# IMPACT OF TORONTO'S AVENUES & MID-RISE BUILDING GUIDELINES ON SOLAR ENERGY GENERATION POTENTIAL


by

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## ABSTRACT

As cities grow, strategies for how and where to accommodate growth are increasingly important. Similarly, renewable energy is gaining importance as a means of reducing our dependency on fossil fuels and other non-renewables, reducing greenhouse gas emissions and pollution, and creating energy resiliency at a local level. The purpose of this Major Research Project is to determine the impact the Mid-Rise Building Performance Standards, from the City of Toronto's 2010 Avenues and Mid-Rise Building Study, have on solar access and to quantify the potential of energy generation using solar photovoltaic systems along the Avenues in Toronto. What impact do the Performance Standards have on solar access to mid-rise buildings along the Avenues? The research concludes that low-podium built form provides the most benefit for the study area – Eglinton Avenue West, at Bathurst Street: the porous street-wall built-form, as outlined in the Mid-Rise Building Performance Standards, provides the highest solar energy generation and energy savings potential.

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To my family and friends, who will likely never read the full extent of this document, you are both the reason I made it this far in my academic career and the reason it took me this long to finish my MRP – you know who you are.

To future students – you got this!

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## 1.0 | Introduction

Today's cities are under immense pressure. Many cities are experiencing population growth, demand for new housing, jobs and amenities, demand for efficient and varied transportation options, demand for affordable housing, and et cetera (UNEP SBCI, 2009). Among the list of demands are also pressures to reduce greenhouse gas emissions, energy demand, and the impact the built environment has on climate change. The challenge is to create a sustainable future while meeting the needs of the present and the ever-increasing population of the future.

Buildings are responsible for more than 40 percent of global energy use and one third of global greenhouse gas emissions, globally, according to the United Nations [UN] as seen in Figure 1 (UNEP SBCI, 2009). Since the United Nations Framework Convention on Climate Change hosted its first annual Conference of Parties [COP] in 1995, leaders were unable to come to a unilateral consensus regarding commitments, until November of 2015 Paris Agreement. For the first time, leaders of all 196 participating countries (i.e. including the United States and China) agreed to keep global temperature increases "well below" 2 degrees Celsius above pre-industrial levels by the end of the century (UN, 2015). Prior to this, the Kyoto Protocol, an internationally binding emissions reduction targets agreement, was in place, however, the United States of America withdrew from it. To achieve these targets, changes must be made. The United Nations Environment Program Sustainable Buildings and Climate Initiative [UNEP SBCI] has conducted the *Buildings and Climate Change Summary for Decision-Makers* to show how the potential for greenhouse gas emission reductions in buildings can be realized – some of the key conclusions from the exercise are as follows:

1. The building sector has the most potential for delivering significant and cost-effective GHG emission reductions;
2. Countries will not meet emission reduction targets without supporting energy efficiency gains in the building sector;
3. Proven policies, technologies and knowledge already exist to deliver deep cuts in building related GHG emissions;
4. The building industry is committed to action and in many countries is already playing a leading role;
5. Significant co-benefits including employment will be created by policies that encourage energy efficient and low-emission building activity; and
6. Failure to encourage energy-efficiency and low-carbon when building new or retrofitting will lock countries into the disadvantages of poor performing buildings for decades (UNEP SBCI, 2009).

Further to the UNEP SBCI's key takeaways, from a planning perspective, municipalities should make use of existing infrastructure – land with existing water, sewer, and road networks. Greenfield development is inefficient use of resources, particularly in regions, such as southern Ontario, where prime agricultural land exists. Development should aim to increase density in existing built-up areas; infill projects, adaptive reuse projects, brownfield development, redevelopment, and retrofit projects, rather than greenfield development need to be prioritized. From a building-scale, the construction, operations and maintenance required over the lifespan of a building are the key contributing factors to the carbon emissions that are put into the atmosphere (UNEP SBCI, 2009). Heating and cooling represent the largest proportion of emissions. Similarly, lighting demands, embodied energy and carbon in materials and construction processes also significantly contribute to emissions. In the City of Toronto, buildings accounted for approximately 50 percent of greenhouse gas emissions in 2014 – more than the global average, based on 2012 data (City of Toronto, 2017d; Ecofys, 2014).

In 2009, the City of Toronto published a Sustainable Energy Strategy that outlined a set of "targets for electrical demand reduction, natural gas reduction and renewable electrical and thermal energy generation for 2020 and 2050" (City of Toronto, 2017d; Toronto, 2009). The city set the targets in response to its commitment to reduce reliance on fossil fuels and GHG emissions by 30 percent below 1990 levels by 2020 and by 80 percent of 1990 levels by 2050. At the time, in 2009, the city had approximately 400 megawatts of renewable electricity installed using solar PV systems. It recognized that continuing to add building-scale sources of renewable energy, such as site and neighbourhood-scale installations, should be continued "to help it meet [its] targets, address climate change mitigation and help ensure energy does not become a limiting factor for growth and prosperity" (City of Toronto, 2017d). Local generation of renewable energy increases the resilience of the built environment by reducing electrical demand and providing back-up power to buildings in the case of area-wide grid failures (City of Toronto, 2017d). With weather events that are evermore extreme, resiliency is important. Renewable energy sources, such as photovoltaics and solar energy generation, can provide cities with an ability of being resilient. Therefore, the importance of setting targets and requirements to help support the City's goals of reducing demand on the grid, improving building resilience and shifting to low-emission sources of energy is evident (City of Toronto, 2017d).

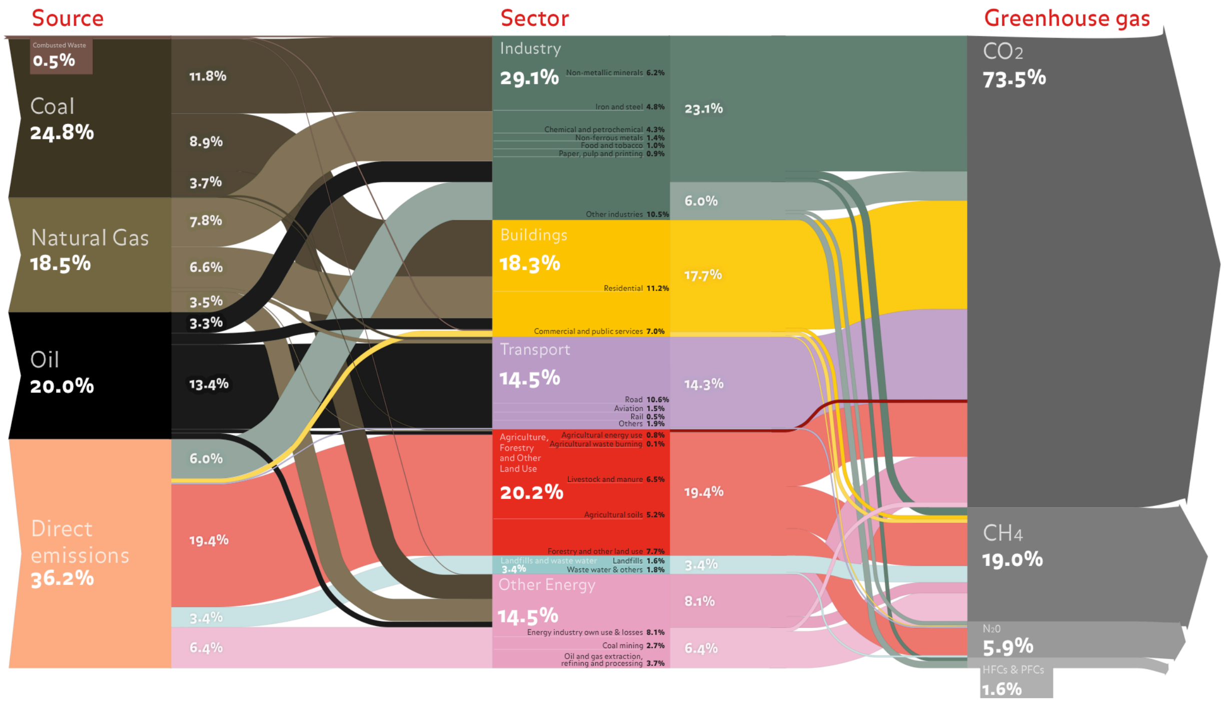


*Figure 1 | World Greenhouse Gas Emissions Flow Chart Based on Year 2012 Data (Ecofys, 2014)*

The City of Toronto is one of the fastest growing cities in North America and, like many other cities, is facing the challenge of providing for a growing population while reducing its carbon emissions. The city has developed a Zero Emissions Building Framework to address some of its key priorities:

1. Improve building energy efficiency to reduce energy costs and stresses on the electrical grid;
2. Enhance resilience to impacts of climate change, including heat waves, power outages, and flooding; and
3. Decrease GHG emissions by 80 percent below 1990 levels, increasing local renewable and distract energy generation (City of Toronto, 2017d).

One of the key goals, as seen in Figure 2, is to reduce energy use and switch to low-carbon fuel choices, such as renewable energy technologies which increase low-carbon energy generation and safeguard against power outages.

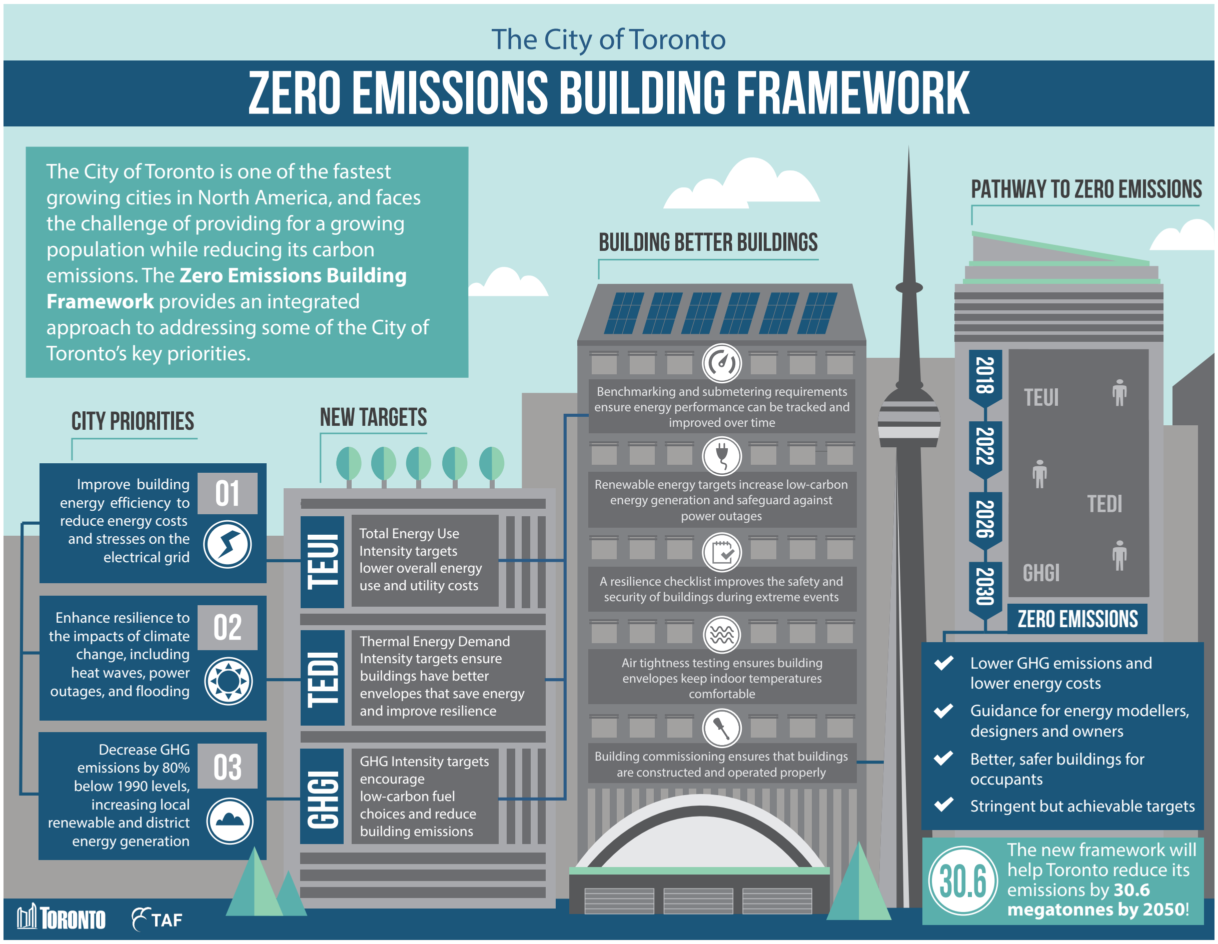


*Figure 2 | City of Toronto's Zero Emissions Building Framework (City of Toronto, 2017d)*

The purpose of this research is to, in light of the importance of greenhouse gas emission reductions, showcase the City of Toronto's urban resiliency potential and analyze the potential for renewable energy generation, specifically, to investigate the potential use of building integrated photovoltaics for solar energy generation for mid-rise buildings in Toronto where mid-rise building design guidelines apply.

## 2.0 | City of Toronto: How + Where to Grow

Solar energy is an abundant renewable energy source, one that is expected to become the most significant contributing source to electricity production in the world by 2050 (IEA, 2014). To illustrate its abundance, the quantity of solar energy that reaches the earth in one hour alone is enough to power the entire world for a year (i.e. based on 2011 global usage) (Brown, Larsen, Roney, Adams, & Earth Policy Institute, 2015; Cass, 2009; IPCC, 2011; National Geographic, n.d.). Renewable energy is increasingly an important means of reducing greenhouse gas emissions and alleviating our dependency on fossil fuels and other non-renewable resources. Similarly, as cities grow, strategies for how and where to accommodate growth are also important. As outlined by the UNEP SBCI and the City of Toronto, targeting the building sector has the most potential for reducing greenhouse gas emissions, energy costs, and stresses on the electrical grid (City of Toronto, 2017d; UNEP SBCI, 2009). Increasing renewable energy generation and the efficiency of buildings, however, is not enough. Efficient land development is also important because the energy required for road transportation is equal to residential building electricity and heat energy usage, as illustrated in Figure 1 (WRI, 2008). Increasing renewable energy generation and the efficiency of buildings is a step in the right direction regarding greenhouse gas emissions, however, if the primary form of transportation to and from buildings is in the form of a personal vehicle run by non-renewables, potential emission reductions will likely be missed out on and lower total emissions may not be achieved.

## 2.1 | Buildings: Emissions + Energy Targets

The City of Toronto has committed to reducing its greenhouse gas emissions by adopting community-wide reduction targets, as seen in Figure 3:

- 6 percent below 1990 levels by 2012;
- 30 percent below 1990 levels by 2020; and
- 80 percent below 1990 levels by 2050 (City of Toronto, 2017d).

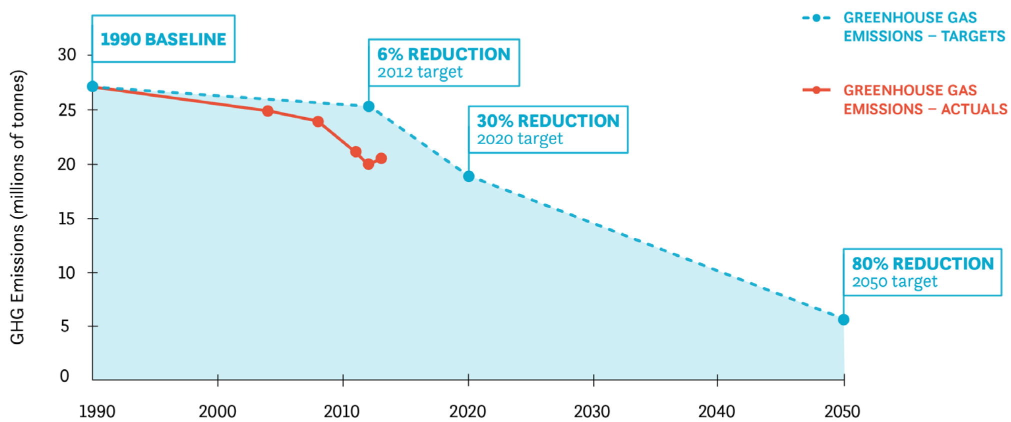


*Figure 3 | Toronto's Greenhouse Gas Emissions and Targets (City of Toronto, 2017d)*

The city has also specified targets for reducing electricity, conserving natural gas and increasing renewable energy generation, as seen in , by prioritizing conservation and demand management while increasing small scale renewable energy generation and smart energy distribution (City of Toronto, 2017d). The city has also investigated and plans to implement low-carbon district energy systems as another potential means of reducing building emissions. For the purposes of this report, in depth analysis of potential building efficiency measures appropriate for Toronto's climate, such as airtight assemblies with continuous insulation, will not be discussed. However, it is important to note that Toronto's current building market trends include construction in the city's core and near key transit nodes (City of Toronto, 2017d). High-rise construction is trending in the city's core and building heights are generally increasing. These trends create challenges in an effort to reduce energy use and greenhouse gas emissions because high-rise residential and commercial development in Toronto tends to use cladding materials and envelope systems that allow high rates of heat transfer between interior conditioned spaces and outside air, reducing overall thermal energy efficiency, thereby increasing energy demand and wasting valuable resources (City of Toronto, 2017d). Similarly, high window-to-wall ratios further contribute to lower energy efficiency and higher demand for energy use, year-round (City of Toronto, 2017d). Although this report does not cover potential building energy efficiency measures, as outlined by the UNEP SBCI, "countries will not meet emission reduction targets without supporting energy efficiency gains in the building sector" (UNEP SBCI, 2009).

*Table 1 | Conservation Targets based on 2009 Sustainable Energy Strategy (City of Toronto, 2017d)*

| SOURCE | 2020 TARGET | 2050 TARGET |
|---|---|---|
| Electricity conservation | 550 MW reduction | 1050 MW reduction |
| Natural gas conservation | 730 $Mm^3$ reduction | 1650 $Mm^3$ reduction |
| Renewable energy generation | 550 MW increase | 1000 MW increase |
| Renewable thermal energy | 90 $Mm^3$ of natural gas displaced | 200 $Mm^3$ of natural gas displaced |

### 2.2 | Planning: Official Plan + Performance Standards for Mid-Rise Buildings

From a planning perspective, the City of Toronto encourages mid-rise development along key corridors and on infill sites across the city (City of Toronto, 2017d). For example, the city's Official Plan encourages growth to be directed towards intensification areas, one of which is the Avenues, as seen in Figure 4 (BMI + Pace, 2010). The City of Toronto's population is forecast to grow by approximately 500,000 over a 20-year period, based on 2010 figures – approximately 3.08 million residents by 2031 (BMI + Pace, 2010). This is an important consideration because mid-rise development can accommodate significant growth, as described in the city's Avenues and Mid-Rise Buildings Study:

> *"The Avenues amount to approximately 324 kilometres of property frontage. About 200 kilometres of this frontage can theoretically be redeveloped through mid-rise built form. If half of these properties were developed over the next twenty years through mid-rise built form, the Avenues could accommodate a new population of approximately 250,000 residents. Mid-rise redevelopment of the Avenues therefore has the ability to address a significant portion of the City's anticipated growth needs over the next twenty years"* (BMI + Pace, 2010, p. i).

Further, the Avenues policies in the Official Plan are intended to direct the city's growth to key main streets and areas with existing infrastructure such as transit, retail, and community services, which, from an emissions reduction perspective is an efficient use of resources, particularly if the development is energy efficient (i.e. high-performance buildings[1]) and generates renewable energy (BMI + Pace, 2010; Neptis, 2010).

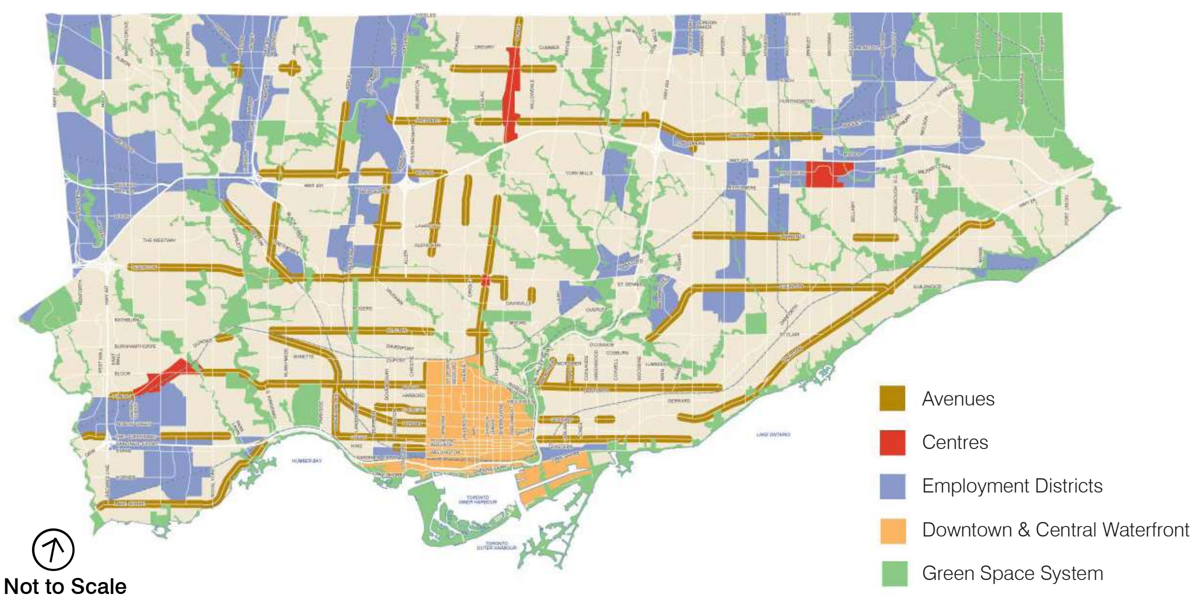


*Figure 4 | City of Toronto Official Plan Urban Structure Map (BMI + Pace, 2010)*

[1] For the purposes of this report, high-performance buildings perform better than conventional buildings for energy targets and greenhouse gas emissions. High-performance buildings can be defined as buildings that achieve leading edge energy and emission performances (e.g. zero emissions or zero energy buildings) (City of Toronto, 2017d).

The City of Toronto initiated an Avenues and Mid-Ride Buildings Study in 2008, in response to Council's direction to determine how to intensify along the Avenues while ensuring that the intensification is compatible with adjacent neighbourhoods (City of Toronto, 2017c). A staff report was presented to Council in July 2010, and adopted, which included the adoption of Section 3 of the study – Performance Standards for Mid-Rise Buildings (i.e. with the exception of Standard 5B: Rear Transition to Neighbourhoods: Shallow Properties – Considerations for Enhancement Zones) (City of Toronto, 2017c). A monitoring period was put in place for the standards, after which point an addendum was put forward and adopted by Council in 2016, to update the Performance Standards based on results from the monitoring period and to clarify their use.

City staff use the Mid-Rise Building Performance Standards and the subsequent addendum for the evaluation of development applications where mid-rise buildings are proposed and the standards apply. The Performance Standards identify best practices, establish a set of performance standards for new mid-rise buildings, and identify areas where the performance standards should be applied. Although the standard aims to provide solar access to the public realm (i.e. to rights-of-way), it does not address renewable energy directly. Sustainable technologies are encouraged, however, performance standards for renewable energy technologies (i.e. explicit guidelines) are not provided. The Mid-Rise Building Performance Standards and addendum will be used until such time as Council considers and adopts updated Mid-Rise Building Design Guidelines. Updated Mid-Rise Building Design Guidelines were to be prepared for consideration by the Planning and Growth Management Committee in late 2017, however, updated guidelines have not yet been adopted (City of Toronto, 2017c). The updated Guidelines will consolidate the 2010 approved Performance Standards and the Addendum, and will include stakeholder consultation, as well as relevant outcomes of the Five Year Official Plan Review and Ontario Municipal Board appeals of relevant Zoning By-laws (BMI + Pace, 2010; City of Toronto, 2017c).

## 3.0 | Literature Review: Solar Energy in an Urban Context

Although solar energy is an abundant renewable energy source, one which can be captured using a range of technologies, unobstructed solar access is required to generate energy from the sun. As a result, the potential of solar energy requires site-specific analysis and, in a city context, is dependent on the built environment that surrounds it. The following section highlights the literature relevant to the topic. The literature review is divided into the following five categories:

3.1 | Solar Access

3.2 | Building Design and the Urban Context

3.3 | Neighbourhood-scale Development

3.4 | Software and Tools

3.5 | Key Knowledge Gaps

### 3.1 | Solar Access

Solar energy can be captured to produce electricity, heat, or light using several different technologies – such as building attached photovoltaics (BAPV), building integrated photovoltaics (BIPV), solar thermal panels (i.e. hydraulic or air-based systems which can also be building attached or integrated), and hybrid systems that combine both electricity and heat generation. Although there are various technologies available to harness the sun's energy, unobstructed solar accessibility is of utmost importance as solar access is required to generate energy from the sun. One of the main challenges for the future of solar technologies in Canada is the fact that Canada is the only industrialized nation that does not have "right to light" legislation – it does not address property owners' "right" to solar access (i.e. the right to access the solar energy that falls on their property) (City of Toronto, 2007).

Solar access legislation is not new to Canada, however, it was rescinded nationwide in the early 1900s due to urban development needs (City of Toronto, 2007). In 2007, City of Toronto staff and professional consultants developed a Sustainable Energy Plan to address energy concerns for the city. The Sustainable Energy Plan outlines three options for protecting owners' access to solar energy:

1. Provincial regulation through the building code;
2. Municipal regulations; and
3. Property owners' legal covenants with neighbours (City of Toronto, 2007).

Of the three options, municipal regulation is the easiest to develop, implement and enforce according to city staff and consultants (City of Toronto, 2007). For example, municipal zoning by-laws can be amended to include regulations pertaining to solar access.

Additional research related to solar energy generation includes analysis of planning for solar energy in Ontario, specifically in urban areas. Planning policies in Ontario, such as the Provincial Policy Statement [PPS] and the Growth Plan for the Greater Golden Horseshoe [GPGGH], provide conflicting policies, however (i.e. either within the same document or between documents). The PPS and the GPGGH both prioritize renewable energy production alongside intensification, and heritage and green infrastructure preservation, which can be conflicting priorities depending on the situation. Research on the topic highlights the importance of setting a clear plan for addressing the conflicts to ensure that planners do not prioritize one item over the other, but address the topics in synergy (Berner, 2015). Similarly, as outlined in *Finding the Balance: Solar Access in the*

*Intensified City*, prepared for the City of Toronto's Economic Development and Culture Division, solar access and right to light are not explicitly used in land use regulation (Gibson, 2014). To ensure solar access and renewable energy development, literature suggests that the Province of Ontario should clarify its policies and enact a Solar Rights Act (Gibson, 2014). Existing policies can also be utilized "to assist smaller municipalities and enable Toronto to make solar access regulations and tools a reality", such as zoning which can determine maximum heights and densities for sites (Gibson, 2014).

## 3.2 | Building Design and the Urban Context

The context in which renewable energy technology is to be utilized must be analyzed to maximize its potential. Sections 3.2.1 | Built Form to 3.2.3 | Façade Utilization and Building Integrated Photovoltaics aim to describe some of the analyses, approaches and tools that are used to maximize solar energy generation in an urban context, specifically, to determine how buildings can be designed to maximize irradiation on building surfaces. Built form, roof design, solar technology, neighbourhood-scale analysis and other important considerations are explored.

### 3.2.1 | Built Form

Literature on the topic of solar energy in an urban context focuses primarily on built form – building dimensions, shape, orientation, materials, window-to-wall ratio, and et cetera. These factors are heavily researched they aspects play a direct role and have a significant impact on harvesting solar energy. For example, *Boosting solar accessibility and potential of urban districts in the Nordic climate: A case study in Trondheim*, found that building orientation is more important for new buildings within existing urban environments, rather than new buildings in new urban developments because new development is restricted by the existing building shapes and functions, which can have complex impacts on solar accessibility (Lobaccaro, Carlucci, Croce, Paparella, & Finocchiaro, 2017). The study maximized the solar potential for the masterplan area of Øvre Rotvoll, Trondheim, Norway, by reducing losses (e.g. overshadowing losses), optimizing ground, façade, and roof reflections, and assigning finishing materials as necessary. The study confirms what other studies have also found – solar radiation on building envelopes is generally increased when the reflectance of finishing materials for the ground and facades are increased; this is as a result of indirect mutual solar reflections from surrounding urban built form. However, overshadowing caused by urban surroundings outweighs the effects of ground reflection, such as the contribution of indirect solar reflections caused by snow (i.e. a high albedo of the ground). Complex morphologies were also utilized to maximize solar potential, as seen in . The study started off by conducting solar analysis for existing row houses and high-rise apartment blocks – the effect of building orientation, the finishing materials of building facades and ground soil on solar potential were estimated and the numerical outcomes were applied as urban planning recommendations for the masterplan of Øvre Rotvoll. For example, the study found that the masterplan area, depending on the energy performance of the buildings in the neighbourhood (i.e. not specified in the study), can provide more than 50 percent of the total energy needs for space heating and cooling from solar active systems based on the applied solar optimization techniques (Lobaccaro, Carlucci, Croce, Paparella, & Finocchiaro, 2017).

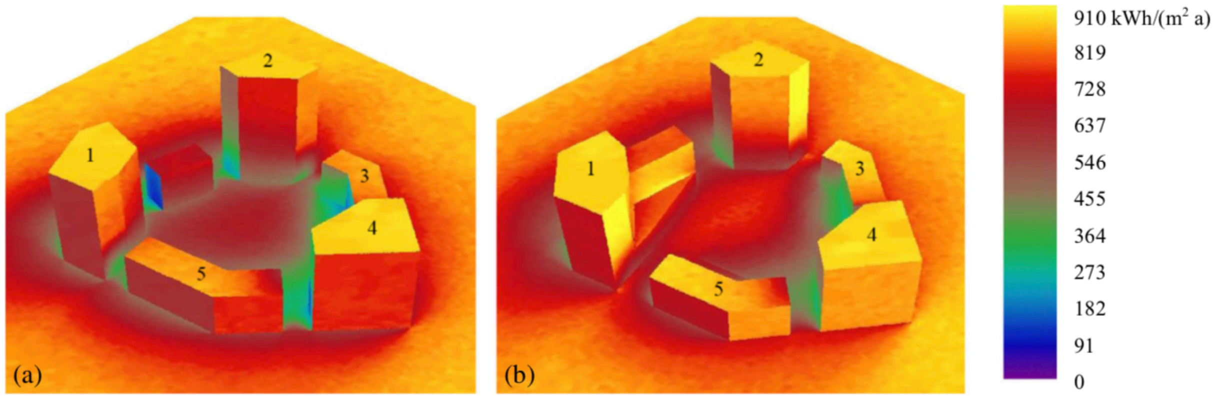


*Figure 5 | Solar Mapping Analysis, Trondheim: (a) initial calculation stage; (b) final calculation stage (Lobaccaro et al, 2017)*

Similarly, a study of low-rise residential dwellings found that the main considerations in the design of rectangular building forms are aspect ratio and orientation relative to south facing facades (i.e. in the northern hemisphere), as seen in . Aspect ratio is defined as the ratio of a south (i.e. or near-south) facing façade dimension to the lateral dimension in *Solar optimized residential neighborhoods: Evaluation and design methodology* (Hachem, Fazio, & Athienitis, 2013). The parameter impacts radiation on facades, solar heat gain and building integrated photovoltaic electricity generation –an aspect ratio of 1.3 is considered optimal in a heating dominated climate like Canada (i.e. the study was conducted using data for Montreal, Canada) (Hachem, Fazio, & Athienitis, 2013). Orientation of buildings affects solar irradiance on the facades, heat gain by windows, electrical generation from BIPV systems, and energy consumption for heating and cooling, as illustrated in  (Hachem, Fazio, & Athienitis, 2013). Annual energy generation is decreased as the orientation of south facing facades change toward the east or west orientation. Inversely, annual heating and cooling consumption increases as the orientation of south facing facades changes east or west.

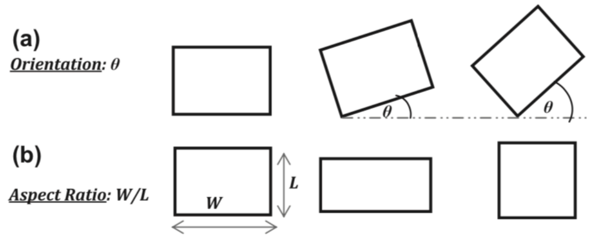


*Figure 6 | Illustration of the main parameters of convex shapes: (a) orientation, and (b) aspect ratio (Hachem, et al., 2013)*

The impact of design decisions regarding built form is evident. Further, many design decisions from an urban planning perspective – built form (e.g. height, shape), urban morphology (e.g. building placement) and orientation – have an impact on the solar energy potential of buildings (Kanters & Wall, 2014; Colucci & Horvat, 2012; Imenes & Kanters, 2016). A study in Sweden found that urban density is the most influential parameter on the solar potential of building blocks, specifically, the floor space index (Kanters & Wall, The impact of urban design decisions on net zero energy solar buildings in Sweden, 2014). Floor pace index (FSI) is defined as the total floor area of a building divided by the property area, however, for the purposes of the study, half of the surrounding street area is also added to the calculation. The study found that for "lower densities and for the electricity load, urban densities had to be lower than FSI = 2.5 to reach a 100% load match (i.e. the contribution renewable energy can deliver in relation to consumed energy), while for heating, it was harder to meet a net zero energy balance" (Kanters & Wall, The impact of urban design decisions on net zero energy solar buildings in Sweden, 2014, p. 330).

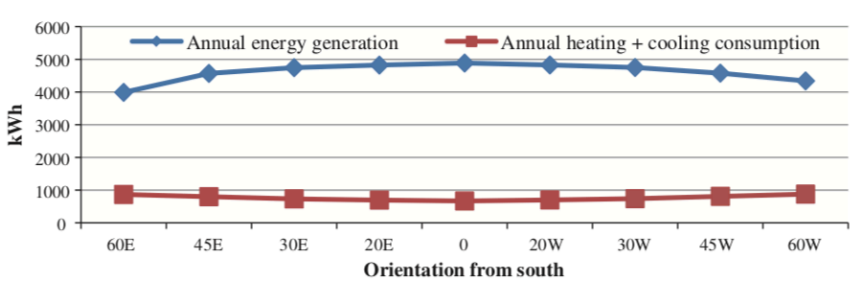


*Figure 7 | Annual energy generation and energy consumption for heating and cooling of rectangular housing unit, assuming the use of a heat pump (Hachem, Fazio, & Athienitis, 2013)*

### 3.2.2 | Roof Design and Utilization

Rooftop areas represent high potential energy utilization, compared to façade utilization which can vary greatly (Imenes & Kanters, 2016). *Solar optimization of housing development* utilized the same Trondheim case study area in Norway, as outlined in subsection 3.2.1, to optimize the shape of building roofs as a means of maximizing solar energy use. A base case building form was developed to represent traditional dwellings in Norway and to define a typical volume for residential dwellings. Next, the shape of dwellings that would optimize the solar radiation harvesting by the roofs' surfaces was established. Optimized units received approximately 50% more irradiation than the baseline building for south/north and 30° south-west orientations and more than 35% for east/west orientations. The study found that annual energy production could reach 146 kWh/m$^2$ if appropriate photovoltaic technology is used (Lobaccaro, Chatzichristos, & Leon, 2016). The Swedish study, previously mentioned, found that for many building block shapes, flat roofs rather than pitched roofs resulted in a higher load match, while gabled roofs never resulted in the maximum load match (Lobaccaro, Chatzichristos, & Leon, 2016; Imenes & Kanters, 2016). Although some areas of gabled roofs receive higher solar irradiation, other areas receive more shade (Kanters & Wall, The impact of urban design decisions on net zero energy solar buildings in Sweden, 2014). Further, roof areas on high-rise buildings typically remain the same for a given building footprint as building height increases, specifically, FSI and total energy consumption increase with height. As seen in Figure 8, the difference between electricity generation and overall energy consumption, therefore, increases with building height if roof area remains the same (i.e. solar energy generation remains constant) (Hachem, Athienitis, & Fazio, 2014). However, for flat roofs, slight inclines of 5° and 10°, for example, can increase photovoltaic production, depending on the building and its surroundings (Imenes & Kanters, 2016).

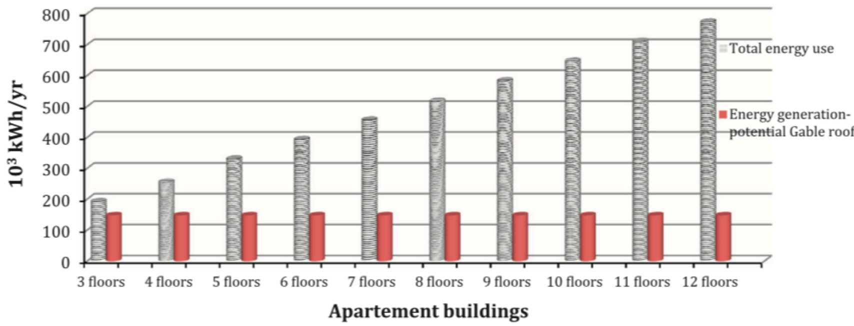


*Figure 8 | Energy Consumption and Energy Generation by a Gable Roof (Hachem, Athienitis, & Fazio, 2014)*

### 3.2.3 | Façade Utilization and Building Integrated Photovoltaics

The focus of many studies has been the potential of solar energy generation from roof surfaces (Hachem, Athienitis, & Fazio, 2014; Imenes & Kanters, 2016; Riddell & Horvat, 2016). These studies have aimed to maximize the potential of roof areas, angles and the use of BAPV, however, as concluded in *Design methodology of solar neighborhoods*, medium and high-rise buildings are not capable of achieving positive energy balances due to limited available roof surfaces relative to the occupied volume and energy demand – it is necessary to utilize façades for solar energy generation on multistory buildings (Hachem, Athienitis, & Fazio, 2012; Imenes & Kanters, 2016). The Swedish low-rise development study found that facades receive less solar irradiation than roofs and also have limited contribution in energy production (Kanters & Wall, The impact of urban design decisions on net zero energy solar buildings in Sweden, 2014). However, façade areas can be feasible places to install solar energy systems, specifically BIPVs. If roofs are partly or fully shaded, or, to produce additional solar energy at times when the optimally placed solar systems are not producing at their peak outputs (Hachem, Athienitis, & Fazio, 2014; Kanters & Wall, The impact of urban design decisions on net zero energy solar buildings in Sweden, 2014; Imenes & Kanters, 2016). Further, cities which are adapting green roof policies, such as Toronto, can create an additional conflict between green roofs (i.e. with vegetation for rainwater absorption) and roof-top renewable energy systems, as roof area becomes unavailable for solar installations (Imenes & Kanters, 2016). However, it has also been found that the combination of green roofs and photovoltaics "may potentially increase PV output due to beneficial temperature and albedo effects" (Imenes & Kanters, 2016; Lamnatou & Chemisana, 2015).

The benefit of BIPVs is space. Installing BAPVs at optimum tilt angles on a flat roof, for example, will give maximum annual production, however, a conflict arises among the distances between PV rows and mutual shading (i.e. when PV rows shade other PV rows) (Imenes & Kanters, 2016). BIPVs are also beneficial in scenarios where the approved building height is fully utilized and there is no room for elements that add height to the design (Kanters & Davidsson, 2014; Imenes & Kanters, 2016). BIPVs can be used in place of façade materials, however, generally at a higher price than traditional exterior cladding, as concluded by a Norwegian case study (Imenes & Kanters, 2016). Cost savings can be achieved, however, when comparing the price of a finished envelope with BAPVs compared to BIPV systems (i.e. a facade and solar energy generation system in one) (Debbarma, Sudhakar, & Baredar, 2016). BIPV systems that are integrated on south façades generate approximately 64 percent of the electricity generated by the same area of a south facing roof with a near optimal tilt angle (i.e. 45° in the study), annually (Imenes & Kanters, 2016). The same study found that east and west facades generally generate approximately 76 percent of the south façade electricity generation. Further, the top part of south facades typically indicate better irradiation conditions than the bottom part – electricity generated by BIPVs integrated on the south façade increases with higher apartment buildings (Hachem, Athienitis, & Fazio, 2014; Imenes & Kanters, 2016). Another benefit of BIPVs for façade integration is the time shift of electricity generation for east and west facades towards morning and afternoon, respectively – this is important for energy generation-demand balances. As seen in Figure 9, peak generation for east and west facades occur earlier and later, respectively, than the south façade peak generation time for both summer and winter degree days. It is important to note that, as seen in Figure 9(b), the combined generation of the facades on a multistory residential building during the winter design day is approximately 50 percent higher than the generation on the roof (Hachem, Athienitis, & Fazio, 2014).

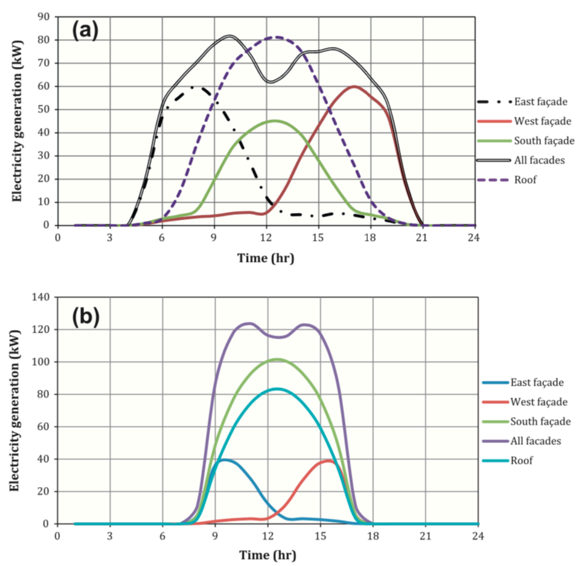


*Figure 9 | Electricity generation of different BIPV components covering different areas of east, south and west facades, and south facing roof of a 12-storey building, (a) on SDD and (b) on WDD. (Hachem, Athienitis, & Fazio, 2014)*

### 3.3 | Neighbourhood-scale Development

Research on the topic of neighbourhood design and its impact on energy performance and greenhouse gas emissions has been conducted by Caroline Hachem at the University of Calgary. *Impact of neighborhood design on energy performance and GHG emissions* focuses on neighbourhood design rather than individual buildings, unlike most existing research on the topic of energy efficiency (Hachem, 2016). The research includes the design of a hypothetical 64-hectare neighbourhood in Calgary, Alberta, using design parameters to maximize solar capture and utilization. Approximately 50 scenarios were investigated to evaluate the energy consumption and energy generation potential of buildings, including greenhouse gas emissions associated with building operations and with transportation. Two types of neighbourhoods were studied – a residential neighbourhood with various types of residential buildings and a mixed-use neighbourhood. Similarly, simulations were conducted for low-density and low-to-medium density neighbourhoods, and neighbourhoods with central business districts located at the edge of the development or outside of the neighbourhood (i.e. at various distances). The results show that communities with high energy-efficient buildings (i.e. designed with the objective of achieving net zero energy status) require 75 percent less energy consumption than existing building stock (i.e. data reflecting the existing building stock in Alberta) and 40 percent less energy for building operations compared to buildings with advanced energy efficiency standards (e.g. R2000 Standard homes – about 30 percent more energy efficient than conventional new homes and must achieve a minimum energy efficiency rating of 80 on the EnerGuide rating scale) (Hachem, 2016). On-site electricity generation using BIPV systems on available roof surfaces can supply up to 90 percent of the total energy use for communities with high energy-efficient buildings and low-density, while 55 percent for advanced performance and low-density (Hachem, 2016).

Additional neighbourhood-scale research, also conducted by Caroline Hachem, has found that mutual shading by adjacent buildings has a major effect on solar potential of neighborhoods (i.e. for roof surfaces) (Hachem, Athienitis, & Fazio, 2012; Hachem, Fazio, & Athienitis, 2013). For south facing facades of a row of units, distance between rows affects incident and transmitted solar radiation, as well as heating and cooling consumptions (Hachem, Athienitis, & Fazio, 2012). For example, heating of detached rectangular units of the obstructed row can increase by 50% as compared to the unobstructed row, for a row spacing of 5 metres – a combination of both reduced energy generating potential by photovoltaic systems integrated on south or near south facing roof surfaces and reduced passive solar gains on the south façade (Hachem, Athienitis, & Fazio, 2012; Hachem, Athienitis, & Fazio, 2012). The same study, which analyzed housing unit configurations, also found heating and cooling consumptions of attached units are lower than for the corresponding detached configurations - reduction in heating consumption was found to reach 35% as compared to detached units (Hachem, Athienitis, & Fazio, 2012).

Neighbourhood-scale research is important because mixed-use neighbourhoods are considered a crucial part of the strategy to achieve sustainable development (Hachem, 2015; Hoppenbrouwer & Louw, 2005; Grant, 2007). Mixed-use neighbourhoods offer a mix of uses – a combination of residential, retail, office, recreation and other functions. These neighbourhoods can reduce automobile dependence, combating sprawl and fragmentation of urban areas, promoting economic development and reducing greenhouse gas emissions (Hachem, 2015; Rabianski, Gibler, Tidwell , & Clements III, 2009; Grant, 2007). Despite this, analysis of neighbourhoods and systematic design is lacking, along with comprehensive design guidelines for achieving high-energy performance mixed-use neighbourhoods, are sorely lacking (Hachem, 2015). However, more directly, for the purposes of this study, neighbourhood-scale analysis is important regarding the impact buildings in a neighbourhood have on energy generating potential (i.e. the impact shading of buildings has on a neighbourhood's ability to generate energy).

