



MORRISON HERSHFIELD

Final Report

Sustainability Metrics Update

Presented to:

City of Richmond Hill

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Canada

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ACKNOWLEDGMENTS

The Sustainability Metrics Update and Incentives Project (Project) represents a unique collaboration between the City of Richmond Hill, City of Brampton, City of Vaughan and the City of Markham.

Morrison Hershfield (MH) was retained to complete the Project. The Project was undertaken in two parts, Part one is to update the inter-municipal Sustainability Metrics in response to changes in Provincial planning policy and legislation. This part was done in collaboration with the municipal partners and is summarized in this report. Part two which will be completed following the completion of Part one will investigate potential incentives to encourage developments to achieve their sustainability metrics goals, and to recommend the implementation of a Green Roof By-law for the City of Richmond Hill.

The success of this Project is attributed to the numerous agencies, stakeholders and professionals who shared their thoughts and insight during an extensive engagement process. The project team would also like to recognize the members of the Decision-Making Advisory Team and Technical Advisory Team who devoted their time to the completion of part one of this Project. They include the following:

Decision-Making Advisory Team (DMAT)

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Consulting Team, Morrison Hershfield

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EXECUTIVE SUMMARY

The Sustainability Metrics Update and Incentives Project (Project) is a collaboration between the cities of Richmond Hill, Brampton, Vaughan and Markham (the municipal partners). A memorandum of understanding was signed by the municipal partners which included a financial contribution. The Federation of Canadian Municipalities also provided a matching grant of \$50,000 from their Green Municipal Fund.

Morrison Hershfield was retained to complete the Project in two parts. Part one focuses on an update to the Sustainability Metrics indicators. The final deliverable is an update report reflecting an update to the current metrics or the creation of new metrics and targets. Following part one, each individual municipality will focus on project implementation, monitoring, and sharing between municipal partners. Part two is to identify and implement incentives and to recommend a Green Roof By-law for the City of Richmond Hill.

Each Sustainability Metric is an optional choice that will help developments achieve their sustainability goals. Through their proposed developments, applicants must accumulate points by committing to metrics resulting in a score that fall above the mandatory threshold scores endorsed by each respective local municipal Council.

The suite of metrics presented in this report reflect a comprehensive update to the Sustainability Metrics tool that was originally established in partnership by the partner municipalities in 2013. Among other matters, the metrics aim to quantify and rank the sustainability performance of proposed developments and facilitate best practices in sustainable development. Updates to the metrics are briefly summarized in the body of this report with detailed requirements for each metric provided in an appendix that identifies the metric intent, targets, point allocations, document compliance and references. These Sustainability Metrics can apply to a range of planning application types (e.g. block plans, draft plans of subdivision, and site plans) and are organized into four overarching themes, consisting of 43 indicators and 125 optional metrics (depending on plan type) that the development proponent can choose from.

Users should note that the Sustainability Metrics are structured in such a manner that allows an applicant to tailor the sustainability design feature to the site. The benefit to have the same metrics available across multiple municipalities is to help the development industry adhere to a consistent set of sustainable measures that will help provide direction, predictability and reliability. While the Sustainability Metrics are consistent across the partner municipalities, each municipality will elaborate how it intends to encourage the implementation of the tool as part of the planning application review process based on its unique context.

1. INTRODUCTION

1.1 Background

Morrison Hershfield Limited has been retained by the City of Richmond Hill to update the current Sustainability Metrics on behalf of the Sustainability Metrics program's municipal partnership (The Municipal Partners). The partnership was originally made up of the cities of Richmond Hill, Brampton, Vaughan, and now includes Markham.

The current Sustainability Metrics program was launched in 2014 as a tool to achieve healthy, complete, and sustainable communities. The metrics are green development standards that quantify and evaluate the sustainability performance of new development and encourage proponents of development to achieve sustainable design targets that go beyond provincial and municipal requirements. The metrics are adopted as development requirements imposed on the development industry, with typical applicants being developers and their consultant teams. Metrics are assigned a point allocation and applicants are free to choose which metrics they wish to apply to their proposed development site. The total points achieved are then calculated and result in a final sustainability score that is used to evaluate the proposed development. Final sustainability scores are then compared against established threshold scores, as determined by each partner municipality. Threshold scores enable the municipalities to ensure that development applications are achieving a certain level of sustainability performance. The degree and method of adoption is at the discretion of each municipality.

This report highlights an update to the Sustainability Metrics tool. The Sustainability Metrics Update project is intended to accomplish the following objectives:

1. Update the inter-municipal Sustainability Metrics in response to changes in legislation, Provincial Planning policy, and best practices in sustainability since the Sustainability Metrics were first developed;
2. Recommend new Sustainability Metrics that help reduce GHG emissions and aid in achieving the goal of becoming a more sustainable, energy efficient community over the long-term; and
3. Develop an appropriate performance indicator to monitor the success and implementation of the metrics.

Changes to municipal and provincial legislation, policies, and plans have necessitated a review of the Sustainability Metrics program. The previous Provincial government's Climate Change Mitigation and Low- carbon Economy Act, 2016 (repealed on November 14, 2018) and the Climate Change Action Plan establish Ontario's GHG reduction targets and set out actions designed to modify behaviour to achieve these targets. The energy efficiency updates to the Ontario Building Code (January, 2017) have now increased energy efficiency requirements for new buildings to a level beyond that in the existing Sustainability Metrics, meaning that the energy efficiency metrics utilized approved by the three partner municipalities in 2013 are redundant and are not advancing energy efficiency in new development beyond the requirements of the Building Code. Other key factors include the approval of the CTC Source Water Protection Plan (December, 2015), which requires low

impact development techniques, the updates to the Growth Plan for the Greater Golden Horseshoe (May 2019), Oak Ridges Moraine Conservation Plan (May 2017), and Greenbelt Plan (May, 2017), and green infrastructure incorporated into asset management regulation (O. Reg. 588/17). In addition, in March 2020, a draft of York Region's Climate Change Action Plan was released for review.

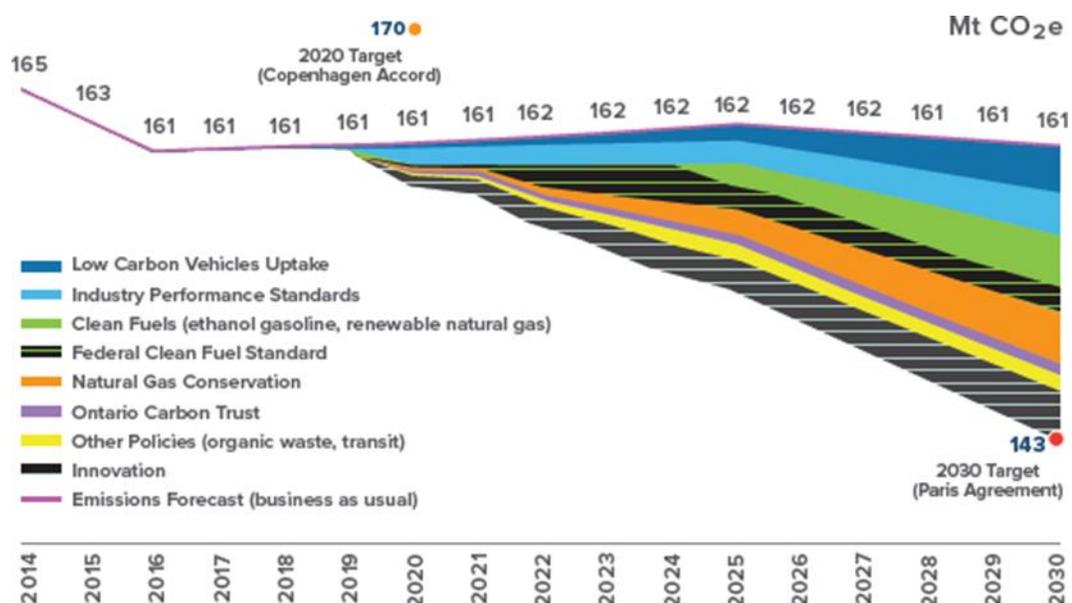


Figure 1: Path to Meeting Ontario's 2030 Emissions Reduction Target (Source: Preserving and Protecting our Environment for Future Generations: A Made-in-Ontario Environment Plan, 2018)

Since 2018 there have been a number of changes to Ontario's approach to greenhouse gas reductions, including the adoption of the Preserving and Protecting our Environment for Future Generations: A "Made -in- Ontario Environment Plan" (see Figures 1 and 2). This latest plan has major sections related to air and water protection, climate change, waste, and land conservation. Each of these sections is discussed briefly below:

- Protecting our Air, Lakes and Rivers: This brief, 7-page section includes some action items but most of these lack the specificity to be beneficial for this work.
- Addressing Climate Change: This 15-page segment states that Ontario will reduce its emissions by 30% below 2005 levels by 2030, aligning with Canada's 2030 target under the Paris Agreement. Action items in this section include some focus on resiliency and adaptation, including helpful guidance on how to prevent floods such as keeping your eavestroughs clean. It also includes language around reviewing policies and laws, including the building code, that may affect this project, but the level of detail is insufficient at this time. The plan does encourage innovation and energy conservation and includes a section on reducing transportation emissions by supporting public transportation.
- Reducing Litter and Waste: This section includes action items including a banning of food waste from landfill, expansion of green bin systems, guidance on reducing plastic waste, and making producers responsible for waste associated with packaging.

- Land Conservation: This section is generally vague in recommendations, but it does state that the Provincial government will work with leaders such as Ducks Unlimited Canada to preserve natural areas and will support the creation of new trails across the province.

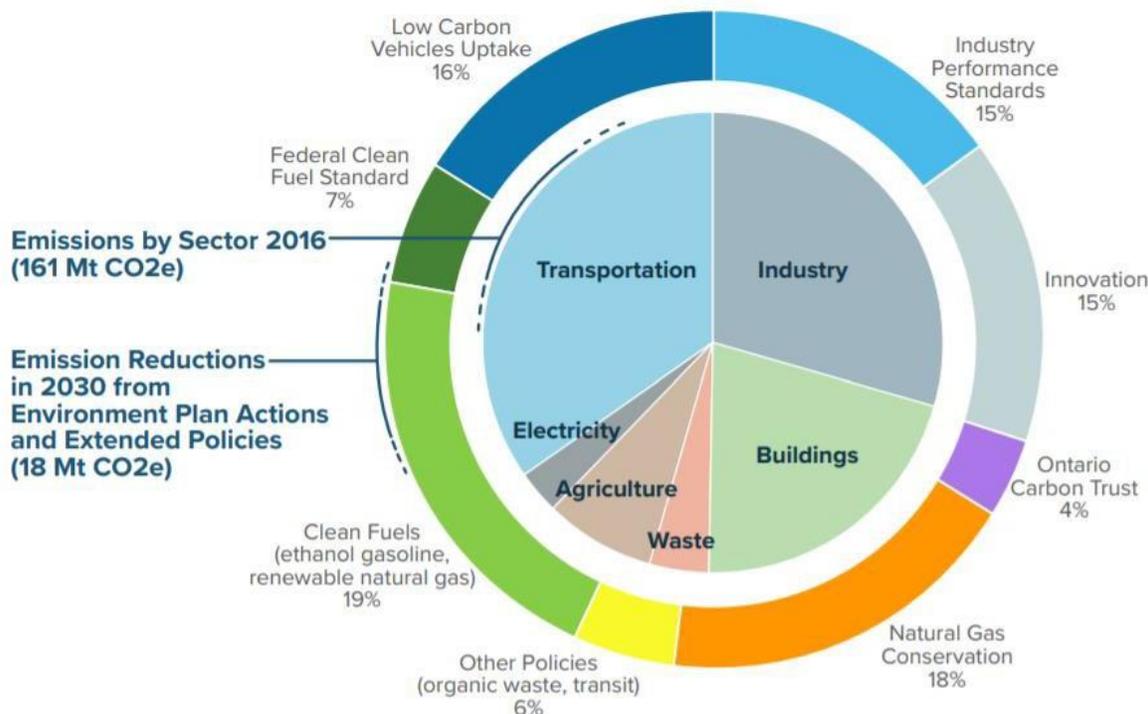


Figure 2: Planned Emission Reductions in 2030 by Sector (Source: Preserving and Protecting our Environment for Future Generations: A Made-in-Ontario Environment)

This project is intended to investigate and recommend methods to update and improve the use of the Sustainability Metrics program and in response to climate change concerns to compel the provision of a lower-carbon built form. By updating the existing Sustainability Metrics and providing additional new metrics and programs aimed at facilitating reducing GHG emission reductions in new built form, this project will also support economic development in emerging green building sectors.

1.2 Sustainability Defined

The term “Sustainability” can mean different things to different people. It ranges from energy efficiency to organics, transportation, and the reduction of homelessness. The term covers a very broad spectrum. Fundamentally, sustainability means meeting our own needs without compromising the ability of future generations to meet their own needs. Our needs and future needs include natural, social and economic resources. These are the three pillars of sustainability, each of which must be considered to fully meet our current and future needs (refer to Figure 3).

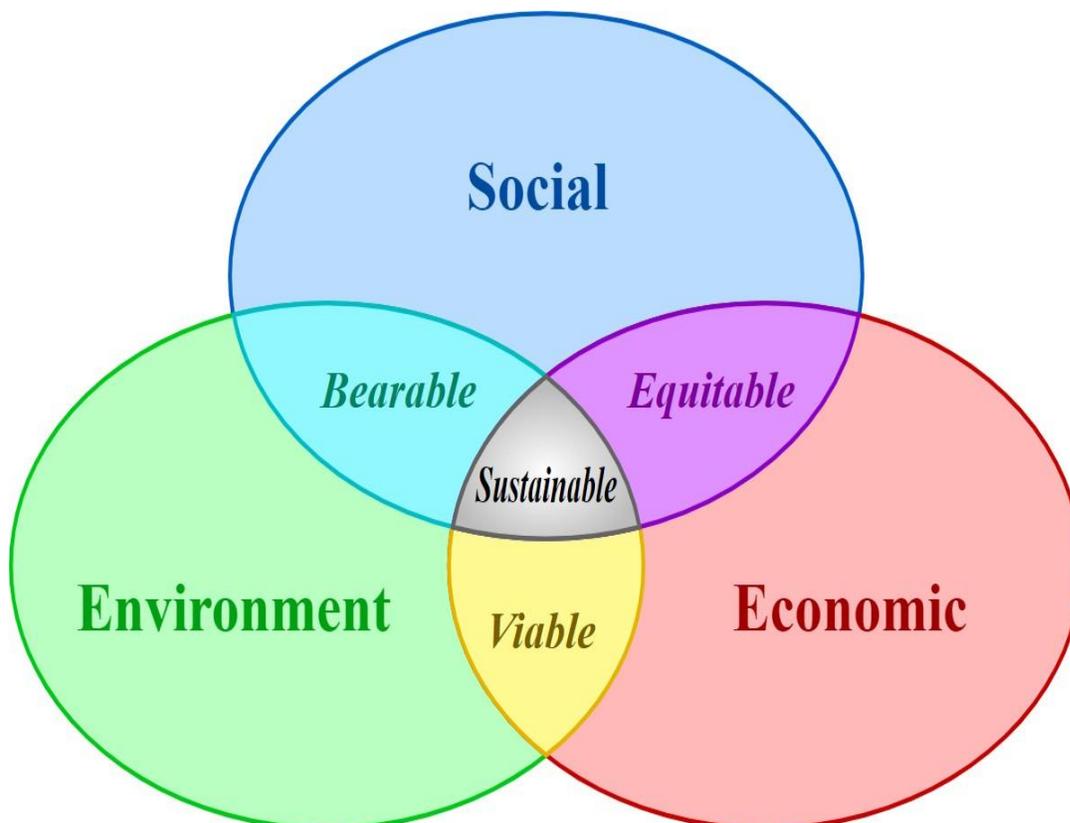


Figure 3: Three Pillars of Sustainability (source: Adam, W.M. IUCN, 2006 retrieved from <https://portals.iucn.org/library/sites/library/files/documents/Rep-2006-002.pdf>)

The following is a brief description of the three pillars of Sustainability:

- **Environmental Sustainability:** Ecological integrity is maintained and all of earth's environmental systems are kept in balance. Natural resources are consumed by humans at a rate where they are able to replenish themselves.
- **Economic Sustainability:** Communities have access to the resources that they require, financial and other, to meet their needs. Economic systems are intact and activities are available to everyone, such as secure sources of livelihood.
- **Social Sustainability:** Universal human rights and basic necessities are attainable by all people.

As indicated in Figure 3 above, the three pillars of sustainability are interrelated. Often specific measures adopted to improve sustainability will affect more than one pillar above. As an example, cycling facilities can lead to a more sustainable community environmentally (lower greenhouse gases), socially (exercise and friendship) and economically (enabling transportation for lower income people).

The metrics presented should be considered in relation to their impact in all three pillars of sustainability.

1.3 Process

This project is broken into four stages, each of which are described briefly below:

1.3.1 Stage 1: Background Analysis

This project began with background research and evaluation of the current Sustainability Metrics in effect in the City of Richmond Hill, City of Vaughan, and the City of Brampton. The goal of the background research was to identify metrics that require updating due to current or anticipated: industry practices, revised reference documents, direction of other jurisdictions. It included a review of over thirty different documents to provide guidance on the current state of the industry with respect to sustainability, including:

1. Ontario Building Code 2012, as amended
2. USGBC, LEED v4 for Neighborhood Developments, July 2018;
3. USGBC, LEED v4 for Building Design and Construction, 2013;
4. Town of East Gwillimbury, Thinking Green! Development Standards Program, February 2012;
5. The Regional Municipality of York's High Density Residential "Green Building" Incentive Program, November 2015;
6. City of Toronto, Toronto Green Standard Version 3, May 2018;
7. Ontario Climate Change Action Plan 2016, updated to Ontario's Made-in-Ontario Environment Plan, November, 2018;
8. City of Richmond Hill, 2018 Strategic Plan Annual Report, June 2018;
9. City of Richmond Hill, Official Plan, January 2018;
10. City of Richmond Hill, 2017 Energy Consumption and GHG Emissions Report;
11. City of Vaughan Suggested Updates to Sustainability Metrics;
12. City of Vaughan, City of Vaughan Official Plan, September 2010;
13. City of Vaughan, Vaughan Municipal Energy Plan: Plug into a Smart Energy Future, June 2016;
14. City of Vaughan, Urban Design Guidelines;
15. City of Vaughan, Green Directions Vaughan Draft 2019 Community Sustainability Plan, June 2019;

16. City of Brampton, Brampton 2040 Vision, May 2018;
17. City of Brampton, Brampton Grow Green Environmental Master Plan: Implementation Action Plan, May 2014;
18. City of Brampton, 2016-2018 Strategic Plan;
19. Brampton's Sustainable Community Development Guidelines, September 2013;
20. City of Toronto. Toronto Draft Pollinator Protection Strategy. July 2017;
21. Region of Peel, Health Background Study Development of a Health Background Study Framework, May 2011;
22. York Region, Sustainable Development through LEED: A High Density Residential "Green" Building Incentive Program, November 2010;
23. Multiple Toronto and Regional Conservation Authority Guidelines;
24. Aquafor Beach Ltd., Earthfx Inc., Runoff Control Volume Targets for Ontario, October 2016;
25. Federation of Canadian Municipalities (FCM), Sustainable Neighbourhood Development: Practical Solutions to Common Challenges, 2016;
26. World Green Building Council, World Green Building Trends 2018 smartMarket Report, 2018;
27. Canadian Alliance for Sustainable Health Care, Community Wellbeing: A Framework for the Design Professions, July 2018;
28. Intergovernmental Panel on Climate Change (IPCC), Global Warming of 1.5C, October 2018;
29. Energystar. Multifamily high-rise (New Construction Program). October 2019;
30. GBCI Canada, Yorkdale Shopping Centre Parkades, 2017;

The background research phase of the project ended with the development of a comprehensive memo summarizing the research and its impact on the existing sustainability metrics.

1.3.2 Stage 2: Draft Metrics Update

Stage 2 began with a full day workshop with staff from the various municipalities. The purpose of this workshop was to set priorities, identify gaps, anticipate future growth

(population, traffic, and resilience), and identify the stakeholders and organizations that should also be included in this process.

Once the needs and issues were identified by municipal staff and the Technical Advisory Team, they were translated into a draft report of suggested updates and revisions to the metrics. The draft report, similar to this final report, included a description of the process, a summary of the proposed changes to the metrics, including metrics that will be removed, changes to the guidebook and metric targets, metric re-categorization and new metrics that will be introduced.

1.3.3 Stage 3: External Stakeholder Consultation

The Stage 3 Consultation period was carefully planned and carried out by MH facilitating four stakeholder consultation workshops during the last week of January 2020. The TAT recommended the four groups for these separate workshops which were;

1. The local development industry (developers and consultants)
2. Building Industry and Land Development Association (BILD) Peel and York Region Chapters,
3. Members from the York Region, Peel Region, Credit Valley Conservation (CVC) and the Toronto and Region Conservation Authority (TRCA),
4. The Clean Air Partnership, The Atmospheric Fund and the Canadian Green Building Council.

Detailed materials were provided to all invitees in advance and comments were collected during or after the workshops. At least two weeks prior to each workshop, invitations were circulated to invitees. Included in each invite was an agenda, a cover letter to explain the update process of the Sustainability Metrics and an explanation of the purpose of each stakeholder feedback workshop and the full Sustainability Metrics Draft Report with the Appendix A (Sustainability Metrics Guidebook) and Appendix B attached for reference. Further, the cover letter explained that the workshop would discuss the proposed updated Sustainability Metrics with the precedent that attendees reviewed the material prior to the workshop and be prepared for feedback and further discussion.

Comments were collected from attendees at each workshop. Verbal feedback was recorded by the consulting team and TAT members, and written comments where provided were also collected at the end of each session. In addition, stakeholders were given the option to further review or circulate the material to a wider group of stakeholders and submit their written comments during a four week comment period between January 27, 2020 and February 21, 2020.

An additional meeting was scheduled mid-February with the Green Building Certification Inc. (GBCI) to collect further comments and feedback from another valuable stakeholder group. A comprehensive list of feedback and comments was provided by the GBCI after the meeting, during the comment period.

Nearly 25% of the comments received pertained to high level topics. The most notable high level topics included the applicability of points, incentives, point thresholds, the consideration of applications where many metrics are not-applicable and the application review process. All the comments were reviewed and noted, however only comments specific to the update of the metrics could be reflected in the updated Sustainability Metrics Guidebook.

In total, 467 comments were received from external stakeholders. All comments were compiled and reviewed for comments and recommendations by MH. The comments and corresponding recommendations from MH were reviewed by the TAT to finalize the updated Sustainability Metrics.

1.3.4 Stage 4: Final Updated Sustainability Metrics

Based on the research, workshop, and consultations performed, the draft has been updated and recommended updates to the Sustainability Metrics are included in this final report.

2. UPDATES TO THE METRICS

The purpose of this report section is to highlight the changes to the Sustainability Metrics. Updates to each metric were proposed by Morrison Hershfield and discussed with the Technical Advisory Team (TAT) or resulted from consensus of the TAT. This section contains a summary of the resulting changes broken into the following categories: metrics that have been carried forward with minimal change, metrics that have moved forward with major changes, metrics that have been removed, and new metrics. The rationale for each suggested change is also included. The updated Sustainability Metrics Guidebook in Appendix A provides additional detail on the metric intent, requirements for each metric, point allocation and documenting compliance.

