options: 0% or 50% Savings
HVAC Systems	Single-zone VAV System
Supply and Ventilation Air	VAV system sized for 12.5 L/s/m^2 room floor area, 20% OA. Option: Yes or no OA economizer
Heat Recovery	Option: None, 70% or 90%
Fans	1.0 W/cfm total supply + return
Cooling	Options: DX Coil, 3.5 COP Dectron Unit w/condenser heat recovery to air, 3.5 COP Dectron Unit w/condenser heat recovery to HW plant, 3.5 COP Central Plant ASHP, 3.3 nominal COP
Heating	Options: Condensing Boiler, 96% seasonal eff. Dectron Unit, Condensing Boiler, 96% seasonal eff. Central Plant ASHP, 4.15 nominal COP
Pumps	72 ft head, variable speed
DHW	90W/person Condensing Boiler or Central ASHP, same as HW plant

APPENDIX B: CAPITAL COST DETAILS

Effective wall performance is calculated assuming that with intentional design, and low-cost, though not necessarily typical detailing, thermal bridging may be reduced such that it contributes only 10% of the heat loss through a wall assembly. High performance wall assemblies typically require exterior insulation with thermally broken clips or clips made of less thermally conductive materials supporting exterior cladding, and glazing that is aligned with the wall insulation plane.

Wall performance premiums are calculated based on the cost of the clear wall required to attain the effective performance after thermal bridging is accounted for. Clip performance can vary widely between manufacturers, and alternate insulation configurations can be used to obtain similar effective performance results.

The construction assembly costs are subjective and are order of magnitude estimates based on information provided by an external cost consultant. There are many variables and constraints on real projects that will overshadow some of the estimated cost differences between assemblies. The main point to remember is that construction costs vary quite widely in practice. This variability is part of the reason that construction projects typically have a bid process, where there can be a big difference between the highest and lowest bid. Consideration of the nature of this analysis and the fluidity of construction costs is required to reach meaningful conclusions. The construction cost estimates utilized in this analysis are broad cost estimates with more uncertainty than a Class D estimate, because the estimates were not arrived for a specific building, nor is there a comprehensive list of requirements to base assumptions. Accordingly, order of magnitude means that the construction cost estimates are +/- 50%.

Table B-1. Library, Fire Hall, Rec Centre Capital Cost Data

Category	Premium	
Air Leakage	Cost per building, dependent on air infiltration level attained Baseline: $0, no testing Code: $37,500 (Fire Hall), $50,000 (Rec Centre), $38,500 (Library) Improved: $60,000 (Fire Hall), $75,000 (Rec Centre), $57,750 (Library) Passive House: $75,500 (Fire Hall), $100,000 (Rec Centre), $70,500 (Library)	
	Baseline Assembly	Exterior insulated steel stud wall assembly, with typical bridging details R-21 ext. ins.
	Baseline Clear Wall R-Value (modelled)	20.4
	Baseline Effective Wall R-Value (with typical thermal bridging)	8.9
	R-5 Assembly	Likely window-wall or curtain wall, but costed as R-5.4 ext. ins.
	Effective R-5 Premium	-$30/m^2 wall
	R-10 Assembly	R-21 ext. ins. plus R-12 batt
	Effective R-10 Premium	$2/m^2 wall
	R-20 Assembly	R-46 ext. ins. plus R-19 batt, improved parapet, grade, and glazing transition
	Effective R-20 Premium	$60/m^2 wall
	R-30 Assembly	R-57.3 ext. ins. plus R-19 batt, further improved at grade and glazing transitions
	Effective R-30 Premium	$80/m^2 wall
	R-40 Assembly	Theoretical, R-136.5 ext. ins. plus R-19 batt
	Effective R-40 Premium	$255/m^2 wall
Roof Performance	R-20: $-18/m^2 roof Baseline: R-30 R-40: $18/m^2 roof R-60: $45/m^2 roof	
Glazing Performance	Baseline: USI to 2.2 USI-2.0: $17/m^2 window USI-1.6: $100/m^2 window USI-1.2: $230/m^2 window USI-0.8: $250/m^2 window	
Heat Recovery	Baseline: No Heat Recovery 70% efficient HRV: $5/cfm 90% efficient HRV: $8/cfm Low preheat temperature, +$1/cfm	
Lighting Power Reductions	Baseline: NECB 2011 Code Values, CFL design 50% reduction, full LED: $69/ m^2 floor (Fire Hall), $79/ m^2 floor (Rec Centre), $64/ m^2 floor (Library) 60% reduction, full LED: $88/ m^2 floor (Fire Hall), $101/ m^2 floor (Rec Centre), $69/ m^2 floor (Library) 70% reduction, full LED: $108/ m^2 floor (Fire Hall), $131/ m^2 floor (Rec Centre), $81/ m^2 floor (Library), targeting innovative design	
HVAC System	Firehall –	

	Baseline HVAC: $245/m^2 Option – Add hydronic radiant slab heating for apparatus bay: $261/m^2 Rec Centre – Baseline HVAC: $196/m^2 Option – Replace with DOAS and VRF-based system: $275/m^2 Library – Baseline HVAC: $100/m^2 Option – Replace with DOAS and VRF-based system: $190/m^2
Base Costs	$4,908/m^2 ($456/ft^2) – Library $5,016/m^2 ($466/ft^2) – Fire Hall $4,155/m^2 ($386/ft^2) – Rec Centre $6,372/m^2 ($592/ft^2) - Pool

Table B-2. Admin Cost Summary

Category	Premium	
Air Leakage	Cost per building, dependent on air infiltration level attained Baseline: $0, no testing Code: $45,000 Improved: $66,500 Passive House: $85,000	
Wall Performance	Climate Zone	5
	Baseline Assembly	Exterior insulated steel stud wall assembly, with typical bridging details
		R-21 ext. ins.
	Baseline Clear Wall R-Value (modelled)	20.4
	Baseline Effective Wall R-Value (with typical thermal bridging)	9.8
	R-5 Assembly	Likely window-wall or curtain wall, but costed as R-5 ext. ins.
	Effective R-5 Premium	-$37/m^2 wall
	R-10 Assembly	R-21 ext. ins.
	Effective R-10 Premium	$0/m^2 wall
	R-20 Assembly	R-39 ext. ins. plus R-19 batt, improved parapet and glazing transition
	Effective R-20 Premium	$45/m^2 wall
	R-30 Assembly	R-50 ext. ins. plus R-19 batt, further improved glazing transitions
	Effective R-30 Premium	$80/m^2 wall
	R-40 Assembly	Theoretical, R-108 ext. ins. plus R-19 batt
	Effective R-40 Premium	$200/m^2 wall
Roof Performance	R-20: $-18/m^2 roof Baseline: R-30 R-40: $18/m^2 roof R-60: $45/m^2 roof	
Glazing Performance	Baseline, USI to 2.2 USI-2.0: $17/m^2 window USI-1.6: $100/m^2 window	

	USI-1.2: $230/m^2 window USI-0.8: $250/m^2 window
Heat Recovery	Baseline: No Heat Recovery 70% efficient HRV: $5/cfm 90% efficient HRV: $7/cfm Low preheat temperature, +$1/cfm
Lighting Power Reductions	Baseline: NECB 2011 Code Values, CFL design 50% reduction, full LED: $99/ m^2 floor 60% reduction, full LED: $127/ m^2 floor 70% reduction, full LED: $169/ m^2 floor, targeting innovative design
HVAC System	Baseline HVAC: $245/$m^2$ Option - Ground-source VRF: $370/$m^2$
Base Costs	$4,080/$m^2$ floor($379/$ft^2$)

Table B-3. Ice Rink Cost Summary

Category	Premium	
Air Leakage	Cost per building, dependent on air infiltration level attained Baseline: $0, no testing Code: $47,500 Improved: $70,000 Passive House: $88,750	
	Baseline Assembly	Exterior insulated steel stud wall assembly, with typical bridging details R-21 ext. ins.
	Baseline Clear Wall R-Value (modelled)	20.4
	Baseline Effective Wall R-Value (with typical thermal bridging)	11.6
	R-5 Assembly	R-4 ext. ins.
	Effective R-5 Premium	-$35/$m^2$ wall
	R-10 Assembly	R-16 ext. ins.
	Effective R-10 Premium	$10/$m^2$ wall
	R-20 Assembly	R-28.5 ext. ins. plus R-19 batt, improved parapet and glazing transition
	Effective R-20 Premium	$20/$m^2$ wall
	R-30 Assembly	R-61.4 ext. ins. plus R-19 batt, improved at grade transition
	Effective R-30 Premium	$90/$m^2$ wall
	R-40 Assembly	Theoretical, R-131 ext. ins. plus R-19 batt, no glazing
	Effective R-40 Premium	$245/$m^2$ wall
Roof Performance	R-20: $-18/$m^2$ roof Baseline: R-30 R-40: $18/$m^2$ roof R-60: $45/$m^2$ roof	
Glazing Performance	Baseline, USI to 2.2 USI-2.0: $17/$m^2$ window USI-1.6: $100/$m^2$ window USI-1.2: $230/$m^2$ window	

	USI-0.8: $250/m^2 window
Heat Recovery	Baseline: No Heat Recovery 70% efficient HRV: $5/cfm 90% efficient HRV: $8/cfm Low preheat temperature, +$1/cfm
Lighting Power Reductions	Baseline: NECB 2011 Code Values, CFL design 50% reduction, full LED: $62/ m^2 floor 60% reduction, full LED: $78/ m^2 floor 70% reduction, full LED: $94/ m^2 floor, targeting innovative design
HVAC System	Baseline HVAC: $409/$m^2$ Option 1, Improved Ice-plant Efficiency to COP 4.0: $440/$m^2$ Option 2, Refrigeration heat recovery serving building heating loads in addition to subfloor/ DHW pre-heat, coupled with GSHP for remaining loads: $515/$m^2$
Base Costs	$3,789/$m^2$ ($352/$ft^2$)

Table B-4. Transit Station Cost Summary

Category	Premium	
Air Leakage	Cost per building, dependent on air infiltration level attained Baseline: $0, no testing Code: $10,000 Improved: $20,000 Passive House: $33,500	
Wall Performance	Climate Zone	5
	Baseline Assembly	Exterior insulated steel stud wall assembly, with typical bridging details
		R-21 ext. ins.
	Baseline Clear Wall R-Value (modelled)	20.4
	Baseline Effective Wall R-Value (with typical thermal bridging)	9.4
	R-5 Assembly	Likely window-wall or curtain wall, but costed as R-5 ext. ins.
	Effective R-5 Premium	-$35.2/m^2 wall
	R-10 Assembly	R-17 ext. ins. plus R-12 batt
	Effective R-10 Premium	-$6.9/m^2 wall
	R-20 Assembly	R-28.4 ext. ins. plus R-19 batt, improved parapet and glazing transition
	Effective R-20 Premium	$19.3/m^2 wall
	R-30 Assembly	R-44.9 ext. ins. plus R-19 batt, further improved glazing transitions
	Effective R-30 Premium	$55.6/m^2 wall
	R-40 Assembly	Theoretical, R-93.3 ext. ins. plus R-19 batt
	Effective R-40 Premium	$160/m^2 wall
Roof Performance	R-20: $-18/m^2 roof Baseline: R-30 R-40: $18/m^2 roof R-60: $45/m^2 roof	
Glazing Performance	Baseline, USI to 2.2 USI-2.0: $17/m^2 window USI-1.6: $100/m^2 window USI-1.2: $230/m^2 window USI-0.8: $250/m^2 window	
Heat Recovery	Baseline: No Heat Recovery 70% efficient HRV: $4.5/cfm 90% efficient HRV: $7/cfm Low preheat temperature, +$1/cfm	
Lighting Power Reductions	Baseline: NECB 2011 Code Values, CFL design 30% reduction, partial LED: $66/ m^2 floor 50% reduction, full LED: $85/ m^2 floor 70% reduction, full LED: $139/ m^2 floor, targeting innovative design	
HVAC System	Baseline HVAC: $803/m^2 Option, VRF with dedicated outdoor air system (DOAS): $985/m^2	
Base Costs	$2,260/m^2 floor ($210/ft^2)	

Table B-5. Transit Repair and Maintenance Cost Summary

Category	Premium	
Air Leakage	Cost per building, dependent on air infiltration level attained Baseline: $0, no testing Code: $42,750 Improved: $65,000 Passive House: $85,500	
Wall Performance	Climate Zone	5
	Baseline Assembly	Exterior insulated steel stud wall assembly, with typical bridging details
		R-21 ext. ins.
	Baseline Clear Wall R-Value (modelled)	20.4
	Baseline Effective Wall R-Value (with typical thermal bridging)	10.6
	R-5 Assembly	R-4.4 ext. ins.
	Effective R-5 Premium	-$36.5/m^2 wall
	R-10 Assembly	R-18.9 ext. ins.
	Effective R-10 Premium	-$4.6/m^2 wall
	R-20 Assembly	R-30 ext. ins., wrapped parapet and door transition thermal break
	Effective R-20 Premium	$19.8/m^2 wall
	R-30 Assembly	R-57 ext. ins., wrapped parapet and door transition thermal break
	Effective R-30 Premium	$79.2/m^2 wall
	R-40 Assembly	Theoretical, R-68.9 ext. ins. further improved parapet and door frame transition
	Effective R-40 Premium	$110/m^2 wall
Roof Performance	R-20: $-18/m^2 roof Baseline: R-30 R-40: $18/m^2 roof R-60: $45/m^2 roof	
Door Performance	R-2: $0/m^2 door R-4: $20/m^2 door R-8: $25/m^2 door	
Heat Recovery	Baseline: No Heat Recovery 70% efficient HRV: $4/cfm 90% efficient HRV: $7/cfm Low preheat temperature, +$1/cfm Demand Control Ventilation: $85,000	
Lighting Power Reductions	Baseline: NECB 2011 Code Values, CFL design 30% reduction, partial LED: $22/ m^2 floor 50% reduction, full LED: $27/ m^2 floor 70% reduction, full LED: $42/ m^2 floor, targeting innovative design	
Base Costs	$2,260/m^2 floor ($210/ft^2)	

Table B-5. Archetype Costing Summary for Example Solutions – All Three Levels

Office							
Level	Air Leakage Premium	Wall Premium ($/m2)	Roof Premium ($/m2)	Window Premium ($/m2)	Mechanical Premium	Lighting Premium	Incremental Capital Cost ($/m2)
1	0	0	0	31	0	0	31
2	6	0	0	21	0	28	54
3	11	22	0	51	126	70	280
Fire							
Level	Air Leakage Premium	Wall Premium ($/m2)	Roof Premium ($/m2)	Window Premium ($/m2)	Mechanical Premium	Lighting Premium	Incremental Capital Cost ($/m2)
1	0	0	0	26	0	0	26
2	15	0	0	26	172	28	240
3	25	43	0	32	178	70	349
Library							
Level	Air Leakage Premium	Wall Premium ($/m2)	Roof Premium ($/m2)	Window Premium ($/m2)	Mechanical Premium	Lighting Premium	Incremental Capital Cost ($/m2)
1	0	0	0	38	0	0	38
2	15	0	0	25	0	5	46
3	25	35	0	64	91	17	232
Transit Station							
Level	Air Leakage Premium	Wall Premium ($/m2)	Roof Premium ($/m2)	Window Premium ($/m2)	Mechanical Premium	Lighting Premium	Incremental Capital Cost ($/m2)
1	0	-6	0	0	0	19	13
2	38	-6	0	86	0	19	137
3	89	29	0	215	21	73	427
Transit Repair							
Level	Air Leakage Premium	Wall Premium ($/m2)	Roof Premium ($/m2)	Door Premium ($/m2)	Mechanical Premium	Lighting Premium	Incremental Capital Cost ($/m2)
1	0	0	0	0	5	0	5
2	0	0	0	0	15	0	15
3	0	5	0	0	84	15	104
Recreation Centre							
Level	Air Leakage Premium	Wall Premium ($/m2)	Roof Premium ($/m2)	Window Premium ($/m2)	Mechanical Premium	Lighting Premium	Incremental Capital Cost ($/m2)
1	0	0	0	33	0	0	33
2	3	0	0	22	0	0	25
3	6	30	46	55	81	52	270
Ice Rink							
Level	Air Leakage Premium	Wall Premium ($/m2)	Roof Premium ($/m2)	Window Premium ($/m2)	Mechanical Premium	Lighting Premium	Incremental Capital Cost ($/m2)
1	0	19	0	0	0	0	0
2	0	19	18	6	31	0	74

3	0	19	18	6	96	52	191
Pool							
Level	Air Leakage Premium	Wall Premium ($/m2)	Roof Premium ($/m2)	Window Premium ($/m2)	Mechanical Premium	Lighting Premium	Capital Cost ($/m2)
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	582	194	0	776

APPENDIX C: UTILITY COST RATES

Electricity

Commodity: $/kWh		Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18
Spot		0.100	0.095	0.121	0.122	0.123	0.124	0.125	0.127	0.128	0.129	0.130	0.131
ToU OnPk		0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.132
ToU MidPk		0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
ToU OffPk		0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065
Rate Structure		Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18
Residential	Admin	22.780	22.780	22.780	22.780	23.110	23.110	23.110	23.110	23.110	23.110	23.110	23.110
Residential	kWh	0.022	0.022	0.022	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Residential	kW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Small Commercial	Admin	9.310	9.310	9.310	9.310	9.390	9.390	9.390	9.390	9.390	9.390	9.390	9.390
Small Commercial	kWh	0.035	0.035	0.035	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Small Commercial	kW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Less than 50 kW	Admin	45.660	45.660	45.660	45.660	46.300	46.300	46.300	46.300	46.300	46.300	46.300	46.300
Less than 50 kW	kWh	0.031	0.031	0.031	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Less than 50 kW	kW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50 to 499 kW	Admin	79.410	79.410	79.410	79.410	82.760	82.760	82.760	82.760	82.760	82.760	82.760	82.760
50 to 499 kW	kWh	0.011	0.011	0.011	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
50 to 499 kW	kW	10.127	10.127	10.127	10.127	10.716	10.716	10.716	10.716	10.716	10.716	10.716	10.716
500 to 4999 kW	Admin	1808.420	1808.420	1808.420	1808.420	1836.250	1836.250	1836.250	1836.250	1836.250	1836.250	1836.250	1836.250
500 to 4999 kW	kWh	0.011	0.011	0.011	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
500 to 4999 kW	kW	7.662	7.662	7.662	7.662	7.925	7.925	7.925	7.925	7.925	7.925	7.925	7.925
StreetLighting	Admin	1.560	1.560	1.560	1.560	1.580	1.580	1.580	1.580	1.580	1.580	1.580	1.580
StreetLighting	kWh	0.011	0.011	0.011	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
StreetLighting	kW	15.724	15.724	15.724	15.724	15.540	15.540	15.540	15.540	15.540	15.540	15.540	15.540
Load Factor		1.036	1.036	1.036	1.036	1.036	1.036	1.036	1.036	1.036	1.036	1.036	1.036

Natural Gas		Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18
Admin		70.000	70.000	70.000	70.000	70.000	70.000	70.000	70.000	70.000	70.000	70.000	70.000
Commodity	$/m^3	0.148	0.148	0.148	0.148	0.148	0.148	0.148	0.148	0.148	0.148	0.148	0.148
Transportation													
Delivery	500	0.106	0.106	0.106	0.104	0.104	0.104	0.104	0.104	0.104	0.104	0.104	0.104
	1050	0.084	0.084	0.084	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082
	4500	0.070	0.070	0.070	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068
	7000	0.060	0.060	0.060	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
	15250	0.056	0.056	0.056	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
	Over 28300	0.055	0.055	0.055	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053
Carbon Tax		0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035

APPENDIX D: ACRONYMS AND DEFINITIONS

AHU	Air Handling Unit
ASHRAE	American Society of Heating, Refrigeration, Air-Conditioning Engineers
BB	Used as Baseboards in parametric maps, also considered as in-floor heating
CHP	Combined Heat and Power
CO2e	Carbon dioxide equivalent
COP	Coefficient of Performance
DCV	Demand Controlled Ventilation
DHW	Domestic (service) hot water
DOAS	Dedicated outdoor air system
DX	Direct expansion
ECM	Energy conservation measure
ekWh	Equivalent kilowatt hours (common nomenclature for energy unit conversion from Joules for Natural Gas for comparison with electricity)
GHG	Greenhouse gas
GHGI	Greenhouse gas intensity
HRV	Heat recovery ventilators
HVAC	Heating, Ventilation, and Air-Conditioning
IR	Infrared
LED	Light-emitting diode
LEED	Leadership in Energy and Environmental Design
MAU	Make-up air unit
MH	Morrison Hershfield Limited
NECB	National Energy Code for Buildings

NPV	Net present value. The values presented in this report are incremental to the NPV of the existing or baseline building (business as usual case).
OA	Outdoor air
PV	Photovoltaic
RTU	Rooftop Units
SHGC	Solar heat gain coefficient
TEDI	Thermal energy demand intensity
(T)EUI	(Total) Energy use intensity
UH	Unit heaters
VAV	Variable air volume
VFD	Variable frequency drive
VRF	Variable refrigerant flow
WSE	Waterside economizer

APPENDIX E: ENERGY CONSULTANT SCOPE OF WORK

The primary objective of the Building Energy Consultant will be to recommend and support design decisions related to building performance through the use of computer simulation and engineering judgement. The Building Energy Consultant will also be required to document compliance with LEED certification and building code, as applicable. The overall goal is to assist the design team in designing a building that operates well and as expected for the City of Mississauga.

Specifically, the Building Energy Consultant will be required to undertake the following tasks. All energy modelling is to be completed using one of the following energy modelling software programs: EnergyPlus, IES/VE, eQUEST, CanQUEST, or an equivalently capable DOE-2 based program. EE4 as a stand-alone tool will not be permitted, as it severely limits the type of options that can be directly explored. Note that software selection shall not be a limitation in exploring any measure deemed appropriate by the City and design team. The consultant shall use whatever tools necessary to provide accurate feedback on building performance as necessary according to the detailed scope identified below.

Phase 1: Conceptual Design

During the Conceptual or Planning phase of the project, the Building Energy Consultant will:

- Assess the impact of up to three massing options presented by the architect, if applicable, and provide feedback on the following metrics:
    - Relative energy use or building loads based on ideal air loads analysis, broken down by end uses
    - Relative peak heating and cooling loads for the building and for the worst performing zones (on a W/m^2 or Btu/h/sq ft basis)
    - Daylight potential and excessive illuminance levels (i.e. glare) in zones of interest, as determined by City and/or Architect
    - Renewable energy potential, as applicable from RFP
    - Alignment of City goals as defined in the RFP, for the target TEUI, TEDI and GHGI metrics for the performance level being targeted

To reduce the number of variables that differentiate between each iteration of the model, plug loads, ventilation rates, and schedules (occupancy, lighting, plug, fans, thermostatic setpoints) are to be kept constant between options and are to be appropriate for the building based on occupancy.

If mechanical systems are known at this stage, they shall be modelled directly. However, absence of mechanical information shall not hold up this phase. In lieu of actual HVAC design parameters at conceptual design, mechanical systems are to be modelled as heating, cooling, and ventilation delivered directly to the zones (i.e. 100% OA with terminal heating and cooling), or as per the best judgement of the modeller. The model shall also take into account the daylighting potential of the building by directly modelling the impact of

daylight sensors in applicable zones. The intent of this phase is to comment only on the impact of architecture on indicative building performance metrics.

Based on the findings from the analysis conducted above, the Building Energy Consultant will work with the architect to recommend strategies around massing, location and amount of glazing, and shading to improve the outcome based on the metrics identified above. Allow for an additional round of energy modelling to assess the impact of resulting recommendations for only one of the massing options.

Where elements of the design may vary from the assumptions outlined in the Energy Modelling Guidelines, these will be brought to the attention of the City of Mississauga's project manager, and a variance in targets or compliance demonstration methodology may be considered on a case by case basis.

The Building Energy Consultant shall prepare a report that clearly identifies the energy modelling strategy employed, a summary of key inputs used, a summary of results based on the above metrics and any recommendations. Units shall be reported in kWh for electricity and GJ for natural gas, as well as an ekWh and ekWh/m2 for total energy and GHG emissions in kg/m^2. Current utility costs shall be retrieved from the City of Mississauga's Energy Management Office. GHG emissions factors shall be derived from the City's Energy Modelling Guidelines.

Include for a minimum of 2 meetings during this phase with the project team, one to identify energy modelling approach with project team, and one to present the findings of this phase. This phase would also contribute to meeting the Integrative Process credit under LEED v4.

Phase 2: Schematic Design

For the purposes of the Building Energy Consultant's work, this phase will begin when the final architectural massing and programming is set. At this stage, the Building Energy Consultant will:

- Assess the impact of the building systems listed below, in isolation and in combination, on the following metrics:
    - Energy use, broken down by end uses (at minimum heating, cooling, lighting, plug loads, fans, and pumps)
    - Energy Cost, broken down by end uses and Utility (including utility rates used)
    - Peak delivered heating and cooling for the building and for the worst performing zones, if applicable
    - City compliance metrics and targets (TEUI, TEDI and GHGI)

If the consultant is using a software that auto-generates a baseline, the appropriate modifications must be made to ensure compliance with the NECB as it applies to the Ontario Building Code and/or LEED v4.

- Building systems to be analyzed shall include at minimum:
    - Wall performance, based on effective R-values and taking into account heat loss from not only assemblies, but also interface details as per the Building

Envelope Thermal Bridging Guide (located at www.bchyrdro.com/thermalguide)

- Window performance, based on Solar Heat Gain Coefficient, Visible Transmittance, and overall U-value (including framing)
- Roof performance
- Lighting power density ranges, as appropriate
- Variations in mechanical system types if under consideration for the project (ex. Air-based heating and cooling with recirculation versus 100% OA with Radiant Heating)
- Mechanical equipment efficiencies, including boiler efficiency, chiller and heat pump COPs, fan and pump static pressures and efficiencies, motor efficiencies, presence of heat recovery and heat recovery efficiency
- Impact of potential renewable energy options, as applicable in the RFP
- Building-type specific innovative measures (ex. Chiller heat recovery for data centre spaces or specialized refrigeration such as ice rinks or innovative dehumidification and reheat strategies in swimming pools, etc.)

The inputs to be used for the analysis in this phase shall be considered by the Building Energy Consultant based on previous experience with similar buildings and discussion and coordination with design team members, including the architect, mechanical and electrical engineers. The intent of this phase is to inform design. Therefore, this exercise is intended to be an input into developing a detailed design that addresses energy as a parameter in design considerations.

For this phase, the Building Energy Consultant shall prepare a report that clearly identifies the energy modelling strategy employed, a summary of key inputs used, a summary of results based on the above metrics and any recommendations. Units shall be reported in kWh for electricity and GJ for natural gas, as well as an ekWh and ekWh/m2 for total energy and GHG emissions in kg/m^2. Current utility costs shall be retrieved from the City of Mississauga's Energy Management Office. GHG emissions factors shall be derived from the City's Energy Modelling Guidelines.

Where elements of the design may vary from the assumptions outlined in the Energy Modelling Guidelines, these will be brought to the attention of the City of Mississauga's project manager, and a variance in targets or compliance demonstration methodology may be considered on a case by case basis.

This phase shall include an energy charrette with the project team led by the Building Energy Consultant. The intent of this meeting will be to explain the results of the schematic design energy model and set direction for the remainder of design.

Phase 3: Design Development

During design development, the Building Energy Consultant will review the drawings and specifications at each of two major milestones (approximately 50% DD Package and Issued for Building Permit) and provide an update on energy performance.

The Building Energy Consultant shall prepare a brief memo to the design team reporting back on the findings of this phase.

For Building Permit, the Building Energy Consultant shall provide all documentation required by The City of Mississauga, Inspections and Permits.

Include for one meeting during this phase to explain updated energy results and answer any questions from the project team.

Phase 4: Compliance

Upon completion of final construction documents (i.e. Issued for Construction drawings and specifications), the Building Energy Consultant shall prepare one final energy model for the purposes of LEED (if applicable) and all supporting documentation as required by the governing authority of the LEED program. The Building Energy Consultant will also respond to review comments by the governing authority to ensure successful achievement of the Energy and Atmosphere Pre-requisite 2 *Minimum Energy Performance* and Credit *1 Optimize Energy Performance*, if applicable.

It is not the expectation of the City for the Building Energy Consultant to review and monitor Shop Drawings during construction. However, it is expected that the Building Energy Consultant clearly communicate to the Prime Consultant and/or the design professionals reviewing shop drawings on what criteria should be reviewed and when and how the Building Energy Consultant should be notified of any relevant changes. If the changes are significant enough to warrant additional iterations to the energy model, this will be completed on a Time and Materials basis.

In compliance with the City of Mississauga's Master Consulting Terms & Conditions, all reports, discussion summaries, meeting minutes, and modelling files will be provided to The City of Mississauga's Project Manager.

Phase 5: As Built Energy Model

A final as-built energy model, reflecting all of the changes from the compliance model to the construction of the building shall be captured in a final energy model that may be used for post-occupancy verification of energy savings at a later date.

Phase 5: Post-Occupancy Verification

The energy and thermal comfort performance of actual buildings will depend on many factors that can vary from the assumptions in spite of multiple model evaluations during the design including hours of use, occupancy, occupant behaviour, and variations in plug and process loads.

The City of Mississauga will compare energy performance results with the As Built Energy Model results using actual metered energy use during the first 12 months of post occupancy data, or to coincide with the schedule prescribed in an approved Measurement & Verification Plan (approved in the Design Development Phase). It is up to the project consultant team to retain a qualified individual for the development of the M&V Plan, but it is expected that the

Building Energy Consultant will contribute in the review of the Plan to ensure that the appropriate metering is in place to facilitate post-occupancy calibration, if required.

The focus of post-occupancy verification is on corrective action for operations, rather than on verifying savings of specific ECMs. The level of effort for such a process may be somewhat variable, however the intent would be an outcomes-based investigation to ensure building operational energy savings are as designed.

If actual results are within 15% of the As Built Energy Model, no further follow up will be required.

If actual TEUI results vary from the model by ≥15% of the as-built model results and the discrepancies are not as a result of operational issues (change in occupancy, schedules, unique events, etc.), the Project Consultant Team shall allow for the calibration of the as-built energy model with post-occupancy metering data, and prepare a written report to investigate the discrepancy between modelled and actual performance.

The Project Consultant Team shall allow for a follow-up meeting with the City of Mississauga to review the explanation and recommend reconciliation measures to help align building operations with the as-designed energy efficiency of the building.

APPENDIX F: ENERGY MODELLING GUIDELINES

This document is intended to provide clarity on energy modelling inputs for the purposes of showing compliance with the Municipal Green Building Standard ("the Standard"). This document is not intended to be an exhaustive set of technical and administrative requirements for energy modelling. Rather, it aims to dictate and/or clarify inputs to ensure that building performance, as shown in the energy models, is equitably rewarded across projects. It is also the hope that these guidelines facilitate closer agreement between energy models and actual operating performance of buildings and therefore, may be updated from time to time.

In general, this document dictates energy modelling inputs that may have a large impact on the Standard's performance targets but are not integral to building system performance (ex. Schedules) as well as clarifies inputs where current industry practice for those inputs does not support the Standard's intended outcomes (ex. Not properly accounting for total envelope heat loss).

Design related modelling inputs not specified in this document shall represent, to an appropriate degree of accuracy, the design of the facility. Software limitations shall not limit the accuracy of energy modelling to show compliance with the Standard; consultants are expected to overcome any software limitations with appropriate engineering calculations. All other modelling inputs not discussed in these guidelines shall be based on accepted industry practice.

Where elements of the design may vary from the assumptions outlined in the Energy Modelling Guidelines, these will be brought to the attention of the City of Mississauga's project manager, and a variance in targets or compliance demonstration methodology may be considered on a case by case basis.

Definitions

Modelled Floor Area – The total floor area of the building, as reported by the energy simulation software, and generally to within 5-10% of the gross floor area from the architectural drawings. The floor area specifically excludes any exterior spaces and parkades, but includes partially conditioned spaces such as apparatus bays in fire halls.

Energy Use Intensity (EUI) – The sum of **all** energy utilities (i.e. Electricity, natural gas, district heating) used on site by the project, divided by the *Modelled Floor Area*. EUI shall be reported in kWh/m^2/year.

$$EUI\ \left[\frac{kWh}{m^2a}\right] = \frac{\sum Site\ Energy\ Use\ \left[\frac{kWh}{a}\right] - \sum Site\ Renewable\ Energy\ Generation\ \left[\frac{kWh}{a}\right]}{Modelled\ Floor\ Area\ [m^2]}$$

Site Energy Use – All energy used on site including all end-uses, such as heating, cooling, fans, pumps, elevators, parkade lighting and fans, and exterior lighting, among others. It incorporates all site efficiencies, including the use of heat pumps or re-use of waste heat. It does not include energy generated on site.

Site Renewable Energy Generation – Energy generated on site from renewable sources, such as solar photovoltaics, wind, and solar thermal. Where a site is not able to send energy off-site (e.g. connected to the electricity grid), only energy that can be consumed (or stored and then consumed) on site shall be counted as Site Renewable Energy Generation.

Greenhouse Gas Intensity (GHGI) – The **total** greenhouse gas emissions associated with the use of **all** energy utilities on site, according the following factors extracted from SB-10:

Natural Gas: 183 g/kWh
Electricity: 50 g/kWh
District Energy: As provided by utility[1],[2]
Purchased Renewable Energy: 0 g/kWh[3]

GHGI shall be reported in kg eCO_2/m^2/year.

Thermal Energy Demand Intensity (TEDI) – The amount of heating energy delivered to the project that is outputted from any and all types of heating equipment, per unit of modelled floor area. Heating equipment includes electric, gas, hot water, or DX heating coils of central air systems (ex. make-up air units, air handling units, etc.), terminal equipment (ex. baseboards, fan coils, heat pumps, reheat coils, etc.) or any other equipment used for the purposes of space conditioning and ventilation. Heating output of any heating equipment whose source of heat is not directly provided by a utility (electricity, gas or district) must still be counted towards the TEDI. For example, hot water or DX heating sources that are derived from a waste heat source or a renewable energy source do not contribute to a reduction in TEDI, as per the above definition.

Specific examples of heating energy that are not for space conditioning and ventilation, that would not be included in the TEDI, include domestic hot water, maintaining swimming pool water temperatures, outdoor comfort heating (ex. Patio heaters), gas fired appliances (stoves, dryers), heat tracing, etc.

TEDI shall be reported in kWh/m^2/year.

Clear Field – An opaque wall or roof assembly with uniformly distributed thermal bridges, which are not practical to account for on an individual basis for U-value calculations. Examples of thermal bridging included in the Clear Field are brick ties, girts supporting cladding, and structural studs. The heat loss associated with a Clear Field assembly is represented by a U-value (heat loss per unit area).

[1] The emissions factor of a district energy system shall be as provided by the utility (and as agreed by the utility and the AHJ).
[2] Where a district energy utility agrees to provide a development with energy at a carbon intensity that varies from that of the overall system, documentation of that agreement (or intent to enter an agreement), and any other measures or agreements required to secure the supply of low-carbon energy, shall be provided to the authority having jurisdiction.
[3] Where renewable energy is purchased directly from utilities, and guarantees of long-term supply (in the proportions used to demonstrate compliance) are provided to the satisfaction of the authority having jurisdiction, an emissions factor of zero may be applied to the portion of the respective utility that is considered renewable.

Interface Details - Thermal bridging related to the details at the intersection of building envelope assemblies and/or structural components. Interface details interrupt the uniformity of a clear field assembly and the additional heat loss associated with interface details can be accounted for by linear and point thermal transmittances (heat loss per unit length or heat loss per occurrence).

Acceptable Energy Modelling Software

The simulation program shall meet the requirements as set out in ASHRAE 90.1-2010, G2.2.

Weather File

Projects shall use the Pearson International Airport CWEC 2016 Weather File, available from http://climate.onebuilding.org/

Unmet Hours

Annual unmet hours for any zone in the energy simulation shall be limited to 100 hours or less, with the following exception: annual cooling unmet hours are allowed, provided that it the cooling capacity has been purposely undersized according to the design intent. Unmet heating or cooling hours does not apply to zones with no heating or cooling equipment.

District Energy

For buildings connecting to a district energy utility, the modeller may chose two options:

1. Model heating or cooling energy as delivered to site with 100% efficiency; or,

2. Model the building systems as including the total district energy system, and use the system efficiency as provided by the utility (and as agreed on by the utility and the AHJ) when calculating site energy use. Where district systems make use of biomass/biofuels to achieve low carbon supply, yet are limited in maximum efficiencies, consideration may be given in system efficiency agreed on with the AHJ.

Schedules, Internal, and DHW Loads

All occupancy, plug, and DHW loads shall be based on Table A-8.4.3.2.(2)-B of NECB 2015, except as specified in Tables F-1 and F-2 below for libraries and recreation centres, modified to reflect typical City of Mississauga facility operation hours. If additional modifications are required to other schedules in order to meet City of Mississauga operating parameters, the model shall be modified to account for the actual hours.

Lighting loads shall be modelled as per the design. Credit for lighting occupancy sensors may be applied as a reduction to the lighting schedule or modelled lighting power density as per the methodology in NECB 2015, Section 4.3.2.10. Daylight sensors shall be modelled directly in the software, where credit will be as per actual modelled results. Lighting schedules for spaces whose functions are not directly tied to the main building function (ex.

Stairways, mechanical, and electrical rooms) may use recommended lighting hours as guidance, provided in Appendix B of BC Hydro's New Construction Program's Energy Modelling Guideline. Spaces which are normally light 24 hours a day, such a parkades and some circulation spaces, shall be modelled as such. Exterior lighting shall be scheduled on at night, using an astronomical clock.

Credit for DHW savings is permitted using industry standard methods for hot water use estimates (for example, LEED Canada NC 2009, Water Efficiency Prerequisite 1) with savings calculated to OBC requirements for maximum fixture flow rates. Reductions are also permitted for installations of passive drain water heat recovery systems to a maximum of 15%, and for heat pump systems, which shall be modelled as per the design. Savings shall be determined using good engineering practice and relative to the areas in which the system is installed (i.e. the 15% reduction is only allowed if drain water heat recovery was installed on all DHW fixtures). Models shall assume an average domestic cold-water inlet temperature of 5°C.

All schedules shall be based on Table A-8.4.3.2.(2)-B of NECB 2015, except as specified in Tables F-1 and F-2 below for libraries and recreation centres, modified to reflect typical City of Mississauga facility operation hours. Space set points for temperature and humidity shall be as per design.

Table F-1 Library Schedules

Hour	Occupancy			Lighting			Receptacle			Fans			DHW		
	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun
1	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
2	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
3	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
4	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
5	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
6	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
7	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
8	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
9	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
10	0.2	0.5	0.5	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.3	0.3	0.3
11	0.5	0.6	0.6	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.4	0.5	0.5
12	0.5	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.8	0.9	0.9
13	0.7	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.8	0.9	0.9
14	0.7	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.8	0.9	0.9
15	0.7	0.7	0.7	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.8	0.7	0.7
16	0.8	0.7	0.7	0.9	0.6	0.6	0.9	0.6	0.6	1	1	1	0.6	0.5	0.5
17	0.7	0	0	0.9	0.05	0.05	0.9	0.05	0.05	1	0	0	0.4	0.3	0.3
18	0.5	0	0	0.9	0.05	0.05	0.9	0.05	0.05	1	0	0	0.3	0.05	0.05
19	0.3	0	0	0.6	0.05	0.05	0.6	0.05	0.05	1	0	0	0.2	0.05	0.05
20	0.3	0	0	0.5	0.05	0.05	0.5	0.05	0.05	1	0	0	0.2	0.05	0.05
21	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
22	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
23	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05
24	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0	0	0	0.05	0.05	0.05

Table F-2 Recreation Centre Schedules

Hour	Occupancy			Lighting			Receptacle			Fans			DHW		
	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun
1	0	0.3	0.3	0.1	0.5	0.5	0.1	0.5	0.5	0	1	1	0.05	0.6	0.5
2	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0.05	0.05	0.05

3	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0.05	0.05	0.05
4	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0.05	0.05	0.05
5	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0.05	0.05	0.05
6	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0.05	0.05	0.05
7	0.1	0.1	0.1	0.5	0.5	0.5	0.5	0.5	0.5	1	1	1	0.7	0.7	0.7
8	0.2	0.2	0.2	0.7	0.7	0.7	0.7	0.7	0.7	1	1	1	0.7	0.7	0.7
9	0.5	0.5	0.5	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.7	0.7	0.7
10	0.5	0.5	0.5	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.7	0.7	0.7
11	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.4	0.4	0.4
12	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.5	0.5	0.5
13	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.6	0.6	0.6
14	0.5	0.5	0.5	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.6	0.6	0.6
15	0.2	0.2	0.2	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.4	0.4	0.4
16	0.2	0.2	0.2	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.3	0.3	0.3
17	0.3	0.3	0.3	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.3	0.3	0.3
18	0.6	0.6	0.6	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.4	0.4	0.4
19	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.5	0.5	0.5
20	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.8	0.8	0.8
21	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.8	0.8	0.8
22	0.6	0.6	0.6	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.9	0.9	0.5
23	0.4	0.4	0.4	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.9	0.9	0.5
24	0.3	0.3	0.3	0.9	0.9	0.9	0.9	0.9	0.9	1	1	1	0.6	0.7	0.5

Other Loads

Elevators

Elevators shall be modelled by using an electrical load of 3kW per elevator and the equipment schedule of the building type.

Other Process Loads

All process loads expected on the project site are to be included in the energy model. This includes but is not limited to: IT/data loads, exterior lighting, swimming pool heating, patio heaters, heat tracing, etc. All loads are to be estimated to reflect the actual design and using good engineering practice.

Note: Electric car charging is not included in the building process loads, as this is a growing load that is associated with transportation rather than buildings, and may include sub-metering and/or re-sale of electricity.

Infiltration

Infiltration shall be modelled as a fixed rate of 0.2 L/s/m^2 (0.0394 cfm/ft^2) at operating pressure, and is to be applied to the modelled above-ground wall area (i.e. walls and windows). Infiltration shall be scheduled on at all times.

Reduced air leakage rates may be modelled. If choosing to model a reduced infiltration rate, the project must commit to achieving the corresponding airtightness target, to be confirmed by mandatory airtightness testing.

Note: projects must provide all airtightness documentation required by the AHJ at each phase of project approval, and projects using reduced infiltration rates may have additional documentation requirements.

Envelope airtightness test results at a pressure of 75 Pa can be converted to ambient pressures for use in energy modelling software by multiplying the value by 0.112. Conversely, modelled infiltration rates may be converted to an airtightness target by dividing by 0.112. Note that airtightness results are often normalized by the total envelope surface area, which is different than the above ground wall area, due to the inclusion of floors and roofs. When converting from an airtightness test to modelled infiltration or vice-versa, the difference in surface areas must be accounted for.

$$I_{AGW} = 0.112 * q_{75Pa} * \frac{S}{A_{AGW}}$$

Where:

I_{AGW} = infiltration rate (L/s.m^2) to be used for energy modelling, and applied to the modelled above-ground wall area

q_{75Pa} = normalized envelope air leakage (L/s.m^2) as tested at 75 Pa

S = total surface area (m^2) of the building envelope included in the air tightness test (i.e. the pressure boundary), including ground floors and roofs, and possibly below-grade walls

A_{AGW} = modelled area (m^2) of the above-ground wall (including windows)

Ventilation

Ventilation rates are to be modelled as per design, including but not limited to ventilation for occupants according to building code requirements, make-up air for exhaust requirements, and pressurization make-up air, among others.

Credit may be taken for demand control ventilation systems that monitor CO_2 levels by zone and that have the ability to modulate ventilation at either the zone or system level in response to CO_2 levels. Reduction in outdoor air shall be modelled as closely as possible to reflect the actual operation of the designed ventilation system and controls. The occupancy schedule can be used as a surrogate for CO_2 control in the model. For example, if a zone has the ability to decrease ventilation in response to CO_2 levels in that zone, the occupancy-based ventilation for that zone at each time step shall be determined by multiplying the zone's design occupancy-based ventilation rate with the schedules occupancy fraction.

Other Considerations

Depending on the stage of the project that the energy model is developed, there may be the need to make a number of assumptions, of which many can have a significant impact on the performance of the building. While it is up to the design team and energy modeller to make reasonable assumptions based on past experience or engineering judgement, the items noted below are explicitly listed as they are often misrepresented in energy models.

Heat or Energy Recovery Ventilators

Heat or energy recovery ventilators shall be modelled according to design, even in instances where there exists software limitations. Appropriate workarounds or external engineering calculations are expected to be performed to accurately assess the performance of the as-designed systems. This includes the use of preheat coils and/or other frost control strategies.

When modelling a heat recovery system, the energy modeller must use Sensible Recovery Efficiency (SRE), and determine if an adjustment to efficiency is required to properly account for fan heat in the system. SRE is a measure of the heat exchanger's efficiency, i.e. removing the impact of case heat loss, air leakage, fan heat, etc., and is defined in CAN-CSA C439-2014. While the impact of such items do improve the heat exchanged to the supply air of the HRV, they do so at the expense of indoor air quality or heat from the space in which the HRV is located, with the exception of fans. The modeller must do one of the following:

a) Use SRE of the specified product and model fan location and power as per the HRV's design directly in the software

b) If the software cannot model exact fan placement and/or fan power as per the HRV's design, adjust the SRE efficiency so that it incorporates the benefit of fan heat directly in the SRE value for any fans that contribute heat to the supply air stream. Model the fans without power and account for their energy use elsewhere in the software or externally to the software.

Heat or energy recovery ventilators that use frost control strategies which limit the amount of ventilation supplied to the space (i.e. exhaust only defrost) shall be modelled to include an electric preheat coil before the heat or energy recovery ventilator that heats the air to the minimum temperature before frost control is employed, as indicated by the manufacturer. For example, if the minimum temperature prior to frost control being deployed is -5°C, then an electric preheat coil shall heat the incoming air to -5°C prior to it entering into the heat or energy recovery ventilator. The purpose of this approach is to not reward designs that reduce ventilation to the space due to their lack of efficiency.

Terminal Equipment Fans

Terminal equipment fans shall be modelled according to design. Specifically, ensure that fan power and fan control (i.e. cycling, always on, multi or variable speed) of terminal equipment represent the design and design intent as accurately as possible.

VAV and Fan-Powered Boxes

Modellers must ensure that minimum flow rates and control sequences of VAV terminals and Fan Powered Boxes are modelled according to the design, and if not available at the time of modelling, according to expected operation based on maintaining ventilation and other air change requirements as appropriate. Note that default values for minimum flows of VAV terminals are often unreasonably low in most energy modelling software.

Exhaust Fans

Exhaust fans that are not part of the ventilation system (ex. kitchen exhaust or bathroom exhaust not connected to an HRV or similar), shall have a runtime of 2 hours/day. Enclosed parking garage ventilation fans shall be modelled as running 4 hours per day. All other exhaust fans, including heat recovery units, shall be modelled to reflect the design intent as accurately as possible.

Calculating Envelope Heat Loss

One of the Standard's key performance targets is based on TEDI, which is primarily a representation of the annual heating load required to offset envelope heat loss and ventilation loads. Choosing TEDI as a target supports the Policy's direction to encourage energy efficient building envelopes. However, building envelope heat loss has historically been simplified due to past difficulties in cost-effectively providing more accuracy. This has generally led to overly optimistic assessments of building envelope performance by way of ignoring or underestimating the impact of thermal bridging.

Typical building envelope thermal bridging elements that can have a significant impact on heat loss that have historically been underestimated or unaccounted for include: balcony slabs, cladding attachments, window wall slab by-pass and slab connection details, interior insulated assemblies with significant lateral heat flow paths such as interior insulated poured-in-place concrete or interior insulation inside of window wall or curtain wall systems, and others. With the recent addition of industry resources that support more efficient and accurate calculations of building envelope heat loss, assemblies and associated thermal bridging elements must be accurately quantified for the purposes of complying with the Standard, according the requirements below.

Opaque Assemblies

The overall thermal transmittance of opaque building assemblies shall account for the heat loss of both the Clear Field performance, as well as the heat loss from Interface Details. Additional heat loss from Interface Details are to be incorporated in the modelled assembly U-values, according to the provisions below.

Overall opaque assembly U-values must be determined using the Enhanced Thermal Performance Spreadsheet (available from BC Hydro New Construction Program), performance data for Clear Fields and Interface Details from the Building Envelope Thermal Bridging Guide (BETBG), and the calculation methodology as outlines in 3.4 of the BETBG. A detailed example is provided in Section 5 of the BETBG.