### 3.4 | Software and Tools

Analyses of solar energy and its potential in an urban context, as outlined in this section, have been conducted using computer software. The literature reviewed can be divided into two categories:

1. Literature that utilizes the computer-aided design [CAD] program Rhinoceros[2] and Radiance[3], a validated lighting simulation tool; and
2. Literature that utilizes EnergyPlus[4], a building energy simulation program, SketchUp[5], a software that generates three-dimensional [3D] geometric data, and OpenStudio[6], a plug-in for SketchUp that assists in the creation of geometry for EnergyPlus.

Additional software, tools and plug-ins have been utilized, depending on the end goal of the study. For example, two Scandinavian studies conducted in Trondheim, Norway, explore how to increase energy production from integrated solar systems (i.e. BIPVs) by enhancing solar accessibility and potential (Lobaccaro, Chatzichristos, & Leon, 2016; Lobaccaro, Carlucci, Croce, Paparella, & Finocchiaro, 2017). Both studies use Rhinoceros software for the geometric modelling and DIVA-for-Rhino[7], a solar dynamic simulation tool (i.e. a plug-

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[2] Rhinoceros (software), Robert McNeel & Associates, Seattle, USA. http://www.rhino3d.com/
[3] Radiance (software), Lawrence Berkeley National Laboratory, USA, http://www.radiance-online.org/
[4] EnergyPlus (building simulation software), U.S. Department of Energy's Building Technologies Office/National Renewable Energy Laboratory. https://energyplus.net/
[5] SketchUp (software), Trimble Inc., https://www.sketchup.com/
[6] OpenStudio (plug-in for SketchUp), National Laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Alliance for Sustainable Energy, https://www.openstudio.net/
[7] DIVA-for-Rhino (software), Solemma LLC, Cambridge, USA. http://diva4rhino.com/

in), to determine solar irradiance (i.e. kWh/m$^2$ of building surfaces). DIVA-for-Rhino uses Radiance and Grasshopper[8] – a graphical algorithm editor, as a platform for its thermal, daylight, solar radiation and glare simulations. It is important to note that there are numerous plug-ins for Grasshopper, however, some of the notable and frequently used plug-ins include Ladybug and HoneyBee tools. These plug-ins connect the 3D Rhinoceros CAD interface to simulations in the Grasshopper interface. Urban Modelling Interface[9] [Umi] is another Rhinoceros-based design environment for modelling neighbourhoods and cities with respect to operational and embodied energy use, walkability and daylighting potential. It also makes use of Grasshopper, EnergyPlus, and Daysim[10], a daylight simulation tool). Lastly, TRNSYS[11] is a software typically used alongside EnergyPlus to simulate the potential of BIPV and thermal systems.

### 3.5 | Key Knowledge Gaps

Solar energy research in urban Canadian contexts is sorely lacking. Research on a neighbourhood-scale has been conducted at the University of Calgary – it is unique and should be continued as buildings are a key component of reducing greenhouse gas emissions and increasing energy efficiency gains (Hachem, 2015; Hoppenbrouwer & Louw, 2005; Grant, 2007; UNEP SBCI, 2009). Studies on a neighbourhood level are also relatively new and there are opportunities to evaluate solar energy generation potential on a scale that is larger than one building and its immediate context. Many studies aim to outline parameters that are important for solar energy generation, however, few analyze existing

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[8] Grasshopper (software), Robert McNeel & Associates, US. http://www.grasshopper3d.com/
[9] Umi (software), Sustainable Design Lab, Massachusetts Institute of Technology, http://urbanmodellinginterface.ning.com/
[10] Daysim (software), http://daysim.ning.com/
[11] TRNSYS (software), Thermal Energy System Specialists, http://www.trnsys.com/

planning policies and regulations, and their impacts on said generation. Yet, these policies and regulations guide development in Canadian municipalities. Other jurisdictions, primarily Scandinavian ones, such as Sweden, have developed tools to assist planners in planning for energy-efficient and energy-producing buildings. One study, which recognizes the impact the early planning phase and design decisions can have on solar energy potential, developed 3D solar maps which give a detailed overview of the amount of energy that can be produced with photovoltaics on both existing and planned new buildings (Kanters & Wall, 2014). A website has been set up with these solar maps for urban planners to use in the urban planning process (www.solarplanning.org). However, for Canada, specifically for the City of Toronto, such solar research and tools are scarce. Further, the neighbourhood-scale research that exists focuses on BIPV systems, but for available roof surfaces (Hachem, 2015; Hachem, 2016; Hachem, Athienitis, & Fazio, 2012; Hachem, Fazio, & Athienitis, 2013). As outlined earlier in this section, it is necessary to utilize façades for solar energy generation on multistory buildings, in cities like Toronto, due to the limited roof area on multi-story buildings for solar energy generation relative to the energy demand.

## 4.0 | Study Objectives

The purpose of this Major Research Project [MRP] is to determine the impact the Avenues and Mid-Rise Buildings Study, specifically, the Performance Standards for Mid-Rise Buildings, have on solar access and to quantify the potential of electricity generation using solar photovoltaic systems along the Avenues in Toronto (i.e. the foundation for the city's future mid-rise building design guidelines). The objectives of this study include:

1. What percentage of buildings' energy use can be covered by energy generated on building surfaces along the Avenues in Toronto, if Performance Standards for Mid-Rise Buildings are used for the design of future buildings and if energy generation potential is maximized during the building design stage (i.e. buildings along east-west corridors)?
2. Which type of built form, high-rise podium or low-rise podium built form, allows for higher energy generation potential along east-west facing avenues in Toronto, such as Eglinton Avenue at Bathurst Street?
3. Are the City of Toronto's neighbourhoods, along avenues such as Eglinton Avenue, a hinderance to its energy generation potential? Or do they pose little-to-no impact on energy generation potential?
4. What changes can be made to the Avenues and Mid-Rise Buildings Study to increase the potential of electricity generation using solar photovoltaic systems along the Avenues in Toronto, specifically east-west corridors?

In keeping with literature that analyzes the potential of solar energy generation, this study utilizes Rhinoceros, Grasshopper, and DIVA-for-Rhino software. This study analyzes mid-rise buildings along Eglinton Avenue West, at Bathurst Street; buildings in the neighbourhood are modelled, however, the impact mid-rise buildings have on surrounding buildings is not analyzed. It does not quantify the energy demand of buildings using EnergyPlus software. Average electricity usage per land use was used to calculate the annual electricity demand per building.

## 5.0 | Methodology

The impact of the Mid-Rise Building Performance Standards on annual solar radiation (i.e. kWh/m$^2$ of building surface) and the potential of electricity generation using building integrated photovoltaic systems for buildings along Eglington Avenue West, at Bathurst Street, Toronto (43° N, 79° W), is investigated. Annual solar radiation is investigated for both building roof and façade surfaces. Below is a summary of the processes that were undertaken, as illustrated in Figure 10.

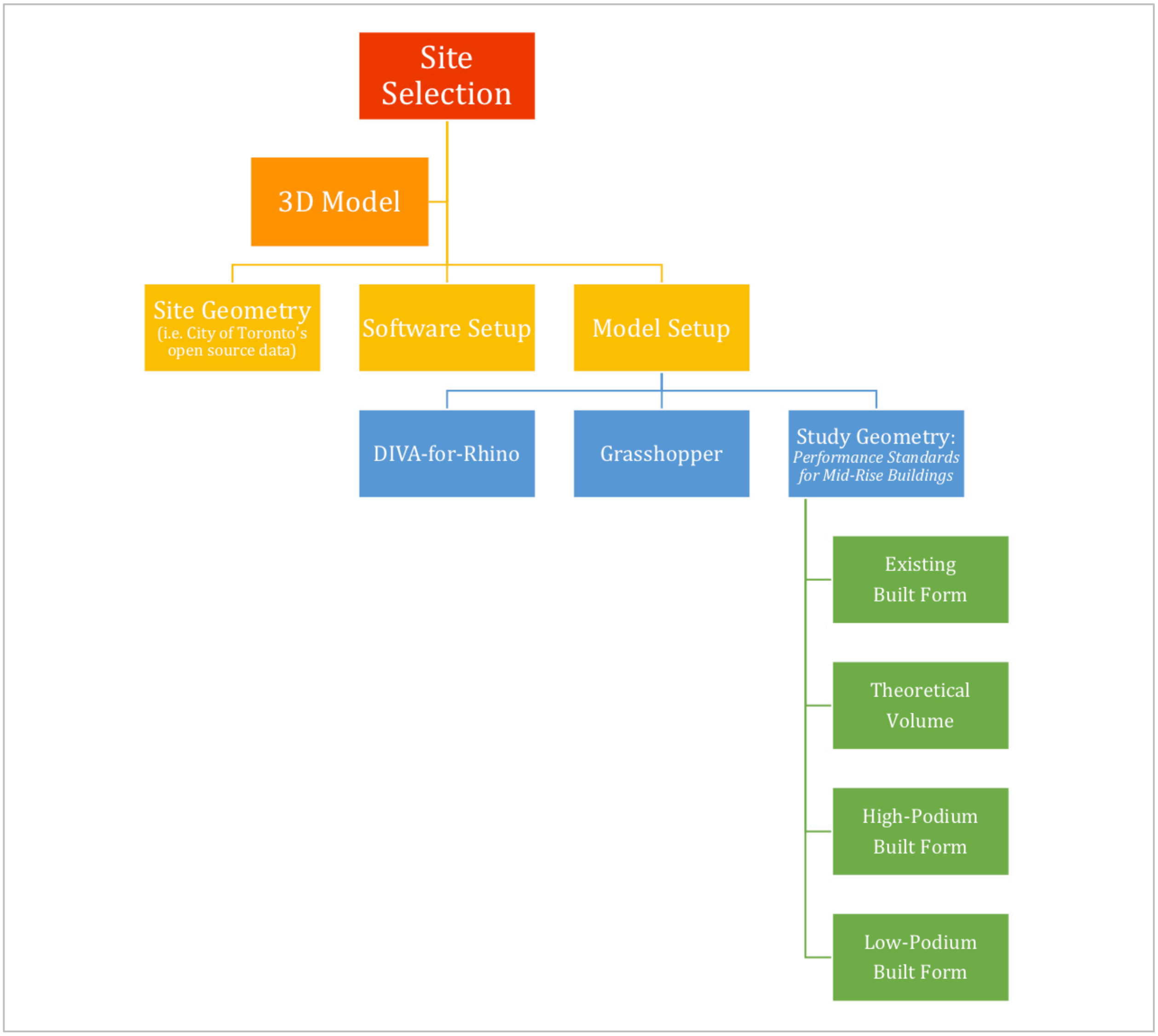



*Figure 10 | Process chart depicting workflow for study*

## 5.1 | Site Selection

As previously mentioned, the City of Toronto has designated Avenues in its Official Plan – refer to Figure 4. Avenues are described as arterial corridors in the city. A study was initiated in 2008 – the Avenues and Mid-Rise Building Study – to “determine how to intensify along the Avenues in a way that is compatible with the adjacent neighbourhoods through appropriately scaled and designed mid-rise buildings” (City of Toronto, 2017c). Following the study, Toronto City Council adopted Mid-Rise Building Standards in 2010 and an Addendum to these Standards in 2016. The Standards and Addendum were implemented and to be used during the evaluation of mid-rise development applications in locations where the Performance Standards are enforced, primarily along the Avenues. The Avenues and the Mid-Rise Building Study outline the Avenues where the Mid-Rise Building

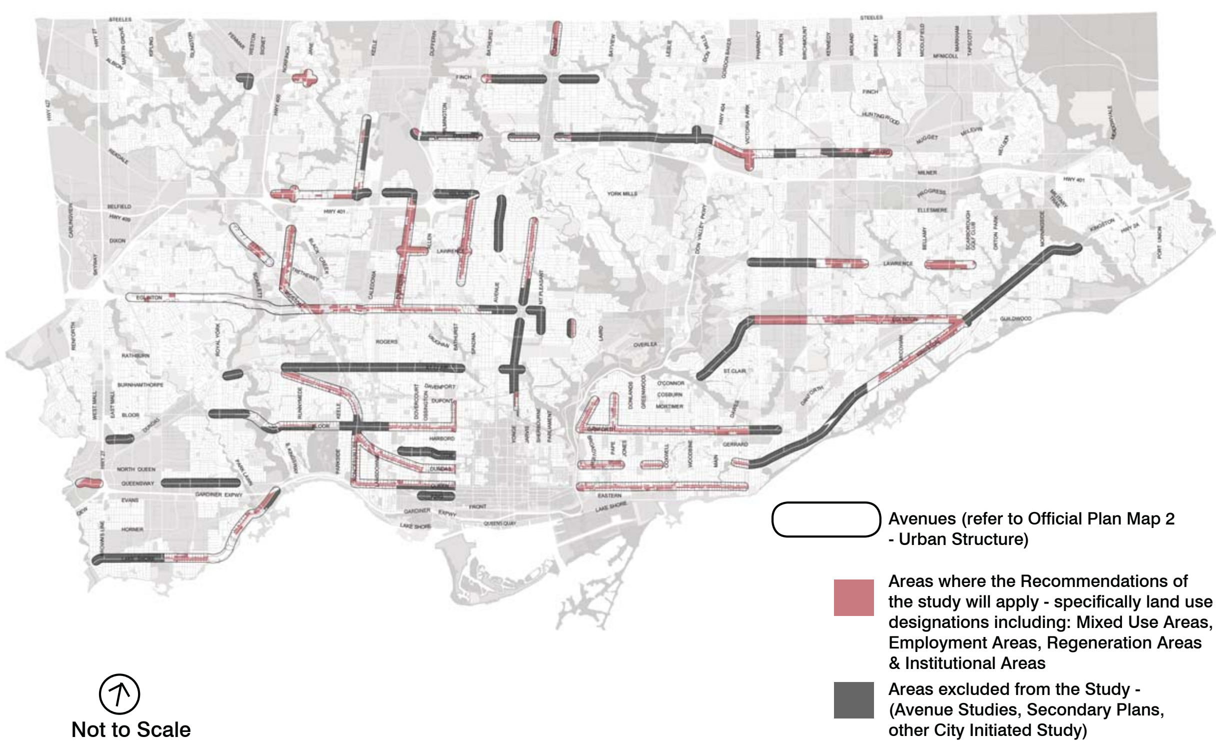



*Figure 11 | Map of parcels where the Performance Standards should apply (BMI + Pace, 2010, p. ii)*

Standards and Addendum to the Standards apply – Mixed Use Areas, Employment Areas, Regeneration Areas and Institutional Areas, as illustrated in Figure 11.

To select the project's study area, four Avenues from the city's official plan, where the standards of the study apply, were selected for preliminary consideration:

1. Eglinton Avenue West at Bathurst Street,
2. St. Clair Avenue West between Oakwood Avenue and Christie Street,
3. Bloor Street West between Dufferin Street and Bathurst Street, and
4. Queen Street West between Roncesvalles Avenue and Dovercourt Road.

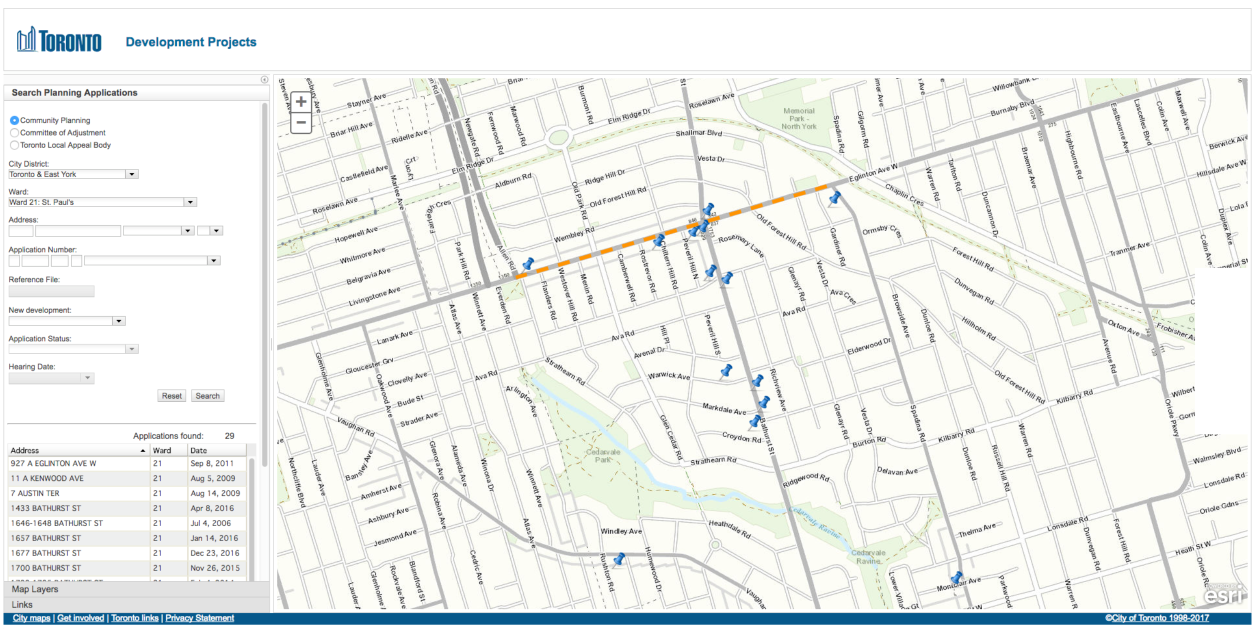



*Figure 12 | Toronto Development Projects Website for Eglinton Avenue West at Bathurst Street (City of Toronto, 2017b)*

Next, the City of Toronto's Development Projects website was referenced to determine the type of development that is currently proposed along the four Avenues. Once the following data was collected, it was determined that Eglinton Avenue West at Bathurst Street would be selected for the project study area, as seen in Figure 11. Queen Street West between Roncesvalles Avenue to Dovercourt Road has already experienced redevelopment and has a list of approximately ten proposed projects, some of which propose development taller than 15-storeys, refer to Appendix A4. The redevelopment that has occurred is approximately 10-storeys in height or taller – slightly higher than the “maximum of 11 storeys on the widest Avenues” that the study suggests for mid-rise development (City of Toronto, 2017c). Therefore, the existing development and near-future development along Queen Street West between Roncesvalles Avenue and Dovercourt Road does not represent mid-rise development for the purposes of this major research project. Although Bloor Street West and St. Clair Avenue West currently represent mid-rise development and future development is primarily fitting with the definition of mid-rise development, Eglinton Avenue West, as seen in Figure 13 through Figure 16, represents the greatest potential due to the proposed light rail transit project along Eglinton Avenue – the Eglinton Crosstown Light Rail Transit project. St. Clair Avenue West is also an interesting study area due to the existing streetcar route along St. Clair Avenue and could be analyzed in future studies due to its mid-rise development potential (e.g. existing transit line as a basis to accommodate future growth more easily).


*Figure 13 | Eglinton Avenue West, looking west from Eglinton and Bathurst intersection – construction for Crosstown LRT*


*Figure 14 | Eglinton Avenue West and Bathurst Street Intersection, looking east – construction for Crosstown LRT*


*Figure 15 | Bathurst Street south of Eglinton Avenue, looking north towards Eglinton and Bathurst intersection*

*Figure 16 | Bathurst Street further south of Eglinton Avenue, looking north towards Eglinton and Bathurst intersection*

## 5.2 | Site Geometry

As a starting point, the City of Toronto's three-dimensional (3D) data from its Open Data Catalogue was used as a reference for the Rhinoceros model geometry (City of Toronto, 2017a). The city has Shapefile, Multipatch, AutoCAD and SketchUp file formats for the buildings within its jurisdiction. SketchUp files were acquired for Eglinton Avenue West at Bathurst Street (i.e. comprised of four files that were stitched together to form the project site). Once the process in Grasshopper began, however, it was evident that using the 3D SketchUp geometry caused warnings, errors, and issues during the Grasshopper analysis phase. As a result, the City of Toronto's open source 3D data was only used as a reference – the buildings analyzed in this research have been manually drawn in Rhinoceros. First, the existing built form was created. Next, a theoretical volume was created and two built forms that are possible under the Avenues and Mid-Rise Building Performance Standards – high-podium and low-podium built form. It should be noted that plugins are available in aiding the exporting process of SketchUp files into Rhinoceros, however, the extent of these plugins is limited as the conversion process is not 100 percent accurate (i.e. the conversion process aims at creating surfaces, however, SketchUp geometry can be converted to meshes which cannot be used for certain analyses in Grasshopper the same way surfaces can).

## 5.3 | Model

To set up the software and model for this research, specific steps were taken, as outlined in the following subsections.

### 5.3.1 | Software Setup

Rhinoceros [Rhino], Version 5, was used to conduct this research. Grasshopper and DIVA-for-Rhino [DIVA] were also added to the Rhino interface for radiation simulations and analysis. Grasshopper, as mentioned in Section 3.4, is a graphical algorithm editor and is used as a platform for simulations. DIVA-for-Rhino is a daylighting and energy modeling plug-in for Rhino and was used both for site-wide radiation mapping (i.e. to generate a visual representation of the irradiation potential), as seen in Figure 17, and for generation of façade-level irradiance values. Grasshopper was used as a platform to run the DIVA-based components for radiation analysis, as seen in Figure 18.

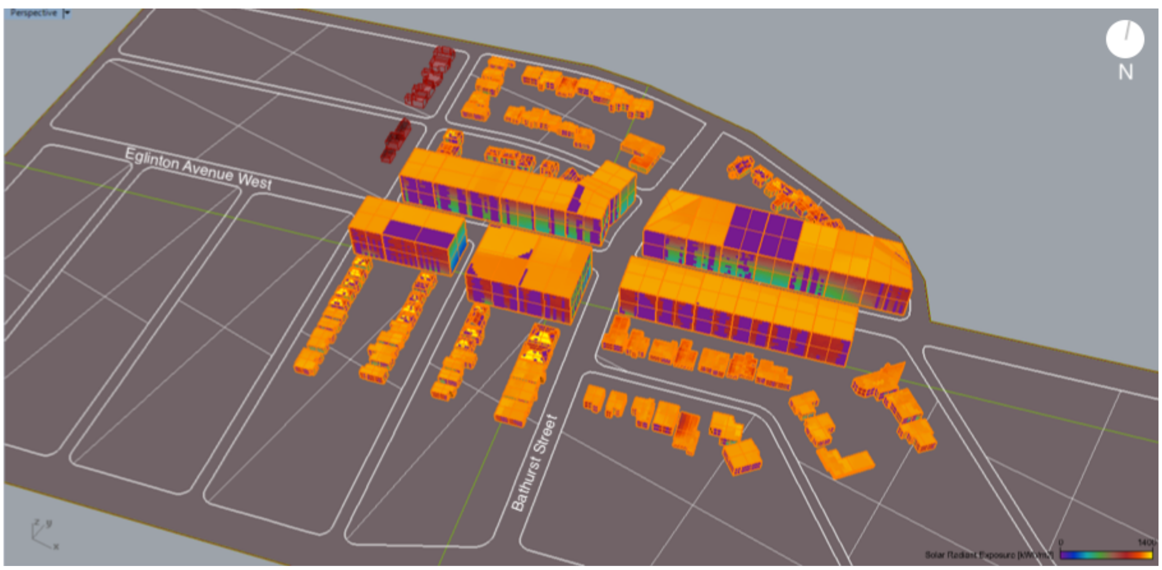



*Figure 17 | Solar Radiant Exposure Map Generated in DIVA-for-Rhino. Surfaces in purple show 0 kWh/m² results (i.e. error)*

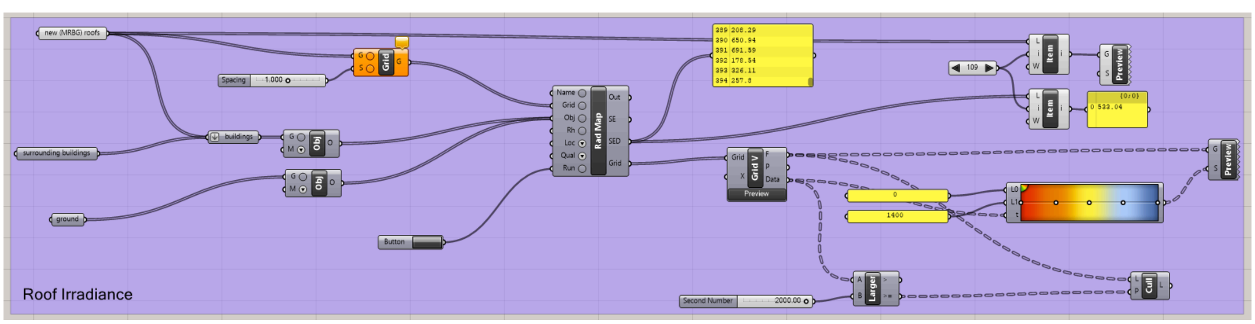



*Figure 18 | Grasshopper Interface - setup of solar irradiance analysis using DIVA-for-Rhino components in Grasshopper*

### 5.3.2 | Model Setup

Once the software and plug-ins were set up, the software file and models were set up next. Rhino was set up using metric units. Once the units were set, the open source data from the City of Toronto's website was imported. Rhino has an import option that allows SketchUp files to be imported. Therefore, the SketchUp file from the city was selected for import with the import parameters outlined in Figure 19. Once imported into Rhino, the geometry was exploded in order to be able to select facades, roofs, and other geometry separately. However, as discovered later on in the modelling process, once the geometry is exploded, meshes are generated. Meshes, although visually acceptable in appearance and representation of the building geometry, albeit messy with multiple lines for some buildings as seen in Figure 20, cause issues for radiation analyses in Grasshopper. Therefore, to this end, the geometry had to be either redrawn manually or set up in Grasshopper using components which would generate a visual representation of the site geometry in the Rhino interface. Due to the scale of the project and familiarity with Rhino (i.e. and similar software), the geometry was redrawn manually, and layers were created to sort the façade, roof and ground surfaces into separate layers for ease of analysis.

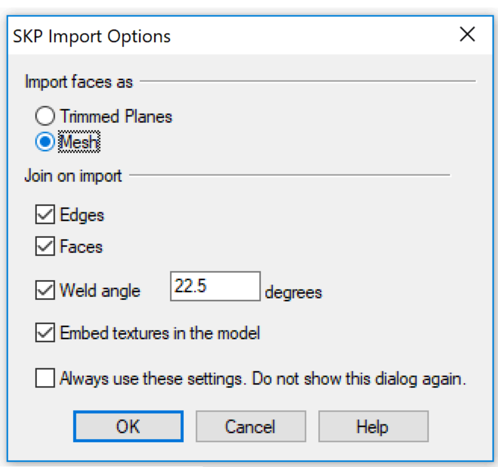



*Figure 19 | Rhinoceros Import Settings for SketchUp file*

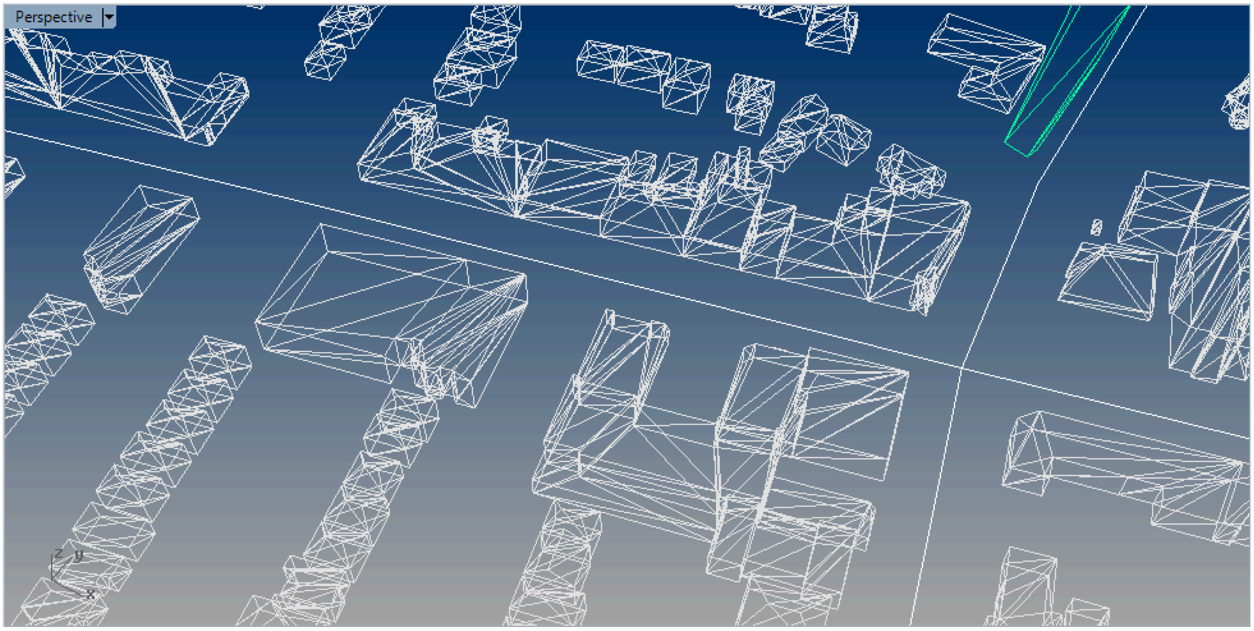


*Figure 20 | Geometry represented using meshes in Rhinoceros*

Due to the anticipated analyses on an annual basis, a Toronto annual weather file was used for modelling. A Canadian Weather Year for Energy Calculation [CWEC] EnergyPlus Weather Format file [EPW] was used for the model (EnergyPlus, 2018; Numerical Logics, 1999). It should be noted that the weather file represents hourly weather observations collected from 1953 to 1995 (Numerical Logics, 1999). Although newer weather data is available, the data only spans a 15-year period (i.e. from 2000 to 2014), it has not been thoroughly vetted and must be purchased (Williams & Harmer, 2016).

#### *5.3.2.1 | DIVA-for-Rhino*

First, the parameters for DIVA were set using the DIVA toolbar in the Rhino interface. A Toronto CWEC 2016 weather file, obtained from the EnergyPlus website, was used under the location input parameter (EnergyPlus, 2018). The materials were assigned in accordance with the methodology outlined in previous literature – facades and roofs were considered to be Lambertian diffusers (i.e. diffuse reflection) with a 35 percent reflectance and the landscape (i.e. ground) albedo was set to 20 percent (Imenes & Kanters, 2016; Jakubiec & Reinhart, 2013). DIVA-for-Rhino uses Radiance to simulate solar irradiation, therefore, "the simulations take into account diffuse light, shading and reflectance from the surroundings" (Imenes & Kanters, 2016). Lastly, for metrics, Radiance parameters were set, also in accordance with the methodology outlined in previous literature, as seen in Table 2 (Kanters & Wall, 2014; Lobaccaro, Carlucci, Croce, Paparella, & Finocchiaro, 2017). Although literature typically makes use of one to three ambient bounces for the parametric settings, for ease of simulation while still maintaining ambient bounces, two ambient bounces were set for the radiation map visualization simulations (Kanters & Wall, 2014).

*Table 2 | Radiance Parameters for DIVA*

Set of 'rtrace' parameters used for all *Radiance*-based simulations.

| Ambient bounces | Ambient division | Ambient super samples | Ambient resolution | Ambient accuracy | Specular threshold | Direct sampling | Direct relays |
|---|---|---|---|---|---|---|---|
| 1–3 | 1000 | 20 | 300 | 0.1 | 0.15 | 0.20 | 2 |

DIVA was used early on in the modelling process as a means to produce overall radiation results – to produce a visualization and to test the software setup (i.e. major issues can be flagged by inspecting the radiation map generated). If the visual representation of the radiation results does not show results or shows unreasonable results, it is an indication that there are issues with the geometry in Rhino. Initially, the City of Toronto's SketchUp model for buildings within the Eglinton Avenue West and Bathurst Street site were imported into Rhino, however, it took trial and error – reviewing software forums, contacting faculty and fellow colleagues to determine, as previously mentioned, that redrawing existing buildings within the site was the simplest and most efficient use of time. Once the existing, as-is building geometry was drawn in Rhino using the SketchUp file geometry as a reference, as seen in Figure 21, the geometry based on the Avenues and Mid-

Rise Buildings Performance Standards from the Avenues and Mid-rise Buildings Study was established.

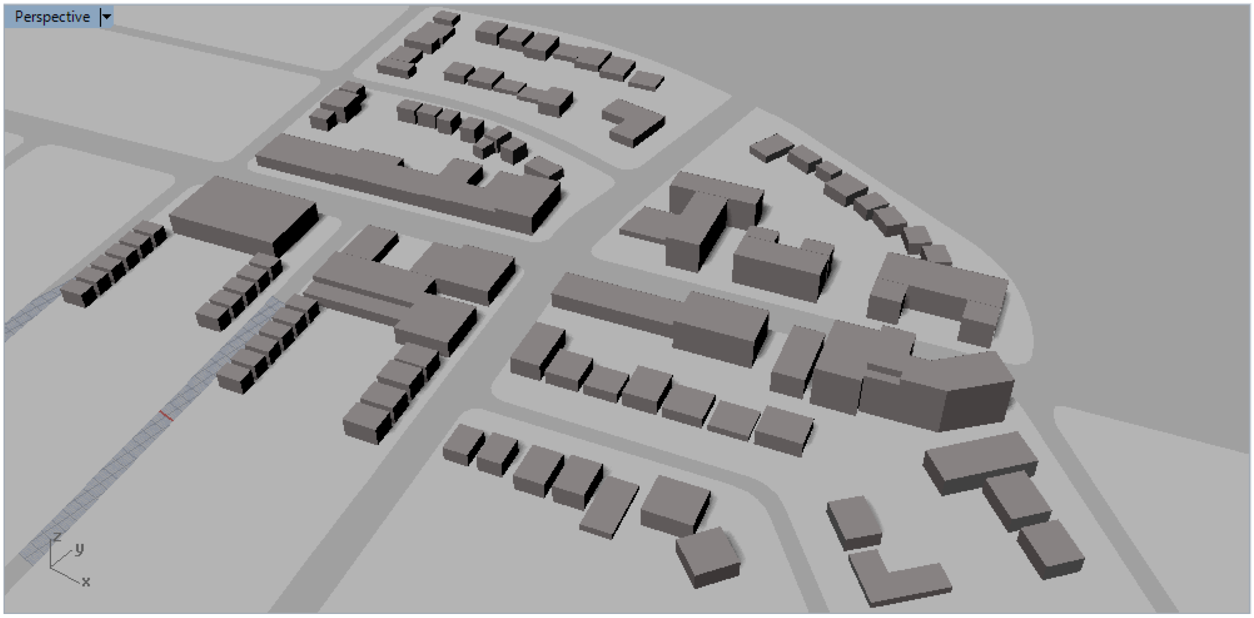



*Figure 21 | Rhinoceros model of the as-is built environment at Eglinton Avenue West and Bathurst Street - the project study area, looking north*

#### *5.3.2.2 | Grasshopper*

Once the settings for DIVA were set and the radiation maps generated from the DIVA plug-in did not produce visible errors, the Grasshopper files for the research and analysis component were set up. As illustrated in Figure 18, the Grasshopper interface is comprised of various components which make up the analysis. For the purposes of this MRP, the Radiation Map component – the component that computes time-integrated solar irradiance on a surface (e.g. roof or façade surface) – is the foundation of the analysis. This DIVA-for-Rhino component includes several inputs and outputs, required to compute the solar irradiance. Inputs include the name of the project (i.e. optional), a grid input for the daylight analysis grids which are applied to the surfaces of interest (i.e. the surfaces to be analyzes), the objects to be included for context (i.e. everything that is not being analyzed),

*Table 3 | Radiance Parameters for Grasshopper, Radiation Map Component*

| Ground reflectance | Start date | End date | Hour range | Radiation map method |
| --- | --- | --- | --- | --- |
| 0.20 | Jan. 1 | Dec. 31 | 0 - 24 | GenCumulativeSky (fast) |

| Ambient bounces | Ambient division | Ambient super samples | Ambient resolution | Ambient accuracy | Specular threshold | Direct sampling | Direct relays |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2 | 512 | 128 | 256 | 0.15 | 0.01 | 0.2 | 2 |

the location for the EPW weather file, the level of quality which is desired, and the run option for executing the simulation. Additional inputs include ground reflectance, Radiance Parameters, the start and end dates, hour range for the simulation and the radiation map method, as outlined in Table 3. The outputs for the Radiation Map component include an output for messages (e.g. errors), solar energy output for a kilowatt hour [kWh] reading per analyzed surface(s) over the run period, solar energy density outputs for kilowatt hour per area [kWh/m$^2$] for the analyzed surface(s) over the run period, and a grid for the analyzed surface(s) as a list which can be used to create a visual representation of the results. As outlined in Figure 22Figure 21, the geometry for the analysis included the surfaces of interest (i.e. roof or façade surfaces), surrounding buildings, and the ground. The surface

type to be analyzed had a daylight analysis grid applied to it, at 1-metre intervals, while the surrounding buildings and ground were input into an Object component, which attaches materials to geometry. These inputs, along with the simulation control button, were input into the Radiation Map component, as seen in Figure 23

. The outputs included both a visual

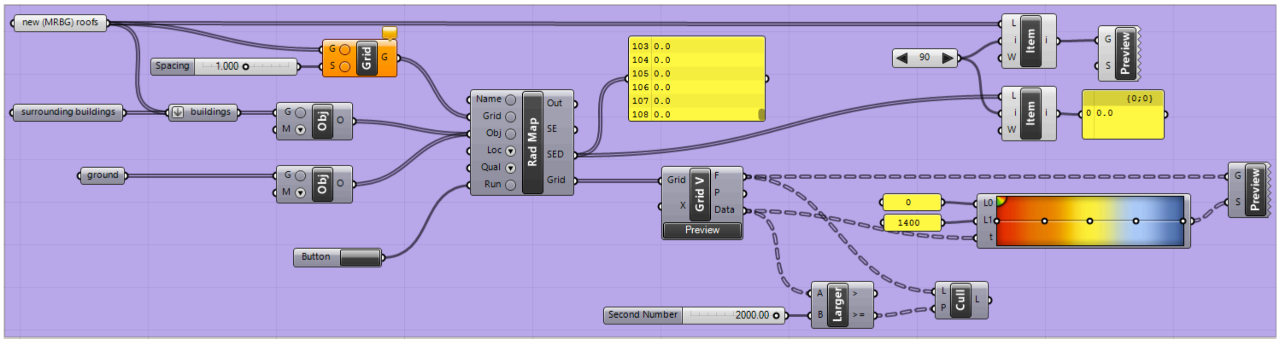



*Figure 22 | Grasshopper Solar Irradiance Analysis Setup*

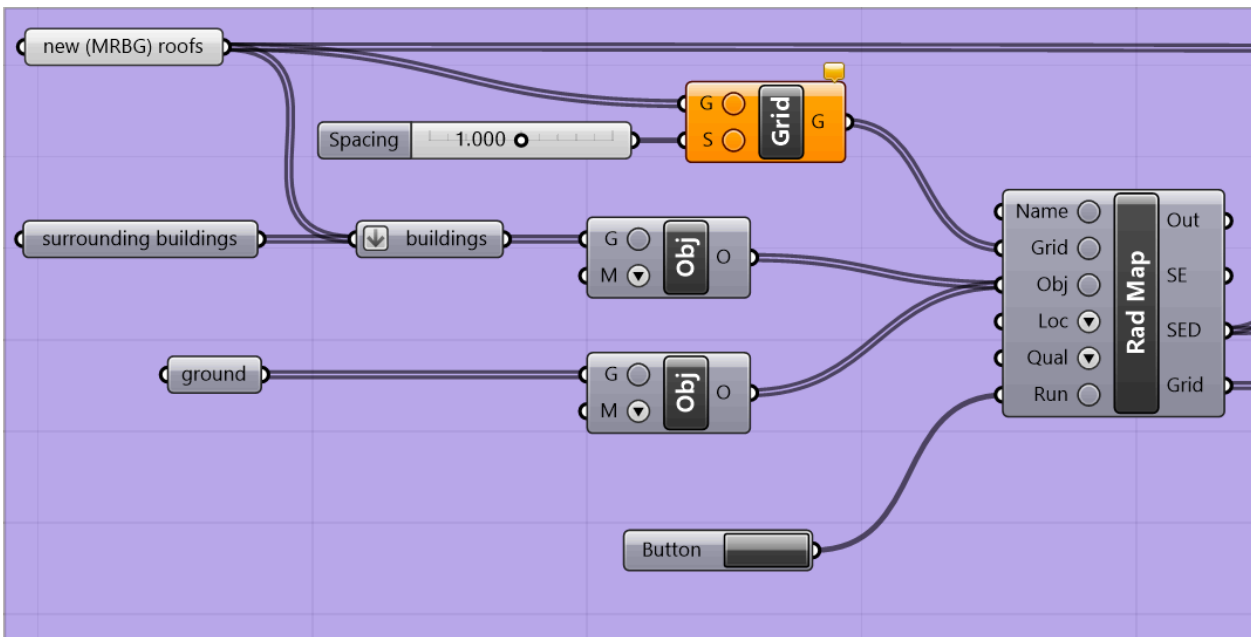



*Figure 23 | Inputs for Grasshopper – roof or façade surfaces for analysis, surrounding buildings and ground for context*

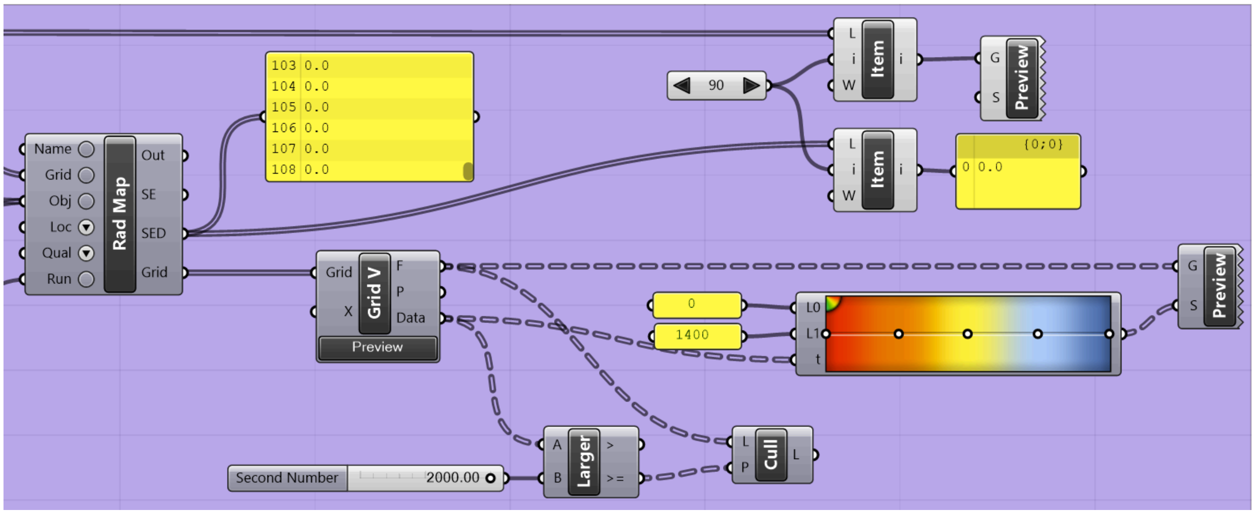



*Figure 24 | Output for Grasshopper – solar energy density values and numerical results, grid analysis for visual representation*

representation and surface specific numerical results – this is, in part, the power and benefit of using Rhino, DIVA-for-Rhino and Grasshopper for this type of analysis. The visual output includes several components which together create a grid that can be seen in the Rhino interface once the simulation is complete, however, layers in Rhino must be turned off or adjusted (e.g. layer colours) to be able to see the visual results without obstructions. To generate numerical results that could be post-processed, a setup was created to extract the results in an orderly fashion. As seen in Figure 24, the output for solar energy density [kWh/m$^2$] without intervention results in a list of solar energy density results which are associated to a surface number, but this surface number cannot readily be accessed in Rhino or Grasshopper (i.e. to visually determine where the surface is located in the project model). As a result, a group of components was attached to the solar energy density output, using trial and error, to determine how best to associate solar energy density values with surfaces on buildings in the model. The resulting setup includes a visual and numerical representation which has to be manually changed using a value sequence button (i.e. Value List). Therefore, the results for this analysis were manually recorded in a spreadsheet, whereby the description of the surface area and the solar energy density could be recorded together – providing important context (e.g. building no. 7, north façade and the $5^{th}$ storey has an annual solar radiation of 325 $kWh/m^2$), as seen in Appendix C – 02: Mid-Rise Building Data – Annual Solar Radiation for Low Podium Built Form.