2.1 Points Allocations and Threshold Scores

The first iteration of the metrics identified “mandatory”, “minimum” and “aspirational” targets with allocated point scores. Applicants accumulate points by proposing to provide any of the minimum or aspirational metrics as part of their Site Plan, Draft Plan or Block Plan application. Under the current tool, metrics identifying minimum targets are classified as “doing better than you have to” while aspirational targets are considered “best in class”. These targets have since been revised through this update to update the “minimum” and “aspirational” nomenclature so that it is more predictable, flexible and less prescriptive. Through this update, categories now reflect “Good”, “Great” and “Excellent” targets which denote progressively complex requirements that transcend the four main themes of the tool: Built Environment, Mobility, Natural Environment and Open Space, and Infrastructure and Buildings. In addition, a new theme entitled “Innovation” has been recommended to allow flexibility for users of the tool to propose innovative sustainability measures that are not specifically captured but which provide a measurable sustainability benefit. This flexibility is intended to allow users to think progressively and outside of the box when proposing sustainability measures on their development site.

Point scores for metrics are awarded when an applicant demonstrates that its proposed plan has satisfied all of the applicable Good, Great or Excellent targets and corresponding documenting compliance requirements. Users should note that not all metrics include all three of the aforementioned targets which are based on the type of requirements listed. Accordingly, the metrics are structured in a manner that allows an applicant to select the appropriate metric requirements to demonstrate whether a baseline, enhanced or best in class sustainability target is achieved. This principle has not changed since the first iteration of the tool, however as noted above, the following are new categories of targets that replace the former “minimum” and “aspirational” nomenclature used:

- Good (“baseline sustainability performance”),
- Great (“enhanced sustainability performance”),
- Excellent (“best in class sustainability performance”).

The revised categories aim to provide clarity and flexibility by allowing applicants to tailor the sustainable design features to the site. It is the intent that each municipality will update their threshold sustainability scores for incentives it wishes to offer applicants to encourage implementation of the metrics. While the Sustainability Metrics will be consistent across the partner municipalities, each municipality will elaborate how it intends to encourage the

implementation of the metrics as part of the planning application review process based on its own unique context. Point scores allow municipal staff to appreciate the overall sustainability performance of the proposed plan, while also identifying key opportunities to further improve the application's performance relative to municipal priorities based on the five categories of the tool.

2.2 Review of Point Allocations

In updating the Sustainability Metrics, point allocations were also reviewed by the project team to ensure clarity and equity among metric requirements and corresponding point allocations. It should be noted that not all metrics and targets carry the same point allocations. Metrics that support the municipalities' priorities, provide multiple sustainability benefits and which are complex and onerous to implement have been considered carefully and generally awarded a greater point allocation. Moreover, not all plan types will be able to score in every category. Depending on the metric and plan type, the respective points will either be excluded from the total, or the plan will not be awarded points. Accordingly, through this update the project team has considered the point allocations holistically which in some instances has resulted in slight adjustments to the point scores. As a result, points have either been increased to reflect complex requirements, decreased or left unchanged where it was determined that the current score represents an equitable point allocation commensurate with requirements.

2.3 Metrics Carried Forward with Minor Changes Only

The following metrics were identified by the TAT and MH as still relevant and only requiring minor changes.

- 1.H.2. Surface Parking Footprint (Renamed from “off-street parking”)
- Community and Neighbourhood Scale (City of Brampton only)
- 1. I.1. Traffic Calming
- 1. I.2. School Proximity to Transit Routes and Bikeways
- 2. B.2. Intersection Density
- 2. C.1. Distance to Public Transit
- 2. D.2. Implementing Trails and Bike Paths (Included Site Plan Applicability)
- 3. A.1. Access to Public Parks (Renamed from “Park accessibility” and Included municipality-specific targets)
- 3. B.2. Stormwater Quality
- 3. B.3. Greywater Reuse (for Interior Functions) (Renamed from “Rainwater Re-use”)
- 3. B.4. Multi-purpose Stormwater Management (Renamed from Stormwater Architecture/ Features)
- 4. A.1. Passive Solar Alignment

The TAT considered the option of combining some of the above metrics, but reached the consensus not to. Decidedly, each metric has a unique intent, and maintaining a ‘large menu’ of metric options is aligned with feedback consistently received by the development industry. Only minor changes have been made for these metrics. These typically included changes to the metric name to align more accurately with the metric intent, and/or slight adjustments to

the target point allocations. Changes to point allocations are based on discussions with the TAT, the uptake of the metrics to-date, and the desire to incentivize priority targets.

2.4 Removed Metrics

Existing metrics that have received minimal uptake to-date, are redundant, or are no longer relevant, have been removed. The table below provided a brief rationale for removing each metric.

1.A.1- Floor Area ratio/Floor Space index	Removed as this is covered by Official Plans and Zoning By-Laws for implementation.
1.A.2- Persons and Jobs per Hectare	Removed as this is covered by Official Plans and Zoning By-Laws for implementation.
1. C.1- Urban Tree Diversity	Removed as the intent of this metric is covered by municipal guidelines.
1.H.3- Surface parking	Removed as this is difficult to implement and enforce.
1.I.3- Proximity to School	Removed because school locations and school site requirements are generally dictated by school boards, with minimal influence from the developer
1. J.4. Tree Canopy Enhancements	Removed as a standalone metric to streamline metrics with similar intents. Targets from the metric have been revised and incorporated into other metrics.
4. B.2. Water Conserving Fixtures 4. C.1. Parking Garage Lighting 4. C.3. Energy Conserving Lighting	Removed from the metrics because they are redundant with the requirements of the Ontario Building Code (OBC) and therefore enforcement of any mandatory requirements will be covered by OBC.
4.E.2 Material Reuse and recycled content 4.E.3 Recycled/ Reclaimed Materials	The industry is moving away from recycled content as a measure of sustainable materials with the updates to the materials credits in LEEDv4 and TGS v3 as an example. New metrics have been included that concentrate on embodied carbon of materials instead, as described further in section 2.3.

2.5 New Metrics

During the iterative process of exploring updates to the metrics, several new metrics were identified as important to include. New metrics relating to cultural heritage enhancements, climate change adaptation, supporting pollinators and the embodied carbon footprint of materials, are discussed in the section below. These metrics have been finalized based on review and discussion with the MH and the TAT and based on feedback from external stakeholders.

Electric Vehicle (EV) Charging Stations	This metric is based on trends in provincial and municipal sustainability initiatives and consumer trends towards Electrical Vehicles. For example, the Toronto Green Standard v3 mandates all Mid to High Rise Buildings to provide Electric Vehicle Supply Equipment (EVSE) to 20% of parking spaces, with the remaining spaces to be designed to permit future EVSE
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	<p>installation. EV parking spaces was formerly included in metric 1.H.4, but has been separated out to establish new targets that are better aligned with the Toronto Green Standard (TGS) v3.</p>
<p>Embodied Carbon of Building Materials- General</p>	<p>Three new metrics have been included to update the original two materials credits; 4.E.2 Material Reuse and recycled content and 4.E.3 Recycled/ Reclaimed Materials, which have been perceived as outdated relative to the most current version of green building assessment tools, such as LEED. There is a growing awareness of the importance of addressing the carbon associated with building materials (embodied carbon) rather than relying on indirect measures such as recycled content. According to the Athena Sustainable Materials Institute (September, 2019), embodied carbon can be defined as the lifetime greenhouse gas (GHG) emissions associated with material. It is life cycle thinking applied to a product, and includes GHG's associated with the manufacture, transportation and installation of a product, any GHG's related to product maintenance and renewal, and GHG's associated with the end of life of the product. This revised credit encourages an increase in supplementary cementing materials (SCMs) content for concrete, conducting a Life Cycle Assessment (LCA) for materials, and efficient use of wood in low rise housing</p>
<p>Embodied Carbon of Building Materials: Supplementary Cementitious Materials (SCMs)</p>	<p>The use of cement in concrete results in large contributions to GHG emissions. SCMs can be used to offset some cement used, resulting in significant GHG savings. Typically, concrete manufacturers will include around 10% SCMs, but increasing the percent of SCMs can be a simple and effective way to reduce the embodied carbon of concrete materials and in many cases, have no significant impacts to the material cost or project schedule. The good target calls for; including a minimum of 20% SCMs for all concrete on site, is a slight increase to the typical conditions. Note that high SCMs can increase the strength of concrete, alter the colour and increase the time required for curing. For the great target, the requirements are that at least 40% on the concrete on site has a minimum 40% SCM content. This is to recognize projects that have reduced their cement content in a major way while also being mindful that it is not realistic for 40% SCM content to be used on 100% of concrete on site. A strategy, for example, could be to use SCMs for the footings only. The intent of this target is to bring awareness to simple adjustments in best practices that would have a dramatic impact on the development's reduction in embodied carbon emissions.</p>
<p>Embodied Carbon</p>	<p>LCAs are used to quantify the embodied carbon of</p>

<p>of Building Materials: Life Cycle Assessments (LCAs)</p>	<p>building materials. Currently, it is not best practice to conduct LCAs and as a result, there is a knowledge gap between understanding the amount of carbon emissions (embodied carbon) that are required to be generated to manufacture certain building materials. The metric requires the applicant conduct an LCA and consider opportunities for reducing the embodied emissions. This knowledge will allow applicants a better understanding of the actual amount of embodied carbon for certain materials and on what scale it is possible to reduce embodied carbon with the consideration of different materials, building geometry and building design. To conduct LCAs, there are a number software applications available that are free to use and have online tutorials, for example the Athena Impact Estimator for Buildings LCA software: https://calculatelca.com/software/impact-estimator/download-impact-estimator/</p> <p>The intent is to encourage the building industry to increase capacity for conducting LCAs and to understand and reduce embodied carbon. This target aligns with the CaGBC's Zero Carbon Building Standard. The great target awards points for conducting an LCA and identifying carbon reduction strategies. The excellent target awards points for committing to at least one of the identified carbon reduction strategies.</p>
<p>Embodied Carbon of Building Materials: Material Efficient Framing</p>	<p>The other Embodied Carbon metrics are not applicable to low rise, wood framed buildings. A great target aligned with LEED for Homes has been included which prescribes building practices that would result in using less materials, resulting in lower embodied carbon.</p>
<p>Supporting Pollinators</p>	<p>A new metric has been added with the intent to prioritize the habitat and survival of pollinator populations, who play an important role in food production. Recent years have seen a sharp decline in pollinator populations due to climate change, habitat loss and pesticide overexposure. This is significant as a decline in pollinator populations could lead to a decline in plant species, impacting ecosystems and our food security. The targets are intended to maintain and increase the habitat of pollinators.</p> <p>The good and great targets have included requirements to select plant species that provide a habitat for pollinators (i.e., flowering grasses and shrubs) which increases their ability to forage, thrive and maintain their habitat.</p>
<p>Salt Management</p>	<p>A new metric has been added to promote salt reduction during winter maintenance activities. Salt management</p>

	<p>was identified as an important addition to the metrics. Reducing salt can extend pavement life, reduce the effects of salt corrosion on buildings, and minimized impacts on terrestrial and aquatic ecosystems. The salt reduction measures listed in the requirements include proper drainage to limit water ponding and freezing, planting salt tolerant landscaping vegetation, using trees as windbreaks around the site perimeter and installing heated or covered walkways.</p>
Sub Metering of Thermal Energy and Water	<p>This new metric has been added based on the discussion and feedback throughout the consultation process to add more metrics that focus on climate change adaptation, including energy and water metering. Sub-metering to track water and energy usage helps increase understanding of how occupant behaviour impacts their energy costs and can motivate building occupants to reduce their energy consumption. Targets have been added for including energy metering and water meters. These targets are in line with the Toronto Green Standard v3 credit GHG 4.4 Submetering.</p>
Back-up Power	<p>This new metric has been added based on the discussion and feedback throughout the consultation process to add more metrics that focus on climate change adaptation. As the frequency of extreme climate events increases, buildings are vulnerable to power outages. Buildings can become more resilient to power outages by incorporating design strategies that enable building owners/users to install and utilize power backup generators.. The metric requirements include providing rough-ins for an external generator or auxiliary power supply and for mid-rise to high rise buildings to provide a refuge area during power failures and/or providing 72 hours of back-up power to essential building systems. These targets are in line with the Building Resilience measures included in the Toronto Green Standard v3 GHG 5.2: Refuge Area and Back-up Power Generation.</p>
Extreme Wind Protection	<p>This new metric has been added based on the discussion and feedback throughout the consultation process to add more metrics that focus on climate change adaptation. The intent of this metric is to encourage more resilient construction to prepare for the increased extreme weather events, specifically for homes against the impact of high wind weather events. The good target requires that roof rafters, roof trusses and roof joists will be tied to loadbearing wall framing with engineered connectors.</p>
Controlling Solar Gain	<p>This metric builds on the intent of the existing Passive Solar Alignment metric to promote energy efficiency through passive solar design. Unwanted or uncontrolled</p>

	<p>solar gain can contribute to unwanted heat gain and increased loads on air conditioning/ cooling systems which can increase energy consumption. A target has been added which requires providing exterior shading for east and west facing windows to control unwanted solar heat gain.</p>
<p>New Category and Metric: Innovation</p>	<p>An innovation category has been added to the metrics, and is aligned with the LEED v4 innovation credit category and has similar requirements and documentation. Although the points will be TBD, the points for the entire category have been capped at a maximum of 10 points.</p> <p>The innovation metric is intended to encourage true innovation resulting in real sustainability benefit. It will include a number of pre-established requirements but should be open to new ideas presented by the applicant.</p>

2.6 Metrics with Changes

This section describes how the existing metrics to remain have been revised or updated. The table below also includes the rationale for changes. Generally, the rationale for most of the changes was to update the metrics to reflect the shifts in the building and development industry since the metrics were developed, and to adjust the targets of original metrics that had a high or low uptake. Where metrics demonstrated a high uptake, more challenging targets were included. Alternatively, changes have been included for metrics with low uptake to align more realistically with today's market with the goal of increasing uptake. Changes were also made to take advantage of demonstrating leadership in sustainability. All changes to the points allocated for metric targets were finalized based on the feedback from stakeholder and through a collaborative discussion that considered the innovation of the metric, potential difficulty, sustainability impact, and other considerations. The updates to the Energy Metrics were significant and have been described in detail in section 2.5 of this report.

<p>General Changes</p>	<p><u>Sustainability Metrics Guidebook Structure (Appendix A)</u></p> <p>The structure of the Sustainability Metrics Guidebook has been changed with the intent of streamlining the presentation and clarifying the points, requirements and documentation for each target. The proposed guidebook most closely resembles the Sustainability Metrics guidebook currently used by the City of Brampton and is in table format. The strategy for reorganizing the structure of the Guidebook included removing the glossary of terms from the proposed guide. We suggest that these resources be available separately for clarity or as a "hover-over" function for digital guides. Where for documentation purposes further descriptions were necessary, such as exclusions, notes have been added</p>
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under the documentation compliance instructions

To streamline the compliance documentation required to confirm the achievement of each metric, the descriptions of “where to demonstrate compliance” and “how to demonstrate compliance” were combined, taking advantage of the many similarities among Block Plan, Draft Plan and Site Plan compliance submittals.

Most notably, we have changed the format of the tables for each metric so that the information reads right to left rather than from top to bottom. The goal of this format is for the user of the guidebook to draw clear conclusions as to the points assigned to each metric target, the requirements to achieve these points and the documentation required to confirm compliance. An example of a metric structured in the updated format is demonstrated below in Figure 4.

Metric:	M-8 Proximity to Active Transportation Network		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To promote active transportation through the provision of enhanced pedestrian walkways multi-purpose paths and bike trails and satisfy City's Official Plan targets. Cycling results in carbon savings and less air pollution. It also provides health benefits and more connectivity between occupants.		
	Points	Requirements	Documenting Compliance
Good Target:	2 points	100% of residents/jobs are within 400 m of existing or Council approved public path/network.	<p>Submit:</p> <p>In the Traffic Impact Study or Transportation Demand Management Plan or Transportation Study:</p> <ul style="list-style-type: none"> Provide a map showing the subject lands/area of development, a 400m buffer from the boundaries of the development as well as any existing or municipally approved cycling networks. <p>Notes:</p> <ul style="list-style-type: none"> These points are only awarded if a cycling network is included in the project boundary and the bike parking requirement is satisfied.
References:	City's Official Plan		

Figure 4: Metric Example from the Updated Sustainability Metrics Guidebook Structure

General Changes	<p><u>Numbering and Category Change for Some Metrics (Appendix B)</u></p> <p>We are proposing that the metrics be re-numbered so that they can be organized effectively for users. We have re-numbered the metrics so that they can be directly associated with one of each of the four categories; Built Environment, Mobility, Natural Environment and Open Space and Infrastructure and Buildings (e.g. BE-1, BE-2, M-1, M-2 etc.). Based on the experience of working with certain metrics, some metrics have been moved to different, more applicable categories.</p>
General Changes	<p><u>Re-naming of Metric Targets from Mandatory, Minimum and Aspirational</u></p> <p>Mandatory Targets have been removed as these are</p>

	<p>required by the Ontario Building Code, provincial and municipal requirements, and other standards. Note that where possible language related to mandatory requirements was incorporated into the metric ‘intent’.</p> <p>The requirements and documentation for the remaining targets are located to the immediate right of the target description so that it is easier for applicants to relate the targets, requirements and documentation</p> <p>Many comments received from the external consultation process noted confusion regarding the naming of “minimum” and “aspirational” targets. As noted earlier, to provide clarity, minimum and aspirational targets have been re-named to “good”, “great” and “excellent”, in part to confirm that minimum targets are not another mandatory requirement and that all credits are optional.</p>
1.B.1 and 1.B.2- Proximity to Basic Amenities/ Lifestyle Amenities	<p>These metrics have been merged for the purpose of simplifying. Additionally, synergies with the LEED ND v4 prerequisite have been included to align with this popular rating system and incorporate existing knowledge and language. Block plan applicability has been removed for this metric to be better aligned with the documentation available at this planning stage.</p>
1.C.2- Preserve Existing Healthy Trees	<p>The name of this metric has been changed from “Maintain Existing Healthy Trees” to “Preserve Existing Healthy Trees” to more accurately reflect the sustainability benefits. Preserving trees and tree canopies were consistently identified as a high priority for all partner municipalities. The targets have been simplified so that all the requirements are increments of the “percent of trees preserved”.. The original aspirational target has increased, reflecting the positive shift in the industry regarding maintaining healthy trees in situ.</p>
1.C.3- Soil Quantity and Quality for New Trees	<p>The name has been changed from “Soil Quantity and Quality” to “Soil Quantity and Quality for New Trees” to more accurately reflect the intent of the metric.</p> <p>Originally, there was no minimum target and one aspirational target with many requirements. Parts were separated to a new good target to provide more options for applicants and encourage uptake of this metric.</p> <p>Using similar rationale, a great target was added that builds on existing mandatory municipal requirements.</p>
1. C.4. Enhancing Urban Tree Canopy and Shaded Walkways and Sidewalks	<p>To clarify the intent of this metric, it has been renamed from, “% tree canopy within proximity to building/ pedestrian infrastructure” to “Enhancing Urban Tree Canopy and Shaded Walkways and Sidewalks”. An additional aspirational target has been added to include shading for parking areas in addition to sidewalks, as parking lots are another common hardscape with</p>

	opportunities to provide shade to pedestrians.
1.D.1- Buildings Designed and/or Certified Under An Accredited 'Green' Rating System	The targets for this metric have been updated to reflect the growing uptake of building green rating systems. Similarly, language has been updated to include relevant green rating systems. An additional good target has been included to award points for green rating systems that are applicable on a neighborhood scale (LEED ND, One Planet Living).
1.E.1- Universal Design	To recognize concerns with the difficulty of reviewing this metric, additional documentation requirements have been added for applicants to provide more evidence of compliance. Further, the allocation of points for the good/ minimum target has increased.
1.E.2 Universally Accessible Points of Entry	To increase uptake for this metric, the good target has been revised to require a reduced percentage of emergency exits and additional points have been added to the great target.
1.F.1- Design for Life Cycle Housing	There was a discussion of removing this metric from Site Plan applicability because the documentation would likely already to be captured in the Block and Site Plan stages. Based on stakeholder feedback, the Site Plan applicability has been kept for this metric. The intent of this metric has been updated and the language of the target requirements and documentation has been streamlined.
1.H.1- Bicycle Parking	To simplify requirements, bicycle parking space requirements were changed to reference the municipal standards/ guidelines. Municipal bicycle parking standards represent the baseline and points are awarded where bicycle parking is provided at rates higher than what is required by the municipality. In addition, based on feedback from stakeholders and further alignment with the credit intent, requirements have been added for the proximity of bike parking to the building entrance and providing for weather protection.
1. H.4. Carpool Parking	Carpooling and efficient vehicle parking have been separated into separate metrics to clarify their different intents and benefits to sustainability. The carpooling requirements have remained the same and additional language has been included in the requirements to clarify how preferred parking is to be provided.
1.J.1 Connection to Natural Heritage	The good and great targets have been updated for clarity and definitions improved.
1.J.2.Cultural Heritage Conservation	The metric has been revised to reflect different degrees of cultural heritage conservation whereby conserving all cultural heritage attributes in situ has been added as a new 'great' target, and conservation in full conformity with the Standards and Guidelines for the Conservation of Historic Places in Canada is recognized as an 'excellent' target. Moreover, new targets have been established for

	conserving cultural heritage resources through relocation, salvage and reuse of materials.
1.J.3- Natural Heritage System Enhancements	<p>This metric has been revised to prioritize the habitat and survival of pollinator populations within natural heritage systems, and increase biodiversity.</p> <p>New targets have been added to include the preparation and implementation of a Woodland Species Management Plan and an Invasive Management Plan, where they are not already required by the municipality. Points will be earned for providing these management plans, providing habitat structures for Species at Risk, and establishing naturalized corridors connecting at least two natural heritage features.</p>
2.A.1 Pedestrian Amenities	The name has been changed from “Connectivity” to “Pedestrian Amenities” to more accurately reflect the intent and sustainability benefits. The original aspirational target has been kept and one new target has been added for an additional amenity.
2. B.1. Block Perimeter and Length	This metric has been carried forward and another more stringent great/aspirational target was added from the Region of Peel’s Healthy Background Study Framework, Core Element 4: Street Connectivity to provide a framework for applicants that are prioritizing smaller blocks and increased pedestrian walkability.
2. D.1. Proximity to Active Transportation Network	The name has been changed from “Proximity to Cycling Network” to “Proximity to Active Transportation Network” to be better aligned with the intent of promoting a connection to multipurpose paths, pedestrian walkways and bike trails. The original aspirational target has been re-named under a good target and the original minimum target has been removed. This streamlines the requirements of the metric while remaining true to the intent.
2. E.1. Promote Walkable Streets	The original aspirational target has been changed into a good target and the original minimum target has been removed. This streamlines the requirements of the metric while remaining true to the intent.
3.B.1 Stormwater Quantity	An additional excellent target has been added that aligns with Toronto Green Standard version 3, Tier 3. This provides a framework for applicants who want to exceed the existing targets and intend to incorporate innovative stormwater management techniques.
3. B.2. Stormwater Quality	The requirement for the great target has been increased, based on stakeholder feedback, to include at least two treatment strategies to meet the 91% Total Suspended Solids (TSS) removal target. Feedback from the stakeholders revealed that it is common for one

	<p>treatment strategy to perform lower than the stated TSS removal percentage, and therefore including the requirement for at least two treatment strategies as a treatment train approach is an effective way to better align the metric requirements with the metric intent.</p>
3.C.1 Dedicate Land for Private Fruit and Vegetable Garden Space	<p>The name has been changed from “Dedicate Land for Food Production” to “Dedicate Land for Private Fruit and Vegetable Garden Space”. To simplify the requirements and increase uptake, the targets have been divided into providing a minimum garden space area for multi-unit residential developments and for ground-oriented residential developments. The metric has now allocated points for providing a garden space on percentage of the landscaped site area or roof.</p>
3.D.1 Solar Readiness	<p>This has been maintained as its own metric and the original targets have been kept. More guidance and clarity has been provided as to what is meant by “solar readiness”, including references to acceptable measures listed in the TGS v3 and a link to resources that provide a solar readiness checklist. In addition, a target has been added for draft plan applicability.</p>
3. E.1. Healthy Soils	<p>The name has been changed from “Restore and Enhance Soils” to “Healthy Soils” to more accurately reflect the intention of the metric. One of the original aspirational targets has been removed because it is related to soil permeability rather than the intention of the credit which is regarding healthy soil. The original minimum target regarding the undertaking of a topsoil fertility test has been removed given that standardized topsoil fertility testing protocols are not established. In addition, a target for increased minimum topsoil depth has been added.</p>
4.A.2- Building Energy Efficiency and Emissions	<p>The name has been changed for 4.A.2 from “Building Energy Efficiency” to “Building Energy Efficiency and Emissions” to more accurately capture the sustainability benefits. Background, information and rationale for this metric has been provided in its own section of this report, Section 2.5.</p>
4.A.3 Energy Management	<p>The name has been changed from “Energy Management” to “Energy Strategy” to more accurately reflect the intention of the metric. This metric has been changed so that the strategy report required is aligned with the targets in metric 4.A.2. Building Energy Efficiency and Emissions. Background, information and rationale for changes to building energy efficiency and emissions targets is described in Section 2.5 and Appendix C.</p>
4.B.1- Reduce Potable Water Use	<p>The name has been changed from “Reduce Potable Water Use for Irrigation” to “Reduce Potable Water Use”</p>

	to more accurately reflect the intention of the metric. The original targets have been carried forward and more explanation has been included (with links to LEED documentation requirements, similar to TGS) to assist in documentation. There was discussion with the TAT to combine this metric with “rainwater harvesting” however it is our suggestion that these stay separate because rainwater harvesting is not always used as a strategy to reduce potable water for irrigation.
4. C.2. Reduce Light Pollution	The original targets have been removed for this metric and replaced with a new target, in line with Tier 1 of the TGS v3, credit EC 5.1; all exterior fixtures must be Dark Sky Compliant, taking advantage in the synergies between the credits in the TGS and metrics that have similar intents. More detailed guidance language, including links to references, aligned with the TGS credit have been incorporated to provide more direction to applicant and encourage the uptake and achievement of this metric.
4.D.1 Bird Friendly Design	This metric has been revised slightly to align with the City of Vaughan’s Urban Design Guidelines, as per consensus from the TAT and Draft Plan applicability has been removed because high-rise development is typically not subject to approval through a Draft Plan of Subdivision approval process.
4.E.1 Solid Waste	The good targets now reflect the TGS v3 credit SW 1.1, SW 1.2 and SW 1.3 Bulky Waste, taking advantage in the synergies between the credits in the TGS and metrics that have similar intents. The new great target aligns with TGS v3 and SW 1.6 Household Hazardous Waste as per consensus with TAT.
4.F.1- Reduce Heat Island– Non-Roof	For simplicity, the name has been changed from “Reduce Heat Island from Built Environment– Non-Roof” to “Reduce Heat Island– Non Roof”. The intent and targets have remained the same. However, language and strategies have been updated for clarity and to align more closely with the TGSv3 AQ 4.1 and AQ 4.3 requirements.
4. F.2. Reduce Heat Island– Roof	For simplicity, the name has been changed from “Reduce Heat Island from Built Environment–Roof” to “Reduce Heat Island– Roof”. This metric has been simplified to align with the TGS v3 AQ 4.2 requirements. Definitions from the TGS have also been included for clarity.