If clear fields or interface details matching the proposed opaque assemblies are not available in the BETBG, overall U-values may be determines using any of the following approaches:

a. Using the performance data for Clear Field and Interface Details from other reliable resources such as ASHRAE 90.1-2010, Appendix A, ISO 14683 Thermal bridges in building construction – Linear thermal transmittance – Simplified Methods and default values, with the methodology described above in BETBG. For spandrel panels, consider using the Reference Procedure for Simulating Spandrel U-Factors, developed for Fenestration BC

b. Calculations, carried out using the data and procedures described in the ASHRAE Handbook – Fundamentals

c. Two- or three-dimensional thermal modelling, or

d. Laboratory tests performed in accordance with ASTM C 1363, “Thermal Performance of Building materials and Envelope Assemblies by Means of a Hot Box Apparatus,” using an average temperature of 24±1°C and a temperature difference of 22±1°C.

Except where it can be proven to be insignificant (see below), the calculation of the overall thermal transmittance of opaque building envelope assemblies shall include the following thermal bridging effect elements:

- Closely spaced repetitive structural members, such as studs and joists, and of ancillary members, such as lintels, sills and plates,
- Major structural penetrations, such as floor slabs, beams, girders, columns, curbs or structural penetrations on roofs and ornamentation or appendages that substantially or completely penetrate the insulation layer,
- The interface junctions between building envelope assembles such as: roof to wall junctions and glazing to wall or roof junctions,
- Cladding structural attachments including shelf angles, girts, clips, fasteners and brick ties
- The edge of walls or floors that intersect the building enclosure that substantially or completely penetrate the insulation layer.

The following items need not be taken into account in the calculation of the overall thermal transmittance of opaque building envelope assemblies:

- Mechanical penetrations such as pipes, ducts, equipment with through-the-wall venting, packaged terminal air conditioners or heat pumps.
- The impact of remaining small unaccounted for thermal bridges can be considered insignificant and ignored if the expected cumulative heat transfer though these thermal bridges is so low that the effect does not change the overall thermal transmittance of the above grade opaque building envelope by more than 10%.

Fenestration and Doors

The overall thermal transmittance of fenestration and doors shall be determined in accordance with NFRC 100, “Determining Fenestration Product U-factors”, with the following limitations:

a. The thermal transmittance for fenestration shall be based on the actual area of the windows and not the standard NRFC 100 size for the applicable product type. It is acceptable to area-weight the modelled fenestration U-value based on the relative proportions of fixed and operable windows and window sizes. It is also acceptable to simplify the calculations by assuming the worst case by using the highest window U-value for all fenestration specified on the project.

b. If the fenestration or door product is not covered by NFRC 100, the overall thermal transmittance shall be based on calculations carried out using the pro procedures described in the ASHRAE Handbook – Fundamentals, or Laboratory tests performed in accordance with ASTM C 1363, “Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus,” using an indoor air temperature of 21±1°C and an outdoor air temperature of -18±1°C measured at the mid-height of the fenestration or door.

Mixed-Use Buildings

Buildings consisting of different occupancies with different EUI, TEDI, and GHGI targets shall create whole-building targets by area-weighting the EUI, TEDI, and GHGI requirements accordingly.

References and Resources

1. 2014 Building America House Simulation Protocols, NREL, 2014
2. ASHRAE Handbook of Fundamentals, ASHRAE, 2013
3. ASHRAE Standard 90.1-2010 – Energy Standard for Buildings Except Low-Rise Residential Buildings, ASHRAE 2010
4. Commercial Buildings Building Envelope Thermal Bridging Guide, Version 1.1, BC Hydro, 2016
5. Energy Modelling Guidelines and Procedures, CONMET, 2014
6. EnergyStar Multifamily High-Rise Program, Simulation Guidelines, Version 1.0, Revision 03, January 2015
7. Infiltration Modelling Guidelines for Commercial Building Energy Analysis, PNNL, 2009
8. National Energy Code of Canada for Buildings, NRCan, 2011
9. New Construction Program’s Energy Modelling Guideline, BC Hydro, March 2015
10. TM54 – Evaluating Operational Energy Performance of Buildings at the Design Stage, CIBSE, 2014
11. National Energy Code of Canada for Buildings, NRCan, 2015
12. Guide to Low Thermal Energy Demand in Large Buildings, BC Housing, March 2018
13. Reference Procedure for Simulating Spandrel U-Values, Fenestration BC, September 2017
14. Illustrated Guide to Achieving Airtight Buildings, BC Housing, September 2017

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/14	Originator's files:
To: Chair and Members of General Committee	
From: Geoff Wright, P. Eng, MBA, Commissioner of Transportation and Works	Meeting date: 2019/12/04

Subject

Burnhamthorpe Road West from Ninth Line to Loyalist Drive – Municipal Class Environmental Assessment Study (Ward 8)

Recommendations

1. That the report titled Burnhamthorpe Road West from Ninth Line to Loyalist Drive – Municipal Class Environmental Assessment Study (Ward 8), dated November 14, 2019 from the Commissioner of Transportation and Works be received;

2. That the draft Environmental Study Report and the preferred design alternative for the Burnhamthorpe Road West Municipal Class Environmental Assessment Study (Ninth Line to Loyalist Drive), dated November 2019 be endorsed by Council;

3. That staff be directed to publish the "Notice of Study Completion" for this study in the local newspaper and to place the Environmental Study Report on the public record for a 45-day review period in accordance with the Municipal Class Environmental Assessment process; and

4. That all necessary by-laws be enacted.

Report Highlights

- The City has carried out, through its consultant, CIMA+, Phases 1 to 4 of a Schedule 'C' Class Environmental Assessment (EA) study for the Burnhamthorpe Road West corridor from Ninth Line to Loyalist Drive.
- Through the EA, there were several opportunities for consultation with the public, stakeholders and various government and technical agencies, including two public information centres.
- The preferred design alternative is to improve Burnhamthorpe Road West from Loyalist Drive to the western city limit from two (2) to four (4) lanes of travel, as well as improving active transportation (AT) facilities, and implementing localized intersection improvements

through the corridor.

- The implementation will be completed with a total estimated design and construction cost of approximately $12 million, to be programmed in the City's Capital Plan for major road improvements.
- A copy of the executive summary of the Environmental Study Report (ESR) has been appended to this report.
- Subject to Council endorsement, the ESR will be posted on the public record for a 45-day review period.

Background

Municipalities in Ontario follow the Municipal Class Environmental Assessment (October 2000, amended 2007, 2011, and 2015) process under the Ontario Environmental Assessment Act to complete a Municipal Class Environmental Assessment (EA) for most transportation, water and wastewater projects. The Municipal Class EA is a phased planning approach that includes five (5) main study phases and public consultation. The complexity and extent of the environmental impact of a specific project determines the number of phases to be completed to comply with the Class EA process.

The five (5) phases are as follows:

Phase 1 - Problem or Opportunity: The completion of this phase requires the proponent to document the factors that lead to the conclusion that an improvement or change is warranted.

Phase 2 - Alternative Solutions: In this phase, alternative solutions to the problem or opportunity are identified and evaluated, taking into account the existing environment. A recommended preferred solution can be developed with input from the public and review agencies. The nature of the solution will determine if the proponent is required to complete additional phases of the Municipal Class EA process.

Phase 3 - Alternative Design Concepts for Preferred Solution: If required, this phase will examine alternative methods of implementing the preferred solution, again considering environmental impacts and public and review agency input.

Phase 4 - Environmental Study Report (ESR): This phase includes the preparation of an ESR that documents the rationale and planning and consultative process undertaken for the project and the publication of the report for public review. The ESR is filed with the Municipal Clerk and placed on the public record for at least 30 calendar days for review by the public and review agencies. At the time of filing the ESR, the public and review agencies are notified via the Notice of Study Completion of the ESR, which is mailed out to area residents and advertised in local newspapers and online at mississauga.ca. Any outstanding comments and concerns must

be provided to the proponent during this time. If concerns regarding this project cannot be resolved through discussion with the proponent, a person or party may request that the Minister of Environment, Conservation and Parks order the project to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order), which addresses individual environmental assessment. If no request for an Order is received by the Minister within the review period, the ESR is deemed approved and the proponent may proceed to Phase 5 and implementation of the project.

Phase 5 - Implementation: This is the implementation phase of the Municipal Class EA process. This phase allows for detail design and construction of the items as planned in earlier phases, and monitoring for compliance with those planning principles.

City staff has worked with their consultants CIMA+ to complete Phases 1 to 4 of a Schedule 'C' Class EA study for the Burnhamthorpe Road West corridor from Ninth Line to Loyalist Drive.

The Executive Summary of the ESR is provided in Appendix 1.

The major objectives of EA were to:

- Confirm and document the need for road improvements, vehicular and non-vehicular;
- Address existing and potential safety issues along the corridor;
- Establish a preferred alignment and right-of-way requirements;
- Prepare a preliminary design;
- Determine active transportation requirements (pedestrian and cyclist), and
- Prepare an ESR.

Study Area

Burnhamthorpe Road West is an east-west arterial road in the City of Mississauga and is within the City's jurisdiction from the western and eastern municipal boundaries with the Town of Oakville and the City of Toronto, respectively. Within the study limits, Burnhamthorpe Road provides a connection between the Town of Oakville in the west and the City of Mississauga in the east, services local residential and commercial traffic as well as commercial and commuter traffic as illustrated in Figure 1.

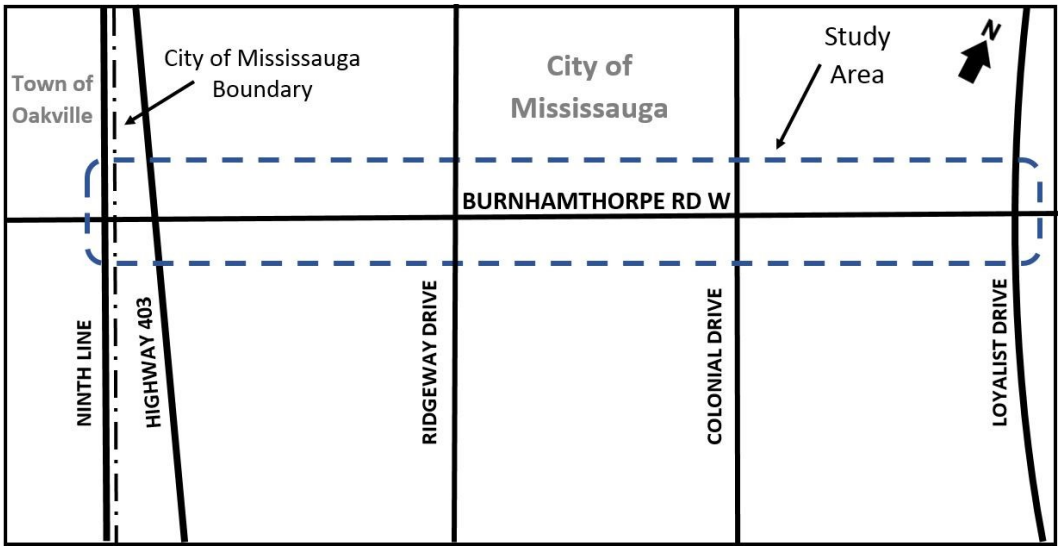


Figure 1: Study Area

Between Ninth Line and Loyalist Drive, Burnhamthorpe Road West consists of a 2-lane road cross-section. East of Loyalist Drive, Burnhamthorpe Road West is a 4-lane road with an existing multi-use trail that is located on the north side of the road. West of Loyalist Drive (at the east study limit), the multi-use trail terminates and the road transitions into the 2-lane cross-section.

The 2-lane section of Burnhamthorpe Road between the western city limit and Loyalist Drive is reaching capacity during peak periods, creating queuing along the corridor that requires capacity and operational improvements to resolve.

Existing Conditions

Existing conditions of the study area were collected and reviewed, including the following:

- Various background studies and reports (e.g. stormwater management reports, Highway 403 condition survey report, etc.);
- Data provided by the City of Mississauga (e.g. traffic data, tree survey data, etc.);
- Investigations undertaken as part of this Class EA study;
- Meetings with the Project Team;
- Meetings and correspondence with agencies including Ministry of Transportation and Halton Region;
- Consultation with members of the public; and
- Site visits.

Comments

Problems and Opportunities

Under existing conditions, several intersections within the study area are experiencing congestion and delays leading to significant queuing along Burnhamthorpe Road West. These

poor traffic conditions are anticipated to worsen in the future as vehicle demand on Burnhamthorpe Road West increases.

There is an opportunity to improve Burnhamthorpe Road West to accommodate not only existing and future vehicle demand, but also active transportation. There is an opportunity to incorporate active transportation elements to match the cross-section elements to the east of the study area and promote active transportation connectivity to the west, particularly over the Highway 403. The possible improvements to Burnhamthorpe Road West also include improvements to the corridor's streetscape.

Evaluation of Alternative Solutions

The Class EA process for municipal roads in Ontario requires consideration and evaluation of all reasonable alternative solutions to accommodate future travel demand. The following alternative solutions have been assessed from a traffic perspective and been identified as possible alternative solutions:

- Alternative 1 – Do Nothing
- Alternative 2 – Diverting traffic or developing Transportation Demand Management (TDM) strategies
- Alternative 3 – Resolving the deficiency elsewhere in the network
- Alternative 4 – Providing and improving active transportation facilities including extending the multi-use trail
- Alternative 5 – Improving operations at localized intersections
- Alternative 6 – Improving transit operations with safe access to transit stops
- Alternative 7 – Widening Burnhamthorpe Road West from Loyalist Drive to the West City Limit

Each alternative solution was evaluated based on the following criteria:

- Transportation and transit;
- Engineering and utilities;
- Socio-economic environment;
- Natural environment;
- Cultural environment;
- Aesthetics and streetscapes; and
- Cost.

Based on the analysis and evaluation of alternative solutions and feedback received from the public and stakeholders, the preferred planning solution is a combination of Alternatives 2, 4, 5 and 7, resulting in the following:

- Widening Burnhamthorpe Road West from Loyalist Drive to the West City Limit;
- Providing and/or improving active transportation facilities including extending the multi-use trail;
- Improving operations at localized intersections; and
- Diverting traffic or developing Transportation Demand Management strategies.

Evaluation of Alternative Designs

Based on the screening of the Alternative Solutions noted above, methods of implementing the preferred alternative solution were developed for the improvement of Burnhamthorpe Road West between Ninth Line and Loyalist Drive.

Various alternative design concepts for the widening were investigated, and included;

- Alternative Design Concept #1 – Do Nothing
- Alternative Design Concept #2 – Widen Burnhamthorpe Road West to 4 Lanes
- Alternative Design Concept #3 – Widen Burnhamthorpe Road West to 4 Lanes with In-Boulevard Parking on the South Side
- Alternative Design Concept #4 – Widen Burnhamthorpe Road West to 4 Lanes with Intersection Improvements at Ridgeway Drive
- Alternative Design Concept #5 – Widen Burnhamthorpe Road West to 4 Lanes with a Roundabout at Ridgeway Drive

Based on the evaluation of alternative design concepts and feedback received from the public and stakeholders, **Alternative #4 - Widen Burnhamthorpe Road West to 4 Lanes with Intersection Improvements at Ridgeway Drive** was selected as the preliminary preferred alternative design. This solution addresses future traffic demand and safety deficiencies within the study area, including the queuing at the intersection of Ridgeway Drive and Burnhamthorpe Road. There are no impacts to private property or green space associated with this design concept. Therefore, Alternative Design Concept #4 was identified as the preferred alternative.

Elements of the Preferred Alternative Design include:

- Widening to 4-through lanes within the existing right-of-way;
- Sidewalks on both sides of the road;
- A multi-use trail on the north side;
- Approximately 150 metres of in-boulevard parking on the south side of Burnhamthorpe Road west of Loyalist Drive (to be revisited at detailed design);
- No significant structural impacts to the Highway 403 Bridge (discussed further in the ESR Section 6.2);
- No impacts to street trees adjacent to the roadway;
- Intersection design compliance with Accessibility for Ontarians with Disabilities Act (AODA);
- Improvements at local intersections without impacting property;
- Intersection improvements at Ridgeway Drive and Burnhamthorpe Road; and
- Enhanced landscaping features.

Typical Cross Section

The typical cross-section for the Preferred Alternative Design is illustrated in Figure 2. The cross-section was developed based on a 70 km/h design speed. The features provided in the typical cross-section include the following:

- 35 metre (114.8 feet) wide right-of-way
- Four 3.5 metre (11.5 feet) wide lanes (two lanes in each direction)
- 1.5 metre (4.9 feet) wide sidewalks on both sides
- 3.5 metre (11.5 feet) wide multi-use trail on the north side
- 1.0 metre (3.3 feet) wide splash pad behind the curb on the north side

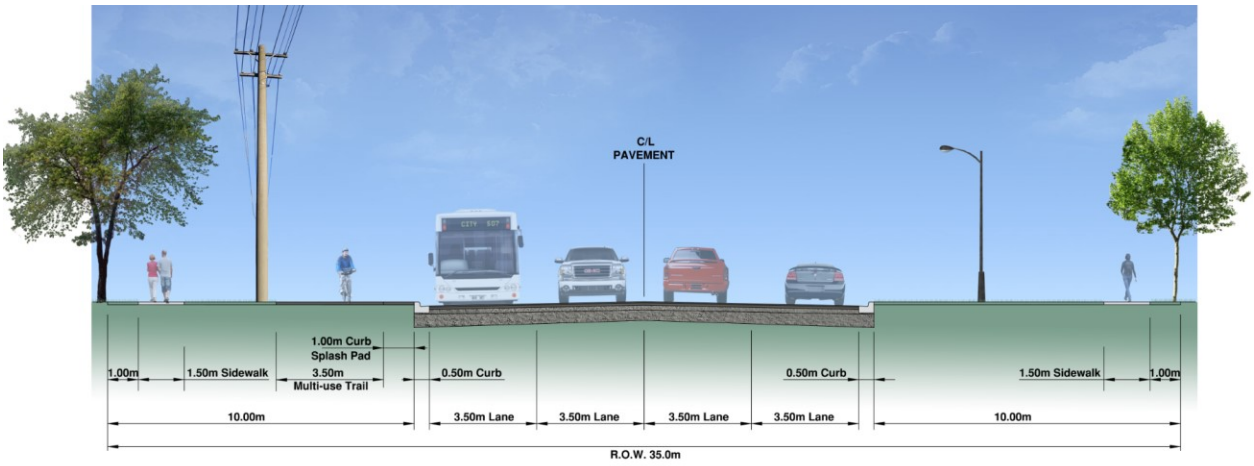


Figure 2: Preferred Alternative Design

In areas available space within the right-of-way is constrained (e.g. intersections), the cross-section has been modified to avoid impacts to private property.

Provisions for in-boulevard parking, west of Loyalist Drive on the south side of Burnhamthorpe Road, are included as part of the preferred design. The typical cross-section for the 150 metre (492 feet) long section west of Loyalist Drive is illustrated below in Figure 3. This section includes the features in the typical cross-section with the addition of approximately 20 in-boulevard parking spaces, 2.6 metres (8.5 feet) wide. The need for the in-boulevard parking will be reviewed during the detailed design phase.

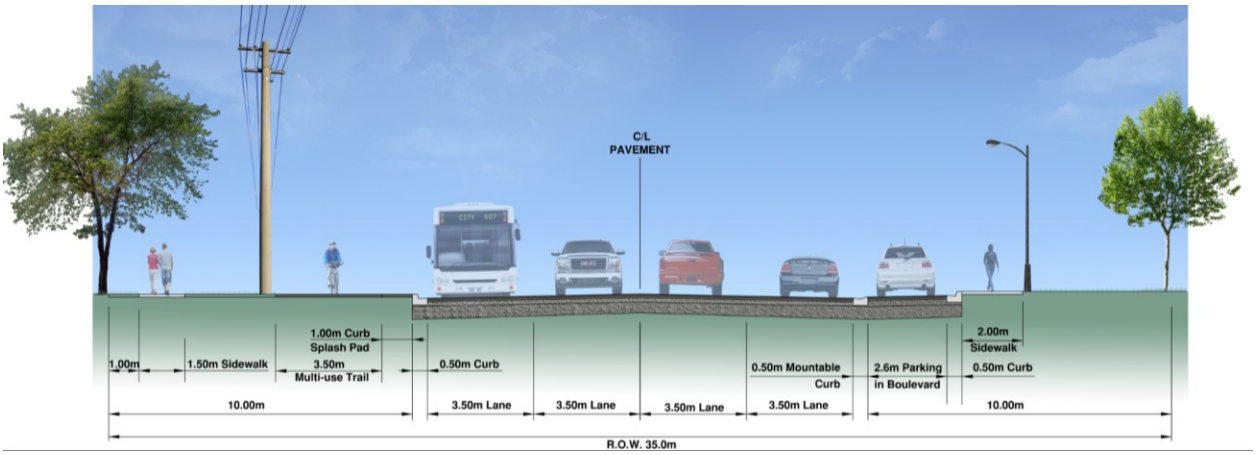


Figure 3: Typical Cross Section - In-Boulevard Parking on the South Side

Transit

The preferred design includes maintaining the existing transit stop locations along this corridor, which are setback from intersection to allow sufficient spacing for transit stops including bus pads. The final location of the transit stops, and the associated transit infrastructure, will be determined during the detailed design stage in coordination with MiWay.

Public Consultation

Public consultation is a key feature of an EA planning process and therefore was a principal component of the Burnhamthorpe Road West from Ninth Line to Loyalist Drive – Municipal Class Environmental Assessment Study. Key features of the consultation program undertaken as part of this study included:

- Notice of Study Commencement published in the local newspaper on January 11 and 18, 2018 and mailed to area property owners and technical agencies;
- Two Public Information Centres, held on March 7, 2018 and June 19, 2018 ; and
- Meetings with technical agencies meetings including Halton Region and Ministry of Transportation (MTO) were held on January 18, 2018, June 12, 2018 and June 18, 2018.

Subject to Council endorsement, a Notice of Study Completion will be published in the local newspaper and mailed to area property owners and technical agencies.

The following general comments from area residents were submitted and noted by the project team regarding the preferred alternative design:

- Desire for improved signal timing along the corridor.
- Support for a buffer between the multi-use path and travel lanes.
- Concern regarding vehicles stopping on the road in non-designated areas near Loyola High School to drop students off.
- Support for not carrying forward the roundabout at Ridgeway Drive.

- Support for intersection improvements at Ridgeway Drive.
- Concerns regarding noise levels and preference for natural solutions (i.e. landscaping) rather than noise walls.
- Desire for noise attenuation.
- Request for a truck prohibition within the study limits.
- Request for a pedestrian crossing at the Dolson Court opening and traffic calming.
- Support for additional landscaping.
- Desire for a 50 km/h speed limit because of the proximity to the school.
- Support for the in-boulevard parking on Burnhamthorpe Road.
- Request for the in-boulevard parking to be provided on the north side.
- Opposition to the widening of Burnhamthorpe Road.
- Opposition to the in-boulevard parking on Burnhamthorpe Road.

Implementation

It is recommended that the preferred alternative design along Burnhamthorpe Road West be constructed in one phase to minimize the impact to surrounding residents. The necessary funding to initiate the detailed engineering design and construction has been identified in the City's Capital Plan and will be included in a future Business Plan and Budget for Council's approval.

Property Requirements

Given that Burnhamthorpe Road West along the study corridor is currently a 35 metre right-of-way, the preferred alternative design can be implemented without additional property requirements.

Next Steps

Should this study ESR and the preferred alternative design be endorsed by Council and no Part II Orders be filed with the Ministry of the Environment, Conservation and Parks during the public notification period, this project will be deemed approved. As the Notice of Study Completion for this ESR will be posted over the holiday season, a 45-day notice period will be provided.

Financial Impact

There are no financial impacts resulting from recommendations in this report.

The fees associated with publishing the "Notice of Study Completion" for this study in the local newspaper and placing the ESR on the public record for a 45-day review period are nominal, with funding available in the existing capital project #16-106 "Burnhamthorpe Road-Ninth Line-Loyalist Dr." for this project.

The estimated cost to implement the preferred design alternative is $12 million is not included in the current 2019 or proposed 2020 capital budget forecast but will be considered in the next year's 2021 Business planning and Budget process.

Conclusion

The Transportation and Works Department recommends that Council endorse the preferred alternative design for Burnhamthorpe Road West from Ninth Line to Loyalist Drive and that staff be directed to publish the Notice of Study Completion for this study in the local newspaper and to place the ESR on the public record for a 45-day review period. The preferred design includes widening from 2 to 4-lanes, intersection and active transportation improvements, as outlined in this report.

Attachments

Appendix 1: Burnhamthorpe Road West Improvements Municipal Class Environmental Assessment Study - Draft Environmental Study Report: Executive Summary

Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Prepared by: Lin Rogers, Manager, Transportation Projects

Appendix 1

City of Mississauga

Burnhamthorpe Road West Improvements Municipal Class Environmental Assessment Study

Draft Environmental Study Report: Executive Summary

November 2019

CIMA+
Partners in excellence

Executive Summary

Introduction

Burnhamthorpe Road West is an east-west arterial road in the City of Mississauga. Within the study limits Burnhamthorpe Road provides a connection between the City of Mississauga in the east and Town of Oakville in the west, servicing local residential and commercial traffic as well as commercial and commuter traffic. East of Ninth Line, Burnhamthorpe Road West is within the City of Mississauga jurisdiction and ultimately terminates in the City of Toronto.

Between Ninth Line and Loyalist Drive, Burnhamthorpe Road West consists of a 2-lane road cross-section. East of Loyalist Drive, Burnhamthorpe Road West is a 4-lane road with an existing multi-use trail that is located on the north side of the road. West of Loyalist Drive (at the east study limit), the multi-use trail terminates and transitions the road into the 2-lane cross-section.

The 2-lane section of Burnhamthorpe Road between the west City limit and Loyalist Drive is reaching capacity during peak periods, creating queuing along the corridor that requires capacity and operational improvements to resolve this issue.

The City of Mississauga is undertaking a Schedule C Municipal Class Environmental Assessment Study to review the existing and future needs of the Burnhamthorpe Road West corridor. The study considers the City's planning principles to build a multi-modal city, which will support a successful, vibrant and active community with a reliance on a range of transportation modes including walking, cycling, transit and vehicles.

Needs and Justification

The needs and justification of the study are discussed in Section 2 of the Environmental Study Report (ESR) and summarized below.

Transportation Assessment

A transportation and traffic assessment was conducted as part of the study to review the existing and projected future transportation and traffic conditions to determine the future needs of the study area. The existing traffic operations can be summarized as follows:

- Several movements (i.e. right turn, left turn, through) operate at or above capacity at the following intersections during the AM and PM peak hour:
    - Burnhamthorpe Road & Ninth Line
    - Burnhamthorpe Road & Ridgeway Drive
- The westbound left-turn at Burnhamthorpe Road & Ninth Line is highly congested in the AM peak.
- The following turning movements result in excessive queuing that is sustained over multiple signal cycles:
    - Burnhamthorpe Road & Ninth Line
        - Eastbound through/right-turn in the AM peak hour
    - Burnhamthorpe Road & Ridgeway Drive:
        - Eastbound through/right-turn in the AM peak hour
        - Northbound left-turn in the PM peak hour.
    - Burnhamthorpe Road & Winston Churchill Boulevard (outside of study area):
        - Westbound through in the PM peak hour

A screenline assessment was completed for future horizon years to assess the total east-west traffic demand and road capacity available considering other parallel roads in the area, thereby, identifying the capacity deficiency in the area.

The results of the screenline assessment indicate that under future conditions, existing demand on Burnhamthorpe Road will be over existing capacity. A review of the mid-block volumes on the Burnhamthorpe Road corridor indicate the following:

- With the 2021 scenario:
  - Total traffic conditions on Burnhamthorpe Road west of Ninth Line remain over capacity.
  - Total traffic conditions on Burnhamthorpe Road west of Ridgeway Drive are also over capacity.
- With the 2031 and 2041 scenarios:
  - Total traffic conditions continue to worsen and Burnhamthorpe Road remains over capacity west of Ninth Line and west of Ridgeway Drive.

Problems and Opportunities

Under existing conditions, several intersections within the study area are experiencing congestion and delays leading to significant queuing along Burnhamthorpe Road West. These poor traffic conditions are anticipated to worsen in the future as vehicle demand on Burnhamthorpe Road West increases.

There is an opportunity to improve Burnhamthorpe Road West to accommodate not only existing and future vehicle demand, but also active transportation. There is an opportunity to incorporate active transportation elements to match the cross-section elements to the east of the study area and promote active transportation connectivity to the west, particularly over the Highway 403. The possible improvements to Burnhamthorpe Road West also includes improvements to the streetscape of the corridor.

Existing Conditions

Existing conditions of the study area were collected and reviewed, including the following:

- Various background studies and reports (i.e. stormwater management reports, Highway 403 condition survey report, etc.);
- Data provided by the City of Mississauga (i.e. traffic data, tree survey data, etc.);
- Investigations undertaken as part of this Class EA study;
- Meetings with the Project Team;
- Meetings and correspondence with agencies including Ministry of Transportation and Halton Region;
- Consultation with members of the public;
- Site visits.

The existing conditions of the study area are discussed below.

Socio-Economic Environment

The City of Mississauga Official Plan (2017) designates the lands east of Ridgeway Drive as Residential Low Density. This section of road is comprised of a mix of uses including business employment, place of worship, schools and residential low density areas. West of Ridgeway Drive, land use is designated as Business Employment, with multiple businesses on the south side of Burnhamthorpe Road West and a secondary school on the north side.

There are two community features located within the study limits between Ninth Line and Loyalist Parkway, Loyola Catholic Secondary School and Iglesia Ni Christo Church. Loyola Catholic Secondary School is located on the north west corner of the Burnhamthorpe Road and Ridgeway Drive intersection. Iglesia Ni Christo is located on the north west corner of the Burnhamthorpe Road and Loyalist Drive intersection.

Natural Environment

A Natural Environment Assessment was conducted to document existing conditions, assess potential impacts to any natural heritage features present within the Study Area and provide recommendations and supporting documentation for the study.

Watercourses and Surface Drainage Features

The Study Area predominantly resides within the Loyalist Subwatershed, with portions to the north-east situated in the Sawmill Subwatershed within the greater Credit River Watershed under the administrative jurisdiction of the Credit Valley Conservation Authority (CVC). A small portion at the west end of the Study Area is situated within the Oakville East Urban Creeks watershed under the jurisdiction of Conservation Halton.

CIMA+ consulted with the CVC to obtain GIS data records for any tributaries crossing the Study Area. CVC records indicated the presence of an historic tributary crossing Burnhamthorpe Road West located approximately 202 m east of Colonial Drive East. Specifically, this tributary was identified to be present along Dolson Court, north of Burnhamthorpe Road West and connecting underneath the road and continuing southbound along Bangor Road. CVC records indicated dry conditions in both the early summer of 1954 and spring of 1965. The results of CIMA+'s field investigations have determined that this highly urbanized drainage path is intermittent and flow is considered either historical or extremely limited; conditions were dry (including the eastwest ditches along both the north and south sides of Burnhamthorpe Road West in this area). There is a major trunk storm sewer in this corridor (drainage path). Very little erosion scarring or changes in soil moisture were observed, and limited changes in species composition to hydrotolerant or hydrophilic vegetation species were observed in these areas at the time of the field investigation.

Drainage ditches are present on both the north and south sides of Burnhamthorpe Road West along the length of the Study Area, however, standing water was only observed in the naturalized ditches west of Highway 403. These ditches were predominantly occupied by Common Reed (*Phragmites australis*) with associates of Common Cattail (*Typha latifolia*). East of Highway 403, the manicured grass swales were dry and catch basins were observed to be present along their lengths.

Aquatic Habitat

CIMA+ evaluated existing conditions at all drainage features and tributary locations (present or historically mapped) throughout the Study Area. The features observed were evaluated based on data obtained from the background review, and observations during field investigations which included an assessment of substrate conditions, water presence and water quality, stream width, top of bank and water depth (if applicable), and aquatic and riparian vegetation community composition.

Standing waters and low flow conditions were observed in the drainage ditches and tributary features west of Highway 403. The previously mapped tributary features north and south of Burnhamthorpe Road East in this area were either recently plowed and barren drainage pathways (across the agricultural field to the north) or were densely established with invasive tall narrow leaved emergents (*P. australis*). Features east of Highway 403, are urban drainage swales established with actively maintained manicured grass, which are not connected to any natural

tributaries, nor exhibited hydrologic or ecological conditions capable of supporting any aquatic species.

None of the features evaluated within or adjacent to the Study Area meet the criteria of fish habitat based on the results of the site investigation. None of the features observed east of Highway 403 are considered suitable for supporting fish populations at any time throughout the year.

Terrestrial Habitat

Lands within the Study Area were assessed to determine the presence or absence of any vegetation species of conservation concern and evaluate habitat conditions. The assessment included detailed biological inventories and vegetation community characterization. Six community classes were identified across the Study Area.

Vegetation communities classified via standard ecological land classification (ELC) procedures and protocols are grouped to represent lands 0.5 hectares or greater, however, given the anticipated Project impacts, the following provides a summary of the main findings within the Study Area's Right-of-Way (ROW).

The greenspaces within the ROW associated with the Study Area east of Ridgeway Drive are characteristic of cultural urban features and are established with manicured grass intermixed with disturbance adapted graminoids and forbs. Streetscaping and naturalized trees were also inventoried as part of the assessment. No listed vegetation species covered under the Endangered Species Act (2007) were observed within the Study Area limits in this location. No vegetation species of conservation concern were observed within the Study Area limits in this location.

The greenspaces within the ROW associated with the Study Area between Ridgeway Drive and Ninth Line, included predominantly cultural features; manicured grass and establishment of invasive and disturbance adapted graminoids, forbs. Landscaping associated with adjacent developments (commercial/industrial to the south and institutional school sports field north of Burnhamthorpe Road West) as well as naturalized trees/shrubs were inventoried as part of the assessment. No listed vegetation species covered under the Endangered Species Act (2007) were observed within the Study Area limits in this location. No vegetation species of conservation concern were observed within the Study Area limits in this location.

Wildlife

Mammals

The Study Area falls within Ecoregion 7E (Lake Simcoe-Rideau). Representative mammalian fauna in this region include White-tailed Deer (Odocoileus virginianus), Northern Raccoon (Procyon lotor), Striped Skunk (Mephitis mephitis), Virginia Opossum (Didelphis virginiana), and Woodchuck (Marmota monax). Eastern Cottontail (Sylvilagus floridanus), and Grey Squirrel (Sciurus carolinensis) was observed in the Study Area, east of Highway 403.

No other mammals were observated at the time of the site investigation, however, potions of the undeveloped meadows may be utilized by deer populations should they occur in the area.

Birds

A review of available bird observation data from the Ebirds Canada and Ontario Breeding Bird Atlas (OBBA) databases was completed as part of the assessment. Records for 30 species have been observed within 10 km of the Study Area. A review of Ministry of Natural Resources and Forestry (MNRF) records indicated the historical presence of Henslow's Sparrow (Ammodramus henslowii) within a 1 km radius of the Study Area (last observation record dated 1932). This observation was taken into consideration as part of the assessment.

CIMA+ observed 17 bird species throughout the duration of the field investigations which included point counts taken from the right-of-way across the length of the Study Area. Point counts were taken in late May 2018 in the morning hours (between 7:20 am and 9:00 am). Visual and auditory observations outside of the point count stations were also noted. The dominant species observed through visual confirmation and/or auditory calls included American Robin (Turdus migratorius), Rock Pigeon (Columba livia livia), Mourning Dove (Zenaida macroura), Cedar Waxwing (Bombycilla cedrorum), American Goldfinch (Spinus tristis), Northern Cardinal (Cardinalis cardinalis), House Finch (Haemorhous mexicanus), European Starling (Sturnus vulgaris), American Crow (Corvus brachyrhynchos), Red-winged Blackbird (Agelaius phoeniceus), and Ring-billed Gull (Larus delawarensis).

One American Robin nest was observed in a Manitoba Maple tree adjacent to the recreational sports field on the north side of Burnhamthorpe Road West at the west end of the Study Area. No other wildlife nests were observed in the Study Area at the time of the site investigations.

Barn Swallows (Hirundo rustica) were listed in the Ebirds Canada database, however, no Barn Swallows were observed (visual or auditory) in the Study Area at the time of the site investigation. Barn Swallows are known to occasionally nest in culverts. All culverts were inspected during the site investigation; no Barn Swallows or other wildlife nesting structures were observed within any of the culverts present within the Study Area.

No SAR species were observed (visual or auditory) within or adjacent to the Study Area at the time of the investigations.

Amphibians and Reptiles

CIMA+ biologists accessed the Ontario Reptile and Amphibians Atlas to perform a search of reptile and amphibian observations recorded within the 10 square-kilometre grid which covers the Study Area. 537 herpetofauna observation records were found, totalling 25 species,16 species of which have been observed within the last 15 years. Six species of conservation concern were among the list.

One Eastern Gartersnake (Thamnophis sirtalis sirtalis) was observed in the field edge adjacent to the agricultural development located at the north-west corner of Burnhamthorpe Road East and Ninth Line. No other herpetofauna species were observed during the field investigation. No roadkill, carapaces, snakeskins, egg shells, tracks, nests or other evidence of turtles or snakes were observed at the time of the field investigations.

Where records of listed species at risk or species of conservation concern were observed by others (conservation authority, MNRF, wildlife atlasses, etc.), they were included in the Species at Risk (SAR) Screening Assessment.

Species at Risk

A SAR Screening Assessment was completed to evaluate known SAR occurrences in the area against specific local habitat features identified during field investigations to determine the likelihood of SAR utilizing lands within or near the Study Area. Eight SAR were identified as being potentially present in the Study Area vicinity but not within the study area itself (i.e. outside of the area of impact).

Phase One Environmental Site Assessment

A Phase One Environmental Site Assessment (ESA) was conducted to determine the likelihood for the presence or absence of areas of potential environmental concern in relation to the proposed construction works where one or more contaminants of concern may have impacted the land or water on, in or under the study area. A review was conducted of the environmental, geological, and historical land use records, persons with knowledge of the property were interviewed and a site

reconnaissance was undertaken. The results of the review identified 30 potentially contaminating activities (PCAs) within the study area, of which two were directly adjacent to Burnhamthorpe Road West.

The PCAs were evaluated as possible areas of potential environmental concern (APECs) in relation to the proposed construction works on the basis of the observations noted during the site reconnaissance, the location and distance of the PCA from Burnhamthorpe Road, the nature and timeframe of the activity, the quantity and nature of substances involved in the PCA, the low permeability of the underlying silty clay soils that are typical of the area, and preferential transport pathways between the PCA location and Burnhamthorpe Road. The evaluation results identified five PCAs related to the potential presence of fill materials and the historical application of pesticides that are expected to contribute to two APECs on Burnhamthorpe Road.

The potential media impacts, if any, are anticipated to consist of the shallow soil conditions since the PCAs involve surface applications of pesticides and the presence of shallow fill materials that may exist within the road allowance or within the raised embankments for the Highway 403 overpass. In addition, low permeable silty clay soils likely underlie Burnhamthorpe Road which would help minimize the vertical migration of potential contaminants, and the depth to the water-bearing layers is more than approximately 10 m below grade.

In this regard, a Phase Two ESA involving an investigation of the shallow soil conditions is recommended to address the APECs identified on Burnhamthorpe Road that may impact the planned construction activities associated with the widening of Burnhamthorpe Road West.

Cultural Environment

Stage 1 Archaeological Assessment

A Stage 1 Archaeological Assessment was completed for the Burnhamthorpe Road West Improvements Class EA. The Stage 1 background assessment resulted in the identification of several features of archaeological potential within the vicinity of the study corridor. The closest and most relevant indicators of archaeological potential include a variety of secondary water sources (i.e., tributaries of the Credit River and Joshua's Creek), two historically-surveyed roadways (Burnhamthorpe Road West and Ninth Line), one church, one schoolhouse, twelve farmsteads, and one registered archaeological site. One historic community (Snider's Corners) is located adjacent to the southwestern extent of the study corridor however it is not located within the study area. It was determined that the study corridor contains no archaeological potential due to previous disturbance by past earth-moving construction activities. Since the study corridor does not contain archaeological potential, further assessment is not required.

Cultural and Built Heritage

A Cultural Heritage Resource Assessment (CHRA) was completed for the Burnhamthorpe Road West corridor within the study limits. The purpose of the assessment was to identify and evaluate the cultural heritage resources within the study area that may be impacted by improvements to Burnhamthorpe Road West. The CHRA included:

- Background research concerning the project context and historical context of the study area
- Consultation with the City of Mississauga, Town of Oakville, and Peel Art Gallery Museum + Archives (PAMA) staff regarding heritage matters in the study area
- Identification of any designated or recognized properties within the limits of the study area
- On-site inspection and photo documentation

After conducting historical research, consultation, and field survey, no cultural heritage resources were identified within the study rea. Therefore, there are no concerns with respect to built heritage

resources and cultural heritage landscapes related to any proposed improvements to Burnhamthorpe Road West from Loyalist Drive to the West City Limit (Ninth Line) in the City of Mississauga.

Drainage and Stormwater Management

A Drainage and Stormwater Management Assessment was conducted to review the existing and future drainage conditions for the study area. To the west of the study area, stormwater drainage from Ninth Line to Ridgeway Drive drains to Joshua's Creek watershed, within the jurisdiction of the Conservation Halton (CH). To the east, stormwater drainage from approximately Ridgeway Drive to Loyalist Drive drains to the Loyalist Creek sub-watershed, within the jurisdiction of the Credit Valley Conservation Authority (CVC).

Burnhamthorpe Road West from Ninth Line to Ridgeway Drive, is a rural cross-section with existing gravel shoulders and ditching primarily draining to the Highway 403 drainage system, ultimately outletting to Joshua's Creek tributary. Burnhamthorpe Road West from Ridgway Drive to Loyalist Drive is a semi-rural cross-section with a gravel shoulder and ditching, draining to a ditch inlet storm sewer system outletting to a 2100 mm trunk sewer at Bangor Road, ultimately draining to the Collegeway stormwater management facility, subsequently to Loyalist Creek tributary.

The existing storm sewer on Burnhamthorpe Road West ranges in size from a 375 mm to 675 mm concrete sewer. A review of the existing sewer capacity confirms that the storm sewer system has adequate capacity to accommodate proposed flows related to a widening of Burnhamthorpe Road.

Utilities

The utilities in the corridor include aerial hydro, telephone, cable, storm sewer and future watermain.

Alectra Utilities has hydro poles located primarily on the north side of Burnhamthorpe Road West within the study limits. Hydro poles are also located on the south side of the road at intersections and intermittently along the corridor.

Peel Region completed the construction of a watermain along Burnhamthorpe Road West within the study limits in late 2018/ early 2019. An existing storm sewer was present that was built when the road was reconstructed at the time of development.

Bell Canada has an existing conduit and buried cable on the south side of Burnhamthorpe Road. The facilities cross Burnhamthorpe intermittently.

Rogers Communications has facilities that cross Burnhamthorpe Road at Ridgeway Drive and Colonial Drive. East of Colonial Drive, the facilities are present on the south side of Burnhamthorpe Road extending past Loyalist Drive.

Alternative Solutions

Seven alternative solutions were examined as part of this Class EA study to address the problems and opportunities in the study area:

Alternative Solution	Description
Alternative Solution #1	**Do Nothing** Burnhamthorpe Road West would remain a two-lane road between Loyalist Drive and Ninth Line. There would not be any improvement to active transportation elements or to local intersections. Level of Service would decrease over time resulting in a relative decrease in air quality due to increased congestion.

Alternative Solution #2	**Diverting traffic or developing Transportation Demand Management (TDM) strategies** Includes the promotion of the use of alternative modes of transportation including transit, cycling and walking in order to reduce vehicle volumes on Burnhamthorpe Road. TDM strategies also include measures to manage travel demand, such as carpooling and flexible work hours. These TDM strategies can be achieved though implementation of the City-wide TDM policies. TDM does not result in sufficient traffic reductions to adequately address future transportation needs. However, TDM strategies are included in the City's overall Transportation strategy and can be incorporated as part of an overall solution but TDM is not sufficient as a stand-alone solution.
Alternative Solution #3	**Resolving the deficiency elsewhere in the network** Involves improvements to roadways adjacent to the immediate study area, such as Dundas Street and Eglington Avenue, to reduce future traffic demand on Burnhamthorpe Road West. Given the built up nature of the lands surrounding Burnhamthorpe Road, there are no opportunities for new east-west roads that would attract traffic away from Burnhamthorpe Road. Dundas Street is an existing 6-lane arterial with limited opportunity for widening. Eglington Avenue is 4-lanes west of Winston Churchill Boulevard (WCB) and 6-lanes east of WCB and would have limited opportunities for widening.
Alternative Solution #4	**Providing and/or improving active transportation facilities including extending the multi-use trail** Implementation of new active transportation facilities on Burnhamthorpe Road West would support future traffic demands and improve accessibility for pedestrians and cyclists within the study area. Burnhamthorpe Road is identified as a proposed primary boulevard route within the Mississauga Cycling Master Plan (September 2010) and the implementation of a multi-use trail on the north side would provide connectivity to the existing active transportation network east of the study area.
Alternative Solution #5	**Improving operations at localized intersections** Improving traffic operations at intersections within the study area, such as the retiming of traffic signals and provision of turning lanes, would improve the overall efficiency of Burnhamthorpe Road West (i.e. maximize throughput) and the surrounding road network. The improvement of intersections as a stand-alone solution does not support the future traffic demand on Burnhamthorpe Road West and provides a marginal increase in Level of Service. However, improvements to localized intersections are incorporated in 'Improvement of Burnhamthorpe Road West from Loyalist Drive to the West City Limit through widening' solution.

Alternative Solution #6	**Improving transit operations with safe access to transit stops** Between Loyalist Drive and the West City Limit, Burnhamthorpe Road West is serviced by one bus route which operates between Colonial Drive and Ridgeway Drive, and Loyalist Drive and Winston Churchill Boulevard. Implementation or improvement of transit services on Burnhamthorpe Road West and the provision of transit infrastructure including transit stops can improve transit access to the study area, however this route (or corridor) is not identified in the City's long-range transportation policies.
Alternative Solution #7	**Improvement of Burnhamthorpe Road West from Loyalist Drive to the West City Limit through widening** Improvement of Burnhamthorpe Road West from Loyalist Drive to the West City Limit through widening involves widening the roadway to increase capacity with additional travel lanes, to support future traffic demands and deficiencies identified in the long-range transportation policies. This solution also includes improvements to localized intersections.

Alternative Solution #1 - 'Do Nothing,' is not a feasible solution as it would not address the problems and/or opportunities identified for the study corridor. Although this alternative is not feasible, it was included in the assessment as a benchmark for comparison purposes.

Implementing **Alternative Solution #2 - Travel demand management measures**, does not fully address the problems and/or opportunities identified for the study corridor. This alternative however, will be carried forward in the Class EA as part of the preferred solution.

Alternative Solution #3 - Resolving the deficiency elsewhere in the network, was also considered as an alternative solution. However, this alternative was identified in the City of Mississauga TMP and will be implemented separately as part of a city-wide transportation improvement strategy to support future travel demand. The TMP confirmed the need for improvements to Burnhamthorpe Road in addition to other roadways, and therefore any plans to improve other roadways as part of the city-wide transportation strategy does not eliminate the need to improve Burnhamthorpe Road.

Alternative Solution #4 - Providing and/or improving active transportation facilities, does not fully address the problems and/or opportunities identified for the study corridor given the magnitude of the projected increase in traffic volumes. However, this alternative was carried forward in the Class EA as part of the preferred solution.

Alternative Solution #5 - Improving operations at localized intersections, does not fully address the problems and/or opportunities identified for the study corridor as a stand-alone solution as it does not support the future traffic demand on Burnhamthorpe Road West and provides a marginal increase in Level of Service. This alternative was carried forward in the Class EA as part of the preferred solution as the improvement to Level of Service provides contributes to the preferred solution in conjunction with improvements through widening (Alternative #7).

Alternative Solution #6 - Improving transit operations with safe access to transit stops, was also considered as an alternative solution. However, modifications to the transit service within the study limits is not identified in the City's long-range transportation policies. Improvements to transit

infrastructure (i.e. bus shelters) will be considered as part of the 'improvements to Burnhamthorpe Road West' alternative solution.

Alternative Solution #7 - Improvements to Burnhamthorpe Road West through widening was identified in the City of Mississauga long-range transportation policies. Further, this alternative solution was justified by the needs analysis completed during Phase 1 of this Class EA. Improving Burnhamthorpe Road West through widening combined with transportation demand management and active transportation, is the only solution among the alternatives considered that fully addresses the problems and/or opportunities identified in this study.

Based on the analysis and evaluation of alternative solutions and feedback received from the public and stakeholders, the preferred planning solution was selected as a combination of the following:

- Improvement of Burnhamthorpe Road West from Loyalist Drive to the West City Limit through widening
    - Providing and/or improving active transportation facilities including extending the multi-use trail
    - Improving operations at localized intersections
- Diverting traffic or developing Transportation Demand Management strategies

Phase 1 and 2 Consultation

During Phases 1 and 2 of the study, the public was notified of the commencement of the Class EA and invited to attend a Public Information Centre (PIC) to review the study progress and provides comments. Meetings with stakeholders and agencies were held to receive feedback on the preliminary preferred solution prior to the PIC. The consultation activities undertaken during Phases 1 and 2 of the Class EA are discussed below.