#### *5.3.2.3 | Performance Standards for Mid-Rise Buildings – Geometry*

Once the model was set up using the existing – as-is building geometry, the geometry for the analysis was created using the Avenues and Mid-Rise Buildings Performance Standards – refer to Avenues and Mid-Rise Buildings Study for detailed illustrations of individual performance standards, as seen in Appendix B (BMI + Pace, 2010). As seen in Figure 26 and Figure 27, the 2010 study outlines thirty-six performance standards which are categorized under nineteen main standards. For the purposes of this research, fourteen standards were followed, as outlined using a blue dashed line in Figure 26. The performance standards include:

1. *Maximum allowable height;*
2. *Minimum building height;*
3. *Minimum ground floor height;*

*4B. Front façade: Pedestrian perception step-back;*

*4C. Front façade: Alignment;*

*5A. Rear transition to neighbourhoods: Deep;*

*5B. Rear transition to neighbourhoods: Shallow;*

*5D. Rear transition to apartment neighbourhoods;*

*6. Corner sites: Heights & angular planes;*

*7A. Minimum sidewalk zones;*

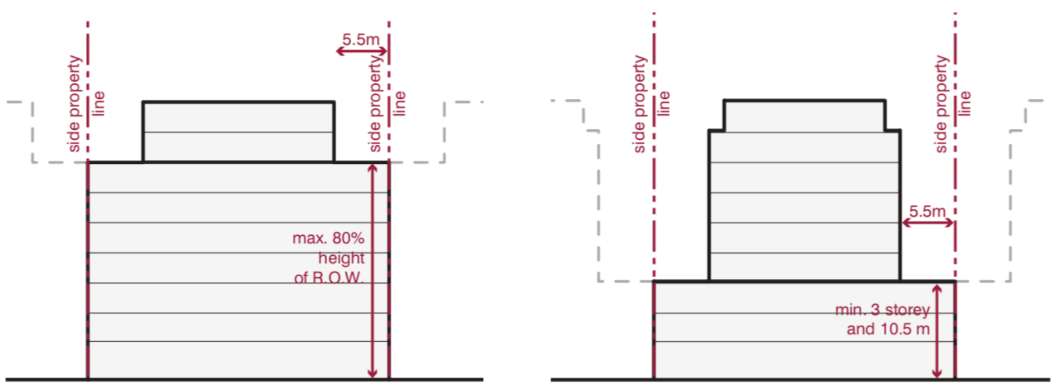
*8A. Side property line: Continuous street walls;*

*8C. Side property line: Step-backs at upper storeys;*

*8D. Side property line: Existing side windows; and*

*8E. Side property line: Side street setbacks* (BMI + Pace, 2010)

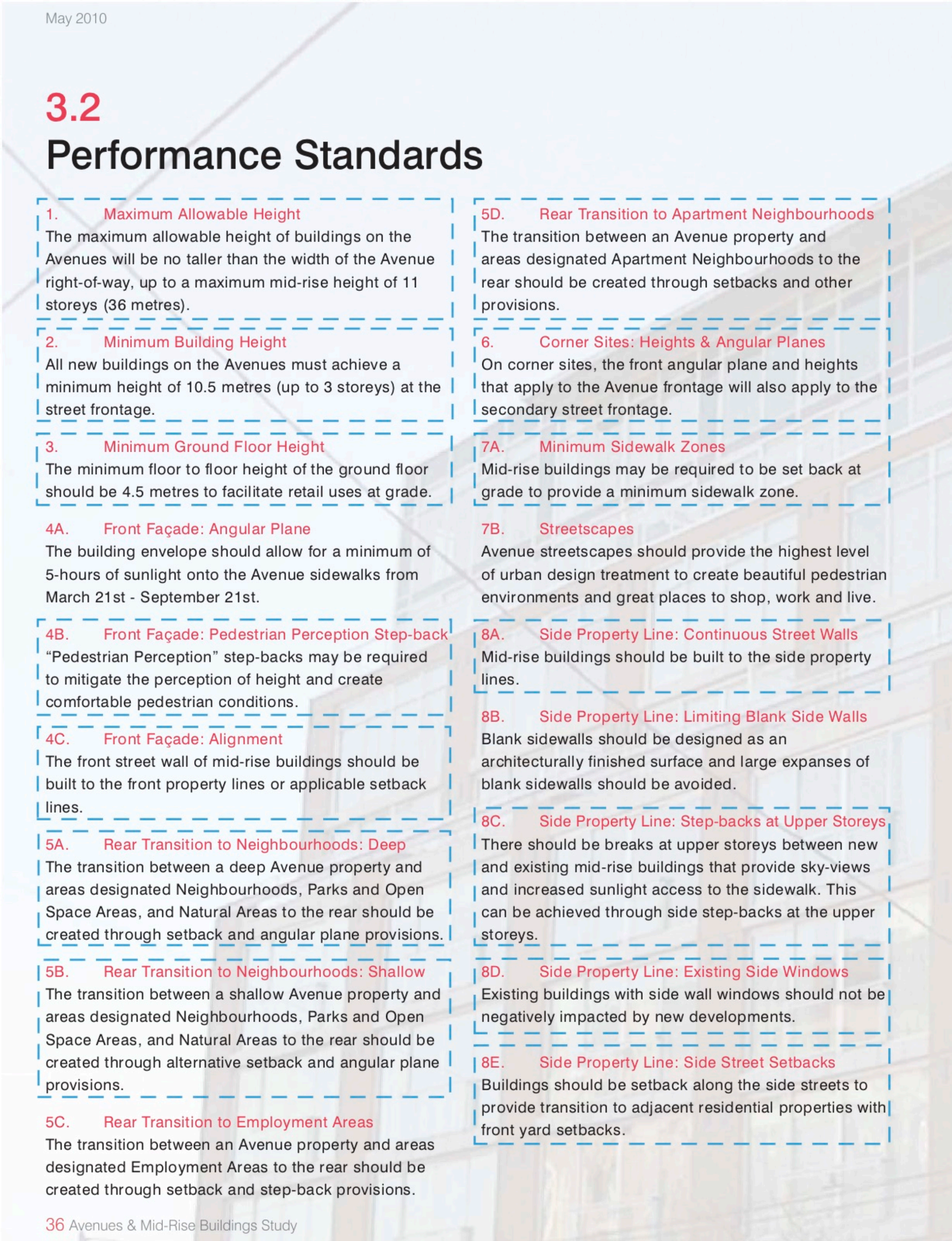
As per the Avenues and Mid-Rise Buildings Performance Standards (refer to Appendix B, see p. 17 of the study), the Eglinton Avenue West right-of-way, at Bathurst (i.e. including Bathurst Street), is 27-metres wide. Therefore, the maximum allowable height for the buildings along Eglinton are 27-metres. For the purposes of the study, the ground floor, at 4.5-metres in height, is assumed to be used as retail space, the 2nd and 3rd storeys are commercial space, and the remaining storeys are residential units (i.e. the remaining storeys are 3-metres in height).




*Example where a tall street wall is desirable.*

*Example where a more porous street wall is desirable, side step-backs are encouraged.*

*Figure 25 | Step-backs and street wall vs. porous wall examples (BMI + Pace, 2010)*



May 2010

# 3.2 Performance Standards

**1. Maximum Allowable Height**
The maximum allowable height of buildings on the Avenues will be no taller than the width of the Avenue right-of-way, up to a maximum mid-rise height of 11 storeys (36 metres).

**2. Minimum Building Height**
All new buildings on the Avenues must achieve a minimum height of 10.5 metres (up to 3 storeys) at the street frontage.

**3. Minimum Ground Floor Height**
The minimum floor to floor height of the ground floor should be 4.5 metres to facilitate retail uses at grade.

**4A. Front Façade: Angular Plane**
The building envelope should allow for a minimum of 5-hours of sunlight onto the Avenue sidewalks from March 21st - September 21st.

**4B. Front Façade: Pedestrian Perception Step-back**
“Pedestrian Perception” step-backs may be required to mitigate the perception of height and create comfortable pedestrian conditions.

**4C. Front Façade: Alignment**
The front street wall of mid-rise buildings should be built to the front property lines or applicable setback lines.

**5A. Rear Transition to Neighbourhoods: Deep**
The transition between a deep Avenue property and areas designated Neighbourhoods, Parks and Open Space Areas, and Natural Areas to the rear should be created through setback and angular plane provisions.

**5B. Rear Transition to Neighbourhoods: Shallow**
The transition between a shallow Avenue property and areas designated Neighbourhoods, Parks and Open Space Areas, and Natural Areas to the rear should be created through alternative setback and angular plane provisions.

**5C. Rear Transition to Employment Areas**
The transition between an Avenue property and areas designated Employment Areas to the rear should be created through setback and step-back provisions.

**5D. Rear Transition to Apartment Neighbourhoods**
The transition between an Avenue property and areas designated Apartment Neighbourhoods to the rear should be created through setbacks and other provisions.

**6. Corner Sites: Heights & Angular Planes**
On corner sites, the front angular plane and heights that apply to the Avenue frontage will also apply to the secondary street frontage.

**7A. Minimum Sidewalk Zones**
Mid-rise buildings may be required to be set back at grade to provide a minimum sidewalk zone.

**7B. Streetscapes**
Avenue streetscapes should provide the highest level of urban design treatment to create beautiful pedestrian environments and great places to shop, work and live.

**8A. Side Property Line: Continuous Street Walls**
Mid-rise buildings should be built to the side property lines.

**8B. Side Property Line: Limiting Blank Side Walls**
Blank sidewalls should be designed as an architecturally finished surface and large expanses of blank sidewalls should be avoided.

**8C. Side Property Line: Step-backs at Upper Storeys**
There should be breaks at upper storeys between new and existing mid-rise buildings that provide sky-views and increased sunlight access to the sidewalk. This can be achieved through side step-backs at the upper storeys.

**8D. Side Property Line: Existing Side Windows**
Existing buildings with side wall windows should not be negatively impacted by new developments.

**8E. Side Property Line: Side Street Setbacks**
Buildings should be setback along the side streets to provide transition to adjacent residential properties with front yard setbacks.

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*Figure 26 | Avenues and Mid-Rise Buildings Study: Performance Standards, 1 – 8E. Standards highlighted in blue dashed line boxes represent the guidelines that were applied to the geometry for the purposes of this research (BMI + Pace, 2010)*

May 2010

**9. Building Width: Maximum Width**
Where mid-rise building frontages are more than 60 metres in width, building façades should be articulated or “broken up” to ensure that façades are not overly long.

**10. At-Grade Uses: Residential**
Where retail at grade is not required, and residential uses are permitted, the design of ground floors should provide adequate public/private transition, through setbacks and other methods, and allow for future conversion to retail uses.

**11. Setbacks for Civic Spaces**
In special circumstances where civic or public spaces are desired, additional setbacks may be encouraged.

**12. Balconies & Projections**
Balconies and other projecting building elements should not negatively impact the public realm or prevent adherence to other Performance Standards.

**13. Roofs & Roofscapes**
Mechanical penthouses may exceed the maximum height limit by up to 5 metres but may not penetrate any angular planes.

**14. Exterior Building Materials**
Buildings should utilize high-quality materials selected for their permanence, durability and energy efficiency.

**15. Façade Design & Articulation**
Mid-rise buildings will be designed to support the public and commercial function of the Avenue through well articulated and appropriately scaled façades.

**16A. Vehicular Access**
Whenever possible, vehicular access should be provided via local streets and rear lanes, not the Avenue.

**16B. Mid-Block Vehicular Access**
For mid-block sites without rear lane access, a front driveway may be permitted, provided established criteria are met.

**17. Loading & Servicing**
Loading, servicing, and other vehicular related functions should not detract from the use or attractiveness of the pedestrian realm.

**18. Design Quality**
Mid-rise buildings will reflect design excellence and green building innovation, utilizing high-quality materials that acknowledge the public role of the Avenues.

**19A. Heritage & Character Areas**
All mid-rise buildings on the Avenues should respect and be sensitively integrated with heritage buildings in the context of Heritage Conservation Districts.

**19B. Development in a HCD**
The character and values of HCDs must be respected to ensure that the district is not diminished by incremental or sweeping change.

**19C. Development Adjacent to a Heritage Property**
Development adjacent to heritage properties should be sensitive to, and not negatively impact, heritage properties.

**19D. Character Area: Fine Grain Fabric**
New mid-rise buildings in Character Areas that have a fine grain, main street fabric should be designed to reflect a similar rhythm of entrances and multiple retail units.

**19E. Character Area: Consistent Cornice Line**
Buildings in a Character Area should maintain a consistent cornice line for the first step-back by establishing a “datum line” or an average of the existing cornice line.

**19F. Character Area: Vertical Additions**
Additions to existing buildings is an alternative to redevelopment projects on the Avenues, and should be encouraged in areas with an existing urban fabric.

**19G. Character Area: Other Considerations**
Additional “context sensitive” design and massing guidelines should be considered for development in Character Areas.

BMI/Pace 37

*Figure 27 | Avenues and Mid-Rise Buildings Study: Performance Standards, 9 – 19G (BMI + Pace, 2010)*

Performance standards 4A through 8E influence the built form, such as step-backs (e.g. residential towers that cover a portion of the podium area) which are used to create a comfortable pedestrian experience, appropriate transitions between uses and building typologies, and to increase sunlight access to the sidewalk, as seen in . Performance standard 8C – Side Property Line: Step-backs at Upper Storeys, specifies that breaks should be added at upper storeys between new and existing buildings to provide sky-views and increase sunlight access to the sidewalk. It should be noted that the standards in the 2010 study do not directly refer to or comment on solar access or right-to-light with respect to solar technologies or renewable energy, rather sunlight access for the public realm (e.g. sidewalks). Under performance standard 13 – Roofs and Roofscapes, for example, "sustainable technologies are encouraged for the roofs of mid-rise buildings, such as photovoltaic panels" (BMI + Pace, 2010, p. 82). As a result, it is evident that renewable energy technologies are not an integral component of the standards or their creation.

Side step-backs were applied to the model geometry for the purposes of this study – both a model with tall street wall characteristics (i.e. high-podium model) and a model with a more porous street wall characteristic (i.e. low-podium model), as seen in , were modelled and analyzed. Performance standard 8C specifies:

- "Side property step-backs of 5.5-metres should be provided above the 80% height to increase sky views and sunlight access to the sidewalk;
- Where more "porous" street walls are desirable, side step-backs are encouraged above the minimum building height of 3 storeys;
- Buildings that are 20-metres or (6 storeys) in height or less, are not required to have upper storey side step-backs. (BMI + Pace, 2010, p. 74)"

Side property step-backs of 5.5-metres above 80 percent of the building height was applied as a guideline for the tall wall street model – high podium model. Side step-backs of 5.5-metres above the minimum height of 3 storeys was applied to the porous street wall model – low podium model. The purpose of the low podium versus high podium model is to compare the impact the porous street wall and tall street wall guidelines have on solar energy generation.

### 5.4 | Study Geometry

The analyses for the major research project started by comparing annual solar radiation levels, on roof and façade surfaces (i.e. kWh/m$^2$/year), for *existing built form*, *theoretical volume*, *high-podium* and *low-podium built form* within the project study area, as seen in Figure 27 – area outlined in purple. Although the entire project site is used for the simulations, only the properties and buildings adjacent to Eglinton Avenue West and Bathurst Street (i.e. to the north of Eglinton) are included in the analyses, as illustrated in Figure 28Figure 27 – area outlined in orange.

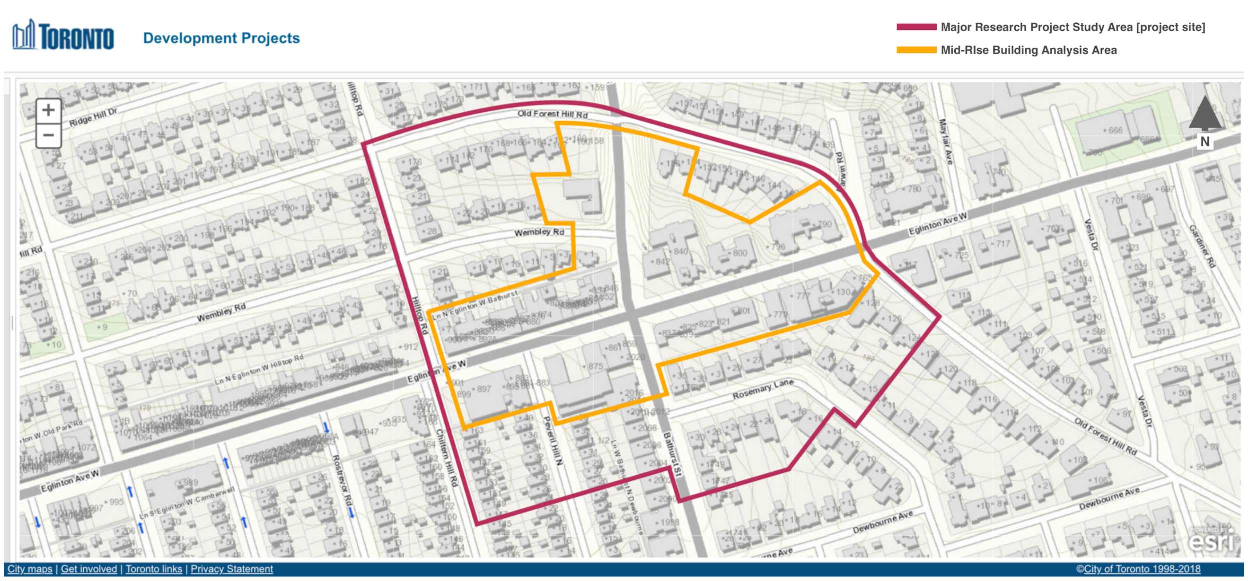



*Figure 28 | Project Study Area and Mid-Rise Building Analysis Area (City of Toronto, 2017b)*

The scenarios for the neighbourhood analysis are defined by the following terms:

1. **Existing Built Form –** Eglinton Avenue West is currently under construction for the Crosstown Light Rail Transit project, however, prior to commencement of the transit project, the buildings that occupied the properties along Eglington Avenue, within the site (i.e. based on the City of Toronto's open source data) were analyzed, as seen in Figure 21.
2. **Theoretical Volume –** Performance standard 1 – Maximum Allowable Height in the Avenues and Mid-Rise Buildings Study specifies that the "maximum allowable height of buildings on the Avenues will be no taller than the width of the Avenue right-of-way, up to a maximum mid-rise height of 11-storeys (i.e. 36-metres)" since there are four prevailing right-of-way widths with 36-metres being the widest right-of-way (BMI + Pace, 2010, p. 38). Eglinton Avenue West and Bathurst Street have a right-of-way of 27-metres. Not all sites will be able to achieve the maximum height because once the guidelines are applied, particularly depending on the lot depth, the maximum height of the building is typically less than the prevailing 20, 27, 30 and 36-metre right-of-way widths. Therefore, the definition of the theoretical volume comes from the idea that, in theory, the maximum height of the mid-rise buildings along Eglinton Avenue West and Bathurst street could be 27-metres, as seen in Figure 29.

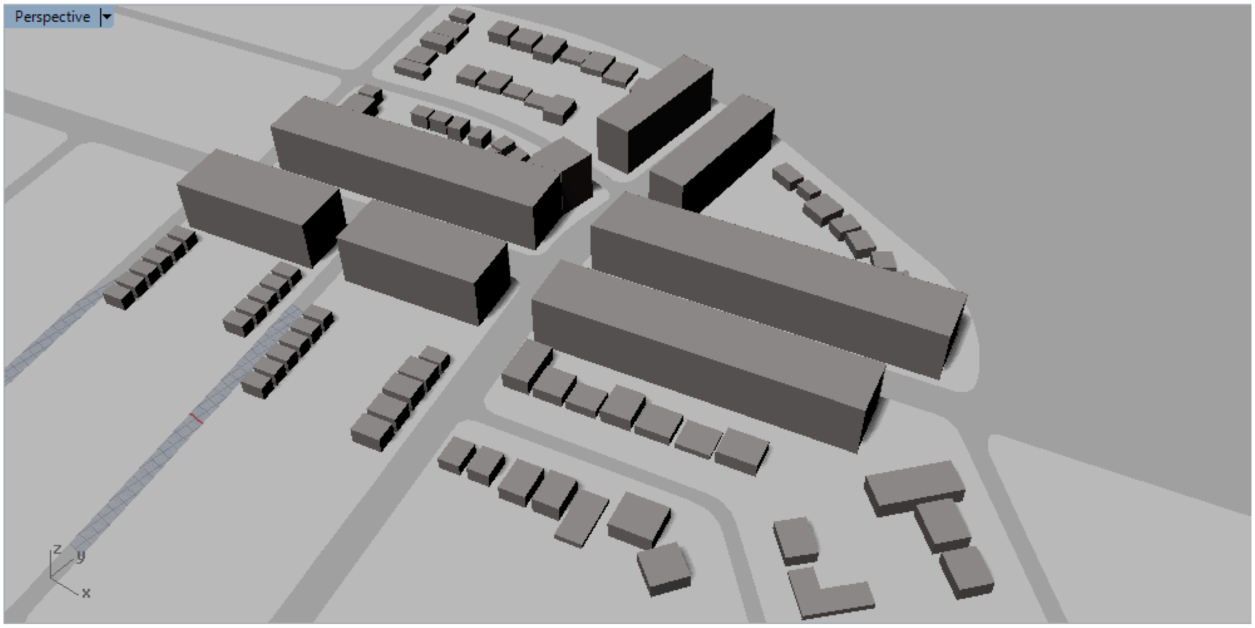



*Figure 29 | Rhinoceros model of Theoretical Volume - the project study area, looking north*

3. **High-Podium Built Form –** The high-podium built form represents the fourteen performance standards that were followed for this project, with the following Performance Standard 8C – Side Property Line: Step-backs at Upper Storeys applied for *tall street wall* applications: "Side property step-backs of 5.5-metres should be provided above the 80% height to increase sky views and sunlight access to the sidewalk" (BMI + Pace, 2010, p. 84). As seen in Figure 30, the purpose of the tall street wall is to provide continuous street walls, lined with shops, restaurants and other community services – continuity is desired for the success of the public realm along the Avenues.

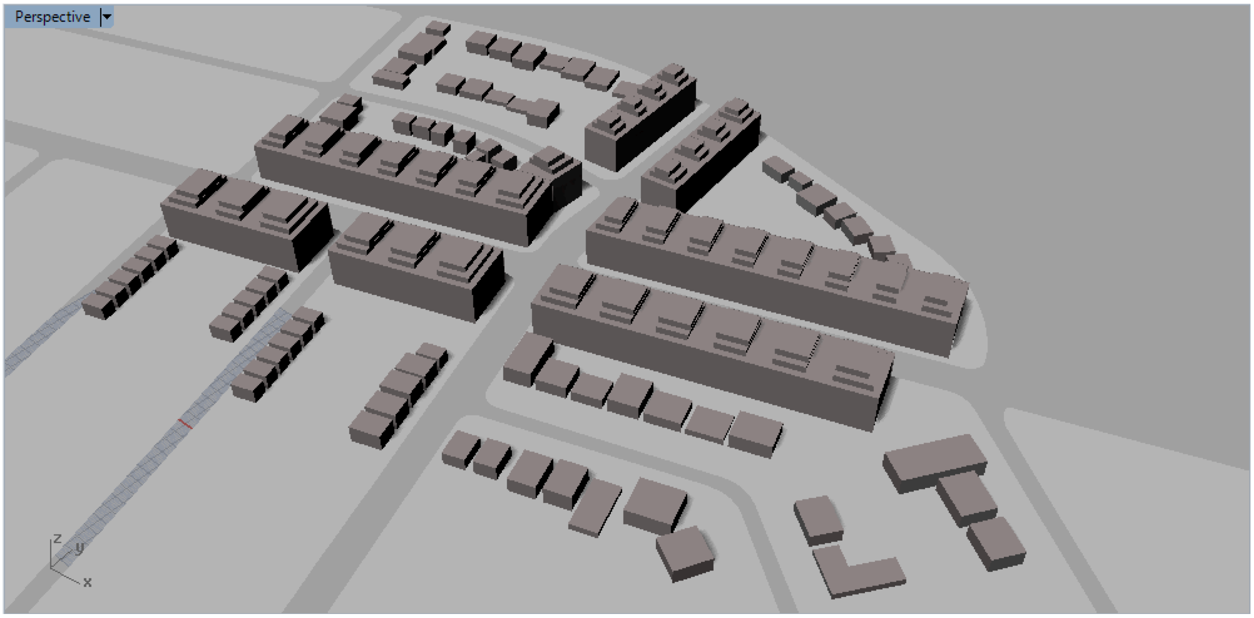



*Figure 30 | Rhinoceros model of High-Podium Built Form - the project study area, looking north*

4. **Low-Podium Built Form –** The low-podium built form represents the fourteen performance standards that were followed for this project, with the following Performance Standard 8C – Side Property Line: Step-backs at Upper Storeys applied for *porous street wall* applications: "where more 'porous' street walls are desirable, side step-backs are encouraged above the minimum building height of 3 storeys", as seen in (BMI + Pace, 2010, p. 84). The purpose of the porous street wall is to provide sky-views and sunlight access to the public realm which is outlined in the performance standards as important for larger rights-of-way.

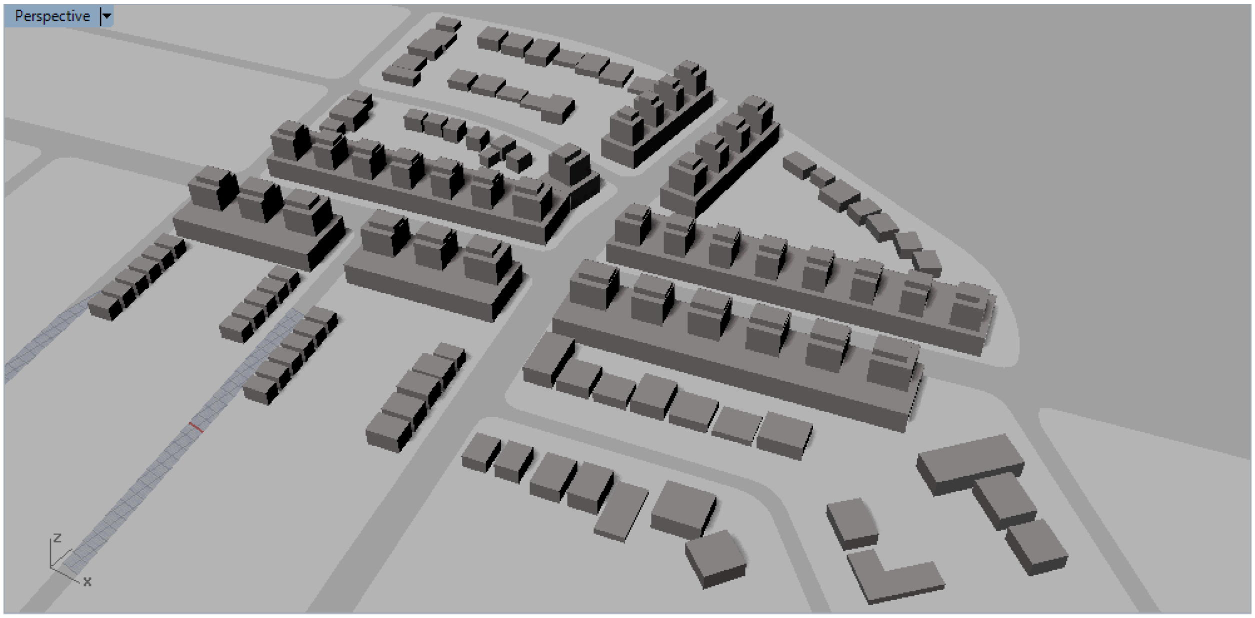



*Figure 31 | Rhinoceros model of Low-Podium Built Form - the project study area, looking north*

It should be noted that the building footprints of the theoretical volume, high-podium and low-podium mid-rises, are all the same. The mid-rise building heights in the scenarios, along with the height of the podiums and towers differ depending on which performance standards were applied (i.e. theoretical volume build form does not have podiums or towers – the buildings are rectangular prisms), however, high-podium and low-podium scenarios follow all fourteen performance standards, as outlined in Section 5.3.2.3 | Performance Standards for Mid-Rise Buildings – Geometry and summarized in Figure 32. Podiums are defined, for the purposes of this study, as the first few storeys that occupy the full extent of the buildings' footprint (i.e. typically allocated for retail or commercial uses); these storeys create the pedestrian environment through street walls – the ground-level facades that line the right-of-way. Towers are defined, for the purposes of this study, as the remaining storeys above the podium. Due to the Performance Standards, the towers are stepped back from the podium.

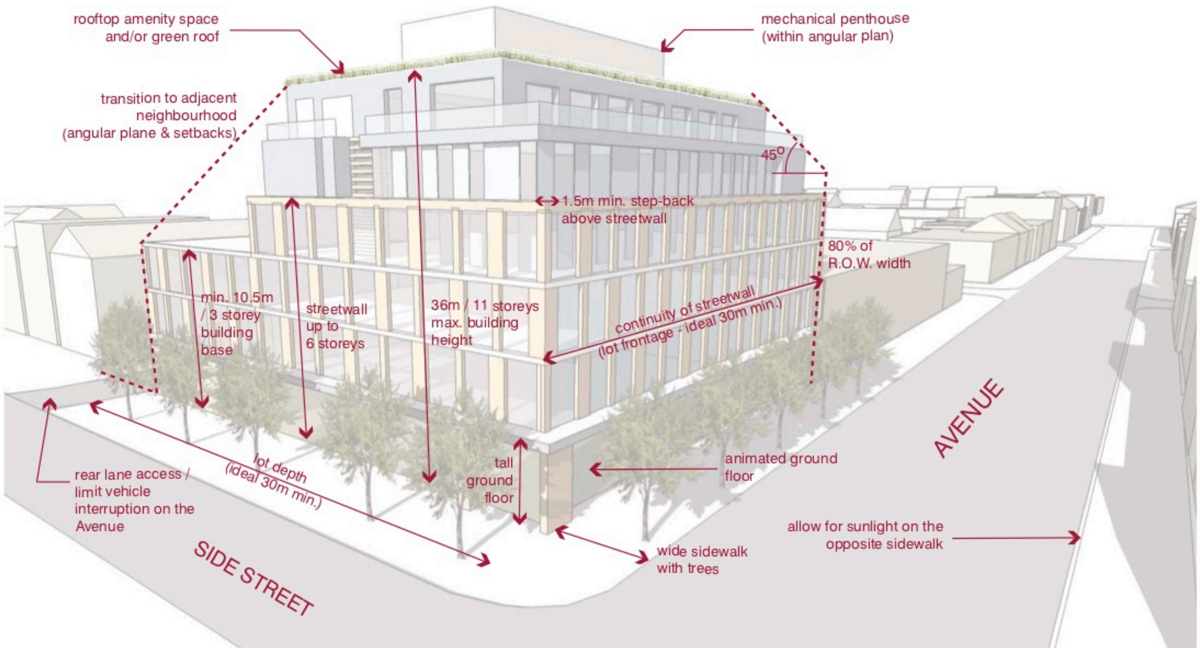



*Figure 32 | Diagram Illustrating Key Components of Avenues & Mid-Rise Buildings Study Performance Standards (BMI + Pace, 2010)*

## 5.5 | Limitations of the Research

Although Radiance, a validated software, is the backbone for the analysis using DIVA-for-Rhino, every software and methodology has its limitations. Although Radiance runs validated simulations, the following list of items, limit the accuracy of the results in this study.

### 5.5.1 | Energy Simulation Software Limitations

It is easier to analyze one building or a few buildings and their surroundings when starting solar analyses for a project with a new Rhino model. Geometry is the biggest hurdle to overcome when open source data is used as a starting point for a site's building geometry. Open source data, specifically the City of Toronto's open source data for 3D massing, such as the available SketchUp files, are difficult to integrate into Rhino and Grasshopper (i.e. surfaces are not recognized properly my components in Grasshopper) and therefore show low irradiance values or don't compute results due to issues with applying daylight analysis grids to open source data geometry (i.e. building surfaces). Further, complex geometry can also cause issues. Small surfaces or detailed facades (e.g. using many surfaces to represent accurately the geometry of a building) can cause simulation errors and slow simulations down. As a result, redrawing the geometry, either manually or using Grasshopper, rather than utilizing open source data, was a required first step for this project since existing buildings were also being analyzed (i.e. if analyzing new or proposed built form, this will not be a concern, apart from generating geometry for the existing surrounding built form, where mass is typically the most important factor anyways). It should be noted that once Grasshopper components are set up for generating geometry in both the Rhino and Grasshopper interface, the process is straightforward. However, this approach was not utilized during this major research project; the limitations of Grasshopper generated geometry, if any, are therefore not known. Further, for this major research project, since the proposed mid-rise buildings have been drawn using simplified geometry and existing buildings have been redrawn using simplified geometry that is not an identical representation of Toronto's built environment, solar simulations will possess some margin of error.

Furthermore, a key software limitation for this project includes the requirement of manually recording the irradiance values from Grasshopper and their geographic location, represented in Rhino (e.g. façade on 3$^{rd}$ storey of podium), in a spreadsheet. It should be noted that a list of results, as previously described and seen in Figure 21 and , can be exported as a text file which can be later imported into spreadsheet software, however, the values' geographical location and surface orientation (i.e. geotag) are not labelled, making meaningful post-analyses impossible. If another method is available for recording values based on orientation, and having those values labelled, this process would be very useful for analyzing buildings on a neighbourhood level (i.e. many buildings of low to mi-rise heights) or for tall building application (i.e. projects with few buildings but many surfaces). The methodology used in this major research project is still manageable for low-rise and mid-rise application, particularly when analyzing one building or a few buildings at once.

#### 5.5.2 | Solar Photovoltaic Technology

Due to the nature of the research, irradiance values were computed for building surfaces – roof and façade surfaces – in the project's study area along the Avenues. It should be noted that the results use these values for analysis. Irradiance values on façades for BIPV technology, for example, is a realistic representation of insolation values for such technology. However, irradiance values for roof surfaces are not as accurate of a representation because BAPVs are likely to be installed on roof surfaces. These technologies are more effective when installed at an angle, particularly in a city like Toronto that has a geographic location of 43° N, 79° W. As a result, the flat roof irradiation results from the Grasshopper simulations are not as accurate if BAPV technology is implemented physically on roof surfaces of buildings in the study area.

#### 5.5.3 | Weather Files

Weather files are an important component of energy simulation software and solar radiation simulations. The accuracy of weather files directly impacts the accuracy of simulation results as the weather files provide the software with the foundation upon which insolation values are calculated. The weather file used for this research project, although accurate and precise for past weather patterns, is likely not as accurate of a representation of future weather, however, newer data hasn't been vetted in the same way the older data sets have been. For this reason, a historical typical meteorological year [TMY] weather file was used for this project. It is likely, however, that newer weather file sets are a more realistic representation of the current and near future weather patterns for the City of Toronto (Williams & Harmer, 2016).

#### 5.5.4 | Vegetation

Although vegetation along Eglinton Avenue West at Bathurst Street is primarily newer trees (i.e. no old growth along Eglington Avenue within the study area) as seen in Figure 13, older growth is present to the north and south of Eglinton Avenue. Further, more importantly, the Avenues and Mid-Rise Buildings Study outlines that "streetscape design plays as important a role as the design of buildings in enhancing the Avenues and promoting strong pedestrian-oriented streets" and that "tree planting strategies should ensure sustainable conditions for the growth of mature trees on the Avenues" (BMI + Pace, 2010, p. 68). Although vegetation does not currently represent a large percentage of Eglinton Avenue West's streetscape, it will in the future. Therefore, the lack of representation of vegetation and the shadows it creates, both for trees along the right-of-way (i.e. which will need to be planted and maintained) and greenery on roofs, balconies, and podium terraces (i.e. which the extent of this vegetation coverage is not known), is a limitation of the research.

Therefore, limitations of the research include the energy simulation software, angles of surfaces based on solar technology to be applied, the weather files, and lack of representation of building geometry and vegetation in the simulations.

## 6.0 | Results and Discussion

The results can be sorted into two categories: neighbourhood data and high-podium and low-podium mid-rise building data. To start, a comparison of annual solar radiation levels (i.e. $kWh/m^2$ on an annual basis) was conducted for existing built form, theoretical volume, high-podium and low-podium built form on a project study area scale. Next, analyses were conducted on a building-by-building basis for high-podium and low-podium scenarios, based on the 2010 Avenues and Mid-Rise Buildings Study Performance Standards (i.e. the performance standards were also applied to the neighbourhood data to establish the high-podium and low-podium built form). The results are presented and discussed below, with supplementary data and information provided in the Appendices, as outlined in the following subsections.

### 6.1 | Neighbourhood Data

Neighbourhood data was obtained by running annual simulations for existing built form, theoretical volume, high-podium and low-podium built form scenarios. The data for all of the buildings in the mid-rise building analysis area, refer to the orange outlined area in Figure 27, are represented in the neighbourhood data analysis. As seen in Appendix C – 01: Neighbourhood Data, the data was split into two categories: roof and façade surfaces. The surface number is there just to provide a count for how many roof and façade surfaces are present. The total and average annual solar radiation levels were then calculated, along with the total solar radiation values on a neighbourhood scale for each scenario. As seen in

*Table 4 | Neighbourhood Data - Existing Built Form*

| Existing Built Form | | | | |
|---|---|---|---|---|
| Roof Surfaces | Annual Solar Radiation | | Area | Generation |
| [#] | [kWh/m2/year] | | [m2] | [kWh/year] |
| 34 | *Total:* | 43,169 | 16,083 | 694,291,998 |
| | *Average:* | 1,270 | | |
| Façade Surfaces | Annual Solar Radiation | | Area | Generation |
| [#] | [kWh/m2/year] | | [m2] | [kWh/year] |
| 116 | *Total:* | 66,743 | 26,870 | 1,793,384,178 |
| | *Average:* | 575 | | |
| | *'Neighbourhood' Total:* | 109,912 | 42,953 | 2,487,676,176 |

*Table 5 | Neighbourhood Data - Theoretical Volume Built Form*

| Theoretical Volume | | | | |
|---|---|---|---|---|
| Roof Surfaces | Annual Solar Radiation | | Area | Generation |
| [#] | [kWh/m2/year] | | [m2] | [kWh/year] |
| 37 | *Total:* | 48,184 | 21,077 | 1,015,581,431 |
| | *Average:* | 1,302 | | |
| Façade Surfaces | Annual Solar Radiation | | Area | Generation |
| [#] | [kWh/m2/year] | | [m2] | [kWh/year] |
| 88 | *Total:* | 50,818 | 52,909 | 2,688,762,615 |
| | *Average:* | 577 | | |
| | *'Neighbourhood' Total:* | 99,003 | 73,986 | 3,704,344,046 |

*Table 6 | Neighbourhood Data - High-Podium*

| Mid-Rise Built Form (High-Podium) | | | | |
|---|---|---|---|---|
| Roof Surfaces | Annual Solar Radiation | | Area | Generation |
| [#] | [kWh/m2/year] | | [m2] | [kWh/year] |
| 109 | *Total:* | 98,111 | 35,834 | 3,515,769,443 |
| | *Average:* | 900 | | |
| Façade Surfaces | Annual Solar Radiation | | Area | Generation |
| [#] | [kWh/m2/year] | | [m2] | [kWh/year] |
| 373 | *Total:* | 236,321 | 50,732 | 11,989,039,462 |
| | *Average:* | 634 | | |
| | *'Neighbourhood' Total:* | 334,432 | 86,567 | 15,504,808,905 |

*Table 7 | Neighbourhood Data - Low-Podium*

| Mid-Rise Built Form (Low-Podium) | | | | |
|---|---|---|---|---|
| Roof Surfaces | Annual Solar Radiation | | Area | Generation |
| [#] | [kWh/m2/year] | | [m2] | [kWh/year] |
| 109 | *Total:* | 112,779 | 30,634 | 3,454,919,444 |
| | *Average:* | 1,035 | | |
| Façade Surfaces | Annual Solar Radiation | | Area | Generation |
| [#] | [kWh/m2/year] | | [m2] | [kWh/year] |
| 811 | *Total:* | 491,729 | 47,316 | 23,266,398,006 |
| | *Average:* | 608 | | |
| | *'Neighbourhood' Total:* | 604,508 | 77,950 | 26,721,317,451 |

Table 4 through Table 7, annual solar radiation values for existing built form and theoretical volume are very similar. The approximately 110,000 kWh/m$^2$/year and

100,000 kWh/m$^2$/year for the existing built form and theoretical volume scenarios, respectively, are interesting because there are fewer, but larger roof areas in the existing built form scenario than there are in the theoretical volume scenario. Similarly, there are more façade surfaces in the existing built form scenario, yet, due to higher annual solar radiation levels for roofs, the neighbourhood total for existing built form is slightly higher than the theoretical volume neighbourhood total annual solar radiation. The comparison between the high and low-podium neighbourhood totals, however, is also interesting. Based on the simulation results, low-podium built form is more desirable for the project study area from an annual solar radiation perspective, as seen in Table 7 | Neighbourhood Data - High-Podium and Table 7 | Neighbourhood Data - Low-Podium. The annual solar radiation level for the low-podium built form scenario is almost double the amount of the high-podium scenario – annual solar radiation levels for the low-podium scenario are 604,508 kWh/m$^2$/year and 334,432 kWh/m$^2$/year for the high-podium scenario.

When comparing roof versus façade surfaces, the annual solar radiation levels for roofs are approximately 600 kWh/m$^2$/year for all four scenarios. Roofs, however, have a higher annual solar radiation level for existing built form and theoretical volume than high and low-podium roof surfaces (i.e. approximately 1,300 kWh/m$^2$/year and 950 kWh/m$^2$/year on average, respectively). Therefore, it is evident that the roofs on existing low-rise development (i.e. for buildings up to three storeys) and roofs with larger surface areas would benefit from solar technology such as BIPVs or BAPVs. Further, as discussed in Section 5.54.2 | Solar Photovoltaic Technology, these irradiation results are not as accurate if BAPV technology is implemented on roof surfaces in the study area as the BAPVs would likely be installed at an angle to take advantage of solar radiation angles, in which case, the annual solar radiation values are likely to be higher than the recorded 1,300 kWh/m$^2$/year.

The slightly lower average annual solar radiation values for roofs on high-podium and low-podium buildings can likely be attributed to the fact that the roof surfaces for these scenarios are located at different elevations, such as rooftop and podium terrace levels, resulting in different values due to the effects of shadowing.

### 6.2 | Mid-Rise Building Data

Eight buildings were selected for the mid-rise building data analyses, as seen in Figure 33Figure 29, from the 36 buildings in the mid-rise building analysis area – refer to the area outlined in orange in Figure 28 (i.e. the same eight buildings are analyzed for both high and low-podium scenarios). These eight buildings were selected based on their geographic location within the mid-rise building analysis area – four of the buildings are located at the Eglinton

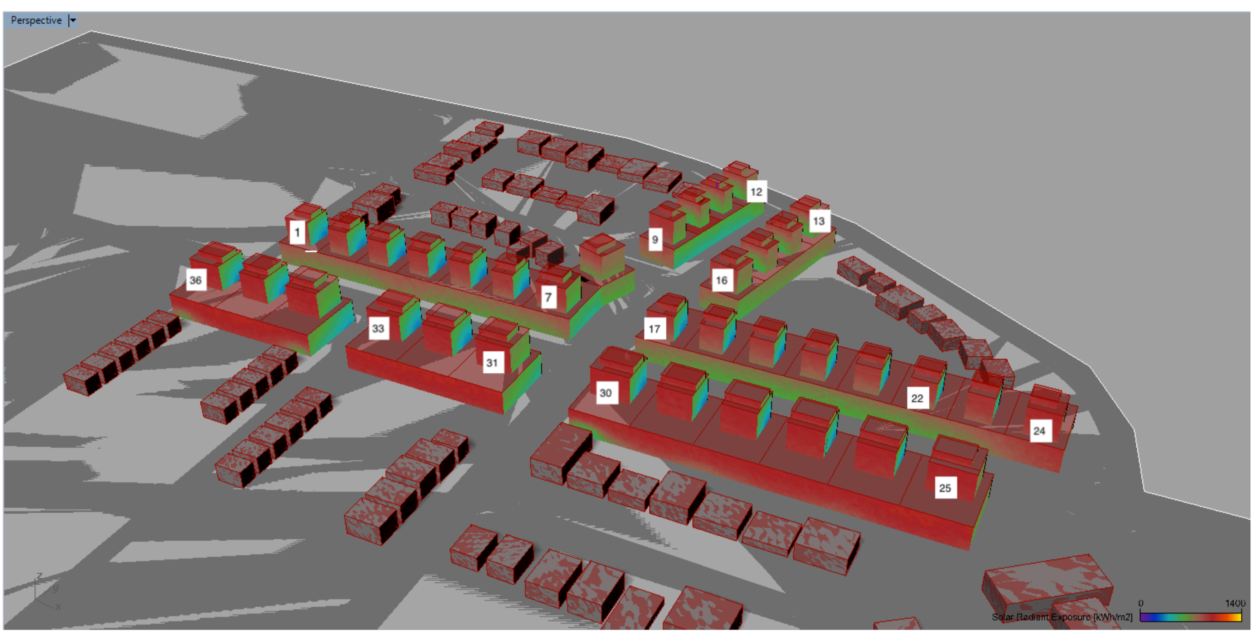



*Figure 33 | Buildings in the Mid-Rise Building Analysis Area – 36 buildings in total, with existing buildings for context, looking north*

Avenue West and Bathurst Street intersection and the remaining four are either located on Eglinton Avenue or Bathurst Street (i.e. the building only fronts one right-of-way). The buildings at the intersection were selected so that analyses of these buildings with frontage on both rights-of-way, and therefore surfaces that have exposure to the sun from multiple directions, can be analyzed. The remaining four buildings are found on either the east-west right-of-way (i.e. Eglinton Avenue West) or on the north-south right-of-way (i.e. Bathurst Street). The remaining four buildings provide context for analysis related to Avenues in Toronto that run primarily east-west and north-south since the City of Toronto's rights-of-way, and therefore majority of its Avenues, have been constructed using a grid formation that runs north-south and east-west.

The results for mid-rise building data (i.e. high-podium and low-podium built form) was obtained by running annual simulations for both built form scenarios (i.e. the results for mid-rise building data was used for both the neighbourhood data and mid-rise building data analyses). Unlike the neighbourhood data found in Appendix C, the annual solar radiation values for mid-rise building data was recorded with the associated surface number found in the Grasshopper components interface, as seen in Appendix C – 02: Mid-Rise Building Data – Annual Solar Radiation. As previously mentioned, the solar radiation levels and their corresponding surface numbers were manually recorded into the tables found in Appendix C – 02. The data was split up by roof and façade surfaces, and further divided by podium, orientation, and building storeys to provide meaningful context for further analysis. Solar annual radiation subtotals for roof types, podium versus tower surfaces, and façade orientations were also calculated.

