Toronto Cancer Prevention Coalition

On Shade and Shadow
A case study on the impacts of overshadowing by tall buildings on Toronto's greenspaces

A report prepared for the Shade Policy Committee (SPC), Ultraviolet Radiation Working Group (UVRWG) of the Toronto Cancer Prevention Coalition (TCPC) by Forest and Field Landscape Architecture Inc. Toronto Ontario

30 November 2018

EXECUTIVE SUMMARY

This report examines the perceived contradiction of City of Toronto policies related to public health and building design revealed by a recent case heard by the Ontario Municipal Board (OMB). Toronto's Board of Health (BOH) has a policy to provide shade in public places in order to protect citizens from the harmful cancer-causing effects of ultraviolet radiation (UVR) from the sun. The City's Official Plan (OP) directs that development minimize additional shadowing on neighbouring parks as necessary to preserve their utility. This report seeks to reframe terminology used to describe shelter from the sun's radiation, articulate the nuances of outdoor human comfort in the Canadian urban context, including the need for shade for skin cancer prevention, and identify concerns in the reduction of solar exposure on existing urban greenspaces, including public parks, recreation spaces and natural environments, by the introduction of new tall buildings that overshadow these spaces and environments.

As a case study, the report examines the findings of a 2016 hearing by the OMB. In that instance, a proposal to build a 12-storey residential building adjacent to a public park in Toronto raised concerns about the impact of the building's overshadowing the neighbouring greenspace. Basing its decision on existing municipal zoning and design standards, the OMB approved the project. The case is reconsidered here. This report addresses the long-term implications on the health of mature trees in urban greenspaces and the impact on human comfort in urban greenspaces by the placement of tall buildings adjacent to greenspaces.

This report concludes the following:

1. There were no contradictions in City of Toronto policies regarding sunlight access and the provision of shade in public greenspaces.
2. The terminology around shade and shadow, and greenspace utility is unclear.
3. Planning and development activities should account for the heating and cooling effects of the sun and interactions between buildings, adjacent trees, and greenspaces.
4. Tall buildings have a significant impact on surrounding greenspaces and microclimates.
5. The benefits provided by greenspaces and urban trees must be assessed through a holistic, ecosystem-based lens rather than using a narrow definition of utility.

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1. Introduction, Purpose and Method

This report has been prepared at the request of the Shade Policy Committee of the Ultraviolet Radiation Working Group (UVRWG), Toronto Cancer Prevention Coalition (TCPC). This report aids in informing revision of the *Shade Policy and Guidelines for the City of Toronto.* As well, this report supports discussions relating to the differentiation between shade cast by tall buildings[1] and shade cast by trees in an urban cold climate setting in order to bring additional clarity to these discussions.

In the fall of 2017, the Toronto Cancer Prevention Coalition (TCPC) Ultraviolet Radiation Working Group (UVRWG) identified the importance of conducting research on questions arising from the OMB decision of July 2017, specifically on the questions of healthy shade, tall buildings, and access to daylight in public places. The purpose of this investigation was to provide input to the UVRWG's review of the City of Toronto's *Shade Policy*, in order to inform identification of possible policies and strategies that would address these questions in support of the shade policy review. Forest and Field Landscape Architects (FFLA) was contracted to lead this research.

In December 2017 – January 2018, FFLA undertook a literature review of pertinent material and set out a number of relevant issues. They presented preliminary findings to members of the UVRWG in the winter of 2018 and subsequently a draft report was circulated for comment to the UVRWG members. During the process, the consultants met with George Kapelos, Chair of the UVRWG, who assisted with the execution of the study on behalf of the UVRWG.

The City of Toronto has policies related to public health and building design as they relate to access to sunlight in Toronto's greenspaces.[2] Toronto's Board of Health (BOH) has a policy to provide shade in public places in order to protect citizens from the harmful cancer-causing effects of ultraviolet radiation (UVR) from the sun.[3] The City's *Official Plan* directs that development minimize additional shadowing on neighbouring parks as necessary to preserve their utility.[4] This policy is further elaborated in the Council-adopted *Tall Buildings Design Guidelines* where access to sunlight, attention to shadow sensitive areas, and ensuring the quality of the public realm are discussed and

[1] The City of Toronto defines a tall building as "a building that is generally taller than the width of the adjacent street right-of-way or the wider of two streets if located at an intersection." Source: https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/design-guidelines/tall-buildings/, accessed 24 November 2018.

[2] For the purposes of this report, "greenspaces" include public parks, recreation areas, urban open spaces and natural environments.

[3] *Shade Policy for the City of Toronto*, https://www.toronto.ca/legdocs/mmis/2007/hl/bgrd/backgroundfile-6600.pdf, accessed 24 November 2018.

[4] See *City of Toronto Official Plan*, 2015, consolidation of policies, https://www.toronto.ca/wp-content/uploads/2017/11/99b3-cp-official-plan-volume-1-consolidation.pdf, accessed 24 November 2018. This policy directs that new development limit the impact on neighbouring streets, parks, open spaces and properties by *inter alia* "providing for adequate light and privacy" (3.1.2 3 (d)) and "minimizing additional shadowing and uncomfortable wind conditions on neighbouring parks so as to preserve their utility" (3.1.2.3 (f)), and "providing high quality comfortable and usable publicly accessible open space areas" (3.1.3.2 (e)).

promoted.[5] Public health-promoters advocate for the necessity of "shade" for preventing chronic diseases such as skin cancer;[6] conversely, planning policies speak to access to daylight and the importance of sunlight in public spaces.[7] These policies appear to be contradictory, as revealed by a recent case heard by the Ontario Municipal Board (OMB) where the OMB's decision allowed a development to proceed whereby a tall building would overshadow an existing public park.[8]

This research has the following objectives:

i) To address and reframe the terminology used to describe shelter from the sun's radiation,
ii) To articulate the nuances of outdoor human comfort in the Canadian urban context,
iii) To examine a recent OMB decision as a case study in order to identify issues relating to the development of new tall buildings and their impact on existing urban greenspaces, and
iv) To present findings aimed at clarifying apparently contradictory existing City of Toronto policies as they relate to access to daylight, prevention of overshadowing greenspaces by tall buildings, and the promotion of shade for skin cancer prevention.

In the effective provision of a comfortable and safe outdoor environment throughout the year in the Canadian context, this report argues that large trees and human-scale built elements contribute more effectively and for a longer duration than tall buildings. The report highlights the importance of recognizing ecosystem services provided by mature trees in regulating a microclimate throughout seasonal changes. Therefore, in developing policies for urban greenspaces, including public parks and schoolyards as well as natural environments, this report makes a case for protecting existing urban greenspaces from abrupt changes brought on by overshadowing created by the construction of new, tall buildings.