Notice of Study Commencement

The Notice of Study Commencement was prepared to inform agencies and the public of the initiation of the Class EA study. The notice was advertised in Mississauga News the on January 11 and January 18, 2018. It was mailed to approximately 1,312 landowners in the study area.

Invitations to participate in the study were mailed to approximately 24 agency representatives. The invitations were sent with the Notice of Commencement and accompanying reply form to indicate interest in participating in the study.

Public Information Centre No.1

The Notice of Public Information Centre No. 1 was prepared to inform the public and agencies of the opportunity to review the project and provide input. The Notice was advertised in the Mississauga News on February 22 and March 1, 2018. The Notice was emailed or mailed to 19 agency representatives and 1,359 property owners and interested members of the public on February 22, 2018. A covering letter was provided with the Notice to agencies.

The Notice of Public Information Centre No. 1 outlined the purpose of the meeting and identified the time, date, and location for the PIC. The Notice invited public comments on the study by either attending the PIC or contacting the project team.

The PIC was held on March 7, 2018 from 6:00 PM to 8:00 PM at the Erin Mills Twin Arena All Purpose Room (AODA accessible) at 3205 Unity Drive in the City of Mississauga. The PIC was held in an open-house format where the public was invited to review display boards, ask questions, and discuss comments with the project team. The display boards described the following:

- Welcome and Introduction

- Purpose of Public Information Centre No. 1
- Study Context and Overview
- Comment Received to Date
- Survey Results
- Municipal Class EA Process and Study Schedule
- Planning and Policy Context
    - Growth and Transportation
    - Cycling & Transit
- Existing Conditions
    - Land Use, Natural Heritage and Tree Inventory
    - Cultural Heritage
    - Transportation
- Future Conditions Without Improvements
- Problem and Opportunity Statement
- Alternative Solutions
- Evaluation Criteria
- Analysis and Evaluation of Alternative Solutions
- Preferred Alternative Solution
- Consideration of Design Concepts
- Initial Look at Design Concepts
- Next Steps

A sign-in sheet and comment sheets were provided to record attendance and obtain written comments. Thirty-seven (37) people signed into the PIC and twelve (12) comments were received through comment sheets and email correspondence.

The following general comments were submitted and noted by the project team during the PIC:

Traffic Operations and Traffic Safety

- Desire to widen Burnhamthorpe Road and provide additional traffic lanes
- Heavy truck volumes and consideration for a by-law restricting commercial vehicles along this section of Burnhamthorpe Road
- Concerns that widening the road will lead to an increase in vehicle traffic
- Consideration for the provision of a dedicated “kiss & go” drop-off for Loyola High School or police enforcement at this location
- Excessive vehicle speeds on Burnhamthorpe Road
- Need for improved signal timing and advanced left-turns at all intersections in the study area
- Need for traffic calming along Burnhamthorpe Road (i.e. speed bumps)

Parking

- Insufficient parking at Iglesia Ni Christo church resulting in cars parking along the shoulder of Burnhamthorpe Road and suggestions that a shuttle service could be considered to relocate the parking

Social Impacts

- Noise concerns related to vehicle volumes and discussion regarding noise barriers

Transit

- Consideration for bus pull-offs at mid-block transit stops
- Desire for an increase in transit service

Streetscaping and Illumination

- Relocation of hydro poles to a buried facility and additional illumination
- Concern that the recently installed hydro poles will require relocation if Burnhamthorpe Road is widened to 4-lanes
- Desire for improved landscaping and maintenance of existing trees

Active Transportation and Pedestrian/Cyclist Safety

- Request for sidewalks and multi-use path on both sides of the roadway that are accessible for wheelchairs
- Existing safety hazard for students crossing Burnhamthorpe Road via the Bangor Road sidewalk opening which can be misleading causing pedestrians to cross Burnhamthorpe Road without a pedestrian crossing
- Consideration for a dedicated pedestrian underpass at Bangor Road across to Dolson Court
- Desire for bicycle lanes
- Concerns regarding high bicycle speeds if dedicated facilities are provided

Ministry of Transportation

Two meetings were held with the Ministry of Transportation (MTO) as part of the study. The first meeting was held on January 19, 2018 in advance of Public Information Centre No. 1. The purpose of the meeting was to introduce the study and receive feedback from MTO on the proposed cross-section over Highway 403.

A second meeting with MTO was held during Phase 3 of the study.

Iglesia Ni Cristo

Two meetings were held with representatives of Iglesia Ni Cristo. The first meeting was held on April 4, 2018. The congregation currently utilizes the shoulders of Burnhamthorpe Road West within the study limits for overflow parking during services. The purpose of the meeting was to provide Iglesia Ni Cristo with an overview of the study and discuss the preferred solution as well as options regarding the parking, as the gravel shoulders along Burnhamthorpe would no longer be available if widened to 4-lanes with an urban cross-section.

A second meeting with Iglesia Ni Cristo was held during Phase 3 of the study.

Alternative Design Concepts

Five alternative design concepts were examined as part of this Class EA study for the preferred solution (Section 5):

Alternative Design Concept	Description
Alternative Design Concept #1	**'Do Nothing'** Burnhamthorpe Road West would remain a two-lane road between Loyalist Drive and Ninth Line. There would not be any improvement to active transportation elements or to local intersections. Level of Service would decrease over time resulting in a relative decrease in air quality due to increased congestion.
Alternative Design Concept #2	**Widen Burnhamthorpe Road West to 4 Lanes** Involves widening the roadway to increase capacity with additional travel lanes, to support future traffic demands and deficiencies identified in the long-range transportation policies. This solution also includes improvements to localized intersections. The alternative includes a multi-use trail on the north side of Burnhamthorpe Road within the study limits. An example of **Alternative Design Concept #2** at the Burnhamthorpe Road and Ridgeway Drive intersection is provided in Figure 1. An example of **Alternative Design Concept #2** 150 metres west of Loyalist Drive is provided in Figure 2.
Alternative Design Concept #3	**Widen Burnhamthorpe Road West to 4 Lanes with In-Boulevard Parking on the South Side** Involves widening the roadway to increase capacity with additional travel lanes, to support future traffic demands and deficiencies identified in the long-range transportation policies. This option also includes the provision of approximately 150 metres of in boulevard parking on the south of Burnhamthorpe Road west of Loyalist Drive and a multi-use trail on the north side of Burnhamthorpe Road within the study limits. An example of **Alternative Design Concept #3** 150 metres west of Loyalist Drive is provided in Figure 3.
Alternative Design Concept #4	**Widen Burnhamthorpe Road West to 4 Lanes with Intersection Improvements at Ridgeway Drive** Involves widening the roadway to increase capacity with additional travel lanes, to support future traffic demands and deficiencies identified in the long-range transportation policies. This option also includes double left turn lanes northbound at Ridgeway Drive to improve intersection operations and a multi-use trail on the north side of Burnhamthorpe Road within the study limits. An example of **Alternative Design Concept #4** at the Burnhamthorpe Road and Ridgeway Drive intersection is provided in Figure 4.

Alternative Design Concept #5	**Widen Burnhamthorpe Road West to 4 Lanes with a Roundabout at Ridgeway Drive** Involves widening the roadway to increase capacity with additional travel lanes, to support future traffic demands and deficiencies identified in the long-range transportation policies. This option also includes a roundabout at the intersection of Burnhamthorpe Road and Ridgeway Drive and a multi-use trail on the north side of Burnhamthorpe Road within the study limits. An example of **Alternative Design Concept #5** at the Burnhamthorpe Road and Ridgeway Drive intersection is provided in Figure 5.

Alternative Design Concept #1 - 'Do Nothing,' was included in the set of alternatives as a baseline measure of the effects of the other alternatives on the environment.

Assessment of Alternative Design Concepts

Each of the five alternative design concepts were assessed for effectiveness based on their advantages and disadvantages. The alternatives were evaluated to determine the recommended alternative design concept based on the following factors:

Evaluation Category	Evaluation Factor
Transportation and Transit	• Level of Service (LOS) • Traffic Safety • Compatibility with Existing Network and City Planning Policies
Natural Environment	• Terrestrial • Wildlife
Socio-Economic	• Land Use • Air Quality • Noise • Archaeology • Cultural/ Built Heritage • Accessibility
Climate Change	• Climate Change
Engineering	• Drainage • Utilities • Staging • Implementation • Property Impacts
Economic	• Cost

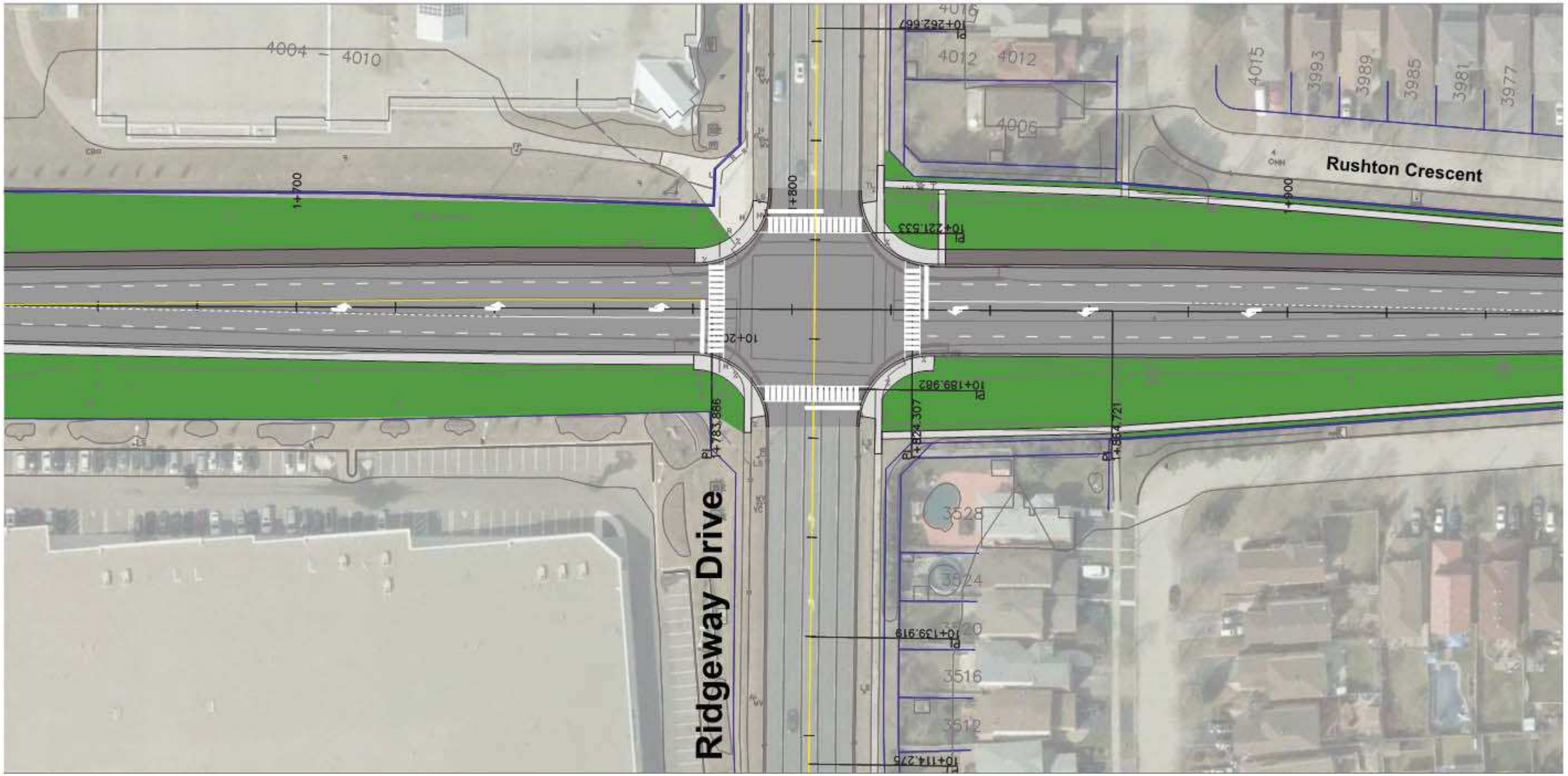


Figure 1: Alternative Design Concept #2 - Widen Burnhamthorpe Road West to 4 Lanes (No intersection Improvements at Ridgeway Drive)

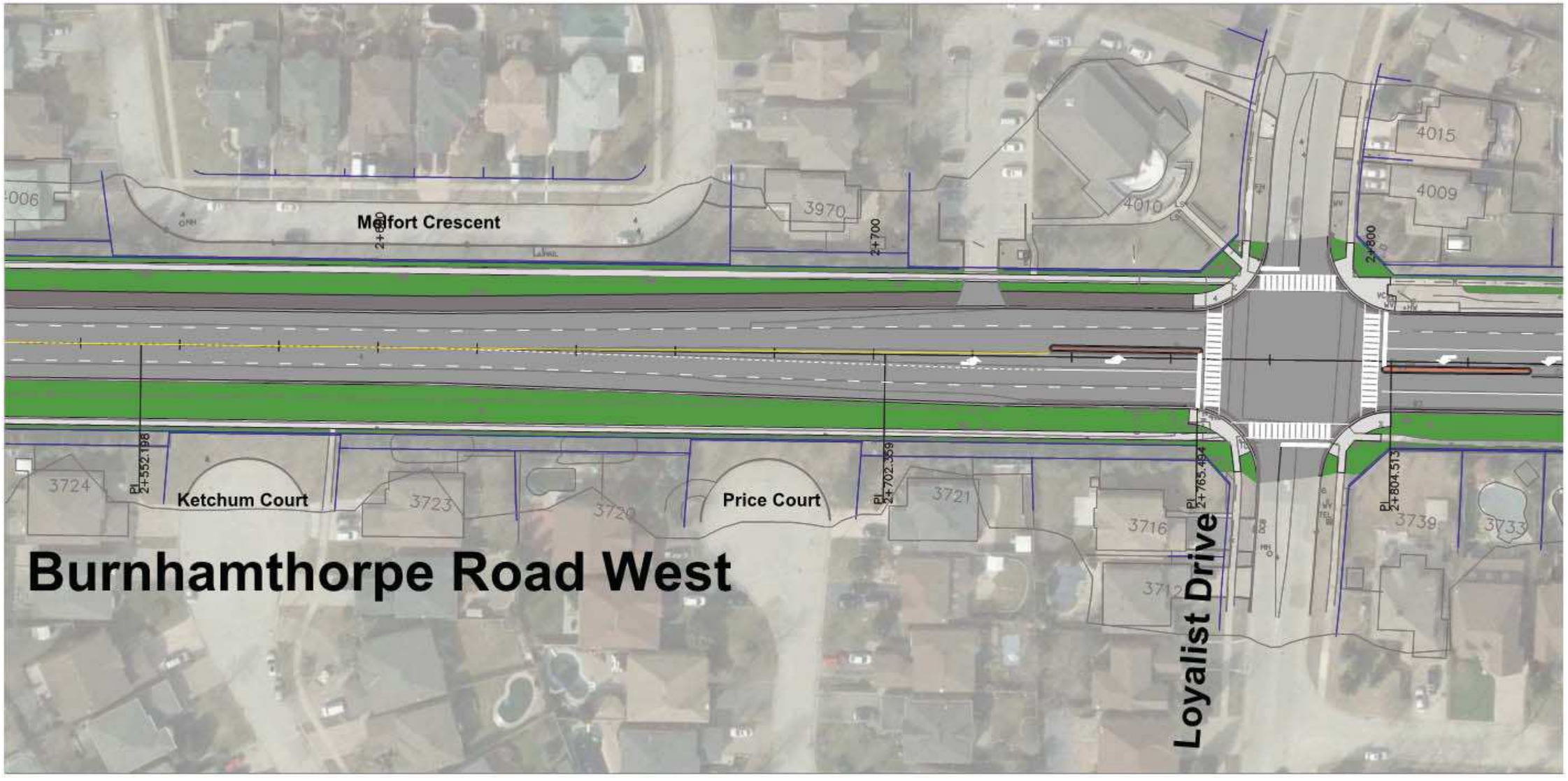


Figure 2: Alternative Design Concept #2 - Widen Burnhamthorpe Road West to 4 Lanes (No In-Boulevard Parking on the South Side)

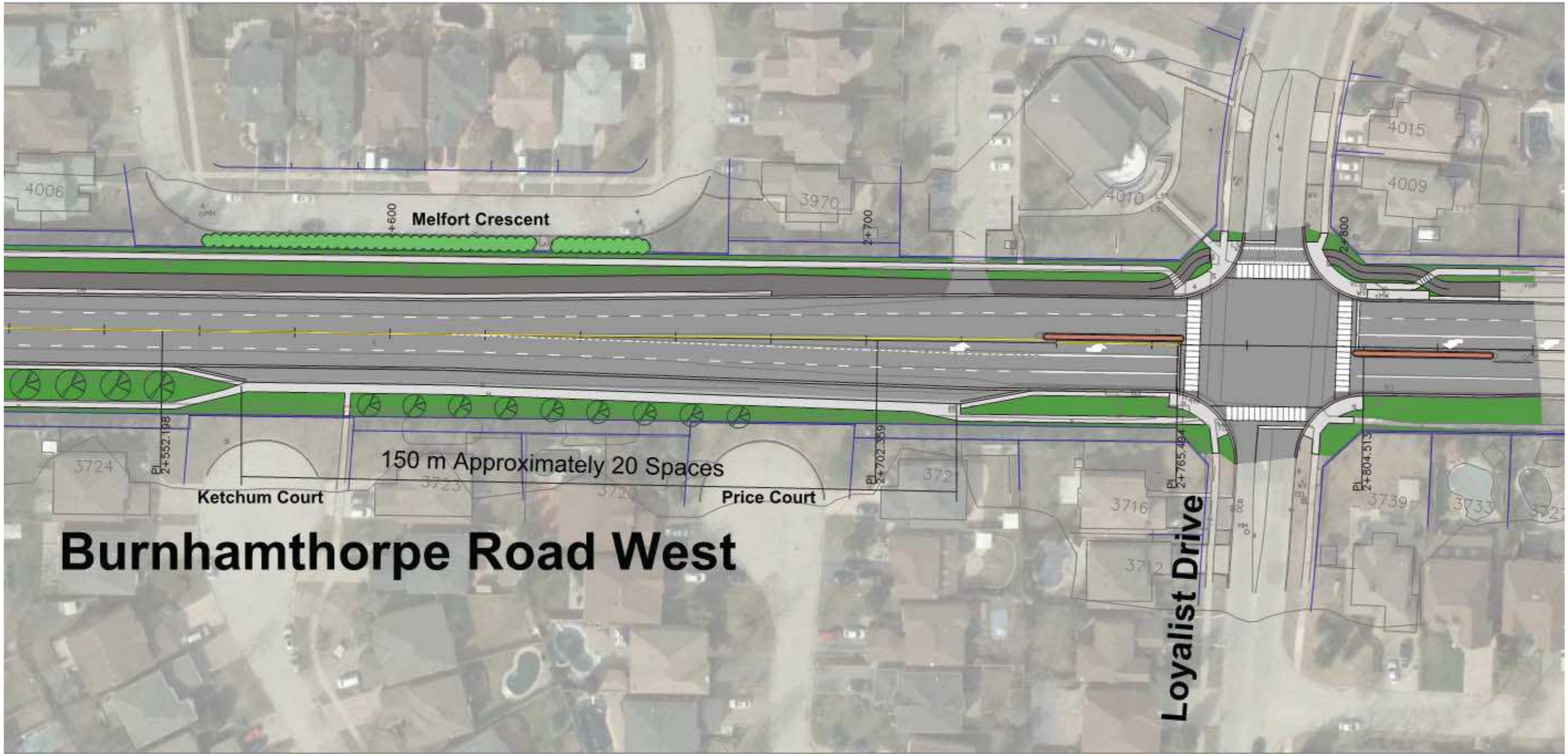


Figure 3: Alternative Design Concept #3 - Widen Burnhamthorpe Road West to 4 Lanes with In-Boulevard Parking on the South Side

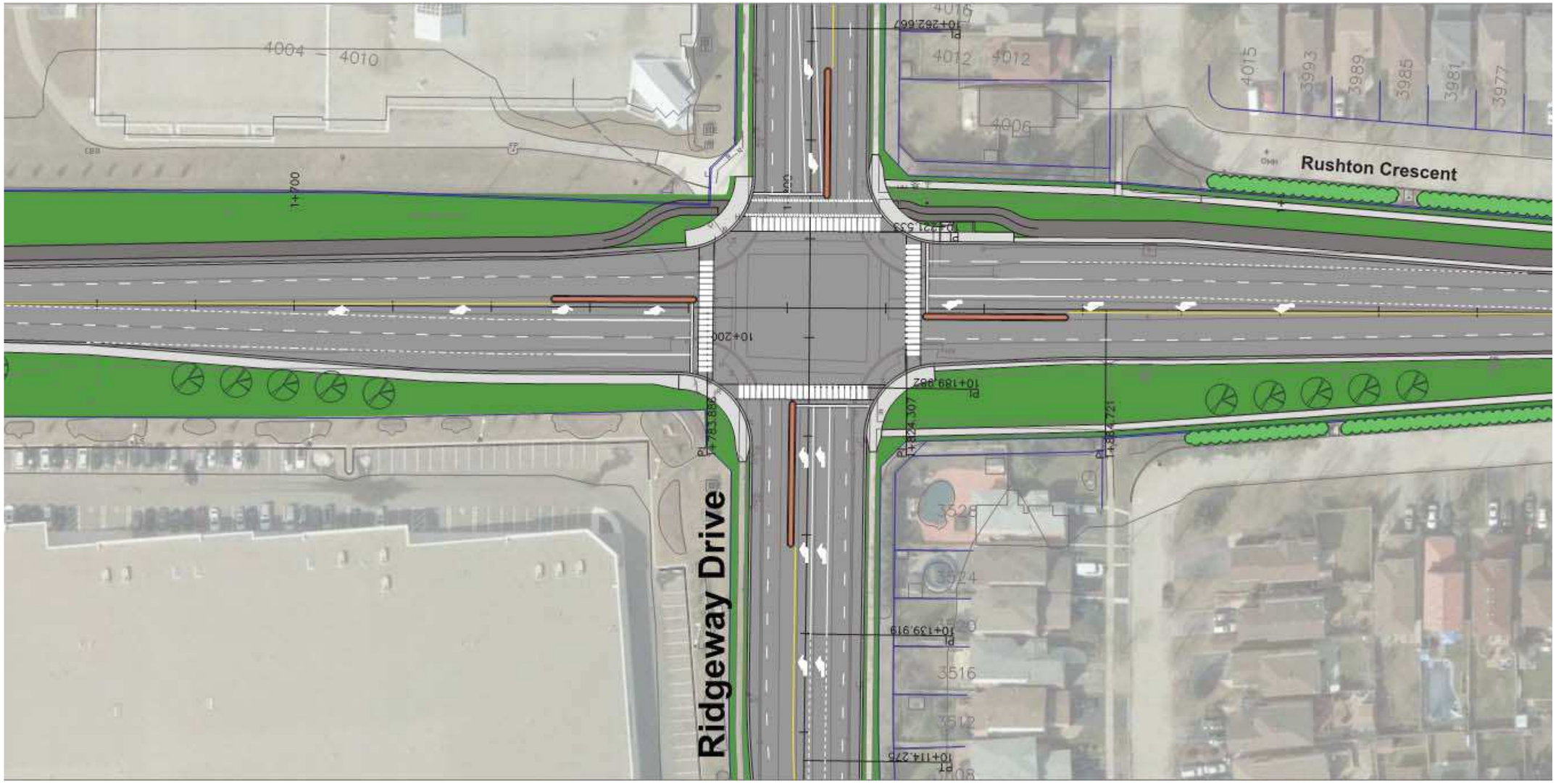


Figure 4: Alternative Design Concept #4 - Widen Burnhamthorpe Road West to 4 Lanes with Intersection Improvements at Ridgeway Drive

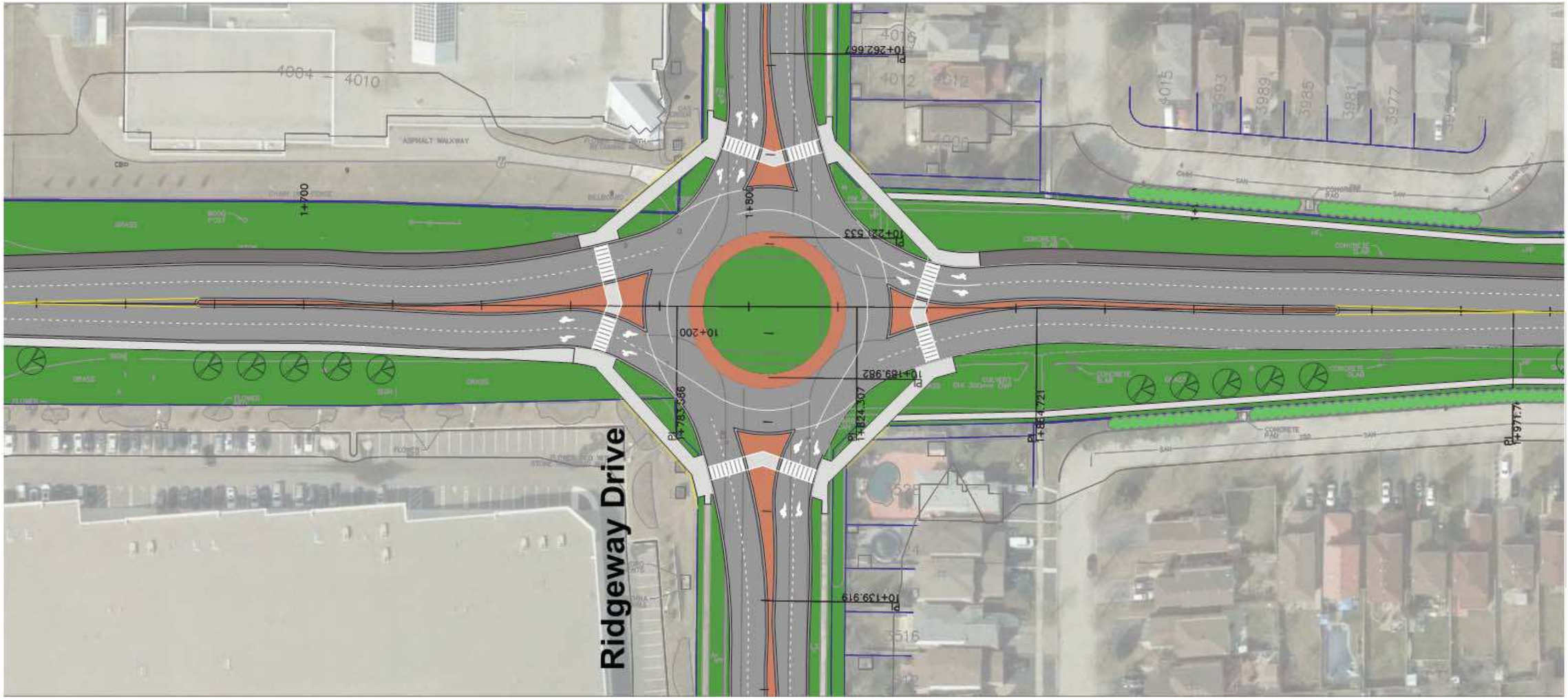


Figure 5: Alternative Design Concept #5 - Widen Burnhamthorpe Road West to 4 Lanes with a Roundabout at Ridgeway Drive

Alternative Design Concept #1 – 'Do Nothing', is was not selected as the recommended alternative design concept as the future traffic demand and safety deficiencies within the study area are not addressed.

Both **Alternative Design Concept #2 - Widen Burnhamthorpe Road West to 4 Lanes** and **Alternative Design Concept #3 - Widen Burnhamthorpe Road West to 4 Lanes with In-Boulevard Parking on the South Side**, address some of the operational and safety deficiencies within the study area however, during the PM peak, westbound queues at Burnhamthorpe Road & Ridgeway Drive may extend to the signal at Burnhamthorpe Road & Colonial Drive.

Alternative Design Concept #3 - Widen Burnhamthorpe Road West to 4 Lanes with In-Boulevard Parking on the South Side provides on-road parking to accommodate vehicles that currently park on the shoulder of Burnhamthorpe Road. The on-road parking has been carried forward to the preferred design concept (to be revisited during detailed design).

Alternative Design Concept #5- Widen Burnhamthorpe Road West to 4 Lanes with a Roundabout at Ridgeway Drive, addresses the future traffic demand and safety deficiencies within the study area, including the queuing at the intersection of Ridgeway Drive and Burnhamthorpe Road. The implementation of a roundabout would have impacts to properties on all four corners of the intersection and has the highest cost compared to other alternative design concepts. Pedestrians would also be required to cross two lanes of traffic and a PXO is required on all legs of the roundabout.

Alternative Design Concept #4 - Widen Burnhamthorpe Road West to 4 Lanes with Intersection Improvements at Ridgeway Drive, addresses future traffic demand and safety deficiencies within the study area, including the queuing at the intersection of Ridgeway Drive and Burnhamthorpe Road. There are no impacts to private property or green space associated with this design concept. Therefore, Alternative Design Concept #4 was identified as the preferred alternative.

Based on the evaluation of alternative design concepts and feedback received from the public and stakeholders, Widen Burnhamthorpe Road West to 4 Lanes with Intersection Improvements at Ridgeway Drive was selected as the preliminary preferred alternative design.

Elements of the Preferred Alternative include:

- Widening to 4-thorough lanes within the existing right-of-way
- Sidewalks on both sides of the road
- A multi-use trail on the north side
- Approximately 150 metres of in-boulevard parking on the south of Burnhamthorpe Road west of Loyalist Drive (to be revisited at detailed design)
- No significant structural impacts to the Highway 403 Bridge (discussed further in the ESR Section 6.2)
- No impacts to street trees adjacent to the roadway
- Intersection design compliance with Accessibility for Ontarians with Disabilities Act (AODA)
- Improvements at local intersections without impacting property
- Intersection improvements at Ridgeway Drive & Burnhamthorpe Road
- Enhanced landscaping features

Phase 3 Consultation

The public was engaged at a second PIC in Phase 3 of the study where the technically preferred alternative design concept was presented for public review and comments. Additional meetings with stakeholders and agencies were held to receive feedback on the technically preferred

alternative design concept. The consultation activities undertaken during Phase 3 of the Class EA are discussed below

Notice of Public Information Centre No.2

The Notice of Public Information Centre No. 2 was prepared to inform the public and agencies of the opportunity to review and provide comments on the alternative design concepts and the preliminary preferred design. The Notice was advertised in the Mississauga News on June 7 and 14, 2018. The Notice was emailed or mailed to 19 agency representatives and 1,332 property owners and interested members of the public on June 6, 2018. A covering letter was provided with the Notice to agencies.

The Notice of Public Information Centre No. 2 outlined the purpose of the meeting and identified the time, date, and location for the PIC. The Notice invited public comments on the study by either attending the PIC or contacting the project team.

Public Information Centre No. 2

The PIC was held on June 19, 2018 from 6:00 PM to 8:00 PM at the South Common Community Centre Arbour Green Room (AODA accessible) at 2233 South Millway in the City of Mississauga. The PIC was held in an open-house format where the public was invited to review display boards, ask questions, and discuss comments with the project team. The display boards described the following:

- Welcome and Introduction
- Purpose of Public Information Centre No. 2
- Study Context and Overview
- Municipal Class EA Process and Study Schedule
- Summary of Public Information Centre No. 1
- Existing Conditions
    - Land Use, Natural Heritage and Tree Inventory
    - Cultural Heritage
    - Transportation
- Future Conditions Without Improvements
- Recommended Planning Solution
- Future Conditions
    - Noise
    - Air Quality
    - Stormwater Management
- Alternative Design Concepts
    - Typical Cross-Section
    - Typical Cross-Section with In Boulevard Parking
- Evaluation Criteria
- Analysis and Evaluation of Alternative Design Concepts
- Preliminary Preferred Alternative Design
- Ridgeway Drive and Burnhamthorpe Road Intersection
- Typical Cross-Section Over Highway 403
- Enhanced Landscaping Features
- Next Steps

A sign-in sheet and comment sheets were provided to record attendance and obtain written comments. Twenty (20) people signed into the PIC and ten (10) comments were received through comment sheets and emails. A copy of the PIC display boards was also available on City's website.

The following general comments were submitted and noted by the project team during the PIC:

- Desire for improved signal timing along the corridor.
- Support for a buffer between the multi-use path and travel lanes.
- Concern regarding vehicles stopping on the road in non-designated areas near Loyola High School to drop students off.
- Support for not carrying forward the roundabout at Ridgeway Drive.
- Support for intersection improvements at Ridgeway Drive.
- Concerns regarding noise levels and preference for natural solutions (i.e. landscaping) rather than noise walls.
- Desire for noise attenuation.
- Request for a truck prohibition within the study limits.
- Request for a pedestrian crossing at the Dolson Court opening and traffic calming.
- Support for additional landscaping.
- Desire for a 50 km/h speed limit because of the proximity to the school.
- Support for the in-boulevard parking on Burnhamthorpe Road.
- Request for the in-boulevard parking to be provided on the north side.
- Opposition to the widening of Burnhamthorpe Road.
- Opposition to the in-boulevard parking on Burnhamthorpe Road.

Ministry of Transportation

A second meeting with the Ministry of Transportation (MTO) was held on June 12, 2018. The purpose of the meeting was to discuss the proposed Highway 403 structure cross-section and receive MTO's feedback.

Following ongoing correspondence and coordination with the MTO project team, a meeting with MTO Senior Management was held on June 24, 2019 to receive final sign-off on the recommended cross-section for the Highway 403 structure. At the meeting, the MTO approved a revised cross-section. A complete structural review of the recommended structure cross-section will be completed during detailed design in coordination with MTO.

Iglesia Ni Cristo

A second meeting with representatives of Iglesia Ni Cristo was held on June 8, 2018 to provide an overview of the preliminary recommended plan to be presented at PIC No. 2. The recommended plan included in-boulevard parking on the south side of Burnhamthorpe Road west of Loyalist Drive.

Halton Region

A meeting with Halton Region was held on June 13, 2018 to provide an overview of the preliminary recommended alternative and discuss the approved roundabout at Ninth Line (Halton Region project).

Description of the Recommended Plan

Typical Cross-Section

The typical cross-section for the recommended plan is illustrated below. The cross-section was developed based on a 70 km/h design speed. The features provided in the typical cross-section include the following:

- 35 metre right-of-way
- Four 3.5 metre lanes (2 lanes in each direction)
- 1.5 metre sidewalks on both sides
- 3.5 metre multi-use trail on the north side
- 1.0 metre splash pad on the north side

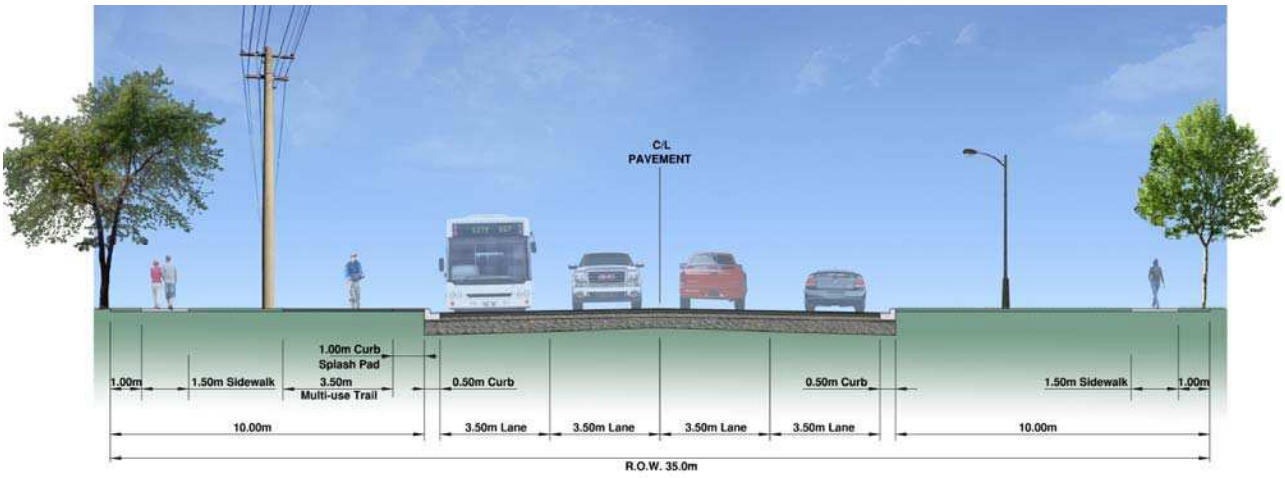


Figure 6: Typical Cross-Section

In areas where right-of-way is constrained (i.e. intersections), the cross-section has been modified in order to avoid impacts to private property.

West of Loyalist Drive, 150 metres of in-boulevard parking is proposed on the south side of Burnhamthorpe Road. The typical cross-section for the 150 metre section west of Loyalist Drive is illustrated below. This section includes the features in the typical cross-section with the addition of approximately 20 in-boulevard parking spaces, 2.6 metres wide. The need for in-boulevard parking with be reviewed during detailed design.

The concept plan for the recommended design concept is provided at the end of this Executive Summary.

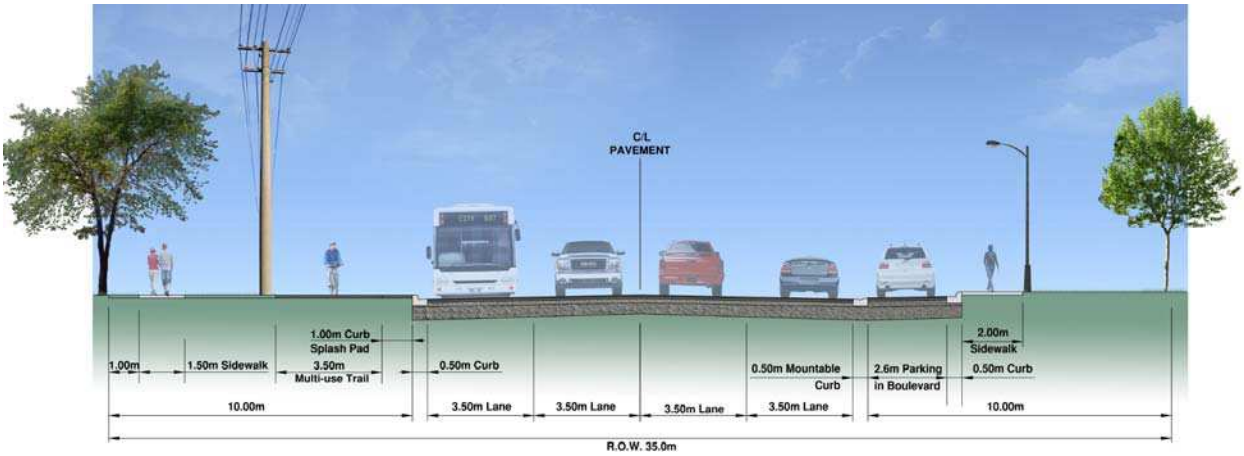


Figure 7: Typical Cross Section - In-Boulevard Parking on the South Side

Intersections

A summary of the recommended improvements for each intersection are illustrated below.

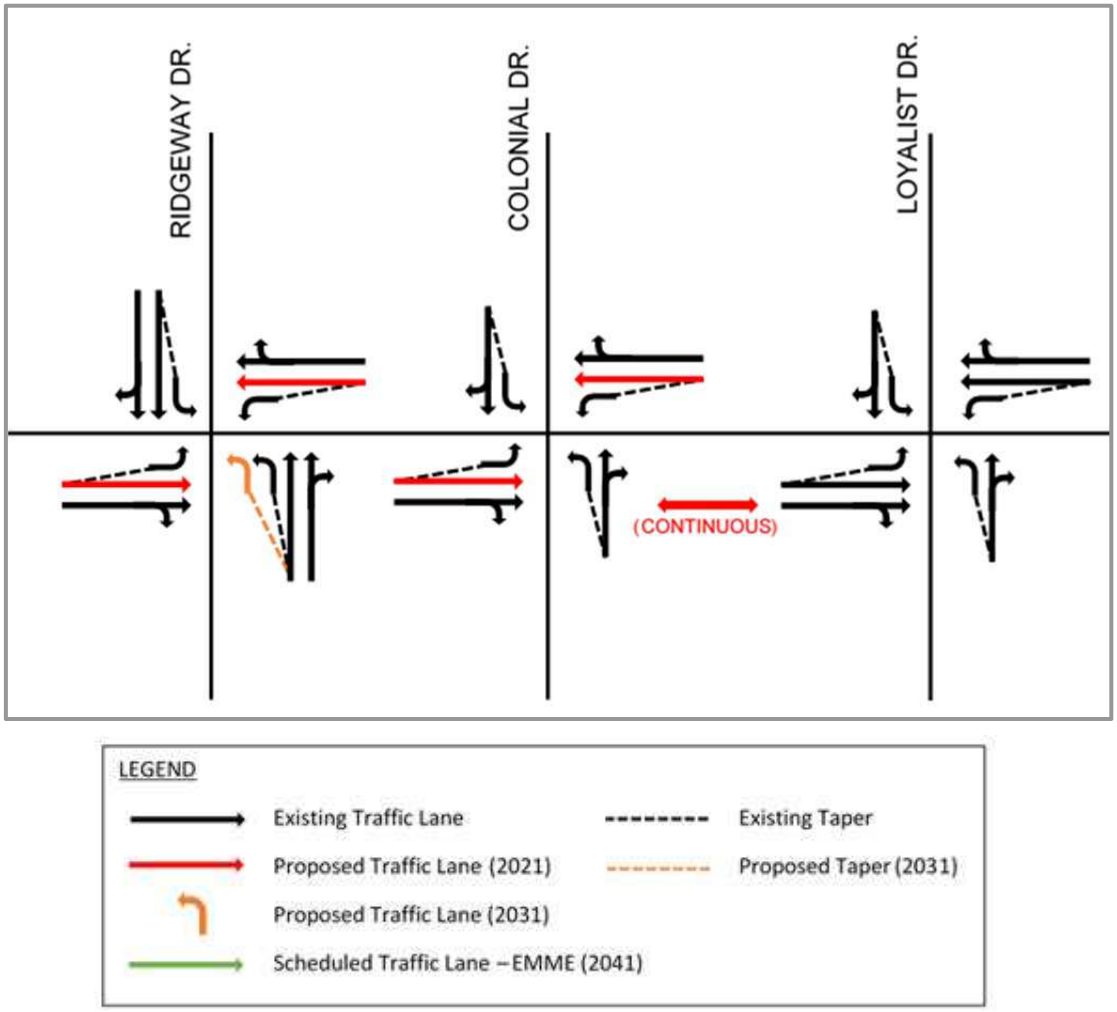


Figure 8: Recommended Intersection Improvements

The recommended plan includes the following elements at the Burnhamthorpe Road/Ridgeway Drive intersection:

- Additional northbound left-turn lane
- Additional eastbound through lane
- Exclusive westbound right-turn lane
- Additional westbound through lane

The recommended plan includes the following elements at the Burnhamthorpe Road/Colonial Drive intersection:

- Additional eastbound through lane
- Additional westbound through lane

Highway 403 Crossing

In consultation with MTO the recommended cross-section for the structure over Highway 403 was confirmed to include the following:

- A 0.3 m limited widening of the structure (in conjunction with the parapet wall replacement)
- A new parapet wall on the north side with a bicycle height railing
- A new 3.17 raised multi-use trail on the north side
- 0.5 m painted buffer on the north side
- Four 3.5 m travel lanes
- 1.6 m raised sidewalk on the south side
- 0.7 m shoulder on the south side

The recommended cross-section for the Highway 403 structure is illustrated below.

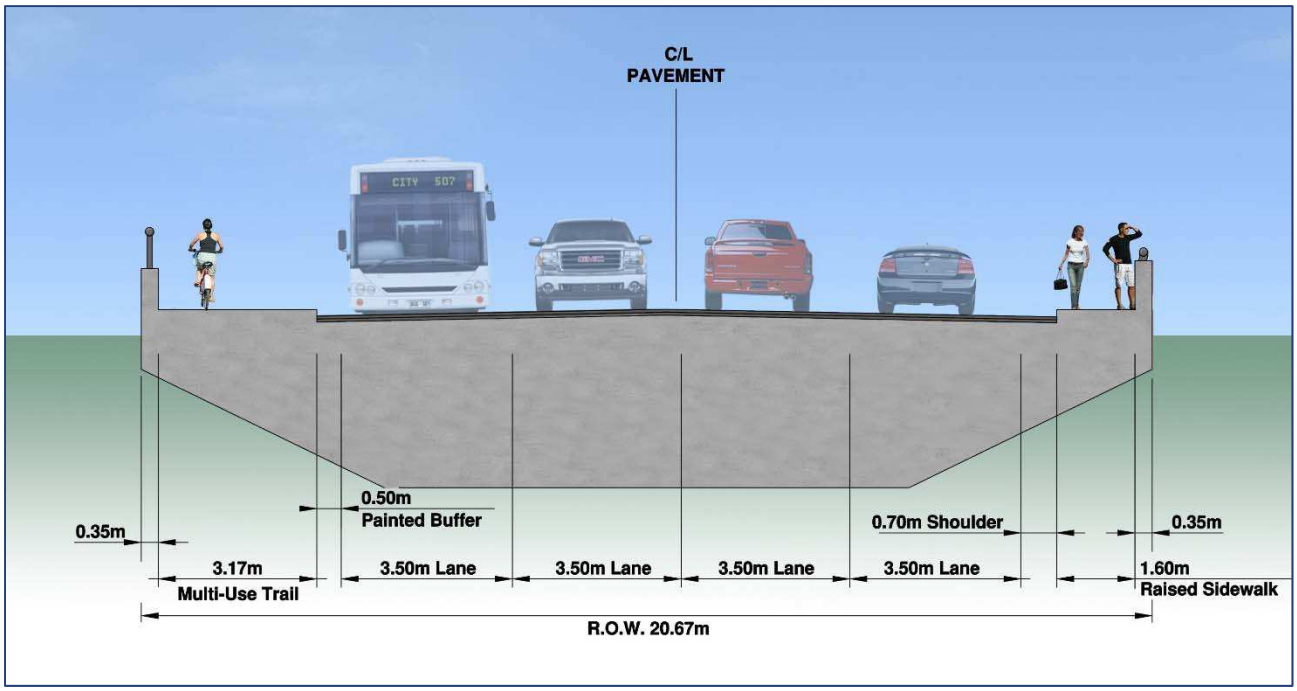


Figure 9: Typical Cross-Section - Highway 403 Structure

All of the elements provided in the recommended cross-section meet or surpass the minimum requirements outlined in the MTO Bikeway Design Manual and Canadian Highway Bridge Design

Code. In order to meet the desired widths, full reconstruction of the Highway 403 structure would be required at a significant cost. A 0.3 metre limited widening of the structure will be undertaken in conjunction with the parapet wall replacement on the north side in order to provide adequate width for the multi-use trail. MTO confirmed that the 0.7 metre shoulder on the south side and 0.5 metre painted buffer on the north side are acceptable given that this is a constrained corridor. The travel lane widths are consistent with the recommended typical cross-section for Burnhamthorpe Road to the east.

As part of a separate Halton Region project, a roundabout is planned for the intersection of Burnhamthorpe Road (future William Halton Parkway) and Ninth Line (. The roundabout plans were received from Halton Region and reviewed as part of the study. The future curb lines of the roundabout align with the proposed curb lines of the recommended plan.

Structural Review

A structural review of the recommended cross-section was completed by Doug Dixon and Associates (DDA). A copy of the Structural Review Memo can be found in Appendix O of the ESR. The following provides a summary of DDA's assessment of the impacts associated with the recommended cross-section and the modifications to the Highway 403 bridge.

The additional loading associated with the recommended cross-section and the 0.3 metre widening is estimated to be 3.7% of the rehabilitated mass (18.6 kN/m total additional dead load) which is not anticipated to result in any issues related to serviceability or ultimate performance of the bridge. This percentage (3.7%) is well within general tolerance for estimating loads and is adequately provided for in the load factors provided to the dead and live loads that would have been used in the 2012 evaluation at the time of the most recent rehabilitation to the structure. No impact to the structural integrity of the voided, post tensioned deck is anticipated.

The bridge bearings were also replaced during the 2012 rehabilitation when the bridge was converted to a semi-integral configuration. The new bearings are 600 mm x 500 mm x 80 mm elastomeric laminated. Using the calculated uniformly distributed load for the proposed multi-use trail of 18.6 kN/m, provides an additional reaction of approximately 200 kN to be carried by only the most northerly bearings. This is a conservative approximation of the increased reaction in the north bearing.