Please note that the Richmond Hill metrics were the starting point for review. It seems that there is some variability in the number of metrics across the municipalities (for example Brampton has the Community and Neighbourhood Scale metric that does not seem to appear, at least by the same name, in the Richmond Hill metrics).

The Draft Sustainability Metrics have been re-formatted into an updated final report, updated Sustainability Metrics Guidebook, which is attached in Appendix A, and updated metric numbering which is attached as Appendix B.

2.7 Energy and GHG Reduction Metrics

There have been significant changes to building energy performance and GHG emissions targets since the Sustainability Metrics were first initiated in 2014. These include the roll-out of provincial and municipal climate change action plans, including the development of the City of Toronto's municipal climate action plan (TransformTO), and subsequent implementation of the updated Toronto Green Standard Version 3.0. The energy efficiency requirements of the Ontario Building Code SB-10 and SB-12 have also been made more stringent, to the extent that they now exceed the recommended minimum level of performance in the current Sustainability Metrics. It is also understood that the partner municipalities have either developed, or are in the process of developing, their community energy and emissions plans, that will likely encourage a significant reduction in energy and GHG emissions associated with the buildings sector to meet their overall GHG emissions reduction targets.

Morrison Hershfield conducted an energy modelling study which reviewed different types of energy and GHG emission reduction targets for five different building archetypes in order to update the original minimum and aspirational targets and develop new performance targets. The report from this study is included in Appendix C. Based on the study results, the target requirements for the energy efficiency and GHG performance targets for this metric were grouped into three categories;

- Part 9 Residential Buildings (less than 3 storeys and less than 600 m² in gross floor area);
- Part 3 Buildings – Multi-Unit Residential, Office and Retail (more than 3 storeys or more than 600 m² in gross floor area);
- All Other Part 3 Buildings

For low-rise residential buildings such as single-family detached dwellings that fall under Part 9 of the Building Code, targets were updated to require certifying the building to achieve ENERGY STAR® for New Homes, R-2000® requirements or certifying the building to achieve CHBA Net Zero Homes program or Passive House requirements. Detailed energy modelling to understand energy of GHG savings would be a technically preferred approach to the prescriptive requirements above, but this type of modelling is not typically economically feasible for smaller building projects. Furthermore, the energy-focused certification programs mentioned for these targets would lead to high-performance building outcomes. These existing certification programs can be leveraged to set energy and GHG emissions performance requirements for this building type.

The Part 3 Buildings that were explored in the energy modelling analysis as building archetypes were multi-unit residential, office and retail buildings (more than 3 storeys or more than 600 m² in gross floor area). Based on the analysis, absolute performance targets have been included in the requirements for this building type. The modelling data revealed that incorporating performance targets for Total Energy Use Intensity (TEUI), Thermal Energy Demand Intensity (TEDI) and Greenhouse Gas Emissions Intensity (GHGI) would contribute

most to the intent of this metric, including contributing to a robust GHG emissions mitigation strategy in the buildings sector. The requirements of each target are aligned with the Toronto Green Standard v3. The great target is equivalent to the TEUI, TEDI and GHGI TGS v3 Tier 1 values and the excellent target is aligned with the Tier 4 values; the highest tier level. This would ultimately require commitment to specific building envelope performance requirements and energy modelling of each building to confirm the requirements are met.

Flexibility has been included for other Part 3 buildings as the studied results of the target-based approach may not be applicable to these building types. For these building types, the targets require a demonstration of proposed building that is a percentage better than Ontario Building Code (OBC) SB-10, Division 3 (2017) reference building; a well understood industry requirement. This would ultimately require energy modelling of each building to confirm the requirements are met.

Three additional targets have been included in this metric for building commissioning, submetering and air tightness testing. These targets have been included because meeting these requirements are effective ways to ensure that energy and emissions performance metrics will translate into real GHG emissions reduction and energy efficiency in the construction process.

3. CONCLUSION

Developing Policy and measuring progress towards sustainability has become increasingly important in managing growth and improving the health and well-being of urban environments. Concerns over public health, climate change, energy, and resource use have brought sustainability to the forefront of planning and decision-making as a means of achieving city building. Provincial legislation, plans and policies are also increasingly speaking to the importance of sustainability and managing resiliency and adaptation to climate change impacts.

This report identifies detailed performance targets that aim to improve the sustainability performance of development. Specific targets have been recommended for each sustainability metric identified based on best practices and stakeholder feedback.

As referenced in this report, background research and stakeholder consultation was carried out to help inform the development of the sustainability metrics. As illustrated in Appendix A, precedents are referenced for over 80% of the metrics, identifying a recognized standard, municipal policy or guideline or provincial policy that has helped inform the proposed requirements. Highlighting these precedents should continue to help improve the implementation of the metrics in both the private and public sectors, as they have largely been based on best practices that are already in practice or which are gaining acceptance in the development of other communities that are focused on becoming more sustainable.

The sustainability metrics and targets are expected to evolve and change over time as market acceptance and implementation of sustainability best practices improve. As new priorities are identified, the targets identified in this tool will need to be re-evaluated to ensure they are kept in pace with best practices in sustainability and the individual sustainability goals and objectives of the partner municipalities.

3.1 Next Steps and Implementation

Users of the Sustainability Metrics should note that the tool is consistent across the partner municipalities of the City of Richmond Hill, City of Brampton, City of Vaughan and City of Markham. This tool was developed in partnership, and the collaborative approach to its development aims to provide consistency in implementation of requirements across the municipalities. However it is noted that the final roll out and implementation of tool may vary slightly in each municipality. Collaboration amongst the partner municipalities is still expected during the next phase, with each municipality defining how it wishes to incentivize the sustainability metrics based on its unique governance structure and local context.

APPENDIX A: Sustainability Metrics Guidebook

In this Appendix, the updates to the Sustainability Metrics have been re-formatted and presented as an updated Sustainability Metrics Guidebook.

LEGEND

Metric Category:

Built Environment

Mobility

Natural Environment & Open Space

Infrastructure & Buildings

Innovation

Appendix B

Metric Categories

The Sustainability Metrics are organized into five main categories; Built Environment, Mobility, Natural Environment and Open Space, Infrastructure and Buildings, and Innovation. The identity of each category is described below.

Built Environment (BE)

The indicators for Built Environment speak to how we inform place and connections within the development. The intensity and diversity of land uses influences decisions on where we live, work, and how we move around the community. A mix of housing types and amenities, employment and live-work opportunities located within walking distance, provides the opportunity for residents to meet their day to day needs without reliance on the private automobile. Further provision for life-cycle housing and accessible buildings allows residents to establish and remain in their communities throughout the various periods of their lives.

Mobility (M)

The indicators of Mobility identify how a variety of transportation options must be available to residents to carry out their daily lives within and beyond the community. A sustainable community is one that encourages physical activity, facilitates active transportation, and supports public transit in place of automobile dependence. The most vulnerable population groups (children, elderly, disabled, and low income individuals) are the most affected by choices available to them for mobility and access to services and amenities. Designing a safe, convenient, and accessible environment for walking and cycling encourages these alternative modes of transportation. Emphasis on mobility and active transportation not only reduces energy use and GHG emissions, but contributes directly to improving public health and the quality of life of residents.

Natural Environment and Open Space (NE)

The natural environment, urban forest, and the open space system are essential components of a healthy, sustainable community. Firstly, the preservation and enhancement of the natural heritage system ensures the health of the environment and supports recreational and cultural opportunities in a community. Secondly, ensuring residents have convenient access to a connected and diverse range of open spaces, parks, and recreation facilities offers opportunities for improved public health and connections within the community.

Infrastructure and Buildings (IB)

The Infrastructure and Buildings indicators identify the means to maximize energy and water conservation and minimize the consumption of non-renewable resources. New buildings and communities should be designed with a focus on reducing water, waste, and energy use. Since human activity is the principal cause of elevated levels of greenhouse gases and demands on energy, water, and waste systems, the measures focus on means of reducing this impact on both the built and natural environments.

Innovation (I)

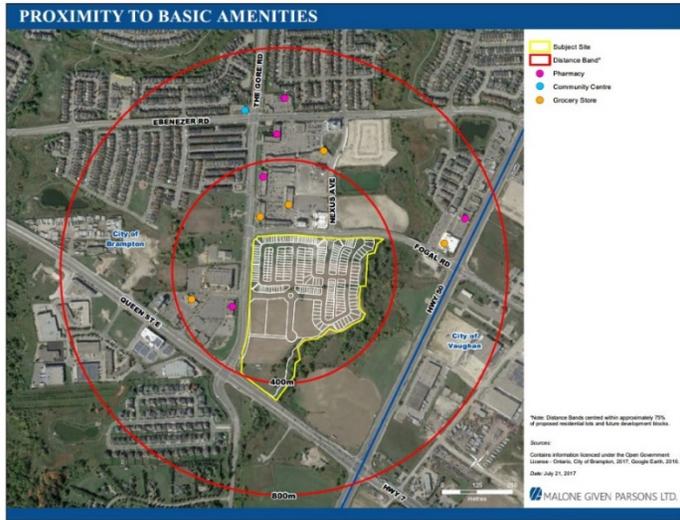
The innovation metric is intended to encourage true innovation resulting in real sustainability benefit. This new theme allows flexibility for users of the tool to propose innovative sustainability measures that are not specifically captured but which provide a measurable sustainability benefit. This flexibility is intended to allow users to think progressively and outside of the box when proposing sustainability measures on their development site.

Indicators

The following are the performance indicators organized by category. Each performance indicator has associated metrics that are allocated a point score. The metrics reflect characteristics of a sustainable community and are designed to outline the required measures or standards for each category to ensure that the overall objectives of the Sustainability Metrics are achieved.

Built Environment	Mobility	Natural Environment and Open Space	Infrastructure and Buildings	Innovation
<ul style="list-style-type: none"> • Proximity to Amenities • Providing Mixed-use Development • Design for Life Cycle Housing • Community and Neighborhood Scale • Cultural Heritage Conservation • Enhancing Urban Treet Canopy and Shaded Walkways and Sidewalks • Salt Management • Carshare & Carpool Parking • Surface Parking Footprint • Electric Vehicle Charging Stations 	<ul style="list-style-type: none"> • Block Length • School Proximity to Transit Routes, Cycling Networks, and Walkways • Intersection Density • Promote Walkable Streets • Pedestrian Amenities • Bicycle Parking • Implementing Trails and Cycling Infrastructure • Proximity to Active Transportation Network • Distance to Public Transit • Traffic Calming 	<ul style="list-style-type: none"> • Preserve Existing Healthy Trees • Soil Quantity and Quality for New Trees • Healthy Soils • Connection to Natural Heritage • Natural Heritage System Enhancements • Supporting Pollinators • Dedicate Land for Private Fruit and Vegetable Garden Space • Access to Public Parks • Stormwater Quantity • Stormwater Quality • Rainwater and Greywater Use • Multi-purpose Stormwater Management 	<ul style="list-style-type: none"> • Buildings Designed and/or Certified under an Accredited "Green" Rating System • Universal Design • Building Accessibility • Embodied Carbon of Building Materials: Supplementary Cementitious Materials • Embodied Carbon of Building Materials: Life Cycle Assessment • Embodied Carbon of Building Materials: Material Efficient Framing • Reduce Heat Island: Non-Roof • Reduce Heat Island: Roof • Passive Solar Alignment • Controlling Solar Gain • Solar Readiness • Energy Strategy • Building Energy Efficiency and Emissions • Reduce Potable Water Use • Back-up Power • Extreme Wind Protection • Sub-Metering of Thermal Energy and Water • Reduce Light Pollution • Bird-friendly Design • Solid Waste 	<ul style="list-style-type: none"> • Innovation

Metric:	BE-1 Proximity to Amenities		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To encourage development within and near existing amenities, limit the development footprint in the region and satisfy the City's Official Plan requirements. Close proximity to amenities enables stronger and more desirable homes and workplaces and less vehicular travel. Locating housing, services, recreation, schools, shopping jobs, and other amenities in close proximity makes it easier for people to walk or cycle to these destinations, helping to build physical activity into our daily lives.		
	Points	Requirements	Documentation Compliance
Good Target:	1 point	1 point achieved for 3 or more amenities within 800m (equivalent to a 10 minute walk) of 75% of dwelling units.	Submit: In the Community Design Guidelines (Block Plan), Planning Justification Report (Draft Plan) or Site Plan Drawings/ Urban Design Brief (Site Plan): <ul style="list-style-type: none">A satellite map or map from the Planning Justification Report highlighting the development cluster that accounts for 75% of the Dwelling Units (DU) and noting the approximate geographic center.List the amenities within 800m and 400m walking distance from the project's geographic center. Amenities can be included towards this metric if they are existing or proposed provided that confirmation is documented confirming the proposed amenity will be available to the public at the time of project completion.
Great Target:	+2 additional points (total 3 points)	2 points achieved for 3 or more amenities within 400m (equivalent to a 5 minute walk) of 75% of dwelling units (in addition to the Good Target points).	Notes: <ul style="list-style-type: none">Amenities captured in the "Good Target" can be counted towards the "Great Target".Amenities include library, public parks and outdoor recreational facilities, , public community or recreation centre, general retail, bank, place of worship, convenience store, , restaurant, food retail (grocery store, supermarket), licensed adult/ senior care and child care, theatre, beauty salon, hardware, laundry, medical or dental office, post office, pharmacy, school, fitness center and museum.Employment lands excluded.One building can be considered multiple amenities (e.g. pharmacy included in a grocery store).If the amenities are included in the proposed plan but have yet to be defined, use the best judgment (based on size, location and planning allocations) to assume the expected end-use of the planned amenity.
References:	City's Official Plan Thinking Green Item 1,2,9 LEED NC SSc2 LEED NDPc3		



Source: Malone Given Parsons Ltd.

Metric:	BE-2 Providing Mixed-Use Development		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input type="checkbox"/> Site Plan		
Metric Intent:	Locating housing, services, recreation, schools, shopping jobs, and other amenities on the same site makes it easier for people to walk or cycle to these destinations. A complete community helps increase people's daily physical activities.		
	Points	Requirements	Documentation Compliance
Good Target:	1 point	Where it does not conflict with and is not already a municipal requirement set out in the local Official Plan, Regional Official Plan or Provincial Plan or policy, provide a mix of uses on the site.	Submit: On the Block Plan, Draft Plan, or Site Plan: <ul style="list-style-type: none"> • Indicate the mix of uses proposed within the application boundary. Notes: <ul style="list-style-type: none"> ○ Employment lands excluded.
References:	City's Official Plan Thinking Green Item 1,2,9 LEED NC SSc2 LEED NDPc3		

Metric:	BE-3 Design for Life Cycle Housing		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	<p>To encourage the planning and creation of mixed-use areas.</p> <p>Diverse and inclusive buildings and neighborhoods expand the number of potential users. They can also be more visually pleasing and encourage aging in place.</p>		
	Points	Requirements	Documenting Compliance
Ownership	Good Target: 2 points	The proposed project includes at least 10% of affordable/low income or purpose-built rental housing.	For a Draft Plan and Site Plan Submission, Submit:
Housing Type	Good Target: 1 point	The proposed project includes 2 of the 4 housing typologies.	<p>In the Planning Justification Report declare the following:</p> <ul style="list-style-type: none"> The percent (%) of the housing, accommodation and ownership types included in the project. The total percent (%) by category (e.g. ownership, housing type, accommodation) should each add up to 100%. <p>On the Block Plan, or Site Plan provide the following:</p> <ul style="list-style-type: none"> Housing types within the project (single-detached, semi-detached townhomes/stacked and mid/hi-rise housing, secondary suites or additional residential unit). Ownership types within the project (market, rental and Secondary Suites/Additional residential units are permitted as of right through recent changes to the Planning Act R.S.O 1990, last amendment: 2019, c.15, Sched 31. Accommodation types within the project may include (live work, purpose built rentals, 1 bedroom/studio, larger than 2 bedrooms). <p>Notes:</p> <ul style="list-style-type: none"> For the definition of affordable/ low-income housing, refer to the applicable Regional Official Plan, Municipal Official Plan or Provincial Policy. Where there is a conflict between Provincial Policy and a lower-tier Official Plan, Provincial policy shall take precedence.
	Great Target: 1 additional point (total 2 points)	The proposed project includes 3 of the 4 housing typologies.	
	Excellent Target: 1 additional point (total 3 points)	The proposed project includes 4 of the 4 housing typologies.	
Accommodation	Good Target: 1 point	The proposed project includes 2 accommodation types.	
	Great Target: 1 additional point (total 2 points)	The proposed project includes more than 2 accommodation types.	
References:	City's Official Plan Thinking Green Item 3 LEED NDPC4 Planning Act. RSO 1990, c. 15, s31.		

Metric:	BE-4 Community and Neighbourhood Scale		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input type="checkbox"/> Site Plan		
Metric Intent:	To focus on retail, personal, human and community services within community core areas (neighbourhood centre and mixed-use node) so that people can meet their daily needs within their communities. Communities designed for a mix of land uses and at neighbourhood scale improve quality of life and make it easier for people of all ages and abilities to be physically active, helping improve their health.		
	Points	Requirements	Documenting Compliance
Excellent Target:	6 points	<p>Show that the community form is based on a hierarchy of the following:</p> <ul style="list-style-type: none"> ▪ Community: formed by a clustering of neighbourhoods, typically 6 to 9 (depending on topography and natural features), to sustain a viable mixed-use node and public transit. ▪ Neighbourhood: shape and size defined by 400 m (5 minute walk) from centre to perimeter with a distinct edge or boundary defined by other neighbourhoods or larger open spaces. ▪ Neighbourhood centre: acts as a distinct centre or focus with a compatible mix of uses that includes: a neighbourhood park; high or medium residential densities; and retail or community facilities (e.g. school, library). ▪ Mixed-use node: central to the cluster of neighbourhoods the node should include higher residential densities, retail, employment opportunities, be accessible, and served by public transit. 	<ul style="list-style-type: none"> • Highlight the community form (typically a cluster of neighbourhoods to sustain a viable mixed-use node and public transit). • Highlight the various neighbourhoods in the community and confirm that each neighbourhood is defined by a 400 m walk from centre to perimeter edge. • On a figure, illustrate the following: <ul style="list-style-type: none"> • Identify the neighbourhood centre and list the uses and amenities included in the centre (e.g. transit hub, parkette, village square, community facilities, amenities, etc.). • Identify the mixed-use node (could include higher residential densities, transit hub, retail, amenities, etc.).
References:	Region of Peel, Health Background Study Development of a Health Background Study Framework, May 2011		

Metric:	BE-5 Cultural Heritage Conservation		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	<p>To preserve and maintain cultural heritage resources. Cultural heritage resources include built heritage resources (listed or designated), cultural heritage landscapes (listed or designated), and archaeological resources.</p> <p><u>Note:</u> This metric is only applicable to a site having existing cultural heritage resources.</p>		
	Points	Requirements	Demonstrating Compliance
Great Target:	3 points	No portion of a cultural heritage resource that contributes to its cultural heritage value is to be demolished or removed or relocated (excluding temporary removal for restoration purposes).	<p>Submit:</p> <p>In the Cultural Heritage Impact Assessment and/or Heritage Conservation Plan and/or other documents acceptable to the municipality prepared by an accredited professional (e.g Canadian Association of Heritage Professionals CAHP):</p> <ul style="list-style-type: none"> An outline of the cultural heritage attributes which contribute to the cultural heritage value and confirm that no portions of the resource that contribute to its cultural heritage value are to be removed.
Good Target:	2 points	If a cultural heritage resource will be relocated, it is moved to a visually prominent location nearby and maintains its original orientation.	<p>Submit:</p> <p>In the Cultural Heritage Impact Assessment and/or Heritage Conservation Plan and/or other documents acceptable to the municipality prepared by an accredited professional (e.g Canadian Association of Heritage Professionals CAHP):</p> <ul style="list-style-type: none"> Identification of the proposed location of the cultural heritage attributes which contribute to the cultural heritage value and clearly demonstrate that it is visually prominent and maintains its original orientation.
Good Target:	1 point	Where reusable materials from a cultural heritage resource are being removed, a portion will be salvaged and reused on site.	<p>Submit:</p> <p>In the Cultural Heritage Impact Assessment and/or Heritage Conservation Plan and/or other documents acceptable to the municipality prepared by an accredited professional (e.g Canadian Association of Heritage Professionals CAHP):</p> <ul style="list-style-type: none"> Identification of the cultural heritage materials which contribute to the cultural heritage value will be salvaged and explain how they will be reused on site. The reuse of the salvaged materials should be demonstrated in supporting documents (e.g. site plan drawings, landscape plans, interpretation plans).
Excellent Target:	3 points	Built cultural heritage resources are conserved in full conformity with the "Standards and Guidelines for the Conservation of Historic Places in Canada".	<p>Submit:</p> <p>In the Cultural Heritage Impact Assessment and/or Heritage Conservation Plan and/or other documents acceptable to the municipality prepared by an accredited professional (e.g Canadian Association of Heritage Professionals CAHP):</p>