Next, solar energy generation potential was calculated, as seen in Appendix C – 03: Mid-Rise Building Data – Solar Energy Generation. First, the area of all of the roof and façade surfaces (i.e. metres squared) was recorded by using the Rhino interface and measurement tool. Second, the area of solely the façade surfaces was reduced by 40 percent to represent the window-to-wall ratio [WWR]. Forty percent is an ideal WWR, however, it was selected because the purpose of this research is to determine the potential of solar energy generation (i.e. the WWR is an optimistic, but realistic number). Third, the energy production in kilowatt hours was calculated using the area without windows and annual solar radiation values for the corresponding surfaces, to determine the production (i.e. production = [kWh/$m^2$/year] x [$m^2$] = [kWh/year]). Fourth, the efficiency of typical solar photovoltaic technology, about 15 percent, was accounted for (Aggarwal, 2018; Murmson, 2017). The final values for energy production for high and low-podium buildings are therefore 15 percent of the production calculated in the third step of this process. Once the necessary data was recorded and the calculations were completed, the annual solar radiation tables were examined for solar radiation levels (i.e. the initial kWh/$m^2$/year). Surfaces with annual solar radiation levels of 700 kWh/$m^2$/year or higher were selected – refer to the purple highlighted cells in Appendix C – 03. Next, surfaces with annual solar radiation levels of 650 kWh/$m^2$/year or higher were selected – refer to the orange highlighted cells in Appendix C – 03. Benchmarks of 700 kWh/$m^2$/year and 650 kWh/$m^2$/year were selected as reasonable thresholds for annual solar radiation. Since, at 700 kWh/$m^2$/year, photovoltaic technology with a 15 percent efficiency can produce up to 105 kWh/$m^2$/year and at 650 kWh/$m^2$/year can produce up to 97.5 kWh/$m^2$/year (Kanters & Horvat, 2012; Kanters & Wall, 2014). Lastly, subtotals and totals for the energy production on a building, tower, and podium level, at 700 and 650 kWh/m$^2$/year per surface or higher, were added. These subtotals and totals allow for analyses at different annual solar radiation levels and benchmarks.

The final step of the mid-rise building data analysis included calculating the building energy consumption based on building uses – retail, commercial, or residential uses and the potential percentage of energy savings from solar energy generation (i.e. solar photovoltaic technology), as seen in Appendix C – 04: Mid-Rise Building Data – Percentage of Building Energy Use Covered by Renewables. First, the area of each storey was recorded. Second, the areas of each floor were subtracted by the typical common area percentages, per building use – 5 percent for retail spaces, 11 percent for commercial spaces, and 30 percent for residential spaces (CBRE, 2012). Third, the energy use per floor was calculated using typical values for annual energy use per square metre per building use – 395 kWh/m$^2$/year for retail spaces, 361 kWh/m$^2$/year for commercial spaces, and 270 kWh/m$^2$/year for residential spaces (City of Toronto, 2007, p. 80). Once the necessary data was recorded and the calculations were completed, the subtotals and totals for the energy use on a building, tower, and podium level were added. Lastly, electricity generated (i.e. kWh/year) was compared to electricity used (i.e. kWh/year) on a building-by-building basis, at 700 and 650 kWh/m$^2$/year per surface or higher, to determine the potential percentage of electricity that can be saved by implementing solar photovoltaic technology on mid-rise buildings along the Avenues.

#### 6.2.1 | Solar Energy Generation Potential

Solar energy generation potential was conducted for eight buildings within the mid-rise building analysis area, as seen in Figure 34 – buildings at the intersection of Eglinton

Avenue West and Bathurst Street (i.e. building SW – 31, NW – 7, NE – 17 and SE – 30), buildings along Eglinton Avenue West (i.e. building S – 26 and N – 22), and buildings along Bathurst Street (i.e. building E – 14 and W – 10) were analyzed.

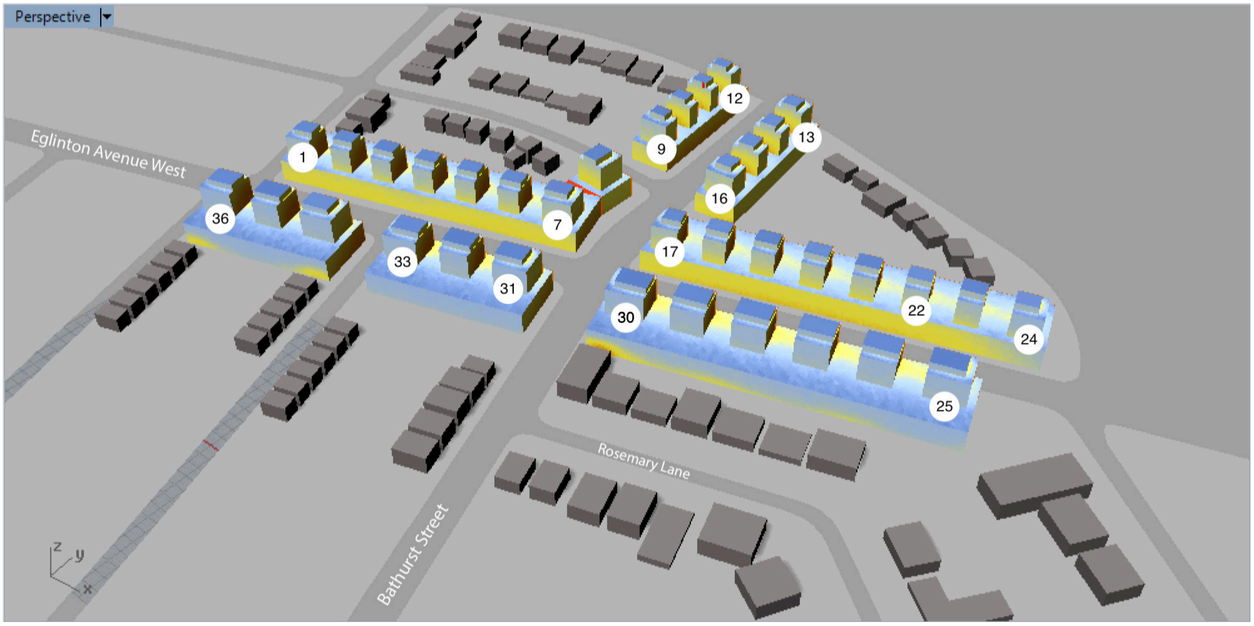



*Figure 34 | Building Key for buildings in the Mid-Rise Building Analysis Area, looking north from the south side of the study area – the eight selected buildings are labelled*

### *6.2.1.1 | High Podium Results*

*Buildings at the Intersection* – As seen in Figure 35, the south-east building, building 30, has the highest annual solar radiation values of the corner buildings at a benchmark of 700 kWh/$m^2$/year or higher, at approximately 97,400 kWh/year; building 31, located at the south-west corner, is a close second with approximately 96,700 kWh/year. The buildings on the northern corners perform more poorly than the buildings on the southern corner – the north-east building performs approximately 3 percent more poorly and the north-west building performs 36 percent more poorly than the southern buildings. However, both buildings on the north corners perform better than the southern buildings when an annual solar radiation benchmark of 650 kWh/$m^2$/year or higher is applied. For example, the northern buildings generate 122,000 and 112,000 kWh/year at a benchmark of 650 kWh/$m^2$/year or higher, while the southern buildings at the intersection generate 97,000 to 100,000 kWh/year. It is expected that the buildings south of Eglinton Avenue will

**High Podium Energy Generation - Buildings at Eglinton Avenue West and Bathurst Street (Corner Buildings)**

**South-West Corner of Eglinton & Bathurst**

| Building: 31 | Annual Solar Radiation Benchmark | Production [kWh/year] |
|---|---|---|
| Total Building: | *>700 kWh/m2/year* | 96,665 |
| | >650 kWh/m2/year | 99,882 |
| Total Tower: | *>700 kWh/m2/year* | 74,275 |
| | >650 kWh/m2/year | 77,492 |
| Total Podium: | *>700 kWh/m2/year* | 22,390 |
| | >650 kWh/m2/year | 22,390 |

**North-West Corner of Eglinton & Bathurst**

| Building: 07 | Annual Solar Radiation Benchmark | Production [kWh/year] |
|---|---|---|
| Total Building: | *>700 kWh/m2/year* | 61,680 |
| | >650 kWh/m2/year | 121,990 |
| Total Tower: | *>700 kWh/m2/year* | 61,680 |
| | >650 kWh/m2/year | 75,008 |
| Total Podium: | *>700 kWh/m2/year* | - |
| | >650 kWh/m2/year | 14,839 |

**North-East Corner of Eglinton & Bathurst**

| Building: 17 | Annual Solar Radiation Benchmark | Production [kWh/year] |
|---|---|---|
| Total Building: | *>700 kWh/m2/year* | 93,975 |
| | >650 kWh/m2/year | 111,770 |
| Total Tower: | *>700 kWh/m2/year* | 60,343 |
| | >650 kWh/m2/year | 64,626 |
| Total Podium: | *>700 kWh/m2/year* | 33,633 |
| | >650 kWh/m2/year | 47,144 |

**South-East Corner of Eglinton & Bathurst**

| Building: 30 | Annual Solar Radiation Benchmark | Production [kWh/year] |
|---|---|---|
| Total Building: | *>700 kWh/m2/year* | 97,414 |
| | >650 kWh/m2/year | 97,414 |
| Total Tower: | *>700 kWh/m2/year* | 78,429 |
| | >650 kWh/m2/year | 78,429 |
| Total Podium: | *>700 kWh/m2/year* | 18,985 |
| | >650 kWh/m2/year | 18,985 |

*Figure 35 | High podium energy generation for the buildings at Eglinton Avenue West and Bathurst Street* receive higher levels of annual solar radiation levels, due to their orientation. Similarly, the buildings on the east side of Bathurst Street receive the solar radiation from the west side, which is also expected due to its positioning. This occurrence may also be a result of the lower benchmark, allowing the northern buildings to receive higher total annual solar radiation measures due to the built form – high-podium built form has more surface area at the tower level than low-podium built form and the lower benchmark (i.e. 650 kWh/m$^2$/year or higher) allows more surfaces to be included in the energy generation potential calculations.

An additional component of the solar energy generation potential analysis included separating the energy generated on the roof of the tower and the tower facades from the energy generated on the roof of the podium and the podium facades and analyzing the energy generation potential. Towers perform significantly better than the podiums in this case. In some instances, the podiums are not able to generate any energy or a fraction of the total energy the building can generate as a whole, however, the building on the north-east corner is able to generate about a third of its energy from the podium alone at 700 kWh/m$^2$/year or higher and about 40 percent at 650 kWh/m$^2$/year or higher. This occurrence is likely due to the fact that towers use less energy; residential energy use (i.e. towers) is relatively lower than energy use for retail and commercial uses (i.e. podiums). It is therefore easier to generate a higher percentage of the towers' total annual energy use than it is to generate energy for the retail and commercial uses in the podiums.

*Eglinton Avenue West Buildings* – The building on the south side of Eglinton Avenue performs better in every respect for energy generation – on a building level, on a tower level and on a podium level, as seen in Figure 36. It is interesting to note, however, that there is no difference on an individual building basis with respect to annual solar radiation levels between the 700 and 650 kWh/m²/year or higher results on a building level, on a tower level and on a podium level.

| High Podium Energy Generation - Buildings on Eglinton Avenue West | | | | | |
|---|---|---|---|---|---|
| South-Side of Eglinton Avenue | | | North-Side of Eglinton Avenue | | |
| Building: 26 | | | Building: 22 | | |
| | Annual Solar Radiation Benchmark | Production [kWh/year] | | Annual Solar Radiation Benchmark | Production [kWh/year] |
| Total Building: | *>700 kWh/m2/year* | 143,578 | Total Building: | *>700 kWh/m2/year* | 88,062 |
| | >650 kWh/m2/year | 143,578 | | >650 kWh/m2/year | 88,062 |
| Total Tower: | *>700 kWh/m2/year* | 81,487 | Total Tower: | *>700 kWh/m2/year* | 45,952 |
| | >650 kWh/m2/year | 81,487 | | >650 kWh/m2/year | 45,952 |
| Total Podium: | *>700 kWh/m2/year* | 62,091 | Total Podium: | *>700 kWh/m2/year* | 42,110 |
| | >650 kWh/m2/year | 62,091 | | >650 kWh/m2/year | 42,110 |

*Figure 36 | High podium energy generation for buildings along Eglinton Avenue West*

*Bathurst Street Buildings* – As seen in Figure 37, building 10 on the west side of Bathurst Street performs slightly better than the building on the east. Further, energy generation potential is typically better at 650 kWh/m²/year or higher than 700 kWh/m²/year or higher. However, the podium for the building on the east side of the right-of-way performs better for both benchmarks.

| High Podium Energy Generation - Buildings on Bathurst Street | | | | | |
|---|---|---|---|---|---|
| East-Side Bathurst | | | West-Side Bathurst | | |
| Building: 14 | | | Building: 10 | | |
| | Annual Solar Radiation Benchmark | Production [kWh/year] | | Annual Solar Radiation Benchmark | Production [kWh/year] |
| Total Building: | *>700 kWh/m2/year* | 64,702 | Total Building: | *>700 kWh/m2/year* | 71,730 |
| | >650 kWh/m2/year | 80,962 | | >650 kWh/m2/year | 83,548 |
| Total Tower: | *>700 kWh/m2/year* | 28,986 | Total Tower: | *>700 kWh/m2/year* | 52,202 |
| | >650 kWh/m2/year | 32,320 | | >650 kWh/m2/year | 52,202 |
| Total Podium: | *>700 kWh/m2/year* | 35,715 | Total Podium: | *>700 kWh/m2/year* | 19,527 |
| | >650 kWh/m2/year | 35,715 | | >650 kWh/m2/year | 31,346 |

*Figure 37 | High podium energy generation for buildings along Bathurst Street*

### *6.2.1.2 | Low Podium Results*

*Buildings at the Intersection* – Once again, the buildings on the south side of the intersection perform better than the buildings on the north side of the intersection, as seen in Figure 38.

Building 31 at the south-west corner has the highest annual solar energy generation among the low podium buildings at the intersection. The south-east building generates approximately 60,000 to 70,000 kWh/year less than building 31 – approximately 40 percent less. It is interesting to note that almost all buildings in the low-podium scenario generate more solar energy at 650 kWh/m$^2$/year or higher than at 700 kWh/m$^2$/year or higher.

Towers perform better than the podiums for the north-west and south-east buildings. Podiums, however, perform better for the south-west and north-east buildings. For the low podium scenario, all podiums are able to generate energy, unlike the high podium scenario. Towers use less energy; residential energy use (i.e. towers) is relatively lower than energy use for retail and commercial uses (i.e. podiums). For example, building 30 has an energy consumption of 133,475 kWh/year for its tower and 1,109,177 kWh/year for its podium – for calculations, refer to Appendix C. Therefore, it is easier to compensate residential energy use with solar energy generation. Similarly, roof and façade surfaces on towers are located at higher altitudes than podium surfaces, allowing for higher irradiance levels and more solar radiation to be taken advantage of in the solar energy generation process.

| Low Podium Energy Generation - Buildings at Eglinton Avenue West and Bathurst Street (Corner Buildings) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **South-West Corner of Eglinton & Bathurst** | | | | **North-West Corner of Eglinton & Bathurst** | | | |
| **Building: 31** | | | | **Building: 07** | | | |
| | **Annual Solar Radiation Benchmark** | | **Production** [kWh/year] | | **Annual Solar Radiation Benchmark** | | **Production** [kWh/year] |
| Total Building: | | *>700 kWh/m2/year* | 158,195 | Total Building: | | *>700 kWh/m2/year* | 33,759 |
| | | >650 kWh/m2/year | 169,022 | | | >650 kWh/m2/year | 40,884 |
| Total Tower: | | *>700 kWh/m2/year* | 59,343 | Total Tower: | | *>700 kWh/m2/year* | 17,841 |
| | | >650 kWh/m2/year | 70,170 | | | >650 kWh/m2/year | 24,966 |
| Total Podium: | | *>700 kWh/m2/year* | 98,852 | Total Podium: | | *>700 kWh/m2/year* | 15,918 |
| | | >650 kWh/m2/year | 98,852 | | | >650 kWh/m2/year | 15,918 |
| **North-East Corner of Eglinton & Bathurst** | | | | **South-East Corner of Eglinton & Bathurst** | | | |
| **Building: 17** | | | | **Building: 30** | | | |
| | **Annual Solar Radiation Benchmark** | | **Production** [kWh/year] | | **Annual Solar Radiation Benchmark** | | **Production** [kWh/year] |
| Total Building: | | *>700 kWh/m2/year* | 72,661 | Total Building: | | *>700 kWh/m2/year* | 98,339 |
| | | >650 kWh/m2/year | 75,231 | | | >650 kWh/m2/year | 102,713 |
| Total Tower: | | *>700 kWh/m2/year* | 20,572 | Total Tower: | | *>700 kWh/m2/year* | 79,183 |
| | | >650 kWh/m2/year | 23,141 | | | >650 kWh/m2/year | 83,557 |
| Total Podium: | | *>700 kWh/m2/year* | 52,090 | Total Podium: | | *>700 kWh/m2/year* | 19,157 |
| | | >650 kWh/m2/year | 52,090 | | | >650 kWh/m2/year | 19,157 |

*Figure 38 | Low podium energy generation for the buildings at Eglinton Avenue West and Bathurst Street*

*Eglinton Avenue West Buildings* – The building on the south side of Eglinton Avenue performs better in every respect for energy generation – on a building level, on a tower level and on a podium level, as seen in Figure 39. Further, more solar energy is generated at 650 kWh/m²/year or higher than at 700 kWh/m²/year or higher. This is due to the fact that the buildings on the north side of the street are shaded by the buildings to the south.

| Low Podium Energy Generation - Buildings on Eglinton Avenue West | | | | | | | |
|---|---|---|---|---|---|---|---|
| **South-Side of Eglinton Avenue** | | | | **North-Side of Eglinton Avenue** | | | |
| **Building: 26** | | | | **Building: 22** | | | |
| | **Annual Solar Radiation Benchmark** | | **Production** [kWh/year] | | **Annual Solar Radiation Benchmark** | | **Production** [kWh/year] |
| Total Building: | | *>700 kWh/m2/year* | 66,283 | Total Building: | | *>700 kWh/m2/year* | 39,766 |
| | | >650 kWh/m2/year | 70,603 | | | >650 kWh/m2/year | 64,025 |
| Total Tower: | | *>700 kWh/m2/year* | 43,727 | Total Tower: | | *>700 kWh/m2/year* | 39,766 |
| | | >650 kWh/m2/year | 48,047 | | | >650 kWh/m2/year | 46,178 |
| Total Podium: | | *>700 kWh/m2/year* | 22,556 | Total Podium: | | *>700 kWh/m2/year* | - |
| | | >650 kWh/m2/year | 22,556 | | | >650 kWh/m2/year | 17,847 |

*Figure 39 | Low podium energy generation for buildings along Eglinton Avenue West*

*Bathurst Street Buildings* – As seen in Figure 40, the building on the west side of Bathurst Street performs better in every respect for energy generation – on a building, tower and podium level. Further, energy generation potential is better at 650 kWh/m2/year or higher than 700 kWh/m2/year or higher. Similar to buildings along the south side of Eglinton Avenue, buildings on the east side of Bathurst do not shade the building on the west side of the right-of-way as much.

| Low Podium Energy Generation - Buildings on Bathurst Street | | | | | |
|---|---|---|---|---|---|
| East-Side Bathurst | | | West-Side Bathurst | | |
| Building: 14 | | | Building: 10 | | |
| Annual Solar Radiation Benchmark | | Production [kWh/year] | Annual Solar Radiation Benchmark | | Production [kWh/year] |
| Total Building: | *>700 kWh/m2/year* | 79,575 | Total Building: | *>700 kWh/m2/year* | 112,436 |
| | >650 kWh/m2/year | 101,738 | | >650 kWh/m2/year | 123,047 |
| Total Tower: | *>700 kWh/m2/year* | 37,304 | Total Tower: | *>700 kWh/m2/year* | 43,432 |
| | >650 kWh/m2/year | 46,421 | | >650 kWh/m2/year | 54,042 |
| Total Podium: | *>700 kWh/m2/year* | 42,271 | Total Podium: | *>700 kWh/m2/year* | 69,005 |
| | >650 kWh/m2/year | 55,316 | | >650 kWh/m2/year | 69,005 |

*Figure 40 | Low podium energy generation for buildings along Bathurst Street*

*Solar Energy Generation Potential* – Overall, the low-podium model generates more solar energy than the high-podium model for the eight buildings analyzed. However, it is interesting to note that the building on the north side of Eglinton Avenue West, building 22, and the building at the north-west corner of the intersection, building 7, generate more solar energy by following the *tall street wall* performance standards application for high-podium built form, than the *porous street wall* performance standards application for low-podium built form from the Avenues and Mid-Rise Buildings Study. The taller built form allows the buildings on these parcels of land to be exposed for longer periods of time to the sun's solar radiation.

### 6.2.2 | Building Energy Use and Solar Energy Generation – Potential Savings

Potential savings for building energy use, based on the solar energy generation results from Section 6.2.1 | Solar Energy Generation Potential, was conducted for the same eight buildings within the mid-rise building analysis area (i.e. also from Section 6.2.1 | Solar

Energy Generation Potential), as seen in Figure 34 – buildings at the intersection of Eglinton Avenue West and Bathurst Street (i.e. building SW – 31, NW – 7, NE – 17 and SE – 30), buildings along Eglinton Avenue West (i.e. building S – 26 and N – 22), and buildings along Bathurst Street (i.e. building E – 14 and W – 10) were analyzed.

***Entire Building*** – Overall, low-podium, porous street wall, built form provides higher energy savings, defined as the difference between energy consumption and energy generation, for the eight buildings analyzed in the mid-rise building analysis area, on a whole building level.

*Buildings at the Intersection* – High-podium built form provides 5 to 12 percent energy savings for buildings at the intersection, whereas low-podium built form provides 4 to 18 percent energy savings on a building level (i.e. energy use and energy generation for the entire building). As seen in Figure 41 and Figure 42 low-podium built form provides higher energy savings on a building scale for the south-west and south-east buildings at the intersection (i.e. SW – 31 and SE – 30). High-podium built form provides higher energy savings for buildings found on the north side of the intersection (i.e. NW – 7 and NE – 17), except for the north-east building with annual solar radiation levels of 650 $kWh/m^2$/year or higher, which low-podium built form provides slightly higher energy savings for. Overall, low-podium built form provides higher energy savings for buildings located at the intersection of Eglinton Avenue West and Bathurst Street.

*Eglinton Avenue West Buildings* – High-podium built form provides 8 percent and 12 percent energy savings for the north and south building, respectively, on Eglinton Avenue, compared to the 5 to 9 percent and 7 percent energy savings for the north and south building in the low-podium built form model, respectively. Overall, high-podium built form provides higher energy savings for buildings located on Eglinton Avenue West. High-podium built form provides more façade surface area for higher irradiance values, in this case, compared to low-podium built form. Further, the project study area is comprised of low-rise development (i.e. one to three storeys) to the north and south of the mid-rise building study area, providing little to no shadows on the mid-rise buildings analyzed in the high and low-podium scenarios.

*Bathurst Street Buildings* – Low-podium built form provides 15 to 19 percent energy savings for the east-side building and 25 to 27 percent for the west side building. High-podium built form provides 10 to 12 percent energy savings for the east-side building and 12 to 14 percent for the west side building. So far, the low-podium provides the highest savings potential on a building scale for the buildings found along Bathurst Street, a right-of-way that roughly follows a north-to-south direction. Overall, low-podium built form provides higher energy savings for buildings located on Bathurst Street. Low-podium built form allows higher levels of solar radiation to reach both the east and west building on Bathurst Street, compared to high-podium built form. Although the high-podium built form scenario provides more surface area for the towers on Bathurst Street, it also creates larger shadows.

***Podium: 1st to 3rd Storeys*** – Energy savings on a podium level is very low – less than 10 percent savings can typically be observed both for high and low podium scenarios. As previously mentioned, podiums consist of retail and commercial uses, which use more energy on a per unit area, making it more difficult to achieve high levels of energy savings. It is easier to generate a higher percentage of the towers' total annual energy use than it is to generate energy for the retail and commercial uses in the podiums. Overall, low-podium built form provides higher energy savings for the eight buildings analyzed in the mid-rise building analysis area, on a podium level.

*Buildings at the Intersection* – Both low-podium and high-podium built form provide less than 10 percent energy savings on a podium level, with the exception of the south-west building at the intersection with a 13 percent energy saving potential.

*Eglinton Avenue West Buildings* – High-podium built form provides less than 10 percent energy savings on a podium level for the buildings along Eglinton Avenue, with low-podium built form proving less than 5 percent energy savings.

*Bathurst Street Buildings* – High-podium built form provides less than 10 percent energy savings on a podium level for the buildings along Bathurst Street, while low-podium built form provides 10 to 19 percent energy savings – the highest energy savings potential for podium level calculations (i.e. for podiums alone).

***Tower: 4$^{th}$ to 8$^{th}$ Storeys*** – Energy savings on a tower level has the highest potential – energy savings of 11 to 59 percent can be observed. Overall, low-podium built form provides higher energy savings for the eight buildings analyzed in the mid-rise building analysis area, on a tower level. As previously mentioned, towers have a lower energy demand than podiums due to the uses that occupy the spaces. Residential energy use (i.e. towers) is relatively lower than energy use for retail and commercial uses (i.e. podiums), making it easier to compensate the total annual energy use of towers with solar energy generation. Similarly, roof and façade surfaces on towers are located at higher altitudes than podium surfaces, allowing for higher irradiance levels, fewer obstructions and shadow impacts, and overall higher solar energy generation potential.

*Buildings at the Intersection* – Overall, low-podium built form provides higher energy savings for buildings located at the intersection of Eglinton Avenue West and Bathurst Street, on a tower level. As seen in Figure 42, the south-west and south-east buildings are provided with a 26 to 31 percent energy savings and 35 to 37 percent energy savings, respectively. High-podium built form provides higher energy savings for the north-west building, 13 percent at 700 $kWh/m^2$/year or higher and both built form scenarios provide 15 percent energy savings potential for 650 $kWh/m^2$/year or higher.

*Eglinton Avenue West Buildings* – Overall, low-podium built form provides higher energy savings for buildings located on Eglinton Avenue West, on a tower level. Low-podium built form provides 22 to 24 percent energy savings for the south building and 31 to 36 percent energy savings for the north building.

*Bathurst Street Buildings* – Overall, low-podium built form provides higher energy savings for buildings located on Bathurst Street, on a tower level. Low-podium built form provides 32 to 40 percent energy savings for the east building and 48 to 59 percent energy savings for the west building on Eglinton Avenue. These potential energy savings are the highest for tower level calculations (i.e. for towers alone).

## High Podium Energy Savings Potential - Buildings at Eglinton Avenue West and Bathurst Street (Corner Buildings)

### South-West Corner of Eglinton & Bathurst

**Building: 31**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| Entire Building | [kWh/year] | Entire Building | [kWh/year] |
| Generated Electricity: | 96,665 | Generated Electricity: | 99,882 |
| Used Electricity: | 1,278,171 | Used Electricity: | 1,278,171 |
| Percentage saved: | 8% | Percentage saved: | 8% |
| 4th - 8th Storeys | [kWh/year] | 4th - 8th Storeys | [kWh/year] |
| Generated Electricity: | 74,275 | Generated Electricity: | 77,492 |
| Used Electricity: | 545,846 | Used Electricity: | 545,846 |
| Percentage saved: | 14% | Percentage saved: | 14% |
| 1st - 3rd Storeys | [kWh/year] | 1st - 3rd Storeys | [kWh/year] |
| Generated Electricity: | 22,390 | Generated Electricity: | 22,390 |
| Used Electricity: | 732,325 | Used Electricity: | 732,325 |
| Percentage saved: | 3% | Percentage saved: | 3% |

### North-West Corner of Eglinton & Bathurst

**Building: 07**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| Entire Building | [kWh/year] | Entire Building | [kWh/year] |
| Generated Electricity: | 61,680 | Generated Electricity: | 121,990 |
| Used Electricity: | 1,143,144 | Used Electricity: | 1,143,144 |
| Percentage saved: | 5% | Percentage saved: | 11% |
| 4th - 8th Storeys | [kWh/year] | 4th - 8th Storeys | [kWh/year] |
| Generated Electricity: | 61,680 | Generated Electricity: | 75,008 |
| Used Electricity: | 483,990 | Used Electricity: | 483,990 |
| Percentage saved: | 13% | Percentage saved: | 15% |
| 1st - 3rd Storeys | [kWh/year] | 1st - 3rd Storeys | [kWh/year] |
| Generated Electricity: | 0 | Generated Electricity: | 14,839 |
| Used Electricity: | 659,153 | Used Electricity: | 659,153 |
| Percentage saved: | 0% | Percentage saved: | 2% |

### North-East Corner of Eglinton & Bathurst

**Building: 17**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| Entire Building | [kWh/year] | Entire Building | [kWh/year] |
| Generated Electricity: | 93,975 | Generated Electricity: | 111,770 |
| Used Electricity: | 946,510 | Used Electricity: | 946,510 |
| Percentage saved: | 10% | Percentage saved: | 12% |
| 4th - 8th Storeys | [kWh/year] | 4th - 8th Storeys | [kWh/year] |
| Generated Electricity: | 60,343 | Generated Electricity: | 64,626 |
| Used Electricity: | 392,404 | Used Electricity: | 392,404 |
| Percentage saved: | 15% | Percentage saved: | 16% |
| 1st - 3rd Storeys | [kWh/year] | 1st - 3rd Storeys | [kWh/year] |
| Generated Electricity: | 33,633 | Generated Electricity: | 47,144 |
| Used Electricity: | 554,106 | Used Electricity: | 554,106 |
| Percentage saved: | 6% | Percentage saved: | 9% |

### South-East Corner of Eglinton & Bathurst

**Building: 30**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| Entire Building | [kWh/year] | Entire Building | [kWh/year] |
| Generated Electricity: | 97,414 | Generated Electricity: | 97,414 |
| Used Electricity: | 1,242,652 | Used Electricity: | 1,242,652 |
| Percentage saved: | 8% | Percentage saved: | 8% |
| 4th - 8th Storeys | [kWh/year] | 4th - 8th Storeys | [kWh/year] |
| Generated Electricity: | 78,429 | Generated Electricity: | 78,429 |
| Used Electricity: | 530,669 | Used Electricity: | 530,669 |
| Percentage saved: | 15% | Percentage saved: | 15% |
| 1st - 3rd Storeys | [kWh/year] | 1st - 3rd Storeys | [kWh/year] |
| Generated Electricity: | 18,985 | Generated Electricity: | 18,985 |
| Used Electricity: | 711,983 | Used Electricity: | 711,983 |
| Percentage saved: | 3% | Percentage saved: | 3% |

## High Podium Energy Savings Potential - Buildings on Eglinton Avenue West

### South-Side of Eglinton Avenue

**Building: 26**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| Entire Building | [kWh/year] | Entire Building | [kWh/year] |
| Generated Electricity: | 143,578 | Generated Electricity: | 143,578 |
| Used Electricity: | 1231683 | Used Electricity: | 1231683 |
| Percentage saved: | 12% | Percentage saved: | 12% |
| 4th - 8th Storeys | [kWh/year] | 4th - 8th Storeys | [kWh/year] |
| Generated Electricity: | 81,487 | Generated Electricity: | 81,487 |
| Used Electricity: | 519700 | Used Electricity: | 519700 |
| Percentage saved: | 16% | Percentage saved: | 16% |
| 1st - 3rd Storeys | [kWh/year] | 1st - 3rd Storeys | [kWh/year] |
| Generated Electricity: | 62,091 | Generated Electricity: | 62,091 |
| Used Electricity: | 711,983 | Used Electricity: | 711,983 |
| Percentage saved: | 9% | Percentage saved: | 9% |

### North-Side of Eglinton Avenue

**Building: 22**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| Entire Building | [kWh/year] | Entire Building | [kWh/year] |
| Generated Electricity: | 88,062 | Generated Electricity: | 88,062 |
| Used Electricity: | 1046871 | Used Electricity: | 1046871 |
| Percentage saved: | 8% | Percentage saved: | 8% |
| 4th - 8th Storeys | [kWh/year] | 4th - 8th Storeys | [kWh/year] |
| Generated Electricity: | 45,952 | Generated Electricity: | 45,952 |
| Used Electricity: | 432227 | Used Electricity: | 432227 |
| Percentage saved: | 11% | Percentage saved: | 11% |
| 1st - 3rd Storeys | [kWh/year] | 1st - 3rd Storeys | [kWh/year] |
| Generated Electricity: | 42,110 | Generated Electricity: | 42,110 |
| Used Electricity: | 614,644 | Used Electricity: | 614,644 |
| Percentage saved: | 7% | Percentage saved: | 7% |

## High Podium Energy Savings Potential - Buildings on Bathurst Street

### East-Side Bathurst

**Building: 14**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| Entire Building | [kWh/year] | Entire Building | [kWh/year] |
| Generated Electricity: | 64,702 | Generated Electricity: | 80,962 |
| Used Electricity: | 679499 | Used Electricity: | 679499 |
| Percentage saved: | 10% | Percentage saved: | 12% |
| 4th - 8th Storeys | [kWh/year] | 4th - 8th Storeys | [kWh/year] |
| Generated Electricity: | 28,986 | Generated Electricity: | 32,320 |
| Used Electricity: | 272652 | Used Electricity: | 272652 |
| Percentage saved: | 11% | Percentage saved: | 12% |
| 1st - 3rd Storeys | [kWh/year] | 1st - 3rd Storeys | [kWh/year] |
| Generated Electricity: | 35,715 | Generated Electricity: | 35,715 |
| Used Electricity: | 406,847 | Used Electricity: | 406,847 |
| Percentage saved: | 9% | Percentage saved: | 9% |

### West-Side Bathurst

**Building: 10**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| Entire Building | [kWh/year] | Entire Building | [kWh/year] |
| Generated Electricity: | 71,730 | Generated Electricity: | 83,548 |
| Used Electricity: | 605964 | Used Electricity: | 605964 |
| Percentage saved: | 12% | Percentage saved: | 14% |
| 4th - 8th Storeys | [kWh/year] | 4th - 8th Storeys | [kWh/year] |
| Generated Electricity: | 52,202 | Generated Electricity: | 52,202 |
| Used Electricity: | 239801 | Used Electricity: | 239801 |
| Percentage saved: | 22% | Percentage saved: | 22% |
| 1st - 3rd Storeys | [kWh/year] | 1st - 3rd Storeys | [kWh/year] |
| Generated Electricity: | 19,527 | Generated Electricity: | 31,346 |
| Used Electricity: | 366,162 | Used Electricity: | 366,162 |
| Percentage saved: | 5% | Percentage saved: | 9% |

*Figure 41 | High Podium Energy Savings Potential Summary by Building – purple represents relative high savings and dark blue represents relatively low savings*

## Low Podium Energy Savings Potential - Buildings at Eglinton Avenue West and Bathurst Street (Corner Buildings)

### South-West Corner of Eglinton & Bathurst

**Building: 31**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| **Entire Building** | [kWh/year] | **Entire Building** | [kWh/year] |
| Generated Electricity: | 158,195 | Generated Electricity: | 169,022 |
| Used Electricity: | 957,606 | Used Electricity: | 957,606 |
| Percentage saved: | 17% | Percentage saved: | 18% |
| **4th - 8th Storeys** | [kWh/year] | **4th - 8th Storeys** | [kWh/year] |
| Generated Electricity: | 59,343 | Generated Electricity: | 70,170 |
| Used Electricity: | 225,281 | Used Electricity: | 225,281 |
| Percentage saved: | 26% | Percentage saved: | 31% |
| **1st - 3rd Storeys** | [kWh/year] | **1st - 3rd Storeys** | [kWh/year] |
| Generated Electricity: | 98,852 | Generated Electricity: | 98,852 |
| Used Electricity: | 732,325 | Used Electricity: | 732,325 |
| Percentage saved: | 13% | Percentage saved: | 13% |

### North-West Corner of Eglinton & Bathurst

**Building: 07**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| **Entire Building** | [kWh/year] | **Entire Building** | [kWh/year] |
| Generated Electricity: | 33,759 | Generated Electricity: | 40,884 |
| Used Electricity: | 828,566 | Used Electricity: | 828,566 |
| Percentage saved: | 4% | Percentage saved: | 5% |
| **4th - 8th Storeys** | [kWh/year] | **4th - 8th Storeys** | [kWh/year] |
| Generated Electricity: | 17,841 | Generated Electricity: | 24,966 |
| Used Electricity: | 169,474 | Used Electricity: | 169,474 |
| Percentage saved: | 11% | Percentage saved: | 15% |
| **1st - 3rd Storeys** | [kWh/year] | **1st - 3rd Storeys** | [kWh/year] |
| Generated Electricity: | 15,918 | Generated Electricity: | 15,918 |
| Used Electricity: | 659,092 | Used Electricity: | 659,092 |
| Percentage saved: | 2% | Percentage saved: | 2% |

### North-East Corner of Eglinton & Bathurst

**Building: 17**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| **Entire Building** | [kWh/year] | **Entire Building** | [kWh/year] |
| Generated Electricity: | 72,661 | Generated Electricity: | 75,231 |
| Used Electricity: | 689,976 | Used Electricity: | 689,976 |
| Percentage saved: | 11% | Percentage saved: | 11% |
| **4th - 8th Storeys** | [kWh/year] | **4th - 8th Storeys** | [kWh/year] |
| Generated Electricity: | 20,572 | Generated Electricity: | 23,141 |
| Used Electricity: | 135,870 | Used Electricity: | 135,870 |
| Percentage saved: | 15% | Percentage saved: | 17% |
| **1st - 3rd Storeys** | [kWh/year] | **1st - 3rd Storeys** | [kWh/year] |
| Generated Electricity: | 52,090 | Generated Electricity: | 52,090 |
| Used Electricity: | 554,106 | Used Electricity: | 554,106 |
| Percentage saved: | 9% | Percentage saved: | 9% |

### South-East Corner of Eglinton & Bathurst

**Building: 30**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| **Entire Building** | [kWh/year] | **Entire Building** | [kWh/year] |
| Generated Electricity: | 98,339 | Generated Electricity: | 102,713 |
| Used Electricity: | 988,120 | Used Electricity: | 988,120 |
| Percentage saved: | 10% | Percentage saved: | 10% |
| **4th - 8th Storeys** | [kWh/year] | **4th - 8th Storeys** | [kWh/year] |
| Generated Electricity: | 79,183 | Generated Electricity: | 83,557 |
| Used Electricity: | 225,281 | Used Electricity: | 225,281 |
| Percentage saved: | 35% | Percentage saved: | 37% |
| **1st - 3rd Storeys** | [kWh/year] | **1st - 3rd Storeys** | [kWh/year] |
| Generated Electricity: | 19,157 | Generated Electricity: | 19,157 |
| Used Electricity: | 762,839 | Used Electricity: | 762,839 |
| Percentage saved: | 3% | Percentage saved: | 3% |

## Low Podium Energy Savings Potential - Buildings on Eglinton Avenue West

### South-Side of Eglinton Avenue

**Building: 26**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| **Entire Building** | [kWh/year] | **Entire Building** | [kWh/year] |
| Generated Electricity: | 66,283 | Generated Electricity: | 70,603 |
| Used Electricity: | 959166 | Used Electricity: | 959166 |
| Percentage saved: | 7% | Percentage saved: | 7% |
| **4th - 8th Storeys** | [kWh/year] | **4th - 8th Storeys** | [kWh/year] |
| Generated Electricity: | 43,727 | Generated Electricity: | 48,047 |
| Used Electricity: | 196327 | Used Electricity: | 196327 |
| Percentage saved: | 22% | Percentage saved: | 24% |
| **1st - 3rd Storeys** | [kWh/year] | **1st - 3rd Storeys** | [kWh/year] |
| Generated Electricity: | 22,556 | Generated Electricity: | 22,556 |
| Used Electricity: | 762,839 | Used Electricity: | 762,839 |
| Percentage saved: | 3% | Percentage saved: | 3% |

### North-Side of Eglinton Avenue

**Building: 22**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| **Entire Building** | [kWh/year] | **Entire Building** | [kWh/year] |
| Generated Electricity: | 39,766 | Generated Electricity: | 64,025 |
| Used Electricity: | 742311 | Used Electricity: | 742311 |
| Percentage saved: | 5% | Percentage saved: | 9% |
| **4th - 8th Storeys** | [kWh/year] | **4th - 8th Storeys** | [kWh/year] |
| Generated Electricity: | 39,766 | Generated Electricity: | 46,178 |
| Used Electricity: | 127666 | Used Electricity: | 127666 |
| Percentage saved: | 31% | Percentage saved: | 36% |
| **1st - 3rd Storeys** | [kWh/year] | **1st - 3rd Storeys** | [kWh/year] |
| Generated Electricity: | 0 | Generated Electricity: | 17,847 |
| Used Electricity: | 614,644 | Used Electricity: | 614,644 |
| Percentage saved: | 0% | Percentage saved: | 3% |

## Low Podium Energy Savings Potential - Buildings on Bathurst Street

### East-Side Bathurst

**Building: 14**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| **Entire Building** | [kWh/year] | **Entire Building** | [kWh/year] |
| Generated Electricity: | 79,575 | Generated Electricity: | 101,738 |
| Used Electricity: | 523817 | Used Electricity: | 523817 |
| Percentage saved: | 15% | Percentage saved: | 19% |
| **4th - 8th Storeys** | [kWh/year] | **4th - 8th Storeys** | [kWh/year] |
| Generated Electricity: | 37,304 | Generated Electricity: | 46,421 |
| Used Electricity: | 116970 | Used Electricity: | 116970 |
| Percentage saved: | 32% | Percentage saved: | 40% |
| **1st - 3rd Storeys** | [kWh/year] | **1st - 3rd Storeys** | [kWh/year] |
| Generated Electricity: | 42,271 | Generated Electricity: | 55,316 |
| Used Electricity: | 406,847 | Used Electricity: | 406,847 |
| Percentage saved: | 10% | Percentage saved: | 14% |

### West-Side Bathurst

**Building: 10**

| Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year | |
|---|---|---|---|
| **Entire Building** | [kWh/year] | **Entire Building** | [kWh/year] |
| Generated Electricity: | 112,436 | Generated Electricity: | 123,047 |
| Used Electricity: | 457139 | Used Electricity: | 457139 |
| Percentage saved: | 25% | Percentage saved: | 27% |
| **4th - 8th Storeys** | [kWh/year] | **4th - 8th Storeys** | [kWh/year] |
| Generated Electricity: | 43,432 | Generated Electricity: | 54,042 |
| Used Electricity: | 90976 | Used Electricity: | 90976 |
| Percentage saved: | 48% | Percentage saved: | 59% |
| **1st - 3rd Storeys** | [kWh/year] | **1st - 3rd Storeys** | [kWh/year] |
| Generated Electricity: | 69,005 | Generated Electricity: | 69,005 |
| Used Electricity: | 366,162 | Used Electricity: | 366,162 |
| Percentage saved: | 19% | Percentage saved: | 19% |

*Figure 42 | Low Podium Energy Savings Potential Summary by Building – purple represents relative high savings and dark blue represents relatively low savings*

### 6.3 | Discussion

As discussed in the previous section, low-podium built form provides the most benefit for the Eglinton Avenue West, at Bathurst Street, study area – the porous street-wall built-form provides the highest solar energy generation and energy savings potential. Further, tower application of solar photovoltaic technology provides the highest efficiency (i.e. the biggest return on investment) – residential spaces use less energy per square metre than retail and commercial spaces and those same residential uses are located in the towers. There are, however, a few locations where high-podium built form – tall street wall built form – performs more efficiently than low-podium built form: the north and south buildings on Eglinton Avenue West (i.e. buildings 22 and 26, respectively) provide higher potential energy savings using the high-podium built form than low-podium built form, on a building level. Buildings 22 and 26, the buildings along Eglinton Avenue benefit from having a high-podium because their south-facing facades take advantage of the sun exposure and relatively high solar irradiance. The larger the surface area for surfaces that face south, the higher the energy savings potential.

Based on these results, it is recommended that the City of Toronto adapts low-podium built form requirements for the Eglinton Avenue West mid-rise building study area, except on a case-by-case basis, as illustrated with buildings 22 and 26, located to the north and south of Eglinton Avenue West, respectively (i.e. buildings located along the east-west avenue). On a tower basis, if photovoltaic technology was to be added solely to the towers of mid-rise development in the project study area, low-podium built form would provide the highest return on investment across the board, for all eight buildings analyzed. It is important to note, however, that additional simulations and analyses would be required to determine whether a mix of design guidelines – high-podium built form for buildings along Eglinton Avenue West and low-podium built form for buildings along Bathurst Street and at the intersection – would yield the same results as when the buildings were analyzed solely using high-podium or low-podium built form scenarios.

To facilitate improved solar energy generation potential for future mid-rise buildings in the City of Toronto, it is recommended that solar energy generation and energy savings potential analysis be conducted for the Avenues, to determine whether high-podium, low-podium, or an alternative built form scenario provides the highest solar energy generation potential for that area of Toronto. It is pertinent to emphasize the importance of context for solar energy generation potential analysis. Although the Avenues in Toronto are primarily surrounded with low-rise development, with minimal to no impact on solar energy generation potential, some Avenues may be surrounded by taller developments, located on a steeper grade change, or surrounded with old growth (i.e. tall deciduous trees).