The report seeks to assist in developing an understanding of how apparently contradictory City of Toronto policies may need to be refined to address the dilemma of providing shade for chronic disease prevention, while allowing for access to sunlight, especially as urban development and population growth calls for more, denser (and potentially higher) buildings.

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[5] See *Tall Building Design Guidelines* - Adopted by Toronto City Council May 2013, (1.4), https://www.toronto.ca/wp-content/uploads/2018/01/96ea-cityplanning-tall-buildings-may2013-final-AODA.pdf, accessed 24 November 2018. *Inter alia*, these guidelines provide specific and measurable directions relating to guiding principles including the consideration of "relationships to other tall buildings, including the cumulative effect of multiple towers on sunlight, comfort and the quality of the public realm" (page 10), and direction to locate and design tall buildings "to protect access to sunlight and sky views within the surrounding context of streets, parks, public and private open spaces and other shadow sensitive areas" (page 14).

[6] The World Health Organization advocates for the use of shade as one means of reducing the harmful effects of ultraviolet radiation and overexposure leading to skin cancer. See http://www.who.int/uv/sun_protection/en/, accessed 24 November 2018.

[7] See *Tall Building Design Guidelines* - Adopted by Toronto City Council May 2013, (1.4), https://www.toronto.ca/wp-content/uploads/2018/01/96ea-cityplanning-tall-buildings-may2013-final-AODA.pdf, accessed 24 November 2018.

[8] See Hussey, Karlene, 200 St. Clair Holdco Ltd. V. Toronto (City). *Case nos. PL 150015, PL 150444 2017*. Ontario Municipal Board, http://www.woodbull.ca/docs/default-source/omb/1044774-ontario-inc-v-toronto-(city), accessed 24 November 2018.

2. Reframing the Terminology: UVR, Human Comfort and Outdoor Activity in Toronto

2.1 Sun exposure and public health: a review of current health, planning and tree policies

Toronto has been promoting shade for good health while concurrently advocating for good planning that discourages the overshadowing of tall buildings on public places. Toronto's Board of Health (BOH) policy seeks to promote shade in city-owned and operated public places to protect citizens from the harmful cancer-causing effects of ultraviolet radiation (UVR). The focus of this policy is particularly directed toward reducing UV exposure of vulnerable populations, especially children.

The City of Toronto *Shade Policy and Guidelines* state that some exposure to sunlight may be beneficial to human health but too much is harmful.[9] Sunlight provides heat through infrared radiation. Sunlight also contains Ultraviolet Radiation A and B (UVA and UVB). UVR can neither be seen nor felt. Both UVA and UVB have a major impact on human health as they penetrate the skin and can cause DNA damage. UVA wavelengths are longer and penetrate deeper into the skin. UVB wavelengths are shorter and more energetic and are the primary cause of sunburn. Both UVA and UVB are involved in causing skin cancer and skin aging.

In a review of current research and policy on sunlight, ultraviolet radiation (UVR) exposure, and public health, it is clear that moderation is essential. As the *Shade Policy and Guidelines* state, "In the Toronto area, the sun reaches its peak around 1:20 p.m. Eastern Daylight Time (EDT) and UV levels generally follow suit. In May through August, UV levels are generally high or very high from 11 a.m. – 3 p.m. This 'high UV' window can be slightly wider in June and July."[10] Having an awareness of the risks of enjoying Toronto's greenspaces during peak sun times, and the means to shelter oneself (such as use of sun screen, wearing of protective clothing or using portable shade offered by a hat or an umbrella), empowers individuals to moderate their exposure to UVR. A 2015 report by Toronto Public Health describes the essence of "health-promotive environments" that consider the holistic value of urban greenspaces:

"Green space is a term that refers to a wide variety of natural and landscaped areas both publicly and privately owned. It includes parks, ravines, school yards, private yards, street trees, landscaped open spaces along streets and around buildings, cemeteries and green roofs. Having access to green spaces promotes physical activity and improves health and wellbeing. The presence of green spaces is associated with reduced mortality, obesity, depression, anxiety, cardiovascular disease and small for

[9] See *City of Toronto, Shade Guidelines*, 2010, 17, https://www.toronto.ca/legdocs/mmis/2007/hl/bgrd/backgroundfile-6600.pdf, accessed 24 November 2018.
[10] Ibid., 20.

gestational age births. It also provides places for stress reduction, mental restoration and social interactions."[11]

Recent guidelines, policies and area plans developed by Toronto's City Planning Division limit overshadowing, particularly in Toronto's urban core: *Toronto Tall Building Guidelines* (May 2013),[12] the *Toronto Official Plan* (June 2015)[13] and the *Toronto Downtown Plan* (May 2018).[14] These documents outline how urban blocks and land parcels are to be developed in relation to adjacent uses and for the provision of the access to sunlight. In general, these regulations aim to limit the extent of building shadows and to protect open spaces from excessive shadow cast by tall buildings. In addition, the City supports green spaces that can facilitate physical activity outdoors and green spaces that provide protection from the sun. In its *Official Plan*, the City requires that the effects of development from adjacent properties, including additional shadows, noise, traffic and wind on parks and open spaces be minimized to preserve their utility.[15] Other planning documents, for example, including the recently adopted *Downtown Plan* and *Yonge-Eglinton Secondary Plan* provide more stringent requirements that "no new net shadow" resulting from development be cast on parks specified in these respective plans.[16] Additionally, a number of *Site and Area Specific Policies* (SASPs) have been adopted that specify "no new net shadow" from development is permitted on public parks, including the area of the case study explored in detail below. Municipal decisions regarding development applications may be appealed to the Ontario Municipal Board (OMB), a provincially-mandated adjudicative body that conducts hearings and makes decisions on land use planning issues. Such was the case at 200 St. Clair Avenue West, Toronto, the case study discussed below. [17]

The City of Toronto has stringent rules and requirements for protecting City and privately owned trees from construction activities. These include the erection of tree protection perimeters and requiring security deposits to guarantee the protection of trees. The security deposit is commensurate with the assessed tree value; ascribed tree values are proportionate with the size of the tree. In the case of tree damage, the City may seek redress from the proponent. If convicted, fines may be levied.[18] By these