			<ul style="list-style-type: none"> Demonstrate how the cultural heritage attributes which contribute to the cultural heritage value will be conserved in full conformity with the “Standards and Guidelines for the Conservation of Historic Places in Canada”.
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Metric:	BE-6 Enhancing Urban Tree Canopy and Shaded Walkways and Sidewalks		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To provide street trees to promote a more pleasant walkable pedestrian environment, contributing to a healthy community. Targets are additional to the municipal planting requirements. Street trees provide ecosystem services and health benefits.		
	Points	Requirements	Documenting Compliance
Good Target:	2 points	Provide shade within 10 years for at least 50% of the walkways/sidewalk lengths All trees should be selected from the applicable municipal tree list.	Submit: On a Landscape Plan: <ul style="list-style-type: none"> Identify the total length of existing and or planned sidewalk in the proposed development, and the total length of existing and or planned sidewalk with trees abutting the sidewalk, measured as a percentage of sidewalk length.
Great Target:	+2 points (total 4 points)	Provide shade within 10 years for at least 75% of the walkways/sidewalk lengths. All trees should be selected from the applicable municipal tree list.	
Great Target:	2 points	Provide shading within 10 years for at least 50% of parking areas. All trees should be selected from the applicable municipal tree list.	Submit: On a Landscape Plan: <ul style="list-style-type: none"> Identify total parking area and the total parking area that is shaded by the tree canopy and quantify as a percentage.
Good Target:	2 points	Provide street trees on both sides of streets at distance intervals 6-8 metres or less.	Submit: On a Landscape Plan: <ul style="list-style-type: none"> Identify the distance intervals of street trees.
References:	City's Official Plan LEED ND NPDC14		

Metric	BE-7 Salt Management		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	Applying more salt than is necessary shortens pavement life and accelerates building and vehicle corrosion. Thoughtful parking lot design can reduce salt use by preventing snowmelt from refreezing and reducing snow deposition by wind. Reducing salt use also helps protect the natural environment from salt exposure.		
	Points	Requirements	Documenting Compliance
Good Target:	2 points	<p>Provide two of the following measures:</p> <ul style="list-style-type: none"> • 2-4% grade throughout all parking lots to ensure proper drainage and limit refreezing • Use of salt-tolerant species of vegetation in areas that will receive meltwater. • Use of trees as windbreaks around the site perimeter. • Heated or covered walkways near building entrances. • Providing well-planned, designated snow storage area(s) to ensure meltwater drains as intended in the site design. 	<p>Submit</p> <p>On a Landscape Plan:</p> <ul style="list-style-type: none"> • Document the measures being used to promote salt reduction.
References:	Parking Lot Design Guidelines to Promote Salt Reduction “ Lake Simcoe Region Conservation Authority, 2017		

Metric:	BE-8 Carshare & Carpool Parking		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To encourage carpooling and reducing dependence on single-occupant vehicles. Carpooling results in carbon savings, less air pollution, less congestion, and improved social connections.		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	Satisfy all municipal parking standards and dedicate 3% of parking spaces on-site to carpooling and/or carshare/zip car (does not apply to compact cars). Provide preferred parking for these vehicles by incorporating signage and/or pavement markings.	Submit: On the Site Plan drawing: <ul style="list-style-type: none"> • Quantify the total parking spaces included per building on the site. • Quantify the total parking spaces that are dedicated to carshare/zip car or carpooling. • Identify the dedicated parking spaces and highlight proximity/preferred location relative to building entry.
Great Target:	+1 additional point (total 2 points)	Satisfy all municipal parking standards and dedicate 5% of parking spaces on-site to carpooling and/or carshare/zip car (does not apply to compact cars). Provide preferred parking for these vehicles by incorporating signage and/or pavement markings.	
References:	TGS LEED 2009 NC SSc4.3		

Metric:	BE-9 Surface Parking Footprint		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	<p>To promote efficient use of developable land and to support on-street retail and pedestrian-oriented built environments by discouraging the location of parking in front of buildings and minimize the adverse environmental impacts of parking facilities.</p> <p>Surface parking can block access and visibility to homes and businesses. Minimizing or carefully locating surface parking can result in more pedestrian-friendly and valuable streetscapes.</p>		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	All surface parking on site is located at the side or rear of buildings.	Submit: On the Site Plan Drawing: <ul style="list-style-type: none"> • Identify the building frontage and the surface parking location(s). Note: <ul style="list-style-type: none"> ○ No more than 20% of the total development footprint area will be used for off-street surface parking facilities and no individual surface parking lot will be larger than 2 acres.
Great Target:	+1 additional point (total 2 points)	Less than 15% of the total developable area is provided to parking at grade and is located at the rear or side of buildings.	<ul style="list-style-type: none"> • Calculate the total area dedicated to surface parking/parking facilities and the total project site area. Identify the percent (%) of site area allocated to surface/facility parking.
Excellent Target:	3 points	All new on-site parking is provided below grade or in structured parking, and no surface parking is provided.	<ul style="list-style-type: none"> • In intensification areas, if the project includes a parking structure, quantify the total parking spaces within the structure and on the site. • Calculate and declare the percent (%) of parking spaces that are provided within the parking structure. Notes: <ul style="list-style-type: none"> ○ For this metric, surface parking facilities include ground-level garages unless they are under habitable building space. ○ Underground or multi-story parking facilities within the habitable building space and on-street parking spaces are exempt from this limitation. ○ Excluding spaces dedicated to short-term parking and pickup/drop-off.
References:	LEED ND NDPc5 City of Vaughan Urban Design Guidelines		

Metric:	BE-10. Electric Vehicle Charging Stations		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To encourage the use of electric vehicles. In Ontario, electric vehicle use can result in carbon savings and less air pollution.		
	Points	Requirements	Documenting Compliance
Good Target:	3 points	Provide electric vehicle supply equipment (EVSE) to serve 10% of the required parking spaces.	<p>Submit:</p> <p>On the Site Plan and Landscape Plan:</p> <ul style="list-style-type: none"> Quantify the number of total parking spaces included per building on the site. Quantify the number of total parking spaces that will be provided with EVSE. <p>For Site Plans and Draft Plan Applications:</p> <ul style="list-style-type: none"> A Letter of Commitment from a qualified professional (e.g. electrical engineer, landscape architect, architect) and the owner/developer/builder confirming the number of EV charging stations and the percent of parking spaces with EVSE. <p>Notes:</p> <ul style="list-style-type: none"> <i>Electric vehicle supply equipment (EVSE)</i> is defined by the Ontario Electrical Safety Code as the complete assembly consisting of cables, connectors, devices, apparatus, and fittings, installed for power transfer and information exchange between the branch circuit and the electric vehicle. For the requirements of this metric, applicants are encouraged to consult with the local municipality to determine the appropriate level or equivalent for EVSE. <i>Rough-in provisions</i> are defined as empty raceways starting in a junction box in the electrical room and terminating in a junction box central to each parking floor. Raceways will be empty to accommodate future wiring.
Great Target:	+2 additional points (total 5 points)	Provide electric vehicle supply equipment (EVSE) to serve 20% of the required parking spaces.	
Great Target:	2 points	Design 50% or more of the required parking spaces to permit future EVSE installation (e.g. rough-in).	
References:	TGSv3 AQ1.3		

Metric:	M-1 Block Length		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input type="checkbox"/> Site Plan		
Metric Intent:	<p>To develop blocks of dwelling units with increased connectivity offering pedestrians multiple routes to reach their destination and to allow blocks with the flexibility to accommodate both residential and commercial lot sizes.</p> <p>Walkable blocks improve connectivity and reduce dependence on vehicles.</p>		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	75% of block lengths do not exceed 250 m.	<p>Submit:</p> <p>In the Urban Design Brief, or Draft Plan site statistics:</p> <ul style="list-style-type: none"> • Measurement of the block lengths for all blocks included in the plan. • Identify and confirm the percentage (%) of block lengths that are less than 250m • Blocks are determined by roads/streets, and not pathways or trails. <p>Block perimeters should generally not to exceed 550m</p> <ul style="list-style-type: none"> •
Great Target:	+1 additional point (total 2 points)	All block lengths do not exceed 250 m.	<ul style="list-style-type: none"> • Measurement of the block lengths and the block perimeter lengths for all blocks included in the plan. • Confirm that all block lengths are less than 250m. • Blocks are determined by roads/streets, and not pathways or trails. <p>Block perimeters should generally not to exceed 550m</p> <ul style="list-style-type: none"> •
Excellent Target:	+1 additional point (total 3 points)	All blocks do not exceed 80m x 150m in size.	<p>In the Urban Design Brief, Planning Justification Report or Draft Plan site statistics:</p> <ul style="list-style-type: none"> • Measure the block sizes and confirm there are no blocks greater than 80m x 150m. • Blocks are determined by roads/streets, and not pathways or trails.
References:	<p>Thinking Green Item 3 LEED NPDp1 HBS Core Element 4: Street Connectivity</p>		

Metric:	M-2 School Proximity to Transit Routes, Cycling Network, and Walkways		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input type="checkbox"/> Site Plan		
Metric Intent:	To encourage children to walk and cycle to school to reduce traffic congestion at school sites and promote active transportation and improve air quality around schools and child care centres. Walking, bicycle or transit use results in carbon savings and less air pollution. They also provide health benefits and more connectivity between occupants.		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	All public schools are located within a 400 m walking distance to transit routes and/or dedicated cycle network.	Submit: On a Block Plan, Draft Plan, or Planning Justification Report, show the following by using radial circles to show the 400 m and 200 m from each school:
Great Target:	+1 additional point (total 2 points)	All public schools are located within a 200 m walking distance to transit routes and/or dedicated cycle network.	<ul style="list-style-type: none"> • Location of the proposed development • Existing or planned public school(s) • Existing or planned transit stops • Existing or planned dedicated cycle network(s) Notes: <ul style="list-style-type: none"> ○ Amenities captured in the “Good Target” can be counted towards the “Great Target”. ○ For all of the existing or planned schools, quantify the radial walking distance (in meters) to existing or planned transit stops and dedicated cycling networks. ○ This metric is only applicable if the plan has schools located within the Block Plan or Draft Plan.
References:	Region of Peel, Healthy Background Study Framework (2011)		

Metric:	M-3 Intersection Density		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input type="checkbox"/> Site Plan		
Metric Intent:	<p>To develop blocks of dwelling units with increased connectivity offering pedestrians multiple routes to reach their destination and to allow blocks with the flexibility to accommodate both residential and commercial lot sizes.</p> <p>Walkable blocks improve connectivity and reduce dependence on vehicles.</p>		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	Provide for 40-50 streets intersections per square kilometre (sq.km).	<p>Submit:</p> <p>In the Urban Design Brief, Planning Justification Report or Draft Plan site statistics:</p> <ul style="list-style-type: none"> • Determine the number of eligible intersections and divide by the net developable area as defined below for “<i>Square Kilometre</i>” • Determine the number of eligible intersections included within the plan per sq.km. <p>Notes:</p> <ul style="list-style-type: none"> ○ Eligible Intersections may include: Publicly accessible streets, the intersection of streets with dedicated alleys, laneways and transit right-of-ways ○ Non-Eligible Intersections generally include intersections where you must enter and leave an area through the same intersection, for example, cul-de-sacs and gated street entrances ○ <i>Square Kilometre</i> is defined as the total area of land available for development, similar to the net developable area, and its calculation excludes water bodies, parks larger than 0.2 hectares, natural heritage system lands, public facility campuses, airports, existing and proposed 400-series highways, and rail yards.
Great Target:	+1 additional point (total 2 points)	Provide for 51-60 street intersections per sq.km.	
Excellent Target:	+2 additional point (total 4 points)	Provide for more than 61 street intersections per sq.km.	

LEED NPDp3
Nets Foundation
The following diagram is an example for 51 intersections per sq.km.

References:



Metric:	M-4 Promote Walkable Streets		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To promote active transportation and encourage walking through the provision of safe and comfortable street environments. Walkable streets reduce the dependence on vehicles, improve connectivity and are an important component for healthy and complete communities.		
	Points	Requirements	Documenting Compliance
Good Target:	2 points	Where not a mandatory requirement, and where supported by the municipality, provide/ extend continuous sidewalks on both sides of public and/or private roads/streets.	Submit: In the Site Plan Drawings (Site Plan) or Transportation Study (Block/ Draft Plans): <ul style="list-style-type: none"> • Verify and document that the sidewalks comply with Municipal Standards and are at a minimum, 1.5 meter in width. • Determine the total length of streets included in the project boundary. • Determine the percentage (%) of street lengths where sidewalks are continuous and included on both sides of the street.
References:	LEED ND NPDC1		

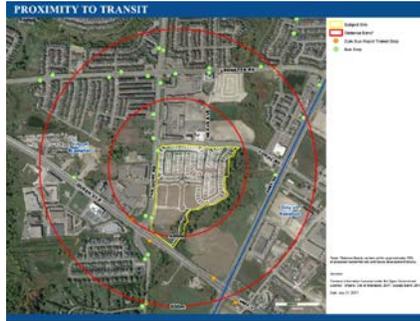
Metric:	M-5 Pedestrian Amenities		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To encourage active transportation through walking and increased use of public transit and to increase daily destinations in our communities to be connected through convenient, safe and accessible pedestrian connections. Walkable connections improves the physical and mental wellbeing of residents of all ages and abilities and helps to reduce dependence on motor vehicle use, reduce air pollution and greenhouse gas emissions and help mitigate climate change.		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	Provide pedestrian connections between the site and adjacent destinations, and provide 1 type of pedestrian amenity consistently along on-site connections.	Submit: On the Site Plan or Landscape Plan: <ul style="list-style-type: none"> Identify existing or proposed transit routes that are within walking distance to the building (e.g. 200 m). If applicable, highlight a linkage that connects a building entry to the transit stop. Identify the connections that link a building entry to adjacent destinations such as but not limited to, pedestrian paths, surface transit stops, parking areas (car and bicycle), schools, etc. Highlight the amenities and/or street furniture (benches, public art, landscaping, etc. that help connects the site to adjacent destinations.
Good Target:	1 point	Provide more than 1 type of amenity and/or street furniture consistently along on-site connections and between the site and adjacent destinations.	Notes: <ul style="list-style-type: none"> List of amenities includes; benches, additional bicycling parking, public art, map stands, interpretive/commemorative signage,play equipment, and weather shelters. Destinations include: pedestrian paths, surface transit stops, parking areas (car and bicycle), existing trails or pathways, or schools. Pedestrian connections are only required to be built to the site boundary and not beyond.
References:	Toronto Green Standard Tier II City's Official Plan Toronto Green Standard v3 AQ3.3		

Metric:	M-6 Bicycle Parking		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To encourage active transportation through cycling as a transportation choice and reduce single-occupant vehicle use, and to incorporate active and sustainable travel modes by design and promote Transportation Demand Management initiatives to influence behavior.		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	Bicycle parking spaces are provided at a rate of 20% higher than municipal standards/guidelines. Bicycle parking shall be located in close proximity to building entrances. Short-term bicycle parking should be located within 25m of building entrance if outdoors. Long-term bicycle parking should be within 50m of an exit or entrance area.	Submit: On the Site Plan drawing: <ul style="list-style-type: none"> • Quantify the total number of bike parking spaces provided per building. • Quantify the total unit count in each of the multi-family buildings. • Identify the building types that are included in the project (e.g. mixed-use, multi-family, commercial, retail, institutional). • Quantify the ratio of bike parking spaces per residential unit (for multi-family buildings). • Label the distance to entrances or access from bicycle parking.
Great Target:	+1 additional point (total 2 points)	Bicycle parking spaces are provided at a rate 50% higher than municipal standards/guidelines.	
Excellent Target:	2 points	Bicycle parking shall be located in close proximity to building entrances. Short-term bicycle parking should be located within 25m of building entrance if outdoors. Long-term bicycle parking should be within 50m of an exit or entrance area. And All bicyclee parking shall be weather protected.	
Excellent Target:	1 point	1 shower and change room are provided (for men and women) per 30 bicycle parking spaces associated with non-residential development.	
References:	Municipal Bicycle Parking Requirements City of Brampton By-Law 270-2004 as amended. City of Vaughan By-Law 1-88 City of Richmond Hill By-law 30-18		

Metric:	M-7 Implementing Trails and Cycling Infrastructure		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To implement pedestrian and cycling infrastructure to further promote active forms of transportation and comply with City's Transportation Master Plan and/or Pathways Master Plan. Cycling and walking results in carbon savings and less air pollution. It also provides health benefits and more connectivity between occupants		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	Advance the objectives of the applicable municipal Active Transportation Master Plan and/or Pathways Master Plan by implementing the objectives of the Plan.	<p>Submit:</p> <p>For Block Plans, Draft Plans and Site Plans in the Transportation Study.</p> <ul style="list-style-type: none"> • Identification of any existing or planned trails and cycling paths located in the plan. • If applicable, highlight the trails and cycling paths that comply with the Municipal Master Plan. <p>Additional documenting for Draft and Site Plans:</p> <ul style="list-style-type: none"> • If applicable, identify the additional features that advance the objectives of the applicable pedestrian and cycling master plan (e.g. Provide trailheads, trail signs, information signage, and/or seating areas).
References:	City's Transportation Master Plan Pathways Master Plan TRCA Trail Strategy TRCA Living City Policy		

Metric:	M-8 Proximity to Active Transportation Network		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To promote active transportation through the provision of public multi-purpose trails/paths and cycling infrastructure and satisfy City's Official Plan policies/targets. Cycling results in carbon savings and less air pollution. It also provides health benefits and more connectivity between occupants.		
	Points	Requirements	Documenting Compliance
Good Target:	2 points	100% of residents/jobs are within 400 m of existing or Council approved public multi-use trails and cycling infrastructure..	Submit: In the Traffic Impact Study or Transportation Demand Management Plan or Transportation Study: <ul style="list-style-type: none"> • Provide a map showing the subject lands/area of development, a 400m buffer from the boundaries of the development as well as any existing or municipally approved cycling networks. Notes: <ul style="list-style-type: none"> o These points are only awarded if a cycling network is included in the project boundary
References:	City's Official Plan City of Vaughan Pedestrian and Bicycle Master Plan 2019		

Metric	M-9 Distance to Public Transit		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To promote and support alternative transportation modes to vehicle use and to satisfy City's Official Plan targets. Transit-oriented communities reduce vehicle-kilometres traveled and associated emissions, have reduced traffic casualty rates and support walking and cycling which improves community health.		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	The site is within 800 m walking distance to an existing or planned commuter rail, light rail, bus rapid transit or subway with stops, OR The site is within 400 m walking distance to 1 or more bus stops with frequent service.	Submit: In the Urban Design Brief and/or Transportation Study (Draft Plans) and Traffic Impact Study and/or Transportation Demand Management Plan (Site Plan): <ul style="list-style-type: none"> • Include a map and/or figure which shows the 400m or 800m radii and the existing or planned commuter rail, subway, light rail, and bus stops with frequent service. Notes: <ul style="list-style-type: none"> • <i>Frequent Service</i> is defined as transit with trips in intervals no greater than 30 minutes during peak times per line per direction and available during hours of typical building operation.
Great Target:	+1 additional point (total 2 points)	The site is within 400 m walking distance to an existing or planned commuter rail, light rail, bus rapid transit, or subway with frequent stops, OR The site is within 200 m walking distance to 1 or more bus stops with frequent service.	
References:	Region of Peel Official Plan City's Official Plan LEED NC 2009 SSc4.1 LEED ND SLLc3		



Source: Malone Given Parsons Ltd.

Metric:	M-10 Traffic Calming		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To encourage active transportation through the provision of walkable streets by reducing operational speeds. Walkable streets and traffic calming measures can provide a safer and more comfortable streetscape to cyclists and pedestrians, and help to reduce traffic speeds, volumes, and related emissions.		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	75% of new local streets/roads are designed with traffic calming strategies.	Submit: In a Transportation Study or Traffic Calming Report: <ul style="list-style-type: none"> • Highlight the new residential-only streets and new non-residential/mixed-use streets in the project, as applicable. • Identify the percent (%) of street length (broken out by residential only and non-residential) that includes street calming techniques developed in consultation with municipal transportation planning staff. • Provide a drawing identifying the traffic calming strategies that are included in the project.
Great Target:	+2 additional point (total 3 points)	100% of new local streets/roads are designed with traffic calming strategies.	
Good Target:	1 point	50% of new non-residential and/or mixed-use streets are designed with traffic calming strategies.	Notes: Traffic calming strategies include but are not limited to: <ul style="list-style-type: none"> o Neckdowns/centre island narrowing, o Raised crosswalks, o Traffic circles and roundabouts, o Speed display boards/vehicle activated traffic calming signs (VATCS).
Great Target:	+2 additional points (total 3 points)	75% of new non-residential and/or mixed-use streets are designed with traffic calming strategies.	
References:	LEED ND NPDc1		

Metric:	NE-1. Preserve Existing Healthy Trees		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	Preservation of existing trees supports health and well-being. Preserving trees can increase property value while providing ecological and climate change benefits. Larger trees are often valued by occupants. Preserving trees can be a cost-effective method to improve the overall appearance of a community while providing ecological and climate change benefits.		
	Points	Requirements	Documenting Compliance
Good Target:	3 points	Preserve 25% of healthy mature trees in situ on site.	Submit: On an Arborist Report: <ul style="list-style-type: none"> • Identify all trees as per municipal standards, label all the healthy mature trees including hedgerows on the site, the trees that will be protected, moved or, removed as per municipal standards. Additionally, identify these trees on Landscaping Plan. • Provide the percent (%) of healthy tableland trees that will be protected (in-situ) on-site on the Landscape Plan. Notes: <ul style="list-style-type: none"> ○ This metric (and associated points) are excluded if there are no healthy mature trees within the project boundary. ○ This metric applies for healthy, mature trees on the developable portion of the site (e.g. not in the protected natural heritage system). ○ Healthy mature trees include those evaluated as being fair or above by a qualified arborist and Xmm DBH as per municipal requirements. Note that the "X" refers to a measurement that will be specific to each municipality.
Great Target:	+2 additional points (total 5 points)	Preserve 50% of healthy, mature trees in situ on site or preserve 100% of healthy hedgerows in situ on site.	
References:	Vaughan Tree Protection Protocol. Markham Trees for Tomorrow Manual.		