Although both roof and façade surfaces were analyzed for the purposes of this research, it is important to highlight the competition for roof space, both on a tower and podium level – mechanical equipment, the City of Toronto's Green Roof By-law and usable outdoor amenity space all compete for roof space. Although the City of Toronto's Green Roof By-law and usable outdoor amenity space do not have to be mutually exclusive, these two potential uses for roofs, balconies and podium terraces compete for prime real estate when it comes to surfaces with high irradiance levels, which are prime for solar technologies and, therefore, for solar energy generation as well. Where shading is planned or provided on a building, such as roofs and podium terraces, solar technology can be incorporated into the shading objects, such as placing photovoltaic technology above the shading objects. Similarly, solar technology can also be incorporated into shading objects around windows.

As a final note, although solar energy generation cannot cover 100 percent of energy demand for the Eglinton Avenue West at Bathurst Street project site, it does not mean that solar energy generation is not worthwhile, particularly from an emissions and resiliency standpoint. For example, on a tower level, the highest energy savings potential is 59 percent at 650 kWh/$m^2$/year or higher benchmark. Although on a building level the highest energy savings potential is 27 percent at a 650 kWh/$m^2$/year or higher benchmark, a third is a meaningful contribution. It must be stated that, in order to determine the full cost and benefit of solar photovoltaics along the Avenues in Toronto, further analyses must be conducted to compare the cost of photovoltaic technology (e.g. higher capital costs up front, maintenance, etc.) to the benefits the technology provides such as the potential GHG emission reductions, the benefit of energy generation during power outages related to extreme weather events, and the potential of reducing stress on the electrical grid. As mentioned at the beginning of this report, a key component of reducing greenhouse gas emissions and pollution is reducing our dependency on non-renewable energy solutions, specifically, fossil fuels. Further, renewable energy sources for energy generation, such as solar energy generation using solar photovoltaic technology, provide an added benefit of stability, reliability and, maybe most importantly, resiliency.

## 7.0 | Conclusions

This major research project analyzes the effectiveness of the City of Toronto's Avenues and Mid-Rise Buildings Performance Standards to determine the solar energy generation potential.

Solar radiation analysis was conducted with Rhinoceros, Grasshopper and DIVA-for-Rhino using models that represent the existing and proposed built environments (i.e. high-rise podium built form – tall street wall versus low-rise podium built form – porous street wall geometry) to determine irradiance values for roof and façade surfaces for buildings in the project's study area.

The following research questions have been answered:

1. *What percentage of buildings' energy use can be covered by energy generated on building surfaces along the Avenues in Toronto, if Performance Standards for Mid-Rise Buildings are used for the design of future buildings and if energy generation potential is maximized during the building design stage (i.e. buildings along east-west corridors)?*

   The highest percentage of a building's energy use that could be covered by energy generated on a building surface in the study area, with the conditions outlined in the above report, is 27 percent. However, on a tower level, where the energy demand of a tower alone is considered, the highest energy savings potential is 59 percent (i.e. the towers were assumed as residential only uses).

2. *Which type of built form, high-rise podium or low-rise podium built form, allows for higher energy generation potential along east-west facing avenues in Toronto, such as Eglinton Avenue at Bathurst Street?*

   Low-podium built form provides the most benefit for the Eglinton Avenue West, at Bathurst Street, study area – the porous street-wall built-form provides the highest solar energy generation and energy savings potential.

3. *Are the City of Toronto's neighbourhoods, along avenues such as Eglinton Avenue, a hinderance to its energy generation potential? Or do they pose little-to-no impact on energy generation potential?*

   Although the Avenues in Toronto, such as Eglinton Avenue West, at Bathurst Street, are primarily surrounded with low-rise development, with minimal to no impact on solar energy generation potential, other Avenues may be surrounded by taller developments, located on a steeper grade change, or surrounded by old growth (e.g. tall deciduous trees). It is pertinent to emphasize the importance of context for solar energy generation potential analysis.

4. *What changes can be made to the Avenues and Mid-Rise Buildings Study to increase the potential of electricity generation using solar photovoltaic systems along the Avenues in Toronto, specifically east-west corridors?*

   The Avenues and Mid-Rise Building Guidelines, if adopted, could require future projects along the Avenues to conduct solar energy generation potential analysis, to determine whether high-rise podium built form – tall street wall or low-rise podium built form – porous street wall geometry is better suited. Based on the analysis conducted at Eglinton Avenue West, at Bathurst Street, it is anticipated that other east-west corridors with similar physical surroundings, will also be better suited to low-rise podium built form.

## 8.0 | Recommendations for Future Research

Based on the research and conclusions from this major research project, potential future research questions include:

1. How can the Avenues and Mid-Rise Buildings Performance Standards (i.e. the basis for the future mid-rise building design guidelines) be improved to allow for higher energy generation using solar photovoltaic technology?
    a. By what quantity can the solar potential be maximized if the guidelines are adjusted?
    b. What will the built form look like based on the proposed changes?
2. What impact can Performance Standard 13 – Roofs & Roofscapes have on annual roof solar radiation levels? How accommodating is Standard 13 for various roof geometries, such as sloped roofs?
    a. With the angular planes rules, how much solar access can be achieved?
3. If another software or set of tools are used for the same analysis, how do the results differ?
    a. Which software is more conducive for solar energy generation analysis with respect to built form and building geometry manipulation?
4. Can DIVA-for-Rhino be used as a tool by municipal planners and project teams to analyze future proposals and projects along the Avenues for solar energy generation potential?
5. What impact does the City of Toronto's Green Roof By-law have on solar energy generation?
    a. What compromises or creative solutions can be achieved?

# Appendices

**Appendix A –** Site Selection Documentation

01 | Eglinton Avenue West & Bathurst Street

02 | St. Clair Avenue

03 | Bloor Street West

04 | Queen Street West

**Appendix B –** Avenues and Mid-Rise Buildings Study, 2010

Section 3: Performance Standards

**Appendix C –** Data

01 | Neighbourhood Data

02 | Mid-Rise Building Data – Annual Solar Radiation

High Podium Data

Low Podium Data

03 | Mid-Rise Building Data – Solar Energy Generation

High Podium Data

Low Podium Data

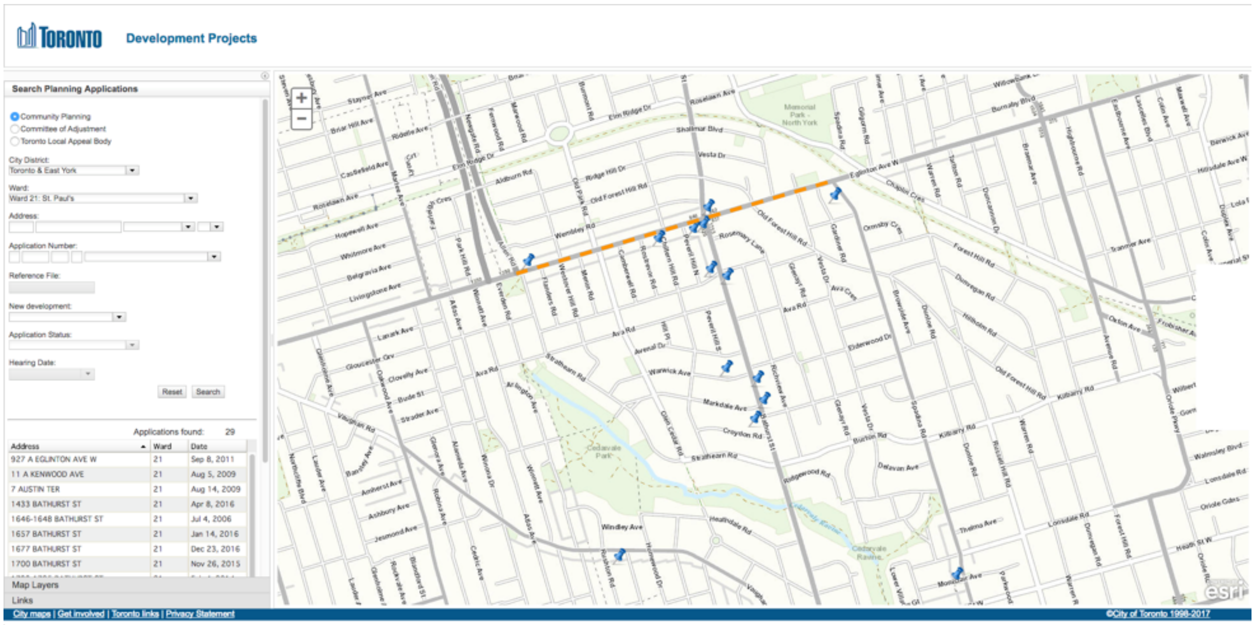
04 | Mid-Rise Building Data – Percentage of Building Energy Use Covered by Renewables

High Podium Data

Low Podium Data

**Appendix A –** Site Selection Documentation

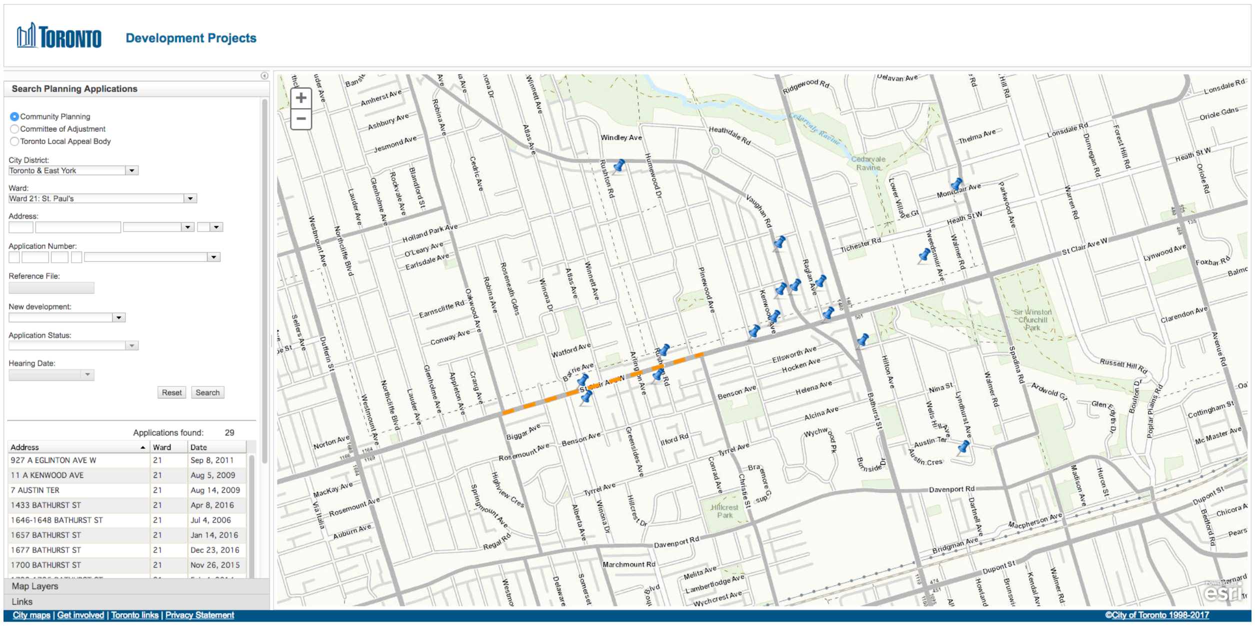
*01 | Eglinton Avenue West & Bathurst Street*




| **Eglinton Avenue West & Bathurst Street** – *approximately 1.4km stretch* |
|---|
| 1. 859 Eglington Ave. W. – 16-storeys mixed use |
| Rezoning |
| *More info.: http://urbantoronto.ca/database/projects/859-eglinton-west* |
| 2. 875 Eglington Ave. W. – Unknown height and use |
| Rezoning |
| 3. 842 Eglington Ave. W. – Eglinton LRT Crosstown Forest Hill Station |
| Site Plan Approval |
| *More info.: http://urbantoronto.ca/database/projects/crosstown-lrt-forest-hill-station* |
| 4. 927 Eglington Ave. W. – Unknown height and use |
| Condominium Approval |
| Minor Variance |
| Site Plan Approval |
| *More info.: http://urbantoronto.ca/database/projects/hill-condos* |
| 5. 1996 Bathurst Street – 7-storey residential development |
| Rezoning |
| Site Plan Approval |
| *More info.: b. http://urbantoronto.ca/database/projects/1996-2000-bathurst-street* |

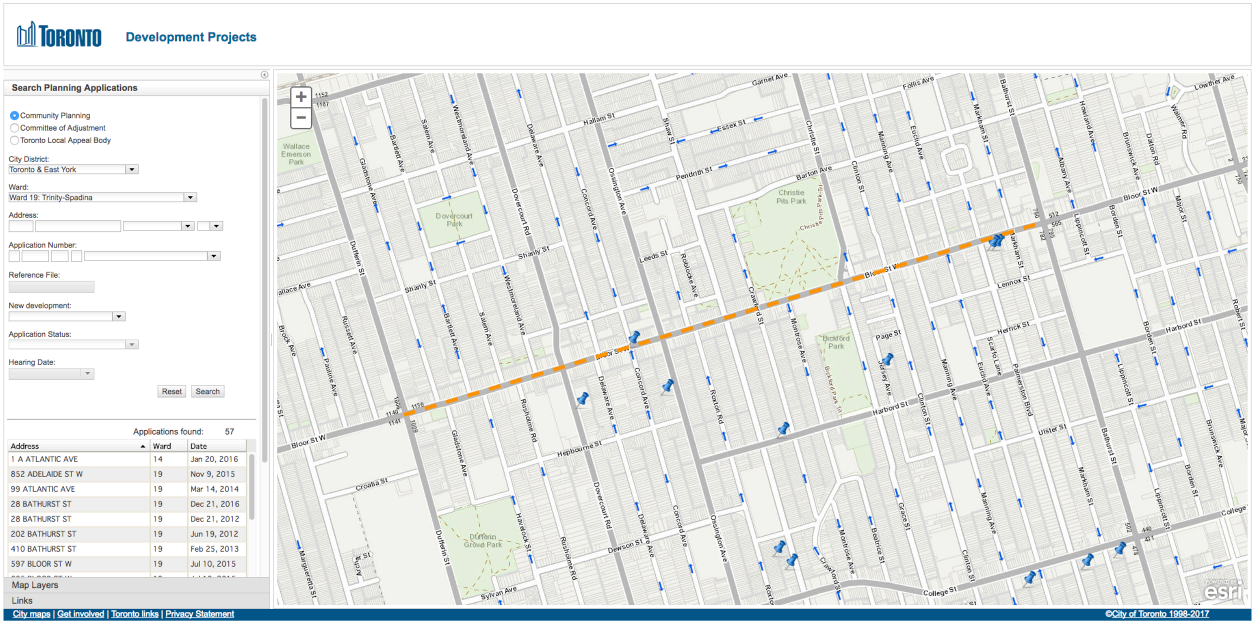
**Appendix A –** Site Selection Documentation

*02 | St. Clair Avenue*



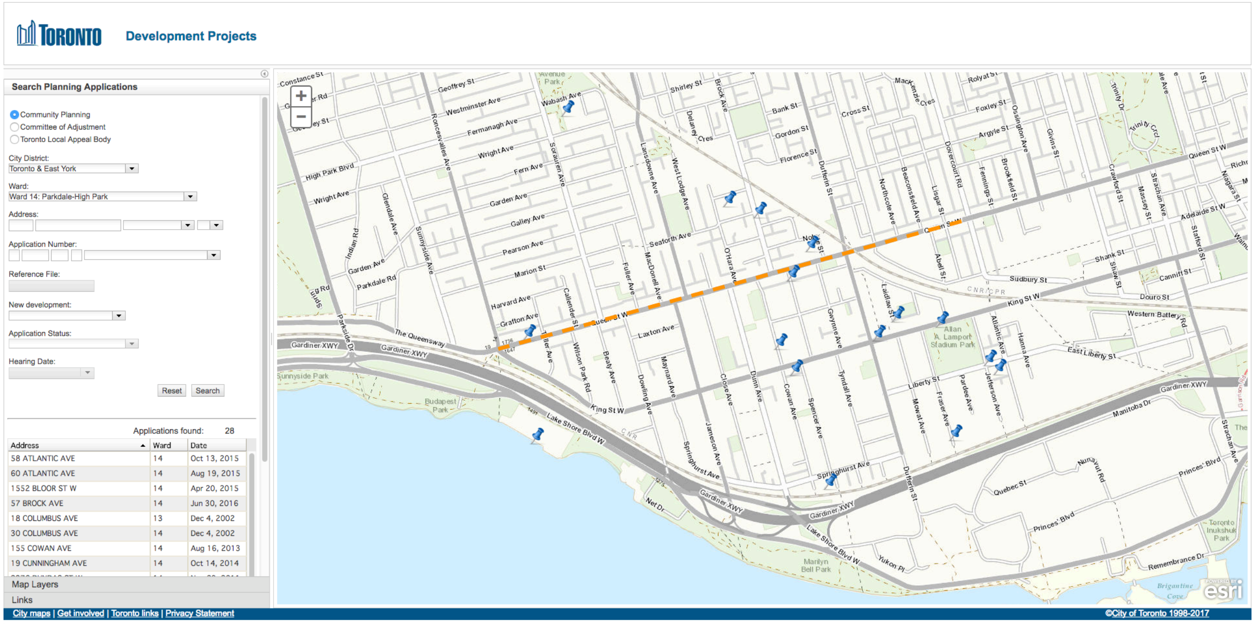
## **Appendix A –** Site Selection Documentation

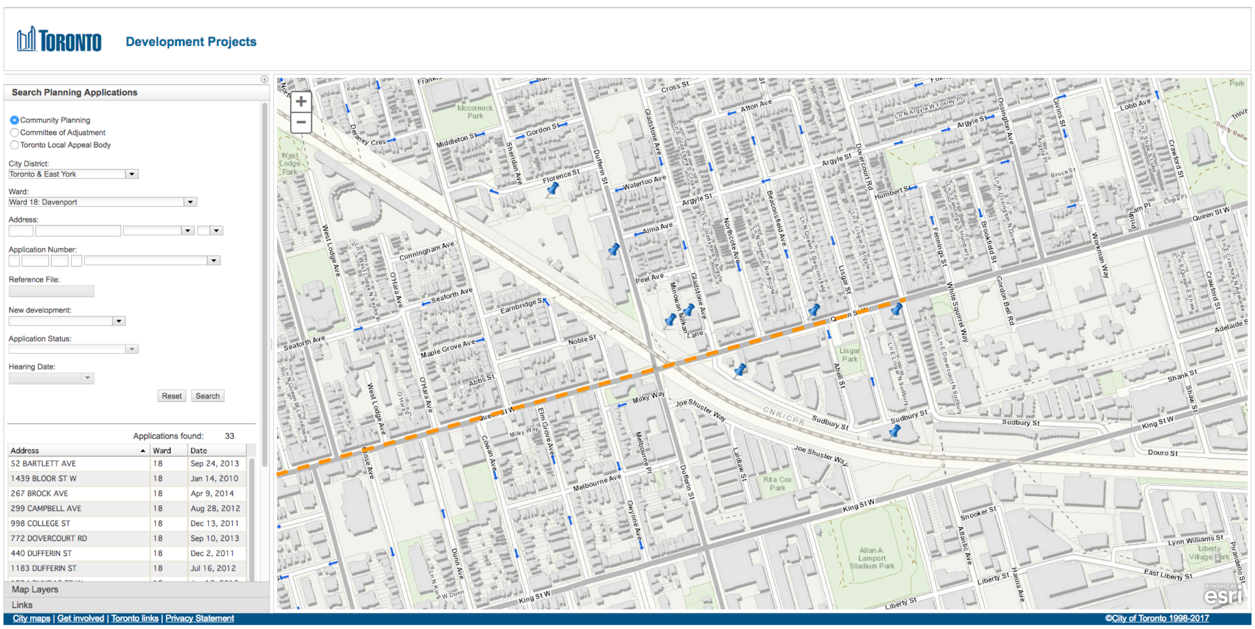
### *03 | Bloor Street West*



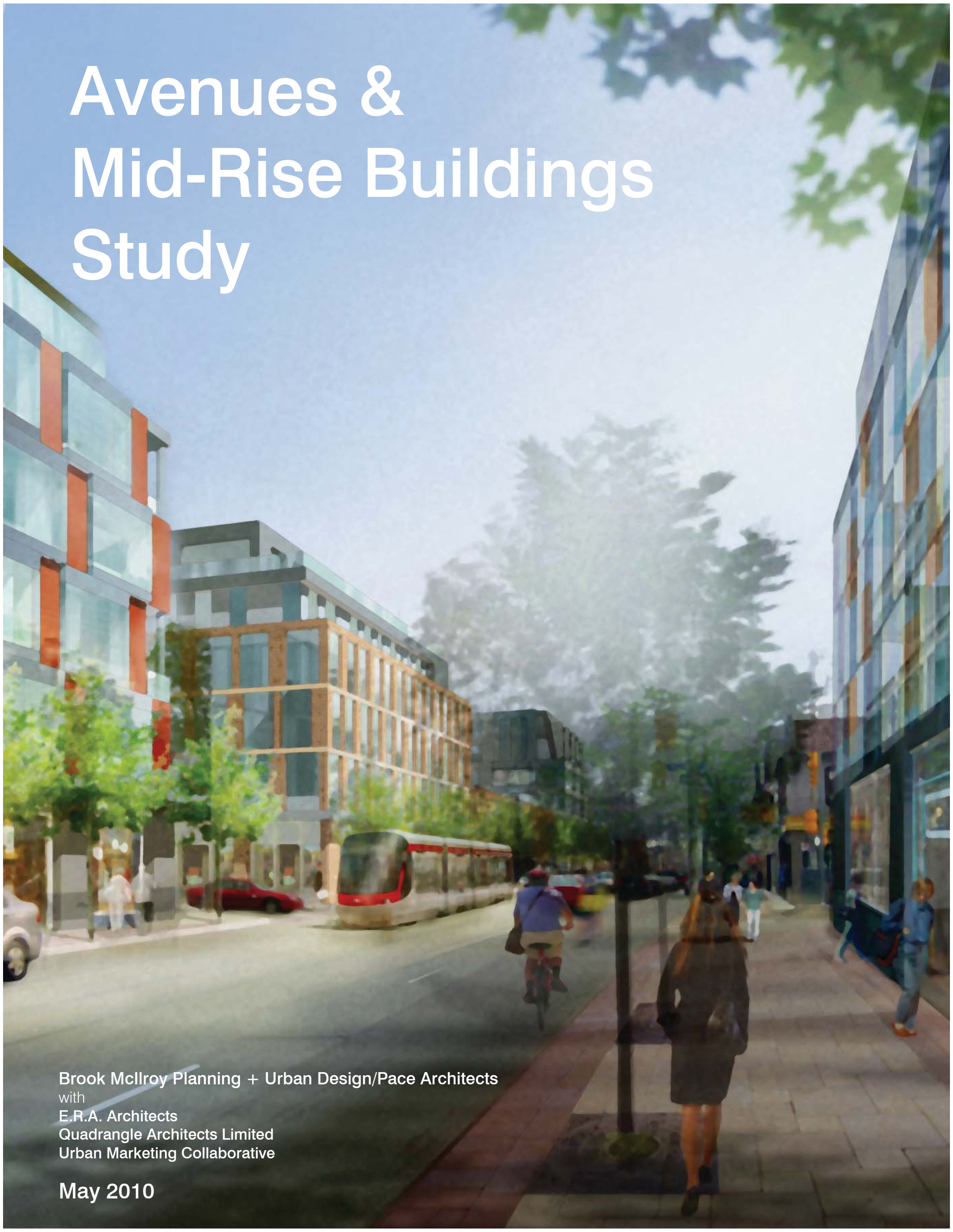
## **Appendix A –** Site Selection Documentation

### *04 | Queen Street West*



**Appendix B –** Avenues and Mid-Rise Buildings Study, 2010




*BMI + Pace, 2010.*

Avenues & Mid-Rise Buildings Study, Performance Standards:
https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/design-guidelines/mid-rise-buildings/

**Appendix C –** Data

01 | Neighbourhood Data

*NOTE: This information represents the solar radiation values for roof and façade surfaces for buildings along Eglinton Avenue West and Bathurst Street. These buildings represent the term 'neighbourhood'.*

| Existing Built Form | | |
|---|---|---|
| Roof Surfaces | Annual Solar Radiation | |
| [#] | [kWh/m2/year] | |
| 34 | *Total:* | 43,169 |
| | *Average:* | 1,270 |
| Façade Surfaces | Annual Solar Radiation | |
| [#] | [kWh/m2/year] | |
| 116 | *Total:* | 66,743 |
| | *Average:* | 575 |
| | *'Neighbourhood' Total:* | 109,912 |

| Theoretical Volume | | |
|---|---|---|
| Roof Surfaces | Annual Solar Radiation | |
| [#] | [kWh/m2/year] | |
| 37 | *Total:* | 48,184 |
| | *Average:* | 1,302 |
| Façade Surfaces | Annual Solar Radiation | |
| [#] | [kWh/m2/year] | |
| 88 | *Total:* | 50,818 |
| | *Average:* | 577 |
| | *'Neighbourhood' Total:* | 99,003 |

| Mid-Rise Built Form (High-Podium) | | |
|---|---|---|
| Roof Surfaces | Annual Solar Radiation | |
| [#] | [kWh/m2/year] | |
| 109 | *Total:* | 98,111 |
| | *Average:* | 900 |
| Façade Surfaces | Annual Solar Radiation | |
| [#] | [kWh/m2/year] | |
| 373 | *Total:* | 236,321 |
| | *Average:* | 634 |
| | *'Neighbourhood' Total:* | 334,432 |

| Mid-Rise Built Form (Low-Podium) | | |
|---|---|---|
| Roof Surfaces | Annual Solar Radiation | |
| [#] | [kWh/m2/year] | |
| 109 | *Total:* | 112,779 |
| | *Average:* | 1,035 |
| Façade Surfaces | Annual Solar Radiation | |
| [#] | [kWh/m2/year] | |
| 811 | *Total:* | 491,729 |
| | *Average:* | 608 |
| | *'Neighbourhood' Total:* | 604,508 |

**Existing Built Form** ✓

| Roof Surface | Annual Solar Radiation |
|---|---|
| [#] | [kWh/m2/year] |
| 1 | 1298.57 |
| 2 | 1224.18 |
| 3 | 1301.47 |
| 4 | 1288.3 |
| 5 | 1293.25 |
| 6 | 1293.69 |
| 7 | 1291.65 |
| 8 | 1291.4 |
| 9 | 1239.88 |
| 10 | 1300.78 |
| 11 | 1191.08 |
| 12 | 1121.52 |
| 13 | 1306.59 |
| 14 | 1282.42 |
| 15 | 1179.22 |
| 16 | 1290.65 |
| 17 | 1289.11 |
| 18 | 1294.12 |
| 19 | 1289.9 |
| 20 | 1289.91 |
| 21 | 1296.38 |
| 22 | 1300.48 |
| 23 | 1295.12 |
| 24 | 1246.97 |
| 25 | 1301.14 |
| 26 | 1170.42 |
| 27 | 1289.7 |
| 28 | 1300.51 |
| 29 | 1147.67 |
| 30 | 1295.02 |
| 31 | 1304.26 |
| 32 | 1299.05 |
| 33 | 1285.36 |
| 34 | 1279.13 |
| *Total:* | 43168.90 |
| *Average:* | 1269.67 |

| Façade Surface | Annual Solar Radiation |
|---|---|
| [#] | [kWh/m2/year] |
| 1 | 580.67 |
| 2 | 331.96 |
| 3 | 638.03 |
| 4 | 960.52 |
| 5 | 483.62 |
| 6 | 321.11 |
| 7 | 954.35 |
| 8 | 189.88 |
| 9 | 963.06 |
| 10 | 811.94 |
| 11 | 332.45 |
| 12 | 911.58 |
| 13 | 616.81 |
| 14 | 330.43 |
| 15 | 380.11 |
| 16 | 959.65 |
| 17 | 269.24 |
| 18 | 966.36 |
| 19 | 645.5 |
| 20 | 335.69 |
| 21 | 444.01 |
| 22 | 949.08 |
| 23 | 797.59 |
| 24 | 945.75 |
| 25 | 634.06 |
| 26 | 336.62 |
| 27 | 318.99 |
| 28 | 491.23 |
| 29 | 690.3 |
| 30 | 715.63 |
| 31 | 808.76 |
| 32 | 464.18 |
| 33 | 258.82 |
| 34 | 691.4 |
| 35 | 807.48 |
| 36 | 307.53 |
| 37 | 625.46 |
| 38 | 234 |
| 39 | 640.28 |
| 40 | 753.78 |
| 41 | 606.81 |
| 42 | 631.91 |
| 43 | 725.11 |
| 44 | 635.19 |
| 45 | 319.86 |
| 46 | 857.15 |
| 47 | 130.87 |
| 48 | 241.52 |
| 49 | 683.51 |
| 50 | 721.13 |
| 51 | 944.54 |
| 52 | 497.21 |
| 53 | 666.34 |
| 54 | 620.95 |
| 55 | 357.09 |
| 56 | 790.31 |
| 57 | 887.8 |
| 58 | 556.91 |
| 59 | 131.6 |
| 60 | 570.31 |
| 61 | 269.77 |
| 62 | 292.7 |
| 63 | 508.3 |

**Theoretical Volume** ✓

| Roof Surface | Annual Solar Radiation |
|---|---|
| [#] | [kWh/m2/year] |
| 1 | 1295.11 |
| 2 | 1293.91 |
| 3 | 1293.91 |
| 4 | 1293.91 |
| 5 | 1293.91 |
| 6 | 1293.91 |
| 7 | 1293.91 |
| 8 | 1293.93 |
| 9 | 1293.93 |
| 10 | 1293.93 |
| 11 | 1304.55 |
| 12 | 1304.55 |
| 13 | 1304.55 |
| 14 | 1310.05 |
| 15 | 1308.39 |
| 16 | 1308.39 |
| 17 | 1308.39 |
| 18 | 1308.39 |
| 19 | 1308.39 |
| 20 | 1308.39 |
| 21 | 1308.39 |
| 22 | 1310.16 |
| 23 | 1310.16 |
| 24 | 1303.06 |
| 25 | 1303.06 |
| 26 | 1303.17 |
| 27 | 1303.17 |
| 28 | 1303.17 |
| 29 | 1303.17 |
| 30 | 1303.06 |
| 31 | 1303.06 |
| 32 | 1303.06 |
| 33 | 1303.06 |
| 34 | 1303.06 |
| 35 | 1303.06 |
| 36 | 1300.33 |
| 37 | 1303.7 |
| *Total:* | 48184.30 |
| *Average:* | 1302.28 |

| Façade Surface | Annual Solar Radiation |
|---|---|
| [#] | [kWh/m2/year] |
| 1 | 551.52 |
| 2 | 723.28 |
| 3 | 276.96 |
| 4 | 983.2 |
| 5 | 328.71 |
| 6 | 817.83 |
| 7 | 1006.29 |
| 8 | 300.48 |
| 9 | 972.25 |
| 10 | 479.09 |
| 11 | 288.51 |
| 12 | 1001.98 |
| 13 | 281.23 |
| 14 | 525.94 |
| 15 | 1007.62 |
| 16 | 275.84 |
| 17 | 1003.29 |
| 18 | 555.93 |
| 19 | 282.09 |
| 20 | 935.35 |
| 21 | 281.97 |
| 22 | 595.35 |
| 23 | 975.08 |
| 24 | 275.91 |
| 25 | 976.29 |
| 26 | 273.7 |
| 27 | 989.28 |
| 28 | 274.84 |
| 29 | 985.82 |
| 30 | 279.81 |
| 31 | 1003.56 |
| 32 | 681.55 |
| 33 | 297.86 |
| 34 | 584 |
| 35 | 290.54 |
| 36 | 617.34 |
| 37 | 288.97 |
| 38 | 684.9 |
| 39 | 299.33 |
| 40 | 678.53 |
| 41 | 312.13 |
| 42 | 678.39 |
| 43 | 324.17 |
| 44 | 683.45 |
| 45 | 330.87 |
| 46 | 702.11 |
| 47 | 337.22 |
| 48 | 772.26 |
| 49 | 354.22 |
| 50 | 704.92 |
| 51 | 895.43 |
| 52 | 595.67 |
| 53 | 579.72 |
| 54 | 596.9 |
| 55 | 492.34 |
| 56 | 347.38 |
| 57 | 732.77 |
| 58 | 479.38 |
| 59 | 713.53 |
| 60 | 510.1 |

**Mid-Rise Built Form (High-Podium)** ✓

| Roof Surface | Annual Solar Radiation |
|---|---|
| [#] | [kWh/m2/year] |
| 1 | 1294.26 |
| 2 | 1294.2 |
| 3 | 1294.15 |
| 4 | 1294.15 |
| 5 | 1294.19 |
| 6 | 1282.38 |
| 7 | 1284.07 |
| 8 | 551.48 |
| 9 | 551.48 |
| 10 | 552.14 |
| 11 | 551.42 |
| 12 | 639.16 |
| 13 | 647.44 |
| 14 | 627.78 |
| 15 | 675.73 |
| 16 | 675.59 |
| 17 | 675.61 |
| 18 | 676.09 |
| 19 | 627.57 |
| 20 | 684.33 |
| 21 | 745.5 |
| 22 | 746.68 |
| 23 | 747.01 |
| 24 | 747.12 |
| 25 | 746.72 |
| 26 | 728.94 |
| 27 | 748.36 |
| 28 | 795.32 |
| 29 | 869.59 |
| 30 | 870.11 |
| 31 | 800.72 |
| 32 | 830.69 |
| 33 | 915.57 |
| 34 | 915.18 |
| 35 | 826.19 |
| 36 | 668.41 |
| 37 | 652.34 |
| 38 | 743.92 |
| 39 | 746.66 |
| 40 | 746.9 |
| 41 | 747.04 |
| 42 | 746.39 |
| 43 | 685.39 |
| 44 | 1297.72 |
| 45 | 1297.78 |
| 46 | 1297.78 |
| 47 | 1297.72 |
| 48 | 1298.56 |
| 49 | 1297.88 |
| 50 | 1297.88 |
| 51 | 1297.76 |
| 52 | 782.82 |
| 53 | 829.09 |
| 54 | 828.74 |
| 55 | 781.53 |
| 56 | 816 |
| 57 | 772.88 |
| 58 | 788.8 |
| 59 | 788.49 |
| 60 | 708.5 |
| 61 | 1285.39 |
| 62 | 1285.34 |
| 63 | 782.98 |
| 64 | 1293.58 |
| 65 | 625.67 |
| 66 | 625.88 |
| 67 | 1299.13 |
| 68 | 626.15 |
| 69 | 1308.17 |
| 70 | 625 |
| 71 | 1282.8 |
| 72 | 625.97 |
| 73 | 1291.65 |
| 74 | 625.46 |
| 75 | 1279.08 |
| 76 | 1280.41 |
| 77 | 766.84 |
| 78 | 1296.19 |
| 79 | 672.32 |
| 80 | 1306.25 |
| 81 | 624.95 |
| 82 | 1300.1 |
| 83 | 625.51 |
| 84 | 1286.17 |
| 85 | 626.76 |
| 86 | 1291.63 |
| 87 | 626.67 |
| 88 | 718.21 |
| 89 | 1300.49 |
| 90 | 625.57 |
| 91 | 1311.63 |
| 92 | 1311.72 |
| 93 | 1311.55 |
| 94 | 1311.55 |
| 95 | 1296.91 |
| 96 | 1296.91 |
| 97 | 627.27 |
| 98 | 676.42 |
| 99 | 623.23 |
| 100 | 644.19 |
| 101 | 634.68 |
| 102 | 541.18 |

**Mid-Rise Built Form (Low-Podium)** ✓

| Roof Surface | Annual Solar Radiation |
|---|---|
| [#] | [kWh/m2/year] |
| 1 | 97.23 |
| 2 | 1066.66 |
| 3 | 791.27 |
| 4 | 1288.05 |
| 5 | 1040.1 |
| 6 | 1042.07 |
| 7 | 1053.21 |
| 8 | 790.83 |
| 9 | 1299.04 |
| 10 | 1038.12 |
| 11 | 1045.75 |
| 12 | 1304.12 |
| 13 | 783.6 |
| 14 | 711.03 |
| 15 | 1305.3 |
| 16 | 1305.3 |
| 17 | 710.48 |
| 18 | 783.08 |
| 19 | 1304.88 |
| 20 | 1051.81 |
| 21 | 780.13 |
| 22 | 1294.07 |
| 23 | 1293.43 |
| 24 | 771.27 |
| 25 | 1044.61 |
| 26 | 1031.12 |
| 27 | 1029.65 |
| 28 | 1028.26 |
| 29 | 1030.58 |
| 30 | 703.93 |
| 31 | 1299.69 |
| 32 | 1299.69 |
| 33 | 699.67 |
| 34 | 1279.87 |
| 35 | 702.53 |
| 36 | 1291.14 |
| 37 | 702.08 |
| 38 | 1045.04 |
| 39 | 1021.5 |
| 40 | 1023.4 |
| 41 | 1021.68 |
| 42 | 1021.69 |
| 43 | 874.24 |
| 44 | 1012.59 |
| 45 | 784.34 |
| 46 | 1296.93 |
| 47 | 1297.05 |
| 48 | 1024.53 |
| 49 | 1302.86 |
| 50 | 787.54 |
| 51 | 1302.86 |
| 52 | 787.05 |
| 53 | 1280.76 |
| 54 | 786.03 |
| 55 | 1280.76 |
| 56 | 786.2 |
| 57 | 819.61 |
| 58 | 1308.26 |
| 59 | 1050.58 |
| 60 | 784.48 |
| 61 | 1315.6 |
| 62 | 1022.55 |
| 63 | 786.61 |
| 64 | 1284.48 |
| 65 | 1018.29 |
| 66 | 785.24 |
| 67 | 1310.81 |
| 68 | 1016.85 |
| 69 | 786.86 |
| 70 | 1285.34 |
| 71 | 1019.52 |
| 72 | 786.19 |
| 73 | 1305.15 |
| 74 | 1019.23 |
| 75 | 788.1 |
| 76 | 1291.84 |
| 77 | 1024.74 |
| 78 | 1038.76 |
| 79 | 865.66 |
| 80 | 1286.72 |
| 81 | 901.63 |
| 82 | 1287.45 |
| 83 | 1029.37 |
| 84 | 815.42 |
| 85 | 1310.98 |
| 86 | 1048.89 |
| 87 | 1024 |
| 88 | 1026.63 |
| 89 | 1023.74 |
| 90 | 1078.06 |
| 91 | 1053.34 |
| 92 | 1056.02 |
| 93 | 1053.15 |
| 94 | 973.51 |
| 95 | 1277.87 |
| 96 | 835.14 |
| 97 | 1277.78 |
| 98 | 1277.78 |
| 99 | 834.98 |
| 100 | 1306.24 |
| 101 | 897.03 |
| 102 | 918.15 |

| | |
|---|---|
| 64 | 556.65 |
| 65 | 337.68 |
| 66 | 346.36 |
| 67 | 340.16 |
| 68 | 695.33 |
| 69 | 577.56 |
| 70 | 644.77 |
| 71 | 635.9 |
| 72 | 765.61 |
| 73 | 530.81 |
| 74 | 593.63 |
| 75 | 809.82 |
| 76 | 693.05 |
| 77 | 309.26 |
| 78 | 919.67 |
| 79 | 726.42 |
| 80 | 684.78 |
| 81 | 977.08 |
| 82 | 462.68 |
| 83 | 300.26 |
| 84 | 493.81 |
| 85 | 940.32 |
| 86 | 93.21 |
| 87 | 293.32 |
| 88 | 446.08 |
| 89 | 987.51 |
| 90 | 216.47 |
| 91 | 313.18 |
| 92 | 318.69 |
| 93 | 283.25 |
| 94 | 283.89 |
| 95 | 472.76 |
| 96 | 920.3 |
| 97 | 983.68 |
| 98 | 903.66 |
| 99 | 487.66 |
| 100 | 353.22 |
| 101 | 183.57 |
| 102 | 651.88 |
| 103 | 649.71 |
| 104 | 329.54 |
| 105 | 528.21 |
| 106 | 657.15 |
| 107 | 912.98 |
| 108 | 619.49 |
| 109 | 393.15 |
| 110 | 737.86 |
| 111 | 351.73 |
| 112 | 337.09 |
| 113 | 684.54 |
| 114 | 889.52 |
| 115 | 608.1 |
| 116 | 965.24 |
| *Total:* | 66743.05 |
| *Average:* | 575.37 |

| | |
|---|---|
| 61 | 680 |
| 62 | 706.29 |
| 63 | 515.38 |
| 64 | 772.41 |
| 65 | 713.83 |
| 66 | 505.94 |
| 67 | 720.72 |
| 68 | 515.54 |
| 69 | 728.27 |
| 70 | 356.87 |
| 71 | 599.75 |
| 72 | 341.43 |
| 73 | 730.76 |
| 74 | 808.25 |
| 75 | 334.28 |
| 76 | 700.22 |
| 77 | 333.94 |
| 78 | 734.32 |
| 79 | 330.21 |
| 80 | 756.59 |
| 81 | 321.79 |
| 82 | 700.04 |
| 83 | 304.46 |
| 84 | 687.83 |
| 85 | 161.12 |
| 86 | 517.45 |
| 87 | 728.97 |
| 88 | 436.64 |
| *Total:* | 50818.28 |
| *Average:* | 577.48 |

| | |
|---|---|
| 103 | 541.78 |
| 104 | 635.02 |
| 105 | 644.39 |
| 106 | 624.86 |
| 107 | 676.01 |
| 108 | 626.25 |
| 109 | 1141.71 |
| *Total:* | 98111.48 |
| *Average:* | 900.11 |

| Façade Surface | Annual Solar Radiation |
|---|---|
| 1 | 970.61 |
| 2 | 632.32 |
| 3 | 350.13 |
| 4 | 762.09 |
| 5 | 733.85 |
| 6 | 351.8 |
| 7 | 626.62 |
| 8 | 971.83 |
| 9 | 734.78 |
| 10 | 352.11 |
| 11 | 630.25 |
| 12 | 974.39 |
| 13 | 736.07 |
| 14 | 350.29 |
| 15 | 632.31 |
| 16 | 974.71 |
| 17 | 732.02 |
| 18 | 350.79 |
| 19 | 629.79 |
| 20 | 970.86 |
| 21 | 675.33 |
| 22 | 354.85 |
| 23 | 736.5 |
| 24 | 972.95 |
| 25 | 622.39 |
| 26 | 344.3 |
| 27 | 533.93 |
| 28 | 972.13 |
| 29 | 622.92 |
| 30 | 342.21 |
| 31 | 534.64 |
| 32 | 967.67 |
| 33 | 621.44 |
| 34 | 343.05 |
| 35 | 536.45 |
| 36 | 970.59 |
| 37 | 619.27 |
| 38 | 342.05 |
| 39 | 536.71 |
| 40 | 962.55 |
| 41 | 966.57 |
| 42 | 674.85 |
| 43 | 346.65 |
| 44 | 623.14 |
| 45 | 538.24 |
| 46 | 342.62 |
| 47 | 741.5 |
| 48 | 963.99 |
| 49 | 303.34 |
| 50 | 674.29 |
| 51 | 999.44 |
| 52 | 288.49 |
| 53 | 974.69 |
| 54 | 284.51 |
| 55 | 979.43 |
| 56 | 283.35 |
| 57 | 961.65 |
| 58 | 285.32 |
| 59 | 960.17 |
| 60 | 625.85 |
| 61 | 290.1 |
| 62 | 900.86 |
| 63 | 351.41 |
| 64 | 702.6 |
| 65 | 915.21 |
| 66 | 334.78 |
| 67 | 808.09 |
| 68 | 329.92 |
| 69 | 748.83 |
| 70 | 326 |
| 71 | 729.5 |
| 72 | 316.24 |
| 73 | 728.48 |
| 74 | 303.5 |
| 75 | 727.46 |
| 76 | 764.53 |
| 77 | 288.29 |
| 78 | 576.36 |
| 79 | 296.86 |
| 80 | 734.97 |
| 81 | 522.75 |
| 82 | 346.23 |
| 83 | 731.62 |
| 84 | 514.58 |
| 85 | 715.01 |
| 86 | 541.67 |
| 87 | 692.11 |
| 88 | 600.06 |
| 89 | 623.22 |
| 90 | 653.83 |
| 91 | 625.92 |
| 92 | 725.11 |
| 93 | 353.98 |
| 94 | 549.38 |
| 95 | 720.35 |
| 96 | 541.9 |
| 97 | 713.54 |
| 98 | 551.93 |
| 99 | 806.23 |
| 100 | 707.98 |
| 101 | 295.87 |
| 102 | 645.03 |
| 103 | 594.57 |
| 104 | 149.13 |
| 105 | 534.85 |
| 106 | 773.64 |
| 107 | 737.46 |
| 108 | 304.29 |

| | |
|---|---|
| 103 | 853 |
| 104 | 794.16 |
| 105 | 794.27 |
| 106 | 1299.18 |
| 107 | 1300 |
| 108 | 1299.22 |
| 109 | 1299.96 |
| *Total:* | 112779.12 |
| *Average:* | 1034.67 |

