

REPORT

YEE HONG CENTRE FOR GERIATRIC CARE

MISSISSAUGA, ON

SUN SHADOW STUDY – AS OF RIGHT MASSING

PROJECT: #1801419

OCTOBER 24, 2018



SUBMITTED TO

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1. INTRODUCTION



RWDI was retained by CXT Architects to conduct a Sun Shadow Study for the as of right massing for the proposed Yee Hong Centre for Geriatric Care development in Mississauga, Ontario (see Image 1). The objectives of this study were to illustrate the sun and shadow patterns for various times and dates identified in *"Urban Design Terms of Reference - Standards for Shadow Studies"* of City of Mississauga, and determine the potential exposure to sunlight and shadow on and around the study site.

This study involved the use of a three-dimensional (3D) computer model of the project site with the existing surroundings and the proposed development in place. The 3D model was used to produce renderings of the shadows cast around the project site by the proposed development. The following report provides a discussion of the methodology and graphic results of the Sun Shadow Study as per the requirements laid out in *"Urban Design Terms of Reference - Standards for Shadow Studies"* for Mississauga.

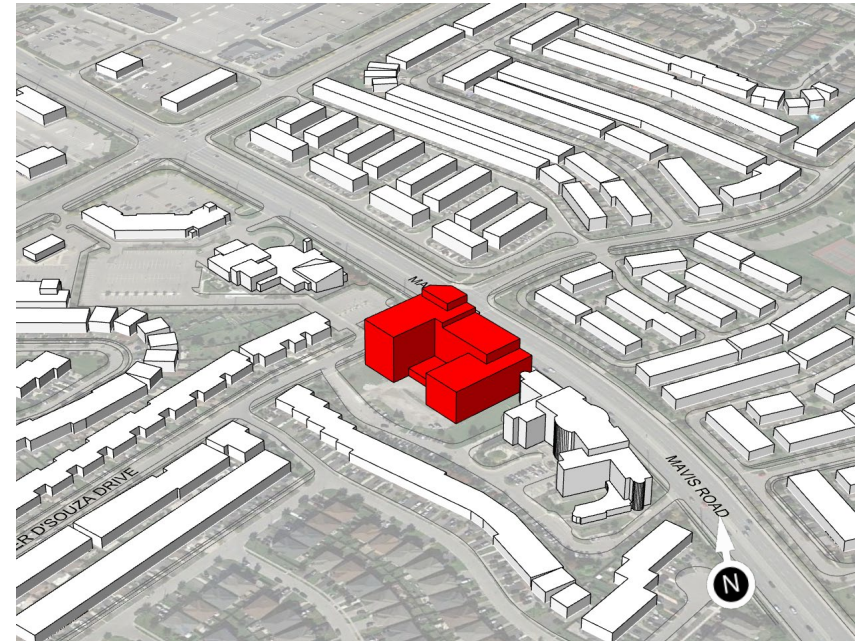


Image 1 – Rendering of the As of Right Massing – View From South

2. SITE & BUILDING INFORMATION



The proposed development is the Yee Hong Centre for Geriatric Care at the north corner of the intersection of Mavis Road and Father D' Souza Drive in Mississauga, Ontario (see Image 2). The Latitude and Longitude of the site are 43.605622°, -79.687986°, respectively. Location was determined by the following: a site plan and a 3D Model provided by CXT Architects (see Appendix A), GoogleEarth, Google Earth and RWDI Master-Trace Database. Astronomic north was never altered for the project and has remained as project north for all images.

The proposed development is an “As of right massing” with a maximum height of 9 storeys and a minimum of 6 storeys (see Image 1). The site is immediately surrounded by an existing 5-storey long-term care building to the south, a church to the north and a low-rise residential buildings in all other directions (see Image 2). Beyond the immediate surroundings, the buildings are generally low rise. Lake Ontario is approximately 11 km to the southeast and Toronto Pearson International Airport approximately 9 km to the northeast.



Image 2- Aerial View of Existing Site and Surrounding
(Courtesy of Google™ earth)

3. METHODOLOGY



The shadow plots illustrated in this report are generated with the aid of a computer graphics program and are shown in Section 5. This was set up for the appropriate settings to simulate the geographic characteristics and solar angles for Mississauga, as per *Urban Design Terms of Reference - Standards for Shadow Studies*. Based on the architectural “As of Right” massing prepared by CXT Architects (received by RWDI on February 13th, 2018), a Computer Aided Design (CAD) three-dimensional computer model of the study site was created by the RWDI.

The computer generated renderings exhibit the simulated shadow conditions anticipated to occur in the vicinity of the study site. The tests conducted in this study assume bright sunlight from sunrise to sunset in order to properly identify shadow patterns created by the proposed structure.

4. ASSESSMENT



Criteria 3.1, 3.3 and 3.5 of Section 3 of *"Urban Design Terms of Reference - Standards for Shadow Studies"* have been identified as applicable to the study site. The times of day simulated for each date are shown in Tables 1 through 3. The shadow cast by the proposed development (Cyan color in the shadow plots in Section 5) are assessed based on its impact on the areas identified in the aforementioned criterion.

Criterion 3.1: "Residential Private Outdoor Amenity Spaces"

Based on this criterion, "Shadow from proposed development should not exceed one hour in duration (or exceed two consecutive hourly test times) on areas such as private rear yards, decks, patios and pools of surrounding residential dwellings on June 21 and September 21". The residential private outdoor amenity areas for the buildings impacted by this criterion on the above mentioned dates are identified around the site and shown by yellow shaded areas on Figure 1.

The rear yards to the houses closest to the building to the west (hatched in red and white in Figures 2 and 3) are shaded by the building at 7.07am and 7.20am. There is also a corner of the yards on the east side of Mavis Road that are shaded at 7.20pm and 7.23pm (Figures 15 and 16) on June 21. The criterion is therefore not breached on June 21. On September 21 there is shade at 5.48pm (Figure 27) on the east side of Mavis Road only, therefore the criterion is also not in breach.

Criterion 3.3: "Public Realm", for "Low and Medium Density Residential Streets"

The project site was identified as Low and Medium Density Residential Streets. Based on this criterion, the development must not impact the opposite boulevard including the full width of the sidewalk, (purple in Figure 1) at 9.12am, 10.12am, 11.12am, 3.12pm, 4.12pm and 5.12pm (Figures 18 - 20 and 24 - 26).

As can be seen in the figures listed above, this criteria is breached on at least a portion of the boulevards for every hour listed except 3.12pm (Figure 24).

Criterion 3.5: "Building faces to allow for the possibility of using solar energy"

The criterion states that the shadow impacts from the proposed developments should not "exceed two consecutive hourly test times in duration on the roofs, front, rear and exterior side walls of adjacent low-rise residential buildings including townhouses, detached and semi-detached dwellings on September 21 to allow for the possibility of harvesting solar energy". The building facades with the potential to use solar panels are shown by orange outlines on Figure 1.

This criteria was breached on the residential units on the north side of Father D'Souza Drive at 9.12am to 11.12am (Figures 18 - 20) on September 21. Additional runs were carried out to determine the extent of the breach and the shadow was found to be outside of the area within 15 minutes (Figures 35 - 37, Appendix B).