The Serviceability Limit State (SLS) capacity of this size of bridge is 1350 kN. Adding the additional 200 kN to the MRC calculated reactions (2012 rehabilitation) of 1145 kN provides a conservative upper limit estimate of the total dead load reaction equal to the SLS capacity of 1350 kN. Based on the structural review, no issues were found relating to the existing bearings ability to carry the dead load if the multi-use pathway is added.

To maintain a parapet wall that complies with the current Test Level (TL) and has been crash tested, the approach recommended is to remove the existing north parapet. The method of removing the existing parapet wall will be determined at the time of detailed design, however, saw cutting may be the most cost effective.

The 0.3 metre widening of the deck would be completed next, followed by the construction of the new raised multi-use trail.

To avoid transverse and longitudinal stressing tensions (over the pier) as well as tendon anchorages, ground penetrating radar or other similar testing methods would be used to identify possible conflict locations before the dowels are installed. As required, the location of the dowels can be adjusted nominally to avoid any interference.

A new parapet wall would be constructed on the sidewalk to meet the requirements of SS110-57. A metal railing on top of the parapet to meet the requirements for a bicycle height barrier would be installed. This could be the standard railing SS110-85.

The existing sign board must be mounted on the north parapet over the southbound lane of Highway 403 would need to be removed, salvaged, temporarily installed on ground mounted supports during construction and reinstated at the conclusion of the work.

Additional structural details and calculations are provided in the structural review memo (Appendix O of the ESR). A complete evaluation and assessment of the existing bridge will be completed during detailed design. This will include serviceability and ultimate limit states for shear and bending in the superstructure, a review of the capacity of the existing bearings in load as well as the transverse bending in the deck over the piers.

Geotechnical

A Preliminary Geotechnical Investigation was completed for the study area to explore the subsurface conditions within the project limits and based on the data obtained, to provide preliminary geotechnical recommendations for road widening, pavement design, and management options for soil that may be removed during construction.

Based on the results of the investigation, the preliminary recommendations for the pavement rehabilitation of Burnhamthorpe Road include full depth reclamation (pulverizing) of the existing asphalt with the underlying granular material, followed by grading and compacting the pulverized material, and placement of new Granular Base and Hot Mix Asphalt (HMA). Due to the thickness of the existing asphalt and limitations on the maximum depth of pulverization (400 mm), milling of the existing asphalt in advance of pulverization is recommended. After milling, the remaining pavement should be pulverized to a depth of 400 mm so that the blended material contains a maximum of 50 percent of asphalt coated aggregate, as permitted by OPSS.MUNI 330. The pulverized material should be graded and compacted (as required), prior to the placement of new granular base material. The recommended asphalt lift types and thicknesses shall consist of:

40 mm	HL1
50 mm	HDBC
50 mm	HDBC
200 mm	Granular ‘A’ Base

In all pavement widening areas (beyond existing shoulder rounding or curb and gutters), the surficial topsoil should be removed with the underlying subgrade graded as required. The preliminary recommended pavement structure for widening of Burnhamthorpe Road shall consist of:

40 mm	HL1
50 mm	HDBC
50 mm	HDBC
200 mm	Granular ‘A’ Base
400 mm	Granular ‘B’ Type I Subbase

Stormwater Management

The proposed widening of Burnhamthorpe Road West will include a grassed boulevard ranging in width from 4.5 m on one side of the road and 7.5 m on the other side of the road, a 3.0 m multi-use trail, 0.5 m curb and gutter, a four-lane urban roadway and a grassed ditch. Burnhamthorpe Road will be widened evenly on both sides, maintaining the existing road centreline. Curbs and storm sewers will be used for Burnhamthorpe Road for directing the surface runoff to appropriate outlets.

An opportunity exists to utilize LID methods to treat some of the surface runoff before collection by the storm sewer system. Grassed swales, bio-swales and tree planters will be investigated at detailed design. Based on a ROW of 35.0 m, the roadway cross-section will have an approximate proposed imperviousness of 61.4%, which is equivalent to a 0.7 runoff coefficient. This is an increase in impervious area of approximately 25.7% from existing conditions.

The minor system for the proposed conditions will be designed to convey the 1:10 year flow as per City of Mississauga's design standards. At the east and west limits, the existing storm sewer system will be utilized. The assessment confirms that the existing sewers on Burnhamthorpe Road were designed adequately for the 4 lane widening. In general, outlets for the proposed minor system will remain the same as the existing condition.

The proposed major drainage system will be provided by overland flow within Burnhamthorpe's road right-of-way. Generally, the drainage system will remain unchanged, and there are no major changes to the major system drainage patterns as part of the future improvements.

The existing storm sewers on Burnhamthorpe Road between Ridgeway Drive and Loyalist Drive have been adequately sized for the 10-year proposed design flows. The receiving trunk sewer on Ridgeway Drive is adequately sized for the proposed flows which discharges to the Laird Road facility. Therefore, no quantity control is proposed for the minor system at this location.

The increase in minor flows to the receiving trunk sewer on Bangor Road is representative of a 2% increase in flow capacity in the storm sewer which discharges to the Collegeway SWM facility. Therefore, no quantity control is proposed for the minor system at this location. Existing SWM strategies for water quantity control (2-year through 100-year) are already in place for the roadway at the Laird SWM and Collegeway SWM facilities. Therefore, no quantity controls are proposed.

Proposed source water quality controls are proposed to mitigate the increase in impervious area associated with the Burnhamthorpe Road West improvements between Ridgeway Drive and Loyalist Drive by utilizing Enhanced Grass Swales. This approach will provide a multi-component approach to water quality control as runoff from the roadway which discharges to the existing Collegeway SWM Facility. The proposed enhanced swale will also mitigate erosion/budget impacts associated with the roadway widening.

Landscaping

All trees within the study area are located behind the existing sidewalks along Burnhamthorpe Road West and will not be impacted as a result of the widening to four lanes. Where there is sufficient boulevard space, additional street tree plantings will be provided to enhance the screening effect while improving urban tree canopy cover and aesthetic appeal. Additional plantings are also proposed behind the fence of the window streets to improve privacy.

Noise

An Environmental Noise Assessment was conducted for the Burnhamthorpe Road West corridor to assess the future "build" and "no-build" sound levels from road traffic noise sources in the area. These predictions were used to assess potential impacts according to the applicable guidelines and specify mitigation measures, where required.

The results show that changes in sound levels resulting from the proposed project are expected to be no higher than approximately 1 to 2 dBA. No investigation of noise mitigation was undertaken because there were no changes in sound levels greater than the criteria set out in the Protocol.

Air Quality

An Air Quality assessment was conducted to assess the local air quality impacts due to the widening of Burnhamthorpe Road West for existing conditions (2017) and future build conditions

(2042). The study also included an assessment of total greenhouse emissions due to the project and an overview of construction impacts. The assessment concluded the following:

- The maximum combined concentrations for the future build scenario were all below their respective MOECC guidelines or CAAQS, with the exception of annual PM2.5, 24-hr PM10, 24-hr TSP and annual benzene. Note that for each of these contaminants, background concentrations alone exceeded the guideline.
- Frequency Analysis determined that there were no additional days on which exceedances of PM10 or TSP occurred between the 2017 Existing and 2041 Future Build scenarios. For both PM10 and TSP, exceedances of the guideline occurred less than 1% of the time.
- Overall, maximum predicted concentrations are similar between the 2017 Existing and 2041 Future Build scenarios, with little or no increase occurring as a result of the project.
- Mitigation measures are not warranted, due to the small number of days which are expected to exceed the guideline.
- Total GHG emissions were predicted to decrease in the study area. Overall, there was a 15% decrease in total GHG emissions predicted between the Existing and Future Build scenarios.

Utilities

Potential areas of conflict have been identified based on the preliminary utility information. The existing buried hydro that runs in conflict with the in-boulevard parking on the south side will require relocation. At the intersections of Burnhamthorpe Road & Ridgeway Drive and Burnhamthorpe Road & Colonial Drive, the existing signal poles will be removed and relocated to suit the intersection widening. Illumination poles in conflict on the south side will also be removed and relocated.

Illumination

The existing illumination in the study area is from luminaires mounted on the existing hydro poles on the north side of the right-of-way. Full illumination is proposed for the project and can be accommodated by providing complementary lighting on the south side of the right-of-way.

Property Requirements

Given that the City has secured a 35 metre right-of-way along the study corridor, the recommended plan can be implemented without additional property requirements.

Cost Estimate

The estimated capital cost associated with the proposed improvements including engineering, construction, and other project costs is approximately $12,000,000.

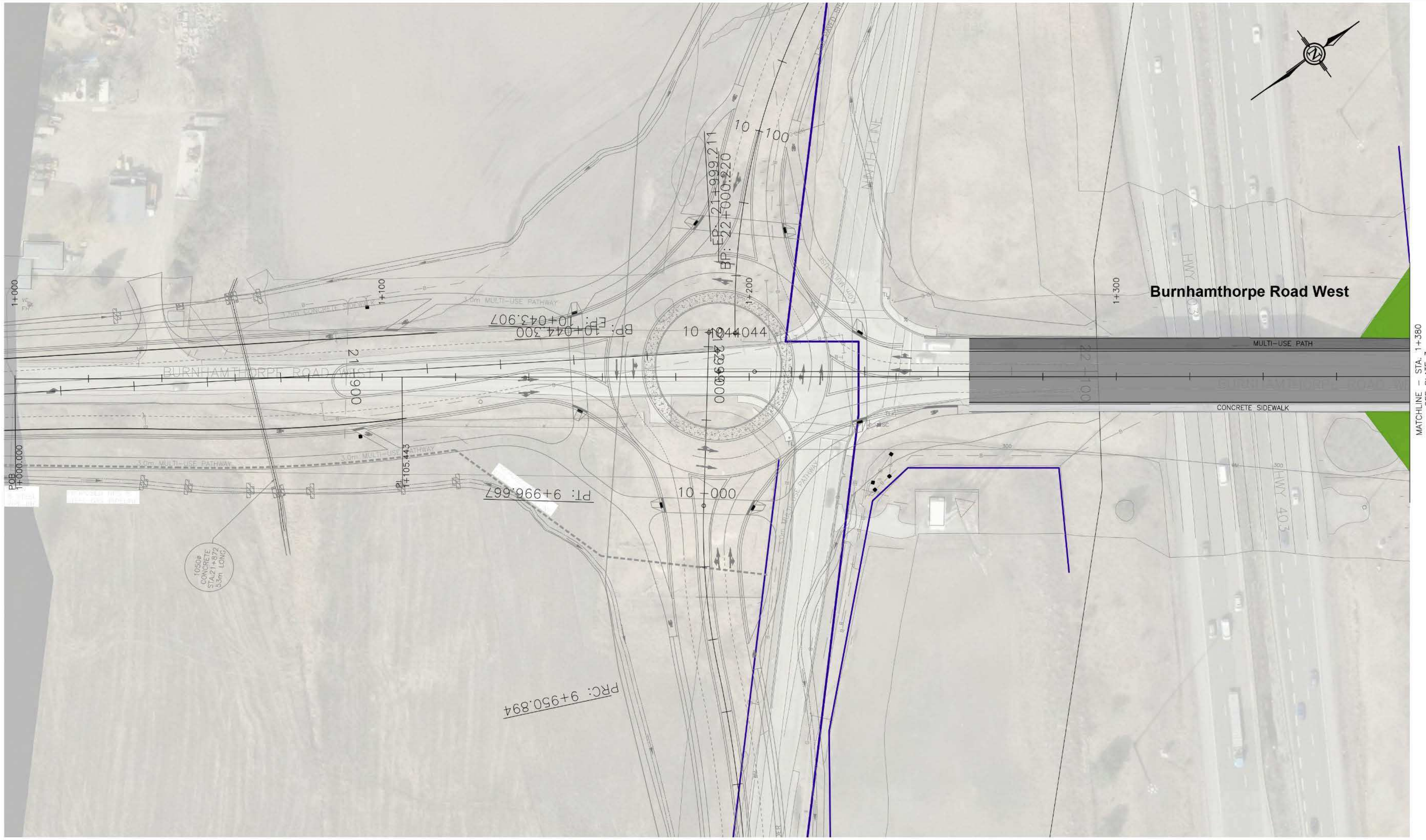
It should be noted that this cost estimate does not include property costs or the costs associated with the modifications to the Highway 403 bridge. A detailed cost estimate for the structure will be completed during detailed design following the structural review.

Mitigation and Commitments to Further Work

In consultation with agencies, the preliminary preferred design has mitigated negative impacts to the environment where possible. Where impacts cannot be entirely avoided, mitigation measures and commitments for detailed design and construction have been developed to minimize or avoid impacts. A detailed list of mitigations and commitments to further work is provided in Section 7 of the ESR.

In general, there are no significant issues that required mitigation measures. Mitigation measures have been proposed for the following aspects of the environment:

- Natural Environment
  - Designated Areas
  - Species at Risk
  - Permitting
- Archaeology
- Environmental Site Assessment
- Highway 403 Structure/ Ministry of Transportation
- Intersections
- Parking
- Noise and Vibration
- Air Quality
- Streetscape Plan and Tree Management
- Drainage and Stormwater Management
- Geotechnical
- Utilities & Municipal Services
- Construction Monitoring



CIMA+

T: 289-288-0287
400-3027 Harvester Rd, Burlington ON L7N 3G7 CANADA

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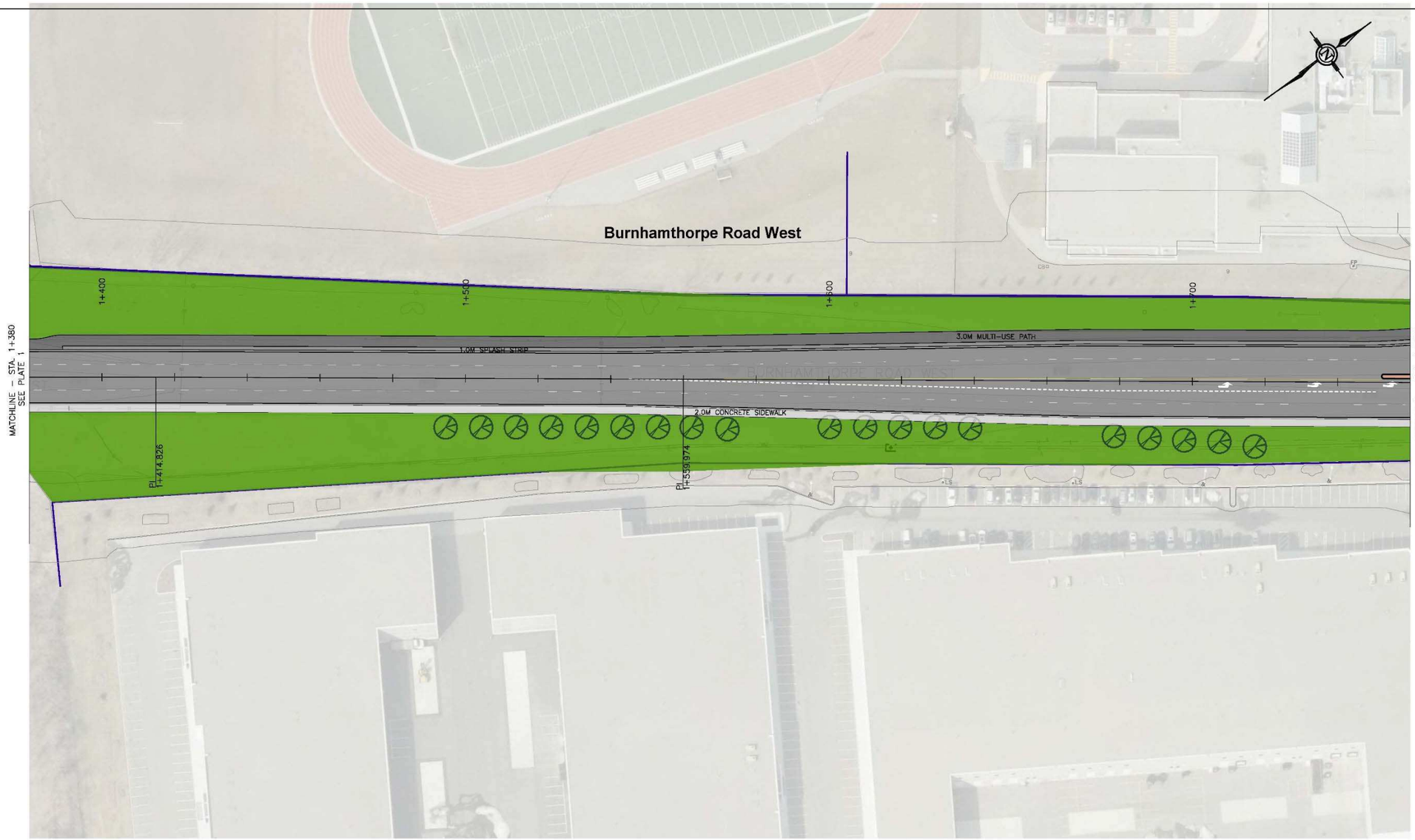
BURNHAMTHORPE RD. WEST IMPROVEMENT
FROM STA. 1+000 TO STA. 1+380

CITY OF MISSISSAUGA
BURHAMTHORPE ROAD WEST
CLASS ENVIRONMENTAL ASSESSMENT STUDY
BURNHAMTHORPE TO LOYALIST DRIVE

LEGEND

- EXISTING PROPERTY LINE
- FUTURE PROPERTY LINE
- PROPOSED PAVEMENT
- RAISED MEDIAN
- 3.0M MULTI–USE PATH
- CURB/GUTTER
- CONCRETE SIDEWALK
- SOD
- 1.0M SPLASH STRIP

PLATE
1



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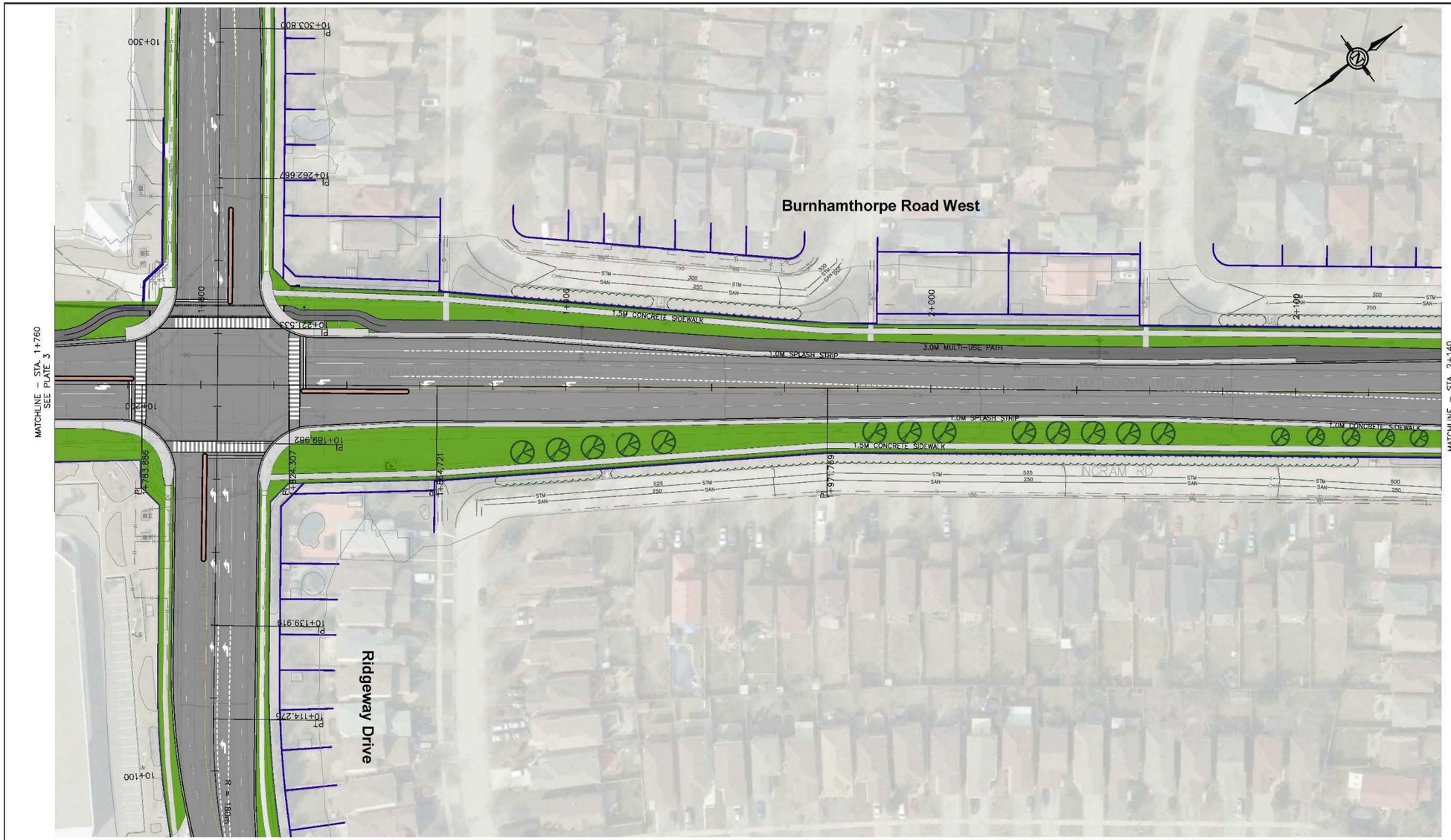
BURNHAMTHORPE RD. WEST IMPROVEMENT
FROM STA. 1+380 TO STA. 1+760

CITY OF MISSISSAUGA
BURHAMTHORPE ROAD WEST
CLASS ENVIRONMENTAL ASSESSMENT STUDY
BURNHAMTHORPE TO LOYALIST DRIVE

LEGEND

- EXISTING PROPERTY LINE
- FUTURE PROPERTY LINE
- PROPOSED PAVEMENT
- RAISED MEDIAN
- 3.0M MULTI-USE PATH
- CURB/GUTTER
- CONCRETE SIDEWALK
- SOD
- 1.0M SPLASH STRIP

PLATE
3



CIMA+
T: 289-288-0287
400-3027 Harvester Rd, Burlington ON L7N 3G7 CANADA

SCALE
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BURNHAMTHORPE RD. WEST IMPROVEMENT
FROM STA. 1+760 TO STA. 2+140

CITY OF MISSISSAUGA
BURHAMTHORPE ROAD WEST
CLASS ENVIRONMENTAL ASSESSMENT STUDY
BURNHAMTHORPE TO LOYALIST DRIVE

LEGEND

- EXISTING PROPERTY LINE
- FUTURE PROPERTY LINE
- PROPOSED PAVEMENT
- RAISED MEDIAN
- 3.0M MULTI–USE PATH
- CURB/GUTTER
- CONCRETE SIDEWALK
- SOD
- 1.0M SPLASH STRIP

PLATE
5

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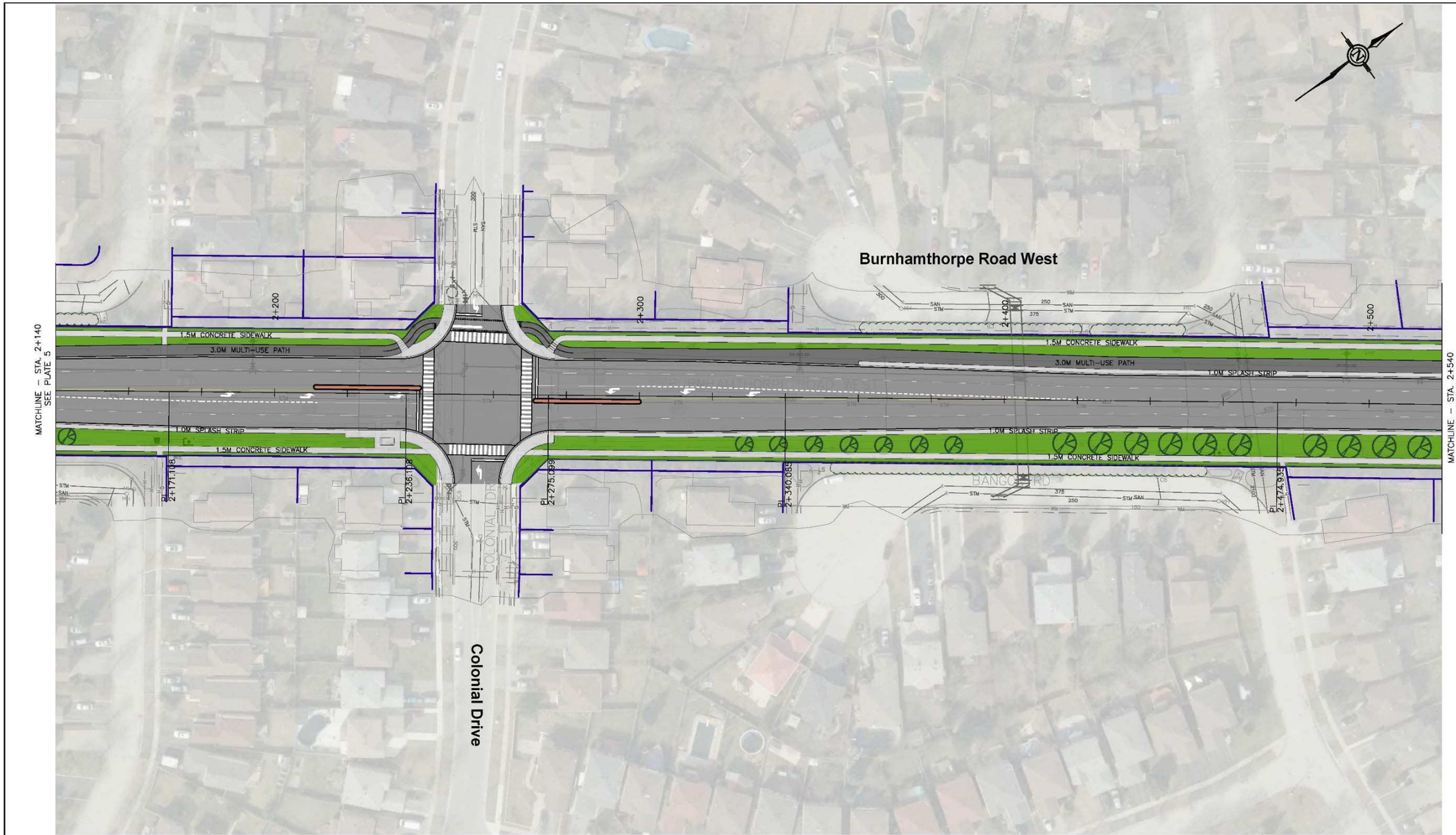

CIMA+
T: 289-268-0287
400-3027 Harvester Rd, Burlington ON L7N 3G7 CANADA

SCALE
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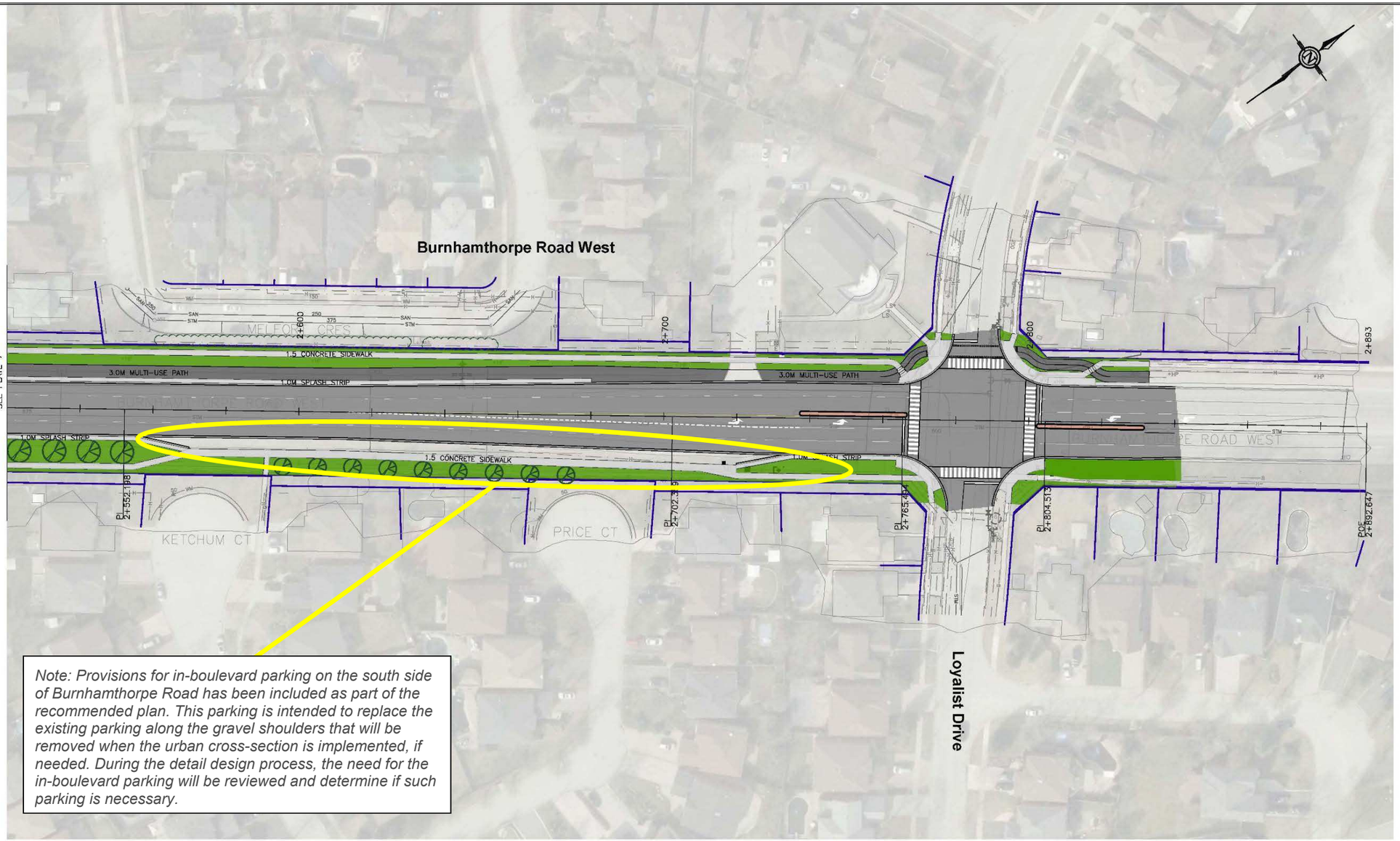
BURNHAMTHORPE RD. WEST IMPROVEMENT
FROM STA. 2+140 TO STA. 2+540

CITY OF MISSISSAUGA
BURHAMTHORPE ROAD WEST
CLASS ENVIRONMENTAL ASSESSMENT STUDY
BURNHAMTHORPE TO LOYALIST DRIVE

LEGEND

- EXISTING PROPERTY LINE
- FUTURE PROPERTY LINE
- PROPOSED PAVEMENT
- RAISED MEDIAN
- 3.0M MULTI-USE PATH
- CURB/GUTTER
- CONCRETE SIDEWALK
- SOD
- 1.0M SPLASH STRIP

PLATE
7



CIMA+
T: 289-288-0287
400-3027 Harvester Rd, Burlington ON L7N 3G7 CANADA

SCALE
1:1000
0 10 20 40

BURNHAMTHORPE RD. WEST IMPROVEMENT
FROM STA. 2+540 TO STA. 2+892

CITY OF MISSISSAUGA
BURHAMTHORPE ROAD WEST
CLASS ENVIRONMENTAL ASSESSMENT STUDY
BURNHAMTHORPE TO LOYALIST DRIVE

LEGEND

- EXISTING PROPERTY LINE
- FUTURE PROPERTY LINE
- PROPOSED PAVEMENT
- RAISED MEDIAN
- 3.0M MULTI-USE PATH
- CURB/GUTTER
- CONCRETE SIDEWALK
- SOD
- 1.0M SPLASH STRIP

PLATE
9

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/11

To: Chair and Members of General Committee

From: Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Originator's files:
MG.23.REP
RT.10.Z-27

Meeting date:
2019/12/04

Subject
Lower Driveway Boulevard Parking – Greybrook Crescent (Ward 3)

Recommendation
That a by-law be enacted to amend the Traffic By-law 555-00, as amended, to implement lower driveway boulevard parking between the curb and sidewalk, at any time on Greybrook Crescent, as outlined in the report from the Commissioner of Transportation and Works, dated November 11, 2019, entitled "Lower Driveway Boulevard Parking – Greybrook Crescent (Ward 3)".

Background
The Transportation and Works Department received a completed petition from an area resident with respect to the feasibility of implementing lower driveway boulevard parking on Greybrook Crescent. Lower Driveway Boulevard parking between the curb and sidewalk is currently prohibited on Greybrook Crescent. A location map is attached as Appendix 1.

Comments
To determine the level of support for lower driveway boulevard parking between the curb and sidewalk, a parking questionnaire was distributed to the residents of Greybrook Crescent.

A total of 66 questionnaires were delivered and 27 (41%) were returned; 24 (89%) supported the implementation of lower driveway boulevard parking and 3 (11%) were opposed. Since greater than 66% of the total respondents are in support, the Transportation and Works Department recommends implementing lower driveway boulevard parking between the curb and sidewalk, at any time on Greybrook Crescent.

The Ward Councillor supports the proposal for lower driveway boulevard parking. The existing on-street parking regulations will be maintained.

Financial Impact

Costs for the sign installation can be accommodated in the 2019 Operating Budget.

Conclusion

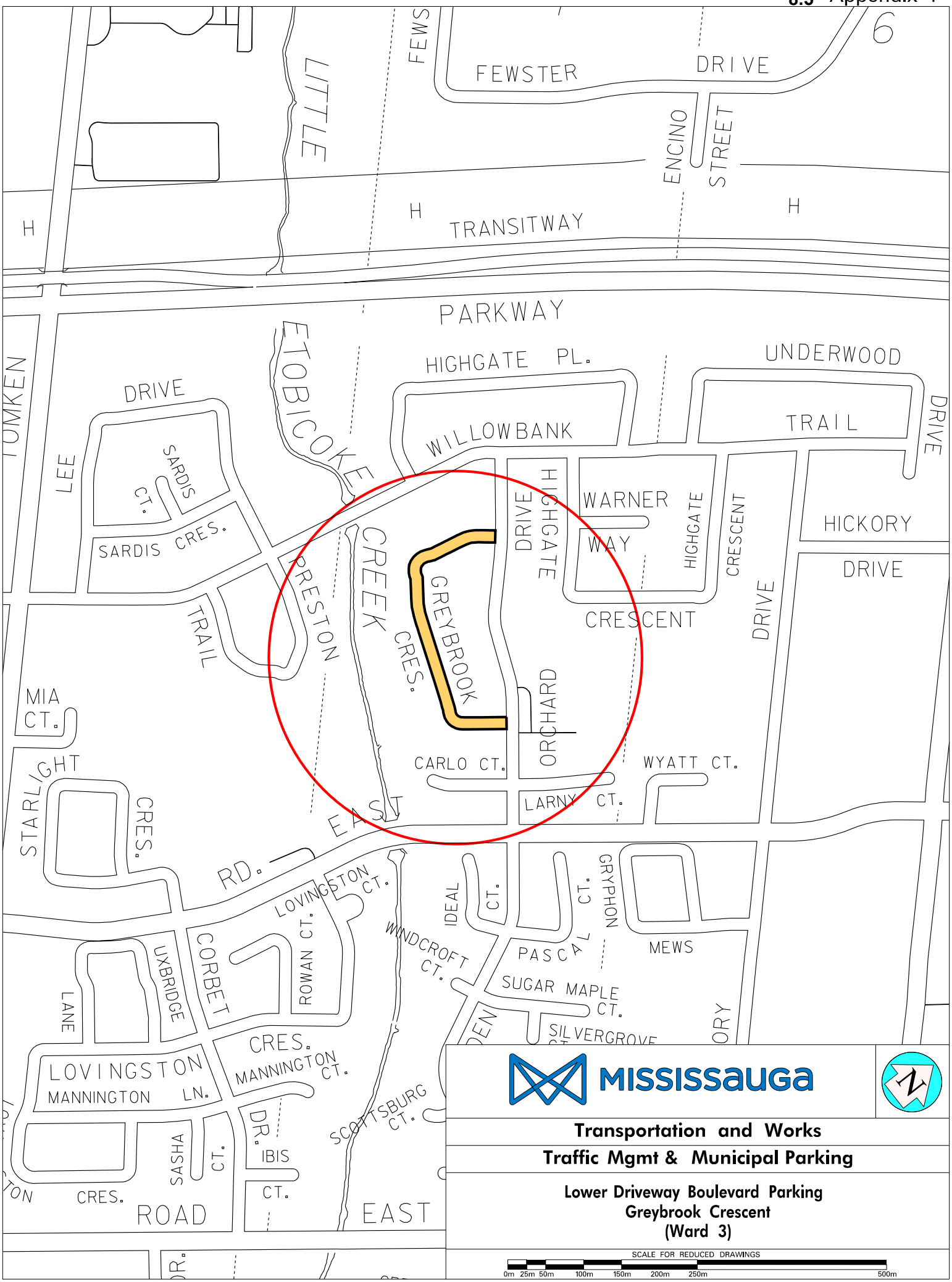
Based on the results of the questionnaire, the Transportation and Works Department supports lower driveway boulevard parking between the curb and sidewalk, on Greybrook Crescent.

Attachments

Appendix 1: Location Map - Lower Driveway Boulevard Parking – Greybrook Crescent.

Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Prepared by: Wasan Yonan, C.E.T., Traffic Technician



MISSISSAUGA

Transportation and Works

Traffic Mgmt & Municipal Parking

Lower Driveway Boulevard Parking
Greybrook Crescent
(Ward 3)

SCALE FOR REDUCED DRAWINGS

0m 25m 50m 100m 150m 200m 250m 500m

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/11

To: Chair and Members of General Committee

From: Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Originator's files: MG.23.REP RT.10.Z-56

Meeting date: 2019/12/04

Subject
Lower Driveway Boulevard Parking – Pintail Circle (Ward 10)

Recommendation
That a by-law be enacted to amend the Traffic By-law 555-00, as amended, to implement lower driveway boulevard parking between the curb and sidewalk on Pintail Circle, as outlined in the report from the Commissioner of Transportation and Works, dated November 11, 2019, entitled "Lower Driveway Boulevard Parking – Pintail Circle (Ward 10)".

Background
The Transportation and Works Department received a completed petition from an area resident with respect to the feasibility of implementing lower driveway boulevard parking on Pintail Circle. Lower Driveway Boulevard parking between the curb and sidewalk is currently prohibited on Pintail Circle. A location map is attached as Appendix 1.

Comments
To determine the level of support for lower driveway boulevard parking between the curb and sidewalk, a parking questionnaire was distributed to the residents of Pintail Circle.

A total of 55 questionnaires were delivered and 27 (49%) were returned; 27 (100%) supported the implementation of lower driveway boulevard parking and 0 (0%) were opposed. Since greater than 66% of the total respondents support lower driveway boulevard parking, the Transportation and Works Department recommends implementing lower driveway boulevard parking between the curb and sidewalk, at any time on Pintail Circle.

The Ward Councillor supports the proposal for lower driveway boulevard parking. The existing on-street parking regulations will be maintained.

Financial Impact
Costs for the sign installation can be accommodated in the 2019 Operating Budget.

Conclusion

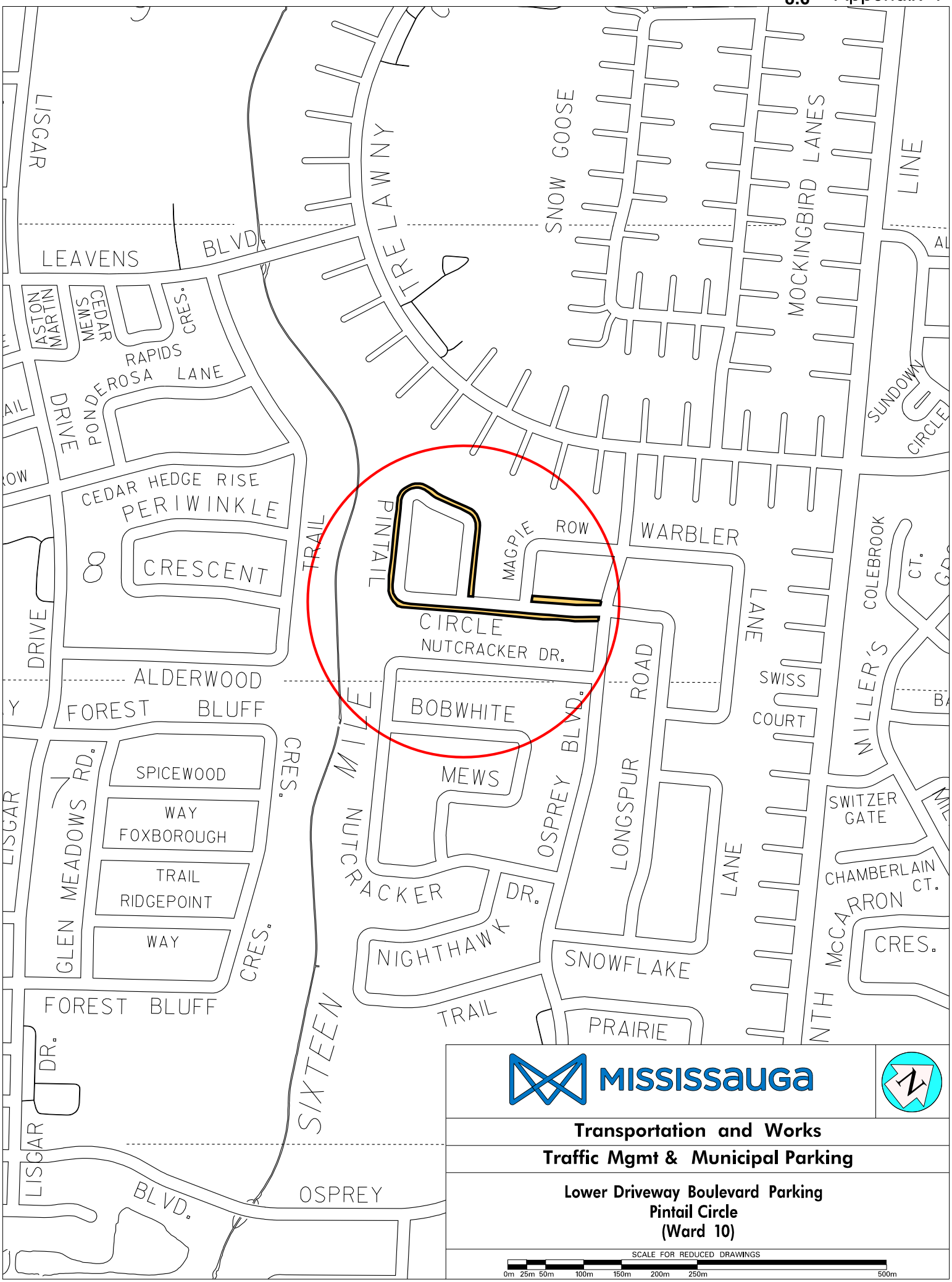
Based on the results of the questionnaire, the Transportation and Works Department supports lower driveway boulevard parking between the curb and sidewalk on Pintail Circle.

Attachments

Appendix 1: Lower Driveway Boulevard Parking – Pintail Circle.

Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Prepared by: Wasan Yonan, C.E.T., Traffic Technician



MISSISSAUGA

Transportation and Works

Traffic Mgmt & Municipal Parking

Lower Driveway Boulevard Parking
Pintail Circle
(Ward 10)

SCALE FOR REDUCED DRAWINGS

0m 25m 50m 100m 150m 200m 250m 500m

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/11

To: Chair and Members of General Committee

From: Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Originator's files:
MG.23.REP
RT.10.Z-57

Meeting date:
2019/12/04

Subject
Lower Driveway Boulevard Parking – Candlelight Drive (Ward 10)

Recommendation
That a by-law be enacted to amend the Traffic By-law 555-00, as amended, to implement lower driveway boulevard parking between the curb and sidewalk, at any time on Candlelight Drive, as outlined in the report from the Commissioner of Transportation and Works, dated November 11, 2019, entitled "Lower Driveway Boulevard Parking – Candlelight Drive (Ward 10)".

Background
The Transportation and Works Department received a completed petition from an area resident with respect to the feasibility of implementing lower driveway boulevard parking on Candlelight Drive. Lower Driveway Boulevard parking between the curb and sidewalk is currently prohibited on Candlelight Drive. A location map is attached as Appendix 1.

Comments
To determine the level of support for lower driveway boulevard parking between the curb and sidewalk, a parking questionnaire was distributed to the residents of Candlelight Drive.

A total of 58 questionnaires were delivered and 19 (33%) were returned; 16 (84%) supported the implementation of lower driveway boulevard parking and 3 (16%) were opposed. Since greater than 66% of the total respondents were in support, the Transportation and Works Department recommends implementing lower driveway boulevard parking between the curb and sidewalk, at any time on Candlelight Drive.

The Ward Councillor supports the proposal for lower driveway boulevard parking. The existing on-street parking regulations will be maintained.

Financial Impact

Costs for the sign installation can be accommodated in the 2019 Operating Budget.

Conclusion

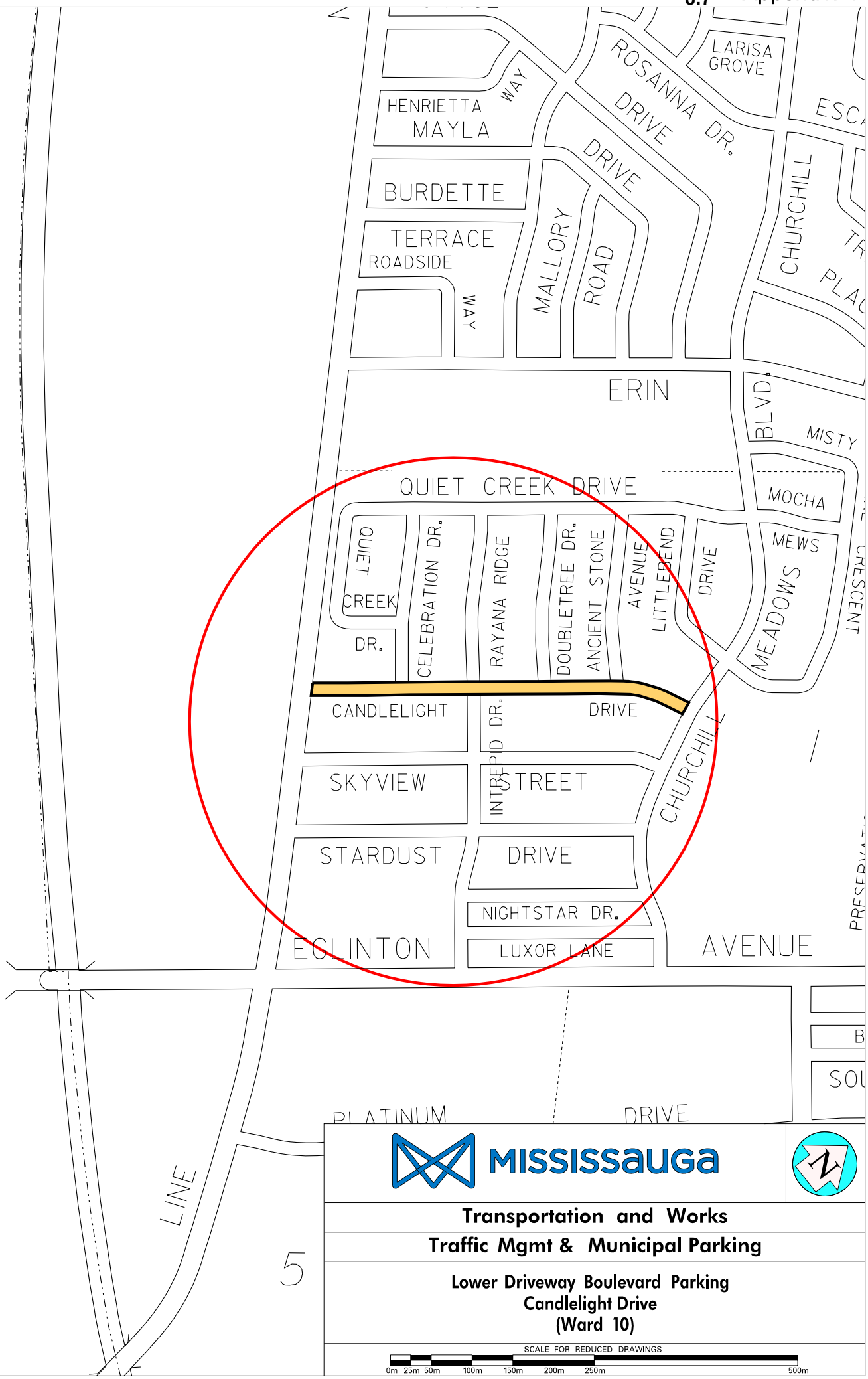
Based on the results of the questionnaire, the Transportation and Works Department supports lower driveway boulevard parking between the curb and sidewalk on Candlelight Drive.