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[11] Toronto Public Health, *Green City: Why Nature Matters to Health (Staff Report),2015: 1*. https://www.toronto.ca/legdocs/mmis/2015/hl/bgrd/backgroundfile-83420.pdf, *accessed* 28 November 2018.
[12] See *City of Toronto, Tall Building Design Guidelines*, 2013. https://www.toronto.ca/legdocs/mmis/2013/pg/bgrd/backgroundfile-57177.pdf, accessed 26 November 2018.
[13] City of Toronto Official Plan, 2015 consolidation of policies.
[14] See *TOcore: Planning Downtown*, / https://www.toronto.ca/city-government/planning-development/planning-studies-initiatives/tocore-planning-torontos-downtown/
[15] See *City of Toronto Official Plan*, 2015, consolidation of policies, 3.2.3.3
[16] See City of Toronto, *Downtown Plan*, adopted May 2018 https://www.toronto.ca/wp-content/uploads/2018/08/966f-city-planning-tocore-opa406-attachment-1-schedule-5-downtown-plan.pdf, accessed 286 November 2018, and City of Toronto, *Yonge-Eglinton Secondary Plan*, adopted July 2018; https://www.toronto.ca/wp-content/uploads/2018/05/970b-2018-05-18-Final-OPA-and-YESP-combined-AODA.pdf, accessed 26 November 2018.
[17] See Environment & Land Tribunals Ontario, www.elto.gov.on.ca/tribunals/lpat/about-lpat/. It is noted that, as of April, 2018, the OMB has been replaced by the Local Planning Appeal Tribunal (LPAT), which serves a similar function. While the workings of the new tribunal were not considered in the preparation of this report, the new "standard of review" put in place by the LPAT will place greater emphasis on maintaining conformity with municipal and higher order policy statements, including those focused on shadow impacts.
[18] See City of Toronto *Tree Protection Policy and Specifications for Construction Near Trees*, 2016. https://www.toronto.ca/data/parks/pdf/trees/tree-protection-specs.pdf, accessed 26 November 2018.

actions, the City of Toronto supports a healthy tree canopy on both public and private property.

2.2 The value of sunlight

The infra-red radiation of the sun creates heat, which sometimes is valued and at other times avoided. In summer, the sun's heat can cause discomfort, relieved by a parasol or refuge in an arcade or under a shade tree. In winter, the heat of solar radiation is welcome. Pockets of sunshine create places of warmth, especially in the depths of winter. Therefore, any discussion of the value of sunlight and shadow, particularly in Canadian cities, must recognize the particularities of the climate in a temperate region and the necessity to differentiate seasonal issues of "solar access" and "solar protection". The dual nature of this question is diagrammed in Figure 1.

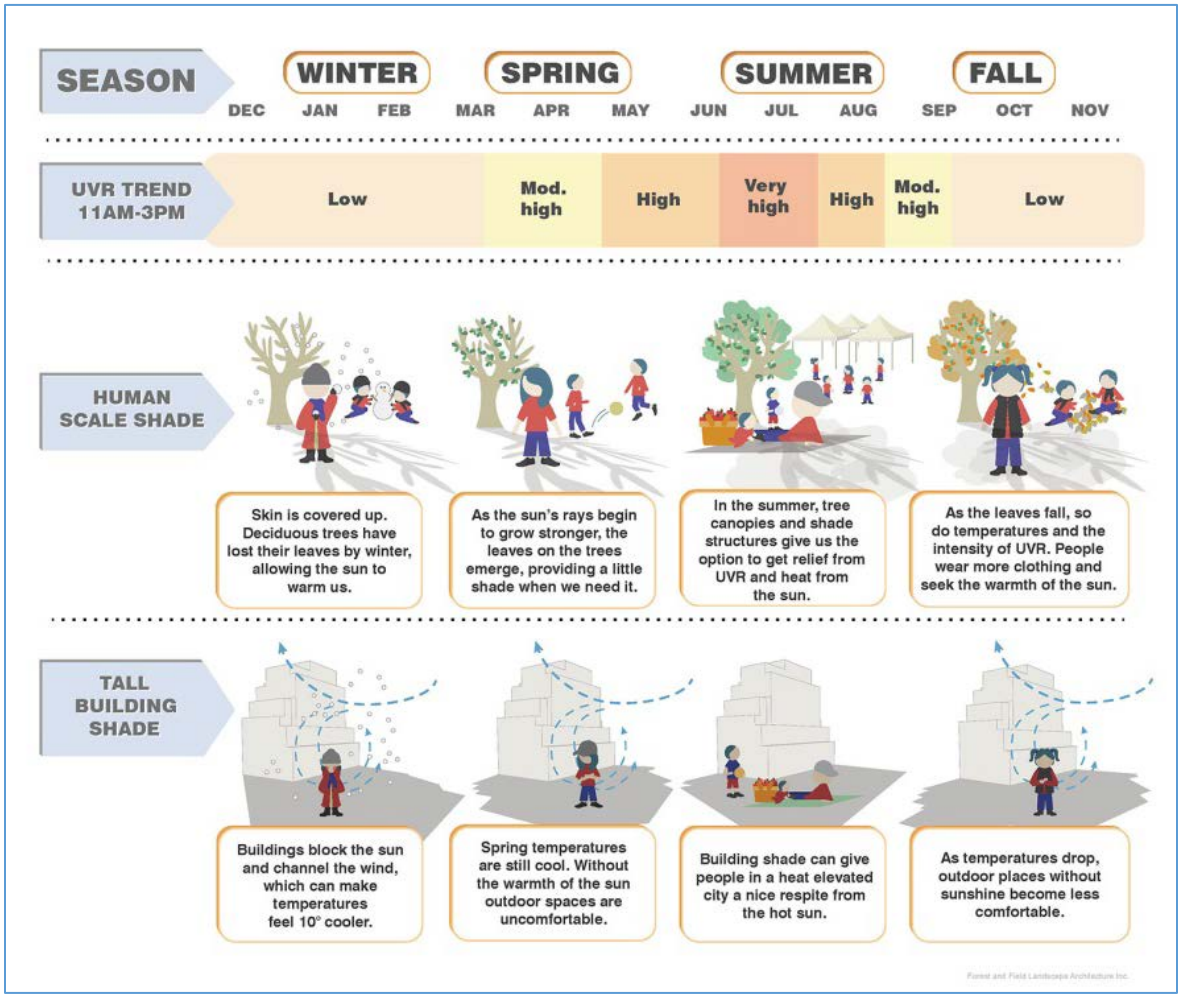

Figure 1. Climate Variations in Toronto (source: Forest and Field Landscape Architecture Inc.)

3. Shade and shadow, and the nuances of outdoor human comfort in the Canadian urban context

3.1 "Shade" versus "shadow"

Among planning, architecture and design professionals, the term "shadow" has come to be understood as the deleterious absence of sunlight caused by a building while among health promoters "shade" is understood to be beneficial shelter from the sun's harmful rays. These terms are consistently used in this manner in the City of Toronto's policies and guidelines discussed above. In other contexts, including the law, literature, and everyday parlance, however, these terms often mean the same thing and the lack of differentiation between these terms may cause confusion.