5. RESULTS



- Legend**
- Building Faces for Solar Energy (3 m Perimeter)
 - Private Outdoor Amenity (7.5m no impact zone)
 - Opposite Boulevard

Key Plan	Figure 1	
	Scale: Refer to Bar	
	Date: July 24th, 2018	
Yee Hong Centre for Geriatric Care – Mississauga, ON		Project #1801419

5. RESULTS CONTINUED







Mississauga Sun Angle Data – June 21

Table 1

DATE: JUNE 21	Azimuth (deg)	SLF (ratio length/height)	COMMENTS
LOCAL TIME EDT			
5:37	235.73		Rise
7:07	250.48	4.1230	Rise + 1.5 hr.
7:20	252.58	3.5045	SN - 6 hr.
8:20	262.02	2.0048	SN - 5 hr.
9:20	272.04	1.3106	SN - 4 hr.
10:20	283.79	0.8976	SN - 3 hr.
11:20	299.52	0.6203	SN - 2 hr.
12:20	323.67	0.4375	SN - 1 hr.
13:20	0.00	0.3670	Solar Noon (SN)
14:20	36.32	0.4375	SN + 1 hr.
15:20	60.47	0.6203	SN + 2 hr.
16:20	76.21	0.8975	SN + 3 hr.
17:20	87.96	1.3105	SN + 4 hr.
18:20	97.98	2.0047	SN + 5 hr.
19:20	107.42	3.5042	SN + 6 hr.
19:33	109.41	4.0852	Set - 1.5 hr.
21:03	124.27		Set



Legend

-  Private Outdoor Amenity (7.5m no impact zone)
-  Private Outdoor Amenity Overlap
-  Proposed Shadows
-  Existing Shadows

Sun Shadow Simulation June 21st 7.07hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419





Figure 2

Scale: Refer to Bar

Date: July 24th, 2018



Legend

-  Private Outdoor Amenity (7.5m no impact zone)
-  Private Outdoor Amenity Overlap
-  Proposed Shadows
-  Existing Shadows

Sun Shadow Simulation June 21st 7.20hrs EDT

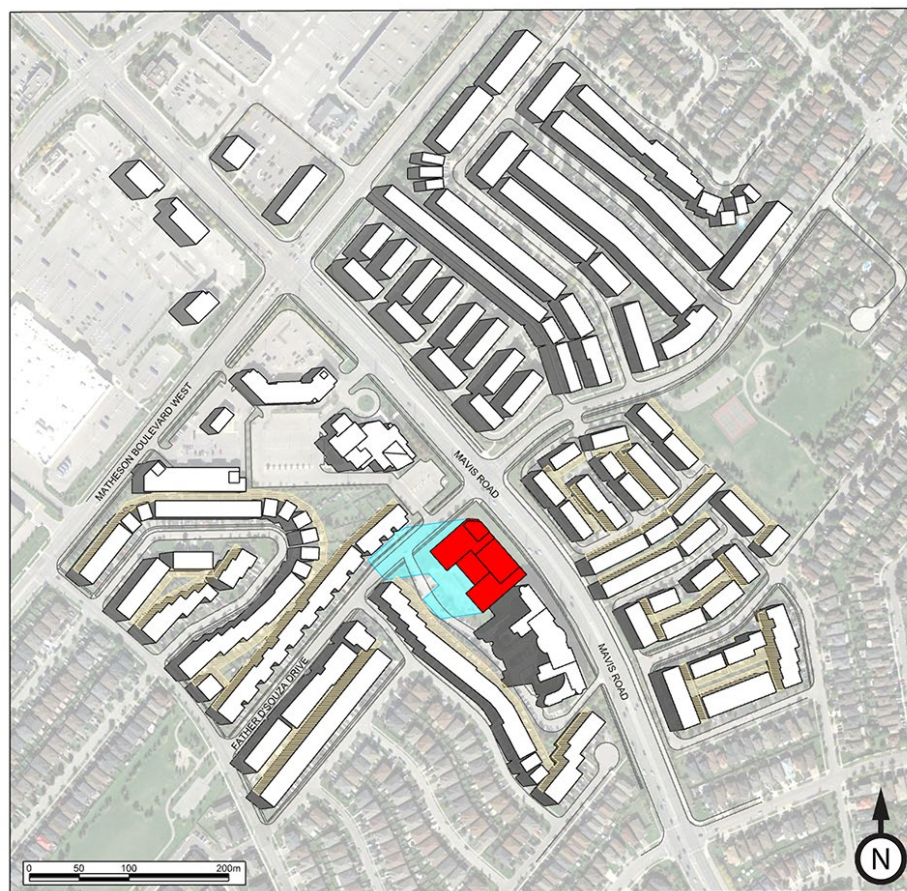
Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419




Figure 3

Scale: Refer to Bar

Date: July 24th, 2018



Legend

-  Private Outdoor Amenity (7.5m no impact zone)
-  Proposed Shadows
-  Existing Shadows

Sun Shadow Simulation June 21st 8.20hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419

Figure 4

Scale: Refer to Bar

Date: July 24th, 2018



Legend

- Private Outdoor Amenity (7.5m no impact zone)
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation June 21st 9.20hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419

Figure 5

Scale: Refer to Bar

Date: July 24th, 2018



Legend

- Private Outdoor Amenity
(7.5m no impact zone)
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation

June 21st 10.20hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419

Figure 6

Scale: Refer to Bar

Date: July 24th, 2018



Legend

- Private Outdoor Amenity (7.5m no impact zone)
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation

June 21st 11.20hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419

Figure 7

Scale: Refer to Bar

Date: July 24th, 2018



Legend

- Private Outdoor Amenity
(7.5m no impact zone)
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation June 21st 12.20hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419

Figure 8

Scale: Refer to Bar

Date: July 24th, 2018





Legend

- Private Outdoor Amenity (7.5m no impact zone)
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation June 21st 13.20hrs EDT Yee Hong Centre for Geriatric Care – Mississauga, ON	Figure 9	
	Scale: Refer to Bar	
	Date: July 24th, 2018	



Legend

- Private Outdoor Amenity
(7.5m no impact zone)
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation
June 21st 14.20hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419

Figure 10

Scale: Refer to Bar

Date: July 24th, 2018





Legend

- Private Outdoor Amenity
(7.5m no impact zone)
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation June 21st 15.20hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419

Figure 11




Scale: Refer to Bar

Date: July 24th, 2018

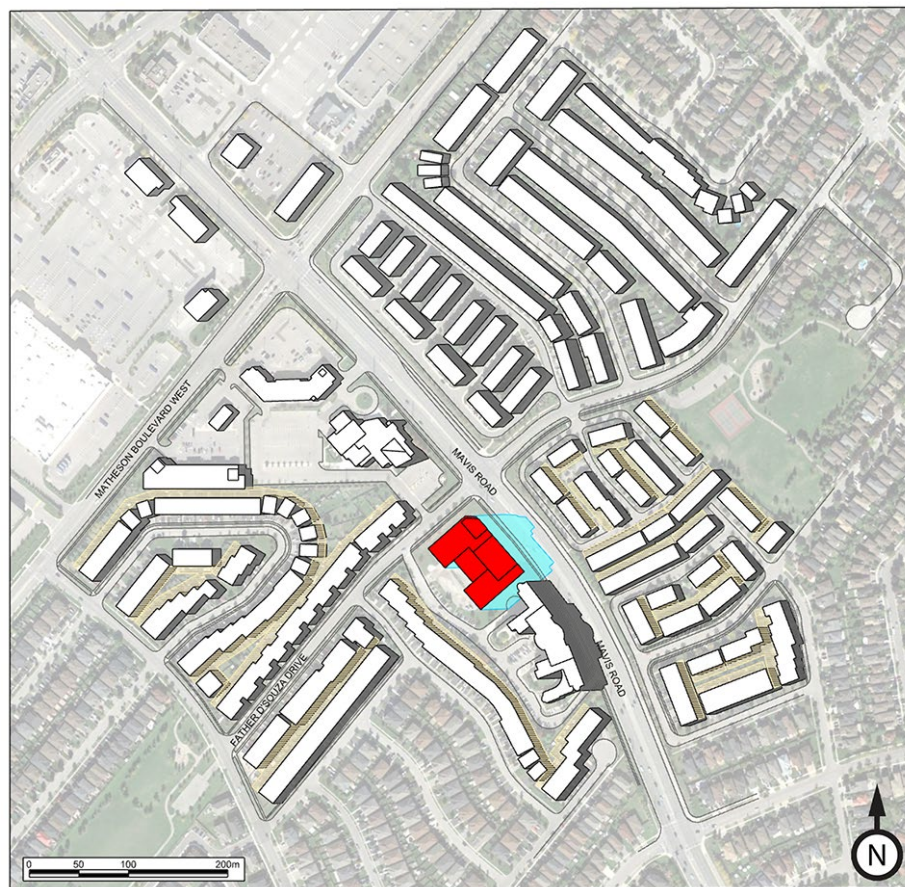







Legend

-  Private Outdoor Amenity
(7.5m no impact zone)
-  Proposed Shadows
-  Existing Shadows