Attachments

Appendix 1: Location Map - Lower Driveway Boulevard Parking – Candlelight Drive.

Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Prepared by: Wasan Yonan, C.E.T., Traffic Technician



MISSISSAUGA

Transportation and Works

Traffic Mgmt & Municipal Parking

Lower Driveway Boulevard Parking
Candlelight Drive
(Ward 10)

SCALE FOR REDUCED DRAWINGS

0m 25m 50m 100m 150m 200m 250m 500m

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/11

To: Chair and Members of General Committee

From: Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Originator's files:
MG.23.REP RT.10.Z-8

Meeting date:
2019/12/04

Subject
Parking Prohibition – Rosemere Road (Ward 1)

Recommendation
That a by-law be enacted to amend the Traffic By-law 555-2000, as amended, to implement a parking prohibition on the south side of Rosemere Road, between Stavebank Road and the east limit of the road, as outlined in the report from the Commissioner of Transportation and Works, dated November 11, 2019 entitled "Parking Prohibition – Rosemere Road (Ward 1)".

Background
The Transportation and Works Department received a completed petition from an area resident with respect to the feasibility of implementing a parking prohibition on the south side of Rosemere Road, between Stavebank Road and the east limit of the road.

Currently, parking is permitted for a maximum of five hours. The Transportation and Works Department has reviewed Rosemere Road with respect to the request and could support prohibiting parking anytime on the south side of Rosemere Road. A location map is attached as Appendix 1.

Comments
To determine the level of support for a parking prohibition on the south side of Rosemere Road, a parking questionnaire was distributed to the residents of Rosemere Road.

A total of 5 questionnaires were delivered and 1(20%) was returned; 1(100%) supported the implementation of a parking prohibition and 0 (0%) were opposed. Since greater than 66% of the total respondents support a parking prohibition, the Transportation and Works Department recommends implementing a parking prohibition on the south side of Rosemere Road. The Ward Councillor supports the proposal for the parking prohibition.

Financial Impact

Costs for the sign installations can be accommodated in the 2019 Operating Budget.

Conclusion

The Transportation and Works Department supports the implementation of a parking prohibition on south side of Rosemere Road, between Stavebank Road and the east limit of the road.

Attachments

Appendix 1: Location Map – Parking Prohibition – Rosemere Road (Ward 1)

Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Prepared by: Wasan Yonan, C.E.T., Traffic Operations Technician

MISSISSAUGA

Transportation and Works

Traffic Mgmt & Municipal Parking

Parking Prohibition Anytime
Rosemere Road
(Ward 1)

SCALE FOR REDUCED DRAWINGS

0m 25m 50m 100m 150m 200m 250m 500m

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/08

To: Chair and Members of General Committee

From: Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Originator's files: RT.10.Z-08

Meeting date: 2019/12/04

Subject
Wesley Avenue - All-way Stop Reviews (Ward 1)

Recommendation
That an all-way stop control not be implemented at the intersections of:

1. Wesley Avenue at Queen Street West,
2. Wesley Avenue at Park Street West, and
3. Wesley Avenue at High Street West,

as outlined in the report from the Commissioner of Transportation and Works, dated November 8, 2019 entitled "Wesley Avenue – All-way Stop Reviews (Ward 1)".

Background
Councillor Dasko has requested that Transportation and Works Department staff submit a report regarding the installation of an all-way stop at the intersections of Wesley Drive at Queen Street West, Park Street West, and High Street West.

Wesley Avenue is a two lane local roadway that runs parallel to Mississauga Road, accessing Lakeshore Road West, west of Mississauga Road. A location map is attached as Appendix 1.

This roadway has been the subject of numerous past reviews related to traffic volumes, operating speeds and overall levels of roadway safety identified by local residents as being an issue. Previous studies completed by staff have failed to substantiate the concerns expressed by residents.

In May 2019, staff arranged for a reassignment of lane designations on Mississauga Road to help alleviate the queues on the north approach to the intersection of Lakeshore Road West. A single left turn lane, an extended right turn only lane and a small through lane at the intersection

were implemented to reduce queues on Mississauga Road and incidences of traffic infiltrating the Wesley Avenue neighbourhood.

Comments

Recent manual turning movement counts were completed in March 2019 to determine the need for an all-way stop based on traffic volumes. The results of the review are as follows:

Wesley Avenue at Queen Street West

		Warrant Value
Warrant 1:	Volume for All Approaches	20%
Warrant 2:	Minor Street Volume	100%

Wesley Avenue at Park Street West

		Warrant Value
Warrant 1:	Volume for All Approaches	27%
Warrant 2:	Minor Street Volume	55%

Wesley Avenue at High Street West

		Warrant Value
Warrant 1:	Volume for All Approaches	38%
Warrant 2:	Minor Street Volume	85%

As per the criteria for all-way stops outlined in the City of Mississauga's Corporate Policy and Procedure – All-Way Stop Signs 10-05-04, in order for an all-way stop to be warranted, both parts "A" and "B" must equal 100%.

A review of the collision history at each intersection did not reveal any reported collisions within the past three years. For an all-way stop control to be warranted based on collision frequency, at least five (5) collisions must occur in a 12-month period, provided the collisions are of the type considered correctable by the use of an all-way stop (i.e. turning movement, angle collisions).

An all-way stop is therefore not warranted at any of the three locations based on the turning movement count results and collision history.

Councillor Dasko is aware of staff's recommendation.

Financial Impact

Should one or more intersections be approved for an all-way stop, costs for the sign and pavement marking installation can be accommodated in the 2019 operating budget.

Conclusion

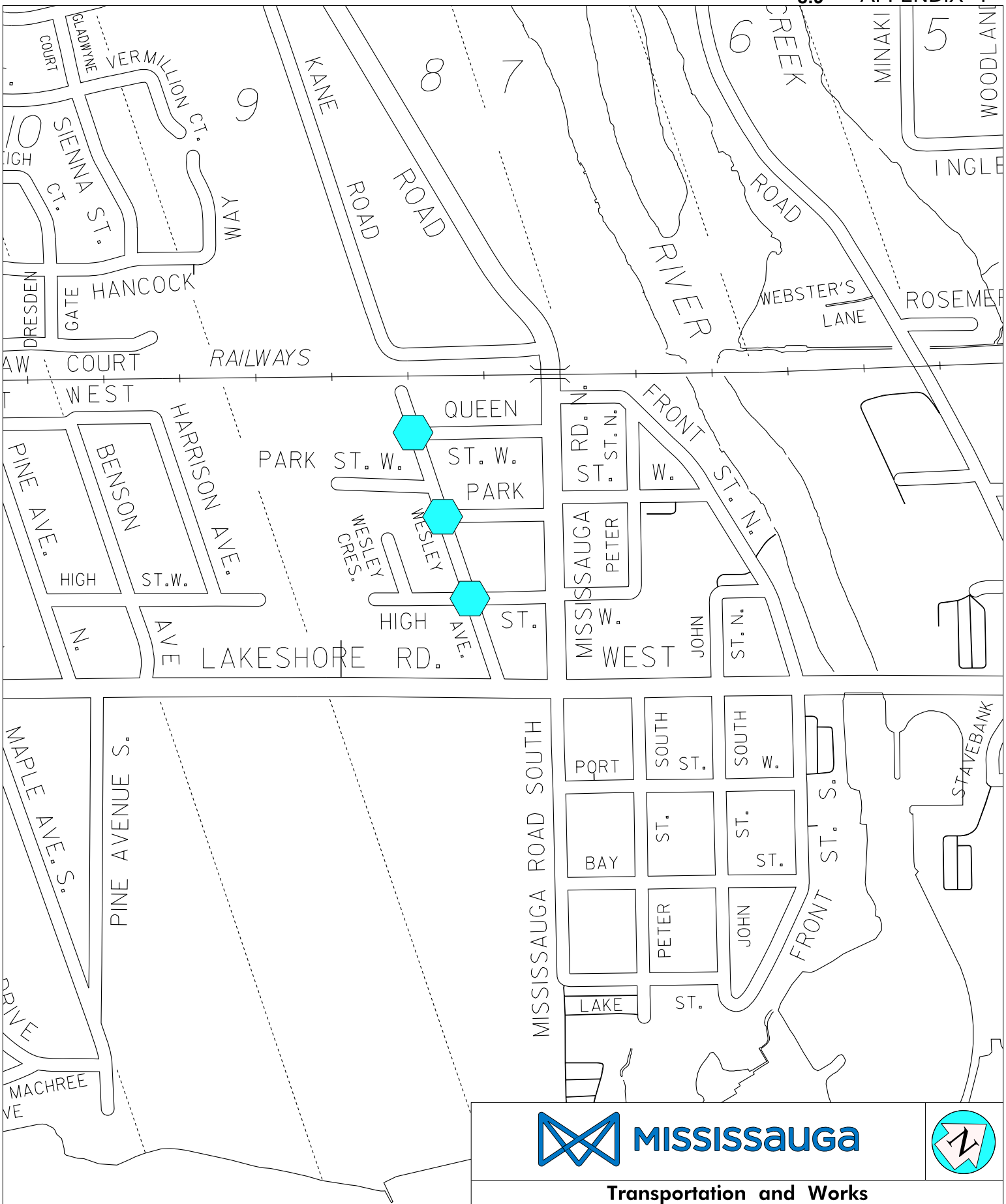
Based on the technical reviews completed on Wesley Avenue, the Transportation and Works Department does not support the installation of all-way stops at the intersections of Wesley Avenue at Queen Street West, Park Street West, and High Street West.

Attachments

Appendix 1: Location Map – Wesley Avenue Neighbourhood (Ward 1)

Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Prepared by: Maxwell Gill, C.E.T., Supervisor of Traffic Operations



MISSISSAUGA

Transportation and Works

Traffic Mgmt & Municipal Parking

Wesley Avenue
All-way Stop Reviews
(Ward 1)

SCALE FOR REDUCED DRAWINGS

0m 25m 50m 100m 150m 200m 250m 500m

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/13

To: Chair and Members of General Committee

From: Geoff Wright, P. Eng, MBA, Commissioner of Transportation and Works

Originator's files:
MG.23.REP
RT.10.Z-53

Meeting date:
2019/12/04

Subject
All-Way Stop – Gazette Gate and Inuit Trail (Ward 11)

Recommendation
That a by-law be enacted to amend the Traffic By-law 555-2000, as amended, to implement an all-way stop control at the intersection of Gazette Gate and Inuit Trail, as outlined in the report from the Commissioner of Transportation and Works, dated November 13, 2019 entitled "All-Way Stop - Gazette Gate and Inuit Trail (Ward 11)".

Background
Concerns were identified by an area resident, through the Ward Councillor's office, regarding the need for operational improvements at the intersection of Gazette Gate and Inuit Trail to increase the overall level of safety at the intersection.

Present Status
Currently, the intersection of Gazette Gate and Inuit Trail operates as a three-leg intersection with a stop control for northbound traffic on Gazette Gate, and free flow for eastbound and westbound traffic on Inuit Trail. A location map is attached as Appendix 1.

Comments
An a.m./p.m. manual turning movement count was completed at the intersection of Gazette Gate and Inuit Trail on October 25, 2018 to determine if an all-way stop is warranted. The results are as follows:

Gazette Gate and Inuit Trail

	Warrant Value
Part "A": Volume for All Approaches	100%
Part "B": Volume Splits	90%

In order for an all-way stop to be warranted, both Parts "A" and "B" must equal 100%. An all-way stop would not be warranted based on the summary of a.m. and p.m. study results. A review of the collision history at this intersection did not reveal any reported collisions within the past three years. An all-way stop would not be warranted based on the collision history.

However, further analysis reveals that warrants are very close to being met, and are fully satisfied for the p.m. study period. Therefore, the Transportation and Works Department supports the installation of an all-way stop control at the intersection of Gazette Gate and Inuit Trail. This will regulate the right-of-way for all approaches and increase the overall level of safety at the intersection.

The Ward Councillor supports the proposal for the installation of an all-way stop at the intersection of Gazette Gate and Inuit Trail.

Financial Impact

Cost for the sign installation and pavement markings can be accommodated in the 2019 operating budget.

Conclusion

The Transportation and Works Department recommends the installation of an all-way stop at the intersection of Gazette Gate and Inuit Trail.

Attachments

Appendix 1: Location Map – All-Way Stop – Gazette Gate and Inuit Trail (Ward 11)

Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Prepared by: Ouliana Drobychevskaia, Traffic Operations Technologist

MISSISSAUGA

Transportation and Works

Works Operations & Maintenance

All-Way Stop
Gazette Gate and Inuit Trail (Ward 11)

SCALE FOR REDUCED DRAWINGS

0m 25m 50m 100m 150m 200m 250m 500m

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/11

To: Chair and Members of General Committee

From: Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Originator's files:
MG.23.REP
RT.10.Z-58

Meeting date:
2019/12/04

Subject
All-way Stop - Southampton Drive and Aquinas Avenue/Half Moon Grove (Ward 8)

Recommendation
That a by-law be enacted to amend The Traffic By-law 555-00, as amended, to implement an all-way stop control at the intersection of Southampton Drive and Aquinas Avenue/Half Moon Grove as outlined in the report from the Commissioner of Transportation and Works, dated November 11, 2019 and entitled "All-way Stop - Southampton Drive and Aquinas Avenue/Half Moon Grove (Ward 8)".

Background
The intersection of Southampton Drive and Aquinas Avenue/Half Moon Grove operates as a four-leg intersection with a stop control for eastbound and westbound motorists on Aquinas Avenue and Half Moon Grove. The unique characteristics of this intersection, which was designed with traffic calming measures (chicanes) on all approaches, are causing operational and safety concerns among the users of the intersection. Through numerous residents' requests for an all-way stop control, it is apparent that operational issues at this intersection is a concern. A location map is attached as Appendix 1.

Comments
The most recent turning movement count was completed on October 3, 2018 to determine the need for an all-way stop based on traffic volumes. The results are as follows:

Southampton Drive and Aquinas Avenue/Half Moon Grove		Warrant Value
Part "A"	Volume for All Approaches	100%
Part "B"	Volume Split	70%

As per the criteria for all-way stops outlined in the City of Mississauga's Corporate Policy and Procedure – All-Way Stop Signs 10-05-04, in order for an all-way stop to be warranted, both parts "A" and "B" must equal 100%.

A review of the collision history at this intersection revealed four reported right-angle collisions within a 12-month period. For an all-way stop control to be warranted based on collision frequency, at least five collisions must occur in a 12-month period, provided the collisions are of the type considered correctable by the use of an all-way stop (i.e. turning movement, angle collisions).

The intersection has a significant offset due to the adjacent traffic calming measures, which makes navigating the intersection somewhat awkward. The installation of an all-way stop and pavement markings at the intersection would help to alleviate any ambiguity. The Transportation and Works Department therefore recommends that an all-way stop be installed at this location. This would regulate the right-of-way for all approaches and increase the overall level of safety at the intersection.

The Ward Councillor was advised and supports the proposal for the installation of an all-way stop at the intersection of Southampton Drive and Aquinas Avenue/Half Moon Grove.

Financial Impact

Costs for the signs installation and pavement markings can be accommodated in the 2019 Operating Budget.

Conclusion

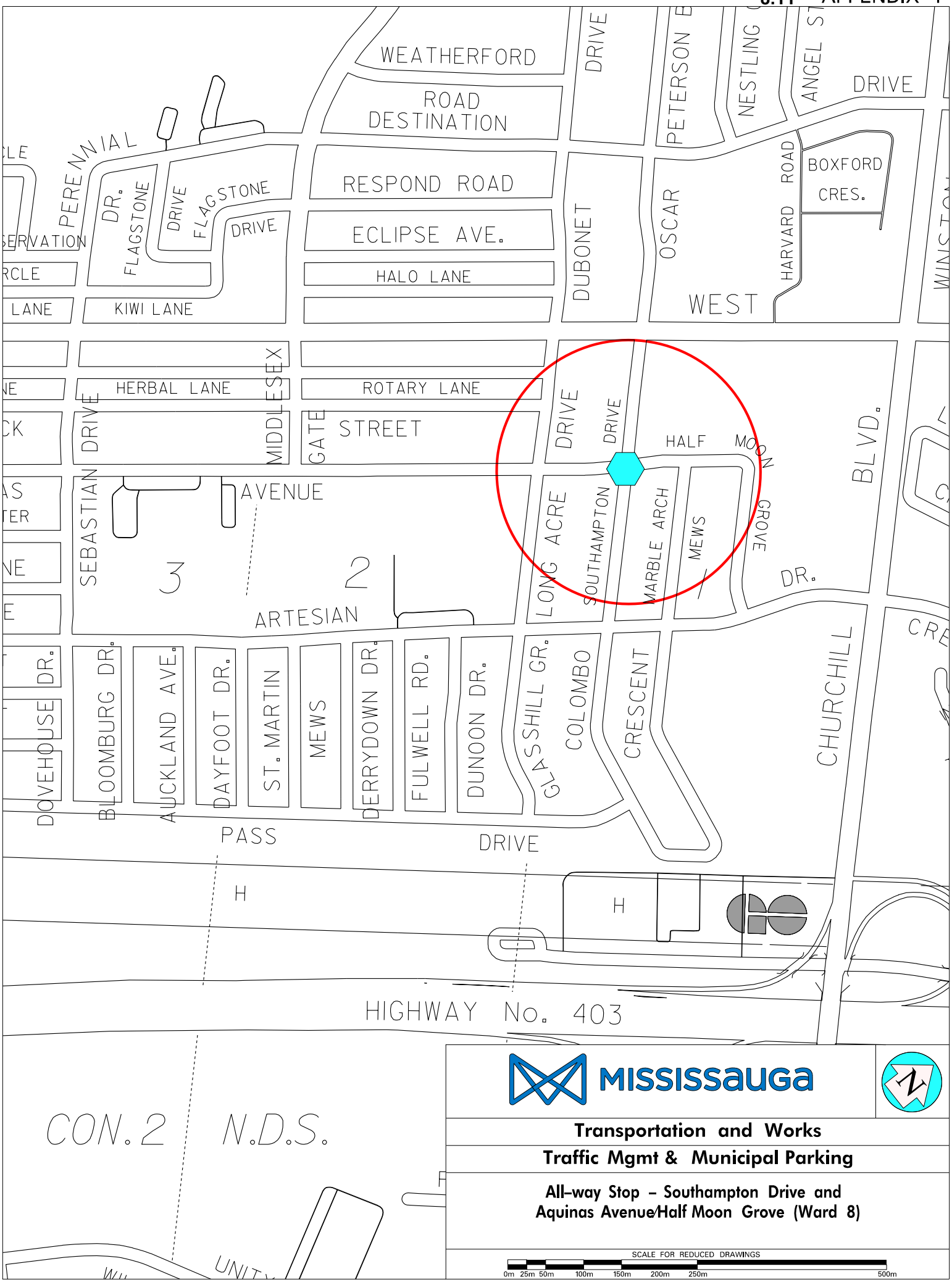
The Transportation and Works Department recommends the installation of an all-way stop at the intersection of Southampton Drive and Aquinas Avenue/Half Moon Grove.

Attachments

Appendix 1: Location Map - All-way Stop - Southampton Drive and Aquinas Avenue/Half Moon Grove (Ward 8)

Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Prepared by: Ouliana Drobychevskaia, Traffic Operations Technologist



MISSISSAUGA

Transportation and Works

Traffic Mgmt & Municipal Parking

All-way Stop – Southampton Drive and Aquinas Avenue/Half Moon Grove (Ward 8)

SCALE FOR REDUCED DRAWINGS

0m 25m 50m 100m 150m 200m 250m 500m

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/15

To: Chair and Members of General Committee

From: Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Originator's files:

Meeting date: 2019/12/04

Subject
Amendments to Transit (rules and regulations) By-law 425-03, as amended

Recommendation
That a by-law be enacted to amend the Transit By-law 425-2003, as amended, to include changes to regulations with respect to the regulation of the Senior $1 fare, conduct on City property and transit vehicles, lost property retention period, parking at Mississauga transitway stations and related housekeeping items as outlined in the report entitled "Amendments to Transit (rules and regulations)By-law 425-03, as amended, from the Commissioner of Transportation and Works dated November 15, 2019.

Report Highlights
- The Transit By-law last amended in December 2016 and requires updates to reflect current changes to the transit system operation.
- Effective July 2019, MiWay introduced 24 hour transit services on selected transit routes and as a result the definition of off-peak times for the senior $1 cash fare has been updated in the by-law.
- Additional items related to behaviour and conduct regarding littering, smoking, public safety, passenger courtesy and loitering on transit vehicles and property requires by-law revision for consistency with neighbouring transit systems and Metrolinx.
- To coincide with the recent changes to the Animal Care and Control By-law 98-04, a muzzle is no longer required when bringing an animal onto a transit vehicle unless a muzzle order was provided.
- Based on the findings of a lean review to lost items on MiWay, the by-law has been updated to retain lost customer items for a period of 7 days.
- MiWay has updated the transit by-law to include a parking limit at transitway stations. This

will permit customers to park at transitway stations for up to a maximum of 48 hours. This change aligns with the by-law at transitway stations owned by Metrolinx.

Background

The City of Mississauga Transit By-law 425-03, as amended (the "Transit By-law") was created in October 2003 to enforce rules and regulations regarding passenger conduct on or about transit property as well as transit fare payment.

The Transit By-law last amended in December 2016 to update the enforcement guidelines to educate, inform and enforce transit safety, acceptable conduct on transit property and vehicles, and to reflect PRESTO technology for MiWay customers and staff.

Comments

In the past 3 years there have been additional changes to regulations, fares and updates to passenger conduct and therefore this report provides a summary of the changes to the Transit By-Law 425-03.

Fare changes- senior $1 fare

In 2017, Council approved the implementation of the senior $1 cash fare during weekday off-peak hours, weekends and holidays to encourage and support senior's by offering an affordable transit travel option. Effective July 2019, MiWay introduced 24 hour transit services on selected transit routes and as a result the definition of off-peak times for the senior $1 cash fare has been updated in the by-law. MiWay off-peak hours for the senior $1 fare is now weekdays 8:30am to 3:30pm, between 7:00pm and 5:59am and all day on Saturdays, Sundays and Holidays. During weekday peak hours from 6:00am to 8:29am and 3:31pm to 7:00pm seniors will be required to pay with PRESTO or full cash fare.

Passenger Conduct

The Transit By-law 425-03 enforces access and behaviour of passengers in, on or about MiWay vehicles and transit property.

To maintain consistency with the by-laws of other GTHA transit systems, the following passenger conduct clauses will be added to the transit by-law:

- As a form of littering - to discard any household, industrial or commercial waste on transit vehicles or city property.
- Related to smoking – specifically "vaping" meaning the action or practice of inhaling and exhaling the vapor produced by an electronic cigarette or similar device.
- From a safety perspective – passengers interfering with a Transit Operator or the safe operation of the vehicle by shining a light.
- As a form of courtesy to other passengers/public – placing ones feet/foot on seats within transit vehicle or bus shelter; laying on any bench, seat or floor of transit property.

- With respect to loitering – idly spending time without the intent of using the transit system; lingering or remaining without due cause; and failing to board the next available transit vehicle where possible for the intended route of travel.

Animal muzzle regulation

To coincide with the recent changes to the Animal Care and Control By-law 98-04, a muzzle is no longer required when bringing an animal onto a transit vehicle unless a muzzle order was provided.

Lost Property

As a part of a City lean project, staff reviewed the lost property process. Data indicated MiWay receives approximately 2600 lost items annually. The findings indicate that 42% of items are claimed by owners within the first 7 days after an item has been logged into the transit database. Only 3% of items are claimed after 7 days and the remaining 55% of items are unclaimed and donated or disposed. Based on the findings, MiWay adjusted the by-law to retain lost items for a period of 7 days. This change saves search time for staff and allows them to focus time on customer inquiries at the counter as well as space savings due to limited storage.

Mississauga Transitway Stations

MiWay has updated the transit by-law to include a parking limit at transitway stations. This will permit customers to park at transitway stations for up to a maximum of 48 hours. This change aligns with the by-law at transitway stations owned by Metrolinx.

Strategic Plan

The changes to the Transit By-law contribute to the following strategic goals:

Move: Developing a transit-orientated city.

- Build a reliable and convenient transit system

Belong: Ensuring Youth, older adults and new immigrants thrive

- Ensure affordability and accessibility

Financial Impact

There is no financial impact as a result of the Transit By-law 425-03 update.

Conclusion

The Transit By-law currently governs regulations with respect to the access and behaviour of passengers on MiWay vehicles, City property and regulations governing all fare related policy. Staff recommend that the current Transit By-law 425-03 be amended to reflect the regulation of the senior $1 fare, lost property retention period, animal muzzle regulation, parking at transitway stations and other aspects related to conduct in, on or about transit vehicles and property.

Attachments

Appendix 1: 2019 Amendments to Transit By-law 425-03, as amended

Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Prepared by: Margaret Johnston, Supervisor of Transit Revenue

A by-law to amend By-law 425-03,
being a by-law to regulate and prohibit matters
relating to bus passenger transportation systems

WHEREAS Council of The Corporation of the City of Mississauga deems it desirable to regulate and prohibit matters relating to its bus passenger transportation systems;

AND WHEREAS sections 8, 9 and 11(2) of the *Municipal Act, 2001*, S.O. 2001, c.25, as amended, enable Council to pass by-laws to regulate and prohibit in respect of matters relating to bus passenger transportation systems;

AND WHEREAS The Council of the Corporation of the City of Mississauga is desirous of amending its Transit By-law 425-03, as amended, to effect housekeeping measures;

NOW THEREFORE the Council of The Corporation of the City of Mississauga hereby **ENACTS** as follows:

1. That section 1 of By-law 425-03, as amended, is hereby amended by adding the following definition in alphabetical order:

   "loiter" means to stand or wait around idly or to remain longer than necessary without apparent purpose.

2. That section 1 of By-law 425-03, as amended, is hereby amended by adding "and/or the MiWay website" to end the definition of "transfer":

   "transfer" means a voucher issued to a passenger after the payment of the applicable exact fare which will permit the passenger to use and be transported by a bus of another route without payment of an additional fare, subject to the conditions of use found on the reverse side of the voucher and/or the MiWay website;

3. That subsection 3(2) of By-law 425-03, as amended, is hereby deleted and replaced by the following subsection:

   (2) Notwithstanding subsection 3(1), no Police Officer, Enforcement Officer, or Mississauga Transit employee while on duty or in the performance of their duties, or a person with vision loss presenting a CNIB card, or a pre-school child, or a support person while accompanying a fare paying person other than a person with a CNIB card, shall be required to pay for boarding, riding upon or otherwise using or being transported by a bus operated and controlled by Mississauga Transit.

4. That subsection 3(4) of By-law 425-03, as amended, is hereby deleted and replaced by the following subsection and subsection 3(5) be added as follows:

   (4) Mississauga Transit will refund an overpayment referred to in subsection 3(3) by mailing to the customer either the overpayment value in tickets, PRESTO card, or by cheque.

5. That a new subsection 3(5) is hereby added to By-law 425-03, as amended, as follows:

   (5) Nothwithstanding subsection 3(1)(a), a person may tender the discounted Senior $1 cash fare during "off-peak" hours weekdays 8:30am to 3:30pm and after 7:00pm to 5:59am and all day on Saturdays, Sundays and Holidays. Full

cash fare or a valid PRESTO card is required during peak hours from 6:00am to 8:29am and 3:31 to 7:00pm.

6. That section 6 of By-law 425-03, as amended, is hereby deleted and replaced with the following:

6. The issuance of every pass and ticket is subject to the following conditions;

(a) the ticket and pass is valid on regular scheduled Mississauga Transit service, and for the period of time shown on the pass voucher, or from the 1st to the last day of each month on a PRESTO card;

(b) if lost, a replacement ticket or pass will not be issued, except in respect of a U-Pass;

(c) the ticket shall not be reproduced or tampered with in any fashion;

(d) the ticket and pass is not refundable;

(e) the holder of the ticket or pass shall comply with all terms and conditions and as set out in Section 7;

7. That section 12(1) of By-law 425-03, as amended, is hereby deleted and replaced with the following:

(1) No person shall do any of the following in, on or about property owned, leased, occupied or used by the Corporation that constitutes any part of the public transportation system including a Mississauga Transit Vehicle, Mississauga Transitway, bus shelter or other vehicle:

(a) litter or discard any household, industrial or commercial waste, unless otherwise authorized;

(b) activate any emergency alarm or device, or use any emergency telephone, except in an emergency;

(c) cause a disturbance or harm to the public, or engage in any other conduct or activity that is contrary to the *Criminal Code*, R.S.C. 1985, c. C-46, or any other applicable law;

(d) smoke, vape, or carry a lighted cigar, cigarillo, cigarette, e-cigarette, waterpipe, or pipe;

(d.1) consume alcoholic beverages or carry an open container of alcohol that is not properly contained or in a re-sealable container;

(e) sell or attempt to sell any newspaper, magazine, merchandise or any other article or thing, distribute any pamphlet or literature, or solicit members of the public for any purpose whatsoever, except with the prior written permission of Mississauga Transit;

(f) wear and/or use roller blades, in line skates, roller skates, ice skates or skateboards;

(g) bring a bicycle on a Mississauga Transit Vehicle, except if the transit vehicle is equipped with a bicycle rack, contrary to instructions of the Mississauga Transit operator;

(g.1) shine a light or occupy a position that interferes or is likely to interfere with the safety of the Mississauga Transit operator or the safe operation of the Mississauga Transit Vehicle;

(g.2) act in any way that interferes or is likely to interfere with the operation of any part of a Mississauga Transit Vehicle;

(g.3) fail to comply with any sign or signal on Transit property;

(h) bring an article of any kind aboard a Mississauga Transit Vehicle that could obstruct the aisle or that prevents a seat from being used by a passenger or that in any way hinders the safety of other passengers, unless permission to do so is first received from the operator of the Mississauga Transit Vehicle;

(i) bring any explosive, flammable or toxic material or any dangerous weapon of any kind;

(j) subject to subsection 12(2), bring any dog that is not leashed or contained in a carrier or hand bag type, or any other animal that could cause a disturbance or a nuisance or threaten the safety of any other person;

(k) play, except with the prior written permission of Mississauga Transit, a musical instrument or operate any radio, transmitting or receiving device, tape recorder, or similar device, unless the sound therefrom is conveyed to that person by an earphone;

(l) fail to be fully clothed at all times; and

(l.1) fail to wear shoes at all times;

(m) spit, urinate or defecate;

(n) conduct himself/herself in a manner that creates public indecency;

(o) fail to comply with an order given by an Enforcement Officer;

(p) use profane, abusive, indecent, foul, insulting or obscene language while upon Mississauga Transit Property.

(q) enter an unauthorized portion of the Mississauga Transitway.

(r) place their foot or feet on seats within transit vehicle or bus shelter;

(s) lay on any bench, seat or floor of transit property;

(t) alter identity through the use of disguise intended to obscure or otherwise alter appearance;

8. That subsection 12(3) of By-law 425-03, as amended, is hereby deleted and replaced by the following subsection, and a new subsection 12(4) be added as follows:

(3) A muzzle is not required when bringing an animal onto a transit vehicle unless a muzzle order was provided. Any person wishing to appeal a muzzle order can apply for a hearing before the Appeal Committee where a muzzle order has been issued. The sections in the Animal Care and Control By-law 98-04, as amended, with respect to the rights and obligations of the appellant and the Corporation at a hearing appealing a muzzle order shall apply with any necessary modifications.

(4) No person shall loiter in, on or about transit property which includes but is not limited to:

(a) idly spend time without the express purpose of using the transit system;

(b) lingering, sauntering or remaining without due cause;

(c) failing to board the next available transit vehicle, where possible, for the intended route.

9. That section 14 and subsections 14(a) and 14(b) of By-law 425-03, as amended, are hereby deleted and replaced with the following:

    14. No person shall remove any article left in or on Mississauga Transit Property, or any other property or premises of the Corporation, by a person as a result of inadvertence or otherwise. This section does not apply to a Mississauga Transit employee or an Enforcement Officer engaged in their duties. Any article so removed shall be kept for a period of 7 days from the date it was removed subject to the following exceptions:

        (a) The owner of the article may retrieve the article within this 7-day period;

        (b) Any perishable item and its container may be disposed of immediately;

10. That sections 15 and 16 of By-law 425-03, as amended, is hereby deleted and replaced with the following:

    15. Any person seeking to retrieve an article left in or on a Mississauga Transit Vehicle, or any other property or premises of the Corporation, and that has been removed from the said vehicle, property or premises, may retrieve the article within 7 days of its removal if:

    16. Any article that is not retrieved by the owner within 7 days is the property of the Corporation and may be used, sold, or otherwise disposed of, by Mississauga Transit.

11. That section 17.1 of By-law 425-03, as amended, is hereby deleted and replaced with the following:

    17.1 No person shall park, stand or stop any vehicle on Mississauga Transit property unless the parking, standing or stopping of the vehicle is within an area so designated for parking, standing or stopping.

12. That a new section 17.2 is hereby added to By-law 425-03, as amended, as follows:

    17.2 No person shall park a vehicle for a period of more than 48 hours at Mississauga Transitway stations.

ENACTED AND PASSED this day of , 2019.

_____

MAYOR

_____

CLERK

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/11

To: Chair and Members of General Committee

From: Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Originator's files:
MG.23.REP
RT.10.Z-29

Meeting date:
2019/12/04

Subject
Designated Accessible On-Street Parking on Tucana Court (Ward 4)

Recommendation
That a by-law be enacted to amend the Traffic By-law 555-00, as amended, to implement a designated accessible parking space on the east side of Tucana Court, from a point 114 metres south of Kingsbridge Garden Circle to a point 7 metres southerly thereof, as outlined in the report from the Commissioner of Transportation and Works, dated November 11, 2019 entitled "Designated Accessible On-Street Parking on Tucana Court (Ward 4)".

Background
The Transportation and Works Department received a request from an area resident through the Ward Councillor's office, with respect to the implementation of one designated accessible parking space on Tucana Court. A location map is attached as Appendix 1.

Comments
Transportation and Works staff conducted a review of the area and could support providing a designated accessible parking space on Tucana Court. The Ward Councillor supports the proposal.

Financial Impact
Costs for the signs installation and pavement markings can be accommodated in the 2019 Operating Budget.

Conclusion
The Transportation and Works Department supports the implementation of a designated accessible parking space on the east side of Tucana Court from a point 114 metres south of Kingsbridge Garden Circle and a point 7 metres southerly thereof.

Originators files: MG.23.REP

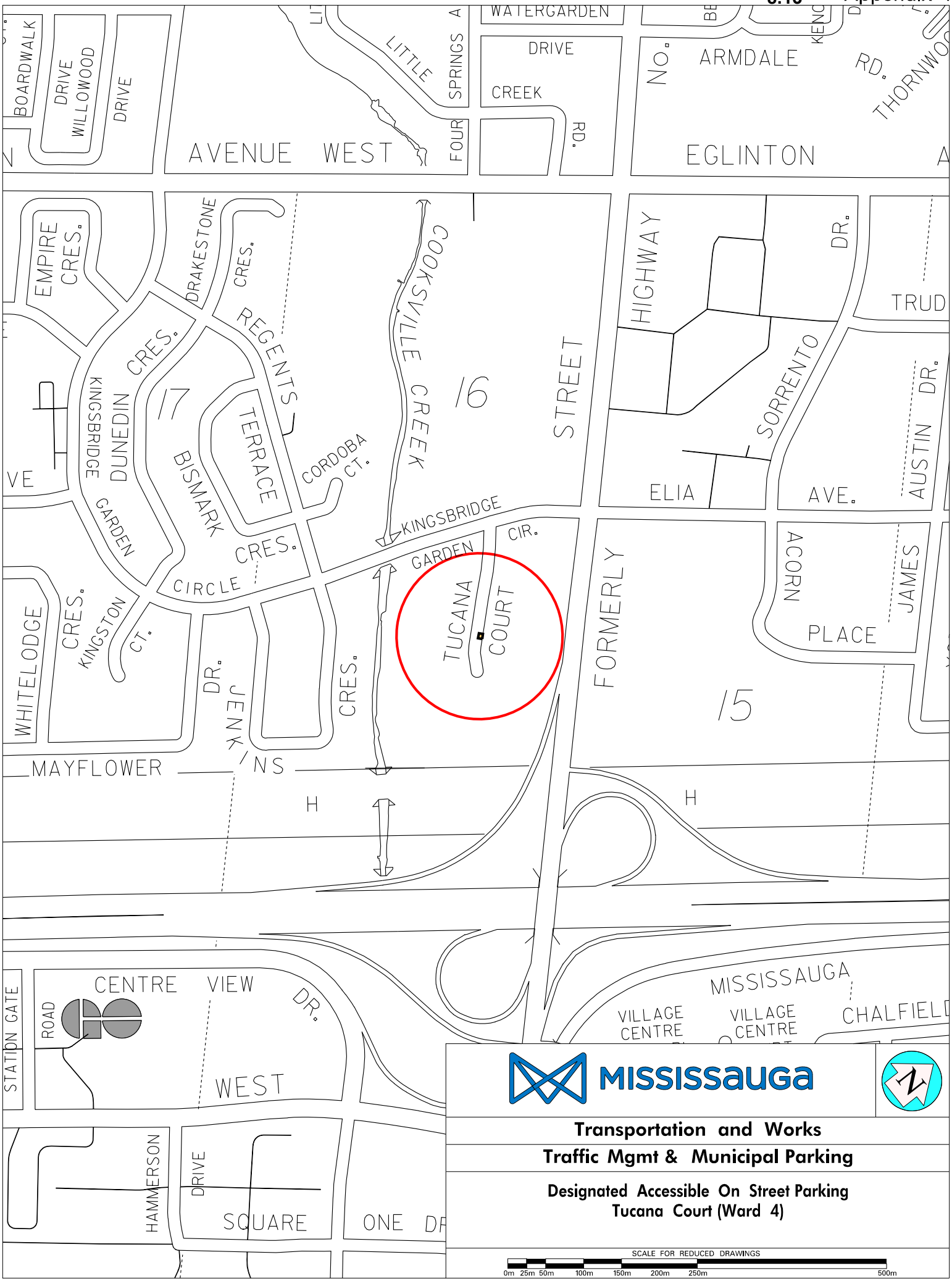
RT.10.Z-29

Attachments

Appendix 1: Location Map – Designated Accessible On Street Parking–Tucana Court (Ward 4)

Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Prepared by: Alex Liya, C.E.T., Traffic Operations Technologist



MISSISSAUGA

Transportation and Works

Traffic Mgmt & Municipal Parking

Designated Accessible On Street Parking
Tucana Court (Ward 4)

SCALE FOR REDUCED DRAWINGS

0m 25m 50m 100m 150m 200m 250m 500m

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 201911/15	Originator's files:
To: Chair and Members of General Committee	
From: Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works	Meeting date: 2019/12/4

Subject

Additional Funding for Corrugated Metal Pipe Rehabilitation - Various Locations, PN 19-137 (Ward 7)

Recommendations

1. That the capital project PN 19-137, Corrugated Metal Pipe Rehabilitation – Various Locations, be amended to a gross and net budget of $4,312,000 and funded from the Pipe Reserve Fund (Account #35993);

2. That additional funding of $3,762,000 be transferred from the Pipe Reserve Fund (Account #35993) to PN 19-137, Corrugated Metal Pipe Rehabilitation – Various Locations;

3. That the existing design contract with *Andrews.engineer*, P.O. 4600017049, be increased by $300,000, to a revised total of $620,371 to include full-time contract administration/site supervision;

4. That authorization be granted to single-source Mississaugua Golf and Country Club for reimbursement of specialized golf course restoration works up to $250,000; and.

5. That all necessary by-laws be enacted.

Background

In 2014, a City-wide condition assessment study of metal trunk storm sewers identified a number of priority rehabilitation works to storm sewer infrastructure within and adjacent to the Mississaugua Golf and Country Club (MGCC). Subsequently, in 2018, the City retained an engineering consulting team, led by *Andrews.engineer*, to undertake the detailed rehabilitation design and associated works.

This project largely involves rehabilitating the metal trunk storm sewers using lining technologies, where possible, as opposed to full sewer replacement to minimize social and

environmental impacts and reduce the overall construction costs. Other works associated with this project include box culvert replacements, erosion protection and watercourse rehabilitation.

A cumulative budget of $2,394,980 under Corrugated Metal Pipe Rehabilitation – Various Locations (PN-16132, PN-17132, PN-18132 and PN-19137) is available for this project. The project cost estimate and funding summary is detailed in Appendix 1.

Comments

In August 2019, the City issued a request for tender for the storm sewer rehabilitation and associated works within and adjacent to MGCC. One bid was received at a cost of $5,090,000; a figure that is approximately $3,000,000 over the consultant's estimated budget. This bid was subsequently rejected by the City due to bid non-compliance.

Given the low bidder turnout and the high bid price received, and in preparation for re-issuing the tender in early 2020, *Andrews.engineer* solicited feedback from prospective bidders. It was found that their main concerns related to difficult site access, restrictive timelines for construction, perceived risks associated with specialized golf course restoration and constructing during the winter months. These concerns are briefly summarized below.

The affected storm infrastructure originates in the municipal right-of-way and drains through a steep forested valley that traverses MGCC before discharging into the Credit River. The construction and removal of temporary access roads is required through MGCC and private properties where the City has entered into consent-to-enter agreements. To minimize disruption to its operation, MGCC would only permit large equipment access outside of the regular golf season, namely November through April. Given the unpredictable weather during winter construction months, snow or ice could significantly reduce the construction window and the temperature could also increase the difficulty and cost of rehabilitation. These factors could contribute to construction delays and result in damage claims by MGCC. Further, it is speculated that the high demand for limited qualified contractors in the region for such technical work contributed to low bidder turnout and high bid price.

In light of the feedback received from prospective bidders and after re-evaluation of this complex construction project, a number of changes will be made when the project is re-tendered in 2020. This includes securing additional access points to allow the contractor more flexibility, maximizing construction during favourable weather conditions, securing a Noise By-law exemption prior to tender to extend working hours and having MGCC reinstate the golf course sod and irrigation system thereby eliminating the contractor's risk from this component of restoration work.

Further, it is recommended that the existing contract with *Andrews.engineer* be revised from part-time to full-time construction supervision due to the project's complexities and constraints.

This report is seeking additional funds of $3,762,000 under Corrugated Metal Pipe Rehabilitation – Various Locations (PN 19-137) to cover the anticipated revised construction estimate and includes $300,000 to extend the contract administration/site supervision services with *Andrews.engineer* to full-time basis for the duration of the construction phase.

Strategic Plan

The construction of this project falls within the Connect Strategic Pillar under its strategic goal to Build and Maintain Infrastructure.

Financial Impact

PN 19-137, Corrugated Metal Pipe Rehabilitation – Various Locations, has $550,000 of approved funds available. The recommended $3,762,000 increase will be transferred from the Pipe Reserve Fund (Account #35993) and total funding for this PN will be $4,312,000.

Additional funding will cover the total project costs for allowances for the City's expenses, Realty fees, Contract Administration, Survey, Inspection & Testing, applicable HST and contingency.

The current approved budget for this project is $2,394,980 and additional funding of $3,762,000 is being requested to bring the total project funds to $6,157,000, as detailed in Appendix 1.

Conclusion

Given a better understanding of the constraints and risks related to the storm sewer rehabilitation and associated works within and adjacent to MGCC, and after a re-evaluation of the estimated construction budget, additional funding is required to undertake the construction works, increase contract administration/site supervision services with *Andrews.engineer* from part-time to full- time basis and single sourcing MGCC directly for sod and irrigation restoration works.

Attachments

Appendix 1: Project Cost Estimate and Funding Summary

Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Prepared by: Scott Perry, Manager, Stormwater Assets & Programming

Appendix 1 - Project Cost Estimate and Funding Summary

#	Contract Item	Current Budget ($)	Additional Costs ($)	New Budget ($)
1	Consulting Fees (Contract Admin/ Site Supervision, Post Construction Survey, As-Builts, Disbursements)	2,394,980	300,000	300,000
2	Construction Costs		2,650,000	5,048,000[1]
3	Capital Delivery (5%)		252,500	252,500
4	Contingency, Internal Survey Fees		150,000	150,000
5	Property Restoration fees (e.g. MGCC sod repairs)		250,000	250,000
6	Realty fees (i.e. HONI license agreement)		50,000	50,000
7	HST (1.76%)		106,500	106,500
	TOTAL:	2,394,980	3,762,000	6,157,000

[1] please refer to Andrews.Engineer estimate

Funding Summary:

Project #	Budget Available	Additional Funding	Total Revised Budget
16132	$213,752	$0	$213,752
17132	$785,000	$0	$785,000
18132	$846,228	$0	$846,228
19137	$550,000	$3,762,000	$4,312,000
Total	$2,394,980	$3,762,000	$6,157,000

Note: Budget available as of November 15, 2019.

andrews.engineer

November 14th, 2019

The Corporation of the City of Mississauga
300 City Centre Drive
Mississauga, ON
L5B 3C1

ATTN: Thomas Nightingale P.Eng., Storm Drainage Coordinator, Environmental Services

SUBJECT: Cost Estimate for the Trenchless Rehabilitation of Corrugated Metal Storm Sewers

Dear Thomas,

We have prepared a construction cost estimate based on the current scope of rehabilitation and repair works related to storm drainage improvements at various locations within, and adjacent to, the Mississauga Golf and Country Club north of the Credit River. The scope of work includes the following: (a) trenchless rehabilitation of six corrugated metal pipes using Cured-In-Place-Pipe (CIPP) and Geopolymer spray lining technologies; (b) one box culvert replacement including open channel improvements; (c) slope stabilization and overland flow diversion at one location; (d) replacement of one ditch inlet structure; (e) construction and removal of temporary access roads; and (f) permanent restoration of all disturbed areas.

This estimate has been prepared based on the design information available at the time of preparation including collection and analysis of all feedback gathered following the initial tendering of the work in August 2019.

We have measured quantities from the design drawings issued for tender in August 2019 to determine generated typical unit rates or lump sums as applicable for the relevant cost items. Historical data from several different sources have been used for the development of the cost estimate. Where cost data is limited, we have made reasonable assumptions based on our experience with projects of similar scope, size, and risk.

Accordingly, we anticipate the probable cost of construction to be in the order of **$5,047,857.80** not including taxes. The cost estimate provided is meant to reflect our best judgement of the current market value for this type of construction project in a competitive bidding scenario and not a prediction of the lowest bid price. That said, it should be noted that recent bid prices for trenchless rehabilitation projects in neighboring municipalities have not been in-line with what the industry considers as fair market prices. Tenders resulting in sole bids and/or inflated bid prices are not uncommon in the local sewer rehabilitation market. This can be attributed in part to the large number of sewer rehabilitation contracts combined with the relatively limited supply of qualified rehabilitation contractors that is causing a supply and demand issue.

We recommend that the City review the estimated value and consider the necessary provisions or contingency plans to manage risk in the tendering process. As always, our team is available to assist and discuss various courses of action to help ensure successful project delivery.

Prepared by:
Andrews.engineer

Ghassan Saket, M.Eng., P.Eng., PMP,

222 Laurier Avenue East, Suite 200, OTTAWA Ontario Canada K1N 6P2 • 55 Horner Avenue, Suite 2a, TORONTO Ontario Canada M8Z 4X6
CONTACT: info@andrews.engineer • +1 416.761.9960

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/15

To: Chair and Members of General Committee

From: Geoff Wright, P. Eng, MBA, Commissioner of Transportation and Works

Originator's files: M-2001

Meeting date: 2019/12/04

Subject

Servicing Agreement Assumption – Industrial Subdivision Servicing Agreement, City File M-2001 Prologis Canada LLC; Crownvetch Developments Inc. and the Erin Mills Development Corporation (Ward 9) (Z-55)

Recommendations

1. That the City of Mississauga assume the municipal works as constructed by Prologis Canada LLC; Crownvetch Developments Inc. and The Erin Mills Development Corporation (the developer), under the terms of the Industrial Subdivision Servicing Agreement for Registered Plan 43M-2001 (Ward 9) (lands north of Derry Road, south of Highway 401, east of Ninth Line and west of Tenth Line), known as Argentia Road Extension Industrial Subdivision;

2. That the letter of credit in the amount of $978,119.56 be returned to the developer; and

3. That a by-law be enacted to assume the road allowance within the Registered Plan as Public Highway and part of the municipal system of the City of Mississauga.

Background

To support the creation of industrial blocks for new building construction, the developer entered into an Industrial Subdivision Servicing Agreement (the Agreement) with the City and the Region of Peel on October 14, 2015 to construct the Argentia Road extension. The municipal infrastructure identified in the Agreement included:

- Underground services comprising of a storm sewer, sanitary sewer and watermain,
- A stormwater management pond, and
- Road construction and boulevard surface works.

Comments

The developer has completed the construction of the required municipal works in accordance with the terms of the Agreement.