For the purposes of this discussion, two types of shade are differentiated: *human scale shade* and *tall building shade.* By its nature, *human scale shade* is localized, with limited impact, and in the case of trees adapts to variations in season in its capacity to address human comfort. This type of shade may best be considered health-promoting shade, shade-with-a-purpose, or healthy shade, as it allows for sun protection and/or personal protection from inclement weather, while allowing sun penetration in colder months. Because human-scale shade in the form of pergolas, canopies or umbrellas is localized and relatively small in scale, it permits larger trees to have access to the sun's rays, providing multiple benefits to the environment and ensuring the continued good health of larger trees. In contrast, *tall-building shade* is unyielding and indiscriminate by its nature, with an impact that is both longer lasting, seasonally unvarying, and spread over a larger area.

3.2 The impact of tall building shade on urban trees, public greenspaces and human comfort

Public greenspaces are of great significance as places for physical activity and urban health. The urban forest is important heat mitigation, carbon reduction. Toronto is home to an estimated 10.2 million trees of which 34% or 3.5 million trees are found in City parks and natural spaces.[19] Healthy trees provide multiple benefits including cooling the air through evapotranspiration, absorbing radiation and heat with the leaves during the hottest months with the highest UV index, and absorbing, reflecting, scattering, and transmitting incoming UV rays prior to reaching the paved surfaces under the tree. They offer other benefits as well, such as reducing the amount of storm water that enters the

[19] See, Toronto Parks Forestry and Recreation, *Every Tree Counts*, 2013, https://www.toronto.ca/wp-content/uploads/2017/12/92de-every-tree-counts-portrait-of-torontos-urban-forest.pdf , accessed 28 November 2018 and Canadian Broadcasting Corporation "Toronto's Trees: your guide to caring for urban green spaces" posted 7 August 2017, https://www.cbc.ca/news/canada/toronto/toronto-trees-pruning-1.3698951, accessed 29 November 2018

municipal waste water systems and are a critical component of Water Sensitive Urban Design (WSUD). Trees also perform the critical function of photosynthesis, converting light energy into chemical energy, a process that is largely responsible for producing and maintaining the oxygen content of the Earth's atmosphere, thereby supplying organic compounds and most of the energy necessary for life on Earth.[20] (Figure 2)

Providing consistent access to sunlight is essential to maintaining healthy trees in urban greenspaces. With increasing urbanization, a tall building placed between an existing treed area and the sun has the potential to have a deleterious effect on existing trees, both on their long-term health and the concomitant value they have in mitigating an otherwise harsh urban environment. Shade-intolerant tree species may not be able to survive a sudden change in their environment.

In an urban setting most surfaces are the result of human constructions and reflect and / or absorb the heat of the sun including UV radiation. During the summer months and especially during periods of extreme heat, this creates a heat sink or "urban heat island" where temperatures in urban, built-up areas become higher than those of adjacent natural areas that are subject to the same conditions. Within this "urban heat island", materials in the built environment will continue giving off heat into the evening long after the sun has set. Consequently, natural areas such as parks and ravines with healthy tree canopy become the only relief from the urban heat island effect.

[20]See Wikipedia, "Photosynthesis", https://en.wikipedia.org/wiki/Photosynthesis , accessed 28 November 2018.

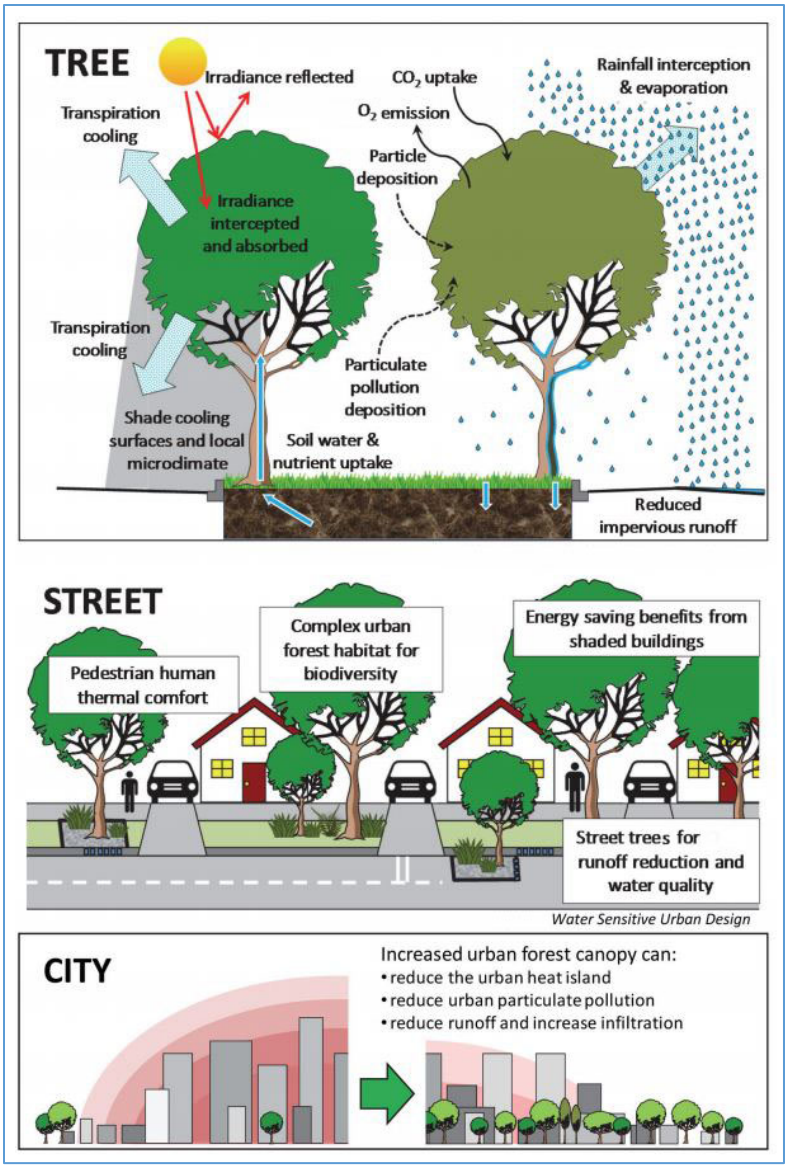

Figure 2. Urban Forest and Ecosystem Services: Impacts on Urban Water, Heat and Pollution. Cycles at the Tree, Street and City Scale (source: S. J. Livesley, E.G. McPherson and C. Calfapietra, 2016)

4. Case study: 200 St. Clair Avenue West, Toronto, at the Ontario Municipal Board

The following provides information on a case adjudicated by the Ontario Municipal Board in 2016. The case involved the planned construction of a proposed 12 storey development at 200 St. Clair Avenue West, Toronto, that would replace an existing four-storey apartment building. The applicant, 200 St. Clair Holdco Inc., proposed a new tall building would be built next to an established park (Glenn Gould Park) that contained a

solid canopy of mature trees and provided cover over an existing playground.[21] The City of Toronto opposed the development proposal. A focus of the case was the impact of the development on the adjacent public park. The OMB found that the tall building as proposed fit within existing city urban design and planning contexts, had minimum impact on adjacent properties, and did not create adverse shadow impacts on the public park to the east.