Sun Shadow Simulation June 21st 16.20hrs EDT Yee Hong Centre for Geriatric Care – Mississauga, ON	Figure 12	
	Scale: Refer to Bar	
	Date: July 24th, 2018	



Legend

-  Private Outdoor Amenity
(7.5m no impact zone)
-  Proposed Shadows
-  Existing Shadows

Sun Shadow Simulation

June 21st 17.20hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

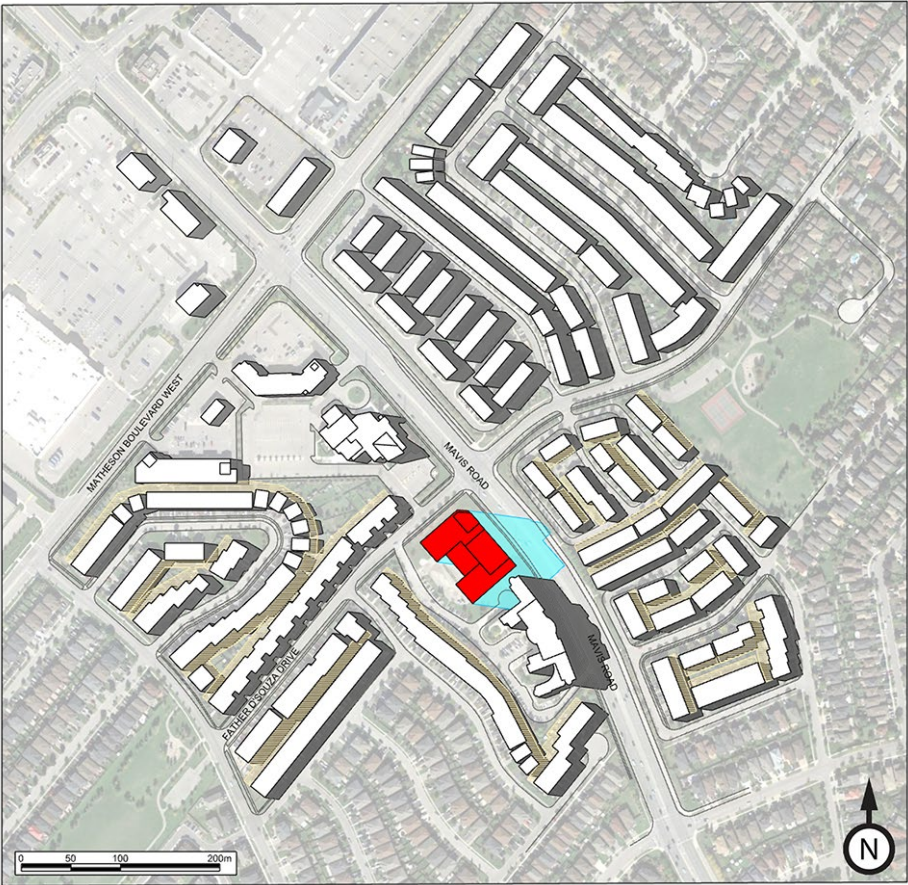
Project #1801419

Figure 13

Scale: Refer to Bar

Date: July 24th, 2018

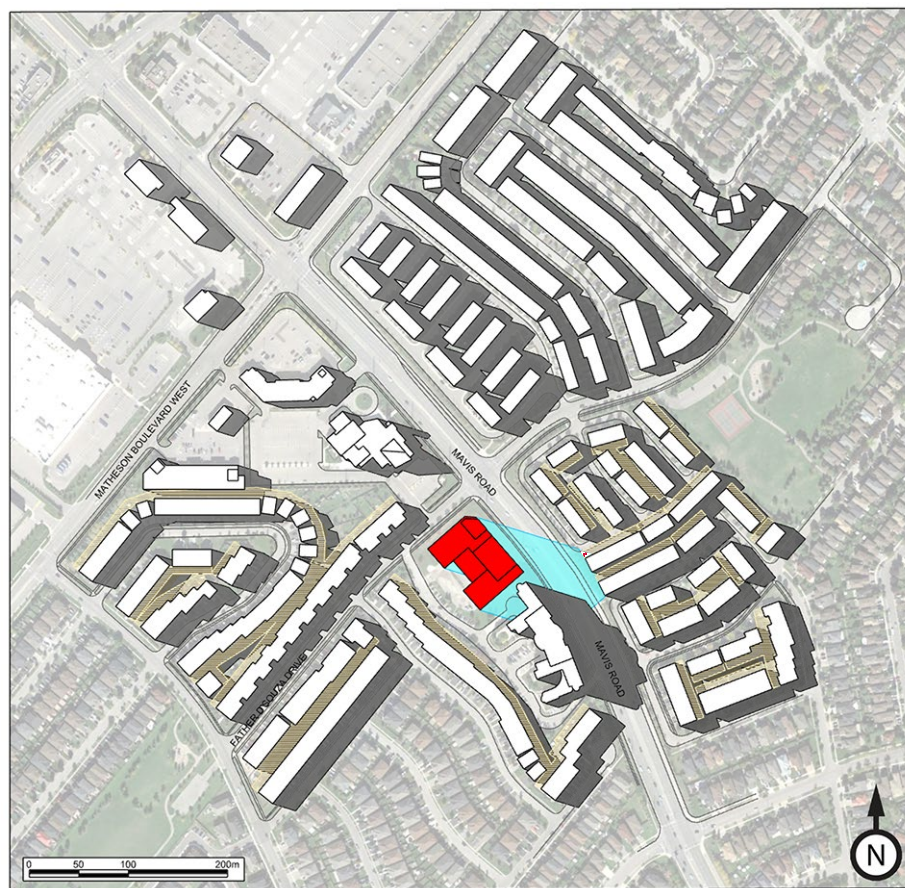








Legend

- Private Outdoor Amenity
(7.5m no impact zone)
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation June 21st 18.20hrs EDT Yee Hong Centre for Geriatric Care – Mississauga, ON	Figure 14	
	Scale: Refer to Bar	
	Date: July 24th, 2018	



Legend

-  Private Outdoor Amenity (7.5m no impact zone)
-  Private Outdoor Amenity Overlap
-  Proposed Shadows
-  Existing Shadows