Metric:	NE-2. Soil Quantity and Quality for New Trees		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To provide soil quantity and quality that enables new trees to thrive. Higher amounts of good quality soil help ensure thriving long-lived plant life.		
	Points	Requirements	Documenting Compliance
Good Target:	2 points	Provide a minimum of 30m ³ of soil for each new tree and a minimum of 100 cm of uncompacted soil depth. Where there is a grouping of trees, provide a minimum of 20m ³ of soil for each new tree, and a minimum of 100 cm of uncompacted soil depth, or equivalent municipal standard.	Submit: As part of Draft Plan of Subdivision submission, provide a Letter of Commitment from a qualified professional (landscape architect or architect) and the owner/ developer/ builder confirming that the metric requirement will be achieved and that details will be provided in the Landscape Plan during subsequent submission. Following Draft Plan approval and as part of the technical review/detailed design, on the Landscape Plan specify and identify the tree planting locations, soil quality and the soil volume provided per tree
Great Target:	+2 additional points (total 4 points)	Provide 25% more than the total soil volume required by municipal standards.	As part of a Site Plan submission, on a Landscape Plan and/ Drawings: • Show the tree planting locations, soil quality and the soil volume provided per tree.
Excellent Target:	2 points	Provide uncompacted topsoil layer of tree pits, trenches, or planting beds with the following properties: • Organic matter content of 10 to 15% by dry weight and a PH of 6.0 to 8.0. • A minimum depth of 100 cm, or in accordance with municipal standards, whichever is higher. • Provide adequate drainage.	
References:	Vaughan's Tree Protection Protocol Toronto Green Standard v3 TRCA (2012) Preserving and Restoring Healthy Soils Best Practice Guide for Urban Construction Credit Valley Conservation (2017) Healthy Soils Guideline for the Natural Heritage System Vineland Research (2019) Ontario Landscape Tree Planting Guide Sustainable Technologies Evaluation Program (STEP) (2017) Compost Amended Planting Soil Specifications		

Metric	NE-3 Healthy Soils		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	<p>To limit disturbance of healthy soil to:</p> <ul style="list-style-type: none"> ○ Protect soil horizons and maintain soil structure. ○ Support biological communities (above-ground and below-ground). <p>Ensure that new development contains healthy soil quality and quantity to help restore the natural functions of soils and vegetation and to help ensure the soil is appropriate for the proposed plantings.</p>		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	A minimum topsoil depth of 200 mm is provided across the entire site (excluding paved surfaces).	Submit: On a Landscape Plan: <ul style="list-style-type: none"> • Identify the minimum topsoil depth that is provided across the entire site.
Great Target:	+1 additional point (total 2 points)	A minimum topsoil depth of 300 mm is provided across the entire site (excluding paved surfaces).	
References:	TRCA Preserving and Restoring Healthy Soils Best Practice Guide for Urban Construction CVC's Healthy Soil Guidelines for Natural Heritage System Sustainable Technologies Evaluation Program (STEP) (2017) Compost Amended Planting Soil Specifications		

Metric:	NE-4 Connection to Natural Heritage		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To provide connections to nature and green spaces to benefit human health through proximity or access, and to minimize the amount of the natural heritage that is backlogged by residential development. Natural spaces are sought after by occupants and can be perceived as a valuable amenity. They can be quiet natural spaces where occupants can connect with nature and exercise.		
	Points	Requirements	Documenting Compliance
Good Target:	2 points	Provide physical public connections (such as public access blocks, single loaded roads, parks, sidewalks, etc.) to 25% of the length of the natural heritage system that abuts the proposed development (interface between development and natural heritage systems).	<p>Submit:</p> <p>On a Landscape Plan or Site Plan:</p> <ul style="list-style-type: none"> • The location of a natural heritage system within the project boundary. Include any pathways within the natural heritage system) and highlight any associated parking for users of the natural heritage system. • Determine the length of the border of the natural heritage system with potential access to the site. • Highlight the proposed strategies to provide the physical public connection to the natural heritage system. • Determine what percentage (%) of the natural heritage system with potential access to the site has been provided with physical public connections. <p>Notes:</p> <ul style="list-style-type: none"> ○ Percentage (%) of the natural heritage system is determined by the length of the border. ○ Backlotting shall not be accepted towards this calculation. ○ Natural Heritage areas which abut parking lots are not counted as part of the physical public connection border. The intent of this metric is to promote accessible green space through low impact access. Development that is directly abutting the Natural Heritage System may adversely affect the natural environment.
Great Target:	+2 additional points (total 4 points)	Provide physical public connections (such as public access blocks, single loaded roads, parks, sidewalks, etc.) to 50% or more of the length of the natural heritage system that abuts the proposed development (interface between development and natural heritage systems).	
References:	City of Vaughan's City-wide Urban Design Guidelines Performance Standard No. 4.3.5		

Metric	NE-5 Natural Heritage System Enhancements		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To improve natural heritage system function with respect to wildlife habitat and/or ecological functions, Satisfy City's Official Plan requirements, and provide habitat for local biodiversity including native pollinator species.		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	Provide and implement Woodland Management Plan within and/or abutting the subject lands, where not already required by the municipality.	Provide a Woodland Management Plan in accordance with the municipal Terms of Reference.
Good Target:	1 point	Provide and implement an Invasive Species Management Plan for a natural heritage feature, where not already required by the municipality.	Provide an Invasive Species Management Plan in accordance with the municipal Terms of Reference.
Good Target:	1 point	Provide habitat structure(s) for species at risk, such as bird structures, butterfly boxes, and hibernaculum.	In the Environmental Impact Study: <ul style="list-style-type: none"> • Outline the design and ecological function of the habitat structure(s). • Provide a figure illustrating the proposed locations of the habitat structure(s). • Provide a design specification of the habitat structure(s).
Great Target:	2 points	Provide a form of natural heritage restoration/enhancement that provides a net ecological gain, above municipal requirements.	In the Environmental Impact Study: <ul style="list-style-type: none"> • Outline the natural heritage restoration/enhancement, its ecological function, and how it achieves a net ecological gain above municipal requirements. • Provide a figure illustrating the proposed locations of the natural heritage restoration/enhancement. • Provide a design specification for the natural heritage restoration/enhancement.
Excellent Target:	5 points	Design and deliver a linear continuous/uninterrupted naturalized corridor that creates a functional linkage between at least two natural heritage features.	In the Environmental Impact Study: <ul style="list-style-type: none"> • Outline the design and ecological function (e.g. wildlife corridor, amphibian passage, meadow-way/grassland) of the linkage. • Provide a plan/figure illustrating the proposed linkage including dimensions, landscape treatment, and the natural heritage features it will be connecting, which will be used to inform detailed design.
References:	TRCA, Invasive Plant List Credit Valley Conservation, Native Plants for Pollinators Toronto Pollinator Protection Strategy, City of Toronto City of Brampton Woodland Management Plan Guidelines		

Metric	NE-6 Supporting Pollinators		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To provide habitat that supports pollinators. Without pollinators, much of the food we eat and the natural habitats we enjoy would not exist. Pollinators are under increasing stress due to habitat loss, invasive species, diseases, pesticides, and climate change.		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	Native plants that support pollinators make up 25% of total quantity of plants proposed on the landscape plan.	Pollinator plant species must be selected from the Credit Valley Conservation "Native Plants for Pollinators", Toronto Region Conservation Authority "Maintaining Your Pollinator Habitat" or alternative list approved by the municipality.
Great Target:	+ 1 additional points (total 2 points)	Native plants that support pollinators make up 50% of the total quantity of plants proposed on the landscape plan.	On the Landscape Plan: <ul style="list-style-type: none"> Identify the species and proposed quantities of native plants (trees, shrubs, perennials, etc.) that support pollinators on the plant list. Provide a calculation that illustrates the total percentage of native pollinator plants by dividing the number of native pollinator plants by the total quantity of all plants.
References:	Credit Valley Conservation, Native Plants for Pollinator Toronto Pollinator Protection Strategy, City of Toronto NRCAN, North American Trees and Shrubs that Provide Forage for Pollinators TRCA, Maintaining Your Pollinator Habitat, https://trca.ca/app/uploads/2016/04/PollinatorMaintenanceGuide_WEB.pdf TRCA, Creating Habitat, https://trca.ca/app/uploads/2016/04/2602-Stewardship_Habitat-SinglePg_PRESS.pdf		

Metric	NE-7 Dedicate Land for Private Fruit and Vegetable Garden Space		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To promote community-based food production, promote self-reliance among users, improve physical and mental wellbeing, and encourage social interaction. Gardens help people of all ages and abilities be physically and mentally active, provide a connection to nature, a connection to our past, and a cost effective way to provide healthy food.		
	Points	Requirements	Documenting Compliance
Good Target:	2 points	Provide garden space for food as follows: For multi-unit residential developments: <ul style="list-style-type: none"> • Provide garden space that is equal to 25 square metres (or 250 square feet) of the rooftop or total landscaped site area. For ground-oriented residential developments: Provide garden space that is equal to 5% of the total project landscaped site area.	Submit: On the Landscape Plan or the Urban Design Submission: <ul style="list-style-type: none"> • Identify the total garden space area. • Determine the total landscaped area of the project. • Specify total area of garden space provided Notes: <ul style="list-style-type: none"> ○ <i>Garden space</i> is defined as land and/or an alternative mechanism with a growing medium that will be used to cultivate plants for food. ○ Achieving this metric for ICI can be considered for meeting the Innovation metric requirements.
References:	LCC 1.2, Place: Urban Agriculture LEED ND NPDc13		

Metric:	NE-8 Access to Public Parks		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To promote visual and physical access to public parks. Natural and community spaces are sought after by occupants and can be perceived as a valuable amenity. Providing access to public parks can make it easier for people of all ages and abilities to integrate physical activity as part of their daily activity, helps to increase energy levels, and can help decrease stress.		
	Points	Requirements	Documenting Compliance
Good Target:	3 points	For Brampton, Richmond Hill, and Markham: Provide 2 or more road frontages for each park (e.g. urban square, parkette, and neighborhood park) and For City of Vaughan Only: A minimum of 50% of a park has a public street frontage.	Submit: On the Site Plan (Site Plan), Urban Design Brief, Landscape Plan (Draft Plans), or Community Design Guidelines (Block Plan): <ul style="list-style-type: none"> Highlight the urban squares, parkettes, neighborhood parks and community parks included within the application. Determine the number or linear metre of public road frontages for each park type.
Great Target:	+3 additional points (total 6 points)	For Brampton, Richmond Hill, and Markham: Provide 3 or more road frontages for all parks. For City of Vaughan Only: Approximately 50-70% of a park has a public street frontage.	
References:	LEED ND Cornell Community (Markham), Mount Pleasant Village (Brampton) City's Development Design Guidelines		

Metric:	NE-9 Stormwater Quantity		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To implement a treatment-train approach to stormwater management practices emphasizing on source and conveyance controls to promote infiltration, evaporation, and/or re-use of runoff and/or rainwater. This will help maintain stream flows and thermal regimes that aims at mimicking predevelopment conditions. Managing stormwater at the early stages of the treatment-train can provide more resilient communities and reduce risks of downstream flooding and erosion.		
	Points	Requirements	Documenting Compliance
Good Target:	2 points	Retain runoff volume from the 10 mm rainfall event on public and private sites.	Submit: In the Functional Servicing Report, Stormwater Management Plan (Block, Plan, Draft Plan and Site Plan), or Master Environmental Servicing Plan (Block, Plan, Draft Plans):
Great Target:	+2 additional points (total 4 points)	Retain runoff volume from the 15 mm rainfall event on public and private site.	<ul style="list-style-type: none"> • List and describe the design measures used to retain stormwater runoff on-site. Measures could include (but not limited to): Low impact development measures; Stormwater ponds. • Highlight the location of design measures (if any) on the applicable plan. • Confirm that the quantity and flood controls are in accordance with applicable Municipal and conservation authority requirements. • Calculations and signoff by a qualified professional (e.g. engineer) quantifying the amount of runoff that will be retained on site.
Excellent Target:	+3 additional points (total 7 points)	Retain runoff volume from the 25 mm rainfall event on public and private sites.	
References:	Toronto Green Standard Tier II TRCA's Stormwater Management Criteria TRCA and CVC (2012) Low Impact Development Stormwater Management Planning and Design Guide Vaughan's Urban Design Guidelines		

Metric:	NE-10 Stormwater Quality		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	<p>To protect receiving water bodies from water quality degradation that may result from development and urbanization.</p> <p>Controlling the quality of stormwater can provide for improved quality of receiving water bodies, resulting in fewer algae blooms, longer swimming seasons, and a variety of other ecological benefits.</p>		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	Remove over 80% of TSS from all runoff leaving the site during a 25 mm rainfall event (based on the post-development level of imperviousness).	Submit: In the Functional Servicing Report, Stormwater Management Plan (for Block Plan, Draft Plan or Site Plan), or Master Environmental Servicing Plan (for Block, Plan, or Draft Plans):
Great Target:	+4 additional points (total 5 points)	Remove over 90% of total suspended solids (TSS) from all runoff leaving the site during a 25mm rainfall event based on the post-development level of imperviousness and at a minimum, two LID strategies must be used to treat the stormwater on-site.	<ul style="list-style-type: none"> • A list and description of the filtration measures used to treat the stormwater runoff on-site. Strategies could include (but are not limited to): <ul style="list-style-type: none"> • Stormwater Ponds, • Oil-grit separators (ETV certified), • Filters, • Bioswales. • Highlight the design measures (if any) on a plan. • Quantify the percent (%) of TSS removed from a 25 mm rainfall event.
References:	Toronto Green Standard Tier II TRCA's Stormwater Management Criteria Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation Authority (CVC) (2012) Low Impact Development Stormwater Management Planning Design		

Metric:	NE-11 Rainwater and Greywater Use		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To reduce potable water use for interior building functions.		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	Buildings designed for rainwater and greywater re-use readiness (e.g. plumbing infrastructure rough-ins or dedicated cistern space for indoor rainwater or greywater use or greywater irrigation that may be connected in the future are included in the building).	Submit: <ul style="list-style-type: none"> • A Letter of Commitment signed by a qualified professional (e.g. architect, engineer) and the owner/developer/builder committing that the project will either be designed for rainwater use ready (e.g. plumbing infrastructure rough-in, dedicated location for cistern) or will re-use rainwater on-site (for toilet flushing, irrigation, and outdoor uses).
Great Target:	+2 additional points (total 3 points)	Rainwater or greywater is captured on-site and used for low-grade functions (e.g. rainbarrels, onsite water recycling systems, plumbing infrastructure or a cistern are included in the building).	On a Site Plan: <ul style="list-style-type: none"> • Highlight the design measures (e.g. Onsite water recycling systems, rainbarrels, cistern location/size, site drainage). ○

Metric:	NE-12 Multi-purpose Stormwater Management		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To beautify naturalized stormwater management facilities, and, to enhance the public use value of these facilities as components of the municipal natural heritage open space system. Stormwater control can be perceived as an opportunity. Ponds can provide amenity space for occupants to enjoy or water can be viewed as an asset for use.		
	Points	Requirements	Documenting Compliance
Good Target:	2 points	Introduce beautification measures/amenities that beautify stormwater management ponds (e.g. public art, interpretive signage).	Submit: In the Functional Servicing Report or Stormwater Management Plan): <ul style="list-style-type: none"> • Identify beautification measures (public art, interpretative signage, visually pleasing infrastructure, etc.) included within the project that is above and beyond City's landscape specifications and applicable standards. Notes: <ul style="list-style-type: none"> ○ Single-lot residential developments are excluded. ○ Any proposed beautification measure will not reduce the performance function of the stormwater pond. ○ Fountains are not acceptable beautification measures.
References:	Appendix E - Stormwater Management Pond Design Guidance of TRCA SWM Criteria document (2012)		

Metric:	IB-1. Buildings Designed and/or Certified under an Accredited "Green" Rating System		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To recognize appropriate independent third-party certification systems incorporated into the proposal. Sustainability certification systems, provide recognizable certifications demonstrating to the public that degrees of sustainability are being achieved. This can result in increased value for the buildings or neighborhoods.		
	Points	Requirements	Documenting Compliance
Good Target:	1 to 7 points (1 point per building, total 7 points available)	The project boundary includes 1 to 7 green buildings enrolled in one or more recognized third party standards.	Submit: <ul style="list-style-type: none"> A Letter of Commitment signed by a qualified professional (architect, professional engineer, LEED professional) and the owner/developer/builder that includes confirmation that at least one building within the project is to be certified to a recognized third-party green rating system. Confirmation of registration for a third-party green rating system (e.g. a receipt of the registration fees). For EnergyStar Multifamily Only: Signed a Partnership Agreement with EnerQuality acknowledging their roles and responsibilities as a partner and documenting their commitment to meet the MFHR Program Requirements. https://www.energystar.gov/partner_resources/residential_new/program_reqs/mfhr/certification
Excellent Target:	1 additional point per building	If a building is registered for more than one green rating system certification.	Notes: <ul style="list-style-type: none"> The application includes one of the following Third-Party Accredited Green Rating Systems for purpose-built neighborhoods and communities: <ul style="list-style-type: none"> LEEDv4 or LEEDv4.1 (not including LEED for Commercial Interiors) Passive House Living Building Challenge CaGBC Zero Carbon Building Design Standard Version 2 (March 2020) Energy Star Multifamily
Good Target:	2 points	The application includes one of the following green neighbourhood rating systems: <ul style="list-style-type: none"> LEED ND One Planet Living 	
References:	City's Official Plan Sustainable Design and Construction Policy for Municipal Buildings CaGBC Zero Carbon Building Design Standard Version 2, March 2020 York Region Sustainable Development through LEED Incentive Program		

Metric:	IB-2 Universal Design		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To enable a wide spectrum of people to live within and access new buildings (regardless of age or ability). To provide accessibility to occupants beyond the Ontario Building Code (OBC) which mandates a barrier-free path of travel is included in 15% of Multi-Residential Units as per OBC. Inclusive buildings and neighborhoods expand the number of potential users, thereby increasing value. They also enable more diversity in age.		
	Points	Requirements	Documenting Compliance
Good Target:	2 points	Design a minimum of 20% of the Dwelling Units (DU) in accordance with ICC/ANSI A117.1 Universal Design Standards (or equivalent).	Submit: A Letter of Commitment signed by an accredited professional (e.g architect, engineer, accessibility consultant) which declares that the metric requirements have been achieved.
Great Target:	+1 additional points (total 3 points)	Design a minimum of 30% of the Dwelling Units (DU) in accordance with ICC/ANSI A117.1 Universal Design Standards (or equivalent).	On a Site Plan: <ul style="list-style-type: none"> • Confirm that 20 or 30% of the units have been designed with a barrier-free path of travel • Quantify the total number of Multi-Residential Units (if applicable) and total dwelling units included within the proposed development • Quantify the number and percent (%) of dwelling units designed to ANSI 117.1 standards or equivalent.
References:	Accessibility Act City's Municipal Accessibility Plan LEED ND NPDC11 Ontario Building Code (2019) requirements		

Metric:	IB-3 Building Accessibility		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To enable a wide spectrum of people to access new buildings, regardless of age or ability. Ontario Building Code (OBC) requires 100% of primary entrances for accessibility. Inclusive buildings and neighborhoods expand the number of potential users, thereby increasing value. They also enable more diversity in age.		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	50% of emergency exits above the OBC requirements are designed to universally accessible standards.	Submit: On a Site Plan drawing:
Great Target:	+2 additional points (total 3 points)	100% of all entries and exits above the OBC requirements are designed to universally accessible standards.	<ul style="list-style-type: none"> Identify all building entrances Identify all building entrances under the OBC that must be designed to accessibility standards and identify the universal accessible design standards that are being applied Quantify the percent (%) of emergency, and remaining entries/exits that are designed to universally accessible standards. Notes: <ul style="list-style-type: none"> Entrances include all access and entry points into a building.
References:	Ontario Accessibility Act City's Municipal Accessibility Plan LEED ND NPDC11		

Metric:	IB-4 Embodied Carbon of Building Materials: Supplementary Cementitious Materials		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	<p>To increase the growing awareness of the importance of addressing the embodied carbon and other GHG emissions associated with building materials.</p> <p>Materials can account for significant impact from their production, and reductions are available through selection and design. Often, lower impact materials are also more cost-effective.</p>		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	All concrete on site must have a minimum of 20% Supplementary Cementitious Materials (SCMs).	Submit: <ul style="list-style-type: none"> • A Letter of Commitment from a qualified professional (professional engineer or architect) declaring that: • Concrete will have an SCM content of 20% or more (Good)/ 40% or more (Great)
Great Target:	+1 additional points (total 2 points)	40% of concrete on site must have a minimum of 40% Supplementary Cementitious Materials (SCMs).	Notes: Supplementary cementing materials (SCMs) contribute to the properties of hardened concrete through hydraulic or pozzolanic activity. Examples include fly ashes, slag cement (ground, granulated blast-furnace slag), and silica fume. They can be used individually with portland or blended cement or in different combinations. SCMs are often added to concrete to make concrete mixtures more economical, reduce permeability, increase strength, or influence other concrete properties.

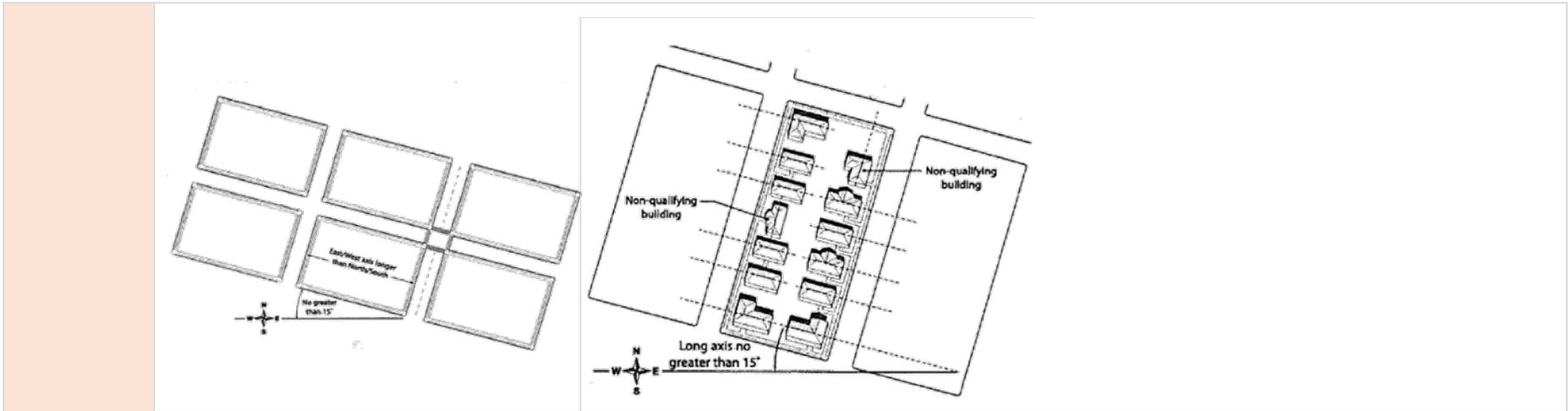
Metric:	IB-5 Embodied Carbon of Building Materials: Life Cycle Assessment		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To increase the growing awareness of the importance of addressing the embodied carbon and other GHG emissions associated with building materials. Materials can account for significant impact from their production, and reductions are available through selection and design. Often, lower impact materials are also more cost-effective.		
	Points	Requirements	Documenting Compliance
Great Target:	3 points	<p>Report embodied carbon emissions for the structural and envelope materials for 10% of Part 3 buildings on site (but at least 1 Part 3 building).</p> <p>To develop the report, use lifecycle assessment software such as Athena Impact Estimator for Buildings Life Cycle Assessment (LCA) software (or equivalent). Consider three methods to reduce the embodied carbon content of each building reviewed.</p> <p>Note Part 3 – Large and complex buildings, four storeys and taller and greater than 600 square metres in the building area.</p>	<p>Submit:</p> <p>On a Site Plan Drawing:</p> <ul style="list-style-type: none"> Identify the building(s) that is being assessed and describe if it is residential, commercial or institutional buildings, the estimated gross floor area, the number of storeys and the number of dwelling units (If residential). Confirm the number of Part 3 buildings on site and if 1 or 10% are being assessed (whichever is greater). Provide the LCA report declaring the materials that are anticipated to be used and the estimated total embodied carbon emissions of these materials used for the structure and envelope. <p>For all requirements that refer to LCA include: Please refer to the Zero Carbon Building Standard for further guidelines on LCA assessments. https://www.cagbc.org/cagbcdocs/zerocarbon/CaGBC_Zero_Carbon_Building_Standard_EN.pdf</p>
Excellent Target:	+2 additional point (total 5 points)	Commit to employing one or more carbon reduction strategies that would result in a 10% reduction in embodied carbon of the design.	<ul style="list-style-type: none"> In addition to the documentation requirements above, provide a Letter of Commitment from a qualified professional (professional engineer or architect) stating the intent to use one or more of low carbon design strategies to reduce the embodied carbon.
References:	CaGBC, Net Zero Carbon Building Standard. May, 2017 CaGBC, Net Zero Carbon Building Standard Version 2. March, 2020		