At the hearing, the applicant's project architect described design provisions that were made to fit the building into the context and minimize the impact on the surrounding neighborhood including the park. The architect also described how the proposed building had been designed to suit the context and step back in accordance with City guidelines. (Figures 3, 4 and 5).

Figure 3. Aerial view of the development site and the adjacent park. Source FFLA / Google images

[21] The building originally proposed in 2014 was for 15 storeys.

Figure 4. Street view of the development site and the adjacent park. Source: FFLA / Google images

Figure 5. The developer's rendering of the proposed building next to the existing park.

Source: 200 St. Clair Holdco Inc.

City of Toronto staff presented the municipality's concerns and proposed design alternatives with respect to overshadowing of Glenn Gould Park and maintaining access to sunlight.[22] City staff referenced Toronto's *Site and Area Specific Policy 221*

[22] See Hussey, Karlene, 200 St. Clair Holdco Ltd. V. Toronto (City). *Case nos. PL 150015, PL 150444 2017*. Ontario Municipal Board, http://www.woodbull.ca/docs/default-source/omb/1044774-ontario-inc-v-toronto-(city), accessed 24 November 2018, point 65.

introduced under *Official Plan Amendment (OPA) 279*, which states: "The building will preserve the existing sunlight access conditions such that it will cast no new net shadows on Glenn Gould Park between 10:00 a.m. and 4:00 p.m. on September 21."[23] In the hearing, City staff acknowledged that the park is already deeply shaded given the dense tree canopy and made a distinction between shading from a building and from trees. The applicant presented an analysis prepared by their expert witness that concluded that shadowing from the proposed building during the restricted time as prescribed by *OPA 279* would have little-to-no impact upon the "utility of the playground". The applicant stated that the impact would be for a small portion of the day. The applicant's expert witness presented sun studies that indicated that no shadows would be cast by the proposed building before 2:18 p.m.

The OMB rejected the alternate proposals presented by City staff as not being feasible. In their decision, the OMB concluded that there was no clear differentiation presented between the shade created by the proposed building and tree canopy shade. Further, the OMB indicated that since the park was already shaded by trees, the playground could be relocated. The OMB noted that the building had been designed to minimize the impact on the park as much as possible. Consequently, the OMB concluded that there was no compelling reason to alter the building design. The development was allowed to proceed. (See Appendix 1 for the complete text OMB decision.)

5. The Ontario Municipal Board case reconsidered

Forest and Field Landscape Architecture Inc. undertook a review of material presented to the OMB, with particular focus on the impact of the proposal on the adjacent public park. This review provided FFLA an opportunity to re-examine the question of the impact of the development on the park in the context of *tall building shade* and *human scale shade*.

At the OMB hearing, the applicant presented evidence that they had considered the impact of overshadowing. The applicant reviewed the design process that included a number of design revisions in line with City policies that led to the building stepping back from the park. The applicant utilized sun / shadow studies to indicate that the overshadowing in September was limited to the mid-to-late afternoon. The applicant focused on the fact that the existing playground was already in shade and that the shadowing from the proposed building during the restricted time prescribed by *OPA 279* would have little-to-no impact upon the "utility of the playground" as overshadowing would occur for only a small portion of the day.

[23] See Amendment No. 279 to the *City of Toronto Official Plan* – adopted December 2014, https://www.toronto.ca/legdocs/bylaws/2015/law0077.pdf

The City presented urban design arguments about the built form's impact on the park while conceding that much of the park was already shaded by a canopy of mature trees. However, it appears that the full range of impacts of overshadowing from the proposed development on the existing mature trees may not have been fully articulated or understood by the OMB.

By its decision, the OMB accepted the applicant's argument that one type of shade was interchangeable with another. Rather than considering the impact of the new development on the overall ecology of the park, including trees and greenspace, the focus was placed on the playground, which could be relocated. Further, the OMB was convinced that the applicant had addressed the issue of overshadowing through design revisions and therefore agreed that the project should proceed.

By focusing only on the at-grade playground, the OMB decision overlooked a number of factors that are typically considered in the design of a park necessary to create a comfortable microclimate where physical activity can occur during times of high UVR as well as during the cooler months. While playground equipment can be replaced as needed and can be relocated with each renovation, mature trees are not so easily moved. Depending upon the species, urban trees can be expected to live for 100 years or more. For example, Glen Gould Park includes a mix of deciduous trees that have a life expectancy of between 75 and 100 years.[24] Available growing space below ground and allowing the tree canopies access to sunlight are critical factors in ensuring continued tree health.

To address the question of the tall building's impact on the trees in the park, FFLA compared overshadowing on the park by the existing four-storey building with the overshadowing by the proposed 12-storey building at 12:18 p.m. and 4:18 p.m. local time at March 21st, June 21st, September 21st and December 21st. (Figures 6, 7, 8 and 9). The software used to generate these comparators does not distinguish between building shade and the shade cast by trees. However, the comparison provides new information. FFLA's studies indicate that the proposed building will cast shadow on the tops of the trees in the summer, thus reducing their capacity for the vital function of photosynthesis. Further, these studies illustrate additional overall overshadowing on the site during the cooler months. Taken together, this information may have provided evidence to the OMB of the longer-term and broader impact of the proposed development on the long-term health of trees in the park and the impact on park use by the public.

Specifically, the health of the mature trees and the benefits of the trees to the overall park and neighborhood were not identified as factors in the OMB's decision. The microclimate adjacent to the proposed building was not considered. The negative

[24] https://www.cbc.ca/news2/background/environment/trees_lifespan.html, accessed 28 November 2018.

impact on the general neighborhood in allowing the building to block sunlight that would contribute to the trees' healthy growth appears not to have been mentioned. The reduction in air quality and increase in temperature in the summer months were not discussed. The colder microclimate in the reduced hours of sunlight in the shoulder seasons was not considered. While it is difficult to conjecture the outcome of the appeal, such evidence may have been deemed sufficient for the OMB to reconsider its decision.