Transportation and Works supports the assumption of the Argentia Road Extension Industrial Subdivision (M-2001), the location of which is illustrated in Appendix 1, based on the following criteria:

- Final inspections completed and approvals issued by Transportation & Works;
- Final approvals received from Community Services and the Region of Peel;
- Final certification of the works received from the Engineering Consultant; and
- Terms of the warranty period have been fulfilled.

Financial Impact

With the assumption of the Argentia Road Extension Industrial Subdivision (M-2001), the City will now be required to provide maintenance to 698 meters (2290 feet) of roadway, 636 meters (2087 feet) of storm sewer and a stormwater management pond.

The financial impact of maintaining this additional municipal infrastructure is minimal and funding is available within the existing 2019 operating budget.

Conclusion

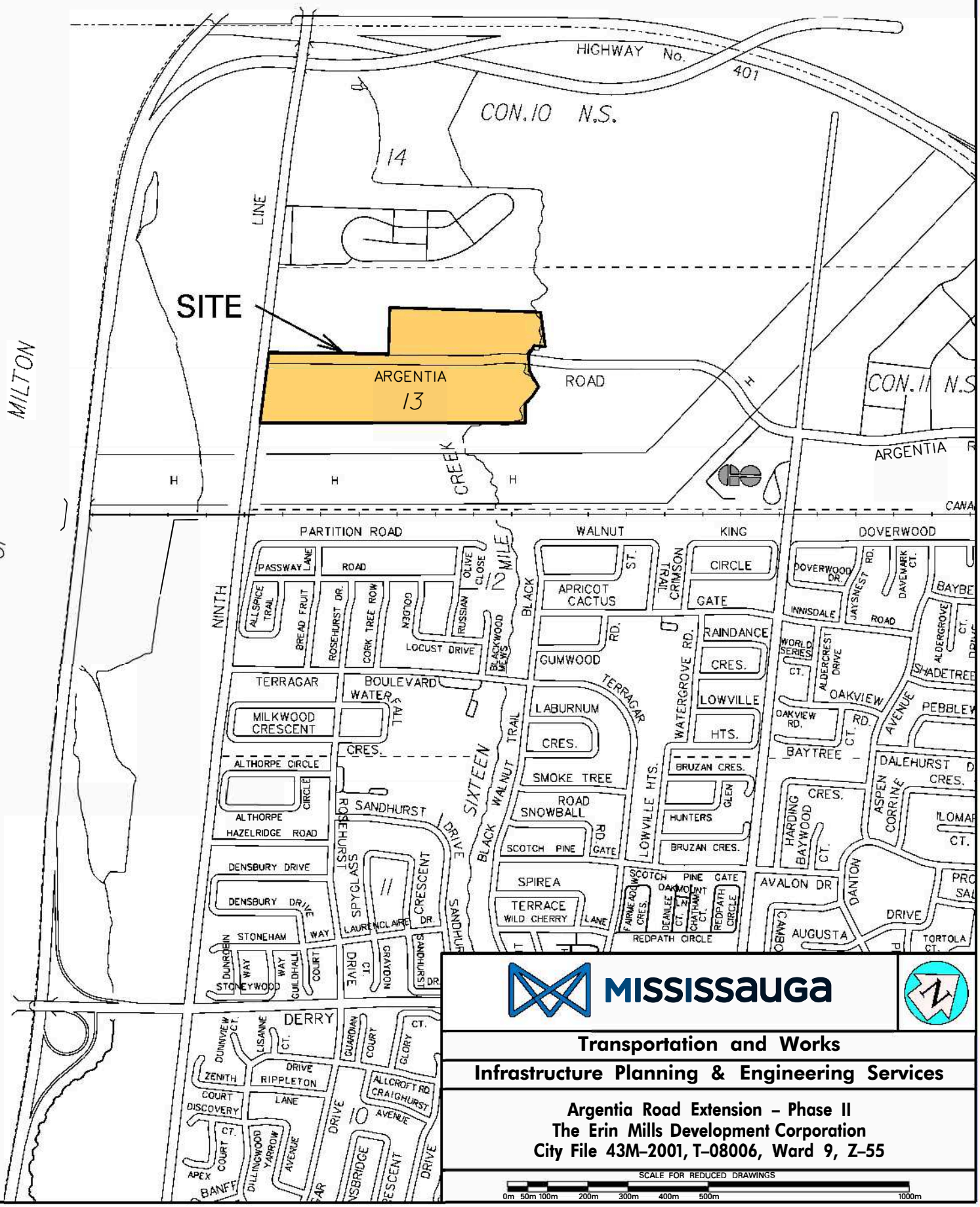
It is in order to assume the municipal works associated with the Argentia Road Extension Industrial Subdivision and return the letter of credit to the developer.

Attachment

Appendix 1: Approximate location of Argentia Road Extension Industrial Subdivision M-2001

Geoff Wright, P. Eng, MBA, Commissioner of Transportation and Works

Prepared by: Donna Waters, Supervisor, Development Engineering and Construction



MISSISSAUGA

Transportation and Works

Infrastructure Planning & Engineering Services

Argentia Road Extension – Phase II
The Erin Mills Development Corporation
City File 43M-2001, T-08006, Ward 9, Z-55

SCALE FOR REDUCED DRAWINGS
0m 50m 100m 200m 300m 400m 500m 1000m

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/11

To: Chair and Members of General Committee

From: Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Originator's files:
MG.23.REP
RT.10.Z-48E

Meeting date:
2019/12/04

Subject
School Bus Loading Zone - Corliss Crescent (Ward 5)

Recommendation
That a by-law be enacted to amend By-law 555-2000, as amended, to implement a school bus loading zone on the east side of Corliss Crescent, from a point 88 metres north of Teeswater Road, to a point 23 metres northerly thereof, as outlined in the report from the Commissioner of Transportation and Works, dated November 11, 2019 and entitled "School Bus Loading Zone – Corliss Crescent (Ward 5)".

Background
The Traffic Safety Council requested that a "School Bus Loading Zone" be implemented on the east side of Corliss Crescent, between Darla Drive and Teeswater Road.

Comments
Transportation and Works Department staff completed an onsite review of Corliss Public School. Based on this review, it was determined that the east side of Corliss Crescent, between Darla Drive and Teeswater Road, is a suitable location to implement a school bus loading zone.

The existing stopping prohibition on Corliss Crescent, between Darla Drive and Teeswater Road, from the hours of 8:00 a.m. to 4:00 p.m., will work in conjunction with the "School Bus Loading zone" signage. The Transportation and Works Department supports the implementation of the "School Bus Loading Zone" on Corliss Crescent.

Financial Impact
Costs for the sign installation can be accommodated in the 2019 Operating Budget.

Conclusion

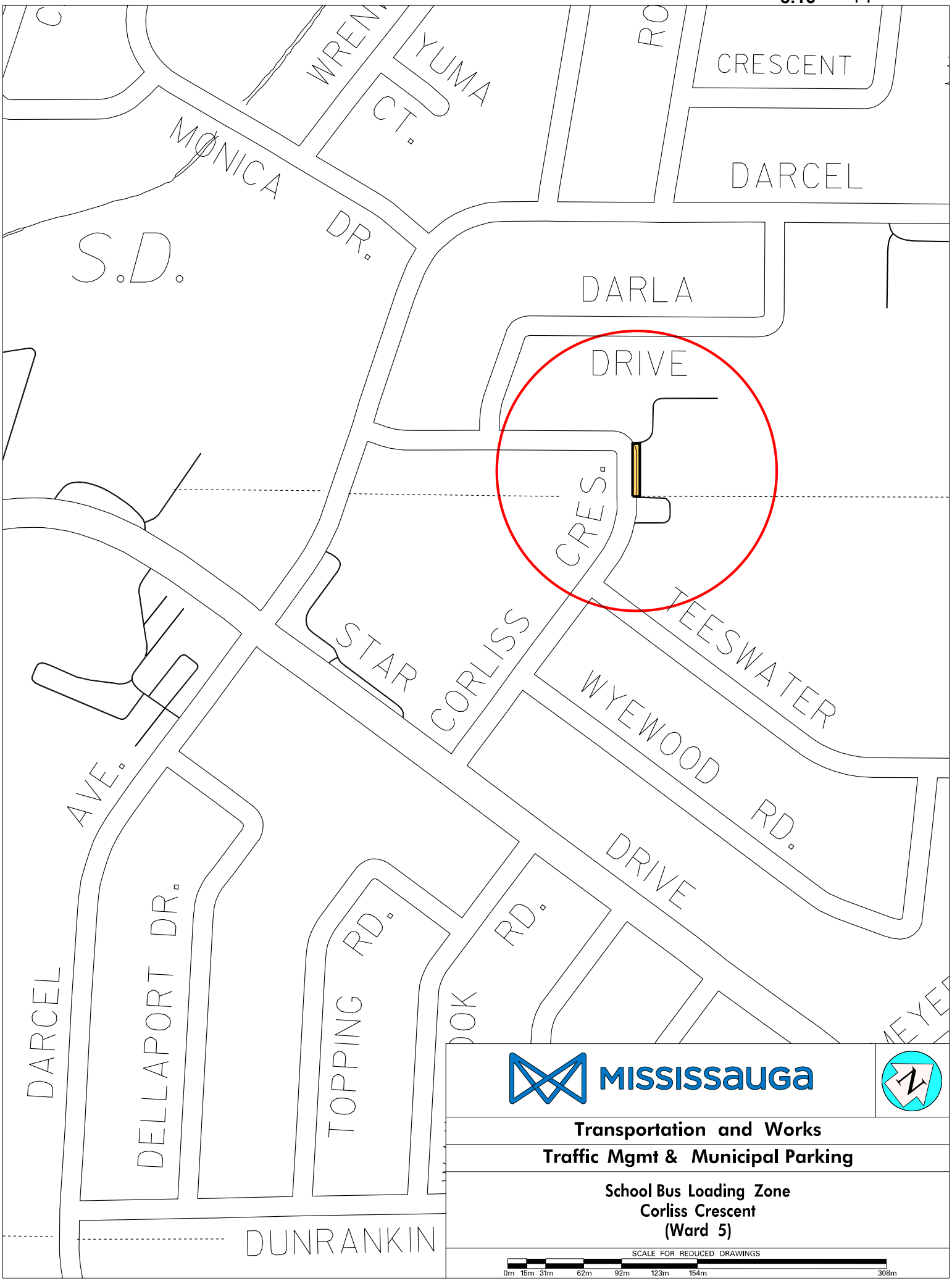
The implementation of a “School Bus Loading Zone” on Corliss Crescent will be beneficial to the school and would not require any changes to the existing stopping/parking regulations on Corliss Crescent.

Attachments

Appendix 1: Location Map – School Bus Loading Zone – Corliss Crescent

Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Prepared by: Milan Pavlovic, Traffic Operations Technician


WREN
YUMA CT.
RO
CRESCENT
MONICA DR.
DARCEL
S.D.
DARLA
DRIVE
CRES.
STAR CORLISS
TEESWATER
WYEWOOD RD.
AVE.
DRIVE
DARCEL
DELLAPORT DR.
TOPPING RD.
RD.
DUNRANKIN
MISSISSAUGA
Transportation and Works
Traffic Mgmt & Municipal Parking
School Bus Loading Zone
Corliss Crescent
(Ward 5)
SCALE FOR REDUCED DRAWINGS
0m 15m 31m 62m 92m 123m 154m 308m

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/14	Originator's files:
To: Chair and Members of General Committee	
From: Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works	Meeting date: 2019/12/04

Subject
Mississauga City Entrance Signs

Recommendations
1. That the "Welcome to Mississauga" City Entrance Sign design be approved as outlined in the report from the Commissioner of Transportation and Works, dated November 14, 2019 entitled "Mississauga City Entrance Signs".

2. That the Transportation and Works Department install the new "Welcome to Mississauga" City Entrance Signs at municipal roadway entrances to the City.

3. That the Transportation and Works Department report back to General Committee in early 2020 with a plan for implementing Enhanced Entrance Features at strategic City entry locations in Mississauga.

Background
A report was brought forward to General Committee on June 14, 2017, entitled Mississauga Entrance Signs, recommending a project initiative to review municipal roadway entrances to the City and to arrange for updated entrance signs and enhanced entrance features. The original report included a recommended "Welcome to Mississauga" entrance sign design, which was subsequently referred back to staff for further review.

The initiative has since been divided into two distinct project phases; namely the standard "Welcome to Mississauga" City entrance sign retrofit, and the Enhanced Entry Feature phase.

Comments
A Steering Committee was established and the first phase of the project is well underway. A redesign exercise was carried out and staff has consulted with Council stakeholders (Councillors Parrish and Saito) to help identify a recommended entrance sign design. The recommended "Welcome to Mississauga" municipal roadway entrance sign is attached as Appendix 1.

Once the new entrance sign design is approved by Council, staff will arrange for sign manufacture and installation. It is anticipated that the new entrance sign installations will begin in early 2020.

Enhanced Entrance Features Project

The second phase of the project will include a review of Enhanced Entrance Features (referred to as Gateway and Secondary Entrance Signs in the June 14, 2017 report). The review will include identifying potential locations, developing a strategy to implement enhanced entrance features, outlining the specific features and developing cost estimates. Staff is developing a plan to deliver this initiative and will report back in the first quarter of 2020 with details on its scope and project timelines.

Financial Impact

Cost for the manufacture and installation of the "Welcome to Mississauga" municipal roadway entrance signs are estimated to be $30,000, and can be accommodated in the 2020 Operating Budget.

An existing capital budget of $600,000 (PN# 18182) has been approved for the design and delivery of enhanced entrance features and an additional $500,000 has been committed in the 2020 Capital Budget as Secondary Entrance Signs (subject to council approval), for a total of $1,100,000 for this initiative.

Conclusion

The Transportation and Works Department, with the support of Council stakeholders, recommends that the new design for the "Welcome to Mississauga" municipal roadway entrance signs be approved as outlined in this report.

Transportation and Works Department staff will report to General Committee in the first quarter of 2020 with a more detailed plan on how the Enhanced Entrance Sign Project will be delivered.

Attachments

Appendix 1: "Welcome to Mississauga" City Entrance Sign

Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Prepared by: Maxwell Gill, C.E.T., Supervisor of Traffic Operations

APPENDIX 1

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/13	Originator's files:
To: Chair and Members of General Committee	
From: Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works	Meeting date: 2019/12/04

Subject

MiWay – University of Toronto at Mississauga (UTM) – Universal Transit Pass Program 2020/2021-2023 Agreement

Recommendation

1. That the Commissioner of Transportation and Works and the City Clerk be authorized to execute the Universal Transit Pass Agreement between the City, the Governing Council of the University of Toronto (the "University") and Erindale College Student Union (the "UTMSU"), including such ancillary documents and amending agreements as may be required to give further effect to the intended relationships of the parties, in a form satisfactory to Legal Services.

2. That Schedule B-3 (Transportation and Works – MiWay Fares) of the User Fees and Charges By-law 0156-2019 be amended to reflect a Universal Pass (U-Pass) annual fee of two hundred and fifty seven dollars and twenty eight cents ($257.28) in September 2020 for the fall/winter term and to reflect the one-time replacement fee of one hundred and twenty five dollars ($125).

3. That Schedule B-3 (Transportation and Works – MiWay Fares) of the User Fees and Charges By-law 0156-2019 be amended to reflect a Universal Pass (U-Pass) annual fee of one hundred and fifty four dollars and fourteen cents ($154.14) in May 2021 for the summer U-Pass term and a one-time replacement fee of seventy dollars ($70).

4. That all necessary by-laws be enacted.

Report Highlights

- MiWay staff in partnership with the University of Toronto's Mississauga Campus UTMSU, has in place a U-Pass agreement until April 30, 2020 for the fall/winter term and until August 31, 2020 for the summer term.

- Building on the success of the U-Pass program over the past thirteen years, MiWay seeks Council approval for a new three year U-Pass agreement with UTM from September 2020 to August 2023.
- A U-Pass price increase of 5% (equivalent to 5 cents per day) was agreed upon by UTM members for both the fall/winter and the summer terms beginning September 2020 to August 30, 2023.
- MiWay will work together with UTM to review and agree on the terms for moving the U-Pass from a paper U-Pass card to the PRESTO farecard during the term of this agreement.

Background

MiWay staff in partnership with the University of Toronto's Mississauga Campus UTMSU, has in place a 3 year U-Pass contract until August 31, 2020. This contract includes full-time and part-time undergraduates and full-time graduates who attend UTM for the 8-month term (September to April), and full-time and part-time undergraduates who attend the summer 4-month term (May to August).

U-Pass programs, being universal by nature, require mandatory participation by all members and therefore 15,735 students are part of the eight month U-Pass program for the 2019/2020 academic year and 7,400 students were part of the summer program for 2019. The U-Pass price for the current year is set at $245.03 per student for the fall/winter term and $146.80 for the summer term. The existing agreement provided an incremental increase during each year of the agreement.

Comments

MiWay's experience with the U-Pass program at UTM has shown it is beneficial for the community. For the students it reduces transportations costs, creates new and convenient travel options and makes it cheaper and easier to use transit more often for school, errands and social outings. Our goal is to encourage students to continue to use transit after they graduate. Benefits for the transit system and City include ridership growth, and reduced fare administrations costs. The community benefits from reduced automobile traffic which leads to a healthier community.

Building on the success of the U-Pass program with UTM over the past thirteen years, staff worked closely with UTM student representatives to explore the possibility of continuing the relationship to provide students with both a fall/winter and summer U-Pass for three additional years.

Based on discussions with UTM representatives, MiWay is recommending a new three year U-Pass agreement beginning September 1, 2020 until August 30, 2023 that includes both

fall/winter and summer school terms. The U-Pass pricing will increase five percent (equivalent to 5 cents per day) each fall/winter and summer term. This pricing strategy is similar to other U-Pass programs in Ontario in that it strives to maintain a balance between affordable transit for students and a reasonable cost recovery for Mississauga taxpayers. MiWay's UTM U-Pass is currently below the average price of a U-Pass price in Ontario; however, the annual increases throughout this next agreement will bring the price closer to that of the average in Ontario. Comparative U-Pass pricing in Ontario is provided in Appendix 1.

Students will also be permitted a one-time replacement U-Pass.

U-Pass on PRESTO

UTM representatives inquired about using the PRESTO farecard instead of a paper pass during the new U-pass term. MiWay staff consulted with Metrolinx and PRESTO to gain a better understanding of the required process and timelines for implementation. Staff advised that there is an existing technical solution, which allows the students to add the U-Pass remotely on a PRESTO farecard through the PRESTO website. UTM will be required to automatically add eligible students through the PRESTO portal using a PRESTO online website for third parties.

At this time the University of Toronto has privacy policies which need to be further discussed to adopt the use of the PRESTO farecard for the U-pass program. In addition, further costs are associated with moving to the PRESTO farecard which include the cost of the card, commission and HST costs. Therefore moving to a PRESTO U-Pass program requires further review and discussions with UTM before it can be adopted.

As a part of the new U-Pass agreement, MiWay has included the option to move the U-Pass to the PRESTO farecard with a price increase to a maximum of 9% for both fall/winter and summer terms to support additional PRESTO costs for the remaining years of the agreement. Staff will report back to Council when more information and details on the PRESTO-enabled U-Pass program become available.

Hamilton Street Railway has adopted U-Pass on PRESTO for students attending McMaster University.

Strategic Plan

The U-Pass program encourages transit ridership leading to improvements in transportation, the environment and the health of the community. This program achieves several of the City's strategic goals by contributing to the following pillars:

Developing a Transit Orientated City

- encouraging environmental responsibility

Living Green

- promoting a green culture

Ensuring Youth, Older Adults and New Immigrants Thrive

- ensure affordability and accessibility for youth
- attract and retain youth

Financial Impact

There are no financial impacts resulting from the recommendations in this report.

The U-Pass fee charged to UTM students is set at an amount that results in a substantial savings for students compared to other MiWay fare options. MiWay establishes the price of the U-Pass based on the following:

- a discount from the current adult and student fare price
- a target of 47% cost recovery to operate routes servicing the University
- comparisons with other U-Pass programs in Ontario

The 2020-2023 Universal Transit Pass Agreement specifies the price of the U-Pass for each academic year as follows:

- 2020/2021 fall/winter term – U-Pass fee of $257.28
- 2021 summer term – U-Pass fee of $154.14
- 2021/2022 fall/winter term – U-Pass fee of $270.15
- 2022 summer term – U-Pass fee of $161.85
- 2022/2023 fall/winter term – U-Pass fee of $283.65
- 2023 summer term – U-Pass fee of $169.94

A replacement fee for a lost, stolen or damaged U-Pass card is also outlined in the Universal Transit Pass Agreement. A single replacement is allowed at $125 for each fall/winter term and $70 for each summer term.

In the fall/winter 2020/2021 academic year enrolment is projected to be 16,500 students. In the first year, with a U-Pass fee of $257.28 per student, the estimated revenue expected from the program in 2021 is $4,245,120. The 2021 summer term enrolment is projected to be 7,800 students at a U-Pass fee of $154.14 it will provide $1,202,292 in revenue for MiWay.

Conclusion

The U-Pass program continues to grow in Mississauga and other communities across Canada. It is supported by the students, post-secondary school administrators, transit systems and local communities. The U-Pass experience provides significant benefits to all groups in meeting community transportation challenges.

Attachments

Appendix 1: Comparative U-Pass programs in Ontario

Geoff Wright, P. Eng., MBA, Commissioner of Transportation and Works

Prepared by: Margaret Johnston, Supervisor of Transit Revenue

Appendix 1

Ontario U-Pass Comparative Programs

2019/2020 Values

U-Pass comparative programs in Ontario

Program rank by cost	**Post-Secondary Education Institution**	Area	**2019/2020 8-month UPass equivalent**	**2019 Summer UPass equivalent**
1	Conestoga College	Kitchener	$600	$300
2	Carleton University	Ottawa	$425	$213
3	Ottawa University	Ottawa	$425	$213
4	Algoma University; Sault College	Sault Ste. Marie	$368	$184
5	Lambton College	Sarnia	$348	$174
6	Trent University	Peterborough	$295	-.-
7	University of Guelph	Guelph	$290	$145
8	Niagara College	Niagara Region	$280	$140
9	University of Ontario Institute of Technology (UOIT)	Oshawa	$278	$139
10	Durham College	Oshawa	$278	$139
11	Trent University	Durham	$278	-.-
12	University of Western Ontario	London	$263	-.-
13	Brock University	St. Catharines	$259	-.-
14	Fanshawe College	London	$259	$129
15	Sir Sanford Fleming College	Peterborough	$256	$142
16	McMaster University	Hamilton	$252	-.-
17	**University of Toronto (Mississauga)**	**Mississauga**	**$245**	**$138**
18	Canadore College	North Bay	$231	-.-
19	Mohawk College	Hamilton	$206	-.-
20	Laurentian University	Sudbury	$200	-.-
21	Nipissing University	North Bay	$199	-.-
22	Lakehead University	Thunder Bay	$199	-.-
23	University of Waterloo	Waterloo	$188	$94
24	Wilfrid Laurier University	Waterloo	$188	$94
25	Georgian College	Barrie	$172	$86
26	Redeemer University College	Ancaster	$172	-.-

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/05

To: Chair and Members of General Committee

From: Paul Mitcham, P. Eng, MBA, Commissioner of Community Services

Originator's files:

Meeting date: 2019/12/04

Subject

Mississauga Digital Gateway Signage Community Partnership Program with Van Horne Outdoor LP - Proposed Extended Signage Inventory

Recommendation

1. That a by-law be enacted to authorize the Commissioner of Community Services and the City Clerk or their respective designate, on behalf of The Corporation of the City of Mississauga, to execute an amendment to the current Master Outdoor Advertising Agreement with Van Horne Outdoor LP (VHO) to add three new proposed locations for digital signs to the existing agreement, with the condition that VHO has obtained all required permits or approvals from the respective owner of each location to construct such digital signs, including all necessary agreements and documents ancillary thereto, in a form satisfactory to Legal Services.

2. That all necessary by-law(s) be enacted.

Report Highlights

- VHO has presented to the City a proposal to extend the existing Master Outdoor Advertising Agreement entered into on March 13, 2018 and amended on May 31, 2019, between the City and VHO to include an additional four (4) digital signs at three (3) new locations on CP Rail corridors operated by Metrolinx, not under the City's jurisdiction.
- VHO will follow the City's Corporate Policy 03-09-01 "Placing Advertisement with the City." The allotted screen time to the City in the current agreement will be extended to these additional signs to be used for community messaging.

Background

Canadian Pacific Railway ("CP") and All Vision entered into a Limited Partnership, VHO, to develop digital signs along CP's federally regulated right-of-way. The City currently has a Master Outdoor Advertising Agreement with VHO in which VHO will install up to twenty (20) digital screens at ten (10) locations. VHO is currently in construction phase with the first 10 overpass bridge facings scheduled for completion by the end of 2019.

VHO has offered to provide the City of Mississauga with additional benefits by including 4 more digital signs at 3 new locations into the existing Master Outdoor Advertising Agreement by including permanent City branding as well as advertising time for City messaging. Proposed extended signage locations are at: (1) Derry Road north of Millcreek Drive; (2) Erin Mills Parkway south of Mississauga Road and (3) Dundas Street west of Cawthra Road. This expansion will bring their Mississauga program and inventory to completion.

Comments

This extension to the partnership continues to benefit the City by increasing communication channels with residents and visitors and providing additional exposure for the City brand in the community. The time allotment to the City time on the digital signs will allow for general community updates; promotion of City services, programs and events; transit updates; and emergency messaging. This amendment for the 3 new locations will fall under the same terms and conditions as the master agreement. This proposed expanded signage inventory will complete the implementation of the Digital Gateway Signage Community Partnership Program with VHO.

Financial Impact

VHO continues to be responsible for all capital and operating costs related to this program. This extension has no direct financial impact to the City. The indirect financial impacts include potential revenue from increased participation in City offerings due to advertising and increased sponsorship revenue with these additional advertising tactics.

Conclusion

Stakeholder considerations have been satisfactorily addressed by VHO. The proposed extended signage will further benefit the City by increasing communication channels with residents and visitors and increasing City branding. These benefits will help the City further its Strategic Plan through supporting the pillars of Move, Belong, and Connect.

Attachments

Appendix 1: New Locations – Proposed Extended Signage Inventory

Paul Mitcham, P. Eng, MBA, Commissioner of Community Services

Prepared by: Tim Sullivan, Manager, Business & Marketing Solutions, Recreation

List of locations with diagrams – Proposed Extended Signage Inventory Appendix 1

Two (2) Digital Bridge Signs at Derry Road north of Millcreek Drive

Derry Road, north of Millcreek Drive Northeast Facing

Derry Road, north of Millcreek Drive Southwest Facing

List of locations with diagrams – Proposed Extended Signage Inventory Appendix 1

One (1) Digital Billboard Sign - Erin Mills Parkway, north of Millcreek Drive

Erin Mills Parkway, Southbound

Erin Mills Parkway, Northbound

List of locations with diagrams – Proposed Extended Signage Inventory Appendix 1

One (1) Digital Billboard Sign - Dundas Street East, west of Cawthra Road

Dundas Street, Eastbound

Dundas Street, Westbound

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/25	Originator's files:
To: Chair and Members of General Committee	
From: Paul Mitcham, P. Eng, MBA, Commissioner of Community Services	Meeting date: 2019/12/04

Subject
Renaming of Fallingbrook Community Park (P-347) to "Fr. Angelos Saad Park" (Ward 6)

Recommendation
1. That General Committee consider, for a period of 30 days, the request to rename "Fallingbrook Community Park" (P-347) to "Fr. Angelos Saad Park";

2. That Community Services staff be directed to provide notice as set out in the "Facility Naming" Corporate Policy 05-02-02 of the proposed renaming of "Fallingbrook Community Park P 347)" to "Fr. Angelos Saad Park";

3. That General Committee waive the requirement that an individual be honoured posthumously as outlined in the City's "Facility Naming" Corporate Policy 05-02-02.

Background
In accordance with the City's "Facility Naming" Corporate Policy 05-02-02, the Community Services Department is directed to present names for the General Committee and Council's consideration for the purposes of naming parks, trails, and facilities in the City of Mississauga. In accordance with the policy, General Committee is requested to consider the recommended name presented by the Community Services Department for a period of 30 days, after which the Committee is asked to make a final recommendation to Council.

The subject report outlines the request for "Fallingbrook Community Park" located at 5135 Fallingbrook Drive to be renamed "Fr. Angelos Saad Park".

Comments
Reverend Father Angelos Mikhail Saad, known by his community simply as Fr. Angelos, was born in Egypt in 1950. A high academic achiever, he graduated from the University of Alexandria Faculty of Medicine, in 1973. While training to become a Pediatrician, he was called

into the ministry of Priesthood, leaving behind his medical practice to pursue a journey as a spiritual father. He was ordained a priest in Alexandria in 1978 at the hands of the late Pope and Patriarch of the Coptic Orthodox Church, His Holiness Pope Shenouda III. After his ordination, Fr. Angelos established the first Coptic hospital in Alexandria, Egypt as well as a senior's home. He also oversaw the expansion of the Church of St. Takla Hemaniout in Alexandria. In 1989, he relocated to Canada.

Fr. Angelos has lived in Mississauga since September 1989. During this time, he has overseen a growth in the population of the Coptic community in Mississauga and the surrounding cities and towns, including the establishment of nine churches and a retreat center in Mono, Ontario. Reverend Fr. Angelos currently leads 10 priests serving 15,000 families.

As a keen proponent of impacting his local community, Fr. Angelos has worked on securing affordable housing. He spearheaded the establishment of the Aghabi Non Profit Housing for low income families in Mississauga. In 1994, he also established the Anba Abraam Charity (AAC), which today serves over 22,000 people living in impoverished conditions in Canada and overseas. AAC currently operates three foodbanks in Mississauga.

Fr. Angelos has also made significant community contributions by providing children with educational opportunities. In Mississauga, he established two schools, Philopateer Christian College from pre-JK to grade 12 (300 students) and the Mississauga Christian French school (100 students) as well as two daycare centers (200 + children). Philapoteer Christian College was recently recognized as the Diamond Winner in the category of Best Private School in the Mississauga News' Readers' Choice 2019.

He is the chairman of the Board of Directors of various organizations. He has assisted in the establishment of over ten churches and associated community centres throughout Ontario. Currently he is establishing two youth centres and churches to focus the service for young couples and youth in Mississauga.

Fr. Angelos was a long-time volunteer faith leader on rotation for coverage at the Trillium Hospital in the pastoral care, always eager to visit the sick and in need in the hospital of all faiths.

In accordance with the City's "Facility Naming" Corporate Policy, City staff undertook research and confirmed that renaming Fallingbrook Community Park to "Fr. Angelos Saad Park" is an appropriate tribute that recognizes the contributions of Reverend Fr. Angelos Saad to Mississauga extending for more than 30 years.

In accordance with the City's "Facility Naming" Corporate Policy, the recommended park renaming is also consistent with the selection criteria which gives preference to names that "reflect the geographic location" of the park. The park proposed to be renamed is in close proximity to The Virgin Mary and Saint Athanasius (VMSA) Coptic Church, located at 1245

Eglinton Ave W, Mississauga. The church is an architectural beacon in the community and the City at large.

The Ward 6 Councillor supports the recommended park renaming.

Financial Impact

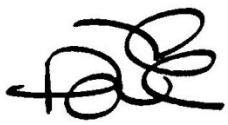
Using the Council approved Official Opening and Event categories, this event falls under Category C: Openings and Events with No Capital Budget. A small ceremony for plaque unveiling will be planned for the spring of 2020. The budget of up to $5,000 for the naming plaque and up to $10,000 for two new park entrance signs will be absorbed through existing Parks, Forestry, & Environment capital budget in PN 16328.

Conclusion

The proposed renaming of 'Fallingbrook Community Park' (P-347) in Ward 6 as "Fr. Angelos Saad Park" is in accordance with the City's "Facility Naming" corporate policy and should be considered by General Committee for approval 30 days as per the policy.

Attachments

Appendix 1: Location of Park 347

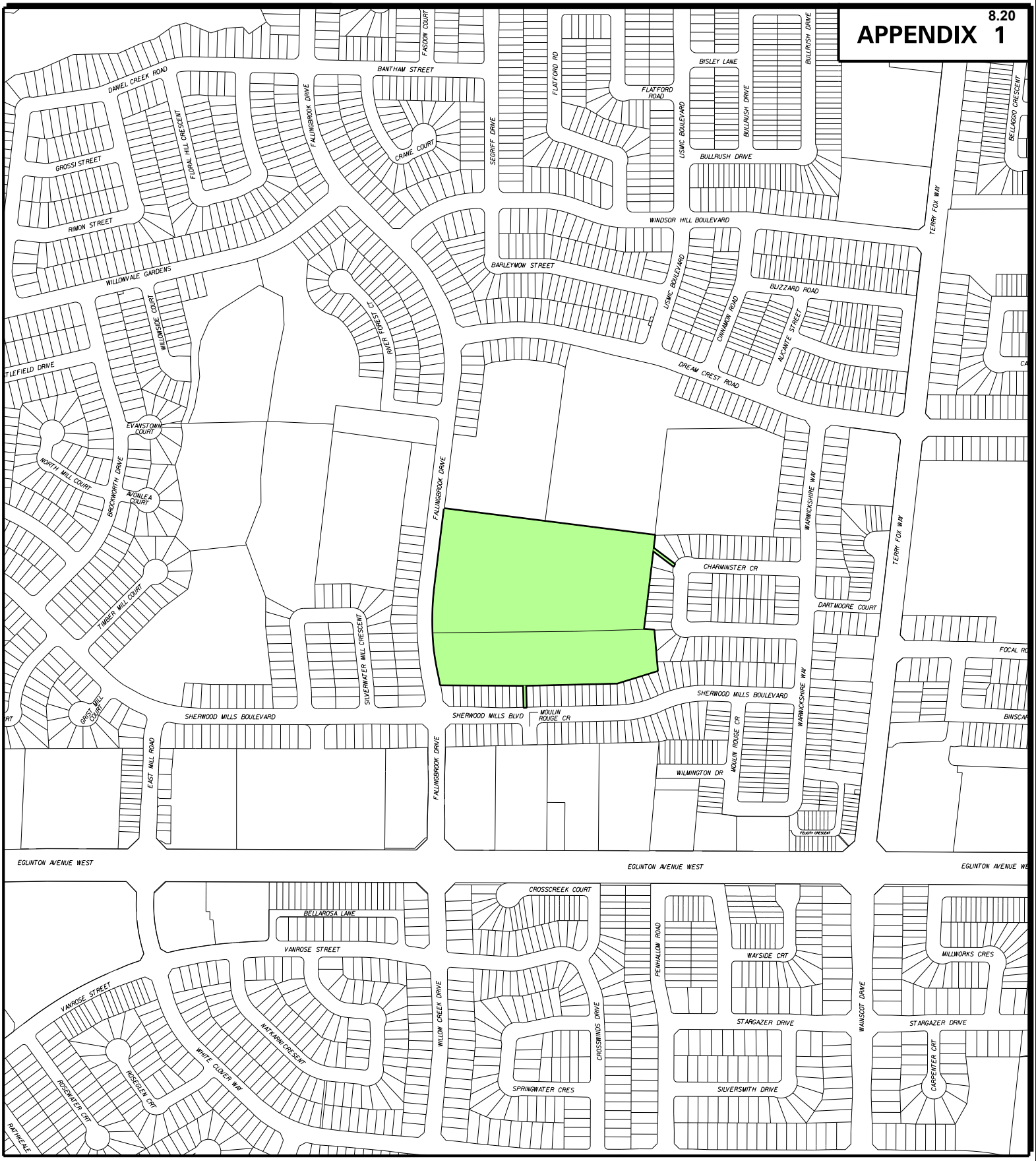


Paul Mitcham, P. Eng, MBA, Commissioner of Community Services

Prepared by: Olav Sibille, Team Leader, Long-Term Planning, Park Planning

8.20

APPENDIX 1



Location Map for P-347

Subject Property Fallingbrook Community Park

Produced by CPS-IT, Geospatial Solutions

FILE NUMBER:
P-347

SCALE:

0 10 50 100m
0 50 200 500ft

MISSISSAUGA

I:\cadd\Projects\ReportMaps\196578 Fallingbrook Park Renaming Map_RPT\Vector\FallingbrookRenamingToFatherAngelosSaad.dgn

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 11/18/2019	Originator's files:
To: Chair and Members of General Committee	
From: Gary Kent, CPA, CGA, ICD.D Commissioner of Corporate Services and Chief Financial Officer	Meeting date: 12/4/2019

Subject

2019 Third Quarter Financial Update

Recommendation

1. That the "2019 Third Quarter Financial Update" report dated November 18, 2019, from the Commissioner of Corporate Services and Chief Financial Officer, including appendices, be approved.
2. That up to $415,000 of the year-end surplus for Operating Budget Reserve Requests be approved for transfer to the Fiscal Stability Reserve (#30125) as listed in Appendix 2.
3. That any 2019 corporate operating surplus, in excess of $415,000 be allocated as follows:
    a. That up to $4,150,000 of the identified surplus be allocated to the Tax Capital Reserve Fund (#33121);
    b. That up to $2,400,000 of the identified surplus be allocated to the Insurance Reserve Fund (#34161);
    c. That up to $1,500,000 of the identified surplus be allocated to the Fiscal Stability Reserve Fund (#30125);
    d. That up to $170,000 of the identified surplus be allocated to the Building Permit Revenue Stabilization Reserve Fund (#30161);
    e. That up to $80,000 of the identified surplus be allocated to the Employee Benefits Reserve Fund (#37122).
4. That any 2019 year-end Stormwater operating program surplus be transferred to the Stormwater Pipe Reserve Fund (#35993).
5. That the 2019 budget adjustments listed in Appendix 3 be approved.

6. That the Treasurer be authorized to fund the capital projects as identified in Appendix 4, Ward Specific Projects from the Tax Capital Reserve Fund (#33121).
7. That the 2020 Budget be amended to add 58 FTE and $4,000,102 to the Gross Operating Expense budget of the Culture Division, offset by a budgeted external recovery of $4,000,102 from the LAC.
8. That the necessary by-laws be enacted.

Report Highlights

Operating Summary, excluding Stormwater

As of September 30, 2019, the City is forecasting a year-end surplus of $8.3 million. This represents 0.95% of the City's gross operating budget.

- This report details Operating Budget Reserve Requests totalling $415,000 for 2019 that will be spent in 2020.

Stormwater Financial Summary

Operating Summary

- As of September 30, 2019, the City is forecasting that the Stormwater operating program will have a $0.1 million surplus, mainly due to lower exemption and credit application volume.

Background

In accordance with the Budget Control By-law, the Finance Division provides Council with a review of the City's financial position a minimum of two times a year. This report covers information related to the Operating Program variances, Budget Adjustments and Reserves & Reserve Fund transfers. On May 1, 2019, Council approved a revised net operating budget of $510.9 million for 2019.

Comments

This report summarizes:

Part 1.1 – Operating Forecast

Part 1.2 – Stormwater Financial Summary

Part 2 – Operating Budget Reserve Requests

Part 3 – Operating Budget Adjustments

Part 4 – Reserves and Reserve Funds

Part 5 – Ward Specific Projects

Part 6 – 2020 Budget Amendment - Living Arts Centre Staff

PART 1.1: OPERATING FORECAST

Based on actual results at September 30, 2019, staff forecast that the City will end the year with a surplus of $8.3 million or 0.95% of the 2019 gross operating budget. The following chart summarizes the forecasted year end operating budget variances by service area. Details are provided in Appendix 1-1, Operating Forecast Details by Service Area.

Service Area ($ Millions)	Net Budget	Year End Forecast	Year End Variance
			$ Surplus/ (Deficit)
Fire & Emergency Services	114.6	111.4	3.2
MiWay	87.1	84.0	3.1
Roads	64.1	62.8	1.3
Parks, Forestry & Environment	36.6	36.3	0.3
Financial Transactions	34.6	42.4	(7.8)
Business Services	32.4	31.5	1.0
Information Technology	30.0	30.2	(0.2)
Mississauga Library	28.1	27.1	1.0
Recreation	27.8	23.3	4.5
Facilities & Property Management	23.7	23.5	0.2
City Manager's Office	11.7	12.6	(0.9)
Land Development Services	9.7	6.9	2.8
Culture	7.1	7.2	(0.0)
Mayor & Council	5.0	5.0	0.0
Regulatory Services	0.7	0.1	0.6
Legislative Services	(2.3)	(1.6)	(0.7)
City	**510.9**	**502.6**	**8.3**

Note: Numbers may not add due to rounding.

Year-End Operating Result Highlights - The major areas of variance from the budget are highlighted below, with further details provided in Appendix 1-1 Operating Forecast Details by Service Area:

Fire and Emergency Services

- Fire & Emergency Services is forecasting a favourable variance of $3.2 million:

- Labour is forecasted to have a $4.1 million favourable variance mainly due to unfilled vacancies in Suppression and Fire Prevention.
- Revenues are projected to be higher than budgeted by $0.4 million due to an increase in number of false alarms, elevator calls and vehicle accidents.
- A transfer of $1.3 million from the Public Safety Fire Program Reserve Fund will be deferred to match the actual expenditures, which results in an offset to the favourable variance.

MiWay

- MiWay is forecasting a net favourable variance of $3.1 million:
  - Expenditures are forecasted to have a favourable variance of $4.2 million due to better diesel pricing and an efficient management of utilities, equipment and marketing expenses.
  - An offsetting unfavourable variance of $1.1 million is forecasted due to a shortfall from bus shelter advertisement and a deferred budgeted transfer from reserve due to favourable diesel costs.

Roads

- Roads is forecasting a net favourable variance of $1.3 million:
  - Revenue surplus of $1.7 million is primarily driven by projected better than budgeted revenues from developer application fees and increased recoveries from internal/external parties.
  - Expenditures account for an unfavourable variance of $0.5 million due to a projected increase in contract cost for utility maintenance.

Financial Transactions

- Financial Transactions is forecasting a deficit of $7.8 million:
  - A budgeted transfer of $7.9 million from the Insurance Reserve Fund will be deferred until claims expenditures are incurred.
  - Unfavourable variances in higher tax cancellations due to volume of appeals and severance costs are offset by additional PILT (mainly hydro properties) and other taxation revenues.

Business Services

- Business Services is forecasting a favourable variance of $1.0 million:
    - Expenditures are projected to have a favourable variance of $0.4 million due to savings from professional services, material, supplies and other operating cost.
    - Labour is projected to result in a favourable variance of $0.7 million primarily due to labour gapping in various units of the service area.
    - Revenues are forecasted to have unfavourable variance of $0.2 million, mainly driven by reassessment of Gas Tax eligibility and lower than expected Provincial Offences Act (POA) revenue volumes.

Mississauga Library

- Mississauga Library is forecasting a favourable variance of $1.0 million.
    - This variance is primarily due to vacancies.

Recreation

- Recreation service is forecasting a favourable variance of $4.5 million:
    - The majority of the variance is primarily due to vacancies, maternity leaves, salary differential for replacement hires and Paramount staffing transition, totalling $3.1 million
    - Revenues are forecasted to result in a favourable variance of $1.1 million, primarily driven by higher than budgeted program and room rental revenues.
    - Expenditures are expected to be favourable by year-end with a variance of $0.3 million due to better utility management and lower contract costs.

Land Development Services

- Land Development Services is forecasting a favourable variance of $2.8 million:
    - A surplus of $2.0 million in revenues is projected due to an increase in volume for site plan applications, rezoning and subdivision fees.
    - Labour surplus of $0.8 million due to vacancies provides the balance of the favourable variance.
    - Building permit revenues is forecasted to exceed the budget by $2.8 million. In accordance with the City's reserve policy, this revenue surplus can be transferred to the Building Permit Revenue Stabilization Reserve Fund at year end to offset any future revenue shortfall. As such, the surplus of $2.8 million does not contribute to the overall City surplus.

Other Service Areas

- All other services are forecasting a net unfavourable variance totalling $0.8 million.
    - These pressures come from increased contract costs, higher levels of maintenance cost for various parks and city buildings, IT equipment (VCOM infrastructure) and licensing costs and higher than budgeted legal cost.
    - POA revenues are projected to be lower due to a drop in pay tickets issued in Mississauga.

Proposed 2020 Budget Adjustments as a result of 2019 actual variances

As part of the on-going budget process, staff track variances and have made appropriate adjustments to the 2020 Business Plan and Budget, seen in the table below. The identified revenues have been increased by $3.3 million while the expenses have been reduced by $0.5 million, with a net reduction of $3.7 million included in the 2020 Proposed Budget.

Service Areas	Increase / Reduction	Details	2020 Budget Adjustments $ Millions
Expense			
MiWay	Reduction	Reduce cost of utilities as a result of better management	(0.3)
Legislative Services	Reduction	Low Adjudicator costs due to less recoveries from APS Enforcement	(0.2)
Total Expenses Decrease			**(0.5)**
Revenues			
Financial Transactions	Increase	PILT and Other Taxes	(2.0)
MiWay	Increase	Transit Fare revenue increase (Volume)	(0.5)
Land Development Services	Increase	Permit and Application Revenues	(0.5)
Regulatory Services	Increase	Net impact of TNC Licensing and replacement of the Parking Enforcement system	(0.2)
Parks, Forestry and Environment	Increase	Permits, Site Plan and Filming Fees	(0.1)
Total Revenues Increase			**(3.3)**
Total Net Reduction in 2020 Budget			**(3.7)**

Numbers may not add due to rounding.

PART 1.2: STORMWATER OPERATING FORECAST

Stormwater Operating and Revenue Charge Summary

As of September 30, 2019, the City is forecasting that the Stormwater operating program will have a favourable variance in the amount of $0.1 million. There was a favourable variance for contractor costs due to lower costs in catchbasin cleaning, catchbasin/ Manhole Repairs, ditch/culvert repairs, storm sewer repair/spills and in professional services and consulting. The favourable surplus in operating expenses is partially offset by the unfavorable variance due to credits for changes in billing units.

Further details are provided in Appendix 1-2, Revenue Charge and Operating Details for Stormwater.

PART 2: OPERATING BUDGET RESERVE REQUEST

The accounting principles used by the City require that expenditures for goods and services be recorded when received. At year-end, there are some legally binding obligations for goods and services ordered prior to year-end and that are not received. Appendix 2 of this report details Operating Budget Reserve Requests totalling $415,000 for 2019 that will be spent in 2020.

PART 3: OPERATING BUDGET ADJUSTMENTS

According to the Budget Control Bylaw, all inter-program adjustments require Council authorization. Apart from the revision due to Assessment Growth of $292,059 on May 1, 2019, there is no change to the City's net operating budget as a result of these adjustments as these adjustments reallocate budget funds from one program/account to another. Appendix 3, Operating Budget Adjustments by Service Area, details operating budget movements which require approval by Council.

PART 4: RESERVES AND RESERVE FUNDS

The forecasted $8.3 million operating surplus is recommended to be allocated to the following reserves and reserve funds based on their current balances compared to identified targets. Once the final surplus is determined at year end, transfers to the Reserves and Reserve funds will be adjusted accordingly.

Reserve/ Reserve Fund	Recommended Allocation up to
Tax Capital Reserve Fund	$4,150,000
Insurance Reserve Fund	$2,400,000
Fiscal Stability Reserve	$1,500,000
Building Permit Revenue Stabilization Reserve	$ 170,000
Employee Benefits Reserve Fund	$ 80,000
TOTAL	**$8,300,000**

PART 5: WARD-SPECIFIC SPECIAL PROJECTS

On May 22nd, 2019 a motion was passed by Council to establish capital projects up to a total amount of $2 million per ward, to be used at the discretion of each local Councillor for infrastructure projects. Appendix 4 has been included in this report as a status update on established projects. Staff will report regularly on these projects including any new projects or allocations requested by each Councillor.

PART 6: 2020 BUDGET AMENDMENT FOR LIVING ARTS CENTRE STAFF

Effective January 2, 2020, staff previously employed at the Living Arts Centre will be transferred to the City of Mississauga. A 2020 budget amendment is required to add 58 full time equivalents (FTE) and $4,000,102 to the Culture Division's gross operating budget. This amount is estimated for budgetary requirements and includes costs of benefits. Staff are developing operational plans to integrate and align LAC services with the municipal service delivery model and will present a full financial picture of the transition prior to August 2020. All labour costs are planned to be recovered from the Living Arts Centre assuming they meet their revenue targets and have access to their reserves. There is no net impact to the 2020 Budget.

Conclusion

The third quarter financial report outlines the projected results of the corporation with recommended actions.