Sun Shadow Simulation June 21st 19.20hrs EDT

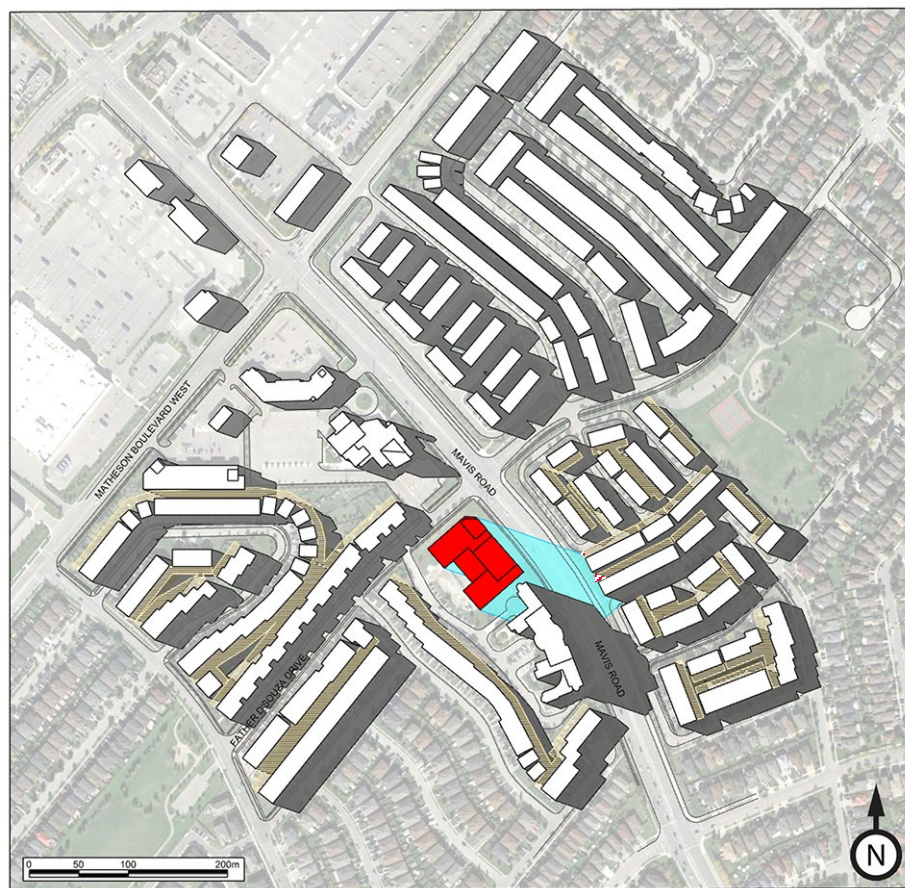
Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419





Figure 15

Scale: Refer to Bar

Date: July 24th, 2018



Legend

-  Private Outdoor Amenity (7.5m no impact zone)
-  Private Outdoor Amenity Overlap
-  Proposed Shadows
-  Existing Shadows

Sun Shadow Simulation June 21st 19.33hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419

Figure 16

Scale: Refer to Bar

Date: July 24th, 2018

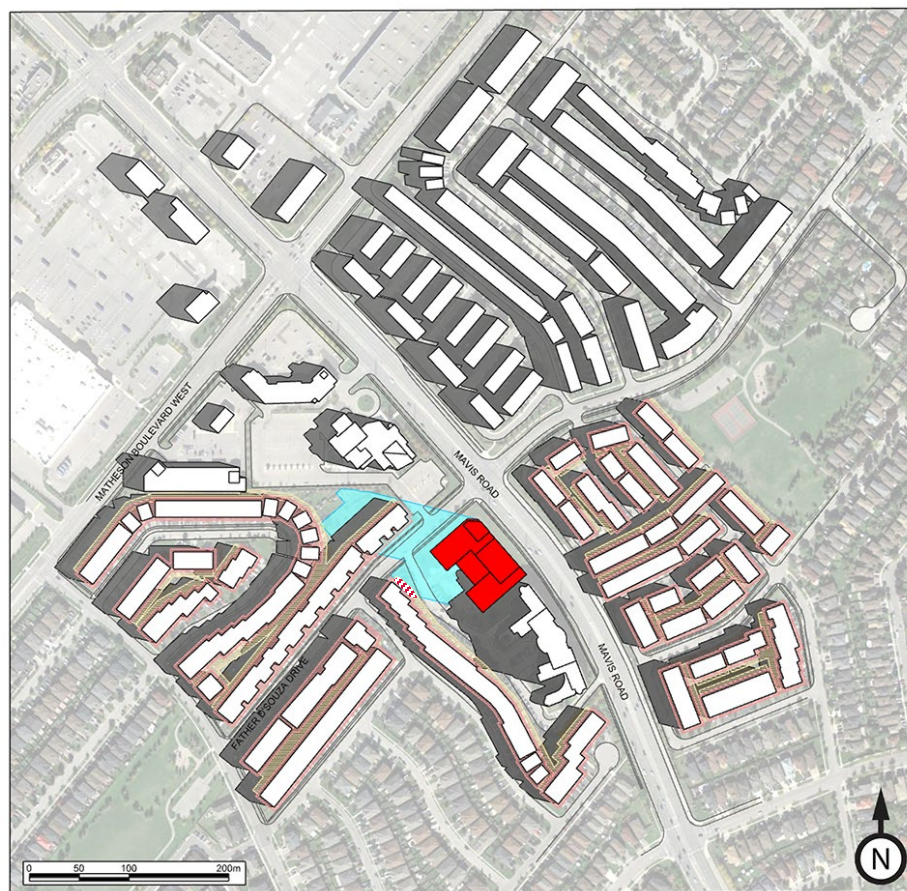
5. RESULTS CONTINUED



Mississauga Sun Angle Data – September 21

Table 2

Date: September 21	Azimuth (deg)	SLF (ratio length/height)	Comments
LOCAL TIME EDT			
7:05	268.27		Rise
8:35	284.22	3.6329	Rise + 1.5 hr.
9:12	291.23	2.5132	SN - 4 hr.
10:12	304.14	1.6445	SN -3 hr.
11:12	319.68	1.2181	SN -2 hr.
12:12	338.54	1.0011	SN -1 hr.
13:12	0.00	0.9329	Solar Noon (SN)
14:12	21.45	1.0022	SN + 1 hr.
15:12	40.28	1.2205	SN + 2 hr.
16:12	55.79	1.6495	SN + 3 hr.
17:12	68.68	2.5255	SN + 4 hr.
17:48	75.63	3.6493	Set - 1.5 hr.
19:18	91.46		Set



Legend

- Building Faces for Solar Energy (3 m Perimeter)
- Private Outdoor Amenity (7.5m no impact zone)
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation September 21st 8.35hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

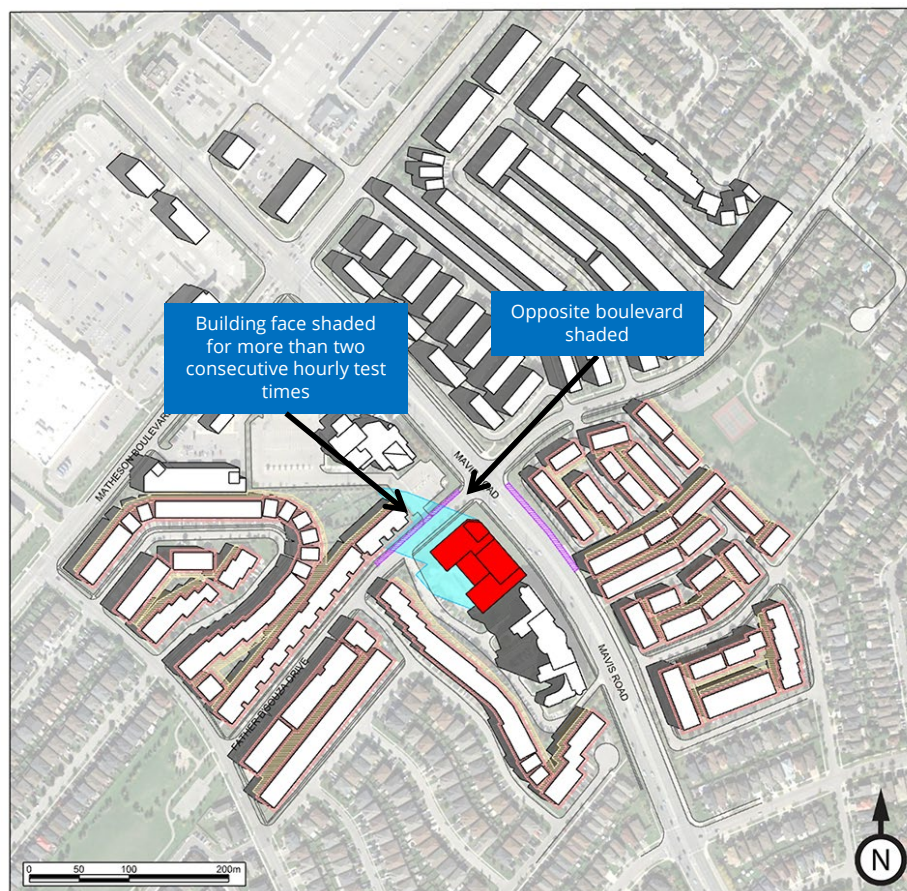
Project #1801419

Figure 17

Scale: Refer to Bar

Date: July 24th, 2018





Legend

- Building Faces for Solar Energy (3 m Perimeter)
- Private Outdoor Amenity (7.5m no impact zone)
- Opposite Boulevards
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation September 21st 9.12hrs EDT