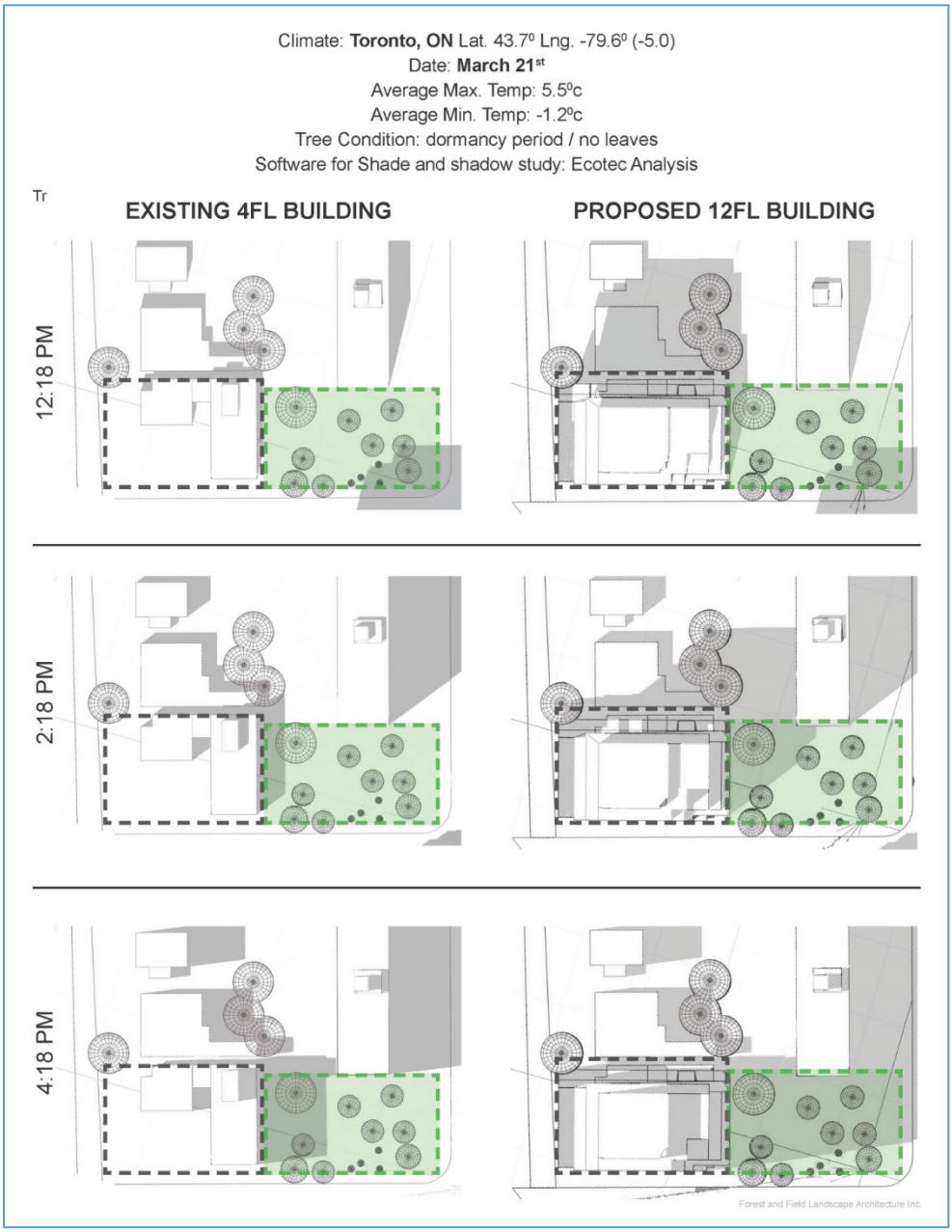

Figure 6. Sun-shade study of the existing and proposed solar conditions on site on March 21. Source: FFLA

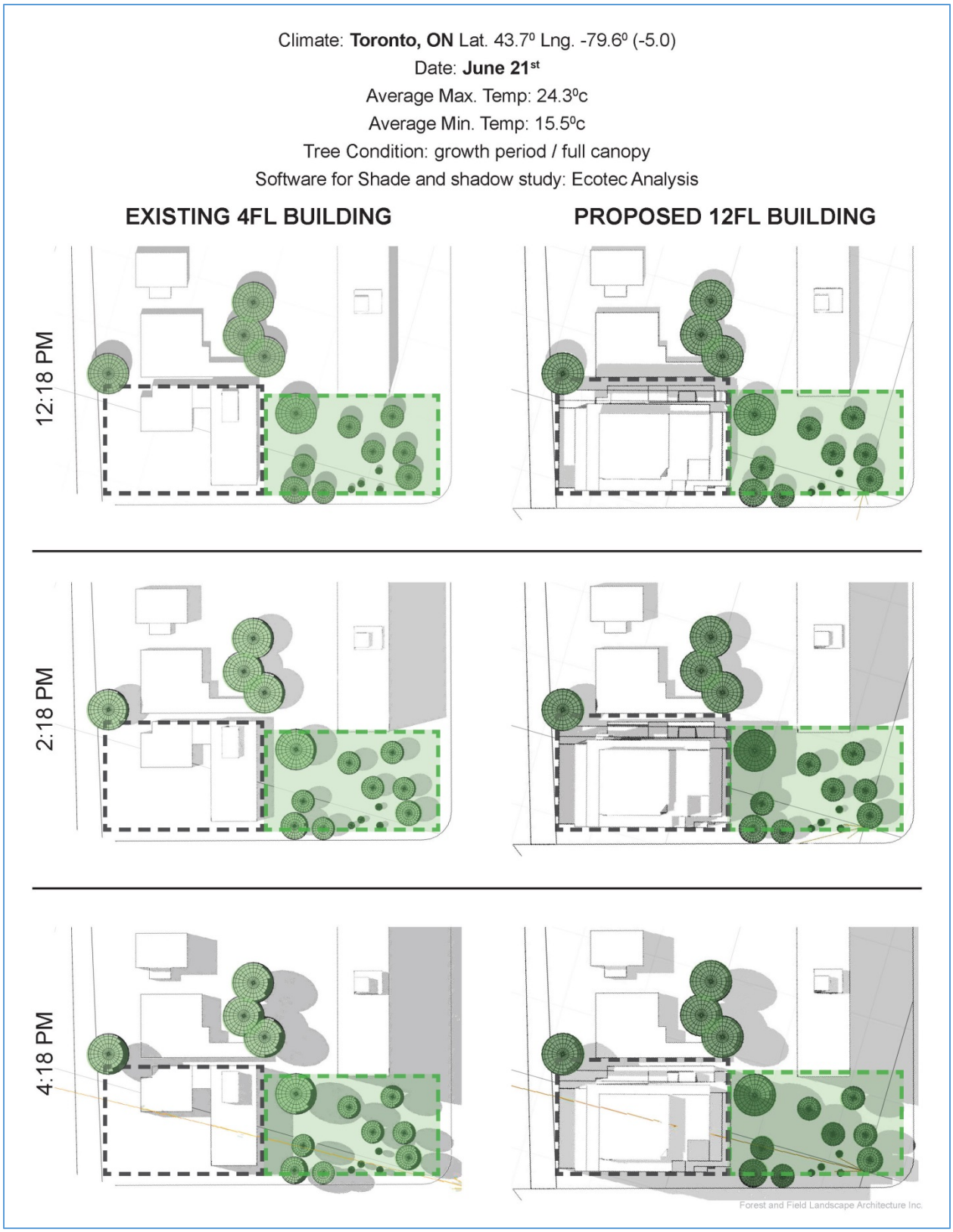

Figure 7. Sun-shade study of the existing and proposed solar conditions, June 21. Source FFLA.