Metric:	IB-6 Embodied Carbon of Building Materials: Material Efficient Framing		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To increase the growing awareness of the importance of addressing the embodied carbon and other GHG emissions associated with building materials. Materials can account for significant impact from their production, and reductions are available through selection and design. Often, lower impact materials are also more cost-effective.		
	Points	Requirements	Documenting Compliance
Great Targets:	3 points	<p>For all low rise wood-framed construction utilize at least 3 of the following measures:</p> <ul style="list-style-type: none"> • Pre-cut framing packages, • Open web floor trusses, • Stud spacing greater than 400 mm (16"), • Ceiling joist spacing greater than 400 mm (16"), • Floor joist spacing greater than 400 mm (16"),All corners have no more than 2 studs. 	<p>Provide a Letter of Commitment from the developer committing to practice material efficient framing and listing the measures that will be employed from the provided eligible measures.</p> <p>Notes:</p> <ul style="list-style-type: none"> • Embodied carbon can be defined as the lifetime greenhouse gas (GHG) emissions associated with material. It is life cycle thinking applied to a product, and includes GHG's associated with the manufacture, transportation and installation of a product, any GHG's related to product maintenance and renewal, and GHG's associated with the end of life of the product. • Modular construction approach can assist in confirming these requirements.
References	LEED For Homes Athena Sustainable Materials Institute (September 2019) http://www.athenasmi.org/wp-content/uploads/2019/09/About_WBLCA.pdf		

Metric:	IB-7 Reduce Heat Island: Non-Roof		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To reduce ambient surface temperatures and provide shade for human health and comfort. Urban areas are typically much warmer than rural or forested areas due to the areas of exposed dark coloured roofing and roadways. Reducing heat gain can provide more comfortable spaces and some cooling savings.		
	Points	Requirements	Documenting Compliance
Good Target:	2 points	<p><u>For Residential and Non-Residential:</u></p> <p>Use one or more of the following strategies to treat 50% of the site's non-roof hardscaping:</p> <ul style="list-style-type: none"> • High albedo paving materials with an initial solar reflectance of at least 0.33 or SRI of 29. • Open grid paving with at least 50% perviousness • Shade from existing or new tree canopy within 10 years of landscape installation. • Shade from architectural structures that are vegetated or have an initial solar reflectance of at least 0.33 at installation or an SRI of 29. • Shade from structures with energy generation. <p>OR</p> <p><u>For Non-Residential:</u></p> <p>Place a minimum of 75% of the required parking spaces under a cover. Any roof used to shade, or cover parking must have a 3 year aged SRI of at least 29 or be a green roof, or be covered by energy generation systems.</p> <p>Note: Hardscaping includes driveways, walkways, courtyards, surface parking areas, artificial turf, and other on-site hard surfaces.</p>	<p>Submit:</p> <p>A Letter of Commitment from a qualified professional (professional engineer or architect) declaring the following:</p> <ul style="list-style-type: none"> • Area of the total hardscape on the site (excluding building footprint) • Highlight on a Site Plan drawing and declare the area for the strategies used to reduce heat island from the hardscape area (e.g. Underground/covered parking, hardscape shading, hardscape materials with an SRI greater than 29, and open grid pavers with pervious greater than 50%). The following products have an SRI greater than 29: <ul style="list-style-type: none"> • White-coated gravel on the built-up roof (SRI 79), • White coating on a metal roof (SRI 82), • White cement tile (SRI 90), • New gray concrete (SRI 35). • For unit pavers and open grid/ pervious paving, provide examples of the products that are intended for the design and provide manufacturer's documentation with the SRI or solar reflectance value to confirm. • Determine the percent (%) of the hardscape area that has employed heat island reduction strategies, relative to the total hardscape area. • Upon completion of construction, provide a Letter of Certification signed by an accredited professional that the metric requirements have been implemented and verified.
Great Target:	+1 additional point (total 3 points)	Use one or more of the strategies presented in the Minimum Target to treat 75% of the site's non-roof hardscaping.	
References	Toronto Green Standard v3 AQ4.1 Toronto Green Standard v3 AQ4.3 LEED NC SSC7.1/7.2		

Metric:	IB-8 Reduce Heat Island–Roof		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	<p>To reduce ambient surface temperatures.</p> <p>Urban areas are typically much warmer than rural or forested areas due to the areas of exposed dark coloured roofing and roadways. The impacts of climate change are expected to increase the projected number of heat and extreme heat warnings in the Region which will magnify the urban heat island effect in urban areas. Reducing heat gain can provide more conformable spaces and some cooling savings.</p>		
	Points	Requirements	Documenting Compliance
Good Target:	2 points	Provide the following: <ul style="list-style-type: none"> Cool roof installed for 100% of the available roof space; or 	Submit: On a Landscape Plan, Elevation drawings, or Roof Plan demonstrate the following: <ul style="list-style-type: none"> Determine the area of Available Roof Space. For Cool Roof products provide examples of the products that are intended for the design and provide manufacturer’s documentation with the SRI or solar reflectance value to confirm. Determine the percent (%) area of roofing surfaces treated with a cool roof, green roof and/or solar PV as a percent (%) of the total available roof space. Notes: <ul style="list-style-type: none"> Available roof space for cool roof areas consists of the total roof area of the building or building addition excluding private terraces no greater in area than the floor of the abutting residential unit at the roof level. <i>Available Roof Space</i> is defined as the total roof area minus the areas designated for renewable energy, residential private terraces, residential outdoor amenity spaces (to a maximum of 2m²/unit, and a tower roof on a building with a floor plate less than 750m². The definition is from the City of Toronto Green Roof Bylaw. Cool roofing materials have a minimum initial reflectance of 0.65 and minimum emittance of 0.90 or a three-year aged SRI value of 64 for a low-sloped roof and a three-year aged SRI of 15 for a steep-sloped roof. Low sloped roofs have a surface slope of less than 1:6 (9.5 degrees) and steeply sloped roofs have a surface slope greater than 1:6 (9.5 degrees).
Great Target:	4 points	Provide the following: <ul style="list-style-type: none"> Green roof installed for 50% of the available roof space; 	
Excellent Target:	+2 additional points (total 6 points)	Provide the following: <ul style="list-style-type: none"> Green roof installed for 75% of the available roof space; 	
References:	City’s Official Plan LEED NC SSC7.1/7.2 Toronto Green Standard v3, AQ4.2 City of Toronto Green Roof Bylaw		

Metric:	IB-9 Passive Solar Alignment		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input type="checkbox"/> Site Plan		
Metric Intent:	To promote energy efficiency by creating the conditions for the use of passive solar design as well as solar photovoltaic and/or solar thermal strategies. Solar energy can provide cost-effective methods to reduce energy use and will have strong climate change benefits.		
	Points	Requirements	Documenting Compliance
Good Target:	3 points	50% (or more) of the blocks have one axis within 15 degrees of East-West (E-W) plane. East-West (E-W) lengths of those blocks are at least as long as the North-South (N-S) lengths of blocks.	Submit: In the Urban Design Brief, or Draft Plan site statistics: <ul style="list-style-type: none"> • Highlight the direction of True North. • Measure 15° from the East-West plain for all blocks and buildings (as shown in the figure below). • Highlight and determine the buildings/blocks that have one axis within 15° of East-West (E-W) plane. • Highlight and determine the buildings and blocks that have the East-West (E-W) lengths at least as long as the North-South (N-S) lengths. • Declare the percent (%) of buildings and blocks (relative to the total number of buildings and blocks) that have: <ul style="list-style-type: none"> • One axis within the 15° of East-West (E-W) and, • East-west (E-W) lengths at least as long as the North-South (N-S) lengths.
Great Target:	+3 additional points (total 6 points)	75% (or more) of the blocks have one axis within 15 degrees of East-West (E-W) plane. East-West (E-W) lengths of those blocks are at least as long as the North-South (N-S) lengths of blocks.	
References:	LEED ND GIBc10 Diagram for Reference (Source: City of Brampton, https://www.brampton.ca/EN/Business/planning-development/Land-Development-Application/Pages/Help-Infrastructure.aspx):		



Metric:	IB-10 Controlling Solar Gain		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To control solar heat gains through east and west facing windows.		
	Points	Requirements	Documentation Compliance
Good Target:	2 points	Provide exterior shading for all east and west facing windows.	<p>On building elevations, identify the exterior shading method that will be used on all east and west facing windows.</p> <p>Notes:</p> <ul style="list-style-type: none"> o Acceptable exterior shading includes operable shutters, overhangs, brise soleil, awnings, solar blinds, screens, horizontal louvers and жалюзи.
References:	Institute for Catastrophic Loss Reduction, and Durham Region. Durham Region Climate Resilience Standard for New Houses - Draft for Consultation (February 2018).		

Metric	IB-11 Solar Readiness		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To reduce the negative impacts of fossil fuel-based energy and reduce dependence on the electricity grid. Solar energy can provide cost-effective methods to reduce energy use and will have strong climate change benefits.		
	Points	Requirements	Documenting Compliance
Good Target:	3 points	All buildings in the project are designed for solar readiness.	<p>Submit:</p> <p>A Letter of Commitment from a qualified professional (architect, energy, structural, electrical or mechanical engineer) and the owner/developer/builder to confirm the following:</p> <ul style="list-style-type: none"> • All new buildings will be designed for solar readiness. <p>Notes:</p> <p>Designing for solar readiness may include:</p> <ul style="list-style-type: none"> ○ Designate an area of the roof for future solar PV and/or solar thermal. ○ Design and build an adequate structural capacity of the roof structure. ○ Install one or two conduits from the roof to the main electrical or mechanical room (size of conduit to be determined based on maximum potential solar PV or solar thermal system size). ○ Designate a 2m by 2m wall area in the electrical and mechanical rooms for future solar electrical/thermal equipment controls and connections (e.g. meters, monitors). ○ Where possible place the HVAC or other rooftop equipment on the north side of the roof to prevent future shading. <p>For more guidance on solar readiness, or to access a Solar Readiness Checklist, consult NREL's Solar Ready Buildings Planning Guide. Applicants are also encouraged to consult the National Renewable Energy Laboratory's Solar Ready Buildings Planning Guide for additional considerations for PV-ready provisions.</p>
Great Target:	2 point	In the project, 1% of the total energy is generated on-site by renewable energy sources.	<ul style="list-style-type: none"> • Provide a Letter of Commitment from a qualified professional (e.g. architect, electrical engineer, mechanical engineer, energy modeler) and the owner/developer/builder to confirm that the percent (%) of renewable energy will be included on-site. The percent (%) of renewable energy generated can be quantified by the following steps:
Excellent Target:	+1 additional point per percent (%) increase up to 5 points (total 7 points)	In the project, more than 1% of the total energy is generated on-site by renewable energy sources, up to 5%.	<ul style="list-style-type: none"> • List the types of buildings (office, commercial, retail, multi-family and/or single-family). • Determine the total GFA for each building type and list the expected/approximate energy use intensities (EUIs) for each building type. • Determine the total building annual energy use for the site. • List the renewable energy technologies being considered for the site.

			<ul style="list-style-type: none"> Determine the expected annual energy generated from renewable technologies and the percent (%) of annual energy generated on-site, relative to the total energy consumed. <p>Notes:</p> <p>Allowable forms of renewable energy systems include the following:</p> <ul style="list-style-type: none"> Solar photovoltaics (PV), Solar thermal, Biogas and biofuel, Wind-based systems. <p>For greater clarity, it should be noted that geo-exchange systems (e.g. 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 on-site renewable energy requirement, but can instead be utilized to meet the energy efficiency targets.</p> <p>The renewable energy calculations can be conducted either within the whole-building energy modelling software or through recognized third-party energy modelling tools such as RETScreen Expert or PVSystem.</p> <p>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.</p>
<p>Good Target (Draft Plan Only)</p>	<p>3 points</p>	<p>For greenfield sites that provide ground-oriented development, 100% of dwellings in the project are designed for solar readiness.</p>	<p>Submit:</p> <p>A Letter of Commitment from a qualified professional (architect, energy, structural, electrical or mechanical engineer) and the owner/developer/builder to confirm the following:</p> <ul style="list-style-type: none"> All dwellings in the project will be designed for solar readiness
<p>References:</p>	<p>NRCAN Solar Ready Guidelines Toronto Green Standard v3 GHG 2.1</p>		

Metric:	IB-12 Energy Strategy		
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To encourage the early consideration and incorporation of sustainable design features in the planning process relating to improved building energy efficiency, carbon reduction, and resilience, as well as to take advantage of district-scale opportunities in the case of multi-building developments. Energy use is a major contributor to climate change. A good energy strategy can offer short paybacks and improved resiliency.		
	Points	Requirements	Documenting Compliance
	Block Plan / Plan of Subdivision		
Great Target:	2 points	<p>Develop an Energy Strategy for the proposed development which includes the following as applicable:</p> <ul style="list-style-type: none"> • High-level energy analysis using archetype modelling or benchmarking data to estimate the overall energy consumption and GHG emissions associated with the development. • Identify and evaluate opportunities to reduce EUI and GHG emissions intensities down to a net-zero ready level of performance (e.g. the Excellent Target) through various measures such as more efficient building form and massing, orientation, improved building envelope performance, highly efficient HVAC systems, heat recovery, and lighting solutions. • Analysis of low-carbon energy solutions and on-site renewable energy generation potential that can be incorporated into the development, including rooftop PV, geo-exchange systems, high-efficiency CHP, thermal energy stores, and sewer water heat recovery. • In the case of multi-building development proposals or in intensification areas identified by the municipality, investigate the feasibility of shared energy solutions such as the development of low-carbon thermal energy networks or connection to planned or existing district energy systems, and identify the required provisions to be district energy-ready. • Identify and evaluate opportunities for backup power systems and passive design features that will improve the resilience of buildings to area-wide power outages. 	<p>Submit:</p> <p>An Energy Strategy Report that meets the terms of reference provided by the City, and at a minimum should include the following information:</p> <ul style="list-style-type: none"> • Executive Summary, • Energy calculations, including data and assumptions, • Graphs of expected energy performance , • Conclusions / Recommendations, • Appendices: supporting documentation, references, etc. <p>For Excellent target, provide Letter of Commitment signed by the owners/developers/builders indicating commitment to meet a development-wide energy use intensity and greenhouse gas emissions intensity target, as well as a zero-carbon transition plan that lays out specific design measures that will be incorporated to facilitate achievement of carbon neutrality in the future (for example, providing electrical infrastructure provisions to allow for full building electrification).</p>
	+6 additional points	In addition to developing an Energy Strategy, commit to meeting an energy use intensity and greenhouse gas emissions	

Excellent Target:	(total 8 points)	<p>intensity target for the site that strives towards a near-net zero emissions level of performance as agreed upon with the City,</p> <p>Develop a zero-carbon transition plan that lays out the pathway towards achieving carbon neutrality in the future through a variety of design measures, such as providing the necessary infrastructure for full building electrification and avoidance of on-site combustion of fossil fuels.</p>	
References:	City of Toronto Energy Strategy Report – Terms of Reference		

Metric:	IB-13 Building Energy Efficiency and Emissions		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric 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 the thermal comfort of occupants and enhancing building resilience. Well-designed buildings that are energy-efficient can improve indoor and outdoor air quality, and reduce greenhouse gas emissions.		
	Points	Requirements	Documenting Compliance
Great Target:	5 points	<p><u>Part 9 Residential Buildings (less than 3 storeys and less than 600 m² in gross floor area).</u></p> <p>Design, construct and certify the building to achieve ENERGY STAR® for New Homes, or R-2000® requirements.</p> <p><u>Part 3 Buildings – Multi-Unit Residential, Office and Retail (more than 3 storeys or more than 600 m² in gross floor area).</u></p> <p>Develop a whole-building energy model, and design and construct the building to achieve the following whole-building performance metrics:</p> <ul style="list-style-type: none"> • Total Energy Use Intensity (TEUI): 170 kWh/m².yr. • Thermal Energy Demand Intensity (TEDI): 70 kWh/m².yr. • Greenhouse Gas Emissions Intensity (GHGI): 20 kgCO₂/m².yr. <p><u>All Other Part 3 Buildings</u></p> <p>Develop a whole-building energy model, and design and construct the building to achieve at least a 15% improvement in energy efficiency over the Ontario Building Code (OBC) SB-10, Division 3 (2017) reference building.</p>	<p>Submit:</p> <ul style="list-style-type: none"> • At the submission stage, a Letter of Commitment signed by an accredited professional and the owner/developer/builder that includes confirmation that requirements are met. • Upon completion of construction, provide a Letter of Certification signed by an accredited professional that the metric requirements have been implemented and verified. <p>Site Plan Approval (SPA) Energy Model Documentation Requirements:</p> <ul style="list-style-type: none"> • Energy Model Report summarizing key modelling inputs, outputs, and assumptions, signed by a licensed professional. • Working Energy Model Simulation Files. • Mechanical and Electrical Design Brief. • Related supporting drawings and calculations done externally from the energy modelling software (for example, thermal bridging calculations). <p>As-Built Energy Model Documentation Requirements:</p> <ul style="list-style-type: none"> • 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 (Modeler’s external calculations to support the model inputs). If applicable, the calculation for model workarounds, 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). <p>Notes:</p> <ul style="list-style-type: none"> ○ For TEUI and TEDI Energy Modelling Guidelines, please refer to the ZCB Energy Modelling Guidelines: https://www.cagbc.org/cagbcdocs/zerocarbon/CaGBC_EMG_for_ZCB_v01.pdf

			<ul style="list-style-type: none"> o For rules on carbon accounting and calculating GHGI, please refer to the Zero Carbon Building Standard: https://www.cagbc.org/cagbcdocs/zerocarbon/CaGBC_Zero_Carbon_Building_Standard_EN.pdf
Great Target:	3 points	<p><u>Building Commissioning</u></p> <p>Building commissioning is a systematic process of verifying that the various building sub-systems such as building envelope, mechanical (HVAC), plumbing and lighting systems are constructed and operational per the project requirements and design intent.</p> <p>Conduct best practice commissioning, per the requirements referenced in LEED BD+C v4 Fundamental Commissioning and Verification pre-requisite.</p>	Letter of Commitment signed by the owner/developer/builder at SPA stage confirming that building commissioning will be carried out per the requirements of LEED v4 BD+C Fundamental Commissioning and Verification pre-requisite.
Excellent Target:	3 points	<p><u>Airtightness Testing</u></p> <p>Conduct a whole-building air leakage test to improve the quality and airtightness of the building envelope.</p>	<p>Applicant to provide Letter of Commitment signed by the owner/developer/builder at SPA stage to retain an airtightness testing provider to conduct a whole-building air leakage test.</p> <p>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.</p> <p>Projects shall conduct an operational envelope airtightness test under negative pressure producing a multi-point regression. However, projects are 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.</p> <p>Projects shall target a test pressure of 75Pa. Projects unable to achieve 75Pa must follow either ASTM W35913 alternative test methods; Repeated Single-Point Test or a Repeated Two-Point test and demonstrate compliance using projected curves for airtightness at 75Pa.</p> <p>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 normalized to the exterior surface area and not include the guarded surface areas.</p> <p>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.</p> <p>Upon completion, the applicant shall provide a completed airtightness testing report to City officials.</p>
Good Target:	3 points	<p><u>Metering</u></p> <p>Install electricity and/or thermal sub-meters for all energy end-uses that represent more than 10% of the building's total energy consumption, following</p>	<p>The provision of electricity and thermal sub-meters clearly indicated on electrical and mechanical single-line diagrams.</p> <p>A metering plan listing all meters along with type, energy source metered, diagrams, and/or references to design documentation.</p>

		<p>the requirements laid out in LEED v4 Reference Guide Advanced Energy Metering credit.</p> <p>For buildings with multiple tenants, provide energy sub-metering for each commercial/institutional tenant, and per residential suite.</p>	
<p>Excellent Target:</p>	<p>+5 additional points (total 10 points)</p>	<p><u>Part 9 Residential Buildings</u></p> <p>Design, construct and certify the building to achieve CHBA Net Zero Homes program or Passive House requirements.</p> <p><u>Part 3 Buildings – Multi-Unit Residential, Office and Retail</u></p> <p>Develop a whole-building energy model and design the building to achieve the following whole-building performance metrics associated with a near-net zero emissions level of performance:</p> <ul style="list-style-type: none"> • Total Energy Use Intensity (TEUI): 75 kWh/m².yr • Thermal Energy Demand Intensity (TEDI): 15 kWh/m².yr • Greenhouse Gas Emissions Intensity (GHGI): 5 kgCO₂/m².yr <p><u>All Other Part 3 Buildings</u></p> <p>Develop a whole-building energy model and design the building to achieve at least a 50% improvement in energy efficiency over the Ontario Building Code (OBC) SB-10, Division 3 (2017) reference building.</p> <p>For intermediate performance levels between the Recommended Great and Excellent targets, points will be awarded on a pro-rated basis (Up to 8 Points).</p>	<p>Site Plan Approval (SPA) Energy Model Documentation Requirements:</p> <ul style="list-style-type: none"> • Energy Model Report summarizing key modelling inputs, outputs and assumptions, signed by a licensed professional. • Working Energy Model Simulation Files. • Mechanical and Electrical Design Brief. • Related supporting drawings and calculations done externally from the energy modelling software (for example, thermal bridging calculations). <p>As-Built Energy Model Documentation Requirements:</p> <ul style="list-style-type: none"> • 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 (Modeler’s external calculations to support the model inputs). If applicable, the calculation for model workarounds, 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). <p>Electrical Drawings and Specifications (issued for construction/as-built).</p> <p>Notes:</p> <ul style="list-style-type: none"> o For TEUI and TEDI Energy Modelling Guidelines, please refer to the ZCB Energy Modelling Guidelines: https://www.cagbc.org/cagbcdocs/zerocarbon/CaGBC_EMG_for_ZCB_v01.pdf o For rules on carbon accounting and calculating GHGI, please refer to the Zero Carbon Building Standard: https://www.cagbc.org/cagbcdocs/zerocarbon/CaGBC_Zero_Carbon_Building_Standard_EN.pdf
<p>References:</p>	<p>Toronto Green Standard Version 3.0</p> <p>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.</p> <p>CHBA Net Zero Homes program</p> <p>ENERGY STAR® for New Homes</p> <p>LEED v4 Reference Guide Advanced Energy Metering credit.</p> <p>LEED BD+C v4 Fundamental Commissioning and Verification pre-requisite.</p> <p>Ontario Building Code (OBC) SB-10, Division 3 (2017) reference building.</p> <p>R-2000®</p>		

Metric:	IB-14 Reduce Potable Water Use		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To promote efficient use of potable water. Promoting efficient use of potable water contributes to water conservation.		
	Points	Requirements	Documenting Compliance
Good Target:	2 points	For highrise multiunit or ICI development: Reduce potable water used for irrigation by 50%, compared to a mid-summer baseline case.	<p>Submit:</p> <p>A Letter of Commitment from a qualified professional (architect, mechanical engineer, landscape architect) and the owner/developer/builder to confirm:</p> <ul style="list-style-type: none"> The project will be designed to reduce potable water requirements for irrigation. List the plant species intended to be used and highlight which are native/ adaptive/ drought tolerant. Determine the percent (%) reduction in potable water used to irrigate, relative to a mid-summer baseline case. For information on how to achieve this credit refer to LEED v4 BD+C WE Credit: Outdoor Water Use Reduction Option 2 and use the calculation tool to demonstrate. Identify the strategies used to reduce potable water demands (e.g. drought-tolerant vegetation, controls, drip irrigation and/or rainwater harvesting/storage). Strategies include: <ul style="list-style-type: none"> Drought tolerant, native/ or adaptive vegetation that requires little to no water in the local climate, Using high-efficiency irrigation such as drip irrigation, Using captured rainwater for irrigation. If captured rainwater is used, provide a Letter from a Qualified professional (mechanical engineer) confirming the proposed cistern size and the calculations to demonstrate the volume of captured water expected.
Great Target:	+4 additional points (total 6 points)	No potable water is used for irrigation.	<p>For Excellent target, provide the documentation as requested for the minimum target unless the target is achieved by not installing any irrigation.</p> <p>In the case where no irrigation is installed, provide a Letter of Commitment from qualified professionals (property managers, building owners, site owners) confirming that no irrigation will be installed past the establishment period and that sod will be allowed to go dormant and brown in off-season months.</p>
References:	LEED NC WEc1 LEED NC BD+C WE Credit: Outdoor water use reduction Toronto Green Standard Tier I, WQ 4.3		

Metric:	IB-15 Back-Up Power		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To encourage the provision of back-up power that enables the functioning of key utilities/building functions during power failures resulting from extreme weather events.		
	Points	Requirements	Documentation Compliance
Good Target:	1 point	Provide rough-ins to allow for the installation of external generators/auxiliary power supply at a later date.	Provide a Letter of Commitment stating that all residential dwellings will be provided rough-ins to allow for the installation of external generators/auxiliary power supply at a later date. Notes: ○ Applies to all residential building types
Good Target:	1 point	For mid-rise and high-rise buildings, provide a refuge area with heating, cooling, lighting, potable water, and power available for 72 hours.	On the Floor Plans, identify the common refuge area. Provide a Letter of Commitment stating that the refuge area will be provided and supplied with heating, cooling, lighting, potable water, and power available for 72 hours. Notes: ○ Applies to residential buildings that contain central amenity/lobby space. A refuge area should be a minimum size of 93m ² (1000 square feet), and/or 0.5m ² /occupant and may act as building amenity space during normal operations. ○ Common refuge areas are temporarily shared, lit spaces where vulnerable residents can gather to stay warm or cool, charge cell phones and access the internet, safely store medicine, refrigerate basic food necessities, access potable water and toilets and perhaps prepare food.
Great Target	3 points	Provide 72 hours of back-up power to essential building systems.	Provide a Letter of Commitment stating that at least 72 hours of back-up power to essential building systems will be provided. Notes: ○ Provide a 72 hour minimum back-up power system, preferably using a non-fossil fuel source, to ensure power is provided to the refuge area, building security systems, domestic water pumps, sump pumps, at least one elevator, boilers and hot water pumps to enable access and egress and essential building functions during a prolonged power outage. ○ Applies to multi-unit residential buildings only
References:	Institute for Catastrophic Loss Reduction, and Durham Region. Durham Region Climate Resilience Standard for New Houses - Draft for Consultation. (February 2018) Toronto Green Standard v3 City of Toronto. Minimum Backup Power Guidelines for MURBs, Voluntary Performance Standards for Existing and New Buildings (2016). City of Brampton. Emergency Preparedness Guide.		