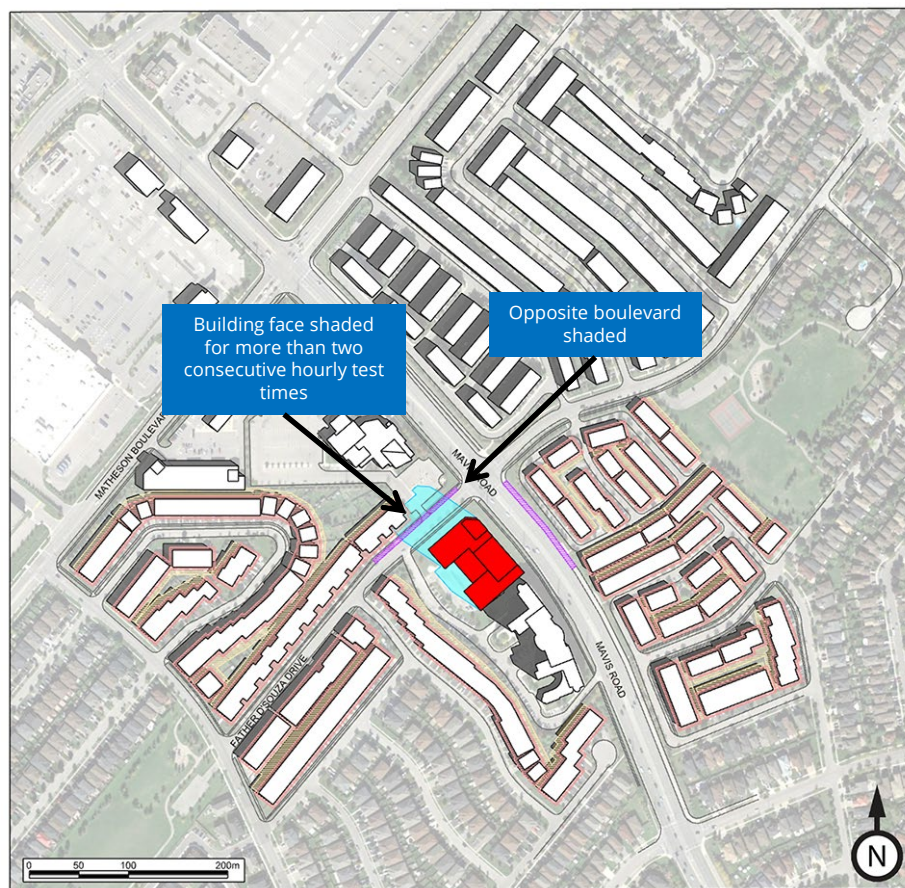
Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419

Figure 18

Scale: Refer to Bar

Date: July 24th, 2018



Legend

- Building Faces for Solar Energy (3 m Perimeter)
- Private Outdoor Amenity (7.5m no impact zone)
- Opposite Boulevards
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation September 21st 10.12hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

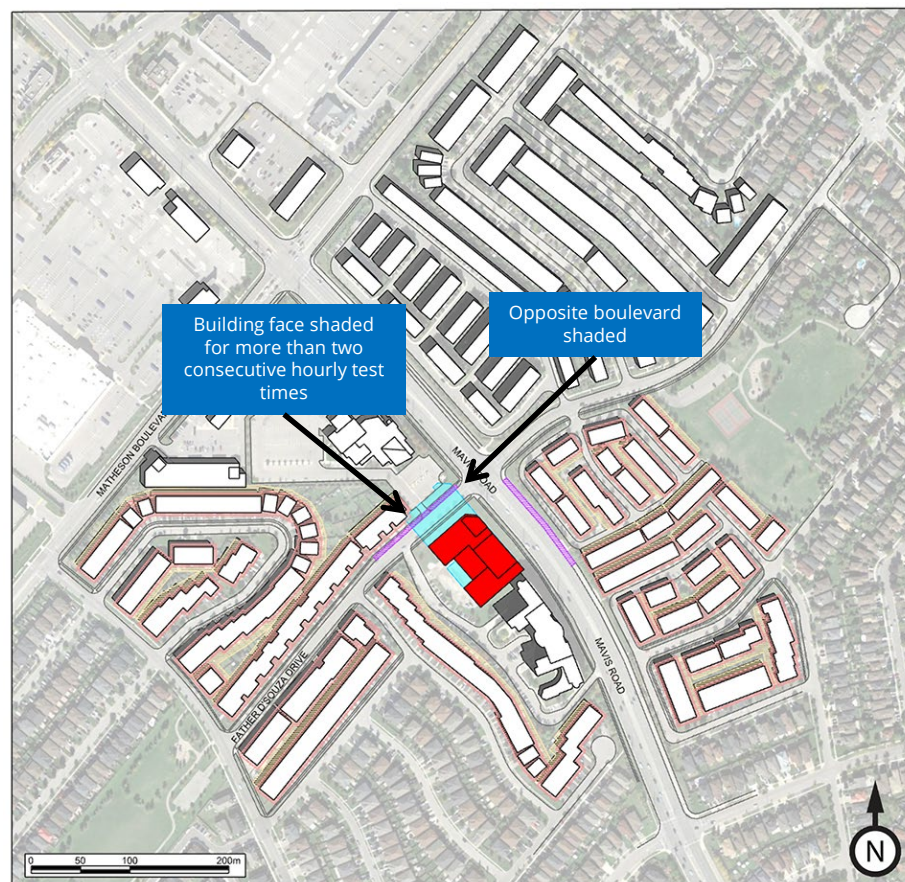
Project #1801419

Figure 19

Scale: Refer to Bar

Date: July 24th, 2018





Legend

- Building Faces for Solar Energy (3 m Perimeter)
- Private Outdoor Amenity (7.5m no impact zone)
- Opposite Boulevards
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation September 21st 11.12hrs EDT