Attachments

Appendix 1-1 Monitoring
Appendix 1-2 Monitoring
Appendix 2 Operating Budget Reserve Request
Appendix 3 Budget Adjustments
Appendix 4 Ward Specific Projects

Gary Kent, CPA, CGA, ICD.D, Commissioner of Corporate Services and Chief Financial Officer

Prepared by: Ann Wong, Sr. Manager, Business Planning & Reporting

Operating Forecast Details by Service Area

Appendix 1-1
Q3 comments

Fire & Emergency Services

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(3.3)	(2.4)	(0.9)	(27.1%)	$1.3M transfer from reserve fund is deferred due to forecasted labour surplus partially offset by $0.4M increase to false alarms and elevator calls, as well as increased vehicle accidents due to poor weather conditions offsets a portion of the variance
Other Operating Expenses	9.6	9.5	0.0	0.4%	
Labour and Benefits	107.3	103.2	4.1	3.8%	$3.3M favourable labour variance expected due to existing vacancies in suppression and fire prevention. Suppression vacancies are due to retirements and long term absences. Fire prevention vacancies are related to new positions that have not yet been filled.
Total Net Cost before Administrative and Support Costs	**113.6**	**110.3**	**3.2**	**2.8%**	
Administrative and Support Costs	1.1	1.1	0.0	0.0%	On Budget
Total Net Cost	**114.6**	**111.4**	**3.2**	**2.8%**	

Roads

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(14.5)	(16.2)	1.7	11.7%	$0.3M favourable parking revenues. $0.3M favourable variance for developer applications fees. $0.3M favourable variance due to increase recoveries from internal and external parties. $0.8M transfer from reserve for the winter maintenance program.
Other Operating Expenses	46.1	46.6	(0.5)	(1.1%)	$0.9M favourable forecast in hydro costs for streetlighting, primarily resulting from rate rider credit from the Ontario Energy Board. ($0.3M) unfavourable variances in utility maintenance resulting from increase contract costs. ($0.3M) increase transfer to parking reserve. ($0.8M) unfavourable forecast for the winter maintenance program.
Labour and Benefits	32.3	32.2	0.1	0.3%	Favourable labour forecast is a result of gapping due to various vacant positions and better than expected labour recoveries for managing capital projects.
Total Net Cost before Administrative and Support Costs	**63.9**	**62.6**	**1.3**	**2.0%**	
Administrative and Support Costs	0.2	0.2	0.0	0.0%	On Budget
Total Net Cost	**64.1**	**62.8**	**1.3**	**2.0%**	

MiWay

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(92.3)	(91.2)	(1.1)	(1.2%)	($0.9M) unfavourable variance in bus shelter advertising revenue shortfall. ($1.0M) reserve transfer not required due to diesel surplus $0.8M favourable variance in farebox revenue.
Transfers from Reserve	(17.0)	(17.0)	0.0	0.0%	On Budget
Other Operating Expenses	48.7	44.5	4.2	8.6%	$2.5M favourable variance in diesel surplus ($0.90/litre vs $1.01/litre). $1.7M favourable variance in utilities, equipment and marketing costs.
Labour and Benefits	146.1	146.1	0.0	0.0%	On Budget
Total Net Cost before Administrative and Support Costs	**85.5**	**82.4**	**3.1**	**3.6%**	
Administrative and Support Costs	1.5	1.5	0.0	0.0%	On Budget
Total Net Cost	**87.1**	**84.0**	**3.1**	**3.6%**	

Operating Forecast Details by Service Area

Appendix 1-1

Parks, Forestry and Environment

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(4.8)	(5.1)	0.3	5.9%	Favourable variance anticipated for site plan application fees based on historical trends as well as increased internal recoveries as a result of requested tree works on multi-use trails.
Other Operating Expenses	14.3	14.6	(0.3)	(2.3%)	Unfavourable variance is due to significant increases in contractor costs for boulevard maintenance services and tree stumping. Contract unit costs for grass seed, paint, chalk and fertilizer contracts also increased. Increased maintenance requirements for fleet as a result of increased hours worked and required repairs. Variances to be addressed in 2020 budget.
Labour and Benefits	27.3	27.0	0.3	1.1%	Favourable year end variance is due to vacancies, backfills and salary differentials for replacement hires as well as an increase in capital chargebacks.
Total Net Cost before Administrative and Support Costs	**36.7**	**36.4**	**0.3**	**0.7%**	
Administrative and Support Costs	(0.2)	(0.2)	0.0	0.0%	
Total Net Cost	**36.6**	**36.3**	**0.3**	**0.7%**	

Mississauga Library

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(2.0)	(2.0)	0.0	0.0%	On budget.
Other Operating Expenses	6.4	6.5	(0.1)	(1.3%)	$0.1M unfavourable variance primarily due to increased custodial & utility fees.
Labour and Benefits	23.2	22.1	1.1	4.7%	$1M favourable labour variance primarily due to vacancies, partially offset by overspending in temp labour to backfill for essential full time staff vacancies, illness and leaves.
Total Net Cost before Administrative and Support Costs	**27.7**	**26.7**	**1.0**	**3.6%**	
Administrative and Support Costs	0.5	0.5	0.0	0.0%	
Total Net Cost	**28.1**	**27.1**	**1.0**	**3.6%**	

Business Services

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(3.2)	(3.0)	(0.2)	(5.3%)	($170K) unfavourable variance mainly driven by reassessment of Gas Tax eligibility and defaulted POA fine admin fee due to lower POA volume
Other Operating Expenses	4.7	4.3	0.4	8.1%	$380K favourable variance mainly driven by savings from professional services in addition to material and supplies
Labour and Benefits	30.8	30.1	0.7	2.4%	$870K favourable variance from Revenue and MM, HR, and Finance due to gapping offset by ($130K) unfavourable variance in Communications due to 311 business pressure
Total Net Cost before Administrative and Support Costs	**32.4**	**31.4**	**1.0**	**2.9%**	
Administrative and Support Costs	0.1	0.1	0.0	0.0%	On Budget
Total Net Cost	**32.4**	**31.5**	**1.0**	**2.9%**	

Operating Forecast Details by Service Area

Appendix 1-1

Facilities & Property Management

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(0.7)	(0.7)	0.0	0.0%	On Budget
Other Operating Expenses	9.4	9.8	(0.4)	(4.4%)	($400K) unfavourable variance in demand maintenance mainly for plumbing work mandated by Region of Peel, sprinklers inspection and Siamese connection mandated by Ontario Fire Code for buildings over 30 years
Labour and Benefits	16.5	15.9	0.6	3.7%	$600K favourable variance is driven by vacancies and gapping partially offset by overspends in part-time and lower chargebacks due to lower capital spends
Total Net Cost before Administrative and Support Costs	**25.3**	**25.1**	**0.2**	**0.8%**	
Administrative and Support Costs	(1.6)	(1.6)	0.0	0.0%	On Budget
Total Net Cost	**23.7**	**23.5**	**0.2**	**0.8%**	

Recreation

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(50.7)	(51.8)	1.1	2.2%	$1.1M favourable year-end variance anticipated for Programs and Room Rentals.
Other Operating Expenses	22.3	22.0	0.3	1.1%	$0.3M favourable net variance is primarily driven by lower than budget utility and contractor costs.
Labour and Benefits	56.2	53.1	3.1	5.5%	Favourable variance is primarily due to vacancies, maternity leaves, salary differential for replacement hires, of which $1.0M is due to the Paramount transition.
Total Net Cost before Administrative and Support Costs	**27.8**	**23.3**	**4.5**	**16.0%**	
Administrative and Support Costs	0.0	0.0	0.0	0.0%	
Total Net Cost	**27.8**	**23.3**	**4.5**	**16.0%**	

Information Technology

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(1.0)	(1.0)	0.0	0.0%	On Budget
Other Operating Expenses	9.6	9.8	(0.2)	(2.1%)	($200K) Unfavourable variance due to equipment maintenance and licenses mainly driven by Adobe and Region of Peel VCOM and higher than anticipated telephone charges
Labour and Benefits	23.1	23.1	0.0	0.0%	On Budget
Total Net Cost before Administrative and Support Costs	**31.8**	**32.0**	**(0.2)**	**(0.6%)**	
Administrative and Support Costs	(1.8)	(1.8)	0.0	0.0%	On Budget
Total Net Cost	**30.0**	**30.2**	**(0.2)**	**(0.7%)**	

Operating Forecast Details by Service Area

Appendix 1-1

City Manager's Office

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(1.6)	(1.6)	0.0	0.0%	On Budget
Other Operating Expenses	2.4	3.4	(1.0)	(41.4%)	($1M) unfavourable driven by Legal and Contractor Professional Fees.
Labour and Benefits	11.0	10.9	0.1	0.9%	$100K favourable varaince driven by vacant positions in the Legal Department. Working to fill current vacant positions but will take a few months until at full capacity. Gapping from first half of the year expected to remain till Year End.
Total Net Cost before Administrative and Support Costs	**11.7**	**12.6**	**(0.9)**	**(7.7%)**	
Administrative and Support Costs	0.0	0.0	0.0	0.0%	On Budget
Total Net Cost	**11.7**	**12.6**	**(0.9)**	**(7.7%)**	

Land Development Services

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(13.2)	(18.0)	4.8	36.4%	A favourable variance of $4.8M is forecasted based on the revenue surplus at the beginning of the year due to an increase in volume and higher value of building permit applications and increased higher value development applications.
Other Operating Expenses	2.2	5.0	(2.8)	(124.9%)	Unfavourable variance of $2.8M is due to transfer of building permit revenue to the Building Permit Revenue Stabilization Reserve, slightly offset by favourable variances in other operating expenses.
Labour and Benefits	20.6	19.8	0.8	3.9%	Favourable variance of $800K is anticipated due to vacant positions and gapping.
Total Net Cost before Administrative and Support Costs	**9.7**	**6.9**	**2.8**	**28.9%**	
Administrative and Support Costs	0.0	0.0	0.0	0.0%	On Budget
Total Net Cost	**9.7**	**6.9**	**2.8**	**28.9%**	

Culture

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(4.1)	(5.1)	1.0	23.5%	Favourable variance of $0.96M which is primarily due to filming revenue ($0.4M) which is offset against increases to transportation and occupancy expenses and Technical Services internal recovery ($0.3M) for works at Paramount. A one-time grant from Peel Police for Community Events ($0.16M) and a one-time grant for the purchase of a new projector for Meadowvale Theatre also increases the variance ($0.1M).
Other Operating Expenses	5.4	6.3	(0.9)	(16.6%)	Unfavourable variance of $0.9M due to film location related expenses (facility rental and road occupancy costs $0.37M) which are offset by revenue. Also a one-time grant from Peel Police is to be expensed to various festivals (0.16M) and a projector at Meadowvale Theatre which is offset by a one-time grant ($0.1M). The remaining relates to additional equipment rentals required for the Raptors celebrations and additional programming at SAIB ($0.2M).
Labour and Benefits	5.8	5.8	(0.1)	(1.3%)	Unfavourable variance in temp labour for Programming (Arts Review) and an increase for Technical Services (due to the assumption of technical services to Paramount and special unplanned events at MCS); some increases will be offset by revenue and full time labour gapping.
Total Net Cost before Administrative and Support Costs	**7.1**	**7.1**	**(0.0)**	**(0.2%)**	
Administrative and Support Costs	0.0	0.0	0.0	0.0%	
Total Net Cost	**7.1**	**7.2**	**(0.0)**	**(0.2%)**	

Operating Forecast Details by Service Area

Appendix 1-1

Mayor & Council

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	0.0	0.0	0.0	0.0%	On Budget
Other Operating Expenses	0.7	0.7	0.0	0.0%	On Budget
Labour and Benefits	4.2	4.2	0.0	0.0%	On Budget
Total Net Cost before Administrative and Support Costs	**5.0**	**5.0**	**0.0**	**0.0%**	
Administrative and Support Costs	0.0	0.0	0.0	0.0%	On Budget
Total Net Cost	**5.0**	**5.0**	**0.0**	**0.0%**	

Regulatory Services

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(15.3)	(15.6)	0.3	2.1%	Favourable variance as a result of increased parking revenues/APS revenues.
Other Operating Expenses	2.0	2.4	(0.4)	(19.1%)	$0.1M favourable variance in TNC Licensing. ($0.5M) TNC Licensing net operating surplus transfer to reserve
Labour and Benefits	13.8	13.1	0.7	4.8%	$0.7M favourable labour forecast is a result of gapping due to various vacant positions of which $0.4M is for TNC Licensing staff.
Total Net Cost before Administrative and Support Costs	**0.5**	**(0.1)**	**0.6**	**123.2%**	
Administrative and Support Costs	0.2	0.2	0.0	0.0%	On Budget
Total Net Cost	**0.7**	**0.1**	**0.6**	**89.6%**	

Legislative Services

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(10.7)	(9.5)	(1.2)	(11.3%)	($1.2M) Lower than expected POA revenue has been forecasted mainly due to drop in pay tickets issued in Mississauga.
Other Operating Expenses	1.5	1.3	0.2	12.4%	$200K Favourable variance driven by lower Interpreter, Adjudicator costs due to process changes at the Courthouse.
Labour and Benefits	6.9	6.6	0.3	4.3%	$300K favourable variance due to vacancies and gapping.
Total Net Cost before Administrative and Support Costs	**(2.3)**	**(1.6)**	**(0.7)**	**(31.4%)**	
Administrative and Support Costs	0.0	0.0	0.0	0.0%	On Budget
Total Net Cost	**(2.3)**	**(1.6)**	**(0.7)**	**(31.4%)**	

Operating Forecast Details by Service Area

Appendix 1-1

Financial Transactions

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Revenues	(130.1)	(122.4)	(7.7)	(5.9%)	($7.9M) less of transfer from reserve for insurance expenses. ($2.6M) less of transfer from reserve for debt expenses required because of timing differences (offset by surplus debt expense below). $1.7M additional PILT and other taxation revenue. $0.7M more transfer from reserve for sick leave expenses (offset by labour expense below). $0.3 M Ontario Cannabis Legalization Implementation Fund grant. $0.1M additional revenue from sale of assets (offset by transfer to reserve below).
Other Operating Expenses	158.1	156.5	1.6	1.0%	$2.6M surplus debt expense due to timing differences (offset by transfer from reserve above). ($0.6M) unfavourable variance of tax cancellations due to the volume of appeals. ($0.3M) transfer to reserve (offset by Ontario Cannabis Legalization Implementation Fund grant receipt above). ($0.1M) transfer to reserve offset by sale of assets above.
Labour and Benefits	6.7	8.4	(1.7)	(25.6%)	($0.7M) sick leave costs (offset by transfer from reserve above). ($1.0M) unfavourable variance for severance costs.
Total Net Cost before Administrative and Support Costs	**34.6**	**42.4**	**(7.8)**	**(22.5%)**	
Administrative and Support Costs	0.0	0.0	0.0	0.0%	On Budget
Total Net Cost	**34.6**	**42.4**	**(7.8)**	**(22.5%)**	

City Grand Total Net Cost	**510.9**	**502.6**	**8.3**	**1.6%**	

Note: Numbers may not add due to rounding.

Revenue Charge and Operating Details for Stormwater

Appendix 1-2

Item ($ Millions)	2019 Budget	2019 Year-End Forecast	Year-End Variance		Comments and Action Plan
			$ Surplus/ (Deficit)	% of Budget	
Stormwater Revenue	(43.2)	(42.8)	(0.4)	0.9%	Unfavorable variance due to credits for changes in billing units.
Stormwater Exemptions and Credits and Other Fees	2.3	2.3	0.0	0.0%	On Budget
Other Operating Expenses and Contribution to Reserves	35.7	35.3	0.4	1.2%	$0.3M favourable variance for contractor costs due to lower costs in Catchbasin Cleaning, Catchbasin/ Manhole Repairs, Ditch/Culvert Repair, Storm Sewer Repair and Spills. $0.1M in professional services and consulting.
Labour and Benefits	5.1	5.0	0.1	1.6%	Favourable variance is a result of gapping due to various vacant positions and recovery of labour costs.
Total Net Cost	**(0.1)**	**(0.2)**	**0.1**	**193.0%**	

2019 OPERATING BUDGET RESERVE REQUEST

Appendix 2

Service Area	Standard or Special Contract Reference	Supplier	Description of Goods/ Services Ordered	Account Number	Amount $
Human Resources	PO will be issued before 2019 year-end	Metrics@work	Diversity & Inclusion Census Survey	715601-27751	$30,000
Strategic Communications	PO will be issued before 2019 year-end	IT Roster	Performance Measures Dashboard	715601-27778	$200,000
Corp Performance & Innovation	PO#4600017071	CMC	Communication Skills Training	715801-27755	$35,000
Economic Development Office	PO will be issued before 2019 year-end	Frequency Foundry	EDO CRM - Client Information Management System - CRM Enhancements and other reltated expenses	715601-21211 715725-21236 715725-21232	$60,000 $21,000 $7,000
Roads	PO will be issued before 2019 year-end	Selection from IPE Consultant Roster	Uptown Node Transportation Capacity Study	715601-23724	$20,000
Roads	PO# 4500505307	Wood Environment & Infrastructure Solutions	Goreway Drive and Morningstar Drive Streetscape Improvement Study (aka “MyMalton project”).	715601-23724	$42,000
Total					**$415,000**

Operating Budget Adjustments **Appendix 3**

BA Number	Services Area	Description	Amount
5785	Culture	2019 Pos#20004348 from cc 25100 to cc 24839	100,616
	Recreation	2019 Pos#20004348 from cc 25100 to cc 24839	(100,616)
		Total	**0**
5786	Facilities & Property Management	Transit Security Officers Transfer - From Transit to FPM	207,548
	MiWay	Transit Security Officers Transfer - From Transit to FPM	(207,548)
		Total	**0**
5791	Business Services	2018 Year-end OBR (Part-2 of 2 Parts)	0
	City Manager's Office	2018 Year-end OBR (Part-2 of 2 Parts)	0
	Land Development Services	2018 Year-end OBR (Part-2 of 2 Parts)	0
		Total	**0**
5806	City Manager's Office	Move pos#2019-156 from cc 22705 to cc 21938	(104,336)
	Facilities & Property Management	Move pos#2019-156 from cc 22705 to cc 21939	104,336
		Total	**0**
5810	Financial Transactions	Trf Fire Contingency budget from ND 28531	(698,732)
	Fire & Emergency Services	Trf Fire Contingency budget from ND 28532	698,732
		Total	**0**
5814	Financial Transactions	2019 Part Time Labour Budget Allocation	(182,300)
	Roads	2020 Part Time Labour Budget Allocation	182,300
		Total	**0**
5816	Culture	Trf 2019 Part time budget from ND cc 28531 to various CMS	57,700
	Financial Transactions	Trf 2019 Part time budget from ND cc 28531 to various CMS	(1,817,700)
	Parks, Forestry & Environment	Trf 2019 Part time budget from ND cc 28531 to various CMS	397,100
	Recreation	Trf 2019 Part time budget from ND cc 28531 to various CMS	1,362,900
		Total	**0**
5817	Facilities & Property Management	F&PM - Re-org and Transit Security balancing	4,097
	MiWay	F&PM - Re-org and Transit Security balancing	(4,097)
		Total	**0**
5820	Culture	Pylon Signs - Utility Budget adjustment	3,454
	Facilities & Property Management	Pylon Signs - Utility Budget adjustment	3,454
	Parks, Forestry & Environment	Pylon Signs - Utility Budget adjustment	3,452
	Recreation	Pylon Signs - Utility Budget adjustment	15,729
	Roads	Pylon Signs - Utility Budget adjustment	(26,089)
		Total	**0**
5821	Business Services	2019 Ricoh copier reductions - year 1 of 3 year contracted reduction	(3,980)
	City Manager's Office	2019 Ricoh copier reductions - year 1 of 3 year contracted reduction	(1,277)
	Culture	2019 Ricoh copier reductions - year 1 of 3 year contracted reduction	(97)
	Facilities & Property Management	2019 Ricoh copier reductions - year 1 of 3 year contracted reduction	(856)
	Fire & Emergency Services	2020 Ricoh copier reductions - year 1 of 3 year contracted reduction	(16,391)
	Information Technology	2019 Ricoh copier reductions - year 1 of 3 year contracted reduction	44,451
	Land Development Services	2019 Ricoh copier reductions - year 1 of 3 year contracted reduction	(2,413)
	Legislative Services	2020 Ricoh copier reductions - year 1 of 3 year contracted reduction	(4,985)
	Mayor & Members Of Council	2021 Ricoh copier reductions - year 1 of 3 year contracted reduction	(107)
	Mississauga Library	2022 Ricoh copier reductions - year 1 of 3 year contracted reduction	0
	MiWay	2023 Ricoh copier reductions - year 1 of 3 year contracted reduction	(3,694)
	Parks, Forestry & Environment	2024 Ricoh copier reductions - year 1 of 3 year contracted reduction	(1,308)
	Recreation	2019 Ricoh copier reductions - year 1 of 3 year contracted reduction	(2,137)
	Regulatory Services	2019 Ricoh copier reductions - year 1 of 3 year contracted reduction	(1,881)
	Roads	2019 Ricoh copier reductions - year 1 of 3 year contracted reduction	(5,325)
	Stormwater	2019 Ricoh copier reductions - year 1 of 3 year contracted reduction	0
		Total	**0**
5822	Business Services	ROGERS reduction	(3,949)
	City Manager's Office	ROGERS reduction	(2,374)
	Culture	ROGERS reduction	(1,316)
	Facilities & Property Management	ROGERS reduction	(3,788)
	Fire & Emergency Services	ROGERS reduction	(14,103)
	Information Technology	ROGERS reduction	149,923
	Land Development Services	ROGERS reduction	(7,130)
	Legislative Services	ROGERS reduction	(231)
	Mayor & Members Of Council	ROGERS reduction	(852)
	Mississauga Library	ROGERS reduction	(692)

Operating Budget Adjustments **Appendix 3**

BA Number	Services Area	Description	Amount
	MiWay	ROGERS reduction	(6,428)
	Parks, Forestry & Environment	ROGERS reduction	(18,651)
	Recreation	ROGERS reduction	(8,587)
	Regulatory Services	ROGERS reduction	(5,069)
	Roads	ROGERS reduction	(76,753)
		Total	**0**
5940	Facilities & Property Management	2019 FPM Recovery adjustment - fr 21938 to 28531	89,736
	Financial Transactions	2020 FPM Recovery adjustment - fr 21938 to 28531	(89,736)
		Total	**0**
6050	Financial Transactions	2019 Tax Ratio Report Adjustment	292,059
		Total	**292,059**
7072	MiWay	TW 2019 labour gapping	(72,813)
		Total	**(72,813)**
7073	Fire & Emergency Services	CMS 2019 labour gapping	(62,313)
	Mississauga Library	CMS 2019 labour gapping	(30,745)
	Parks, Forestry & Environment	CMS 2019 labour gapping	(24,614)
	Recreation	CMS 2019 labour gapping	(18,481)
		Total	**(136,153)**
7074	Business Services	CPS 2019 labour gapping	71,444
	Facilities & Property Management	CPS 2019 labour gapping	73,797
	Information Technology	CPS 2019 labour gapping	62,618
	Legislative Services	CPS 2019 labour gapping	30,212
		Total	**238,071**
7075	Land Development Services	PB 2019 labour gapping	(29,104)
		Total	**(29,104)**
7169	Business Services	Contract FTE funded from IT Capital S4 Hanna	116,614
	Information Technology	Contract FTE funded from IT Capital S4 Hanna	336,228
	IT Capital Project	Funded from IT Capital S4 Hanna	(452,842)
		Total	**0**
Grand Total		**Grand-Total**	**292,059**

Appendix 4

Ward-Specific Special Projects

Ward	Project status	Project Number	Project Name	Approved Net Cost ($000)
Ward 3	New Request	A19183	Noise Wall - Rathburn Road E Behind (1543 - 1591) Bryce Road	429.3
Ward 3	New Request	B19183	Noise Wall - Rathburn Road E Behind (1662 - 1608) Anworld Court & Behind (1508 - 1528) Grazia Court	310.3
Ward 5	New Request	19351	AVRO Arrow	500.0
Ward 6	New Request	19351	AVRO Arrow	100.0
Ward 10	New Request	A19352	Spray Pad - Lisgar Green Park (P-310)	544.0
Ward 10	New Request	B19352	Spray Pad - Jim Murray Community Park (P-477)	544.0
Ward 10	New Request	C19352	Washroom - Tobias Mason Park (P-385)	425.0
Ward 10	New Request	A19200	Speed Humps , Ward 10	50.0
Ward 10	New Request	A19189	Raised Pedestrian Crossover – at Osprey Boulevard, connecting Lisgar Meadowbrook Trail	40.0
Ward 10	New Request	B19189	Raised Pedestrian Crossover– at Churchill Meadows Boulevard, connecting pathway just north of Lacman Trail	40.0
Ward 11	New Request	19351	AVRO Arrow	100.0
Ward 11	New Request	19182	Banner Poles- Streetsville	15.0
Ward 11	New Request	A19353	Shelters/Shelter Benches	23.0
Ward 11	New Request	B19353	Entrance Garden/Sign	30.0
Ward 11	New Request	19785	Meadowvale Village Bell/Bellfry	110.0
Ward 11	New Request	19145	Public Parking/Fence	247.5
Ward 11	New Request	C19353	Comprehensive signage and way finding program for Streetsville Memorial	40.0
Ward 11	New Request	D19353	Public Art Wrap on City-owned electrical box-Streetsville square	5.0
	Total New Requests			3,553.1

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/12

To: Chair and Members of General Committee

From: Gary Kent, CPA, CGA, ICD.D
Commissioner of Corporate Services and Chief Financial Officer

Originator's files:

Meeting date:
2019/12/04

Subject

Cessation of Collection Activities for Defaulted Provincial Offences Act (POA) Fines Deemed Uncollectible

Recommendation

1. That the report of the Commissioner of Corporate Services and Chief Financial Officer dated November 12, 2019 entitled Cessation of Collection Activities for Defaulted Provincial Offences Act (POA) Fines be received.

2. That in accordance with the City's Policy 04-07-03 Provincial Offences Act (POA) Collection of Defaulted Fines, Council approve the cessation of collection activities on 40 fines totalling $3,099,988.47.

Report Highlights

- The cessation of active collection is in accordance with The Ministry of Attorney General's Write-Off Directive and Operating Guideline and the City's Policy 04-07-03 Provincial Offences Act (POA) Collection of Defaulted Fines.
- This report is administrative in nature to update the POA fines portfolio based on the Policy approved by Council in 2018.
- Collection activities have ended on 88,182 uncollectible defaulted POA fines totalling $23,171,260.18 based on the authorization levels in the Policy.
- Cessation of collection activities on 40 uncollectible defaulted POA fines where each fine is greater than $25,000 and totalling $3,099,988.47 is being recommended.
- 88,222 uncollectible defaulted POA fines totalling $26,271,248.65 will be coded as uncollectible in the MAG Integrated Court Offences Network (ICON) system pursuant to their Write-Off Directive and Operating Guideline. Of these, 42,794 fines totalling $6,877,558.42 are from before the City assumed responsibility to collect POA fines for MAG in 1999.

- The City of Mississauga uses the cash basis of accounting for POA fines and does not accrue the fines as receivables, therefore there is no financial impact as the revenue is only recorded when received.
- This discontinuation of collection does not absolve a convicted offender from the requirement to pay a fine, as debts to the Crown are perpetual.

Background

In 1999, the City of Mississauga assumed responsibility for court administration procedures and the collection of fines in default under the Provincial Offences Act from the Ministry of the Attorney General (MAG). At that time $12.5 million in defaulted fines was transferred to the City. The current balance of defaulted fines is $59.8 million. POA is a procedural law for administering and prosecuting provincial offences that exist within provincial legislation, minor federal offences designated as contraventions and municipal by-laws. Provincial Offences are non-criminal charges and highlighted below are some examples:

- Highway Traffic Act, such as speeding, careless driving, not wearing a seatbelt, driving while under suspension;
- Compulsory Automobile Insurance Act, such as failing to surrender your insurance, or possessing a fake or invalid insurance card;
- Trespass to Property Act, such as entering premises when entry is prohibited or failing to leave premises after being directed to do so;
- Liquor Licence Act, such as being intoxicated in a public place or selling alcohol to a minor;
- Retail Sales Tax Act, such as failure to submit a retail sales tax return or providing false statements in a completed retail sales tax return.

The City's collection effort for defaulted POA fines includes:

- Issuance of Final Notice
- Addition to the City's property tax roll or the tax roll of another municipality
- Civil action by Legal Services
- Third party Collection Agency for first placement for eight months
- Third party Collection Agency for second placement for four years

Subsequent to municipalities assuming the collection of defaulted POA fines, MAG published a Write-Off Directive and Operating Guideline (Directive) for the handling of POA fines deemed uncollectible. The purpose is to ensure that municipal partners make all reasonable efforts to collect fines. Furthermore, the Directive indicates that the decision to cease collection is a decision to be made by the local municipality once all collection efforts outlined in their policy are exhausted. A municipal partner must follow the Directive in order to ensure that the Province of Ontario, its Ministries and Agencies will not attempt to collect any portion of the written off

funds from the municipal partner including funds related to dedicated fines, fees or surcharges. After the publication of the Directive, several municipalities established POA policies for the termination of collection activities. This discontinuation of collection efforts does not absolve a convicted offender from the requirement to pay a fine, as debts to the Crown are perpetual.

In February 2018, Council approved Policy 04-07-03, Provincial Offences Act (POA) Collection of Defaulted Fines that includes the ability for the cessation of active collection on uncollectible fines as required by MAG's Write-Off Directive and Operating Guideline and establishes levels of authorization to end collection activities. This is the first administrative clean up that is being done on the POA fines portfolio since approval of the policy. In future, this will be an annual process which will mirror the method and timing of reporting on Accounts Receivable write-offs.

The City exhausts all reasonable and appropriate measures as outlined in the Policy to collect unpaid fines prior to considering stopping active collection. The cessation of collection activity is only considered where:

- There is no tax account to which the fine can be added;
- Fine is returned from first and second placement assignment to a third party collection agency as uncollectible or untraceable;
- Litigation against an offender is unsuccessful;
- Upon notification from the trustee in bankruptcy indicating that no dividends are available to cover a bankruptcy claim;
- On the advice of Legal Services indicating the City's claim would not be successful due to defunct entities or there are no assets to pursue;
- The offender cannot be located;
- The offender is deceased;
- All collection methods are deemed to be exhausted; or
- Further collection efforts exceed the value of the debt.

Comments

A number of outstanding POA fines have completed all collection activities outlined in Policy 04-07-03 and are now deemed uncollectible. There are 88,222 uncollectible defaulted POA fines totalling $26,271,248.65.

Revenue staff has determined that 88,182 fines totalling $23,171,260.18 meet the criteria for cessation of collection activity and have been removed from active collection based on authorization levels outlined in the Policy. The Director, Revenue & Materiel Management has authorized 23,347 fines ($55 or less) totalling $718,067.21 and the Commissioner, Corporate Services and CFO has authorized 64,835 fines ($55.01 to $25,000) totalling $22,453,192.97 for termination of collection activities. Of this total amount $6,487,192.58 is from defaulted fines prior to municipal assumption of collection.

An additional 40 uncollectible defaulted fines totalling $3,099,988.47 are provided in Appendix 1 as each fine is greater than $25,000. In accordance with the Policy, Council approval is required to stop active collection for fines greater than $25,000. All reasonable collection efforts have been taken and active collection should be stopped for the outstanding amounts.

Upon Council approval, the Revenue and Materiel Management division will cease collection efforts on these fines and code them as uncollectible in the ICON system. This action does not absolve the convicted offender from the requirement to pay the fine.

Financial Impact

The City of Mississauga uses the cash basis of accounting for POA fines and does not accrue POA receivables. There is no financial implication relating to stopping collection activities as the revenue is only recorded when received. These fines are deemed uncollectible as all collection efforts have been exhausted and need to be coded as such in ICON as per the Directive. This ensures that the Province of Ontario, its Ministries and Agencies will not attempt to collect any portion of the funds from the municipal partner including funds related to dedicated fines, fees or surcharges.

Conclusion

The Revenue and Materiel Management division will cease collection efforts on 88,222 fines totalling $26,271,248.65 as per Policy 04-07-03 and code them as uncollectible in the MAG ICON system pursuant to the Write-Off Directive and Operating Guideline. This allows the removal of the fines for administrative purposes only and does not absolve a convicted offender from the requirement to pay a fine as debts to the Crown continue in perpetuity.

Attachments

Appendix 1: Individual POA Defaulted Fines over $25,000 Recommended for Cessation of Collection Activities

G. Kent.

Gary Kent, CPA, CGA, ICD.D, Commissioner of Corporate Services and Chief Financial Officer

Prepared by: Mouzelle Higgs, Supervisor, Collections

Individual POA Defaulted Fines over $25,000 Recommended for Cessation of Collection Activities

OFFENCE NUMBER	YEAR OF DEFAULT	FINE AMOUNT	COMMENTS
3161-310-90-2364-00	1994	$26,000.00	These fines have been outstanding prior to the City assuming responsibility for the administration and collection of the fines from the Ministry of the Attorney General. These fines were assigned to third party collection agencies, verified against tax roll addition and pursued by Legal Services as applicable.
3161-999-97-7689-00	1998	$27,169.06	
3161-999-98-5659-00	1998	$27,217.49	
3161-999-98-7407-00	1999	$26,929.22	
3161-310-94-6328-00	1995	$41,598.00	These fines have been outstanding prior to the City assuming responsibility from MAG. They are uncollectible as the organizations are no longer in operation or the individuals have no assets against which the City can pursue a claim.
3161-999-92-13598-00	1997	$60,020.00	
3161-999-92-13599-00	1997	$60,020.00	
3161-310-97-6109-00	1999	$121,412.07	
3161-999-00-5171-00	2000	$27,967.29	These fines were assigned to third party collection agencies, verified against tax roll addition and pursued by Legal Services as applicable.
3161-999-00-6065-99	2001	$25,179.07	
3161-999-00-6118-00	2001	$27,460.47	
3161-999-99-6584-00	2001	$39,294.75	
3161-999-98-7318-00	2003	$26,947.41	
3161-999-01-2162-00	2004	$37,600.06	
3161-999-02-6326-01	2004	$156,490.00	
3161-999-03-5733-00	2004	$213,183.03	
3161-999-04-2825-00	2005	$31,344.45	
3161-999-05-4061-00	2007	$25,568.37	
3161-999-06-938-00	2007	$25,386.50	
3161-999-05-104-00	2008	$30,542.72	
3161-999-06-2015-00	2008	$99,012.84	
3161-999-99-5769-00	2008	$27,169.06	
3161-999-08-000965-00	2010	$28,918.08	
3161-999-10-002954-00	2011	$32,485.00	
3161-999-00-6806-00	2001	$50,171.39	These fines are uncollectible as the organizations are no longer in operation or the individuals have no assets against which the City can pursue a claim.
3161-999-00-3325-99	2003	$60,020.00	
3161-999-00-366-99	2003	$84,020.00	
3161-999-01-1758-01	2003	$28,522.55	
3161-999-03-5199-00	2004	$47,212.38	
3161-999-99-6055-00	2004	$38,739.00	
3161-999-01-1850-01	2005	$63,127.54	
3161-999-05-198-01	2007	$49,862.42	
3161-999-05-198-02	2007	$41,579.55	
3161-999-05-5125-41	2007	$43,113.05	
3161-999-05-647-99	2009	$100,020.00	
3161-999-07-595-99	2010	$31,290.00	
3161-999-09-000297-00	2016	$59,925.00	
3161-999-04-2384-00	2005	$36,568.63	Collection efforts were enforced during the initial years fine and in 2016 Legal Services received confirmation that the individual was deceased since 2010.
3161-999-10-000952-00	2013	$1,088,681.32	Legal Services was pursuing collection, the offender is the same for both fines and filed for bankruptcy in 2017, a payment of $37,317.95 was received through the bankruptcy settlement.
3161-999-10-002269-00	2015	$32,220.70	
		$3,099,988.47	

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 11/18/2019

To: Chair and Members of General Committee

From: Gary Kent, CPA, CGA, ICD.D, Commissioner of Corporate Services and Chief Financial Officer

Originator's files: CA.22

Meeting date: 12/4/2019

Subject
2018 Annual Report for Access Requests under the Municipal Freedom of Information and Protection of Privacy Act

Recommendation
That the report from the Commissioner of Corporate Services and Chief Financial Officer, dated November 18, 2019, regarding the 2018 Access Requests under the Municipal Freedom of Information and Protection of Privacy Act be received.

Background
The City of Mississauga is governed by the Municipal Freedom of Information and Protection of Privacy Act (the Act). The two key purposes of the Act are to ensure the right of access to government held records and information and to protect the personal privacy of individuals.

Much of the information released by the City occurs on a routine basis. However, when information is of a personal, confidential or commercial nature, the release of the information may be handled by the Office of the City Clerk through a formal access request under the Act. A decision regarding the release of the requested information is then issued by the City Clerk. This decision can be appealed to the Information and Privacy Commissioner by the requester of the information.

The Information and Privacy Commissioner (IPC) is an officer of the Legislature appointed to provide an independent review of the decisions of provincial and municipal organizations under access and privacy laws. This report contains 2018 statistics that were submitted in the beginning of this year to the IPC for their annual report, published subsequently on June 27, 2019, which provides statistics on the number and type of access requests received across the province and highlights significant access and privacy issues.

Comments

Access Request Statistics

In 2018, the City received 905 requests representing an increase of 34 requests or 4% increase from last year's number. The number of requests is almost doubled when compared to that of 2008. A graph showing the statistics of requests received for the last 11 years is included in the Appendix 1.

In accordance with the Act, the City has 30 days to issue an access decision once a request for records is received. In qualifying circumstances, a decision can be made later than 30 days. In 2018, 874 requests were completed within the 30 day with a compliance rate of 97.1%, an increase over 2017's rate of 96.8%. The remaining requests were completed at the extended compliance rate of 98.4%. In comparison to all municipal government organizations in Ontario, the City's rates continue to surpass the average 30-day compliance rate of 75.2% and extended compliance rate of 81.9%.

Fee Statistics

Under the Act, a $5 application fee is mandatory. In addition, there are several regulated fees that may apply to requests. Over half of the requests completed warranted additional fees, such as search time, reproduction costs, preparation time, shipping, computer costs and invoiced costs. The total amount collected in 2018 was $33,727.90.

Appeal to the IPC

The City Clerk's decision on an access request is appealable to the IPC by the requestor or, in some cases, by an affected third party. The City received 6 appeals to the IPC in 2018. Of these 6 appeals, 4 have been resolved. The other 2 appeals are currently being adjudicated by the IPC.

Public Interest

As part of the City of Mississauga's commitment to accountability and transparency, a list of requests received under the Act that could be of public interest has been compiled and is included in the Appendix 2.

Financial Impact

Not Applicable

Conclusion

The 2018 access request statistics have once again highlighted the City of Mississauga's excellent record in complying with the response rate requirements of the Act. The City of Mississauga will strive to continue its outstanding response rate, at the same time promoting the importance of privacy issues.

Originators files: CA.22

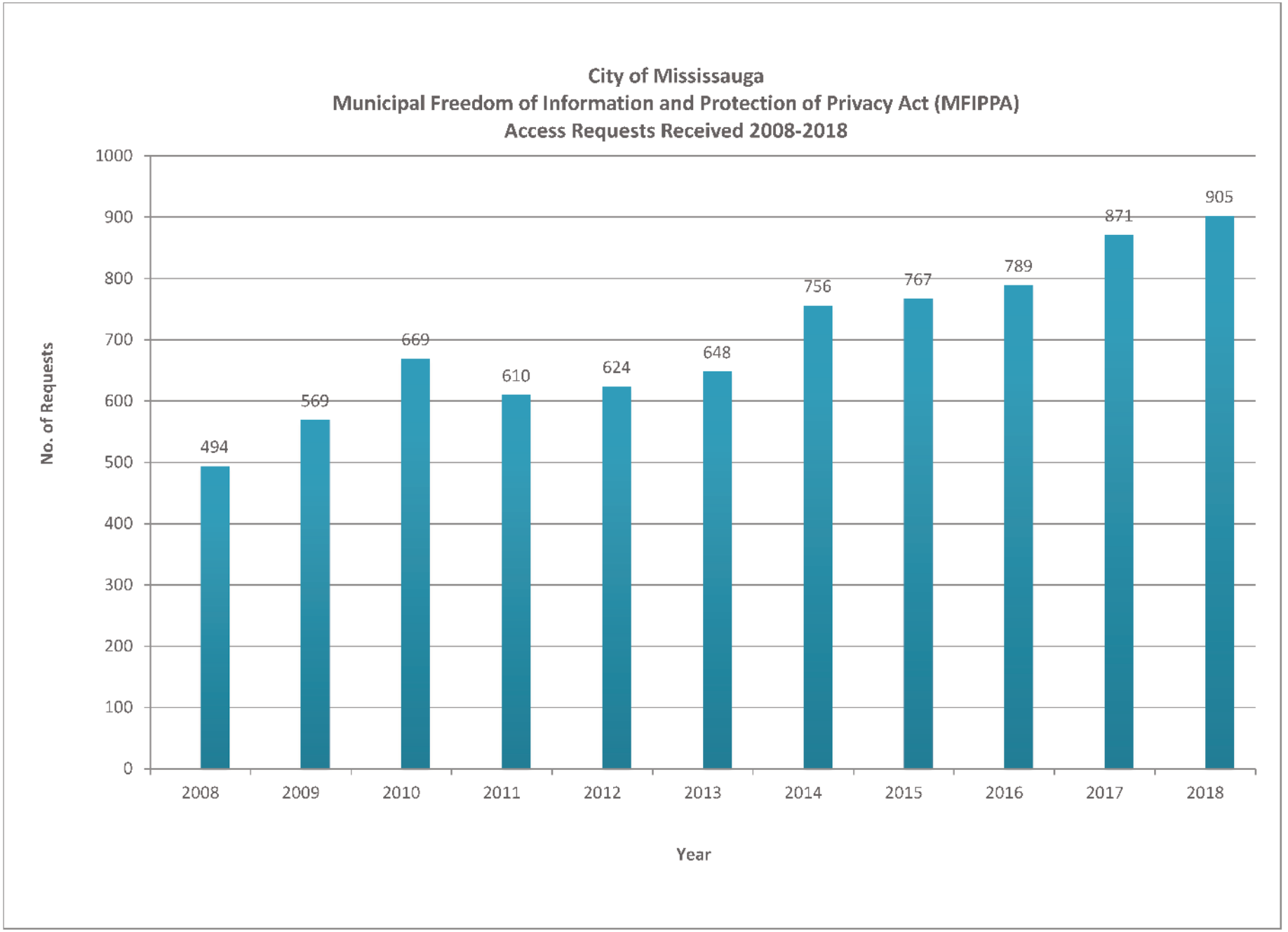
Attachments

Appendix 1: Access Requests Received 2008-2018
Appendix 2: 2018 Report of Public Interest Requests

Gary Kent, CPA, CGA, ICD.D, Commissioner of Corporate Services and Chief Financial Officer

Prepared by: Cory Crabtree, Access and Privacy Officer

Appendix 1


City of Mississauga
Municipal Freedom of Information and Protection of Privacy Act (MFIPPA)
Access Requests Received 2008-2018
No. of Requests
1000
900
800
700
600
500
400
300
200
100
0
494
569
669
610
624
648
756
767
789
871
905
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Year

Appendix 2

2018 Report of Public Interest Requests

Request no.	Subject
2018-0053	Citations for missed training, fleet issues or other infractions from municipal licensing companies contracted with the Region for paratransit.
2018-0057	Lease prices for taxicab plates from January 1, 2010 to present date.
2018-0243	MiWay Transit bus maintenance records: 1. Annual mean distance between failure (MDBF) statistics by subfleet for 2014, 2015, 2016 & 2017; 2. Average operating costs per km by subfleet for 2017; 3. Maintenance activity records listing all inspections, repairs and interior cleanings performed by date and mileage from March 1st 2017 to February 28th, 2018
2018-0386	Service planning guidelines/policy, crowding standards, "closed doors" statistics for 2012-Present, Boarding counts by route, by time period and by service day (weekday, Saturday, Sunday) for routes counted in 2017. Please include boardings per service hour, subsidy per boarding and service hour count by same format as boarding count data for routes counted in 2017.
2018-0634	MiWay revenue ridership statistics: Annual presto trip amounts by rider category (adult, youths, students, child and senior) for 2012 through 2017. Total revenue trips, not total boarding. A breakdown of free trips taken under the Presto loyalty program in the same fashion, if available.
2018-0796	Employee absenteeism. 1) Average hourly lost time per eligible employee for all lost time for all City department & divisions, must include Transit. For 2011, 2012, 2013, 2014, 2015, 2016, 2017. 2) MiWay detailed operating budget. Current budget / Actual variance report with budgeted and actual amounts for expenditure and revenue accounts for 2017 & budgeted numbers for 2018
2018-0804	Any reports to 311 and/or Animal Services with regards to dog walkers for the past 3 years. Reports of dog attacks/bites of people or dogs that occurred in a dog park in the last 3 years.

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 11/18/2019	Originator's files:
To: Chair and Members of General Committee	
From: Gary Kent, CPA, CGA, ICD.D, Commissioner of Corporate Services and Chief Financial Officer	Meeting date: 12/4/2019

Subject

Recommendation for Single Source Procurement with eSolutions Group for Professional Services to develop the City of Mississauga's Online Services.
File Ref: PRC001968

Recommendation

1. That Council approve the new purchase of professional services for a period of two (2) years as detailed in the report titled "Recommendation for Single Source Procurement with eSolutions Group for Professional Services to develop the City of Mississauga's Online Services", dated November 18, 2019 by the Commissioner of Corporate Services and Chief Financial Officer (the "Purchase", File Ref: PRC001968).That the Purchasing Agent or designate be authorized to execute all contract and related ancillary documents with respect to the Purchase between the City and eSolutions Group in accordance with the City's Purchasing By-law 374-06, as amended.

Report Highlights

- The City of Mississauga is going through a series of digital transformations to improve city operations and services. One of the major initiatives under way is the modernization of the City's website and online services (www.mississauga.ca).
- A competitive procurement process was awarded to Wipro Technologies to complete a statement of work that provided recommendations for the system architecture and software options for a full cloud solution based on AWS Public Cloud hosting.
- The Digital Modernization project is a complex initiative and comprised of two major components. The transition and modernization of existing web content and the redevelopment of all of the City's existing online services.
- Through a competitive bid process eSolutions Group was awarded the Online Services proof of concept to re-build three simple online services, in line with the recommendations from the Wipro report.
- As part of the overall www.mississauga.ca modernization project sufficient IT Capital funds

were budgeted for and allocated for Professional Services, Resources, Hardware and Software.

- A significant amount of work has been completed to implement the AWS Cloud infrastructure, Wordpress Content Management System and rebuild of most of the City website content under the leadership of Strategic Communications and Information Technology.
- This report recommends the eSolutions Group to undertake with work defined in Appendix 1 – Statement of Work to rebuild the remaining online services given their demonstrated ability and knowledge of our environment and services as we approach a September 2020 transition deadline.

Background

The City of Mississauga is going through a series of digital transformations to improve city operations and services. One of the major initiatives under way is the modernization of the City's website and online services (www.mississauga.ca). Early in 2003 the City launched a modern and robust portal hosted by Bell Canada. At the time this was very progressive and placed the City as an early adopter of a managed cloud service. With the contract end date approaching, September 30, 2020, staff initiated a Cloud proof of concept to assess the implications of cloud and agile for a solution platform for the transformation of online services.

At the November 21, 2017 General Committee meeting the report titled "Single Source Recommendation for Amazon Web Services, Inc. for Amazon Web Services (AWS) as a City Standard – File PRC000530" was endorsed setting the foundation for standing up a modern cloud environment.

After further testing and assessment of the AWS cloud solution a study was undertaken through a competitive procurement process with the IT Roster awarding Wipro Technologies to complete a statement of work that provided recommendations for the system architecture and software options for a full cloud solution based on AWS Public Cloud hosting.

At the February 27, 2019 General Committee meeting the report titled "Update on Agile Software Development and Modernization of Application Development" highlighted the City's direction as it related to a modern technology architecture and platform to support and Agile Software Development.

The report also included the findings from a professional services engagement with Wipro Technologies including a recommended technology architecture that enables a modern software development environment that integrates platforms using AWS Cloud and WordPress. The report also recommended that a proof of concept for the development of three simple online services should be undertaken to validate the recommended architecture.

Comments

The Digital Modernization project is a complex initiative comprised of two major components. The first major step is well under way including the transition and modernization of existing web content from the legacy eCity platform to a modern and innovative cloud platform hosted on Amazon Web Services (AWS) and using WordPress as the Content Management System. The second major step is the redevelopment of all of the City's existing online services as well as the transition of all data, records and financial transactions to the AWS platform built according to the recommendation for a cloud based architecture using Microservices technology.

Through a competitive bid process eSolutions Group was awarded the Online Services proof of concept to re-build three simple online services, in line with the recommendations from the Wipro report. It was established that eSolutions Group was the only vendor to meet the requirements from the nine proponents that submitted a proposal, and the only vendor who qualified through the procurement process.

Through the engagement with eSolutions Group they successfully developed the three online services and demonstrated their capabilities to develop on a Microservices platform and has the skills and ability to transition all of the City's current online services in line with our current eCity contract end date of September 30, 2020. The engagement with eSolutions Group also validated the amount of work required to transition from a commercial off-the-shelf solution to a solution that brings the software development and support in-house.