Metric:	IB-16 Extreme Wind Protection		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To increase the resistance of homes to the impacts of high wind events.		
	Points	Requirements	Documentation Compliance
Good Target:	1 point	Tie roof rafters, roof trusses, or roof joist to loadbearing wall framing with engineered connectors (commonly referred to as "hurricane ties") that will resist factored uplift load of 3 kN.	<p>Provide a Letter of Commitment stating that roof rafters, roof trusses, or roof joist will be tied to loadbearing wall framing with engineered connectors (commonly referred to as "hurricane ties") that will resist factored uplift load of 3 kN.</p> <p>Notes:</p> <ul style="list-style-type: none"> o Builders should request that truss manufacturers supply appropriate roof-to-wall connectors along with trusses.
References:	Institute for Catastrophic Loss Reduction, and Durham Region. Durham Region Climate Resilience Standard for New Houses - Draft for Consultation. (February 2018) Sandink, D., et al. Increasing High Wind Safety for Canadian Homes: A Foundational Document for Low-Rise Residential and Small Buildings. (April 2019)		

Metric:	IB-17 Sub-Metering of Thermal Energy and Water		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	Sub-metering allows measurement of individual unit consumption, which helps residents understand how their behaviour drives energy costs, and motivates change in behaviour, often resulting in reductions in energy consumption.		
	Points	Requirements	Documentation Compliance
Good Target:	2 points	Design buildings to include thermal energy meters for each tenant in multi-tenant residential, commercial/retail buildings.	<p>Submit:</p> <p>A Letter of Commitment signed by an accredited professional (e.g. architect, engineer) to confirm that all buildings will be designed and constructed to include thermal energy and/or water meters for each unit.</p>
Good Target:	2 points	Design buildings to include water meters for each tenant in multi-tenant residential, commercial/retail buildings.	
References:	Toronto Green Standards Version 3.0		

Metric:	IB-18 Reduce Light Pollution		
Applicable To:	<input type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To reduce nighttime glare and light trespass from the building and the site. Light pollution can be perceived as an inefficient use of energy in addition to its negative impacts on neighbors and night time animals.		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	All exterior fixtures are Dark Sky Compliant	<p>Submit:</p> <p>A Letter of Commitment from a qualified professional (architect, energy, structural, electrical or mechanical engineer), and the owner/developer/builder confirming that:</p> <ul style="list-style-type: none"> • The City’s applicable standards have been satisfied. • All fixtures intended for exterior lighting will be Dark Sky Compliant. <p>Notes:</p> <ul style="list-style-type: none"> ○ The requirement of this metric meets minimum City and Regional standards for lighting. ○ In alignment to the TGS v3 EC5.1 credit, the following guidance is provided for Dark Sky Compliant fixtures on the City’s TGS website and can be used for this metric: ○ Dark Sky Compliant fixture must have the Dark Sky Fixture Seal of Approval which provides objective, third-party certification for lighting that minimizes glare, reduces light trespass and doesn’t pollute the night sky. If a Dark Sky Fixture Seal of Approval is not available fixtures must be full-cutoff and with a colour temperature rating of 3000K or less. ○ All exterior light fixtures should be efficient while providing minimum illumination levels sufficient for personal safety and security. ○ <i>Efficient exterior lighting</i> is defined as 60 Lumens/Watt minimum system efficiency. Safety and security lighting should minimize glare and/or light trespass. For more information see the Best Practices for Effective Lighting.
References:	LEED NC SSc8 Toronto Green Standard v3 EC5.1 City of Vaughan Urban Design Guidelines City of Markham Bird Friendly Guidelines International Dark-Sky Association		

Metric:	IB-19 Bird-Friendly Design		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To reduce the incidents of bird collisions and provide an urban environment where birds can thrive. The built environment can have strong negative impacts on birds. Design and system selection can result in fewer bird collisions and deaths.		
	Points	Requirements	Documenting Compliance
Good Target	2 points	<p>Apply a combination of Bird-Friendly Design strategies on at least 85% of contiguous glass area greater than 2 m² within the first 16 m of the building above-grade (including interior courtyards) and above green roofs.</p> <p>The remaining 15% of glazed windows do not need to be treated unless the glazing is larger than 2m² or in close proximity to open spaces, a green roof or a natural heritage feature.</p> <p>Bird-Friendly Design Strategies may Include:</p> <ul style="list-style-type: none"> • Visual patterns on glass, • Window films, • Fenestration patterns, • Angled glass downwards, • Reducing night sky lighting. <p>Visual markers provided on the glass of proposed buildings with spacing no greater than 10 cm x 10 cm.</p>	<p>Submit:</p> <p>On an Elevation Plan:</p> <ul style="list-style-type: none"> • Highlight and declare the total area of contiguous glass, below 16m above grade that is greater than 2 m². • Indicate the areas treated bird friendly design strategy, noting which strategy has been used. • Quantify the total area of continuous glass that has been treated by bird-friendly design strategies and confirm that it is at least 85%. • Confirm that the visual markers on the glass have spacing no greater than 10cm x 10cm.
Good Target:	2 points	<p>Apply Bird-Friendly Design strategies for ground-oriented residential development that is adjacent to natural heritage systems and open spaces.</p>	<p>Submit:</p> <p>Letter of Commitment signed by an accredited professional (architect or professional engineer) that includes confirmation that Bird Friendly Design strategies are incorporated for developments adjacent to natural heritage systems and open spaces, listing which acceptable Bird Friendly Design strategies are to be included.</p>
References:	City of Vaughan: Urban Design Guidelines. City of Markham Bird Friendly Guidelines		

Metric:	IB-20 Solid Waste		
Applicable To:	<input type="checkbox"/> Block Plan <input type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan		
Metric Intent:	To promote waste reduction and diversion of materials from landfills. A reduction in waste can be a very cost-effective method for material savings and results in fewer contributions to landfills and lower carbon emissions due to savings in materials.		
	Points	Requirements	Documenting Compliance
Good Target:	1 point	Provide a waste system for garbage, recycling, and organics using one or more of the following options: <ul style="list-style-type: none"> ○ three separate chutes for garbage, recycling, and organics collection on all floors. 	Submit: On a Site Plan and/ or Floor Plans: <ul style="list-style-type: none"> • Confirm that City's applicable standards have been satisfied. • Identify the waste systems for garbage, recycling, and organic waste. Notes: <ul style="list-style-type: none"> ○ The requirements apply to residential developments with 31 units or more and building heights greater than 5 storeys.
Good Target:	1 point	<u>Residential:</u> Provide accessible waste storage room with minimum 25m ² floor space for the first 50 units plus an additional 13m ² for each additional 50 Units to accommodate containers and compactor units. (not applicable in Richmond Hill, a requirement already covered in Richmond Hill's waste development standard). <u>Non-residential:</u> Provide a fully enclosed waste storage space to accommodate garbage and materials diversion of recycling and organics. (not applicable in Richmond Hill, a requirement already covered in Richmond Hill's waste development standard).	Submit: On a Site Plan and/ or Floor Plans: <ul style="list-style-type: none"> • Confirm that City's applicable standards have been satisfied. • Identify waste storage areas. Determine the floor area provided for the waste storage space and identify the separate garbage storage, recycling storage, and organics storage, • (Residential only): Determine the waste storage area required based on the number of dwelling units and declare on Floor Plans/ Site Plan drawing.
Good Target:	1 point	Provide a minimum of 10m ² for bulky items and items eligible for special collection services. (not applicable in Richmond Hill, a requirement already covered in Richmond Hill's waste development standard).	Submit: On a Site Plan and/ or Floor Plans: <ul style="list-style-type: none"> • Identify the storage for bulky items and declare the area. The 10m² may not be shared with other purposes and be solely dedicated to bulky waste to meet this Excellent target, although it may be in the same room as other waste storage. Notes: <ul style="list-style-type: none"> ○ Bulky items are household items greater than 1.2m in any one dimension or weigh more than 20 kg (including furniture).

Great Target:	1 point	<p><u>Residential only:</u> Provide a dedicated collection area or room for the collection of household hazardous waste and/or electronic waste. (not applicable in Richmond Hill, a requirement already covered in Richmond Hill's waste development standard).</p>	<p>Submit:</p> <p>On a Site Plan and/ or Floor Plans,</p> <ul style="list-style-type: none"> • Identify the dedicated collection area or room for the collection of household hazardous waste and/or electronic waste. <p>Notes:</p> <ul style="list-style-type: none"> ○ Household Hazardous Waste (HHW) includes car products, motor oil, windshield fluid; household cleaning products; paint, glue, primers, stains; pesticides and garden products; cooking oil; batteries; propane tanks; CFLs, syringes, medical sharps; medication; air fresheners, swimming pool chemicals.
References	<p>Toronto Green Standard v3 SW1.1, SW1.2, SW1.3, SW1.6 City of Richmond Hill By-law 18-19</p>		

Metric:	I-1 Innovation	
Applicable To:	<input checked="" type="checkbox"/> Block Plan <input checked="" type="checkbox"/> Draft Plan <input checked="" type="checkbox"/> Site Plan	
Metric Intent:	To encourage applicants to achieve innovative performance. Innovation strategies must demonstrate a comprehensive approach, have significant, measurable environmental Benefits, and be better than standard practice.	
	Points	Requirements & Documenting Compliance
Exceptional Target:	Up to a total of 10 points (maximum) based on the measurable sustainability benefit provided	<p>The proposed innovation metric must demonstrate a quantitative improvement in sustainable performance by identifying or establishing a baseline of standard performance and comparing that benchmark with the final design performance. Should this Innovation Metric be pursued by an applicant, as part of first submission, the applicant must provide a high-level concept of the proposed Innovation metric for review by the municipality. This concept should include a description of the sustainability benefit being pursued and the proposed point allocation. Applicant's may choose to explore innovative measures listed in the Innovation Library as detailed below and must indicate this as part of their submission. As part of the application review process of the first submission, the municipality will then provide a response as to whether the applicant's proposal will be considered further.</p> <p>Should the applicant's proposal be considered acceptable by the municipality to pursue further, applicants shall be required to demonstrate the following to the satisfaction of the municipality as part of the second submission:</p> <p>The applicant must explain in detail the benefit of the proposed innovation metric and submit:</p> <ul style="list-style-type: none"> • The intent of the proposed innovation metric, • The proposed requirements for compliance, • The proposed submittals to demonstrate compliance, • The design approach to strategies used to meet the requirements. <p>Innovation points will only be considered for strategies not already identified in the menu of metric options. Innovation points are not awarded for the use of a particular product or design strategy if the technology aids in the achievement of an existing metric, even if the project is not attempting to earn that metric. Corporate strategies are not considered innovative.</p> <p>The Innovation Library</p> <p>Idea #1 - Include on the site, a Tall Wood Building, an exemplary performance of in the intent behind Embodied Carbon metric and a demonstration of leadership in tall wood construction. A tall wood building is defined as a building over 6 storeys that uses wood for its structural system and is built using mass timber construction. Tall wood building projects with mass timber requires Alternative Solutions for approval under OBC. Ontario's Tall Wood Building Reference (2017) is a technical resource to help applicants with how tall wood buildings can be designed as alternative solutions in a way that achieves the level of performance required by the Ontario Building Code.</p>
References:	LEEDv4 Innovation Credit	

APPENDIX B: Metrics Re-Numbering

The renumbering of the metrics is presented in Appendix B. The metrics are renumbered to be more reflective of the categories; Built Environment, Mobility, Natural Environment and Open Space Infrastructure and Buildings, and Innovation. This Appendix also shows which metrics have been moved to other categories that better represent the metrics' intent.

LEGEND

Metric Category:

Built Environment

Mobility

Natural Environment & Open Space

Infrastructure & Buildings

Innovation

	Original Number	Metric Name	New Metric Number
Built Environment	1.B.1/ 1.B.2	Proximity to Amenities	BE-1
	New	Providing Mixed-Use Development	BE-2
	1.F.1	Design for Life Cycle Housing	BE-3
	N/A	Community Neighbourhood Scale	BE-4
	1.J.2	Cultural Heritage Conservation	BE-5
	1.C.4	Enhancing Urban Tree Canopy and Shaded Walkways and Sidewalks	BE-6
	New	Salt Management	BE-7
	1.H.4	Carpooling Parking	BE-8
	1.H.2	Surface Parking Footprint	BE-9
	New	Electric Vehicle Charging Stations	BE-10
Mobility	2.B.1	Block Perimeter/Length	M-1
	1.I.2	School Proximity to transit routes and bikeways	M-2
	2.B.2	Intersection Density	M-3
	2.E.1	Promote walkable streets	M-4
	2.A.1	Pedestrian Amenities	M-5
	1.H.1	Bicycle Parking	M-6
	2.D.2	Implementing Trail and Bike Paths	M-7
	2.D.1	Proximity to Active Transportation Network	M-8
	2.C.1	Distance to Public Transit	M-9
	1.I.1	Traffic Calming	M-10
Natural Environment	1.C.2	Preserve Existing Healthy Trees	NE-1

LEGEND

Metric Category:

Built Environment

Mobility

Natural Environment & Open Space

Infrastructure & Buildings

Innovation

	1.C.3	Soil Quantity and Quality for New Trees	NE -2
	3.E.1	Healthy Soils	NE-3
	1.J.1	Connection to Natural Heritage	NE-4
	1.J.3	Natural Heritage System Enhancements	NE-5
	New	Supporting Pollinators	NE-6
	3.C.1	Dedicate Land for Private Fruit and Vegetable Garden Space	NE-7
	3.A.1	Access to Public Parks	NE-8
	3.B.1	Storm water quantity	NE-9
	3.B.2	Storm water quality	NE-10
	3.B.3	Greywater re-use (for interior building functions)	NE-11
	3.B.4	Multi-purpose Stormwater Management	NE-12
Infrastructure and Buildings	1.D.1	Buildings Designed and/or Certified under an Accredited “Green” Rating System	IB-1
	1.E.1	Universal Design	IB-2
	1.E.2	Universally Accessible Entry to Buildings and Sites	IB-3
	New	Embodied Carbon of Materials: SCMs	IB-4
	New	Embodied Carbon of Materials: LCAs	IB-5
	New	Embodied Carbon of Materials: Material Efficient Framing	IB-6
	4.F.1	Reduce Heat Island–Non Roof	IB-7
	4.F.2	Reduce Heat Island–Roof	IB-8
	4.A.1	Passive Solar Alignment	IB-9
	New	Controlling Solar Gain	IB-10
	3.D.1	Solar Readiness	IB-11
	4.A.3	Energy Strategy	IB-12
	4.A.2	Building Energy Efficiency and Emissions	IB-13
	4.B.1	Reduce potable water use	IB-14

LEGEND

Metric Category:

Built Environment

Mobility

Natural Environment & Open Space

Infrastructure & Buildings

Innovation

Appendix B

	New	Back up Power	IB-15
	New	Extreme Wind Protection	IB-16
	New	Sub-Metering of Thermal Energy and Water	IB-17
	4.C.2	Reduce light pollution	IB-18
	4.D.1	Bird friendly design	IB-19
	4.E.1	Solid waste	IB-20
Innovation	New	Innovation	I-1

APPENDIX C: Energy and GHG Analysis

ENERGY AND GHG REDUCTION METRICS

There have been significant changes to building energy performance and GHG emissions targets since the Sustainability Metrics were first initiated in 2014. These include the roll-out of provincial and municipal climate change action plans, including the development of the City of Toronto's municipal climate action plan (TransformTO), and subsequent implementation of the updated Toronto Green Standard Version 3.0. The energy efficiency requirements of the Ontario Building Code SB-10 and SB-12 have also been made more stringent, to the extent that they now exceed the recommended minimum level of performance in the current Sustainability Metrics. It is also understood that the partner municipalities have either developed, or are in the process of developing, their community energy and emissions plans, that will likely encourage a significant reduction in energy and GHG emissions associated with the buildings sector to meet their overall GHG emissions reduction targets.

In order to assist with the decision-making process to incorporate more stringent and/or alternative performance metrics associated with energy and GHG reduction, a cost-benefit analysis has been completed for five common building archetypes 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 five archetype buildings that have been analyzed include a medium-sized single family dwelling, a low-rise multi-unit residential building (MURB), a mid to high-rise MURB, office, and retail.

The building energy analysis was completed using EnergyPlus modelling software, costing information based on Morrison Hershfield's internal costing database and previous energy policy projects. The impact of a variety of parameters including envelope performance, Heating, Ventilation and Air Conditioning (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.

1.1 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 the identified building archetypes, and to develop performance requirements for identified archetype facilities across three distinct levels that form the structure of the Sustainability Metrics: Mandatory, Minimum and Aspirational. A parametric modelling study was completed for five of the most common city building types: medium-sized single family dwelling, low-rise MURB, mid-to-high rise MURB, office and retail.

The three levels of targets are established to generally correspond to the following performance levels:

- Level 1: "Mandatory" – Required for all new buildings and facilities as a mandatory minimum level of performance, and is equivalent to that required by the 2012 Ontario Building Code.

- Level 2: “Recommended Minimum/Great” – Performance targets that represent a more ambitious level of performance overall, and serve as the recommended base performance level for sustainable development in the community.
- Level 3: “Aspirational/Excellent” – Performance targets that are considered best in class and should be pursued when project constraints allow. The targets are generally with net zero emissions-ready and net zero energy outcomes, as well as performance levels typically aimed towards Passive House or the Living Building Challenge.

For the purpose of this report study, the targets will be referred to as “Minimum” and “Aspirational” as they were in the original Sustainability Metrics. Re-naming into their respective “Good”, “Great” and “Excellent” targets has occurred after the conclusion of the energy modelling study.

1.2 Energy Performance Approaches and Metrics

1.2.1 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 implications of these modelling rules are further examined in Section 2.5.4 of the report.
- 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 temperature set-points reductions in receptacle and process loads, and other types of measures that would be considered standardized assumptions.
- The reference building approach does not always lead towards absolute

reductions in energy and GHG emissions that strive towards net-zero emissions ready scenarios.

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, the Model National Energy Code for Buildings (MNECB) 1997 is currently referenced in the Sustainability Metrics, and the City of Markham references ASHRAE

90.1 for building retrofits. However, the reference building approach is less common in other parts of the world, such as Europe, where a target based approach is used.

Potential reference building based metrics that could be included in the updated Sustainability Metrics are listed below:

1.2.2 Energy Savings over Ontario SB-10 (2012 Ontario Building Code)

This metric looks at the relative energy consumption savings of a particular design over an NECB/NBC 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.

1.2.3 Number of LEEDv4 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 Green Buildings metric requires that municipal buildings greater than 500 m² be designed to LEED Silver or an alternative equivalent as a mandatory requirement, and additional points are available for development plans that include multiple buildings, based on the number of buildings that pursue third-party green building certification.

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 will not 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.

1.2.4 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 (e.g. 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. Another example, as noted by the C40 Cities Climate Leadership Group, is Washington D.C.’s voluntary Appendix Z to their building code which species a net zero energy compliance path, including identifying specific targets for annual heating demand and annual cooling demand (https://www.c40knowledgehub.org/s/article/How-to-set-energy-efficiency-standards-for-new-buildings?language=en_US). 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 the industry.

Given the shift towards a target-based approach in some of the more progressive energy policies across Canada, it is recommended to develop a set of absolute performance-based targets for key metrics that help drive towards low energy and carbon outcomes. The following target based metrics may be considered for the redeveloped Sustainability Metrics:

1.2.5 Energy Use Intensity (EUI)

This metric target looks at the absolute energy use of the building, and is typically varied depending on building type or climate. The Energy Use Intensity (EUI) 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 v3.

1.2.6 GHG Emissions Intensity (GHGI)

This metric target is similar to EUI, but instead of focusing on absolute energy use, it focuses on absolute GHG emissions, with the intent of minimizing GHG emissions by prioritizing savings for high GHG fuels, encouraging low carbon fuel choices, and reducing building emissions.

The incorporation of the GHGI target into the Municipal Green Building Standard will help for better alignment with city-wide environmental policies outlined in the municipal Environmental Master Plans for Richmond Hill, Markham, Brampton, and Vaughan, as well as alignment with the provincial climate change mitigation mandate outlined in the 2018 'Made in Ontario' Environmental Plan.

1.2.7 Thermal Energy Demand Intensity (TEDI)

Thermal Energy Demand Intensity 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 measure is to maximize passive or near passive systems before looking at heating delivery methods and technology. This measure 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 measure is agnostic to fuel source, with the primary intention of imposing efficient building envelope solutions. According to the Pembina Institute's 2016 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 energy affecting 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 and the NECB, 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.

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 municipal building stock, it is recommended that the TEDI be adopted as a target in the redeveloped Sustainability Metrics.

1.3 Archetype Building Descriptions

Morrison Hershfield (MH) modelled the archetype buildings from MH’s internal database based on real building floor plans from buildings that best reflected the five building types that were to be analyzed. The Part 9 single family dwelling archetype -detached dwelling archetype was based on the energy modelling data set generated by MH’s Pathfinder tool.

1.3.1 Single Family Dwelling (Part 9)

The Part 9 low-rise residential archetype is represented by a medium-size single family dwelling (SFD) with a total gross floor area of 237 m², consisting of 2 storeys and a basement. The building would fall under the scope of Part 9 of Division B of the 2012 Ontario Building Code, and would be subject to the energy efficiency requirements of OBC SB-12 at a minimum.

The following variations in building design parameters and energy conservation measures (ECMs) are considered to determine the impact on higher levels of energy efficiency on the identified key whole-building performance measures.