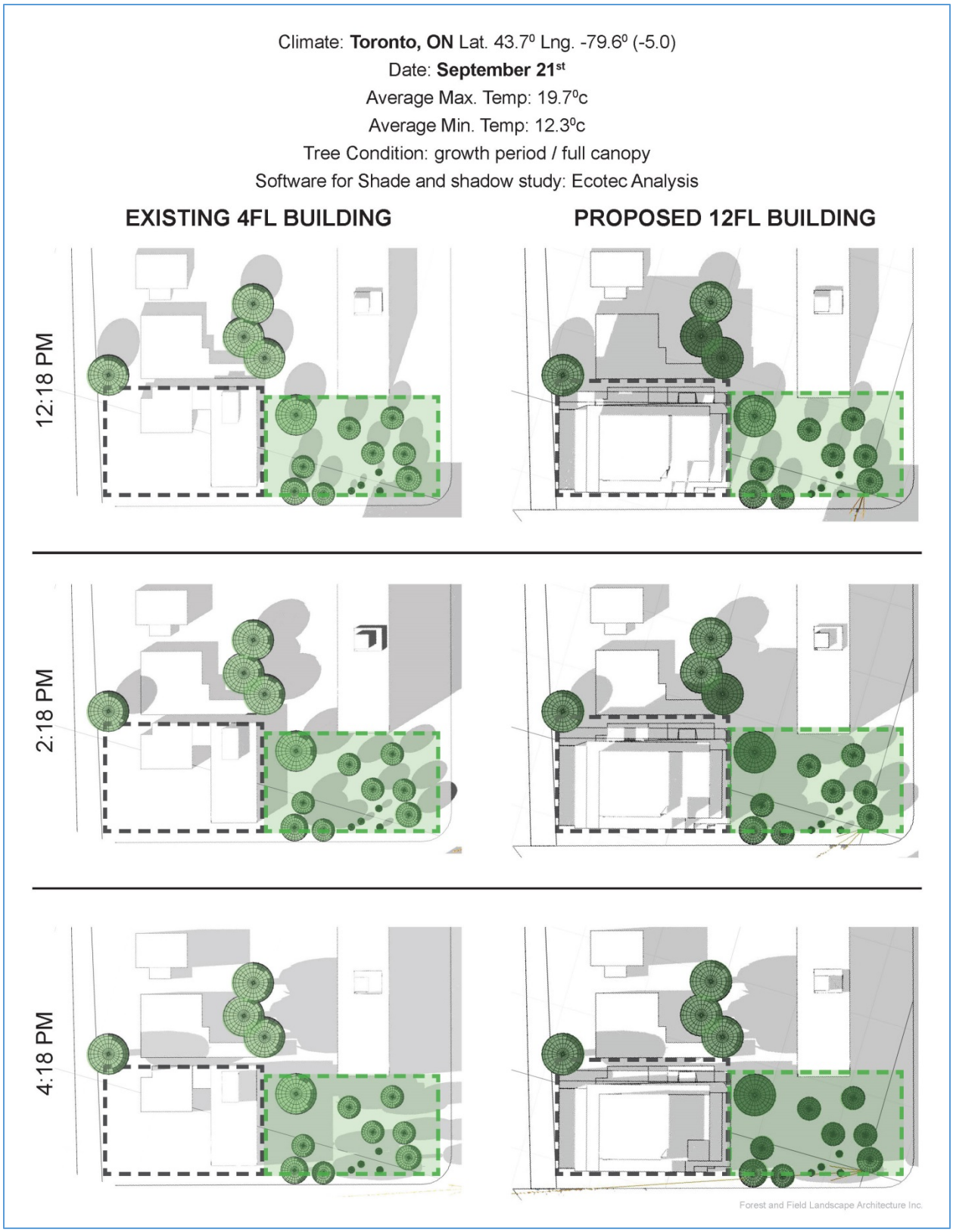

Figure 8. Sun-shade study of the existing and the proposed solar conditions on September 21. Source: FFLA.