| Façade Surface | Annual Solar Radiation |
|---|---|
| 1 | 233.2 |
| 2 | 921.21 |
| 3 | 320.77 |
| 4 | 811.39 |
| 5 | 774.25 |
| 6 | 948.46 |
| 7 | 412.51 |
| 8 | 316.77 |
| 9 | 812.57 |
| 10 | 973.26 |
| 11 | 452.51 |
| 12 | 352.43 |
| 13 | 824.68 |
| 14 | 989.39 |
| 15 | 508.06 |
| 16 | 363.74 |
| 17 | 824.84 |
| 18 | 1002.79 |
| 19 | 586.53 |
| 20 | 371.36 |
| 21 | 783.29 |
| 22 | 979.26 |
| 23 | 659.83 |
| 24 | 351.6 |
| 25 | 992.43 |
| 26 | 295.55 |
| 27 | 910.47 |
| 28 | 517.6 |
| 29 | 282.35 |
| 30 | 989.06 |
| 31 | 271.75 |
| 32 | 566.3 |
| 33 | 648.24 |
| 34 | 949.49 |
| 35 | 413.3 |
| 36 | 288.04 |
| 37 | 702.54 |
| 38 | 959.22 |
| 39 | 451.25 |
| 40 | 325.06 |
| 41 | 739.87 |
| 42 | 981.02 |
| 43 | 506.64 |
| 44 | 341.46 |
| 45 | 771.84 |
| 46 | 993.28 |
| 47 | 580.95 |
| 48 | 353.75 |
| 49 | 770.94 |
| 50 | 970.15 |
| 51 | 656.05 |
| 52 | 347.23 |
| 53 | 995.71 |
| 54 | 269.53 |
| 55 | 990.47 |
| 56 | 574.94 |
| 57 | 276.9 |
| 58 | 349.52 |
| 59 | 762.39 |
| 60 | 971.15 |
| 61 | 661.53 |
| 62 | 356.81 |
| 63 | 678.43 |
| 64 | 1000.84 |
| 65 | 662.21 |
| 66 | 346.03 |
| 67 | 572.73 |
| 68 | 985.92 |
| 69 | 634.92 |
| 70 | 329.92 |
| 71 | 494.89 |
| 72 | 971.17 |
| 73 | 604.69 |
| 74 | 294.41 |
| 75 | 439.17 |
| 76 | 955.52 |
| 77 | 558.11 |
| 78 | 442.94 |
| 79 | 948.36 |
| 80 | 409.25 |
| 81 | 306.76 |
| 82 | 497.55 |
| 83 | 965.77 |
| 84 | 449.05 |
| 85 | 340.29 |
| 86 | 577.85 |
| 87 | 983.57 |
| 88 | 507.63 |
| 89 | 352.1 |
| 90 | 680.22 |
| 91 | 996.2 |
| 92 | 584.36 |
| 93 | 363.15 |
| 94 | 769.18 |
| 95 | 973.63 |
| 96 | 656.51 |
| 97 | 348.91 |
| 98 | 761.56 |
| 99 | 972.25 |
| 100 | 651.96 |
| 101 | 343.52 |
| 102 | 671.55 |
| 103 | 990.49 |
| 104 | 584.22 |
| 105 | 353.5 |
| 106 | 564.81 |
| 107 | 978.28 |
| 108 | 507.67 |

| | | | |
|---|---|---|---|
| 109 | 745.67 | 109 | 340.58 |
| 110 | 320.4 | 110 | 487.43 |
| 111 | 798.04 | 111 | 965.94 |
| 112 | 329.38 | 112 | 451.27 |
| 113 | 775.65 | 113 | 325.24 |
| 114 | 332.17 | 114 | 427.89 |
| 115 | 750.51 | 115 | 940.8 |
| 116 | 330.26 | 116 | 410.38 |
| 117 | 770.17 | 117 | 289.2 |
| 118 | 336.3 | 118 | 290.03 |
| 119 | 807 | 119 | 431.64 |
| 120 | 699.26 | 120 | 948.2 |
| 121 | 918.32 | 121 | 592.17 |
| 122 | 743.58 | 122 | 326.33 |
| 123 | 367.5 | 123 | 485.21 |
| 124 | 694.51 | 124 | 962.31 |
| 125 | 914.57 | 125 | 637.55 |
| 126 | 738.82 | 126 | 342.66 |
| 127 | 330.53 | 127 | 565.73 |
| 128 | 912.26 | 128 | 983.32 |
| 129 | 733.37 | 129 | 660.89 |
| 130 | 327.84 | 130 | 356.07 |
| 131 | 694.59 | 131 | 673.33 |
| 132 | 938.46 | 132 | 995.18 |
| 133 | 719.52 | 133 | 674.57 |
| 134 | 323.82 | 134 | 345.5 |
| 135 | 696.54 | 135 | 760.85 |
| 136 | 366.54 | 136 | 966.74 |
| 137 | 742.3 | 137 | 664.55 |
| 138 | 928.46 | 138 | 271.87 |
| 139 | 712.9 | 139 | 626.3 |
| 140 | 713.7 | 140 | 810.7 |
| 141 | 917.45 | 141 | 778.89 |
| 142 | 736.09 | 142 | 687.68 |
| 143 | 330.69 | 143 | 948.93 |
| 144 | 915.35 | 144 | 410.87 |
| 145 | 730.5 | 145 | 287.16 |
| 146 | 327.87 | 146 | 733.39 |
| 147 | 713.65 | 147 | 973.61 |
| 148 | 704 | 148 | 452.37 |
| 149 | 326.71 | 149 | 323.93 |
| 150 | 727.27 | 150 | 765.11 |
| 151 | 937.02 | 151 | 984.84 |
| 152 | 336.86 | 152 | 508.5 |
| 153 | 729.28 | 153 | 340.51 |
| 154 | 854.29 | 154 | 784.35 |
| 155 | 714.47 | 155 | 998.04 |
| 156 | 713.06 | 156 | 580.2 |
| 157 | 848.89 | 157 | 354.5 |
| 158 | 714.15 | 158 | 767.26 |
| 159 | 298.29 | 159 | 968.09 |
| 160 | 836.46 | 160 | 656.24 |
| 161 | 711.13 | 161 | 346.75 |
| 162 | 294.09 | 162 | 347.78 |
| 163 | 710.29 | 163 | 759.06 |
| 164 | 704.04 | 164 | 970.46 |
| 165 | 293.2 | 165 | 677.94 |
| 166 | 702.77 | 166 | 359.78 |
| 167 | 900.62 | 167 | 672.71 |
| 168 | 684.18 | 168 | 995.75 |
| 169 | 335.8 | 169 | 710.52 |
| 170 | 737.78 | 170 | 348.56 |
| 171 | 853.5 | 171 | 563.73 |
| 172 | 294.6 | 172 | 989.15 |
| 173 | 703.71 | 173 | 706.41 |
| 174 | 886.84 | 174 | 333.96 |
| 175 | 678.13 | 175 | 487.14 |
| 176 | 842.6 | 176 | 968.07 |
| 177 | 731.83 | 177 | 696.47 |
| 178 | 295.71 | 178 | 295.18 |
| 179 | 677.63 | 179 | 430.17 |
| 180 | 845.01 | 180 | 950.78 |
| 181 | 724.71 | 181 | 659.68 |
| 182 | 294.65 | 182 | 985.69 |
| 183 | 678.42 | 183 | 656.46 |
| 184 | 676.29 | 184 | 280.26 |
| 185 | 361.47 | 185 | 266.24 |
| 186 | 940.9 | 186 | 929.87 |
| 187 | 674.43 | 187 | 260.04 |
| 188 | 363.51 | 188 | 929.28 |
| 189 | 728.43 | 189 | 260.06 |
| 190 | 953.29 | 190 | 955.38 |
| 191 | 928.5 | 191 | 264.25 |
| 192 | 623.42 | 192 | 953.61 |
| 193 | 355.01 | 193 | 431.7 |
| 194 | 711.9 | 194 | 943.35 |
| 195 | 904.96 | 195 | 411.54 |
| 196 | 531.85 | 196 | 286.02 |
| 197 | 347.62 | 197 | 487.53 |
| 198 | 690.55 | 198 | 970.6 |
| 199 | 731.76 | 199 | 451.05 |
| 200 | 363.8 | 200 | 320.69 |
| 201 | 617.34 | 201 | 573.57 |
| 202 | 940.5 | 202 | 981.14 |
| 203 | 535.92 | 203 | 506.68 |
| 204 | 362.65 | 204 | 336.65 |
| 205 | 917.58 | 205 | 675.35 |
| 206 | 537.4 | 206 | 983.85 |
| 207 | 358.69 | 207 | 582.05 |
| 208 | 615.11 | 208 | 349.2 |
| 209 | 900.76 | 209 | 342.19 |
| 210 | 728.04 | 210 | 758.37 |
| 211 | 357.77 | 211 | 969.83 |
| 212 | 621.01 | 212 | 656.13 |
| 213 | 934.35 | 213 | 341.9 |
| 214 | 535.95 | 214 | 760.49 |
| 215 | 354.02 | 215 | 972.83 |
| 216 | 617.26 | 216 | 652.1 |
| 217 | 901.93 | 217 | 671.81 |
| 218 | 724.81 | 218 | 985.85 |
| 219 | 355.72 | 219 | 582 |
| 220 | 624.17 | 220 | 347.13 |
| 221 | 928.84 | 221 | 569.48 |
| 222 | 534.55 | 222 | 978.28 |
| 223 | 353.07 | 223 | 506.43 |
| 224 | 895.42 | 224 | 334.41 |
| 225 | 728.98 | 225 | 484.53 |
| 226 | 357.72 | 226 | 963.32 |
| 227 | 627.24 | 227 | 450.59 |

| | | | |
|---|---|---|---|
| 228 | 927.38 | 228 | 317.63 |
| 229 | 532.52 | 229 | 430.46 |
| 230 | 346.63 | 230 | 944.51 |
| 231 | 610.32 | 231 | 410.98 |
| 232 | 896.48 | 232 | 282.04 |
| 233 | 723.13 | 233 | 343.22 |
| 234 | 351.69 | 234 | 756.55 |
| 235 | 617.54 | 235 | 972.93 |
| 236 | 927.19 | 236 | 657.61 |
| 237 | 533.28 | 237 | 669.54 |
| 238 | 346.46 | 238 | 991.32 |
| 239 | 607.14 | 239 | 575.12 |
| 240 | 892.95 | 240 | 348.77 |
| 241 | 726.32 | 241 | 566.86 |
| 242 | 350.95 | 242 | 979.2 |
| 243 | 620.12 | 243 | 490.32 |
| 244 | 926.71 | 244 | 335.59 |
| 245 | 338.06 | 245 | 486.73 |
| 246 | 669.59 | 246 | 959.29 |
| 247 | 908.88 | 247 | 438.66 |
| 248 | 759.16 | 248 | 317.29 |
| 249 | 327.27 | 249 | 430.91 |
| 250 | 663.43 | 250 | 939.58 |
| 251 | 820.16 | 251 | 392.5 |
| 252 | 736.88 | 252 | 282.24 |
| 253 | 648.86 | 253 | 343.56 |
| 254 | 348.2 | 254 | 760.6 |
| 255 | 731.02 | 255 | 970.12 |
| 256 | 934.54 | 256 | 659.08 |
| 257 | 623.51 | 257 | 674.2 |
| 258 | 319.65 | 258 | 992.11 |
| 259 | 616.04 | 259 | 585.91 |
| 260 | 907.44 | 260 | 348.92 |
| 261 | 729.14 | 261 | 564.23 |
| 262 | 357.01 | 262 | 982.58 |
| 263 | 620.21 | 263 | 509.9 |
| 264 | 930.23 | 264 | 336.31 |
| 265 | 530.65 | 265 | 486.31 |
| 266 | 356.43 | 266 | 963.4 |
| 267 | 617.82 | 267 | 454.22 |
| 268 | 903.92 | 268 | 321.7 |
| 269 | 727.15 | 269 | 430.38 |
| 270 | 353.59 | 270 | 940.72 |
| 271 | 617.09 | 271 | 412.49 |
| 272 | 933.34 | 272 | 285.71 |
| 273 | 524.86 | 273 | 803.05 |
| 274 | 350.8 | 274 | 754.82 |
| 275 | 617.21 | 275 | 325.23 |
| 276 | 903.68 | 276 | 751.57 |
| 277 | 728.81 | 277 | 325.56 |
| 278 | 359.03 | 278 | 766.97 |
| 279 | 621.49 | 279 | 323.98 |
| 280 | 936.14 | 280 | 722.18 |
| 281 | 531.73 | 281 | 314.57 |
| 282 | 358.3 | 282 | 722.68 |
| 283 | 612.92 | 283 | 299.57 |
| 284 | 910.1 | 284 | 821.52 |
| 285 | 727.72 | 285 | 940.29 |
| 286 | 356.92 | 286 | 572.22 |
| 287 | 624.78 | 287 | 375.79 |
| 288 | 934.22 | 288 | 816.26 |
| 289 | 532.7 | 289 | 924.52 |
| 290 | 357.9 | 290 | 494.43 |
| 291 | 615.2 | 291 | 366.44 |
| 292 | 900.42 | 292 | 802.24 |
| 293 | 778.21 | 293 | 888.34 |
| 294 | 362.13 | 294 | 435.8 |
| 295 | 530.78 | 295 | 355.57 |
| 296 | 910.8 | 296 | 752.63 |
| 297 | 779.9 | 297 | 531.04 |
| 298 | 362.48 | 298 | 159.29 |
| 299 | 626.48 | 299 | 764.66 |
| 300 | 931.35 | 300 | 822.53 |
| 301 | 534.48 | 301 | 385.3 |
| 302 | 361 | 302 | 332.8 |
| 303 | 614.04 | 303 | 812.84 |
| 304 | 900.1 | 304 | 391.98 |
| 305 | 727.19 | 305 | 337.76 |
| 306 | 360.03 | 306 | 428.81 |
| 307 | 626.51 | 307 | 870.35 |
| 308 | 933.29 | 308 | 440.16 |
| 309 | 658.57 | 309 | 352.47 |
| 310 | 351.12 | 310 | 488.94 |
| 311 | 734.78 | 311 | 918.86 |
| 312 | 971.08 | 312 | 498.58 |
| 313 | 729 | 313 | 361.96 |
| 314 | 351.17 | 314 | 571.41 |
| 315 | 622.86 | 315 | 934.56 |
| 316 | 968.66 | 316 | 576.88 |
| 317 | 759.95 | 317 | 369.66 |
| 318 | 354.13 | 318 | 676.05 |
| 319 | 628.29 | 319 | 940.8 |
| 320 | 970.82 | 320 | 648.36 |
| 321 | 657.41 | 321 | 352.92 |
| 322 | 354.74 | 322 | 759.27 |
| 323 | 734.33 | 323 | 649.12 |
| 324 | 973.54 | 324 | 356.67 |
| 325 | 734.57 | 325 | 780.43 |
| 326 | 355.67 | 326 | 940.03 |
| 327 | 627.58 | 327 | 731.35 |
| 328 | 971.49 | 328 | 320.5 |
| 329 | 779.79 | 329 | 939.79 |
| 330 | 356.36 | 330 | 647.15 |
| 331 | 624.24 | 331 | 351.21 |
| 332 | 973.29 | 332 | 760.21 |
| 333 | 816.16 | 333 | 941.09 |
| 334 | 331.41 | 334 | 573.91 |
| 335 | 966.37 | 335 | 367.76 |
| 336 | 306.65 | 336 | 673.27 |
| 337 | 1000.47 | 337 | 919.55 |
| 338 | 296.9 | 338 | 493.06 |
| 339 | 493.32 | 339 | 360.1 |
| 340 | 956.77 | 340 | 568.34 |
| 341 | 776.11 | 341 | 882.75 |
| 342 | 351.8 | 342 | 432.44 |
| 343 | 529.8 | 343 | 351.33 |
| 344 | 968.93 | 344 | 485.9 |
| 345 | 628.64 | 345 | 822.94 |
| 346 | 347.02 | 346 | 386.93 |

| | |
|---|---|
| 347 | 618.17 |
| 348 | 968.53 |
| 349 | 615.02 |
| 350 | 351.05 |
| 351 | 530.36 |
| 352 | 966.25 |
| 353 | 610.04 |
| 354 | 343.62 |
| 355 | 528.52 |
| 356 | 967.99 |
| 357 | 643.16 |
| 358 | 341.88 |
| 359 | 615.3 |
| 360 | 964.93 |
| 361 | 729.2 |
| 362 | 343.88 |
| 363 | 530.11 |
| 364 | 967.54 |
| 365 | 292.7 |
| 366 | 565.2 |
| 367 | 999.92 |
| 368 | 285.01 |
| 369 | 1003.41 |
| 370 | 547.71 |
| 371 | 289.88 |
| 372 | 1000.04 |
| 373 | 172.7 |
| *Total:* | 236320.58 |
| *Average:* | 633.57 |

| | |
|---|---|
| 347 | 336.45 |
| 348 | 427.3 |
| 349 | 938.21 |
| 350 | 648.79 |
| 351 | 350.34 |
| 352 | 754.07 |
| 353 | 942.74 |
| 354 | 572.03 |
| 355 | 366.37 |
| 356 | 672.51 |
| 357 | 920.95 |
| 358 | 491.91 |
| 359 | 358.49 |
| 360 | 567.99 |
| 361 | 883.14 |
| 362 | 428.37 |
| 363 | 347.5 |
| 364 | 482.71 |
| 365 | 823.75 |
| 366 | 382.49 |
| 367 | 334.36 |
| 368 | 424.75 |
| 369 | 935.34 |
| 370 | 644.39 |
| 371 | 349.71 |
| 372 | 749.88 |
| 373 | 934.48 |
| 374 | 573.69 |
| 375 | 364.93 |
| 376 | 674.14 |
| 377 | 907.64 |
| 378 | 491.08 |
| 379 | 355.42 |
| 380 | 568.35 |
| 381 | 869.94 |
| 382 | 429.66 |
| 383 | 346.11 |
| 384 | 488.57 |
| 385 | 804.34 |
| 386 | 380.44 |
| 387 | 333.58 |
| 388 | 431.1 |
| 389 | 937.22 |
| 390 | 651.01 |
| 391 | 348.16 |
| 392 | 753.37 |
| 393 | 934.65 |
| 394 | 574.72 |
| 395 | 358.57 |
| 396 | 675.13 |
| 397 | 911.77 |
| 398 | 495.61 |
| 399 | 349.67 |
| 400 | 564.5 |
| 401 | 869.36 |
| 402 | 434.31 |
| 403 | 340.5 |
| 404 | 487.56 |
| 405 | 807.47 |
| 406 | 389.1 |
| 407 | 330.52 |
| 408 | 430.63 |
| 409 | 421.36 |
| 410 | 823.64 |
| 411 | 563.11 |
| 412 | 312.47 |
| 413 | 476.99 |
| 414 | 885.48 |
| 415 | 615.38 |
| 416 | 325.99 |
| 417 | 560.3 |
| 418 | 921.37 |
| 419 | 639.47 |
| 420 | 337.91 |
| 421 | 671.41 |
| 422 | 945.02 |
| 423 | 660.78 |
| 424 | 350.99 |
| 425 | 934.51 |
| 426 | 655.67 |
| 427 | 350.12 |
| 428 | 751.72 |
| 429 | 290.97 |
| 430 | 719.09 |
| 431 | 580.98 |
| 432 | 777.97 |
| 433 | 383.3 |
| 434 | 319.8 |
| 435 | 413.31 |
| 436 | 845.28 |
| 437 | 429.25 |
| 438 | 333.91 |
| 439 | 475.63 |
| 440 | 889.5 |
| 441 | 491.13 |
| 442 | 344.94 |
| 443 | 562.44 |
| 444 | 916.5 |
| 445 | 575.22 |
| 446 | 358.18 |
| 447 | 669.38 |
| 448 | 931.69 |
| 449 | 648.1 |
| 450 | 346.82 |
| 451 | 756.46 |
| 452 | 683.78 |
| 453 | 300.03 |
| 454 | 772.24 |
| 455 | 381.4 |
| 456 | 321.29 |
| 457 | 408.13 |
| 458 | 835.45 |
| 459 | 429.95 |
| 460 | 335.53 |
| 461 | 472.19 |
| 462 | 888.23 |
| 463 | 493.35 |
| 464 | 347.72 |
| 465 | 557.03 |

| | |
|---|---|
| 466 | 921.95 |
| 467 | 571.7 |
| 468 | 357.06 |
| 469 | 664.58 |
| 470 | 930.05 |
| 471 | 641.52 |
| 472 | 347.54 |
| 473 | 749.56 |
| 474 | 671.13 |
| 475 | 301.09 |
| 476 | 772.49 |
| 477 | 384.58 |
| 478 | 325.7 |
| 479 | 406.06 |
| 480 | 841.63 |
| 481 | 432.47 |
| 482 | 340.49 |
| 483 | 467.73 |
| 484 | 892.38 |
| 485 | 492.92 |
| 486 | 352.37 |
| 487 | 556 |
| 488 | 911.89 |
| 489 | 572.97 |
| 490 | 361.06 |
| 491 | 661.49 |
| 492 | 924.94 |
| 493 | 645.02 |
| 494 | 347.92 |
| 495 | 750.98 |
| 496 | 671.74 |
| 497 | 310.65 |
| 498 | 774.98 |
| 499 | 389.97 |
| 500 | 328.44 |
| 501 | 410.1 |
| 502 | 842.78 |
| 503 | 434.34 |
| 504 | 343.12 |
| 505 | 468.23 |
| 506 | 899.76 |
| 507 | 499.73 |
| 508 | 355.44 |
| 509 | 556.18 |
| 510 | 923.88 |
| 511 | 579.28 |
| 512 | 364.57 |
| 513 | 663.47 |
| 514 | 933.2 |
| 515 | 643.11 |
| 516 | 348.74 |
| 517 | 751.03 |
| 518 | 676.59 |
| 519 | 319.86 |
| 520 | 798.45 |
| 521 | 404.09 |
| 522 | 331.43 |
| 523 | 412.86 |
| 524 | 856.25 |
| 525 | 450.3 |
| 526 | 347.88 |
| 527 | 474.55 |
| 528 | 898.25 |
| 529 | 511.64 |
| 530 | 359.7 |
| 531 | 554.1 |
| 532 | 931.04 |
| 533 | 586.63 |
| 534 | 367.29 |
| 535 | 662.91 |
| 536 | 936.84 |
| 537 | 660.13 |
| 538 | 351.19 |
| 539 | 747.52 |
| 540 | 697.87 |
| 541 | 322.92 |
| 542 | 826.22 |
| 543 | 417.92 |
| 544 | 334.02 |
| 545 | 415.5 |
| 546 | 892.81 |
| 547 | 461.62 |
| 548 | 353.65 |
| 549 | 477.46 |
| 550 | 928.3 |
| 551 | 521.98 |
| 552 | 362.67 |
| 553 | 559.3 |
| 554 | 951.38 |
| 555 | 595.97 |
| 556 | 371.82 |
| 557 | 668.46 |
| 558 | 941.94 |
| 559 | 660.36 |
| 560 | 352.5 |
| 561 | 745.89 |
| 562 | 761.51 |
| 563 | 327.29 |
| 564 | 345.89 |
| 565 | 888.15 |
| 566 | 695.65 |
| 567 | 374.63 |
| 568 | 669.24 |
| 569 | 989.88 |
| 570 | 718.14 |
| 571 | 366.91 |
| 572 | 563.65 |
| 573 | 971.41 |
| 574 | 713.81 |
| 575 | 353.98 |
| 576 | 480.35 |
| 577 | 952.17 |
| 578 | 701.7 |
| 579 | 334.95 |
| 580 | 418.96 |
| 581 | 902.35 |
| 582 | 662.14 |
| 583 | 948.85 |
| 584 | 675.96 |

| | |
|---|---|
| 585 | 356.27 |
| 586 | 752.51 |
| 587 | 308.68 |
| 588 | 381.25 |
| 589 | 799.89 |
| 590 | 633.64 |
| 591 | 330.01 |
| 592 | 428.04 |
| 593 | 864.15 |
| 594 | 682.27 |
| 595 | 343.57 |
| 596 | 490.47 |
| 597 | 908.72 |
| 598 | 714.5 |
| 599 | 358.78 |
| 600 | 570.35 |
| 601 | 931.87 |
| 602 | 727.13 |
| 603 | 720.93 |
| 604 | 934.38 |
| 605 | 644.49 |
| 606 | 349.43 |
| 607 | 649.28 |
| 608 | 284.26 |
| 609 | 599.33 |
| 610 | 289.22 |
| 611 | 626.74 |
| 612 | 698.84 |
| 613 | 674.5 |
| 614 | 328.46 |
| 615 | 666.08 |
| 616 | 767.43 |
| 617 | 723.12 |
| 618 | 341.63 |
| 619 | 677.7 |
| 620 | 839.99 |
| 621 | 749.44 |
| 622 | 351.66 |
| 623 | 687.67 |
| 624 | 890.89 |
| 625 | 774.74 |
| 626 | 761.72 |
| 627 | 341.18 |
| 628 | 668.24 |
| 629 | 927.12 |
| 630 | 641.99 |
| 631 | 588.29 |
| 632 | 713.59 |
| 633 | 690.19 |
| 634 | 536.77 |
| 635 | 707.43 |
| 636 | 508.3 |
| 637 | 715.87 |
| 638 | 337.36 |
| 639 | 507.24 |
| 640 | 801.2 |
| 641 | 544.08 |
| 642 | 700.1 |
| 643 | 530.22 |
| 644 | 702.49 |
| 645 | 533.91 |
| 646 | 709.45 |
| 647 | 598.11 |
| 648 | 343.99 |
| 649 | 710.77 |
| 650 | 942.45 |
| 651 | 728.94 |
| 652 | 328.6 |
| 653 | 739.56 |
| 654 | 919.45 |
| 655 | 701.46 |
| 656 | 302.4 |
| 657 | 734.75 |
| 658 | 897.42 |
| 659 | 666.89 |
| 660 | 275.24 |
| 661 | 725.07 |
| 662 | 836.88 |
| 663 | 613.62 |
| 664 | 245.9 |
| 665 | 687.63 |
| 666 | 714.83 |
| 667 | 351.42 |
| 668 | 734.04 |
| 669 | 929.61 |
| 670 | 608.39 |
| 671 | 249.41 |
| 672 | 688.45 |
| 673 | 593.47 |
| 674 | 658.62 |
| 675 | 279.22 |
| 676 | 725.51 |
| 677 | 661.05 |
| 678 | 700.45 |
| 679 | 307 |
| 680 | 733.14 |
| 681 | 751.63 |
| 682 | 731.29 |
| 683 | 330.56 |
| 684 | 738.42 |
| 685 | 861.12 |
| 686 | 729.6 |
| 687 | 355.02 |
| 688 | 709.33 |
| 689 | 935.8 |
| 690 | 735.16 |
| 691 | 358.91 |
| 692 | 713.78 |
| 693 | 822.7 |
| 694 | 729.28 |
| 695 | 338.4 |
| 696 | 747.71 |
| 697 | 860.46 |
| 698 | 704.79 |
| 699 | 312.23 |
| 700 | 741.87 |
| 701 | 753.91 |
| 702 | 671.47 |
| 703 | 287.2 |

| | |
|---|---|
| 704 | 736.03 |
| 705 | 662.77 |
| 706 | 610.83 |
| 707 | 256.12 |
| 708 | 693.13 |
| 709 | 600.78 |
| 710 | 343.49 |
| 711 | 739.03 |
| 712 | 928.18 |
| 713 | 710.18 |
| 714 | 700.21 |
| 715 | 599.28 |
| 716 | 654.69 |
| 717 | 324.3 |
| 718 | 737.31 |
| 719 | 670.53 |
| 720 | 705.18 |
| 721 | 360.07 |
| 722 | 752.18 |
| 723 | 758.63 |
| 724 | 731.24 |
| 725 | 372.13 |
| 726 | 758.62 |
| 727 | 862.24 |
| 728 | 754.64 |
| 729 | 374.83 |
| 730 | 799.59 |
| 731 | 615.7 |
| 732 | 242.79 |
| 733 | 658.25 |
| 734 | 856.13 |
| 735 | 666.24 |
| 736 | 274.37 |
| 737 | 704.27 |
| 738 | 896.47 |
| 739 | 688.56 |
| 740 | 300.41 |
| 741 | 719.01 |
| 742 | 914.14 |
| 743 | 708.3 |
| 744 | 327.07 |
| 745 | 739.84 |
| 746 | 778.75 |
| 747 | 860.46 |
| 748 | 709.28 |
| 749 | 371.48 |
| 750 | 770.4 |
| 751 | 749.63 |
| 752 | 677.23 |
| 753 | 366.4 |
| 754 | 712.5 |
| 755 | 591.65 |
| 756 | 585.35 |
| 757 | 317.91 |
| 758 | 755.79 |
| 759 | 660.55 |
| 760 | 648.44 |
| 761 | 356.33 |
| 762 | 692.32 |
| 763 | 244.85 |
| 764 | 602.05 |
| 765 | 585.06 |
| 766 | 730.5 |
| 767 | 274.82 |
| 768 | 654.27 |
| 769 | 654.59 |
| 770 | 749.56 |
| 771 | 301.71 |
| 772 | 685.38 |
| 773 | 744.27 |
| 774 | 757.36 |
| 775 | 328.48 |
| 776 | 696.28 |
| 777 | 852.5 |
| 778 | 330.21 |
| 779 | 695.86 |
| 780 | 852.44 |
| 781 | 771.58 |
| 782 | 304.53 |
| 783 | 675.44 |
| 784 | 750.18 |
| 785 | 758.2 |
| 786 | 277.49 |
| 787 | 633.04 |
| 788 | 660.49 |
| 789 | 744.79 |
| 790 | 246.84 |
| 791 | 587.66 |
| 792 | 589.41 |
| 793 | 705.4 |
| 794 | 920.28 |
| 795 | 703.54 |
| 796 | 348.36 |
| 797 | 730.67 |
| 798 | 741.46 |
| 799 | 926.07 |
| 800 | 699.78 |
| 801 | 346.34 |
| 802 | 927.28 |
| 803 | 733.96 |
| 804 | 350.92 |
| 805 | 697.11 |
| 806 | 695.76 |
| 807 | 925.55 |
| 808 | 739.3 |
| 809 | 353.38 |
| *Total:* | 491728.86 |
| *Average:* | 607.82 |

**Appendix C –** Data

02 | Mid-Rise Building Data – Annual Solar Radiation

*NOTE: Solar radiation for individual buildings, 36 buildings in total.*

**South-West Corner of Eglinton & Bathurst**

| Building: 31 | | |
|---|---|---|
| | **Roof Surfaces** | **Annual Solar Radiation** |
| [#] | [#] | [kWh/m2/year] |
| 91 | Roof 1 | 1289.99 |
| 103 | Roof 2 | 635.21 |
| | *Total:* | *1925.2* |
| | Podium Surface | [kWh/m2/year] |
| 105 | Podium Roof | 625.18 |
| | *Total: Roof Surface:* | *2550.38* |
| | **Façade Surfaces** | **Annual Solar Radiation** |
| 364 | Podium: N - 1 to 3 storeys | 389.57 |
| 365 | Podium: N - 4 to 6 storeys | 457.93 |
| | *Total N Podium:* | *847.5* |
| - | Podium: W - 1 to 3 storeys | - |
| - | Podium: W - 4 to 6 storeys | - |
| | *Total W Podium:* | *-* |
| 360 | Podium: S - 1 to 3 storeys | 987.22 |
| 361 | Podium: S - 4 to 6 storeys | 1014.14 |
| | *Total S Podium:* | *2001.36* |
| 362 | Podium: E - 1 to 3 storeys | 248.09 |
| 363 | Podium: E - 4 to 6 storeys | 330.3 |
| | *Total E Podium:* | *578.39* |
| | *Tower* | [kWh/m2/year] |
| 341 | N - 7 storey | 341.81 |
| 293 | N - 8 storey | 351.66 |
| | *Total North Tower:* | *693.47* |
| 342 | W - 7 storey | 616.43 |
| 294 | W - 8 storey | 729.91 |
| | *Total West Tower:* | *1346.34* |
| 343 | S - 7 storey | 961.18 |
| 295 | S - 8 storey | 971.99 |
| | *Total South Tower:* | *1933.17* |
| 340 | E - 7 storey | 642.15 |
| 292 | E - 8 storey | 661.92 |
| | *Total East Tower:* | *1304.07* |
| | *Total Building:* | 11254.68 |

**North-West Corner of Eglinton & Bathurst**

| Building: 07 | | |
|---|---|---|
| | **Roof Surfaces** | **Annual Solar Radiation** |
| [#] | [#] | [kWh/m2/year] |
| 77 | Roof 1 | 1302.94 |
| 78 | Roof 2 | 670.9 |
| | *Total:* | *1973.84* |
| | Podium Surface | [kWh/m2/year] |
| 36 | Podium Roof | 652 |
| | *Total: Roof Surface:* | *2625.84* |
| | **Façade Surfaces** | **Annual Solar Radiation** |
| - | Podium: N - 1 to 3 storeys | - |
| - | Podium: N - 4 to 6 storeys | - |
| | *Total N Podium:* | *-* |
| 377 | Podium: W - 1 to 3 storeys | 489.08 |
| 376 | Podium: W - 4 to 6 storeys | 594.32 |
| | *Total W Podium:* | *1083.4* |
| 375 | Podium: S - 1 to 3 storeys | 698.64 |
| 374 | Podium: S - 4 to 6 storeys | 854.86 |
| | *Total S Podium:* | *1553.5* |
| - | Podium: E - 1 to 3 storeys | - |
| - | Podium: E - 4 to 6 storeys | - |
| | *Total E Podium:* | *-* |
| | *Tower* | [kWh/m2/year] |
| 241 | N - 7 storey | 320.75 |
| 237 | N - 8 storey | 346.69 |
| | *Total North Tower:* | *667.44* |
| 242 | W - 7 storey | 616.18 |
| 238 | W - 8 storey | 730.23 |
| | *Total West Tower:* | *1346.41* |
| 243 | S - 7 storey | 905.83 |
| 239 | S - 8 storey | 928.55 |
| | *Total South Tower:* | *1834.38* |
| 240 | E - 7 storey | 625.56 |
| 236 | E - 8 storey | 645.44 |
| | *Total East Tower:* | *1271* |
| | *Total Building:* | 13018.87 |

**North-East Corner of Eglinton & Bathurst**

| Building: 17 | | |
|---|---|---|
| | **Roof Surfaces** | **Annual Solar Radiation** |
| [#] | [#] | [kWh/m2/year] |
| 61 | Roof 1 | 1302.12 |
| 62 | Roof 2 | 783.73 |
| | *Total:* | *2085.85* |
| | Podium Surface | [kWh/m2/year] |
| 25 | Podium Roof | 728.24 |
| | *Total: Roof Surface:* | *2814.09* |
| | **Façade Surfaces** | **Annual Solar Radiation** |
| 357 | Podium: N - 1 to 3 storeys | 254.7 |
| 356 | Podium: N - 4 to 6 storeys | 321.88 |
| | *Total N Podium:* | *576.58* |
| 359 | Podium: W - 1 to 3 storeys | 205.22 |
| 358 | Podium: W - 4 to 6 storeys | 645.34 |
| | *Total W Podium:* | *850.56* |
| 355 | Podium: S - 1 to 3 storeys | 680.83 |
| 354 | Podium: S - 4 to 6 storeys | 843.79 |
| | *Total S Podium:* | *1524.62* |
| - | Podium: E - 1 to 3 storeys | - |
| - | Podium: E - 4 to 6 storeys | - |
| | *Total E Podium:* | *-* |
| | *Tower* | [kWh/m2/year] |
| 180 | N - 7 storey | 348.75 |
| 176 | N - 8 storey | 354.81 |
| | *Total North Tower:* | *703.56* |
| 181 | W - 7 storey | 689.71 |
| 177 | W - 8 storey | 710.43 |
| | *Total West Tower:* | *1400.14* |
| 178 | S - 7 storey | 901.46 |
| 174 | S - 8 storey | 934.3 |
| | *Total South Tower:* | *1835.76* |
| 179 | E - 7 storey | 529.17 |
| 175 | E - 8 storey | 623.15 |
| | *Total East Tower:* | *1152.32* |
| | *Total Building:* | 13809.39 |

**South-East Corner of Eglinton & Bathurst**

| Building: 30 | | |
|---|---|---|
| | **Roof Surfaces** | **Annual Solar Radiation** |
| [#] | [#] | [kWh/m2/year] |
| 1 | Roof 1 | 1295.95 |
| 12 | Roof 2 | 647.97 |
| | *Total:* | *1943.92* |
| | Podium Surface | [kWh/m2/year] |
| 18 | Podium Roof | 627.76 |
| | *Total: Roof Surface:* | *2571.68* |
| | **Façade Surfaces** | **Annual Solar Radiation** |
| 366 | Podium: N - 1 to 3 storeys | 261.72 |
| 367 | Podium: N - 4 to 6 storeys | 450.81 |
| | *Total N Podium:* | *712.53* |
| 368 | Podium: W - 1 to 3 storeys | 207.85 |
| 369 | Podium: W - 4 to 6 storeys | 287.57 |
| | *Total W Podium:* | *495.42* |
| 371 | Podium: S - 1 to 3 storeys | 803.59 |
| 370 | Podium: S - 4 to 6 storeys | 1011.38 |
| | *Total S Podium:* | *1814.97* |
| - | Podium: E - 1 to 3 storeys | - |
| - | Podium: E - 4 to 6 storeys | - |
| | *Total E Podium:* | *-* |
| | *Tower* | [kWh/m2/year] |
| 45 | N - 7 storey | 341.33 |
| 2 | N - 8 storey | 350.66 |
| | *Total North Tower:* | *691.99* |
| 46 | W - 7 storey | 738.22 |
| 3 | W - 8 storey | 765.73 |
| | *Total West Tower:* | *1503.95* |
| 47 | S - 7 storey | 968.52 |
| 395 | S - 8 storey | 974.03 |
| | *Total South Tower:* | *1942.55* |
| 44 | E - 7 storey | 539.92 |
| 1 | E - 8 storey | 632.86 |
| | *Total East Tower:* | *1172.78* |
| | *Total Building:* | 13928.79 |

**South-Side of Eglinton Avenue**

| Building: 26 | | |
|---|---|---|
| | **Roof Surfaces** | **Annual Solar Radiation** |
| [#] | [#] | [kWh/m2/year] |
| 2 | Roof 1 | 1295.9 |
| 7 | Roof 2 | 552.36 |
| | *Total:* | *1848.26* |
| | Podium Surface | [kWh/m2/year] |
| 14 | Podium Roof | 675.29 |
| | *Total: Roof Surface:* | *2523.55* |
| | **Façade Surfaces** | **Annual Solar Radiation** |
| 381 | Podium: N - 1 to 3 storeys | 441.85 |
| 380 | Podium: N - 4 to 6 storeys | 477.71 |
| | *Total N Podium:* | *919.56* |
| - | Podium: W - 1 to 3 storeys | - |
| - | Podium: W - 4 to 6 storeys | - |
| | *Total W Podium:* | *-* |
| 373 | Podium: S - 1 to 3 storeys | 947.46 |
| 372 | Podium: S - 4 to 6 storeys | 1005.09 |
| | *Total S Podium:* | *1952.55* |
| - | Podium: E - 1 to 3 storeys | - |
| - | Podium: E - 4 to 6 storeys | - |
| | *Total E Podium:* | *-* |
| | *Tower* | [kWh/m2/year] |
| 25 | N - 7 storey | 344.17 |
| 5 | N - 8 storey | 352.02 |
| | *Total North Tower:* | *696.19* |
| 24 | W - 7 storey | 621.77 |
| 4 | W - 8 storey | 737.52 |
| | *Total West Tower:* | *1359.29* |
| 27 | S - 7 storey | 969.12 |
| 7 | S - 8 storey | 971.31 |
| | *Total South Tower:* | *1940.43* |
| 26 | E - 7 storey | 533.24 |
| 6 | E - 8 storey | 627.24 |
| | *Total East Tower:* | *1160.48* |
| | *Total Building:* | 13424.16 |

**North-Side of Eglinton Avenue**

| Building: 22 | | |
|---|---|---|
| | **Roof Surfaces** | **Annual Solar Radiation** |
| [#] | [#] | [kWh/m2/year] |
| 66 | Roof 1 | 1300.44 |
| 65 | Roof 2 | 626.64 |
| | *Total:* | *1927.08* |
| | Podium Surface | [kWh/m2/year] |
| 21 | Podium Roof | 746.63 |
| | *Total: Roof Surface:* | *2673.71* |
| | **Façade Surfaces** | **Annual Solar Radiation** |
| 383 | Podium: N - 1 to 3 storeys | 437.4 |
| 382 | Podium: N - 4 to 6 storeys | 359.26 |
| | *Total N Podium:* | *796.66* |
| - | Podium: W - 1 to 3 storeys | - |
| - | Podium: W - 4 to 6 storeys | - |
| | *Total W Podium:* | *-* |
| 379 | Podium: S - 1 to 3 storeys | 160.05 |
| 378 | Podium: S - 4 to 6 storeys | 203.53 |
| | *Total S Podium:* | *363.58* |
| - | Podium: E - 1 to 3 storeys | - |
| - | Podium: E - 4 to 6 storeys | - |
| | *Total E Podium:* | *-* |
| | *Tower* | [kWh/m2/year] |
| 190 | N - 7 storey | 358.55 |
| 194 | N - 8 storey | 357.06 |
| | *Total North Tower:* | *715.61* |
| 191 | W - 7 storey | 614.2 |
| 193 | W - 8 storey | 724.33 |
| | *Total West Tower:* | *1338.53* |
| 192 | S - 7 storey | 902.56 |
| 196 | S - 8 storey | 930.81 |
| | *Total South Tower:* | *1833.37* |
| 189 | E - 7 storey | 538.07 |
| 195 | E - 8 storey | 624.77 |
| | *Total East Tower:* | *1162.84* |
| | *Total Building:* | 10044.54 |

**East-Side Bathurst**

| Building: 14 | | |
|---|---|---|
| | **Roof Surfaces** | **Annual Solar Radiation** |
| [#] | [#] | [kWh/m2/year] |
| 44 | Roof 1 | 1276.81 |
| 57 | Roof 2 | 788.25 |
| | *Total:* | *2065.06* |
| | Podium Surface | [kWh/m2/year] |
| 28 | Podium Roof | 868.98 |
| | *Total: Roof Surface:* | *2934.04* |
| | **Façade Surfaces** | **Annual Solar Radiation** |
| - | Podium: N - 1 to 3 storeys | - |
| - | Podium: N - 4 to 6 storeys | - |
| | *Total N Podium:* | *-* |
| 394 | Podium: W - 1 to 3 storeys | 435.18 |
| 393 | Podium: W - 4 to 6 storeys | 606.47 |
| | *Total W Podium:* | *1041.65* |
| - | Podium: S - 1 to 3 storeys | - |
| - | Podium: S - 4 to 6 storeys | - |
| | *Total S Podium:* | *-* |
| 388 | Podium: E - 1 to 3 storeys | 683.98 |
| 387 | Podium: E - 4 to 6 storeys | 352.71 |
| | *Total E Podium:* | *1036.69* |
| | *Tower* | [kWh/m2/year] |
| 161 | N - 7 storey | 297 |
| 110 | N - 8 storey | 330.61 |
| | *Total North Tower:* | *627.61* |
| 162 | W - 7 storey | 674.68 |
| 107 | W - 8 storey | 697.07 |
| | *Total West Tower:* | *1371.75* |
| 159 | S - 7 storey | 844 |
| 108 | S - 8 storey | 915.8 |
| | *Total South Tower:* | *1759.8* |
| 160 | E - 7 storey | 732.98 |
| 109 | E - 8 storey | 739.32 |
| | *Total East Tower:* | *1472.3* |
| | *Total Building:* | 10932.78 |

**West-Side Bathurst**

| Building: 10 | | |
|---|---|---|
| | **Roof Surfaces** | **Annual Solar Radiation** |
| [#] | [#] | [kWh/m2/year] |
| 49 | Roof 1 | 1276.91 |
| 53 | Roof 2 | 831.03 |
| | *Total:* | *2107.94* |
| | Podium Surface | [kWh/m2/year] |
| 33 | Podium Roof | 914.85 |
| | *Total: Roof Surface:* | *3022.79* |
| | **Façade Surfaces** | **Annual Solar Radiation** |
| - | Podium: N - 1 to 3 storeys | - |
| - | Podium: N - 4 to 6 storeys | - |
| | *Total N Podium:* | *-* |
| 392 | Podium: W - 1 to 3 storeys | 694.8 |
| 391 | Podium: W - 4 to 6 storeys | 734.79 |
| | *Total W Podium:* | *1429.59* |
| - | Podium: S - 1 to 3 storeys | - |
| - | Podium: S - 4 to 6 storeys | - |
| | *Total S Podium:* | *-* |
| 390 | Podium: E - 1 to 3 storeys | 464.93 |
| 389 | Podium: E - 4 to 6 storeys | 357.97 |
| | *Total E Podium:* | *822.9* |
| | *Tower* | [kWh/m2/year] |
| 145 | N - 7 storey | 295.05 |
| 129 | N - 8 storey | 328.66 |
| | *Total North Tower:* | *623.71* |
| 146 | W - 7 storey | 707.47 |
| 130 | W - 8 storey | 710.77 |
| | *Total West Tower:* | *1418.24* |
| 143 | S - 7 storey | 840 |
| 127 | S - 8 storey | 918.48 |
| | *Total South Tower:* | *1758.48* |
| 144 | E - 7 storey | 709.14 |
| 128 | E - 8 storey | 729.98 |
| | *Total East Tower:* | *1439.12* |
| | *Total Building:* | 11586.45 |