- Airtightness ACH: 3.5 ACH, 2.5 ACH, 1.5 ACH, 0.6 ACH
- Wall Effective R-Value: R-16, R-18, R-22, R-30, R-40
- Underslab R-Value: R-0 (uninsulated), R-11.1, R-20
- Roof R-Value: R-40, R-50
- Window U-Value: Double-Glazed (U-0.32), Triple-Glazed (U-0.21), High-Performance Triple-Glazed (U-0.14)

- Domestic Hot Water: Electric tank, Gas-fired instantaneous water heater, heat pump water heater
- Drainwater Heat Recovery: None, 42% effective drainwater heat recovery
- Space Heating: Electric baseboards, forced-air gas-fired heating furnace, cold climate air-source heat pump
- Ventilation Air Heat Recovery: None, 62% effective energy recovery ventilator (ERV), 72% effective ERV, 84% effective ERV

1.3.2 Low and Mid/High-Rise Multi-Unit Residential (Part 3)

The low-rise residential archetype is represented by a four-storey multi-unit residential building (MURB) with a total gross floor area of 5,290 m², whereas the mid/high-rise is represented by a 30-storey MURB with a total gross floor area of 22,660 m². The buildings would fall under the scope of Part 3 of Division B of the 2012 Ontario Building Code, and would be subject to the energy efficiency requirements of OBC SB-10 at a minimum.

The energy and emissions performance outcomes of the two archetypes are generally expected to be quite similar, with the primary difference being in costing outcomes due to differing envelope construction (i.e. combustible vs. non-combustible construction).

The following variations in building design parameters and energy conservation measures are considered to determine the impact on higher levels of energy efficiency on the identified key whole-building performance metrics.

- Airtightness: Up to 75% reduction from code (NECB) baseline value
- Wall Effective R-Value: Options between R-10 and R-30
- Roof R-Value: Options between R-20 and R-40
- Window-to-Wall Ratio: Options between 30% and 80%
- Window Performance: Options ranging between U-0.4 (double-glazed) and U-0.14 (high-performance triple glazed)
- Lighting Power Density: Up to 50% reduction in common area lighting from code values through usage of high efficiency LED lighting
- Plug Loads: Option for 20% load reduction from ENERGY STAR rated appliances
- Corridor Ventilation: Options for corridor pressurization between 30 cfm/suite and ASHRAE 62.1-2010 minimum requirements.
- Ventilation Air Heat Recovery: Options – None to 85% suite ERV efficiency
- HVAC System: Option of conventional fan coil units served by condensing boiler/water-cooled chiller, or air/ground source heat pumps
- Domestic Hot Water: Option for up to 50% load savings from low-flow fixtures.

1.3.3 Commercial Office (10 Storey Office Building)

The commercial office archetype will be represented by a ten-storey office building with a total gross floor area of 18,200 m². The building would fall under the scope of Part 3 of Division B of the 2012 Ontario Building Code, and would be subject to the energy efficiency requirements of OBC SB-10 at a minimum.

The following variations in building design parameters and energy conservation measures (ECMs) are considered to determine the impact on higher levels of energy efficiency on the identified key whole-building performance metrics.

- Wall Effective R-Value: Options between R-5 and R-30
- Roof R-Value: Options between R-20 and R-40
- Window-to-Wall Ratio: Options between 40% and 80%
- Window Performance: Options ranging between U-0.4 (double-glazed) and U-0.2 (high-performance triple glazed)
- Lighting Power Density: Up to 50% reduction in common area lighting from code values through usage of high efficiency LED lighting
- Plug Loads: Option for 25% load reduction through energy-efficient plug loads
- Ventilation Air Heat Recovery: Options – None to 90% energy recovery effectiveness
- HVAC System: Option of conventional variable air volume (VAV) or fan coil units with dedicated outdoor air system (DOAS)
- Central Plant: Option of conventional high efficiency plant (i.e. condensing boiler and magnetic bearing chillers), air-source heat pump with back-up boiler, or ground-source variable refrigerant flow (VRF) systems.

1.3.4 Retail (Single-storey Building)

The retail archetype is represented by a single-storey Big Box store configuration with a total gross floor area of 4,500 m² and height of 6.1 m. The building would fall under the scope of Part 3 of Division B of the 2012 Ontario Building Code, and would be subject to the energy efficiency requirements of OBC SB-10 at a minimum. The following variations in building design parameters and energy conservation measures (ECMs) are considered to determine the impact on higher levels of energy efficiency on the identified key whole-building performance metrics.

- Wall Effective R-Value: Options between R-5 and R-30
- Roof R-Value: Options between R-20 and R-40
- Window-to-Wall Ratio: Options between 5% and 40%
- Window Performance: Options ranging between U-0.4 (double-glazed) and U-0.2 (high-performance triple glazed)
- Lighting Power Density: Up to 50% reduction in common area lighting from code values through usage of high efficiency LED lighting
- Ventilation Air Heat Recovery: Options – None to 90% energy recovery effectiveness
- HVAC System: Option of conventional gas-fired unitary rooftop units, unitary air-source heat pumps, or fan coil units with a dedicated outdoor air system (DOAS).
- Central Plant: Option of standard efficiency boiler/chiller plant, high-efficiency plant (i.e. condensing boiler and magnetic bearing chillers), or ground-source variable refrigerant flow (VRF) systems.

1.4 Parametric Analysis of Energy, Cost and Carbon Outcomes

The archetype energy models described above 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:

The metrics that were extracted for each run included:

- Electricity and Gas Use of building (per m² of floor area)
- Total energy use, GHG emissions and thermal energy demand intensities (EUI, GHGI and TEDI) (per m² of floor area)
- Energy and GHG savings over Building Code
- Incremental Capital Cost, expressed as a percentage of total construction cost
- Annual Utilities cost of building (per m² of floor area)
- NPV Savings over typical design – this is the present value of the financial benefit over the 20 year study period
- Breakdown of energy consumption by end-use and fuel type

The resulting data set was then dynamically visualized using MH's Building Pathfinder tool to better understand the interrelationships between the different metrics, as well to determine which metric would best lead to the intended outcome of GHG emissions reduction.

1.4.1 Option 1—Prescriptive Approach

One option would be to simply adopt prescriptive requirements for the elements of building design that have a significant impact on energy and GHG emissions.

The Figure below illustrates the outcomes for such an approach for a mid-rise Part 3 MURB, where prescriptive requirements have been applied on the window-to-wall ratio (maximum 40%), Wall R-value (minimum effective R-20), and 70% effective heat recovery ventilators for dwelling units.

While imposing these requirements would result in at least 20% energy consumption and cost savings, as well as 10% GHG savings relative to the current OBC SB-10, there is still a wide range of outcomes for energy use intensity (could range between 60 and 180 kWh/m².yr) as well as absolute GHG intensities ranging from 2.5 to 27 kgCO_{2,e}/m².yr.

In order to obtain greater certainty on absolute energy and GHG performance outcomes, a greater number and/or more stringent prescriptive requirements could be imposed, however this is generally not preferred as a policy approach due to the greater degree of complexity, restrictiveness in terms of design options, and may not necessarily always result in cost-optimal approaches in achieving the intended reductions.

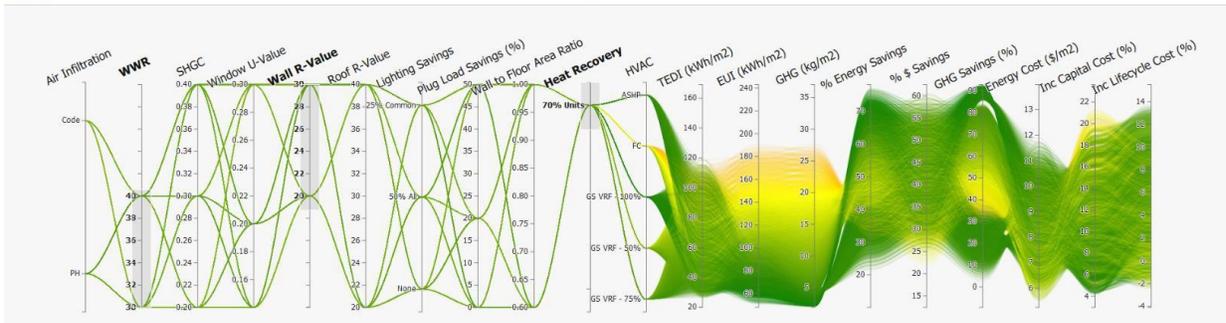


Figure 5: Option 1 - Prescriptive Approach

1.4.2 Option 2 –“Percent-Better-Than” Building Code

Option 2 is similar to the current approach adopted by the Sustainability Metrics, in that it involves setting an energy savings target relative to the Building Code minimum. Compliance would be demonstrated by comparing the modelled performance of the proposed building with the modelled performance of the code-minimum reference building.

This approach is illustrated in the Figure below for a Part 3 mid-rise MURB, where a target of 35% improvement in energy efficiency over the OBC SB-10 is applied. In terms of GHG reduction, it can be seen that this would result in at least a 15% reduction GHG emissions relative to the OBC baseline model, depending on the measures that are adopted in the design.

However, in terms of absolute GHG emissions, there is still a significant range in expected performance; this is a virtue of the limitations associated with the reference-building based approach, wherein elements of the reference building model mirror those of the proposed model per the modelling requirements in the underlying energy codes. For example, if the proposed building is served by a gas-fired heating system, a gas-fired heating system would also be modelled in the reference building, which would inherently have higher GHG emissions due to the carbon-intensive nature of the fuel source. As such, an improvement in relative performance may not necessarily correlate to an improvement in absolute performance, as is evident in the modelling data.

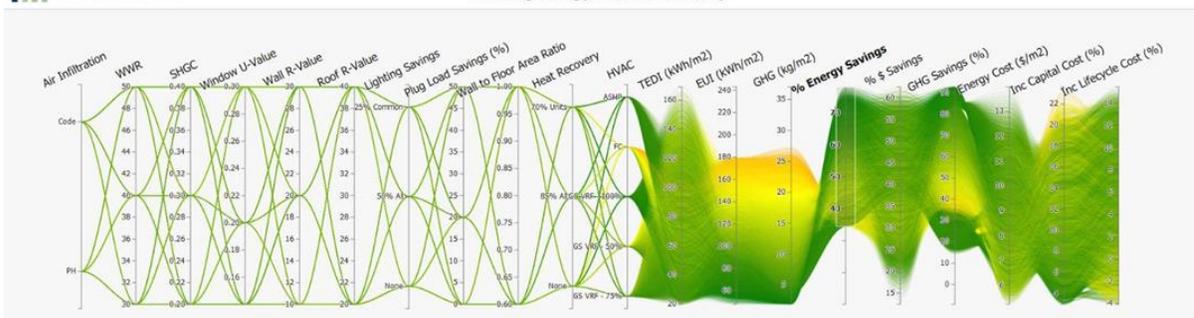


Figure 6: Option 2 – “Percent-Better-Than” Building Code

1.4.3 Option 3 –Minimum LEED Energy Points (% Cost Savings)

Option 3 would involve tying energy performance requirements with that of a green building certification program such as LEED. In the case of LEED, points for energy performance are awarded on the basis of percentage improvement in energy costs relative to an energy standard such as ASHRAE 90.1-2010 or NECB 2011.

This approach is illustrated in the Figure below, wherein a minimum % cost reduction target of 20% relative to the energy code is applied, as an example. It can be seen that imposing this target may not necessarily lead to reductions in absolute GHG emissions intensity; this is partially due to the difference in utility cost rates between electricity and natural gas currently in the province, with the latter typically being about five to six times less expensive than electricity. However, in terms of GHG emissions, electricity is about four times cleaner than natural gas in terms of equivalent carbon emissions per unit of energy. The result is that while electrical load reductions typically tend to have a more significant impact on operating costs, the impact on GHG emissions is relatively small compared to natural gas savings. As such, a metric that prioritizes energy cost reductions may not necessarily result in equivalent GHG emissions reductions.

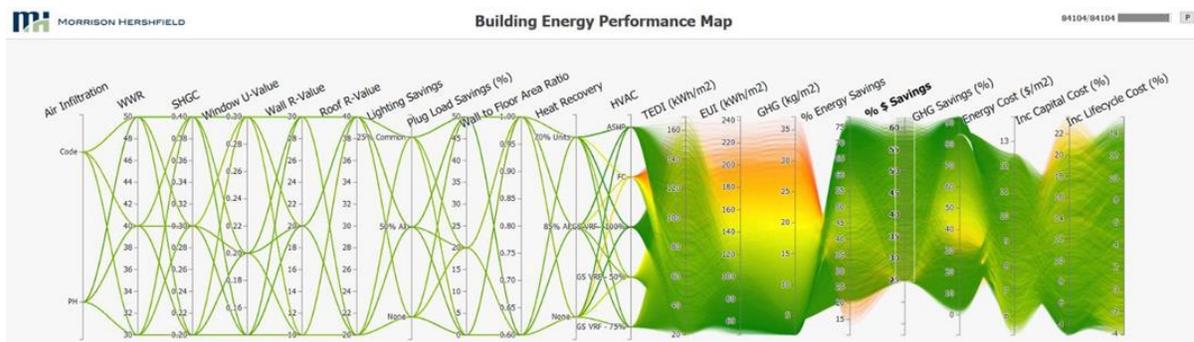


Figure 7: Option 3 - Minimum LEED Energy Points (% Cost Savings)

1.4.4 Option 4 –GHGI Target Only

Figure 8 below indicates the outcomes associated with imposing a GHGI target of 20 kg/m2.yr, which corresponds to the TGS Tier 1 target for a Part 3 MURB as an illustrative example.

While this metric is beneficial in itself for GHG reductions due to its very nature, there are several shortfalls with this approach of solely imposing a GHG reduction target that are evident in the modelling data:

1. It may not necessarily lead to outcomes that are energy-efficient in nature; for example, the TEDI measure, which is primarily measure of the efficiency of the building envelope, could be as high as 160 kWh/m2.yr (compared to the TGS Tier 1 target of 70 kWh/m2.yr), while still meeting the GHG target. This is primarily associated with pathways that rely on fuel switching from gas to electricity, while doing little to improve building energy efficiency.

- As a result of fuel switching without improvements in energy efficiency, there could be the potential for significant increases in utility operating costs due to the higher cost of electricity; as indicated in the Figure below, the annual energy cost could exceed \$13/m² in some cases.

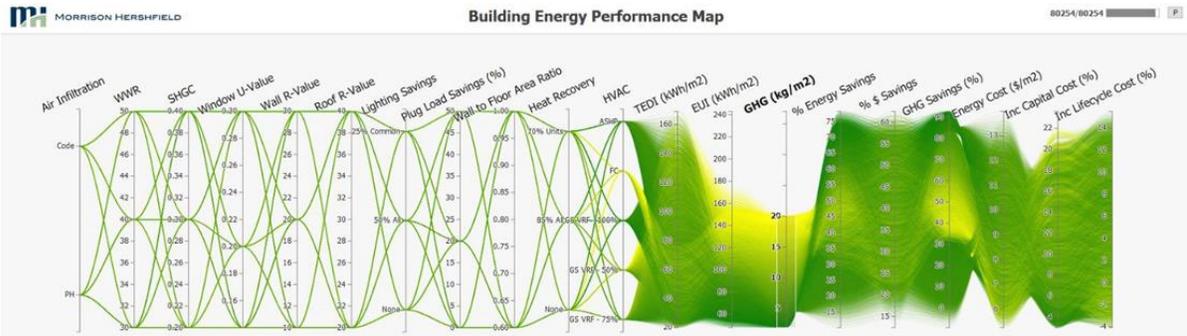


Figure 8: Option 4 – GHGI Target Only

1.4.5 Option 5 –EUI, Target and GHGI Targets

This option involves setting absolute targets for energy use intensity (EUI), thermal energy demand intensity (TEDI) and greenhouse gas emissions intensity (GHGI), each of which is intended to address a specific policy outcome:

- EUI – Promotes improvements in building energy efficiency across all building energy end-uses (space heating, cooling, lighting, etc.), while also reducing peak demand and stresses on the local grid.
- TEDI – Specifically targets improvements in building envelope performance, given the co-benefits associated with durability and thermal resiliency, in addition to energy and GHG emissions reduction.
- GHGI – Encourages the use of alternative low-carbon fuels and sources of energy to minimize the carbon footprint of the development.

Figure 9 below shows the scenario where the TGS Tier 1 targets for EUI, TEDI and GHGI to the high-rise MURB archetype. The associated outcomes are that the design would achieve at least a 10% improvement over the OBC SB-10 baseline, as well as providing for greater certainty in terms of GHG emissions (i.e. no more than 20 kgCO₂e/m².yr). Due to the incorporation of EUI and TEDI targets, the energy operating costs are also lower (i.e. more than \$9.5/m².yr) compared to Option 4 above with just a GHGI target. Furthermore, there are a variety of design solutions.

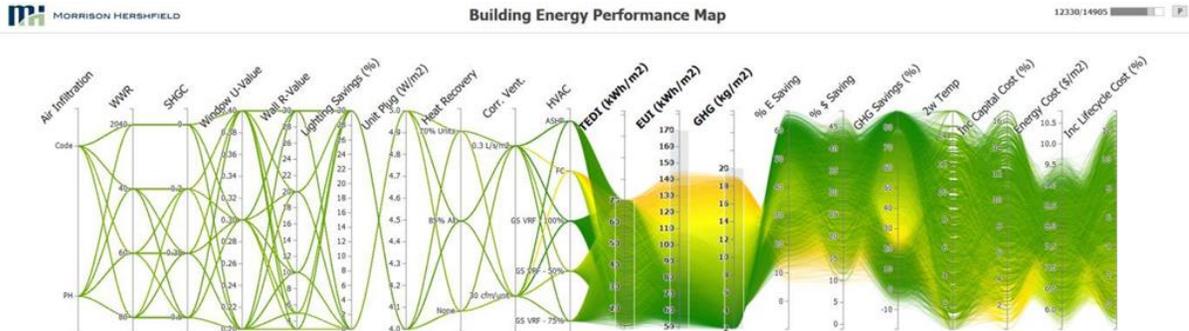


Figure 9: Option 5 - Recommended Minimum Scenario

Figure 10 shows the application of the TGS Tier 4 to the same archetype model, and is generally considered to be equivalent to near-net zero (net-zero ready) level of performance in terms of GHG emissions. To achieve this level, certain design constraints are evident such as usage of high-performance triple glazing (maximum U-0.30), at least an R-10 effective opaque wall assembly, highly effective heat recovery (over 70% effectiveness), and fuel switching from gas-fired boilers to either air-source or ground-source electrically-driven heat pumps. The incremental capital costs could range between 6% and 15% depending on the chosen measures, however the incremental lifecycle costs (i.e. including the benefits of energy savings over a 20-year period) could be as little as 2%.

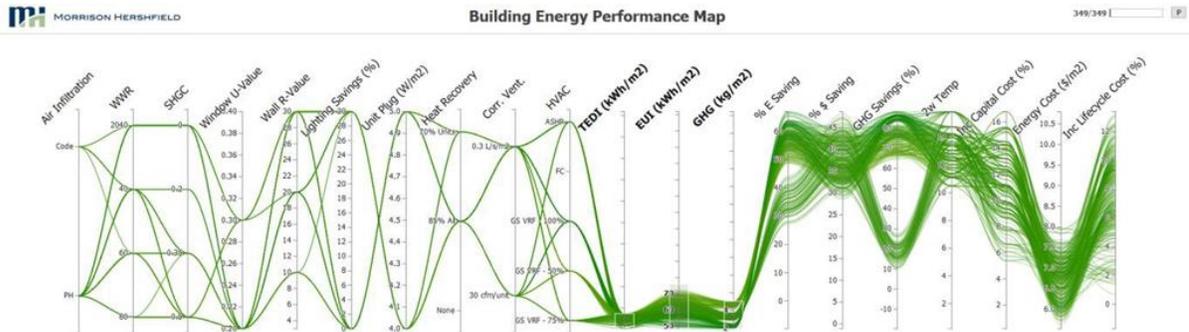


Figure 10: Option 5 - Aspirational Scenario

1.5 Proposed Metric Changes

Based on the results of the energy modelling analysis and discussion above, Morrison Hershfield recommends the following for the update of metrics associated with the energy and GHG emissions performance of buildings:

1. Adopt absolute performance-based targets for EUI, TEDI and GHGI for the Part 3 building archetypes explored in the energy modelling analysis, i.e., multi-unit residential, office and retail. As evident in the modelling data, incorporating performance targets for all three metrics would result in specific policy outcomes that would contribute to a robust GHG emissions mitigation strategy in the buildings sector.

A target for EUI would promote improvements in building energy efficiency across all building energy end-uses (space heating, cooling, lighting, etc.), a TEDI target would specifically target improvements in building envelope performance, given

the co- benefits associated with durability and thermal resiliency, in addition to energy and GHG emissions reduction, and a GHGI metric would encourage the use of alternative low-carbon fuels and sources of energy to minimize the carbon footprint of the development. In addition, improvements in all three metrics would result in lower utility operating cost for the building owner and/or tenant, thereby resulting in lower lifecycle costs (ex. total cost of ownership), and contributing positively in terms of affordability.

Targets that are aligned with TGS Tier 1 are suggested for the “Minimum”, and those aligned with Tier 4 are suggested for the “Aspirational” performance scenario. A pro- rated points-based system can be implemented to reward intermediate performance between these two levels.

2. For low-rise residential buildings such as single-family detached dwellings that fall under Part 9 of the Building Code, it is generally atypical to perform detailed hourly energy modelling, given the associated costs relative to the overall construction value of the building. Furthermore, there are several energy-focused certification programs available on the market such as Energy STAR for New Homes, R-2000, the CHBA Net Zero Home Labelling Program and Passive House, all of which would lead to high- performance building outcomes. As such, these existing certification programs can be leveraged to set energy and GHG emissions performance requirements for this building typology.
3. For metric 4.A.3. Energy Management, we recommend developing specific terms of reference that outlines the minimum requirements and expectations for the Energy Strategy report that are aligned with the community energy and emissions plans as well as overall municipal objectives, to assist applicants with pursuing this metric. Requirements may include:
 - High-level energy analysis using archetype modelling or benchmarking data to estimate the overall energy consumption and GHG emissions associated with the development.
 - Identify and evaluate opportunities to reduce EUI and GHG emissions intensities down to a net-zero emissions ready level of performance (i.e. the Aspirational building efficiency target) through various measures such as more efficient building form and massing, orientation, improved building envelope performance, highly efficient HVAC systems, heat recovery and lighting solutions.
 - Analysis of low-carbon energy solutions and on-site renewable energy generation potential that can be incorporated to the development, including rooftop PV, geo-exchange systems, high efficiency CHP, thermal energy stores, and sewer water heat recovery.
 - In the case of multi-building development proposals or for sites in intensification areas identified by the municipality, investigate the feasibility of shared energy solutions such as development of low-carbon thermal energy networks or connection to planned or existing district energy systems, and identify the required provisions to be district energy-ready.

- Identify and evaluate opportunities for backup power systems and passive design features that will improve the resilience of buildings to area-wide power outages.

Out of the three points available for this metric, we suggest that one point be awarded for the completion of an Energy Strategy report, and an additional two points be awarded for committing to meet an energy use intensity (kWh/m².yr) and GHG emissions intensity target (kgCO_{2,eq}/m².yr) for the entire development.

4. Consideration might be given for the development of an online parametric analysis tool similar to that developed for this project. The availability of this tool to applicants might better enable them to make informed decisions on building parameters. It would also demonstrate leadership by the municipality. Note a version of the tool is now online for B.C. buildings at <http://www.buildingpathfinder.com>

1.6 Implementation Considerations

In order to ensure that the proposed performance metrics translate to real GHG emissions reductions and energy efficiency 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:** Building commissioning is a systematic process of verifying that the various building sub-systems such as building envelope, mechanical (HVAC), plumbing and lighting systems are constructed and operational per the project requirements and design intent. The practice of commissioning has become relatively standard and common for most large new construction Part 3 building projects. 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.
- **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.
- **Energy modeling guidelines** to clarify standard schedules, assumptions and methodologies around energy models so that projects are meeting the proposed performance criteria as intended.
- **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 implemented, but would likely result in actual air leakage reductions and related energy savings. Airtightness testing is mandatory for projects targeting Tier 2 or higher under the TGS.