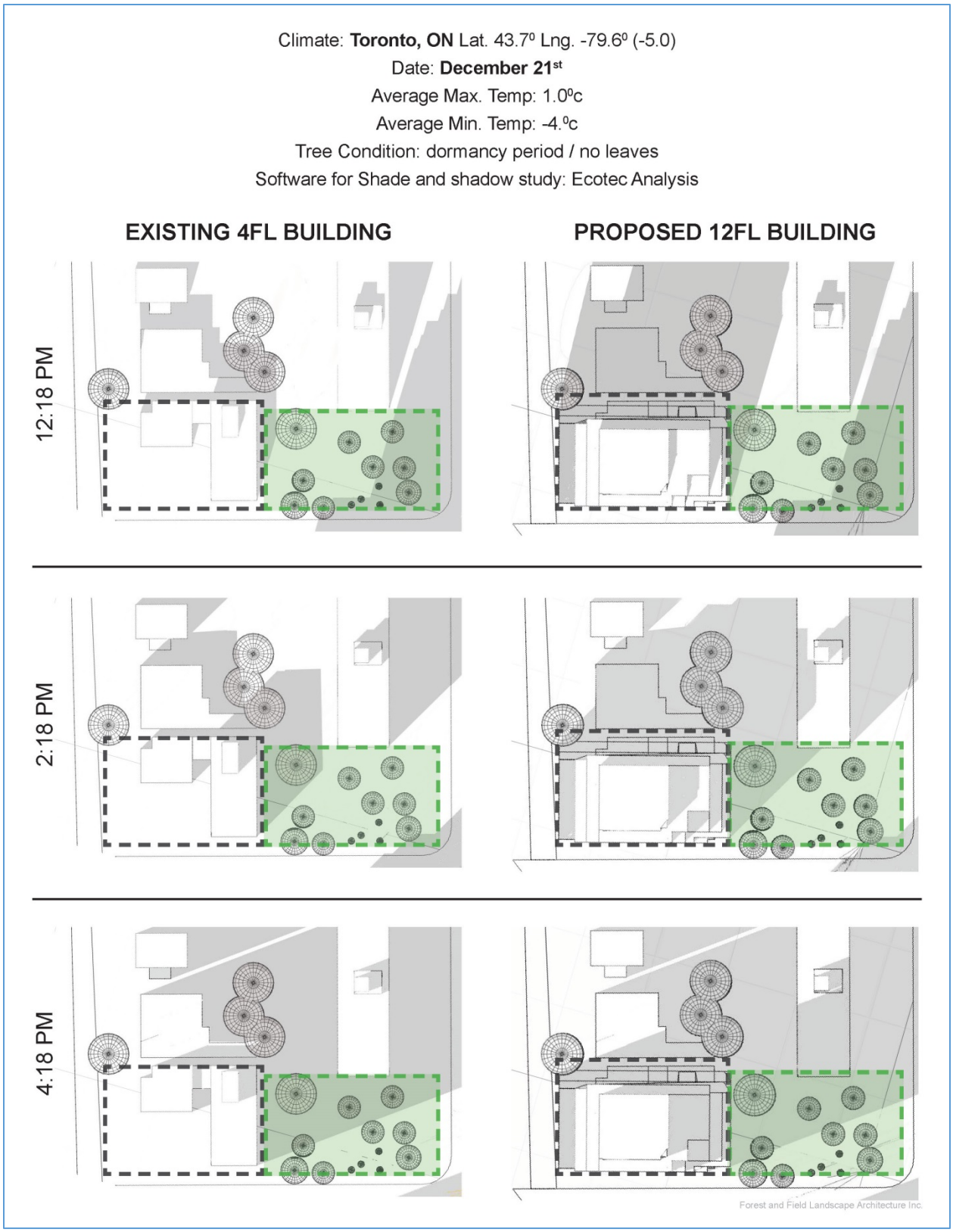

Figure 9. Sun-shade study of the existing and proposed solar conditions, December 21. Source: FFLA

6. Findings

The following are the findings of this investigation:

6.1 No contradictions in the City of Toronto policies regarding sunlight access, urban trees and the provision of shade were found.

- Through its by-laws and policies, the City of Toronto supports a healthy tree canopy on both public and private property.
- The City's park policies support green spaces that provide protection from the sun.
- The *Official Plan* requires that new buildings minimize additional shadowing on existing parks and public open spaces, with a focus on preserving utility.
- *Secondary Plans* and *Site and Area Specific Plans* (SASPs), including the area of the case study examined, provide more prescriptive policy language of "no new net building shadow".

6.2 The terminology around shade and shadow, and parkland utility is unclear.

- Using clear terminology that is easily understood by the development community and the general public will aid in the understanding of this topic.
- This may also be supported by visual graphics.
- This report presents suggested changes to the terminology and descriptors, which may assist in bringing clarity to land use planning discussions on this issue.
- Specifically, it is important that the terminology used in policy statements clearly differentiates between the monolithic *tall building shade* (the overshadowing created by tall buildings) and *human scale shade* (health-promotive shade created by tree canopy and other human-scaled park design elements).
- The concept of “utility” for parks may need to be clarified to encompass the entire park ecosystem and not simply elements such as playgrounds.
- These distinctions and clarifications should be incorporated into municipal planning documents.

6.3 Municipal planning decisions should account for the heating and cooling effects of the sun and interactions of buildings, adjacent trees, and greenspaces.

- Attention needs to be paid to the human comfort in all seasons as it relates to humans’ seeking sun protection when outdoors and/or engaging in outdoor physical activities, especially with considered emphasis on shoulder seasons and winter warmth.

- Given increasing concerns about the urban heat island effect, it is imperative to recognize the value of trees in mitigating the rate of heat accumulation.
- The locations of trees and buildings in the built environment can be intentionally planned to bring benefits to human comfort and health while reducing energy consumption.

6.4 Tall buildings have a significant impact on surrounding parkland and microclimates.

- *Tall building shade* is unyielding and indiscriminate by its nature, with an impact that is both longer lasting, and spread over a larger area.
- Unlike trees that allow the sun's heat into a greenspace in the winter and cooler shoulder seasons, *tall building shade* will block the sun year-round. Overshadowed portions of greenspaces become undesirable to users during colder seasons, decreasing the overall amenity of these spaces.
- Unlike the fixed shadows of *tall building shade*, the *human scale shade* created by trees is seasonally variable and is critical to create comfortable urban greenspaces affording UVR protection.

6.5 The benefits provided by greenspaces and urban trees must be assessed through a holistic, ecosystem-based lens rather than by using a narrow definition of utility.

- Trees provide a wide range of benefits both locally and regionally. Benefits include cooling through shade provision and transpiration, photosynthesis leading to CO_2 uptake, rainfall interception and evaporation, and particulate pollution deposition.
- The impacts of *tall building shade* on greenspaces are not limited to public parks. Impacts extend beyond park boundaries to other types of urban greenspaces such as ravines or school grounds and therefore merit holistic consideration.

7.Conclusions

As Toronto's population increases and urban intensification continues, the application of apparently contradictory concepts of promoting access to sunlight in public spaces while advocating for purpose-built shade for UVR protection and skin cancer prevention will continue to be tested. The City of Toronto's planning policies and regulations limit the placement and height of buildings to avoid conditions such as those that will now occur at Glenn Gould Park.

To ensure compliance with City guidelines and by-laws in the protection of existing trees and existing greenspaces from the overshadowing effects of tall buildings, a better understanding is required of the distinction between *human scale shade* and *tall*

building shade. Policies preventing the negative microclimate effects of the overshadowing of mature trees in existing greenspaces caused by new tall buildings could be further strengthened.

The findings of this investigation suggest that greater clarity is needed with regard to terminology in the use of the words “shade” and “shadow”. Evaluating and testing the impact of taller buildings on adjacent public spaces requires consideration of the heating and cooling effects of the sun and interactions between buildings, adjacent trees, and greenspaces. Use of a holistic, ecosystem-based approach extends the discussion of impact beyond the question of immediate utility. Consensus is required among health promoters, urban designers, planners, architects, urban foresters, parks planners and building developers in order to develop a balanced approach allowing for urban growth while protecting valuable ecological resources and advancing the value of health-promotive urban environments.

8. Acknowledgements and citation

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Note:

The Ontario Municipal Board decision related to this case is available on Canadian Legal Information Institute web page:
https://www.canlii.org/en/on/onomb/doc/2017/2017canlii49735/2017canlii49735.html
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