As part of the overall www.mississauga.ca modernization project sufficient IT Capital funds have been budgeted for and allocated for Professional Services, Resources, Hardware and Software. A significant amount of good work has been completed to implement the AWS cloud, Wordpress Content Management System and rebuild the City website content under the leadership of Strategic Communications and Information Technology. The next big piece of work is to rebuild all of the online services and migrate all of the data from the legacy eCity portal.

This new and modern Microservices technology is leading edge and establishes the City of Mississauga as a leader in digital transformation in the public service. Having said that, with very little public sector experience on this platform there is limited vendors with the technical and public sector experience in Canada. This is why a study and proof of concept phase was completed to prove out the technology prior to committing to a full implementation. For this reason staff is recommending eSolutions Group to undertake this work given their demonstrated ability and knowledge of the technology environment and services considering a September 2020 transition deadline. Appendix 1 – Statement of Work is included defining the services that will be migrated from the eCity portal. It is proposed to establish a two (2) year Professional Services Agreement to enable sufficient time to enable a transition of skills to City staff that will be supporting and developing on the new AWS cloud infrastructure, Wordpress and Microservices technologies.

The Bell ATG contract is set to expire on September 30, 2020, putting some time pressure on the City to transition the remaining services and content off of the Bell ATG portal. To this end Information Technology would require an extension of the Bell ATG Portal through to September 30, 2021 if other options to rebuild the online services needed to be considered at a cost with diminishing return as new services are transferred over to the new AWS platform.

Purchasing By-law Authorization

The recommendation in this report is being made in accordance with Purchasing By-law 374-06, Section 12, Schedule "A" 1. (a), (ii) scarcity of supply in the market and (b) (iv) " The solicitation of competitive Bids would not be economical to the City"

Information Technology, Materiel Management and Legal Services staff will collaborate to establish the detailed requirements, negotiate the final arrangements and prepare the requisite forms including the contract agreements.

Financial Impact

The modernization of the City's website continues to be well under way and has sufficient funding in the capital budget through to the end of 2020 to complete the full rebuild of the website, online services and migration of the historical and financial data. The www.mississauga.ca Modernization Project has $2.1 million in IT Capital funding through to the end of 2020 allocated for Professional Services to complete the transition of online services.

The ongoing operating costs of the current Bell eCity portal are budgeted in the IT Maintenance Budget for 2019 and 2020 at $600,000 per year. Based on the proposed design and architecture it is forecasted that this will be sufficient to support the ongoing cost of the AWS hosting and related staff resources required to support and operate the new website and online services.

Conclusion

The modernization of Mississauga.ca is a strategic initiative supported by the IT Master Plan and Communications Master Plan. There has been significant progress on the modernization of www.mississauga.ca website with the introduction of Amazon Web Services (AWS) and WordPress as the Cloud hosting solution. This positions the City of Mississauga as a leader in the public sector and puts a modern technology solution in place that supports agile and rapid application development.

Through our recent engagement with eSolutions Group, the new recommended architecture has been proven out and validated as a result of the development/re-creation of three online services. This is a significant project which requires a strategic approach, proven professional services and resources as anticipated in the capital budget, with a timeline that concludes in the fall of 2020.

Attachments

Appendix 1: Statement of Work

Gary Kent, CPA, CGA, ICD.D, Commissioner of Corporate Services and Chief Financial Officer

Prepared by: Shawn Slack, Director of Information Technology, Chief Information Officer

Statement of Work (SOW)

OBJECTIVES

Deliver a one-to-one feature complete version of all of the existing online services on an up-to-date, expandable, and easily maintainable platform that the City can leverage for the foreseeable future. This document sets out the scope of the engagement to re-build the services and work collaboratively with the City team to smoothly roll-out the new platform to the public with no disruption to the services. It is anticipated that upon the completion of all work contemplated the City will have:

a) All the new online services, which are a 1:1 port of the existing online services
b) All existing user-specific data migrated to the new platform and accessible to the users
c) The services are inclusive of:
    a. a new user interface and experience layer
    b. built on a scalable infrastructure
    c. microservice architecture to communicate with legacy systems and front-end applications.
    d. a new eCommerce platform and payment gateway
d) Supports City's new digital standards
e) Follows the application architecture defined in the first phase POC as set out by the City
f) Meets industry's best security practices and aligned with requirements set out by the City
g) Integrates ecommerce transactional data into SAP aligned with current processes

DELIVERABLES -

Engage the appropriate teams at the City throughout the project to ensure successful completion of the following deliverables:

- Project and Resource Plan & Project Management
- Re-build existing Online Services & Application Design and Architecture
- Continuous Integration and Continuous Delivery Pipeline
- Testing and Quality Assurance
- Documentation & Knowledge Transition and Training
- Warranty
- Two Year Term for Professional Services

List of Major Online Services – Completed by August 2020

1. Pay Parking Tickets / Penalties
2. Plan and Build Services
3. eSigns / Portable Sign Permits
4. Tax Self-Service
5. Pet Licensing
6. eStore / e-commerce platform to support online orders and payments
7. eStore Admin
8. User Log In
9. Demonstration, Rally or Vigil Notifications (Form)

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 2019/11/06	Originator's files:
To: Chair and Members of General Committee	
From: Gary Kent, CPA, CGA, ICD.D Commissioner of Corporate Services and Chief Financial Officer	Meeting date: 2019/12/04

Subject

Amendments to Agreement with Teranet Inc. for the Provision of Municipal Assessment and Property Data PRC000804

Recommendation

1. That Council approve a five-year extension to the delivery term of the General Municipal Licence Agreement, the OPMA Products Delivery Agreement and the End User Data Licence Agreement (collectively, the "Agreement") for products detailed in the "Amendments to Agreement with Teranet Inc. for the Provision of Municipal Assessment and Property Data PRC000804" dated November 6, 2019, as approved by the Commissioner of Corporate Services and Chief Financial Officer.

2. That the Purchasing Agent or designate be authorized to execute all contracts and related ancillary documents with respect to the extension of the delivery term of the Agreement between the City and Teranet Inc., in accordance with the City's Purchasing By-law 374-06, as amended.

3. That Council authorize the Purchasing Agent or designate to issue necessary future amendments with respect to the Agreement to increase the value of the contract up to $100,000 per year between the City and Teranet Inc. for products and professional services for the purpose of facilitating improvement to the City's property and assessment data, if the funding for such contract increase has been approved by Council.

4. That Council approve the Ontario Parcel Master licence as a City Standard for a period of 5 years, in accordance with the City's Purchasing By-law 374-06, as amended.

Report Highlights

- Municipal Property Assessment Corporation ("MPAC") and Teranet Inc. ("Teranet") are the sole authorised agencies to provide Land Registry, property ownership and assessment

information in the Province of Ontario since 2002.

- The information provided by MPAC and Teranet enables the City to collect property taxes, informs planning decisions and maintain property and assessment base maps.
- The property and ownership information is provided to the City by a number of services and products.
- Additional data products from Teranet may be required with to fulfill requests for specialised reports such as on housing, airport lands and property resale.

Background

The City has acquired property data from MPAC and Teranet for at least the past twenty years. Although the Agreement continues until terminated, the purpose of this report is to obtain approval for the Purchasing Agent to extend the delivery term of the Agreement with Teranet as the sole supplier for 5 years from the date the current delivery terms of the Agreement expire.

The information provided by MPAC and Teranet plays a critical role in enabling the City to collect property taxes, maintain its own property & assessment mapping base maps, inform City planning decisions and support day-to-day operations.

Comments

In April 2002, under the Ontario Parcel Master Agreement ("OPMA"), Teranet, MPAC and the Ministry of Natural Resources replaced their property fabric and assessment mapping products with an integrated property and assessment map available under agreement with Teranet and MPAC and administered by Teranet on behalf of both parties. The City must have an agreement with MPAC to be able to continue to access the assessment component of the mapping as well as older, more traditional forms of assessment data. With respect to the Teranet ownership property data, this information is critical to ensure the long-term survivability of our parcel mapping base. Although the City maintains its own property data, the Teranet ownership information is necessary as an input to update and validate the City's database.

Over the course of the last five years, the city acquired additional data and services from Teranet which were amended into the existing agreement. These include the following deliverables;

- Teranet Xchange On-Demand Delivery Service - nightly updates
    - Digital Ownership & Assessment Parcel Fabrics in Spatial Database format
    - Ownership Property & POLARIS Tables
- Enhanced Address Data - monthly updates
- GeoWarehouse Online Service Subscription - 2 User Licences

- PIN-ARN Cross Reference Report - monthly updates

The Teranet Xchange product is currently downloading to an Oracle database. With the switch of our Enterprise GIS platform, this will change to an Esri spatial database. Along with professional services for the project, we will have a three-month data validation period. During this time, we will continue to run the Oracle version, along with the Esri version to ensure the new service is correct and complete.

With the increase in requests for specialised reports such as on housing, airport lands and property resale, additional data products from Teranet may be required. This capacity will increase as Teranet continues to improve its reporting abilities. Envisioned through the Geospatial Master Plan (GSMP), the City aims to provide a multitude of different services and data retrieval capabilities to the various City Departments to inform important decisions. Improvements to our GIS systems can be supported through the generation of specialized reports from Teranet. For this and future requests, authority to purchase additional Teranet data products for up to $100,000 per year is requested for the five-year term.

Purchasing By-law Authorization

The recommendation in this report for the Teranet sole source procurement award is made in accordance with the Purchasing By-law 374-06, Schedule A, item 1 (a), (i) “The Goods and/or Services are available from one supplier by reason of: a statutory or market based monopoly.”

Information Technology, Legal Services and Materiel Management staff will collaborate to establish the requirements, negotiate the final arrangements and prepare the requisite form including contract agreement.

Financial Impact

The financial impact resulting from this report will be absorbed with existing budgets and no additional impacts will result.

The estimated expenditure for the 5-year extension of the delivery term of the Agreement is estimated to be $600,000 or $120,000 annually with additional contingency funds. Approved funding exists through the annual IT Maintenance budget for these agreements.

Funding for the conversion of the Teranet Xchange data to the Esri platform in the anticipated amount of $20,000 will be from the GSMP capital project account 19532.

The additional Teranet data products will be procured in the five-year delivery term subject to future business plan and budget approvals.

Conclusion

In order to continue being able to access municipal assessment and ownership property data for the purpose of applying assessment values, collecting property taxes and maintaining its own assessment and property mapping products and databases, it is necessary that the City extend

the delivery term of the Agreement with the sole supplier Teranet. Reasonable pricing and terms have been obtained.

Attachments

Appendix1: Statement of Work - Amendments to Agreement with Teranet Inc. for the Provision of MPAC Data

Gary Kent, CPA, CGA, ICD.D, Commissioner of Corporate Services and Chief Financial Officer

Prepared by: Simon Langham, Project Manager, IT GIS

Statement of Work - Amendments to Agreement with Teranet Inc. for the Provision of MPAC Data

Summary of proposed 5 year Expenditures for existing Teranet products.

Teranet Products	**Per Year Cost**	**5 Years (2020 - 2025)**
Teranet Xchange	$28,728	$143,640
OP CAD Mapping	$8,736	$43,680
MAPS Report	$5,172	$25,860
Ownership Property	$38,640	$193,200
PIN-ARN Table	$12,684	$63,420
GeoWarehouse	$7,400	$37,000
Sub-Total		$506,800
Contingency		$93,200
Total		$600,000

The Teranet Xchange product is currently downloading to an Oracle database. With the switch of our Enterprise GIS platform, this will change to an Esri spatial database. Along with professional services for the project, we will have a three-month data validation period. During this time, we will continue to run the Oracle version, along with the Esri version to ensure the new service is correct and complete.

Estimate cost of conversion from Oracle to Esri spatial database.	$20,000

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 11/8/2019	Originator's files:
To: Chair and Members of General Committee	
From: Gary Kent, CPA, CGA, ICD.D Commissioner of Corporate Services and Chief Financial Officer	Meeting date: 12/4/2019

Subject

City Standards for Information Technology (IT) Systems Requiring Maintenance and Support Services and Subscription Renewals in 2020 (File Ref: PRC001925)

Recommendation

1. That Council approve the IT Systems listed in Appendix 1 of the report dated November 8, 2019, from the Commissioner of Corporate Services and Chief Financial Officer entitled "City Standards for Information Technology (IT) Systems Requiring Maintenance and Support Services and Subscription Renewals in 2020 (File Ref: PRC001925)" as City Standards, in accordance with the City's Purchasing By-law 374-06, as amended.

2. That the Purchasing Agent or designate be authorized to execute all contracts and related ancillary documents with respect to the purchase of 2020 annual maintenance and support services and subscription renewals for City Standards where the cost exceeds $100,000.

Background

The Purchasing By-law 374-06, as amended, provides for the establishment of "City Standards", which are defined as "specific Goods approved by Council that best fill a long-term City-wide need or requirement".

This report updates Council of the proposed changes in City Standards for IT Systems for 2020 and requests Council approval.

The Purchasing By-law also requires Council approval for Single Source procurements of support and maintenance services and subscription renewals for the City Standards for IT Systems for 2020 which exceed $100,000 during the year.

Comments

IT follows standard processes for procuring software, maintenance and support, and subscription services through a balance of competitive procurements, single/sole source procurements and renewals.

Appendix 1 identifies the City Standards for IT Systems which are required in 2020 to maintain operations. A continued use of City Standards for IT Systems is required to ensure business continuity and is a best business practice in the industry. These systems may require renewals on a single/sole source basis in 2020. Switching over to new systems would either cause major disruptions to City operations, be cost prohibitive, or both. Amounts shown are based on historical spend amounts and are included in the IT Division budget.

The City Standards for IT Systems are established to ensure yearly maintenance and support and subscription renewals can be paid for systems where contract renewals are in progress or for low-value acquisitions.

Purchasing By-law Authorization

The second recommendation in this report is made in accordance with the Purchasing By-law 374-06, Schedule "A", 1. (b) (xi) A need exists for compatibility with, or for the maintenance and support of a City Standard and there are no reasonable alternatives, substitutes, or accommodations.

Information Technology, Materiel Management and Legal Services staff will collaborate to establish the detailed requirements, negotiate the final arrangements and prepare the requisite form including the contract agreements.

Financial Impact

The required annual maintenance and support and subscription renewal costs for City Standards for IT Systems are included in the 2020 approved IT Operating Budget and any future increases are subject to the 2021 budget approval.

The proposed IT Maintenance Budget for 2020 is $8.87 million and covers the ongoing and growth related cost of all IT system maintenance and support and subscription renewals including those systems identified in the City Standards for IT Systems (Appendix 1).

Conclusion

Various IT Systems have become essential to City services and operations and have been designated by Council as City Standards. In accordance with the Purchasing By-law 374-06, purchase contracts with the suppliers of these City Standards are executed on a single/sole source basis. Staff in IT and Materiel Management will negotiate agreement terms and all commitments are reviewed by Legal Services.

This report recommends that the Purchasing Agent or designate be authorized to purchase maintenance and support and subscription renewals for the City Standards for IT Systems for 2020 as identified in Appendix 1 which is attached to this report.

Attachments

Appendix 1: Refresh of City Standards for IT Systems List

Gary Kent, CPA, CGA, ICD.D, Commissioner of Corporate Services and Chief Financial Officer

Prepared by: Sabrina Stan, CPA, CA, IT Asset Management Specialist

Appendix 1

Refresh of City Standards for IT Systems List

No	Vendor	IT Systems Description	2020 Estimated Amount
1	32 Auctions	Hosted auction site for annual CMO United Way Auction	$200
2	Accenture	SAP clone and test software M&S	$7,500
3	Active Network, Ltd.	M&S for Computerized Leisure Activity Software System (CLASS) software solution for Recreation's registration, booking, membership and payment processing	$170,000
4	Agree Ya (Solutions)	SharePoint analytics and mgmt. (Quest tools)	$1,000
5	Altova	XML Spy Pro software subscriptions	$1,000
6	AMAG	Access control system	$39,000
7	Archive Systems Inc. Access Corporation)	Document Mgmt (OMNI RIM) M&S	$25,000
8	Autodesk	M&S for AutoCAD software that creates precise 2D and 3D drawings	$3,000
9	Avolve Corporation Software (Premium Support)	ePlans/ePermitting - Premium Support	$40,000
10	Bang the Table Canada Limited	EngagementHQ Licence	$30,000
11	Bell Canada	Mississauga.ca portal and Mobile Device Management (AirWatch/MDM)	$715,000
12	Bentley	Microstation	$400,000
13	Boost Solutions	M&S of Lookup Pack software used to build cascading lookup columns on SharePoint	$2,500
14	BOX Inc.	Cloud content management and file sharing service for businesses	$45,000
15	Brightcove	Video hosting service for showing the public the City Council and Committee meetings	$70,000
16	Canadian Centre for Occupation Health and Safety	M&S of the City material safety data sheets used in all City departments	$7,000
17	Canon Plotters (Microimage Technologies Ltd)	Plotter Maintenance	$500
18	Cansel - Trimble MGIS	Subscription and M&S for the TRIMBLE MGIS, Software and RTK, Survey tools used by Works and GIS	$7,180
19	Clearview	Whistleblower software	$22,900
20	Collabion Charts (DRI FusionCharts)	M&S of Collabion Charts software used to show business data graphs, analytics and business data tables on SharePoint	$4,000
21	Competitive Edge Software, Inc. (Omnigo Software)	M&S of Report Exec application	$7,180
22	Compugen (Server Hardware)	M&S Server Hardware	$130,000
23	Compugen (VMWare Licenses)	M&S VMWare Licences	$200,000
24	Faronics	M&S of Deep Freeze (Public Library PC software)	$5,000
25	Global System Solutions	MAC Support	$8,200
26	Globe POS Systems Inc.	Maintenance and licensing of the Point of Sale System (POS) used at the cashier's counter at City Hall	$2,500
27	GolfNow	GEN (Golf eNetwork) for reserving tee times	$10,000
28	Harvest	Time tracking system for Legal	$10,000
29	Herjavec Group	Falcon Sandbox Private Cloud security tool used to analyze malware samples	$8,000
30	High Criteria Inc.	Court House Digital Recording (Liberty Recording)	$5,000
31	Hoefler	Gotham Fonts (Typography Web Subscription)	$2,000
32	HPE	HP 3Par 7200 SAN maintenance,V400 (main SAN) + fibre channel switches + HP Tape Libraries	$150,000

No	Vendor	IT Systems Description	2020 Estimated Amount
33	Industry Canada	Radio Trunking Licenses	$55,000
34	Infor Public Sector	Infor Public Sector Solutions	$434,000
35	Infor Public Sector - Enroute	Fire Dispatch/Software Public Safety	$230,000
36	Information System Architects	McAfee (Desktop & Server) M&S	$110,000
37	Intraprint	Print Mgmt & Doc System	$7,460
38	Iron Mountain (TXM)	Escrow Services	$2,000
39	ITC	Print Q Mgr (Library sw)	$11,800
40	JW Player	Video player used for viewing Council & Committee streaming on Inside Mississauga	$1,600
41	Key Stroke Quality Computing Inc.	ACT! Software subscription	$7,000
42	Lightning Conductor (Lightning Tools)	M&S of Lightning Conductor used to build cross-site SharePoint lists	$1,100
43	Lucid Design Group, Inc.	Energy Dashboard web hosting fees	$22,800
44	Messageware	OWAGuard applications for security software for Outlook Web App	$40,000
45	Methodicall	Long Distance Reporting	$2,000
46	Microfocus	Self-service password application software	$20,000
47	Momentuum BPO Inc.	CivicTrack	$30,000
48	Muhimbi SharePoint PDF Converter	M&S of SharePoint PDF Converter software used to convert InfoPath forms to printable PDF files	$4,000
49	Netwrix	Auditing tool subscription (Active Directory, SQL Server, VMware, Windows File Server, Windows Server)	$10,000
50	Nordat Inc.	Annual Freedom Of Information (FOI) software support and maintenance	$450
51	ONIX Networking Canada Inc.	Technical support for Google Services subscription	$4,000
52	ONX	SolarWinds M&S for monitoring, alerting and performance management software used for entire Data Centre monitoring	$140,000
53	Optiv Canada	Carbon Black Protection (formerly known as Bit9) - subscription for security software for servers and workstations	$10,000
54	Oracle	Maintenance and licensing of the WebCenter software (eCity portal), and database software used by Information Technology systems including TAX and MAX	$225,000
55	Orderline	Maintenance and licensing for maintaining the Mississauga Zoning By-law	$6,000
56	Park Smart Inc.	Parking Enforcement (AutoCite/AutoIssue/AutoProcess). Contract will require extension for the AutoProcess component only	$35,000
57	Perspective Geomatics	Summit Evolution M&S (3D Workstation)	$7,500
58	Pluralsight	Training (IT Infrastructure) subscription	$10,000
59	Portswigger Web Security	Burp Suite Pro subscription for security	$1,000
60	Provox	Agenda Management System (BR38 - 2013)	$8,000
61	Regional Municipality of Niagara / White Acre	CAMS support	$9,000
62	SafeNet	used for VPN (replaces Cryptocard)	$20,000
63	Silverware POS Inc.	Restaurant POS	$18,505
64	Simple K	Key and door tracking system	$800
65	SIMS Inc.	Intrusion alarm monitoring	$3,000
66	Siteimprove	Siteimprove hosting fees	$9,000
67	Tenable	Nessus security scanner	$3,000
68	Teranet	GIS Database. Subscription service that provides access to the Province s parcel info and ownership. Crucial to support the maintenance of the City s Property based data	$80,000
69	Teraview	Teraview software	$13,500
70	The Mathworks Inc.	Matlab M&S renewal for T&W team	$4,000

No	Vendor	IT Systems Description	2020 Estimated Amount
71	The Public Sector Digest	Tangible Capital Asset System required for reporting our assets to the Provincial/Federal Government	$15,000
72	Thycotic	M&S for Secret Server enterprise password management software	$3,000
73	TRAKA	Automated key distribution application	$2,000
74	Transoft	Autoturn software is a plugin for Microstation and is used by the roads design group (T&W), Transoft Torus design software added in 2018	$3,000
75	Treesize Professional	M&S for harddisc space manager used by CPS (platform systems)	$2,000
76	Trimble	Sketchup M&S and subscription renewal	$7,000
77	University of Toronto	M&S for the transportation models, INRO Emme Software through UoT who manages on behalf of the funding agencies under The Data Management Group (DMG) a research group	$2,400
78	Verisign	Verisign Certificate GW WebAccess	$1,400
79	VFA	Maintenance and licensing fee of Facility Asset Program system	$27,000
80	Wilmac Canada Ulc	Voice & Radio Recording System (NICE NRX & Inform) for MiWay transit call centre, Works dispatch, Transit dispatch, 311, and Corp Security	$21,000
81	Wowza	Video hosting service for showing internal staff City Council and Committee meetings, MFES training, Leadership Conference videos, and more	$1,000
82	Zoho Corp	Site24x7.com Site monitoring	$900

City of Mississauga
Corporate Report

MISSISSAUGA

Date: 11/07/2019

To: Chair and Members of General Committee

From: Gary Kent, CPA, CGA, ICD.D
Commissioner of Corporate Services and Chief Financial Officer

Originator's files:
PO.11.VES

Meeting date:
12/4/2019

Subject

Surplus Declaration - City-owned lands south of Vesta Drive (Ward 1)

Recommendation

1. That the Corporate Report titled "Surplus Declaration - City-owned lands, south of Vesta Drive (Ward 1)" dated November 7, 2019 from the Commissioner of Corporate Services & Chief Financial Officer, be received.

2. That the City-owned lands lying directly south of Vesta Drive and forming a portion of the Mary Fix drainage channel, containing an area of approximately 695.6 square metres (7,487.38 square feet, more or less), and legally described as part of PIN #13461-0133 (LT), and more particularly described as Part of Lot 4, Range 1, Credit Indian Reserve, in the City of Mississauga, Regional Municipality of Peel, designated as Part 1, 2, 3, 4, 5, 6, 7 on draft Reference Plan dated October 10, 2019 by A. T. McLaren Limited and identified as Drawing No. 36134, in Ward 1, be declared surplus to the City's requirements, for the purpose of sale to Metrolinx, with the sale subject to retention of an easement for protection and maintenance of the Mary Fix drainage channel and on terms satisfactory to the Commissioner of Transportation and Works.

3. That all steps necessary to comply with the requirements of Section 2.(1) of City Notice By-law 215-08 be taken, including giving notice to the public by posting a notice on the City of Mississauga's website for at least three weeks prior to the execution of an agreement for the sale of the subject land.

Background

In July of 2019, the City completed its purchase of that portion of the Mary Fix Creek drainage culvert from roughly the easterly limit of Vesta Drive running westerly to the Credit River (Parts 1 to 12 on Plan 43R37927) from the Province. The City purchased the lands from the Province at a rate of $12,000 per acre. At the time of conveyance, the Province required that the City agree

that if the City sells all or a portion of the subject lands prior to the 31st day of March, 2024, the City will pay to the Province the difference between the $12,000 per acre price it paid and the price at which it sells the land.

Following acquisition, Metrolinx identified that it was encroaching on a portion of the lands acquired by the City from the Province with its tunnel access to the train platforms. As well, Metrolinx Station operations personnel indicated a desire to make further improvements to their system consisting of improved road access and installation of elevators at this location. In addition to these requirements, Metrolinx personnel have identified a need to access a portion of the City-owned lands for construction staging and lay down in connection with the Hurontario LRT project.

Comments

The City is the owner of that portion of the Mary Fix drainage channel which runs from the easterly limit of Vesta Drive westerly to the Credit River.

Metrolinx has existing infrastructure within the easterly limit of the City's landholdings and plans to construct additional improvements upon the newly acquired City lands. As the improvements are permanent in nature it is appropriate to declare the occupied portions of the lands surplus to City needs, and transfer the required lands to Metrolinx to avoid liability.

As this proposal represents a transfer of a portion of the newly acquired lands, City staffs are recommending that the subsequent transfer be at the same value at which it was acquired.

Realty Services has completed its circulation and received confirmation that these lands can be declared surplus to the City's requirements and sold, subject to retention of an easement for protection and maintenance of the Mary Fix drainage channel and on terms satisfactory to the Commissioner of Transportation and Works.

Prior to the sale of the subject lands, public notice will have been given by the posting of a notice of proposed sale on the City of Mississauga's website for a two week period, where the expiry of the two week period will be at least one week before the execution of the agreement for the sale of the said lands. This notice satisfies the requirements of the City Notice By-law 0215-2008, as amended by by-law 0376-2008.

An Agreement of Purchase and Sale to convey the subject property to Metrolinx will be processed for approval pursuant to Delegated Authority By-Law 0148-2018.

Financial Impact

There is no financial impact from declaring the lands surplus.

Originators files: PO.11.VES

Conclusion

As Metrolinx already has infrastructure on the lands and to avoid liability and future requests for occupancy and construction, it is recommended and reasonable to declare the lands surplus to the City's needs for subsequent transfer to Metrolinx, subject to retaining an easement for protection and maintenance of the Mary Fix drainage channel and on terms satisfactory to the Commissioner of Transportation and Works.

Attachments

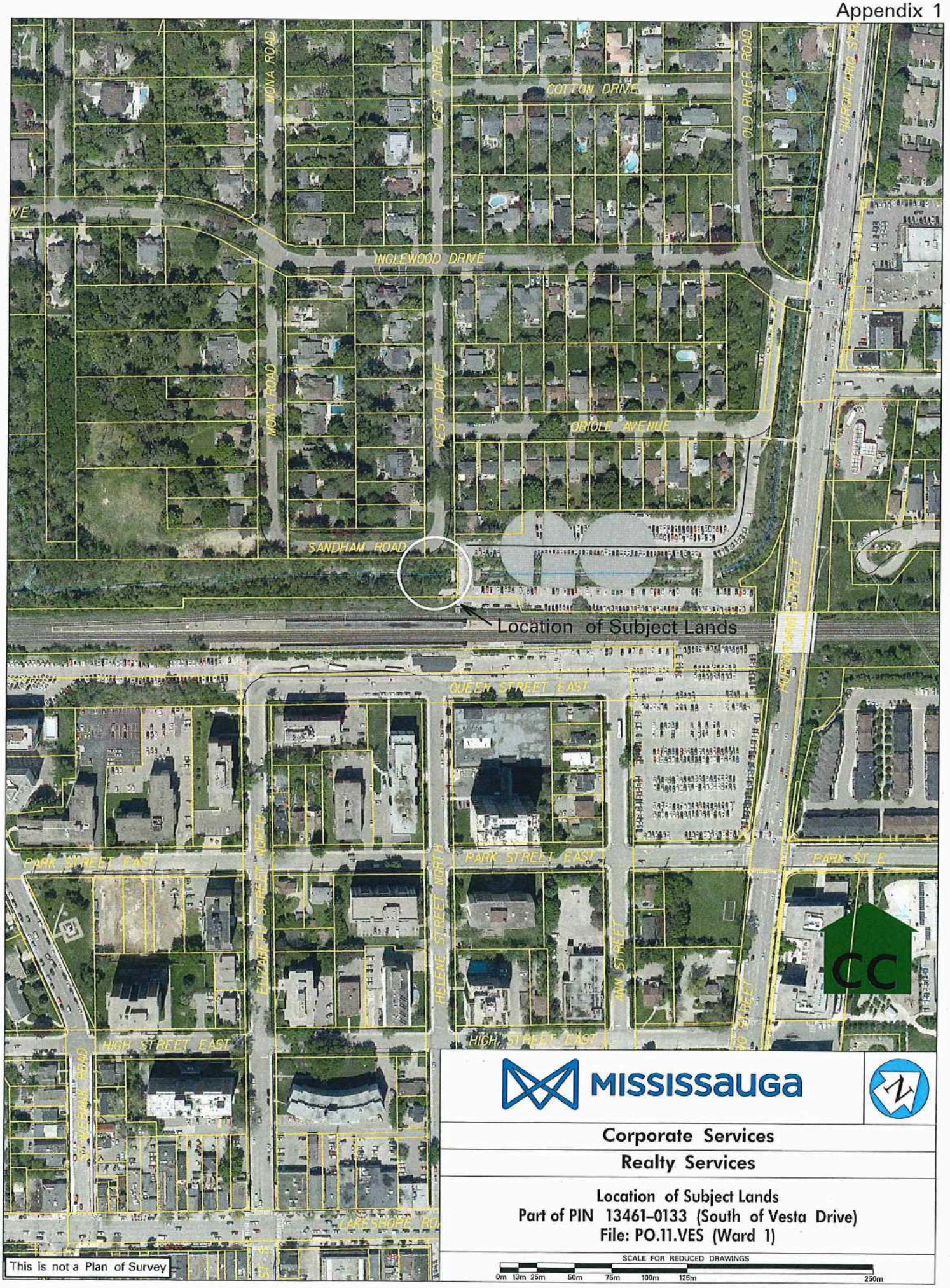
Appendix 1: Approximate location of lands to be declared surplus
Appendix 2: Sketch showing the parcel of land to be declared surplus

G. Kent.

Gary Kent, CPA, CGA, ICD.D, Commissioner of Corporate Services and Chief Financial Officer

Prepared by: William Moffatt, Supervisor Acquisitions, Realty Services, Facilities & Property Management

Appendix 1



MISSISSAUGA

Corporate Services

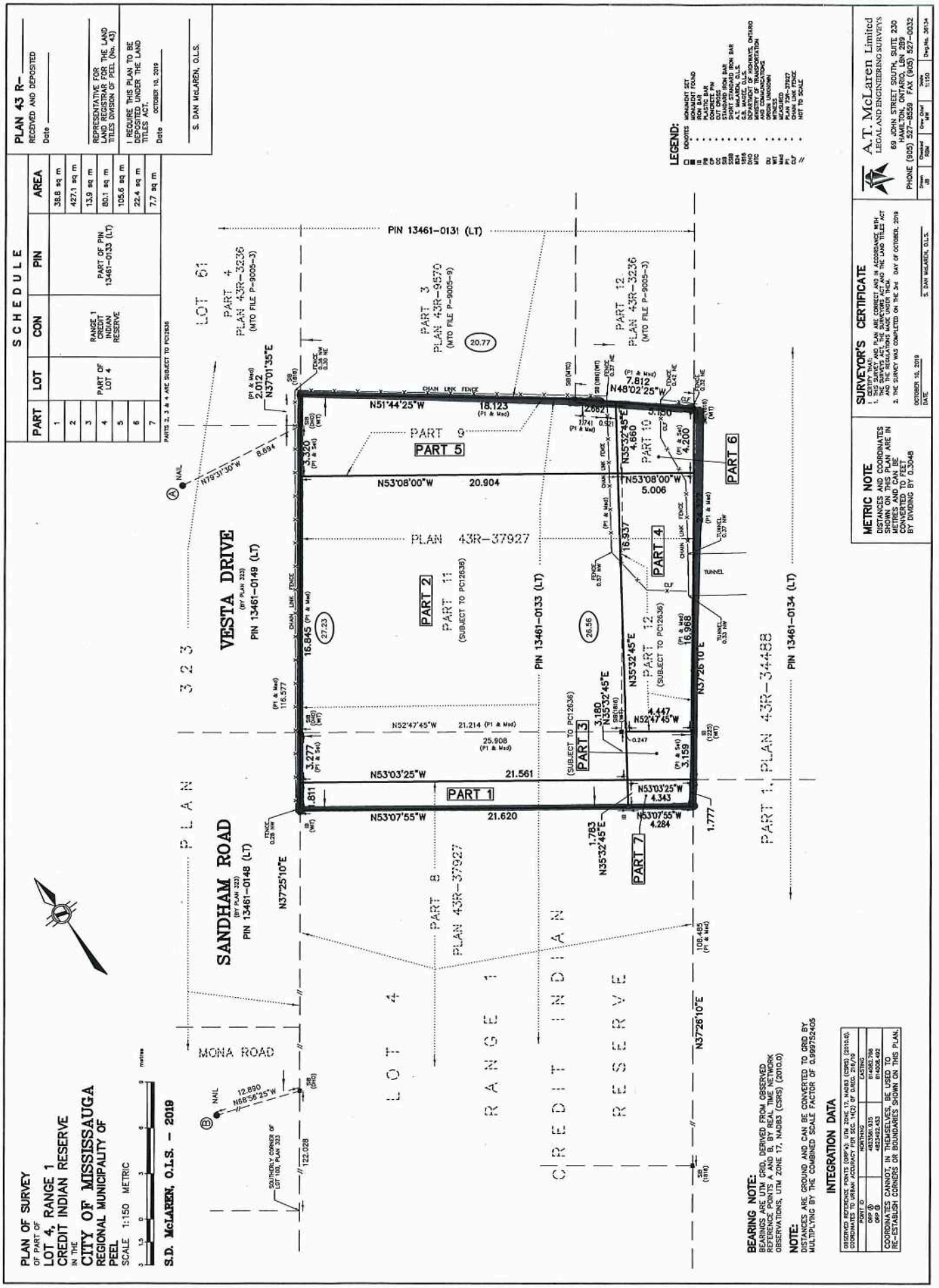
Realty Services

Location of Subject Lands
Part of PIN 13461-0133 (South of Vesta Drive)
File: PO.11.VES (Ward 1)

SCALE FOR REDUCED DRAWINGS

0m 13m 25m 50m 75m 100m 125m 250m

Appendix 2


PLAN OF SURVEY
OF PART OF
LOT 4, RANGE 1
CREDIT INDIAN RESERVE
IN THE
CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF
PEEL
SCALE 1:150 METRIC
S.D. McLAREN, O.L.S. – 2019
SCHEDULE
PART | LOT | CON | PIN | AREA
1 | PART OF LOT 4 | RANGE 1 CREDIT INDIAN RESERVE | PART OF PIN 13461-0133 (LT) | 38.8 sq m
2 | | | | 427.1 sq m
3 | | | | 13.9 sq m
4 | | | | 80.1 sq m
5 | | | | 105.6 sq m
6 | | | | 22.4 sq m
7 | | | | 7.7 sq m
PARTS 2, 3 & 4 ARE SUBJECT TO PC12636
PLAN 43R-
RECEIVED AND DEPOSITED
Date
REPRESENTATIVE FOR LAND REGISTRAR FOR THE LAND TITLES DIVISION OF PEEL (No. 43)
I REQUIRE THIS PLAN TO BE DEPOSITED UNDER THE LAND TITLES ACT.
Date OCTOBER 10, 2019
S. DAN McLAREN, O.L.S.
LEGEND:
IB IRON BAR
SIB SHORT IRON BAR
CC CUT CROSS
SSIB SHORT STANDARD IRON BAR
BP4 A.T. McLAREN, O.L.S.
CHIO CHICAGO HOOK
MTO DEPARTMENT OF HIGHWAYS, ONTARIO
MTC MINISTRY OF TRANSPORTATION
CLF CHAIN LINK FENCE
ORION UNKNOWN
WIT WITNESS
MEAS MEASURED
PI PLAN 73R-37927
CLF CHAIN LINK FENCE
// NOT TO SCALE
PIN 13461-0131 (LT)
PIN 13461-0133 (LT)
PIN 13461-0134 (LT)
VESTA DRIVE
(BY PLAN 323)
PIN 13461-0149 (LT)
SANDHAM ROAD
(BY PLAN 323)
PIN 13461-0148 (LT)
MONA ROAD
PLAN 323
PLAN 43R-37927
PLAN 43R-34488
LOT 61
PART 4 PLAN 43R-3236 (MTO FILE P-9005-3)
PART 3 PLAN 43R-9570 (MTO FILE P-9005-9)
PART 12 PLAN 43R-3236 (MTO FILE P-9005-3)
PART 5
PART 6
PART 2
PART 11 (SUBJECT TO PC12636)
PART 4
PART 12 (SUBJECT TO PC12636)
PART 3
PART 1
PART 7
PART 8 PLAN 43R-37927
LOT 4
RANGE 1 CREDIT INDIAN RESERVE
PART 1, PLAN 43R-34488
N37°01'35"E 2.012
N79°31'30"W 8.694
N51°44'25"W 18.123
N48°02'25"W 7.812
N53°08'00"W 20.904
N53°08'00"W 5.006
N35°32'45"E 4.660
N52°47'45"W 21.214 (P1 & Mea)
25.908 (P1 & Mea)
N53°03'25"W 21.561
N53°07'55"W 21.620
N53°03'25"W 4.343
N53°07'55"W 4.284
N35°32'45"E 1.783
N35°32'45"E 3.180
N35°32'45"E 4.447
N37°26'10"E 1.777
N37°26'10"E 108.485
N37°25'10"E 122.028
N68°56'25"W 12.890
16.845 (P1 & Mea)
116.577
16.937
16.988
3.320 (P1 & Sas)
3.277 (P1 & Sas)
3.159 (P1 & Sas)
4.200 (P1 & Sas)
1.811
27.33
26.56
20.77
METRIC NOTE
DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048
SURVEYOR'S CERTIFICATE
1. CERTIFY THAT:
THIS PLAN AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 3rd DAY OF OCTOBER, 2019
OCTOBER 10, 2019
DATE
S. DAN McLAREN, O.L.S.
A.T. McLaren Limited
LEGAL AND ENGINEERING SURVEYS
69 JOHN STREET SOUTH, SUITE 230
HAMILTON, ONTARIO, L8N 2B9
PHONE (905) 527-8559 FAX (905) 527-0032
Drawn AB | Checked RBM | Crew Chief MW | Date 1:150 | Dwg No. 36134
BEARING NOTE:
BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS 'A' AND 'B' BY REAL TIME NETWORK OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0)
NOTE:
DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.99975405
INTEGRATION DATA
OBSERVED REFERENCE POINTS (ORP'S), UTM ZONE 17, NAD83 (CSRS) (2010.0). COORDINATES TO URBAN ACCURACY PER SEC. 14(2) OF O.REG. 216/10
POINT ID | NORTHING | EASTING
ORP A | 4833561.933 | 614662.798
ORP B | 4832482.453 | 614636.462
COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

Environmental Action Committee **2019/11/12**

REPORT 8 - 2019

To: CHAIR AND MEMBERS OF GENERAL COMMITTEE

The Environmental Action Committee presents its eighth report for 2019 and recommends:

EAC-0039-2019
That the deputation and associated presentation by Bernadeta Suroweic, Specialist, Integrated Water Management, Credit Valley Conservation with respect to the Smart Blue Roof Systems for Flood and Drought Resilience and Adaptation be received for information.
(EAC-0039-2019)

EAC-0040-2019
That the deputation and associated presentation by Muneef Ahmad, Manager, Stormwater Projects with respect to the Stormwater Master Plan be received for information.
(EAC-0040-2019)

EAC-0041-2019
1. That the deputation and associated presentation by Leya Barry, Climate Change Specialist with respect to the final version of the Climate Change Action Plan be received for information.
2. That the Environmental Action Committee are in support of the Climate Change Action Plan and bringing it to General Committee on December 4, 2019 for endorsement.

(EAC-0041-2019)

EAC-0042-2019
1. That the verbal update regarding Paperless Agendas be received.
2. That the Legislative Coordinator for the Environmental Action Committee (EAC) eliminates the distribution of paper copies of the agenda and will only provide electronic copies of the agendas for all EAC meetings starting December 10, 2019.

(EAC-0042-2019)

EAC-0043-2019
That the Environmental Action Committee Work Plan be approved as discussed at the November 12, 2019 Environmental Action Committee meeting.
(EAC-0043-2019)

EAC-0044-2019
That the Final Climate Change Action Plan Memo be received for information.
(EAC-0044-2019)

EAC-0045-2019
That the 2020 Environmental Action Committee Meeting Dates be received for information.
(EAC-0045-2019)

Traffic Safety Council **2019/11/27**

REPORT 7 - 2019

To: CHAIR AND MEMBERS OF GENERAL COMMITTEE

The Traffic Safety Council presents its seventh report for 2019 and recommends:

TSC-0088-2019
That the Site Inspection Report for the safety review conducted on Lisgar Drive, Allcroft Road and Dillingwood Drive for the students attending Lisgar Middle School be received for information.
(Ward 10)
(TSC-0088-2019)

TSC-0089-2019
That Transportation and Works be requested to review the feasibility of moving the bus stop east of the Trelawny Public School driveway further east and expanding the "No Stopping" zone protecting the school crosswalk and the school entrance driveway for better visibility.
(Ward 10)
(TSC-0089-2019)

TSC-0090-2019
1. That Transportation and Works be requested to review all the signage on Ceremonial Drive in the school zone and on Esprit Crescent and sign "No Stopping" opposite Champlain Trail Public School on Ceremonial Drive.
2. That the Principal of Champlain Trail Public School be encouraged to work with the Peel Board of Education to re-open the Kiss and Ride to help alleviate the dangerous situation on the street with parents dropping off and picking up unsafely and blocking through travel lanes thereby blocking access for emergency vehicles.
3. That Traffic Safety Council school walking routes subcommittee be requested to work with the Principal of Champlain Trail Public School to ramp up their school walking routes program.
4. That Parking Enforcement be requested to enforce the "No Stopping" zones on Ceremonial Drive and on Esprit Crescent between the Peak Times of 8:25-8:50 AM and 2:55-3:20 PM once the signage is in place.
5. That Peel Regional Police be requested to enforce the "No U-Turn" signage on Ceremonial Drive between the peak times of 2:55-3:20 PM once the signage is in place, as time and resources permit.

(Ward 5)
(TSC-0090-2019)

TSC-0091-2019
That Transportation and Works be requested to review the signage on Windwood Drive in the area of the Windwood Park path for the students attending Settlers Green Public School.
(Ward 9)
(TSC-0091-2019)

TSC-0092-2019
1. That the warrants have not been met for the placement of a school crossing guard, as there are many safe gaps in traffic for students to cross the road at Britannia Public School.
2. That Transportation and Works be requested to review the signage south of the Britannia Public School exit driveway and to add "No Stopping" corner prohibitions on Ewing Crescent and to add "No Stopping" prohibitions to protect the landing pad on the east side of Swinbourne Drive opposite Ewing Crescent where students and parents cross Swinbourne Drive.
3. That Parking Enforcement be requested to enforce the "No Stopping/No Parking" prohibitions at Britannia Public School once the signage is updated between the peak times of 8:20 - 8:45 AM and 2:50 - 3:15 PM.

(Ward 11)
(TSC-0092-2019)

TSC-0093-2019
1. That the Warrants have not been met for the placement of a school crossing guard at the intersection of Miller's Grove and Tours Road for the students attending Miller's Grove Public School.
2. That Transportation and Works be requested to paint zebra markings on the east leg of the intersection of Miller's Grove and Tours Road, where students and parents of Miller's Grove Public School cross.

(Ward 9)
(TSC-0093-2019)

TSC-0094-2019
1. That Transportation and Works be requested to install "No Right or Left Turns on Red" signage at the intersection of Hillcrest Avenue and the West GO Access Road between the hours of 8:00 – 9:30 AM and 3:00 – 4:30 PM.
2. That Transportation and Works be requested to replace the brick paving trippers with concrete pads curbside on both East and West GO Access Road on the north side of Hillcrest Avenue.

(Ward 7)
(TSC-0094-2019)

TSC-0095-2019
That Traffic Safety Council be requested to work with the Peel District School Board, Student Transportation of Peel Region and the Principals of both David Leeder Middle School and Meadowvale Village Public School to accommodate the loading and unloading of three David Leeder Middle School Buses on Meadowvale Village Public School property that pick up and drop off students west of Meadowvale Village Public School to avoid traffic congestion around David Leeder Middle School.
(Ward 11)
(TSC-0095-2019)

TSC-0096-2019
1. That Transportation and Works be requested to review signage on both Darcel Avenue and Middleshire Drive for the students attending Darcel Avenue Senior Public School.
2. That Transportation and Works be requested to conduct a speed study on Darcel Avenue in front of Darcel Avenue Senior Public School and request Police Enforcement of speeding if warranted between the times of 8:10 – 8:40 AM and 2:50 – 3:20 PM, as time and resources permit.
3. That the Peel District School Board be requested to accommodate access to the school entry doors from Darcel Avenue at the east end of Darcel Avenue Senior Public School property.
4. That Transportation and Works road safety be requested to review the feasibility of implementing a crossover at the intersection of Darcel Avenue and Middleshire Drive for the students attending Darcel Avenue Senior Public School.

(Ward 5)
(TSC-0096-2019)

TSC-0097-2019
1. That the warrants have not been met for the placement of a school crossing guard at the rear access of St. Catherine of Siena on Confederation Parkway for the students attending St. Catherine of Sienna Catholic Elementary School and Floradale Public School.
2. That Transportation and Works be requested to review the feasibility of implementing a crossover at the walkway/driveway behind St. Catherine of Sienna Catholic Elementary School on Confederation Parkway between the Queensway and Paisley Boulevard West.

(Ward 7)
(TSC-0097-2019)

TSC-0098-2019
That the Memorandum dated November 6, 2019 from Megan Piercey, Legislative Coordinator entitled “2020 Traffic Safety Council Meeting Schedule” be received for information.
(TSC-0098-2019)

TSC-0099-2019
That the verbal report from Louise Goegan and Miles Roque, Citizen Members in regards to the Ontario Traffic Council School Zone Safety Workshop on November 8, 2019 be received.
(TSC-0099-2019)

TSC-0100-2019
That Miles Roque, Citizen Member be appointed as a member of the Public Information Subcommittee of the Traffic Safety Council for the term ending November 14, 2022 or until successors are appointed.
(TSC-0100-2019)

TSC-0101-2019
1. That selection of the recipient of the 2019 Dr. Arthur Wood Award be deferred to the next Traffic Safety Council meeting.
2. That the Legislative Coordinator be requested to provide the members of Traffic Safety Council with a list of qualifications for the recipient of the Dr. Arthur Wood Award and advise the committee to provide their nominations within a two week period once the qualifications have been provided.

(TSC-0101-2019)

TSC-0102-2019
1. That the 2019 Wilde Wood Award for School Zone Safety be awarded to the following schools that have demonstrated that they have a team of staff and/or volunteers that deserve to be recognized for the efficient operation of the School Zone Safety (Kiss & Ride) Program and promote and/or encourage active transportation to and from school.
   a. Castlebridge Public School (Ward 9)
   b. Plum Tree Park Public School (Ward 9)
2. That $1,000.00 ($500.00 per school) be allocated for awarding the recipients of the 2019 Wilde Wood Award.

(TSC-0102-2019)

TSC-0103-2019
That the Parking Enforcement in School Zone Report for October 2019 be received for information.
(TSC-0103-2019)

TSC-0104-2019
That the Transportation and Works Action Items List for October 2019 be received for information.
(TSC-0104-2019)

TSC-0105-2019
That the Site Inspection Statistics Report for November 2019 be received for information.
(TSC-0105-2019)

TSC-0106-2019
That the email dated November 26, 2019 from Denna Tallia, Traffic Operations Technologist in regards to Recommendation TSC-0074-2019 for St. Joseph Catholic Elementary School be received.
(Ward 11)
(TSC-0106-2019)