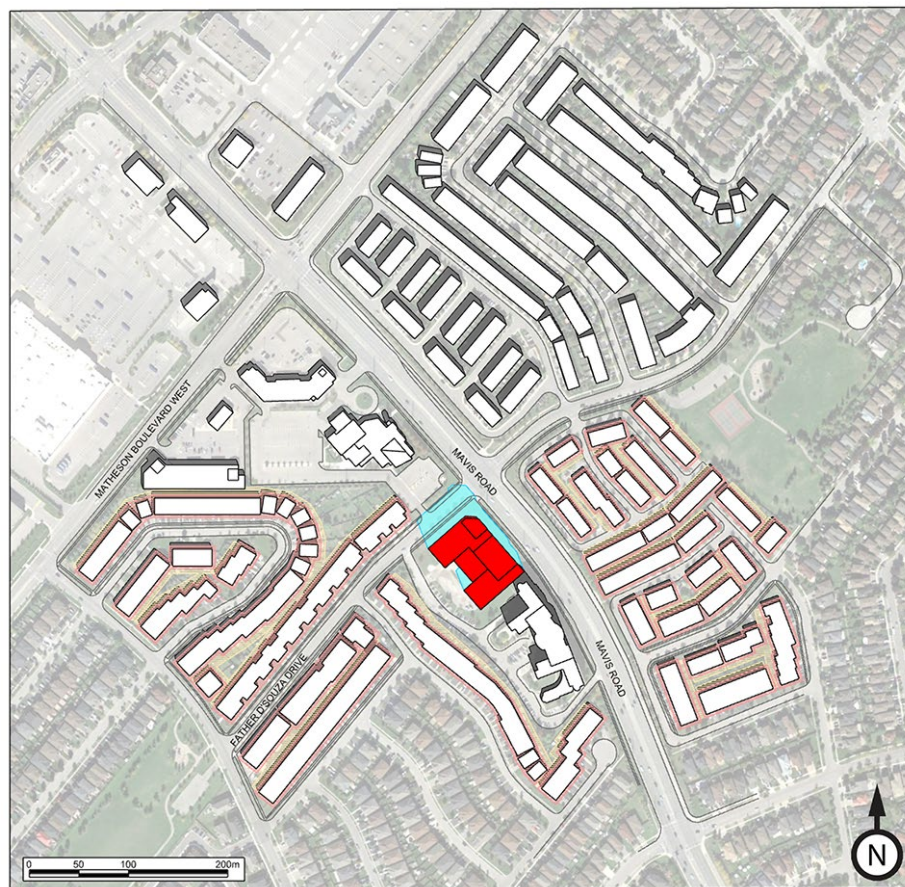
Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419

Figure 20

Scale: Refer to Bar

Date: July 24th, 2018



Legend

- Building Faces for Solar Energy (3 m Perimeter)
- Private Outdoor Amenity (7.5m no impact zone)
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation September 21st 12.12hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

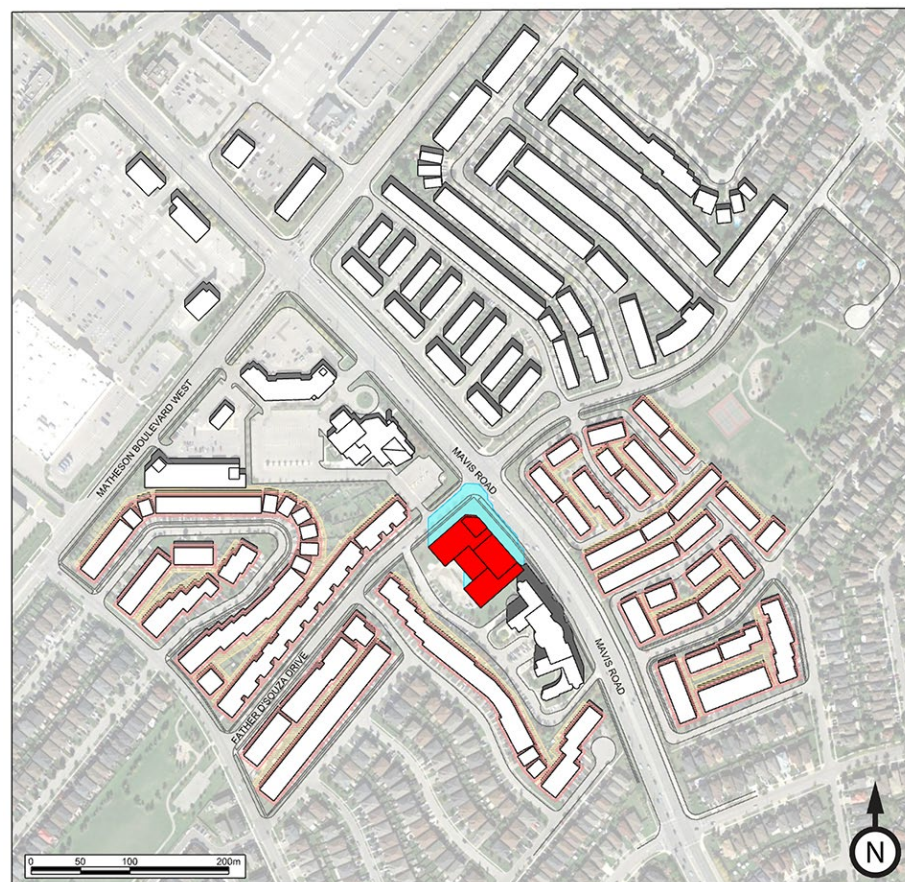
Project #1801419

Figure 21

Scale: Refer to Bar

Date: July 24th, 2018





Legend

- Building Faces for Solar Energy (3 m Perimeter)
- Private Outdoor Amenity (7.5m no impact zone)
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation September 21st 13.12hrs EDT

5510 Mavis Road – Mississauga, ON

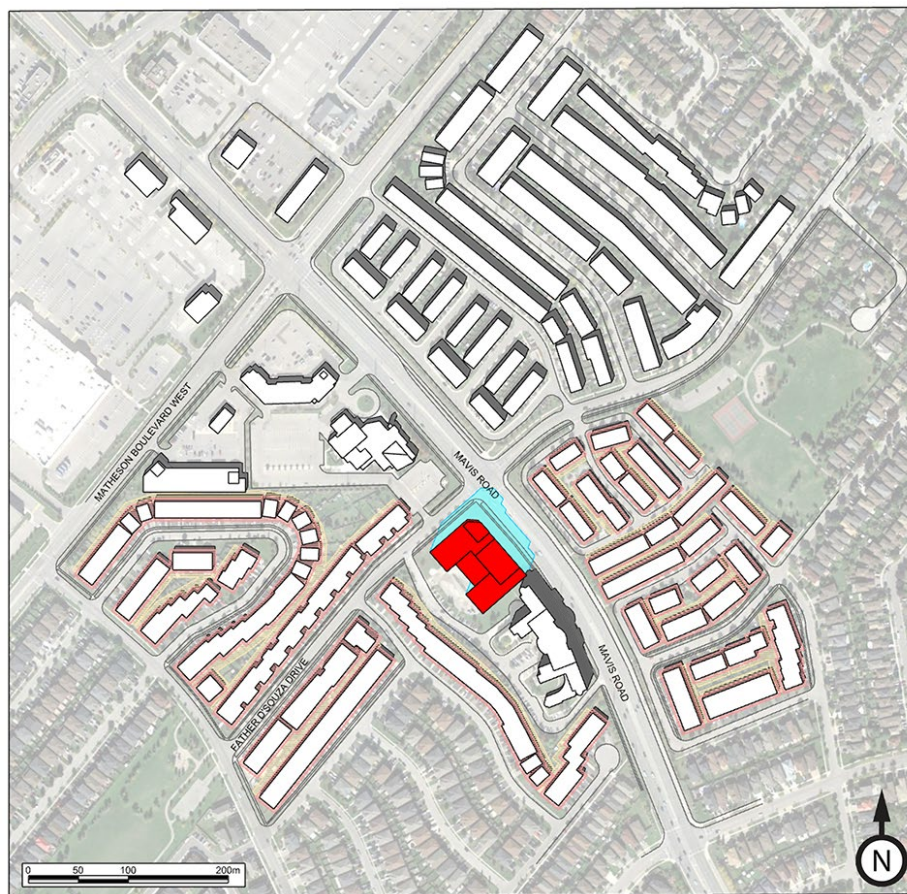
Project #1801419

Figure 22

Scale: Refer to Bar

Date: July 24th, 2018





Legend

- Building Faces for Solar Energy (3 m Perimeter)
- Private Outdoor Amenity (7.5m no impact zone)
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation September 21st 14.12hrs EDT