**South-West Corner of Eglinton & Bathurst**

| Building: 31 | | |
|---|---|---|
| | Roof Surfaces | Annual Solar Radiation |
| [#] | [#] | [kWh/m2] |
| 18 | Roof 1 | 1292.07 |
| 17 | Roof 2 | 782.82 |
| | *Total:* | *2074.89* |
| | Podium Surface | [kWh/m2] |
| 10 | Podium Roof | 1044.73 |
| | *Total: Roof Surface:* | *3119.62* |
| | Façade Surfaces | Annual Solar Radiation |
| 56 | Podium: N | 276.82 |
| - | Podium: W | - |
| 54 | Podium: S | 990.15 |
| 55 | Podium: E | 574.61 |
| | *Total Podium Tower:* | *1841.58* |
| | *Tower* | [kWh/m2] |
| 117 | N - 4 storey | 290.19 |
| 121 | N - 5 storey | 326.94 |
| 125 | N - 6 storey | 340.99 |
| 129 | N - 7 storey | 355.89 |
| 133 | N - 8 storey | 345.65 |
| | *Total North Tower:* | *1659.66* |
| 118 | W - 4 storey | 430.67 |
| 122 | W - 5 storey | 486.7 |
| 126 | W - 6 storey | 564.73 |
| 130 | W - 7 storey | 672.7 |
| 134 | W - 8 storey | 754.35 |
| | *Total West Tower:* | *2909.15* |
| 119 | S - 4 storey | 951.38 |
| 123 | S - 5 storey | 964.6 |
| 127 | S - 6 storey | 982.37 |
| 131 | S - 7 storey | 998.91 |
| 135 | S - 8 storey | 967.98 |
| | *Total South Tower:* | *4865.24* |
| 120 | E - 4 storey | 591.56 |
| 124 | E - 5 storey | 636.29 |
| 128 | E - 6 storey | 662.08 |
| 132 | E - 7 storey | 675.36 |
| 136 | E - 8 storey | 663.17 |
| | *Total East Tower:* | *3228.46* |
| | *Total Building:* | 17623.71 |

**North-West Corner of Eglinton & Bathurst**

| Building: 07 | | |
|---|---|---|
| | Roof Surfaces | Annual Solar Radiation |
| [#] | [#] | [kWh/m2] |
| 57 | Roof 1 | 349.48 |
| 56 | Roof 2 | 276.82 |
| | *Total:* | *626.3* |
| | Podium Surface | [kWh/m2] |
| 43 | Podium Roof | 341.33 |
| | *Total: Roof Surface:* | *967.63* |
| | Façade Surfaces | Annual Solar Radiation |
| - | Podium: N | - |
| - | Podium: W | - |
| 297 | Podium: S | 747.94 |
| 298 | Podium: E | 531.33 |
| | *Total Podium Tower:* | *1279.27* |
| | *Tower* | [kWh/m2] |
| 413 | N - 4 storey | 312.41 |
| 417 | N - 5 storey | 325.27 |
| 421 | N - 6 storey | 337.98 |
| 425 | N - 7 storey | 350.83 |
| 428 | N - 8 storey | 349.53 |
| | *Total North Tower:* | *1676.02* |
| 410 | W - 4 storey | 420.24 |
| 414 | W - 5 storey | 478.38 |
| 418 | W - 6 storey | 564.59 |
| 422 | W - 7 storey | 665.65 |
| 429 | W - 8 storey | 752.52 |
| | *Total West Tower:* | *2881.38* |
| 411 | S - 4 storey | 826.31 |
| 415 | S - 5 storey | 875.29 |
| 419 | S - 6 storey | 919.34 |
| 423 | S - 7 storey | 935.71 |
| 426 | S - 8 storey | 933.51 |
| | *Total South Tower:* | *4490.16* |
| 412 | E - 4 storey | 565.64 |
| 416 | E - 5 storey | 612.82 |
| 420 | E - 6 storey | 639.3 |
| 424 | E - 7 storey | 658.05 |
| 427 | E - 8 storey | 655.41 |
| | *Total East Tower:* | *3131.22* |
| | *Total Building:* | 14425.68 |

**North-East Corner of Eglinton & Bathurst**

| Building: 17 | | |
|---|---|---|
| | Roof Surfaces | Annual Solar Radiation |
| [#] | [#] | [kWh/m2] |
| 81 | Roof 1 | 495.98 |
| 80 | Roof 2 | 307.36 |
| | *Total:* | *803.34* |
| | Podium Surface | [kWh/m2] |
| 58 | Podium Roof | 766.04 |
| | *Total: Roof Surface:* | *1569.38* |
| | Façade Surfaces | Annual Solar Radiation |
| 430 | Podium: N | 291.54 |
| 432 | Podium: W | 581.35 |
| 431 | Podium: S | 716.44 |
| - | Podium: E | - |
| | *Total Podium Tower:* | *1589.33* |
| | *Tower* | [kWh/m2] |
| 588 | N - 4 storey | 308.35 |
| 592 | N - 5 storey | 329.44 |
| 596 | N - 6 storey | 344.34 |
| 600 | N - 7 storey | 354.3 |
| 605 | N - 8 storey | 350.53 |
| | *Total North Tower:* | *1686.96* |
| 591 | W - 4 storey | 633.39 |
| 595 | W - 5 storey | 683.87 |
| 599 | W - 6 storey | 713.5 |
| 603 | W - 7 storey | 730.96 |
| 604 | W - 8 storey | 716.91 |
| | *Total West Tower:* | *3478.63* |
| 590 | S - 4 storey | 800.31 |
| 594 | S - 5 storey | 863.45 |
| 598 | S - 6 storey | 914.23 |
| 602 | S - 7 storey | 939.07 |
| 605 | S - 8 storey | 933.55 |
| | *Total South Tower:* | *4450.61* |
| 589 | E - 4 storey | 380.16 |
| 593 | E - 5 storey | 427.17 |
| 597 | E - 6 storey | 490.58 |
| 601 | E - 7 storey | 570.11 |
| 606 | E - 8 storey | 645.94 |
| | *Total East Tower:* | *2513.96* |
| | *Total Building:* | 15288.87 |

**South-East Corner of Eglinton & Bathurst**

| Building: 30 | | |
|---|---|---|
| | Roof Surfaces | Annual Solar Radiation |
| [#] | [#] | [kWh/m2] |
| 21 | Roof 1 | 977.34 |
| 20 | Roof 2 | 790.33 |
| | *Total:* | *1767.67* |
| | Podium Surface | [kWh/m2] |
| 19 | Podium Roof | 371.74 |
| | *Total: Roof Surface:* | *2139.41* |
| | Façade Surfaces | Annual Solar Radiation |
| 137 | Podium: N | 272.31 |
| 138 | Podium: W | 629.48 |
| 139 | Podium: S | 810.86 |
| - | Podium: E | - |
| | *Total Podium Tower:* | *1712.65* |
| | *Tower* | [kWh/m2] |
| 146 | N - 4 storey | 287.61 |
| 150 | N - 5 storey | 323.83 |
| 154 | N - 6 storey | 339.92 |
| 158 | N - 7 storey | 352.35 |
| 162 | N - 8 storey | 345.21 |
| | *Total North Tower:* | *1648.92* |
| 143 | W - 4 storey | 685.85 |
| 147 | W - 5 storey | 730.61 |
| 151 | W - 6 storey | 765.38 |
| 140 | W - 7 storey | 778.09 |
| 159 | W - 8 storey | 768.57 |
| | *Total West Tower:* | *3728.5* |
| 144 | S - 4 storey | 947.07 |
| 148 | S - 5 storey | 971.53 |
| 152 | S - 6 storey | 983.55 |
| 156 | S - 7 storey | 990.47 |
| 160 | S - 8 storey | 970.31 |
| | *Total South Tower:* | *4862.93* |
| 145 | E - 4 storey | 411.48 |
| 149 | E - 5 storey | 449.02 |
| 153 | E - 6 storey | 508.27 |
| 157 | E - 7 storey | 583.34 |
| 161 | E - 8 storey | 656.89 |
| | *Total East Tower:* | *2609* |
| | *Total Building:* | 16701.41 |

**South-Side of Eglinton Avenue**

| Building: 26 | | |
|---|---|---|
| | Roof Surfaces | Annual Solar Radiation |
| [#] | [#] | [kWh/m2] |
| 35 | Roof 1 | 288.51 |
| 36 | Roof 2 | 701.48 |
| | *Total:* | *989.99* |
| | Podium Surface | [kWh/m2] |
| 28 | Podium Roof | 282.09 |
| | *Total: Roof Surface:* | *1272.08* |
| | Façade Surfaces | Annual Solar Radiation |
| 192 | Podium: N | 264.75 |
| - | Podium: W | - |
| 193 | Podium: S | 954.77 |
| - | Podium: E | - |
| | *Total Podium Tower:* | *1219.52* |
| | *Tower* | [kWh/m2] |
| 273 | N - 4 storey | 286.85 |
| 269 | N - 5 storey | 321.99 |
| 265 | N - 6 storey | 336.8 |
| 261 | N - 7 storey | 350.21 |
| 254 | N - 8 storey | 343.22 |
| | *Total North Tower:* | *1639.07* |
| 270 | W - 4 storey | 431.51 |
| 266 | W - 5 storey | 484.51 |
| 262 | W - 6 storey | 565.99 |
| 258 | W - 7 storey | 671.71 |
| 255 | W - 8 storey | 760.55 |
| | *Total West Tower:* | *2914.27* |
| 271 | S - 4 storey | 431.51 |
| 267 | S - 5 storey | 963.58 |
| 263 | S - 6 storey | 980.3 |
| 259 | S - 7 storey | 983.73 |
| 256 | S - 8 storey | 972.46 |
| | *Total South Tower:* | *4331.58* |
| 272 | E - 4 storey | 411.89 |
| 268 | E - 5 storey | 451.04 |
| 264 | E - 6 storey | 510.37 |
| 260 | E - 7 storey | 590.27 |
| 257 | E - 8 storey | 658.39 |
| | *Total East Tower:* | *2621.96* |
| | *Total Building:* | 13998.48 |

**North-Side of Eglinton Avenue**

| Building: 22 | | |
|---|---|---|
| | Roof Surfaces | Annual Solar Radiation |
| [#] | [#] | [kWh/m2] |
| 72 | Roof 1 | 601.98 |
| 71 | Roof 2 | 966.23 |
| | *Total:* | *1568.21* |
| | Podium Surface | [kWh/m2] |
| 73 | Podium Roof | 295.64 |
| | *Total: Roof Surface:* | *1863.85* |
| | Façade Surfaces | Annual Solar Radiation |
| 542 | Podium: N | 323.00 |
| - | Podium: W | - |
| 541 | Podium: S | 698.42 |
| - | Podium: E | - |
| | *Total Podium Tower:* | *1021.42* |
| | *Tower* | [kWh/m2] |
| 523 | N - 4 storey | 327.98 |
| 527 | N - 5 storey | 346.28 |
| 531 | N - 6 storey | 358.72 |
| 535 | N - 7 storey | 366.99 |
| 539 | N - 8 storey | 351.5 |
| | *Total North Tower:* | *1751.47* |
| 524 | W - 4 storey | 410.82 |
| 528 | W - 5 storey | 472.21 |
| 532 | W - 6 storey | 558.39 |
| 536 | W - 7 storey | 662.81 |
| 540 | W - 8 storey | 751.71 |
| | *Total West Tower:* | *2855.94* |
| 521 | S - 4 storey | 792.62 |
| 525 | S - 5 storey | 859.18 |
| 529 | S - 6 storey | 903.33 |
| 533 | S - 7 storey | 933.22 |
| 537 | S - 8 storey | 938.86 |
| | *Total South Tower:* | *4427.21* |
| 522 | E - 4 storey | 404.31 |
| 526 | E - 5 storey | 448.3 |
| 530 | E - 6 storey | 510.8 |
| 534 | E - 7 storey | 587.07 |
| 538 | E - 8 storey | 658.1 |
| | *Total East Tower:* | *2608.58* |
| | *Total Building:* | 14528.47 |

**East-Side Bathurst**

| Building: 14 | | |
|---|---|---|
| | Roof Surfaces | Annual Solar Radiation |
| [#] | [#] | [kWh/m2] |
| 108 | Roof 1 | 1290.12 |
| 104 | Roof 2 | 792.41 |
| | *Total:* | *2082.53* |
| | Podium Surface | [kWh/m2] |
| 87 | Podium Roof | 1028.48 |
| | *Total: Roof Surface:* | *3111.01* |
| | Façade Surfaces | Annual Solar Radiation |
| - | Podium: N | - |
| 635 | Podium: W | 535.94 |
| - | Podium: S | - |
| 634 | Podium: E | 690.26 |
| | *Total Podium Tower:* | *1226.2* |
| | *Tower* | [kWh/m2] |
| 764 | N - 4 storey | 244.68 |
| 768 | N - 5 storey | 274.34 |
| 772 | N - 6 storey | 301.48 |
| 776 | N - 7 storey | 328.29 |
| 805 | N - 8 storey | 350.77 |
| | *Total North Tower:* | *1499.56* |
| 765 | W - 4 storey | 609.77 |
| 769 | W - 5 storey | 656.27 |
| 773 | W - 6 storey | 684.46 |
| 777 | W - 7 storey | 702.1 |
| 806 | W - 8 storey | 697.61 |
| | *Total West Tower:* | *3350.21* |
| 766 | S - 4 storey | 585.77 |
| 770 | S - 5 storey | 654.2 |
| 774 | S - 6 storey | 745.26 |
| 778 | S - 7 storey | 853.3 |
| 803 | S - 8 storey | 925.33 |
| | *Total South Tower:* | *3763.86* |
| 763 | E - 4 storey | 695.79 |
| 767 | E - 5 storey | 726.18 |
| 771 | E - 6 storey | 745.57 |
| 775 | E - 7 storey | 759.83 |
| 804 | E - 8 storey | 733.56 |
| | *Total East Tower:* | *3660.93* |
| | *Total Building:* | 16611.77 |

**West-Side Bathurst**

| Building: 10 | | |
|---|---|---|
| | Roof Surfaces | Annual Solar Radiation |
| [#] | [#] | [kWh/m2] |
| 96 | Roof 1 | 1301.6 |
| 95 | Roof 2 | 835.97 |
| | *Total:* | *2137.57* |
| | Podium Surface | [kWh/m2] |
| 90 | Podium Roof | 1052.85 |
| | *Total: Roof Surface:* | *3190.42* |
| | Façade Surfaces | Annual Solar Radiation |
| - | Podium: N | - |
| 645 | Podium: W | 702.99 |
| - | Podium: S | - |
| 644 | Podium: E | 531.3 |
| | *Total Podium Tower:* | *1234.29* |
| | *Tower* | [kWh/m2] |
| 672 | N - 4 storey | 248.69 |
| 676 | N - 5 storey | 278.72 |
| 680 | N - 6 storey | 304.05 |
| 684 | N - 7 storey | 330.57 |
| 688 | N - 8 storey | 355.62 |
| | *Total North Tower:* | *1517.65* |
| 673 | W - 4 storey | 692 |
| 677 | W - 5 storey | 723.85 |
| 681 | W - 6 storey | 734.09 |
| 685 | W - 7 storey | 746.9 |
| 689 | W - 8 storey | 709.75 |
| | *Total West Tower:* | *3606.59* |
| 674 | S - 4 storey | 592.55 |
| 678 | S - 5 storey | 657.7 |
| 682 | S - 6 storey | 754.21 |
| 686 | S - 7 storey | 854.03 |
| 690 | S - 8 storey | 926.94 |
| | *Total South Tower:* | *3785.43* |
| 671 | E - 4 storey | 608.5 |
| 675 | E - 5 storey | 662.36 |
| 679 | E - 6 storey | 698.59 |
| 683 | E - 7 storey | 725.15 |
| 687 | E - 8 storey | 729.44 |
| | *Total East Tower:* | *3424.04* |
| | *Total Building:* | 16758.42 |

**Appendix C –** Data

03 | Mid-Rise Building Data – Solar Energy Generation

*NOTE: Solar radiation for individual buildings, 36 buildings in total.*

## South-West Corner of Eglinton & Bathurst

| Building: 31 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 91 | Roof 1 | 1289.99 | 226 | - | 291318 | 43698 |
| 103 | Roof 2 | 635.21 | | | | |
| | *Total:* | *1925.2* | | | | |
| | Podium Surface | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 105 | Podium Roof | 625.18 | | | | |
| | *Total: Roof Surface:* | *2550.38* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| 364 | Podium: N - 1 to 3 storeys | 389.57 | | | | |
| 365 | Podium: N - 4 to 6 storeys | 457.93 | | | | |
| | *Total N Podium:* | *847.5* | | | | |
| - | Podium: W - 1 to 3 storeys | - | - | - | - | - |
| - | Podium: W - 4 to 6 storeys | - | - | - | - | - |
| | *Total W Podium:* | *-* | | | | |
| 360 | Podium: S - 1 to 3 storeys | 987.22 | 252 | 151 | 149268 | 22390 |
| 361 | Podium: S - 4 to 6 storeys | 1014.14 | 216 | 130 | 131433 | 19715 |
| | *Total S Podium:* | *2001.36* | | | | |
| 362 | Podium: E - 1 to 3 storeys | 248.09 | | | | |
| 363 | Podium: E - 4 to 6 storeys | 330.3 | | | | |
| | *Total E Podium:* | *578.39* | | | | |
| | *Tower* | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 341 | N - 7 storey | 341.81 | | | | |
| 293 | N - 8 storey | 351.66 | | | | |
| | *Total North Tower:* | *693.47* | | | | |
| 342 | W - 7 storey | 616.43 | | | | |
| 294 | W - 8 storey | 729.91 | 54 | 32 | 23649 | 3547 |
| | *Total West Tower:* | *1346.34* | | | | |
| 343 | S - 7 storey | 961.18 | 47 | 28 | 26817 | 4023 |
| 295 | S - 8 storey | 971.99 | 38 | 23 | 21951 | 3293 |
| | *Total South Tower:* | *1933.17* | | | | |
| 340 | E - 7 storey | 642.15 | | | | |
| 292 | E - 8 storey | 661.92 | 54 | 32 | 21446 | 3217 |
| | *Total East Tower:* | *1304.07* | | | | |

| | | | |
|---|---|---|---|
| *Total Building:* | 11,255 | *>700 kWh/m2/year* | 96,665 |
| | | >650 kWh/m2/year | 99,882 |
| | Total Tower: | *>700 kWh/m2/year* | 74,275 |
| | | >650 kWh/m2/year | 77,492 |
| | Total Podium: | *>700 kWh/m2/year* | 22,390 |
| | | >650 kWh/m2/year | 22,390 |

## North-West Corner of Eglinton & Bathurst

| Building: 07 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 77 | Roof 1 | 1302.94 | 187 | - | 243519 | 36528 |
| 78 | Roof 2 | 670.9 | 132 | - | 88854 | 13328 |
| | *Total:* | *1973.84* | | | | |
| | Podium Surface | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 36 | Podium Roof | 652 | 329 | - | 214286 | 32143 |
| | *Total: Roof Surface:* | *2625.84* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| - | Podium: N - 1 to 3 storeys | - | - | - | - | - |
| - | Podium: N - 4 to 6 storeys | - | - | - | - | - |
| | *Total N Podium:* | *-* | | | | |
| 377 | Podium: W - 1 to 3 storeys | 489.08 | | | | |
| 376 | Podium: W - 4 to 6 storeys | 594.32 | | | | |
| | *Total W Podium:* | *1083.4* | | | | |
| 375 | Podium: S - 1 to 3 storeys | 698.64 | 236 | 142 | 98927 | 14839 |
| 374 | Podium: S - 4 to 6 storeys | 854.86 | 203 | 122 | 104122 | 15618 |
| | *Total S Podium:* | *1553.5* | | | | |
| - | Podium: E - 1 to 3 storeys | - | - | - | - | - |
| - | Podium: E - 4 to 6 storeys | - | - | - | - | - |
| | *Total E Podium:* | *-* | | | | |
| | *Tower* | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 241 | N - 7 storey | 320.75 | | | | |
| 237 | N - 8 storey | 346.69 | | | | |
| | *Total North Tower:* | *667.44* | | | | |
| 242 | W - 7 storey | 616.18 | | | | |
| 238 | W - 8 storey | 730.23 | 51 | 31 | 22345 | 3352 |
| | *Total West Tower:* | *1346.41* | | | | |
| 243 | S - 7 storey | 905.83 | 42 | 25 | 22827 | 3424 |
| 239 | S - 8 storey | 928.55 | 33 | 20 | 18385 | 2758 |
| | *Total South Tower:* | *1834.38* | | | | |
| 240 | E - 7 storey | 625.56 | | | | |
| 236 | E - 8 storey | 645.44 | | | | |
| | *Total East Tower:* | *1271* | | | | |

| | | | |
|---|---|---|---|
| *Total Building:* | 13,019 | *>700 kWh/m2/year* | 61,680 |
| | | >650 kWh/m2/year | 121,990 |
| | Total Tower: | *>700 kWh/m2/year* | 61,680 |
| | | >650 kWh/m2/year | 75,008 |
| | Total Podium: | *>700 kWh/m2/year* | - |
| | | >650 kWh/m2/year | 14,839 |

## North-East Corner of Eglinton & Bathurst

| Building: 17 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 61 | Roof 1 | 1302.12 | 126 | - | 163676 | 24551 |
| 62 | Roof 2 | 783.73 | 111 | - | 87143 | 13071 |
| | *Total:* | *2085.85* | | | | |
| | Podium Surface | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 25 | Podium Roof | 728.24 | 308 | - | 224218 | 33633 |
| | *Total: Roof Surface:* | *2814.09* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| 357 | Podium: N - 1 to 3 storeys | 254.7 | | | | |
| 356 | Podium: N - 4 to 6 storeys | 321.88 | | | | |
| | *Total N Podium:* | *576.58* | | | | |
| 359 | Podium: W - 1 to 3 storeys | 205.22 | | | | |
| 358 | Podium: W - 4 to 6 storeys | 645.34 | | | | |
| | *Total W Podium:* | *850.56* | | | | |
| 355 | Podium: S - 1 to 3 storeys | 680.83 | 221 | 132 | 90074 | 13511 |
| 354 | Podium: S - 4 to 6 storeys | 843.79 | 189 | 113 | 95686 | 14353 |
| | *Total S Podium:* | *1524.62* | | | | |
| - | Podium: E - 1 to 3 storeys | - | - | - | - | - |
| - | Podium: E - 4 to 6 storeys | - | - | - | - | - |
| | *Total E Podium:* | *-* | | | | |
| | *Tower* | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 180 | N - 7 storey | 348.75 | | | | |
| 176 | N - 8 storey | 354.81 | | | | |
| | *Total North Tower:* | *703.56* | | | | |
| 181 | W - 7 storey | 689.71 | 69 | 41 | 28554 | 4283 |
| 177 | W - 8 storey | 710.43 | 51 | 31 | 21739 | 3261 |
| | *Total West Tower:* | *1400.14* | | | | |
| 178 | S - 7 storey | 901.46 | 36 | 22 | 19472 | 2921 |
| 174 | S - 8 storey | 934.3 | 26 | 16 | 14569 | 2185 |
| | *Total South Tower:* | *1835.76* | | | | |
| 179 | E - 7 storey | 529.17 | | | | |
| 175 | E - 8 storey | 623.15 | | | | |
| | *Total East Tower:* | *1152.32* | | | | |

| | | | |
|---|---|---|---|
| *Total Building:* | 13,809 | *>700 kWh/m2/year* | 93,975 |
| | | >650 kWh/m2/year | 111,770 |
| | Total Tower: | *>700 kWh/m2/year* | 60,343 |
| | | >650 kWh/m2/year | 64,626 |
| | Total Podium: | *>700 kWh/m2/year* | 33,633 |
| | | >650 kWh/m2/year | 47,144 |

## South-East Corner of Eglinton & Bathurst

| Building: 30 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 1 | Roof 1 | 1295.95 | 218 | - | 282517 | 42378 |
| 12 | Roof 2 | 647.97 | | | | |
| | *Total:* | *1943.92* | | | | |
| | Podium Surface | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 18 | Podium Roof | 627.76 | | | | |
| | *Total: Roof Surface:* | *2571.68* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| 366 | Podium: N - 1 to 3 storeys | 261.72 | | | | |
| 367 | Podium: N - 4 to 6 storeys | 450.81 | | | | |
| | *Total N Podium:* | *712.53* | | | | |
| 368 | Podium: W - 1 to 3 storeys | 207.85 | | | | |
| 369 | Podium: W - 4 to 6 storeys | 287.57 | | | | |
| | *Total W Podium:* | *495.42* | | | | |
| 371 | Podium: S - 1 to 3 storeys | 803.59 | 263 | 158 | 126565 | 18985 |
| 370 | Podium: S - 4 to 6 storeys | 1011.38 | 225 | 135 | 136536 | 20480 |
| | *Total S Podium:* | *1814.97* | | | | |
| - | Podium: E - 1 to 3 storeys | - | - | - | - | - |
| - | Podium: E - 4 to 6 storeys | - | - | - | - | - |
| | *Total E Podium:* | *-* | | | | |
| | *Tower* | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 45 | N - 7 storey | 341.33 | | | | |
| 2 | N - 8 storey | 350.66 | | | | |
| | *Total North Tower:* | *691.99* | | | | |
| 46 | W - 7 storey | 738.22 | 66 | 40 | 29234 | 4385 |
| 3 | W - 8 storey | 765.73 | 48 | 29 | 22053 | 3308 |
| | *Total West Tower:* | *1503.95* | | | | |
| 47 | S - 7 storey | 968.52 | 50 | 30 | 28765 | 4315 |
| 395 | S - 8 storey | 974.03 | 41 | 24 | 23757 | 3563 |
| | *Total South Tower:* | *1942.55* | | | | |
| 44 | E - 7 storey | 539.92 | | | | |
| 1 | E - 8 storey | 632.86 | | | | |
| | *Total East Tower:* | *1172.78* | | | | |

| | | | |
|---|---|---|---|
| *Total Building:* | 13,929 | *>700 kWh/m2/year* | 97,414 |
| | | >650 kWh/m2/year | 97,414 |
| | Total Tower: | *>700 kWh/m2/year* | 78,429 |
| | | >650 kWh/m2/year | 78,429 |
| | Total Podium: | *>700 kWh/m2/year* | 18,985 |
| | | >650 kWh/m2/year | 18,985 |

## South-Side of Eglinton Avenue

| Building: 26 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 2 | Roof 1 | 1295.9 | 225 | - | 291578 | 43737 |
| 7 | Roof 2 | 552.36 | 83 | - | 45846 | 6877 |
| | *Total:* | *1848.26* | | | | |
| | Podium Surface | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 14 | Podium Roof | 675.29 | 392 | - | 264714 | 39707 |
| | *Total: Roof Surface:* | *2523.55* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| 381 | Podium: N - 1 to 3 storeys | 441.85 | | | | |
| 380 | Podium: N - 4 to 6 storeys | 477.71 | | | | |
| | *Total N Podium:* | *919.56* | | | | |
| - | Podium: W - 1 to 3 storeys | - | - | - | - | - |
| - | Podium: W - 4 to 6 storeys | - | - | - | - | - |
| | *Total W Podium:* | *-* | | | | |
| 373 | Podium: S - 1 to 3 storeys | 947.46 | 263 | 158 | 149225 | 22384 |
| 372 | Podium: S - 4 to 6 storeys | 1005.09 | 225 | 135 | 135687 | 20353 |
| | *Total S Podium:* | *1952.55* | | | | |
| - | Podium: E - 1 to 3 storeys | - | - | - | - | - |
| - | Podium: E - 4 to 6 storeys | - | - | - | - | - |
| | *Total E Podium:* | *-* | | | | |
| | *Tower* | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 25 | N - 7 storey | 344.17 | | | | |
| 5 | N - 8 storey | 352.02 | | | | |
| | *Total North Tower:* | *696.19* | | | | |
| 24 | W - 7 storey | 621.77 | | | | |
| 4 | W - 8 storey | 737.52 | 48 | 29 | 21241 | 3186 |
| | *Total West Tower:* | *1359.29* | | | | |
| 27 | S - 7 storey | 969.12 | 42 | 25 | 24422 | 3663 |
| 7 | S - 8 storey | 971.31 | 42 | 25 | 24477 | 3672 |
| | *Total South Tower:* | *1940.43* | | | | |
| 26 | E - 7 storey | 533.24 | | | | |
| 6 | E - 8 storey | 627.24 | | | | |
| | *Total East Tower:* | *1160.48* | | | | |

| | | | |
|---|---|---|---|
| *Total Building:* | 13,424 | *>700 kWh/m2/year* | 143,578 |
| | | >650 kWh/m2/year | 143,578 |
| | Total Tower: | *>700 kWh/m2/year* | 81,487 |
| | | >650 kWh/m2/year | 81,487 |
| | Total Podium: | *>700 kWh/m2/year* | 62,091 |
| | | >650 kWh/m2/year | 62,091 |

## North-Side of Eglinton Avenue

| Building: 22 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 66 | Roof 1 | 1300.44 | 161 | - | 209371 | 31406 |
| 65 | Roof 2 | 626.64 | 67 | - | 41985 | 6298 |
| | *Total:* | *1927.08* | | | | |
| | Podium Surface | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 21 | Podium Roof | 746.63 | 376 | - | 280733 | 42110 |
| | *Total: Roof Surface:* | *2673.71* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| 383 | Podium: N - 1 to 3 storeys | 437.4 | | | | |
| 382 | Podium: N - 4 to 6 storeys | 359.26 | | | | |
| | *Total N Podium:* | *796.66* | | | | |
| - | Podium: W - 1 to 3 storeys | - | - | - | - | - |
| - | Podium: W - 4 to 6 storeys | - | - | - | - | - |
| | *Total W Podium:* | *-* | | | | |
| 379 | Podium: S - 1 to 3 storeys | 160.05 | | | | |
| 378 | Podium: S - 4 to 6 storeys | 203.53 | | | | |
| | *Total S Podium:* | *363.58* | | | | |
| - | Podium: E - 1 to 3 storeys | - | - | - | - | - |
| - | Podium: E - 4 to 6 storeys | - | - | - | - | - |
| | *Total E Podium:* | *-* | | | | |
| | *Tower* | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 190 | N - 7 storey | 358.55 | | | | |
| 194 | N - 8 storey | 357.06 | | | | |
| | *Total North Tower:* | *715.61* | | | | |
| 191 | W - 7 storey | 614.2 | | | | |
| 193 | W - 8 storey | 724.33 | 51 | 30 | 21991 | 3299 |
| | *Total West Tower:* | *1338.53* | | | | |
| 192 | S - 7 storey | 902.56 | 30 | 18 | 16246 | 2437 |
| 196 | S - 8 storey | 930.81 | 30 | 18 | 16755 | 2513 |
| | *Total South Tower:* | *1833.37* | | | | |
| 189 | E - 7 storey | 538.07 | | | | |
| 195 | E - 8 storey | 624.77 | | | | |
| | *Total East Tower:* | *1162.84* | | | | |

| | | | |
|---|---|---|---|
| *Total Building:* | 10,045 | *>700 kWh/m2/year* | 88,062 |
| | | >650 kWh/m2/year | 88,062 |
| | Total Tower: | *>700 kWh/m2/year* | 45,952 |
| | | >650 kWh/m2/year | 45,952 |
| | Total Podium: | *>700 kWh/m2/year* | 42,110 |
| | | >650 kWh/m2/year | 42,110 |

## East-Side Bathurst

| Building: 14 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 44 | Roof 1 | 1276.81 | 73 | - | 93079 | 13962 |
| 57 | Roof 2 | 788.25 | 53 | - | 41856 | 6278 |
| | *Total:* | *2065.06* | | | | |
| | Podium Surface | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 28 | Podium Roof | 868.98 | 274 | - | 238101 | 35715 |
| | *Total: Roof Surface:* | *2934.04* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| - | Podium: N - 1 to 3 storeys | - | - | - | - | - |
| - | Podium: N - 4 to 6 storeys | - | - | - | - | - |
| | *Total N Podium:* | *-* | | | | |
| 394 | Podium: W - 1 to 3 storeys | 435.18 | | | | |
| 393 | Podium: W - 4 to 6 storeys | 606.47 | | | | |
| | *Total W Podium:* | *1041.65* | | | | |
| - | Podium: S - 1 to 3 storeys | - | - | - | - | - |
| - | Podium: S - 4 to 6 storeys | - | - | - | - | - |
| | *Total S Podium:* | *-* | | | | |
| 388 | Podium: E - 1 to 3 storeys | 683.98 | 210 | 126 | 86181 | 12927 |
| 387 | Podium: E - 4 to 6 storeys | 352.71 | | | | |
| | *Total E Podium:* | *1036.69* | | | | |
| | *Tower* | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 161 | N - 7 storey | 297 | | | | |
| 110 | N - 8 storey | 330.61 | | | | |
| | *Total North Tower:* | *627.61* | | | | |
| 162 | W - 7 storey | 674.68 | 27 | 16 | 10930 | 1639 |
| 107 | W - 8 storey | 697.07 | 27 | 16 | 11293 | 1694 |
| | *Total West Tower:* | *1371.75* | | | | |
| 159 | S - 7 storey | 844 | 42 | 25 | 21269 | 3190 |
| 108 | S - 8 storey | 915.8 | 24 | 14 | 13188 | 1978 |
| | *Total South Tower:* | *1759.8* | | | | |
| 160 | E - 7 storey | 732.98 | 27 | 16 | 11874 | 1781 |
| 109 | E - 8 storey | 739.32 | 27 | 16 | 11977 | 1797 |
| | *Total East Tower:* | *1472.3* | | | | |

| | | | |
|---|---|---|---|
| *Total Building:* | 10,933 | *>700 kWh/m2/year* | 64,702 |
| | | >650 kWh/m2/year | 80,962 |
| | Total Tower: | *>700 kWh/m2/year* | 28,986 |
| | | >650 kWh/m2/year | 32,320 |
| | Total Podium: | *>700 kWh/m2/year* | 35,715 |
| | | >650 kWh/m2/year | 35,715 |

## West-Side Bathurst

| Building: 10 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 49 | Roof 1 | 1276.91 | 57 | - | 72401 | 10860 |
| 53 | Roof 2 | 831.03 | 161 | - | 133796 | 20069 |
| | *Total:* | *2107.94* | | | | |
| | Podium Surface | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 33 | Podium Roof | 914.85 | 142 | - | 130183 | 19527 |
| | *Total: Roof Surface:* | *3022.79* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| - | Podium: N - 1 to 3 storeys | - | - | - | - | - |
| - | Podium: N - 4 to 6 storeys | - | - | - | - | - |
| | *Total N Podium:* | *-* | | | | |
| 392 | Podium: W - 1 to 3 storeys | 694.8 | 189 | 113 | 78790 | 11819 |
| 391 | Podium: W - 4 to 6 storeys | 734.79 | 162 | 97 | 71422 | 10713 |
| | *Total W Podium:* | *1429.59* | | | | |
| - | Podium: S - 1 to 3 storeys | - | - | - | - | - |
| - | Podium: S - 4 to 6 storeys | - | - | - | - | - |
| | *Total S Podium:* | *-* | | | | |
| 390 | Podium: E - 1 to 3 storeys | 464.93 | | | | |
| 389 | Podium: E - 4 to 6 storeys | 357.97 | | | | |
| | *Total E Podium:* | *822.9* | | | | |
| | *Tower* | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 145 | N - 7 storey | 295.05 | | | | |
| 129 | N - 8 storey | 328.66 | | | | |
| | *Total North Tower:* | *623.71* | | | | |
| 146 | W - 7 storey | 707.47 | 21 | 13 | 8914 | 1337 |
| 130 | W - 8 storey | 710.77 | 21 | 13 | 8956 | 1343 |
| | *Total West Tower:* | *1418.24* | | | | |
| 143 | S - 7 storey | 840 | 42 | 25 | 21168 | 3175 |
| 127 | S - 8 storey | 918.48 | 24 | 14 | 13226 | 1984 |
| | *Total South Tower:* | *1758.48* | | | | |
| 144 | E - 7 storey | 709.14 | 21 | 13 | 8935 | 1340 |
| 128 | E - 8 storey | 729.98 | 21 | 13 | 9198 | 1380 |
| | *Total East Tower:* | *1439.12* | | | | |

| | | | |
|---|---|---|---|
| *Total Building:* | 11,586 | *>700 kWh/m2/year* | 71,730 |
| | | >650 kWh/m2/year | 83,548 |
| | Total Tower: | *>700 kWh/m2/year* | 52,202 |
| | | >650 kWh/m2/year | 52,202 |
| | Total Podium: | *>700 kWh/m2/year* | 19,527 |
| | | >650 kWh/m2/year | 31,346 |

*NOTE: Solar radiation for individual buildings, 36 buildings in total.*

## South-West Corner of Eglinton & Bathurst

| Building: 31 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 18 | Roof 1 | 1292.07 | 113 | - | 145901 | 21885 |
| 17 | Roof 2 | 782.82 | 120 | - | 93610 | 14041 |
| | *Total:* | *2074.89* | | | | |
| | Podium Surface | [kWh/m2] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 10 | Podium Roof | 1044.73 | 488 | - | 509306 | 76396 |
| | *Total: Roof Surface:* | *3119.62* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| 56 | Podium: N | 276.82 | | | | |
| - | Podium: W | - | - | - | - | - |
| 54 | Podium: S | 990.15 | 252 | 151 | 149711 | 22457 |
| 55 | Podium: E | 574.61 | | | | |
| | *Total Podium Tower:* | *1841.58* | | | | |
| | *Tower* | [kWh/m2] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 117 | N - 4 storey | 290.19 | | | | |
| 121 | N - 5 storey | 326.94 | | | | |
| 125 | N - 6 storey | 340.99 | | | | |
| 129 | N - 7 storey | 355.89 | | | | |
| 133 | N - 8 storey | 345.65 | | | | |
| | *Total North Tower:* | *1659.66* | | | | |
| 118 | W - 4 storey | 430.67 | | | | |
| 122 | W - 5 storey | 486.7 | | | | |
| 126 | W - 6 storey | 564.73 | | | | |
| 130 | W - 7 storey | 672.7 | 45 | 27 | 18163 | 2724 |
| 134 | W - 8 storey | 754.35 | 45 | 27 | 20367 | 3055 |
| | *Total West Tower:* | *2909.15* | | | | |
| 119 | S - 4 storey | 951.38 | 47 | 28 | 26544 | 3982 |
| 123 | S - 5 storey | 964.6 | 47 | 28 | 26912 | 4037 |
| 127 | S - 6 storey | 982.37 | 47 | 28 | 27408 | 4111 |
| 131 | S - 7 storey | 998.91 | 47 | 28 | 27870 | 4180 |
| 135 | S - 8 storey | 967.98 | 47 | 28 | 27007 | 4051 |
| | *Total South Tower:* | *4865.24* | | | | |
| 120 | E - 4 storey | 591.56 | | | | |
| 124 | E - 5 storey | 636.29 | | | | |
| 128 | E - 6 storey | 662.08 | 45 | 27 | 17876.16 | 2681.42 |
| 132 | E - 7 storey | 675.36 | 45 | 27 | 18234.72 | 2735.21 |
| 136 | E - 8 storey | 663.17 | 45 | 27 | 17905.59 | 2685.84 |
| | *Total East Tower:* | *3228.46* | | | | |

| | | | | |
|---|---|---|---|---|
| *Total Building:* | 17,624 | | *>700 kWh/m2/year* | 158,195 |
| | | | >650 kWh/m2/year | 169,022 |
| | | Total Tower: | *>700 kWh/m2/year* | 59,343 |
| | | | >650 kWh/m2/year | 70,170 |
| | | Total Podium: | *>700 kWh/m2/year* | 98,852 |
| | | | >650 kWh/m2/year | 98,852 |

## North-West Corner of Eglinton & Bathurst

| Building: 07 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 57 | Roof 1 | 349.48 | | | | |
| 56 | Roof 2 | 276.82 | | | | |
| | *Total:* | *626.3* | | | | |
| | Podium Surface | [kWh/m2] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 43 | Podium Roof | 341.33 | | | | |
| | *Total: Roof Surface:* | *967.63* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| - | Podium: N | - | - | - | - | - |
| - | Podium: W | - | - | - | - | - |
| 297 | Podium: S | 747.94 | 236 | 142 | 106119 | 15918 |
| 298 | Podium: E | 531.33 | | | | |
| | *Total Podium Tower:* | *1279.27* | | | | |
| | *Tower* | [kWh/m2] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 413 | N - 4 storey | 312.41 | | | | |
| 417 | N - 5 storey | 325.27 | | | | |
| 421 | N - 6 storey | 337.98 | | | | |
| 425 | N - 7 storey | 350.83 | | | | |
| 428 | N - 8 storey | 349.53 | | | | |
| | *Total North Tower:* | *1676.02* | | | | |
| 410 | W - 4 storey | 420.24 | | | | |
| 414 | W - 5 storey | 478.38 | | | | |
| 418 | W - 6 storey | 564.59 | | | | |
| 422 | W - 7 storey | 665.65 | 40 | 24 | 15976 | 2396 |
| 429 | W - 8 storey | 752.52 | 24 | 14 | 10832 | 1625 |
| | *Total West Tower:* | *2881.38* | | | | |
| 411 | S - 4 storey | 826.31 | 42 | 25 | 20823 | 3123 |
| 415 | S - 5 storey | 875.29 | 42 | 25 | 22057 | 3309 |
| 419 | S - 6 storey | 919.34 | 42 | 25 | 23167 | 3475 |
| 423 | S - 7 storey | 935.71 | 42 | 25 | 23580 | 3537 |
| 426 | S - 8 storey | 933.51 | 33 | 20 | 18483 | 2773 |
| | *Total South Tower:* | *4490.16* | | | | |
| 412 | E - 4 storey | 565.64 | | | | |
| 416 | E - 5 storey | 612.82 | | | | |
| 420 | E - 6 storey | 639.3 | | | | |
| 424 | E - 7 storey | 658.05 | 40 | 24 | 15793 | 2369 |
| 427 | E - 8 storey | 655.41 | 40 | 24 | 15730 | 2359 |
| | *Total East Tower:* | *3131.22* | | | | |

| | | | | |
|---|---|---|---|---|
| *Total Building:* | 14,426 | | *>700 kWh/m2/year* | 33,759 |
| | | | >650 kWh/m2/year | 40,884 |
| | | Total Tower: | *>700 kWh/m2/year* | 17,841 |
| | | | >650 kWh/m2/year | 24,966 |
| | | Total Podium: | *>700 kWh/m2/year* | 15,918 |
| | | | >650 kWh/m2/year | 15,918 |

## North-East Corner of Eglinton & Bathurst

| Building: 17 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 81 | Roof 1 | 495.98 | 63 | | | |
| 80 | Roof 2 | 307.36 | 152 | | | |
| | *Total:* | *803.34* | | | | |
| | Podium Surface | [kWh/m2] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 58 | Podium Roof | 766.04 | 330 | - | 252479 | 37872 |
| | *Total: Roof Surface:* | *1569.38* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| 430 | Podium: N | 291.54 | | | | |
| 432 | Podium: W | 581.35 | | | | |
| 431 | Podium: S | 716.44 | 221 | 132 | 94785 | 14218 |
| - | Podium: E | - | - | - | - | - |
| | *Total Podium Tower:* | *1589.33* | | | | |
| | *Tower* | [kWh/m2] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 588 | N - 4 storey | 308.35 | | | | |
| 592 | N - 5 storey | 329.44 | | | | |
| 596 | N - 6 storey | 344.34 | | | | |
| 600 | N - 7 storey | 354.3 | | | | |
| 605 | N - 8 storey | 350.53 | | | | |
| | *Total North Tower:* | *1686.96* | | | | |
| 591 | W - 4 storey | 633.39 | | | | |
| 595 | W - 5 storey | 683.87 | 42 | 25 | 17131 | 2570 |
| 599 | W - 6 storey | 713.5 | 42 | 25 | 17873 | 2681 |
| 603 | W - 7 storey | 730.96 | 42 | 25 | 18311 | 2747 |
| 604 | W - 8 storey | 716.91 | 24 | 14 | 10203 | 1530 |
| | *Total West Tower:* | *3478.63* | | | | |
| 590 | S - 4 storey | 800.31 | 36 | 22 | 17340 | 2601 |
| 594 | S - 5 storey | 863.45 | 36 | 22 | 18708 | 2806 |
| 598 | S - 6 storey | 914.23 | 36 | 22 | 19808 | 2971 |
| 602 | S - 7 storey | 939.07 | 36 | 22 | 20346 | 3052 |
| 605 | S - 8 storey | 933.55 | 26 | 16 | 14558 | 2184 |
| | *Total South Tower:* | *4450.61* | | | | |
| 589 | E - 4 storey | 380.16 | | | | |
| 593 | E - 5 storey | 427.17 | | | | |
| 597 | E - 6 storey | 490.58 | | | | |
| 601 | E - 7 storey | 570.11 | | | | |
| 606 | E - 8 storey | 645.94 | | | | |
| | *Total East Tower:* | *2513.96* | | | | |

| | | | | |
|---|---|---|---|---|
| *Total Building:* | 15,289 | | *>700 kWh/m2/year* | 72,661 |
| | | | >650 kWh/m2/year | 75,231 |
| | | Total Tower: | *>700 kWh/m2/year* | 20,572 |
| | | | >650 kWh/m2/year | 23,141 |
| | | Total Podium: | *>700 kWh/m2/year* | 52,090 |
| | | | >650 kWh/m2/year | 52,090 |