5510 Mavis Road – Mississauga, ON

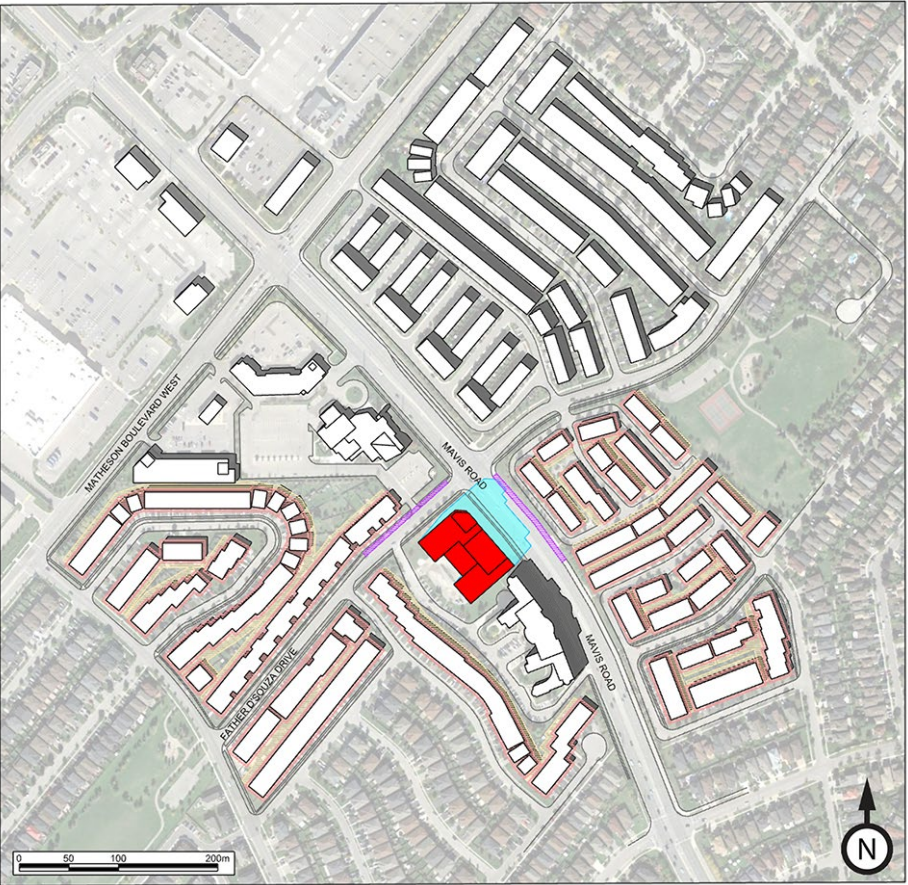
Project #1801419

Figure 23

Scale: Refer to Bar

Date: July 24th, 2018

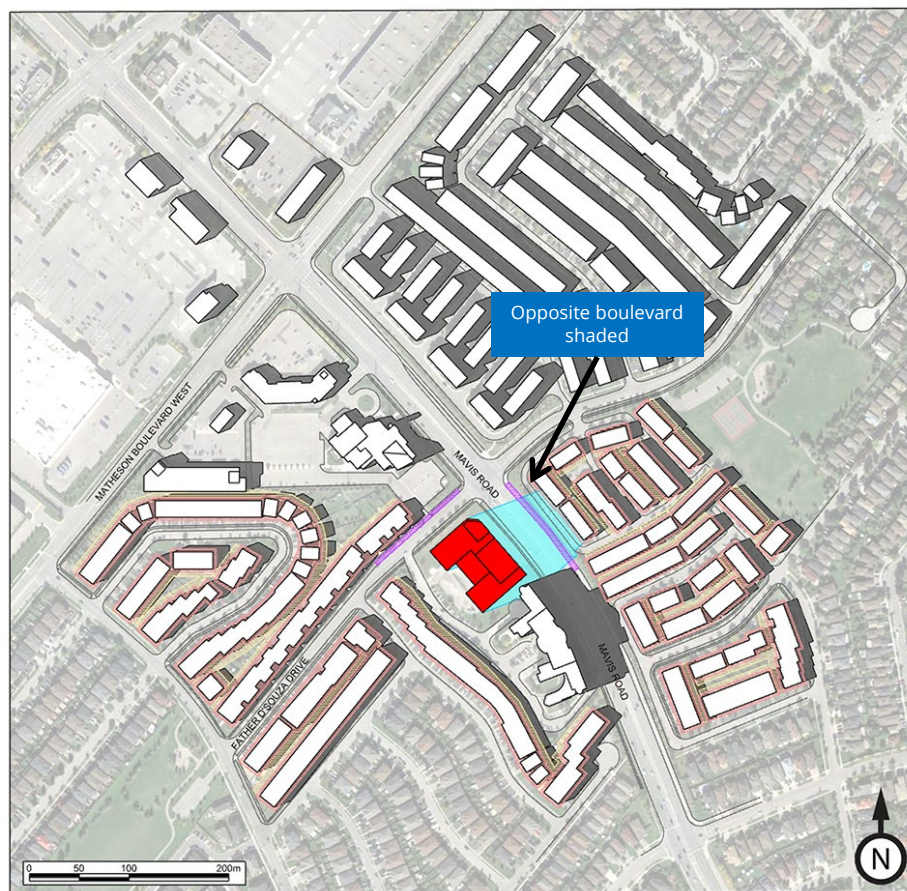




- Legend**
- Building Faces for Solar Energy (3 m Perimeter)
 - Private Outdoor Amenity (7.5m no impact zone)
 - Opposite Boulevards
 - Proposed Shadows
 - Existing Shadows

Sun Shadow Simulation September 21st 15.12hrs EDT Yee Hong Centre for Geriatric Care – Mississauga, ON	Figure 24	
	Scale: Refer to Bar	
	Date: July 24th, 2018	





Legend

- Building Faces for Solar Energy (3 m Perimeter)
- Private Outdoor Amenity (7.5m no impact zone)
- Opposite Boulevards
- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation September 21st 17.12hrs EDT

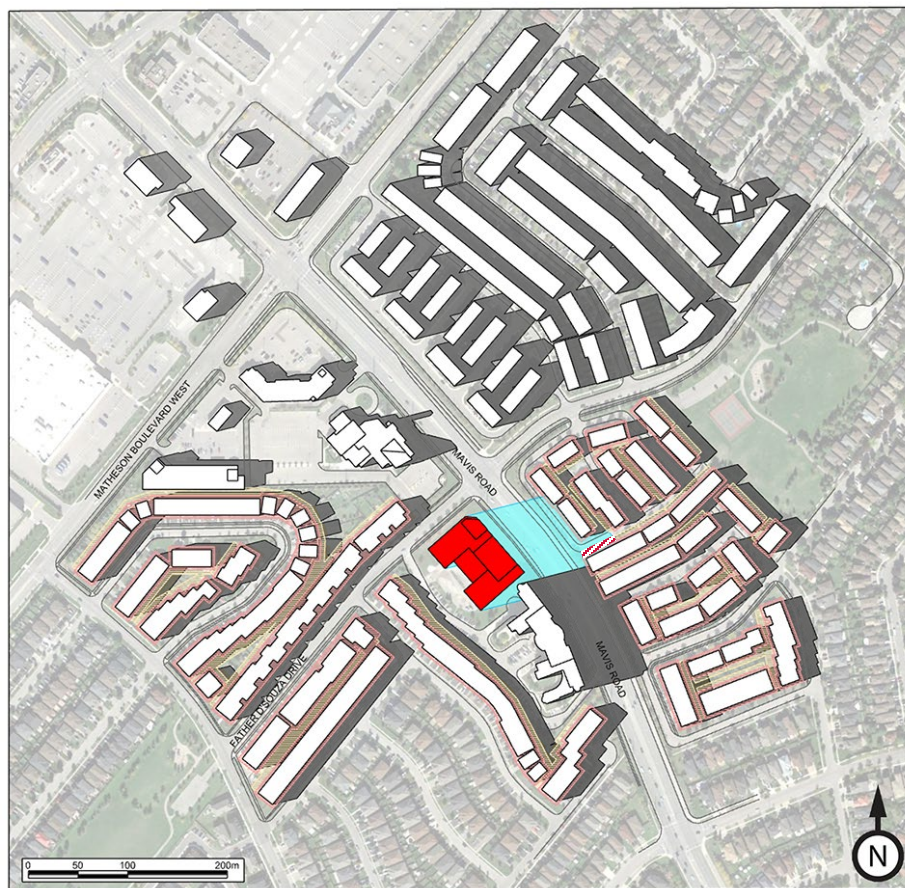
Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419