## South-East Corner of Eglinton & Bathurst

| Building: 30 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 21 | Roof 1 | 977.34 | 122 | - | 119157 | 17874 |
| 20 | Roof 2 | 790.33 | 248 | - | 195607 | 29341 |
| | *Total:* | *1767.67* | | | | |
| | Podium Surface | [kWh/m2] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 19 | Podium Roof | 371.74 | | | | |
| | *Total: Roof Surface:* | *2139.41* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| 137 | Podium: N | 272.31 | | | | |
| 138 | Podium: W | 629.48 | | | | |
| 139 | Podium: S | 810.86 | 263 | 158 | 127710 | 19157 |
| - | Podium: E | - | - | - | - | - |
| | *Total Podium Tower:* | *1712.65* | | | | |
| | *Tower* | [kWh/m2] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 146 | N - 4 storey | 287.61 | | | | |
| 150 | N - 5 storey | 323.83 | | | | |
| 154 | N - 6 storey | 339.92 | | | | |
| 158 | N - 7 storey | 352.35 | | | | |
| 162 | N - 8 storey | 345.21 | | | | |
| | *Total North Tower:* | *1648.92* | | | | |
| 143 | W - 4 storey | 685.85 | 45 | 27 | 18518 | 2778 |
| 147 | W - 5 storey | 730.61 | 45 | 27 | 19726 | 2959 |
| 151 | W - 6 storey | 765.38 | 45 | 27 | 20665 | 3100 |
| 140 | W - 7 storey | 778.09 | 45 | 27 | 21008 | 3151 |
| 159 | W - 8 storey | 768.57 | 27 | 16 | 12451 | 1868 |
| | *Total West Tower:* | *3728.5* | | | | |
| 144 | S - 4 storey | 947.07 | 50 | 30 | 28128 | 4219 |
| 148 | S - 5 storey | 971.53 | 50 | 30 | 28854 | 4328 |
| 152 | S - 6 storey | 983.55 | 50 | 30 | 29211 | 4382 |
| 156 | S - 7 storey | 990.47 | 50 | 30 | 29417 | 4413 |
| 160 | S - 8 storey | 970.31 | 41 | 24 | 23660 | 3549 |
| | *Total South Tower:* | *4862.93* | | | | |
| 145 | E - 4 storey | 411.48 | | | | |
| 149 | E - 5 storey | 449.02 | | | | |
| 153 | E - 6 storey | 508.27 | | | | |
| 157 | E - 7 storey | 583.34 | | | | |
| 161 | E - 8 storey | 656.89 | 27 | 16 | 10642 | 1596 |
| | *Total East Tower:* | *2609* | | | | |

| | | | | |
|---|---|---|---|---|
| *Total Building:* | 16,701 | | *>700 kWh/m2/year* | 98,339 |
| | | | >650 kWh/m2/year | 102,713 |
| | | Total Tower: | *>700 kWh/m2/year* | 79,183 |
| | | | >650 kWh/m2/year | 83,557 |
| | | Total Podium: | *>700 kWh/m2/year* | 19,157 |
| | | | >650 kWh/m2/year | 19,157 |

## South-Side of Eglinton Avenue

| Building: 26 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 35 | Roof 1 | 968.13 | 126 | - | 121984 | 18298 |
| 36 | Roof 2 | 701.48 | 84 | - | 58924 | 8839 |
| | *Total:* | *1669.61* | | | | |
| | Podium Surface | [kWh/m2/year] | | | | |
| 28 | Podium Roof | 621.29 | | | | |
| | *Total: Roof Surface:* | *2290.9* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| 192 | Podium: N | 264.75 | | | | |
| - | Podium: W | - | - | - | - | - |
| 193 | Podium: S | 954.77 | 263 | 158 | 150376 | 22556 |
| - | Podium: E | - | - | - | - | - |
| | *Total Podium Tower:* | *1219.52* | | | | |
| | *Tower* | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 273 | N - 4 storey | 286.85 | | | | |
| 269 | N - 5 storey | 321.99 | | | | |
| 265 | N - 6 storey | 336.8 | | | | |
| 261 | N - 7 storey | 350.21 | | | | |
| 254 | N - 8 storey | 343.22 | | | | |
| | *Total North Tower:* | *1639.07* | | | | |
| 270 | W - 4 storey | 431.51 | | | | |
| 266 | W - 5 storey | 484.51 | | | | |
| 262 | W - 6 storey | 565.99 | | | | |
| 258 | W - 7 storey | 671.71 | 45 | 27 | 18136 | 2720 |
| 255 | W - 8 storey | 760.55 | 27 | 16 | 12321 | 1848 |
| | *Total West Tower:* | *2914.27* | | | | |
| 271 | S - 4 storey | 431.51 | | | | |
| 267 | S - 5 storey | 963.58 | 42 | 25 | 24282 | 3642 |
| 263 | S - 6 storey | 980.3 | 42 | 25 | 24704 | 3706 |
| 259 | S - 7 storey | 983.73 | 42 | 25 | 24790 | 3718 |
| 256 | S - 8 storey | 972.46 | 42 | 25 | 24506 | 3676 |
| | *Total South Tower:* | *4331.58* | | | | |
| 272 | E - 4 storey | 411.89 | | | | |
| 268 | E - 5 storey | 451.04 | | | | |
| 264 | E - 6 storey | 510.37 | | | | |
| 260 | E - 7 storey | 590.27 | | | | |
| 257 | E - 8 storey | 658.39 | 27 | 16 | 10666 | 1600 |
| | *Total East Tower:* | *2621.96* | | | | |

| | | | | |
|---|---|---|---|---|
| *Total Building:* | 15,017 | | *>700 kWh/m2/year* | 66,283 |
| | | | >650 kWh/m2/year | 70,603 |
| | | Total Tower: | *>700 kWh/m2/year* | 43,727 |
| | | | >650 kWh/m2/year | 48,047 |
| | | Total Podium: | *>700 kWh/m2/year* | 22,556 |
| | | | >650 kWh/m2/year | 22,556 |

## North-Side of Eglinton Avenue

| Building: 22 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 72 | Roof 1 | 730.2 | 78 | - | 56780 | 8517 |
| 71 | Roof 2 | 966.23 | 60 | - | 57974 | 8696 |
| | *Total:* | *1696.43* | | | | |
| | Podium Surface | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 73 | Podium Roof | 539.59 | | | | |
| | *Total: Roof Surface:* | *2236.02* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| 542 | Podium: N | 323.00 | | | | |
| - | Podium: W | - | - | - | - | - |
| 541 | Podium: S | 698.42 | 221 | 132 | 118980 | 17847 |
| - | Podium: E | - | - | - | - | - |
| | *Total Podium Tower:* | *1021.42* | | | | |
| | *Tower* | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 523 | N - 4 storey | 327.98 | | | | |
| 527 | N - 5 storey | 346.28 | | | | |
| 531 | N - 6 storey | 358.72 | | | | |
| 535 | N - 7 storey | 366.99 | | | | |
| 539 | N - 8 storey | 351.5 | | | | |
| | *Total North Tower:* | *1751.47* | | | | |
| 524 | W - 4 storey | 410.82 | | | | |
| 528 | W - 5 storey | 472.21 | | | | |
| 532 | W - 6 storey | 558.39 | | | | |
| 536 | W - 7 storey | 662.81 | 41 | 25 | 27394 | 4109 |
| 540 | W - 8 storey | 751.71 | 23 | 14 | 17537 | 2631 |
| | *Total West Tower:* | *2855.94* | | | | |
| 521 | S - 4 storey | 792.62 | 30 | 18 | 23779 | 3567 |
| 525 | S - 5 storey | 859.18 | 30 | 18 | 25775 | 3866 |
| 529 | S - 6 storey | 903.33 | 30 | 18 | 27100 | 4065 |
| 533 | S - 7 storey | 933.22 | 30 | 18 | 27997 | 4199 |
| 537 | S - 8 storey | 938.86 | 30 | 18 | 28166 | 4225 |
| | *Total South Tower:* | *4427.21* | | | | |
| 522 | E - 4 storey | 404.31 | | | | |
| 526 | E - 5 storey | 448.3 | | | | |
| 530 | E - 6 storey | 510.8 | | | | |
| 534 | E - 7 storey | 587.07 | | | | |
| 538 | E - 8 storey | 658.1 | 23 | 14 | 15353 | 2303 |
| | *Total East Tower:* | *2608.58* | | | | |

| | | | | |
|---|---|---|---|---|
| *Total Building:* | 14,901 | | *>700 kWh/m2/year* | 39,766 |
| | | | >650 kWh/m2/year | 64,025 |
| | | Total Tower: | *>700 kWh/m2/year* | 39,766 |
| | | | >650 kWh/m2/year | 46,178 |
| | | Total Podium: | *>700 kWh/m2/year* | - |
| | | | >650 kWh/m2/year | 17,847 |

## East-Side Bathurst

| Building: 14 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 108 | Roof 1 | 1290.12 | 72 | - | 92889 | 13933 |
| 104 | Roof 2 | 792.41 | 54 | - | 42790 | 6419 |
| | *Total:* | *2082.53* | | | | |
| | Podium Surface | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 87 | Podium Roof | 1028.48 | 274 | - | 281804 | 42271 |
| | *Total: Roof Surface:* | *3111.01* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| - | Podium: N | - | - | - | - | - |
| 635 | Podium: W | 535.94 | | | | |
| - | Podium: S | - | - | - | - | - |
| 634 | Podium: E | 690.26 | 210 | 126 | 86973 | 13046 |
| | *Total Podium Tower:* | *1226.2* | | | | |
| | *Tower* | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 764 | N - 4 storey | 244.68 | | | | |
| 768 | N - 5 storey | 274.34 | | | | |
| 772 | N - 6 storey | 301.48 | | | | |
| 776 | N - 7 storey | 328.29 | | | | |
| 805 | N - 8 storey | 350.77 | | | | |
| | *Total North Tower:* | *1499.56* | | | | |
| 765 | W - 4 storey | 609.77 | | | | |
| 769 | W - 5 storey | 656.27 | 27 | 16 | 10632 | 1595 |
| 773 | W - 6 storey | 684.46 | 27 | 16 | 11088 | 1663 |
| 777 | W - 7 storey | 702.1 | 27 | 16 | 11374 | 1706 |
| 806 | W - 8 storey | 697.61 | 27 | 16 | 11301 | 1695 |
| | *Total West Tower:* | *3350.21* | | | | |
| 766 | S - 4 storey | 585.77 | | | | |
| 770 | S - 5 storey | 654.2 | 42 | 25 | 16486 | 2473 |
| 774 | S - 6 storey | 745.26 | 42 | 25 | 18781 | 2817 |
| 778 | S - 7 storey | 853.3 | 42 | 25 | 21503 | 3225 |
| 803 | S - 8 storey | 925.33 | 24 | 14 | 13325 | 1999 |
| | *Total South Tower:* | *3763.86* | | | | |
| 763 | E - 4 storey | 695.79 | 27 | 16 | 11272 | 1691 |
| 767 | E - 5 storey | 726.18 | 27 | 16 | 11764 | 1765 |
| 771 | E - 6 storey | 745.57 | 27 | 16 | 12078 | 1812 |
| 775 | E - 7 storey | 759.83 | 27 | 16 | 12309 | 1846 |
| 804 | E - 8 storey | 733.56 | 27 | 16 | 11884 | 1783 |
| | *Total East Tower:* | *3660.93* | | | | |

| | | | | |
|---|---|---|---|---|
| *Total Building:* | 16,612 | | *>700 kWh/m2/year* | 79,575 |
| | | | >650 kWh/m2/year | 101,738 |
| | | Total Tower: | *>700 kWh/m2/year* | 37,304 |
| | | | >650 kWh/m2/year | 46,421 |
| | | Total Podium: | *>700 kWh/m2/year* | 42,271 |
| | | | >650 kWh/m2/year | 55,316 |

## West-Side Bathurst

| Building: 10 | | | | | | |
|---|---|---|---|---|---|---|
| | Roof Surfaces | Annual Solar Radiation | Area | | Production | Efficiency |
| [#] | [#] | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 96 | Roof 1 | 1301.6 | 56 | - | 72890 | 10933 |
| 95 | Roof 2 | 835.97 | 42 | - | 35111 | 5267 |
| | *Total:* | *2137.57* | | | | |
| | Podium Surface | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 90 | Podium Roof | 1052.85 | 262 | - | 275847 | 41377 |
| | *Total: Roof Surface:* | *3190.42* | | | | |
| | Façade Surfaces | Annual Solar Radiation | Area | Area w/o Windows | Production | Efficiency |
| - | Podium: N | - | - | - | - | - |
| 645 | Podium: W | 702.99 | 189 | 113 | 184183 | 27628 |
| - | Podium: S | - | - | - | - | - |
| 644 | Podium: E | 531.3 | | | | |
| | *Total Podium Tower:* | *1234.29* | | | | |
| | *Tower* | [kWh/m2/year] | [m2] | @40% WWR - [m2] | [kWh] | @15% - [kWh] |
| 672 | N - 4 storey | 248.69 | | | | |
| 676 | N - 5 storey | 278.72 | | | | |
| 680 | N - 6 storey | 304.05 | | | | |
| 684 | N - 7 storey | 330.57 | | | | |
| 688 | N - 8 storey | 355.62 | | | | |
| | *Total North Tower:* | *1517.65* | | | | |
| 673 | W - 4 storey | 692 | 21 | 13 | 14532 | 2180 |
| 677 | W - 5 storey | 723.85 | 21 | 13 | 15201 | 2280 |
| 681 | W - 6 storey | 734.09 | 21 | 13 | 15416 | 2312 |
| 685 | W - 7 storey | 746.9 | 21 | 13 | 15685 | 2353 |
| 689 | W - 8 storey | 709.75 | 21 | 13 | 14905 | 2236 |
| | *Total West Tower:* | *3606.59* | | | | |
| 674 | S - 4 storey | 592.55 | | | | |
| 678 | S - 5 storey | 657.7 | 42 | 25 | 27623 | 4144 |
| 682 | S - 6 storey | 754.21 | 42 | 25 | 31677 | 4752 |
| 686 | S - 7 storey | 854.03 | 42 | 25 | 35869 | 5380 |
| 690 | S - 8 storey | 926.94 | 24 | 14 | 22247 | 3337 |
| | *Total South Tower:* | *3785.43* | | | | |
| 671 | E - 4 storey | 608.5 | | | | |
| 675 | E - 5 storey | 662.36 | 21 | 13 | 13910 | 2086 |
| 679 | E - 6 storey | 698.59 | 21 | 13 | 14670 | 2201 |
| 683 | E - 7 storey | 725.15 | 21 | 13 | 15228 | 2284 |
| 687 | E - 8 storey | 729.44 | 21 | 13 | 15318 | 2298 |
| | *Total East Tower:* | *3424.04* | | | | |

| | | | | |
|---|---|---|---|---|
| *Total Building:* | 16,758 | | *>700 kWh/m2/year* | 112,436 |
| | | | >650 kWh/m2/year | 123,047 |
| | | Total Tower: | *>700 kWh/m2/year* | 43,432 |
| | | | >650 kWh/m2/year | 54,042 |
| | | Total Podium: | *>700 kWh/m2/year* | 69,005 |
| | | | >650 kWh/m2/year | 69,005 |

**Appendix C –** Data

04 | Mid-Rise Building Data – Percentage of Building Energy Use Covered by Renewables

# High Podium Energy Generation and Use - Potential Savings

## South-West Corner of Eglinton & Bathurst

**Building: 31**

| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
|---|---|---|---|---|---|---|---|
| [#] | [#] | [m2] | [m3] | [%] | [m2] | [kWh/m2/year] | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 720 | 3240 | 5% | 684 | 395 | 270180 |
| | 2nd storey | 720 | 2160 | 11% | 641 | 361 | 231072 |
| | 3rd storey | 720 | 2160 | 11% | 641 | 361 | 231072 |
| | 4th storey | 720 | 2160 | 30% | 504 | 270 | 136181 |
| | 5th storey | 720 | 2160 | 30% | 504 | 270 | 136181 |
| | 6th storey | 720 | 2160 | 30% | 504 | 270 | 136181 |
| | *Podium Total:* | *2160* | *7560* | | | | 1140867 |
| | | | | *Tower* | | | |
| | 7th storey | 372 | 1116 | 15% | 316 | 270 | 85437 |
| | 8th storey | 226 | 677 | 15% | 192 | 270 | 51866 |
| | *Tower Total:* | *598* | *1793* | | *1012* | | *137304* |
| | *Total Building:* | *2758* | *15833* | | *3986* | | *1278171* |

| | Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year |
|---|---|---|---|
| **Entire Building** | | **Entire Building** | |
| Generated Electricity: | 96,665 | Generated Electricity: | 99,882 |
| Used Electricity: | 1,278,171 | Used Electricity: | 1,278,171 |
| Percentage saved: | 8% | Percentage saved: | 8% |
| **4th - 8th Storeys** | | **4th - 8th Storeys** | |
| Generated Electricity: | 74,275 | Generated Electricity: | 77,492 |
| Used Electricity: | 545,846 | Used Electricity: | 545,846 |
| Percentage saved: | 14% | Percentage saved: | 14% |
| **1st - 3rd Storeys** | | **1st - 3rd Storeys** | |
| Generated Electricity: | 22,390 | Generated Electricity: | 22,390 |
| Used Electricity: | 732,325 | Used Electricity: | 732,325 |
| Percentage saved: | 3% | Percentage saved: | 3% |

## North-West Corner of Eglinton & Bathurst

**Building: 07**

| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
|---|---|---|---|---|---|---|---|
| [#] | [#] | [m2] | [m3] | [%] | [m2] | [kWh/m2/year] | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 648 | 2916 | 5% | 616 | 395 | 243185 |
| | 2nd storey | 648 | 1944 | 11% | 577 | 361 | 207984 |
| | 3rd storey | 648 | 1944 | 11% | 577 | 361 | 207984 |
| | 4th storey | 648 | 1944 | 30% | 454 | 270 | 122574 |
| | 5th storey | 648 | 1944 | 30% | 454 | 270 | 122574 |
| | 6th storey | 648 | 1944 | 30% | 454 | 270 | 122574 |
| | *Podium Total:* | *1944* | *6805* | | | | 1026876 |
| | | | | *Tower* | | | |
| | 7th storey | 319 | 958 | 15% | 271 | 270 | 73343 |
| | 8th storey | 187 | 561 | 15% | 159 | 270 | 42925 |
| | *Tower Total:* | *506* | *1519* | | *884* | | *116268* |
| | *Total Building:* | *2450* | *14156* | | *3560* | | *1143144* |

| | Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year |
|---|---|---|---|
| **Entire Building** | | **Entire Building** | |
| Generated Electricity: | 61,680 | Generated Electricity: | 121,990 |
| Used Electricity: | 1,143,144 | Used Electricity: | 1,143,144 |
| Percentage saved: | 5% | Percentage saved: | 11% |
| **4th - 8th Storeys** | | **4th - 8th Storeys** | |
| Generated Electricity: | 61,680 | Generated Electricity: | 75,008 |
| Used Electricity: | 483,990 | Used Electricity: | 483,990 |
| Percentage saved: | 13% | Percentage saved: | 15% |
| **1st - 3rd Storeys** | | **1st - 3rd Storeys** | |
| Generated Electricity: | 0 | Generated Electricity: | 14,839 |
| Used Electricity: | 659,153 | Used Electricity: | 659,153 |
| Percentage saved: | 0% | Percentage saved: | 2% |

## North-East Corner of Eglinton & Bathurst

**Building: 17**

| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
|---|---|---|---|---|---|---|---|
| [#] | [#] | [m2] | [m3] | [%] | [m2] | [kWh/m2/year] | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 545 | 2452 | 5% | 518 | 395 | 204429 |
| | 2nd storey | 545 | 1634 | 11% | 485 | 361 | 174838 |
| | 3rd storey | 545 | 1634 | 11% | 485 | 361 | 174838 |
| | 4th storey | 545 | 1634 | 30% | 381 | 270 | 103040 |
| | 5th storey | 545 | 1634 | 30% | 381 | 270 | 103040 |
| | 6th storey | 545 | 1634 | 30% | 381 | 270 | 103040 |
| | *Podium Total:* | *1634* | *5720* | | | | 863225 |
| | | | | *Tower* | | | |
| | 7th storey | 237 | 711 | 15% | 201 | 270 | 54407 |
| | 8th storey | 126 | 377 | 15% | 107 | 270 | 28879 |
| | *Tower Total:* | *363* | *1088* | | *690* | | *83285* |
| | *Total Building:* | *1997* | *11711* | | *2940* | | *946510* |

| | Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year |
|---|---|---|---|
| **Entire Building** | | **Entire Building** | |
| Generated Electricity: | 93,975 | Generated Electricity: | 111,770 |
| Used Electricity: | 946,510 | Used Electricity: | 946,510 |
| Percentage saved: | 10% | Percentage saved: | 12% |
| **4th - 8th Storeys** | | **4th - 8th Storeys** | |
| Generated Electricity: | 60,343 | Generated Electricity: | 64,626 |
| Used Electricity: | 392,404 | Used Electricity: | 392,404 |
| Percentage saved: | 15% | Percentage saved: | 16% |
| **1st - 3rd Storeys** | | **1st - 3rd Storeys** | |
| Generated Electricity: | 33,633 | Generated Electricity: | 47,144 |
| Used Electricity: | 554,106 | Used Electricity: | 554,106 |
| Percentage saved: | 6% | Percentage saved: | 9% |

## South-East Corner of Eglinton & Bathurst

**Building: 30**

| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
|---|---|---|---|---|---|---|---|
| [#] | [#] | [m2] | [m3] | [%] | [m2] | [kWh/m2/year] | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 700 | 3150 | 5% | 665 | 395 | 262675 |
| | 2nd storey | 700 | 2100 | 11% | 623 | 361 | 224654 |
| | 3rd storey | 700 | 2100 | 11% | 623 | 361 | 224654 |
| | 4th storey | 700 | 2100 | 30% | 490 | 270 | 132398 |
| | 5th storey | 700 | 2100 | 30% | 490 | 270 | 132398 |
| | 6th storey | 700 | 2100 | 30% | 490 | 270 | 132398 |
| | *Podium Total:* | *2100* | *7350* | | | | 1109177 |
| | | | | *Tower* | | | |
| | 7th storey | 363 | 1089 | 15% | 309 | 270 | 83370 |
| | 8th storey | 218 | 654 | 15% | 185 | 270 | 50105 |
| | *Tower Total:* | *581* | *1743* | | *984* | | *133475* |
| | *Total Building:* | *2681* | *15393* | | *3875* | | *1242652* |

| | Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year |
|---|---|---|---|
| **Entire Building** | | **Entire Building** | |
| Generated Electricity: | 97,414 | Generated Electricity: | 97,414 |
| Used Electricity: | 1,242,652 | Used Electricity: | 1,242,652 |
| Percentage saved: | 8% | Percentage saved: | 8% |
| **4th - 8th Storeys** | | **4th - 8th Storeys** | |
| Generated Electricity: | 78,429 | Generated Electricity: | 78,429 |
| Used Electricity: | 530,669 | Used Electricity: | 530,669 |
| Percentage saved: | 15% | Percentage saved: | 15% |
| **1st - 3rd Storeys** | | **1st - 3rd Storeys** | |
| Generated Electricity: | 18,985 | Generated Electricity: | 18,985 |
| Used Electricity: | 711,983 | Used Electricity: | 711,983 |
| Percentage saved: | 3% | Percentage saved: | 3% |

## South-Side of Eglinton Avenue

**Building: 26**

| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
|---|---|---|---|---|---|---|---|
| [#] | [#] | [m2] | [m3] | [%] | [m2] | [kWh/m2/year] | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 700 | 3150 | 5% | 665 | 395 | 262675 |
| | 2nd storey | 700 | 2100 | 11% | 623 | 361 | 224654 |
| | 3rd storey | 700 | 2100 | 11% | 623 | 361 | 224654 |
| | 4th storey | 700 | 2100 | 30% | 490 | 270 | 132398 |
| | 5th storey | 700 | 2100 | 30% | 490 | 270 | 132398 |
| | 6th storey | 700 | 2100 | 30% | 490 | 270 | 132398 |
| | *Podium Total:* | *2100* | *7350* | | | | 1109177 |
| | | | | *Tower* | | | |
| | 7th storey | 308 | 924 | 15% | 262 | 270 | 70738 |
| | 8th storey | 225 | 676 | 15% | 192 | 270 | 51768 |
| | *Tower Total:* | *598* | *1600* | | *943* | | *122506* |
| | *Total Building:* | *2633* | *15250* | | *3834* | | *1231683* |

| | Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year |
|---|---|---|---|
| **Entire Building** | | **Entire Building** | |
| Generated Electricity: | 143,578 | Generated Electricity: | 143,578 |
| Used Electricity: | 1231683 | Used Electricity: | 1231683 |
| Percentage saved: | 12% | Percentage saved: | 12% |
| **4th - 8th Storeys** | | **4th - 8th Storeys** | |
| Generated Electricity: | 81,487 | Generated Electricity: | 81,487 |
| Used Electricity: | 519700 | Used Electricity: | 519700 |
| Percentage saved: | 16% | Percentage saved: | 16% |
| **1st - 3rd Storeys** | | **1st - 3rd Storeys** | |
| Generated Electricity: | 62,091 | Generated Electricity: | 62,091 |
| Used Electricity: | 711,983 | Used Electricity: | 711,983 |
| Percentage saved: | 9% | Percentage saved: | 9% |

## North-Side of Eglinton Avenue

**Building: 22**

| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
|---|---|---|---|---|---|---|---|
| [#] | [#] | [m2] | [m3] | [%] | [m2] | [kWh/m2/year] | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 604 | 2719 | 5% | 574 | 395 | 226764 |
| | 2nd storey | 604 | 1813 | 11% | 538 | 361 | 193940 |
| | 3rd storey | 604 | 1813 | 11% | 538 | 361 | 193940 |
| | 4th storey | 604 | 1813 | 30% | 423 | 270 | 114297 |
| | 5th storey | 604 | 1813 | 30% | 423 | 270 | 114297 |
| | 6th storey | 604 | 1813 | 30% | 423 | 270 | 114297 |
| | *Podium Total:* | *1813* | *6345* | | | | 957536 |
| | | | | *Tower* | | | |
| | 7th storey | 228 | 683 | 15% | 194 | 270 | 52310 |
| | 8th storey | 161 | 484 | 15% | 137 | 270 | 37025 |
| | *Tower Total:* | *389* | *1167* | | *754* | | *89335* |
| | *Total Building:* | | *12951* | | *3249* | | *1046871* |

| | Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year |
|---|---|---|---|
| **Entire Building** | | **Entire Building** | |
| Generated Electricity: | 88,062 | Generated Electricity: | 88,062 |
| Used Electricity: | 1046871 | Used Electricity: | 1046871 |
| Percentage saved: | 8% | Percentage saved: | 8% |
| **4th - 8th Storeys** | | **4th - 8th Storeys** | |
| Generated Electricity: | 45,952 | Generated Electricity: | 45,952 |
| Used Electricity: | 432227 | Used Electricity: | 432227 |
| Percentage saved: | 11% | Percentage saved: | 11% |
| **1st - 3rd Storeys** | | **1st - 3rd Storeys** | |
| Generated Electricity: | 42,110 | Generated Electricity: | 42,110 |
| Used Electricity: | 614,644 | Used Electricity: | 614,644 |
| Percentage saved: | 7% | Percentage saved: | 7% |

## East-Side Bathurst

**Building: 14**

| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
|---|---|---|---|---|---|---|---|
| [#] | [#] | [m2] | [m3] | [%] | [m2] | [kWh/m2/year] | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 400 | 1800 | 5% | 380 | 395 | 150100 |
| | 2nd storey | 400 | 1200 | 11% | 356 | 361 | 128374 |
| | 3rd storey | 400 | 1200 | 11% | 356 | 361 | 128374 |
| | 4th storey | 400 | 1200 | 30% | 280 | 270 | 75656 |
| | 5th storey | 400 | 1200 | 30% | 280 | 270 | 75656 |
| | 6th storey | 400 | 1200 | 30% | 280 | 270 | 75656 |
| | *Podium Total:* | *1200* | *4200* | | | | 633815 |
| | | | | *Tower* | | | |
| | 7th storey | 126 | 378 | 15% | 107 | 270 | 28938 |
| | 8th storey | 73 | 219 | 15% | 62 | 270 | 16745 |
| | *Tower Total:* | *199* | *597* | | *449* | | *45684* |
| | *Total Building:* | *1399* | *8397* | | *2101* | | *679499* |

| | Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year |
|---|---|---|---|
| **Entire Building** | | **Entire Building** | |
| Generated Electricity: | 64,702 | Generated Electricity: | 80,962 |
| Used Electricity: | 679499 | Used Electricity: | 679499 |
| Percentage saved: | 10% | Percentage saved: | 12% |
| **4th - 8th Storeys** | | **4th - 8th Storeys** | |
| Generated Electricity: | 28,986 | Generated Electricity: | 32,320 |
| Used Electricity: | 272652 | Used Electricity: | 272652 |
| Percentage saved: | 11% | Percentage saved: | 12% |
| **1st - 3rd Storeys** | | **1st - 3rd Storeys** | |
| Generated Electricity: | 35,715 | Generated Electricity: | 35,715 |
| Used Electricity: | 406,847 | Used Electricity: | 406,847 |
| Percentage saved: | 9% | Percentage saved: | 9% |

## West-Side Bathurst

**Building: 10**

| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
|---|---|---|---|---|---|---|---|
| [#] | [#] | [m2] | [m3] | [%] | [m2] | [kWh/m2/year] | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 360 | 1620 | 5% | 342 | 395 | 135090 |
| | 2nd storey | 360 | 1080 | 11% | 320 | 361 | 115536 |
| | 3rd storey | 360 | 1080 | 11% | 320 | 361 | 115536 |
| | 4th storey | 360 | 1080 | 30% | 252 | 270 | 68090 |
| | 5th storey | 360 | 1080 | 30% | 252 | 270 | 68090 |
| | 6th storey | 360 | 1080 | 30% | 252 | 270 | 68090 |
| | *Podium Total:* | *1080* | *3780* | | | | 570434 |
| | | | | *Tower* | | | |
| | 7th storey | 98 | 294 | 15% | 83 | 270 | 22508 |
| | 8th storey | 57 | 170 | 15% | 48 | 270 | 13022 |
| | *Tower Total:* | *155* | *464* | | *383* | | *35530* |
| | *Total Building:* | *1235* | *7484* | | *1870* | | *605964* |

| | Stats for > 700 kWh/m2/year | | Stats for > 650 kWh/m2/year |
|---|---|---|---|
| **Entire Building** | | **Entire Building** | |
| Generated Electricity: | 71,730 | Generated Electricity: | 83,548 |
| Used Electricity: | 605964 | Used Electricity: | 605964 |
| Percentage saved: | 12% | Percentage saved: | 14% |
| **4th - 8th Storeys** | | **4th - 8th Storeys** | |
| Generated Electricity: | 52,202 | Generated Electricity: | 52,202 |
| Used Electricity: | 239801 | Used Electricity: | 239801 |
| Percentage saved: | 22% | Percentage saved: | 22% |
| **1st - 3rd Storeys** | | **1st - 3rd Storeys** | |
| Generated Electricity: | 19,527 | Generated Electricity: | 31,346 |
| Used Electricity: | 366,162 | Used Electricity: | 366,162 |
| Percentage saved: | 5% | Percentage saved: | 9% |

# Low Podium Energy Generation and Use - Potential Savings

## South-West Corner of Eglinton & Bathurst

| Building: 31 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
| [#] | [#] | [m2] | [m3] | [%] | [m2] | [kWh/m2/year] | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 720 | 3240 | 5% | 684 | 395 | 270180 |
| | 2nd storey | 720 | 2160 | 11% | 641 | 361 | 231072 |
| | 3rd storey | 720 | 2160 | 11% | 641 | 361 | 231072 |
| | *Podium Total:* | *2160* | *7560* | | *1966* | | *732325* |
| | | | | *Tower* | | | |
| | 4th storey | 248 | 743 | 30% | 173 | 270 | 46812 |
| | 5th storey | 248 | 743 | 30% | 173 | 270 | 46812 |
| | 6th storey | 248 | 743 | 30% | 173 | 270 | 46812 |
| | 7th storey | 248 | 743 | 15% | 210 | 270 | 56843 |
| | 8th storey | 122 | 366 | 15% | 104 | 270 | 28001 |
| | *Tower Total:* | *1112* | *3336* | | *487* | | *225281* |
| | *Total Building:* | *3272* | *10896* | | *2799* | | *957606* |

| Stats for > 700 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 158,195 |
| Used Electricity: | 957,606 |
| Percentage saved: | 17% |
| **4th - 8th Storeys** | |
| Generated Electricity: | 59,343 |
| Used Electricity: | 225,281 |
| Percentage saved: | 26% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 98,852 |
| Used Electricity: | 732,325 |
| Percentage saved: | 13% |

| Stats for > 650 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 169,022 |
| Used Electricity: | 957,606 |
| Percentage saved: | 18% |
| **4th - 8th Storeys** | |
| Generated Electricity: | 70,170 |
| Used Electricity: | 225,281 |
| Percentage saved: | 31% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 98,852 |
| Used Electricity: | 732,325 |
| Percentage saved: | 13% |

## North-West Corner of Eglinton & Bathurst

| Building: 07 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
| [#] | [#] | [m2] | [m3] | [%] | [m2] | [kWh/m2/year] | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 648 | 2916 | 5% | 616 | 395 | 243162 |
| | 2nd storey | 648 | 1944 | 11% | 577 | 361 | 207965 |
| | 3rd storey | 648 | 1944 | 11% | 577 | 361 | 207965 |
| | *Podium Total:* | *1944* | *6804* | | *1769* | | *659092* |
| | | | | *Tower* | | | |
| | 4th storey | 187 | 562 | 30% | 131 | 270 | 35418 |
| | 5th storey | 187 | 562 | 30% | 131 | 270 | 35418 |
| | 6th storey | 187 | 562 | 30% | 131 | 270 | 35418 |
| | 7th storey | 187 | 562 | 15% | 159 | 270 | 43008 |
| | 8th storey | 88 | 264 | 15% | 75 | 270 | 20211 |
| | *Tower Total:* | *837* | *2511* | | *365* | | *169474* |
| | *Total Building:* | *2781* | *9315* | | *2396* | | *828566* |

| Stats for > 700 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 33,759 |
| Used Electricity: | 828,566 |
| Percentage saved: | 4% |
| **4th - 8th Storeys** | |
| Generated Electricity: | 17,841 |
| Used Electricity: | 169,474 |
| Percentage saved: | 11% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 15,918 |
| Used Electricity: | 659,092 |
| Percentage saved: | 2% |

| Stats for > 650 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 40,884 |
| Used Electricity: | 828,566 |
| Percentage saved: | 5% |
| **4th - 8th Storeys** | |
| Generated Electricity: | 24,966 |
| Used Electricity: | 169,474 |
| Percentage saved: | 15% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 15,918 |
| Used Electricity: | 659,092 |
| Percentage saved: | 2% |

## North-East Corner of Eglinton & Bathurst

| Building: 17 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
| [#] | [#] | [m2] | [m3] | [%] | [m2] | kWh/m2/year | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 545 | 2452 | 5% | 518 | 395 | 204429 |
| | 2nd storey | 545 | 1634 | 11% | 485 | 361 | 174838 |
| | 3rd storey | 545 | 1634 | 11% | 485 | 361 | 174838 |
| | *Podium Total:* | *1634.34* | *5720.19* | | *1487* | | *554106* |
| | | | | *Tower* | | | |
| | 4th storey | 152 | 457 | 30% | 107 | 270 | 28785 |
| | 5th storey | 152 | 457 | 30% | 107 | 270 | 28785 |
| | 6th storey | 152 | 457 | 30% | 107 | 270 | 28785 |
| | 7th storey | 152 | 457 | 15% | 129 | 270 | 34953 |
| | 8th storey | 63 | 190 | 15% | 54 | 270 | 14561 |
| | *Tower Total:* | *672* | *2016* | | *290* | | *135870* |
| | *Total Building:* | *2307* | *7737* | | *1990* | | *689976* |

| Stats for > 700 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 72,661 |
| Used Electricity: | 689,976 |
| Percentage saved: | 11% |
| **4th - 8th Storeys** | |
| Generated Electricity: | 20,572 |
| Used Electricity: | 135,870 |
| Percentage saved: | 15% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 52,090 |
| Used Electricity: | 554,106 |
| Percentage saved: | 9% |

| Stats for > 650 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 75,231 |
| Used Electricity: | 689,976 |
| Percentage saved: | 11% |
| **4th - 8th Storeys** | |
| Generated Electricity: | 23,141 |
| Used Electricity: | 135,870 |
| Percentage saved: | 17% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 52,090 |
| Used Electricity: | 554,106 |
| Percentage saved: | 9% |

## South-East Corner of Eglinton & Bathurst

| Building: 30 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
| [#] | [#] | [m2] | [m3] | [%] | [m2] | [kWh/m2/year] | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 750 | 3375 | 5% | 713 | 395 | 281438 |
| | 2nd storey | 750 | 2250 | 11% | 668 | 361 | 240701 |
| | 3rd storey | 750 | 2250 | 11% | 668 | 361 | 240701 |
| | *Podium Total:* | *2250* | *7875* | | *2048* | | *762839* |
| | | | | *Tower* | | | |
| | 4th storey | 248 | 743 | 30% | 173 | 270 | 46812 |
| | 5th storey | 248 | 743 | 30% | 173 | 270 | 46812 |
| | 6th storey | 248 | 743 | 30% | 173 | 270 | 46812 |
| | 7th storey | 248 | 743 | 15% | 210 | 270 | 56843 |
| | 8th storey | 122 | 366 | 15% | 104 | 270 | 28001 |
| | *Tower Total:* | *1112* | *3336* | | *487* | | *225281* |
| | *Total Building:* | *3362* | *11211* | | *2881* | | *988120* |

| Stats for > 700 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 98,339 |
| Used Electricity: | 988,120 |
| Percentage saved: | 10% |
| **4th - 8th Storeys** | |
| Generated Electricity: | 79,183 |
| Used Electricity: | 225,281 |
| Percentage saved: | 35% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 19,157 |
| Used Electricity: | 762,839 |
| Percentage saved: | 3% |

| Stats for > 650 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 102,713 |
| Used Electricity: | 988,120 |
| Percentage saved: | 10% |
| **4th - 8th Storeys** | |
| Generated Electricity: | 83,557 |
| Used Electricity: | 225,281 |
| Percentage saved: | 37% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 19,157 |
| Used Electricity: | 762,839 |
| Percentage saved: | 3% |

## South-Side of Eglinton Avenue

| Building: 26 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
| [#] | [#] | [m2] | [m3] | [%] | [m2] | [kWh/m2/year] | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 750 | 3375 | 5% | 713 | 395 | 281438 |
| | 2nd storey | 750 | 2250 | 11% | 668 | 361 | 240701 |
| | 3rd storey | 750 | 2250 | 11% | 668 | 361 | 240701 |
| | *Podium Total:* | *2250* | *7875* | | *2048* | | *762839* |
| | | | | *Tower* | | | |
| | 4th storey | 210 | 630 | 30% | 147 | 270 | 39719 |
| | 5th storey | 210 | 630 | 30% | 147 | 270 | 39719 |
| | 6th storey | 210 | 630 | 30% | 147 | 270 | 39719 |
| | 7th storey | 210 | 630 | 15% | 179 | 270 | 48231 |
| | 8th storey | 126 | 378 | 15% | 107 | 270 | 28938 |
| | *Tower Total:* | *966* | *2898* | | *433* | | *196327* |
| | *Total Building:* | *3216* | *10773* | | *2774* | | *959166* |

| Stats for > 700 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 66,283 |
| Used Electricity: | 959166 |
| Percentage saved: | 7% |
| **Tower** | |
| Generated Electricity: | 43,727 |
| Used Electricity: | 196327 |
| Percentage saved: | 22% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 22,556 |
| Used Electricity: | 762,839 |
| Percentage saved: | 3% |

| Stats for > 650 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 70,603 |
| Used Electricity: | 959166 |
| Percentage saved: | 7% |
| **Tower** | |
| Generated Electricity: | 48,047 |
| Used Electricity: | 196327 |
| Percentage saved: | 24% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 22,556 |
| Used Electricity: | 762,839 |
| Percentage saved: | 3% |

## North-Side of Eglinton Avenue

| Building: 22 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
| [#] | [#] | [m2] | [m3] | [%] | [m2] | [kWh/m2/year] | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 604 | 2719 | 5% | 574 | 395 | 226764 |
| | 2nd storey | 604 | 1813 | 11% | 538 | 361 | 193940 |
| | 3rd storey | 604 | 1813 | 11% | 538 | 361 | 193940 |
| | *Podium Total:* | *1812.9* | *6345.15* | | *1650* | | *614644* |
| | | | | *Tower* | | | |
| | 4th storey | 138 | 413 | 30% | 96 | 270 | 26056 |
| | 5th storey | 138 | 413 | 30% | 96 | 270 | 26056 |
| | 6th storey | 138 | 413 | 30% | 96 | 270 | 26056 |
| | 7th storey | 138 | 413 | 15% | 117 | 270 | 31639 |
| | 8th storey | 78 | 233 | 15% | 66 | 270 | 17859 |
| | *Tower Total:* | *629* | *1886* | | *280* | | *127666* |
| | *Total Building:* | *2442* | *8232* | | *2122* | | *742311* |

| Stats for > 700 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 39,766 |
| Used Electricity: | 742311 |
| Percentage saved: | 5% |
| **Tower** | |
| Generated Electricity: | 39,766 |
| Used Electricity: | 127666 |
| Percentage saved: | 31% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 0 |
| Used Electricity: | 614,644 |
| Percentage saved: | 0% |

| Stats for > 650 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 64,025 |
| Used Electricity: | 742311 |
| Percentage saved: | 9% |
| **Tower** | |
| Generated Electricity: | 46,178 |
| Used Electricity: | 127666 |
| Percentage saved: | 36% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 17,847 |
| Used Electricity: | 614,644 |
| Percentage saved: | 3% |

## East-Side Bathurst

| Building: 14 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
| [#] | [#] | [m2] | [m3] | [%] | [m2] | kWh/m2/year | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 400 | 1800 | 5% | 380 | 395 | 150100 |
| | 2nd storey | 400 | 1200 | 11% | 356 | 361 | 128374 |
| | 3rd storey | 400 | 1200 | 11% | 356 | 361 | 128374 |
| | *Podium Total:* | *1200* | *4200* | | *1092* | | *406847* |
| | | | | *Tower* | | | |
| | 4th storey | 126 | 378 | 30% | 88 | 270 | 23832 |
| | 5th storey | 126 | 378 | 30% | 88 | 270 | 23832 |
| | 6th storey | 126 | 378 | 30% | 88 | 270 | 23832 |
| | 7th storey | 126 | 378 | 15% | 107 | 270 | 28938 |
| | 8th storey | 72 | 216 | 15% | 61 | 270 | 16536 |
| | *Tower Total:* | *576* | *1728* | | *257* | | *116970* |
| | *Total Building:* | *1776* | *5928* | | *1525* | | *523817* |

| Stats for > 700 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 79,575 |
| Used Electricity: | 523817 |
| Percentage saved: | 15% |
| **Tower** | |
| Generated Electricity: | 37,304 |
| Used Electricity: | 116970 |
| Percentage saved: | 32% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 42,271 |
| Used Electricity: | 406,847 |
| Percentage saved: | 10% |

| Stats for > 650 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 101,738 |
| Used Electricity: | 523817 |
| Percentage saved: | 19% |
| **Tower** | |
| Generated Electricity: | 46,421 |
| Used Electricity: | 116970 |
| Percentage saved: | 40% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 55,316 |
| Used Electricity: | 406,847 |
| Percentage saved: | 14% |

## West-Side Bathurst

| Building: 10 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Storey | Area | Volume | Common Area | Area for Calc. | Energy Use | Calc. Energy Use |
| [#] | [#] | [m2] | [m3] | [%] | [m2] | [kWh/m2/year] | [kWh/year] |
| | | | | *Podium* | | | |
| | 1st storey | 360 | 1620 | 5% | 342 | 395 | 135090 |
| | 2nd storey | 360 | 1080 | 11% | 320 | 361 | 115536 |
| | 3rd storey | 360 | 1080 | 11% | 320 | 361 | 115536 |
| | *Podium Total:* | *1080* | *3780* | | *983* | | *366162* |
| | | | | *Tower* | | | |
| | 4th storey | 98 | 294 | 30% | 69 | 270 | 18536 |
| | 5th storey | 98 | 294 | 30% | 69 | 270 | 18536 |
| | 6th storey | 98 | 294 | 30% | 69 | 270 | 18536 |
| | 7th storey | 98 | 294 | 15% | 83 | 270 | 22508 |
| | 8th storey | 56 | 168 | 15% | 48 | 270 | 12862 |
| | *Tower Total:* | *448* | *1344* | | *200* | | *90976* |
| | *Total Building:* | *1528* | *5124* | | *1320* | | *457139* |

| Stats for > 700 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 112,436 |
| Used Electricity: | 457139 |
| Percentage saved: | 25% |
| **Tower** | |
| Generated Electricity: | 43,432 |
| Used Electricity: | 90976 |
| Percentage saved: | 48% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 69,005 |
| Used Electricity: | 366,162 |
| Percentage saved: | 19% |

| Stats for > 650 kWh/m2/year | |
|---|---|
| **Entire Building** | |
| Generated Electricity: | 123,047 |
| Used Electricity: | 457139 |
| Percentage saved: | 27% |
| **Tower** | |
| Generated Electricity: | 54,042 |
| Used Electricity: | 90976 |
| Percentage saved: | 59% |
| **1st - 3rd Storeys** | |
| Generated Electricity: | 69,005 |
| Used Electricity: | 366,162 |
| Percentage saved: | 19% |

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