Figure 26

Scale: Refer to Bar

Date: July 24th, 2018



Legend

-  Building Faces for Solar Energy (3 m Perimeter)
-  Private Outdoor Amenity (7.5m no impact zone)
-  Private Outdoor Amenity Overlap
-  Proposed Shadows
-  Existing Shadows

Sun Shadow Simulation September 21st 17.48hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419

Figure 27

Scale: Refer to Bar

Date: July 24th, 2018

5. RESULTS CONTINUED



Mississauga Sun Angle Data – December 21

Table 3

Date: December 21	Azimuth (degrees)	SLF (ratio length/height)	Comments
LOCAL TIME EST			
7:49	302.37		Rise
9:19	319.05	4.8874	Rise + 1.5 hr.
10:17	331.25	3.1643	SN -2 hr.
11:17	345.21	2.5293	SN -1 hr.
12:17	0.00	2.3589	Solar Noon (SN)
13:17	14.79	2.5293	SN + 1 hr.
14:17	28.75	3.1644	SN + 2 hr.
15:15	41.06	4.9172	Set - 1.5 hr.
16:45	57.63		Set



Sun Shadow Simulation
December 21st 9.19hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

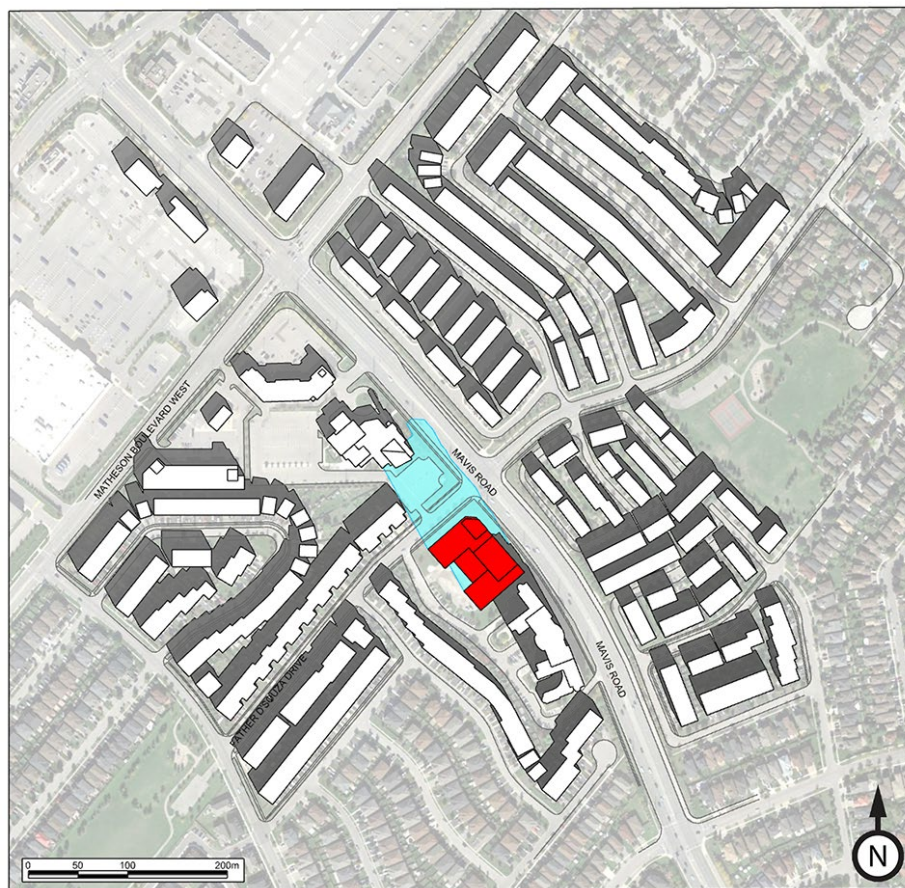
Project #1801419

Figure 28

Scale: Refer to Bar

Date: July 24th, 2018





Legend

- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation
December 21st 10.17hrs EDT

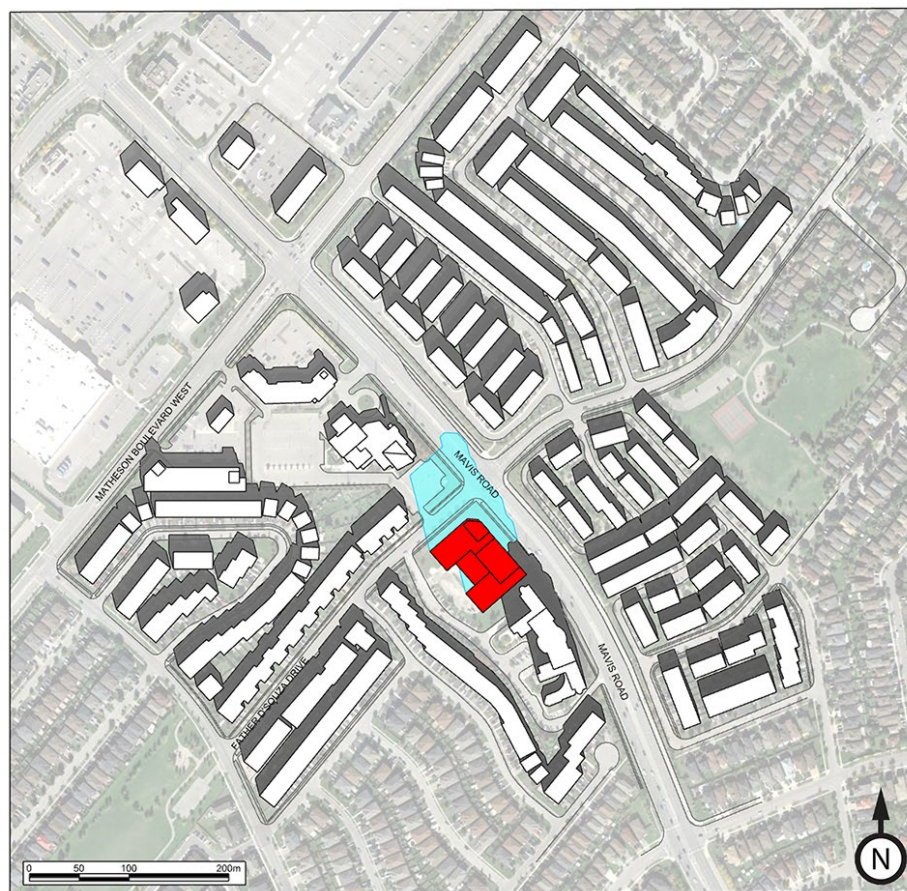
Yee Hong Centre for Geriatric Care – Mississauga, ON

Project #1801419

Figure 29

Scale: Refer to Bar

Date: July 24th, 2018



Legend

- Proposed Shadows
- Existing Shadows

Sun Shadow Simulation December 21st 11.17hrs EDT

Yee Hong Centre for Geriatric Care – Mississauga, ON

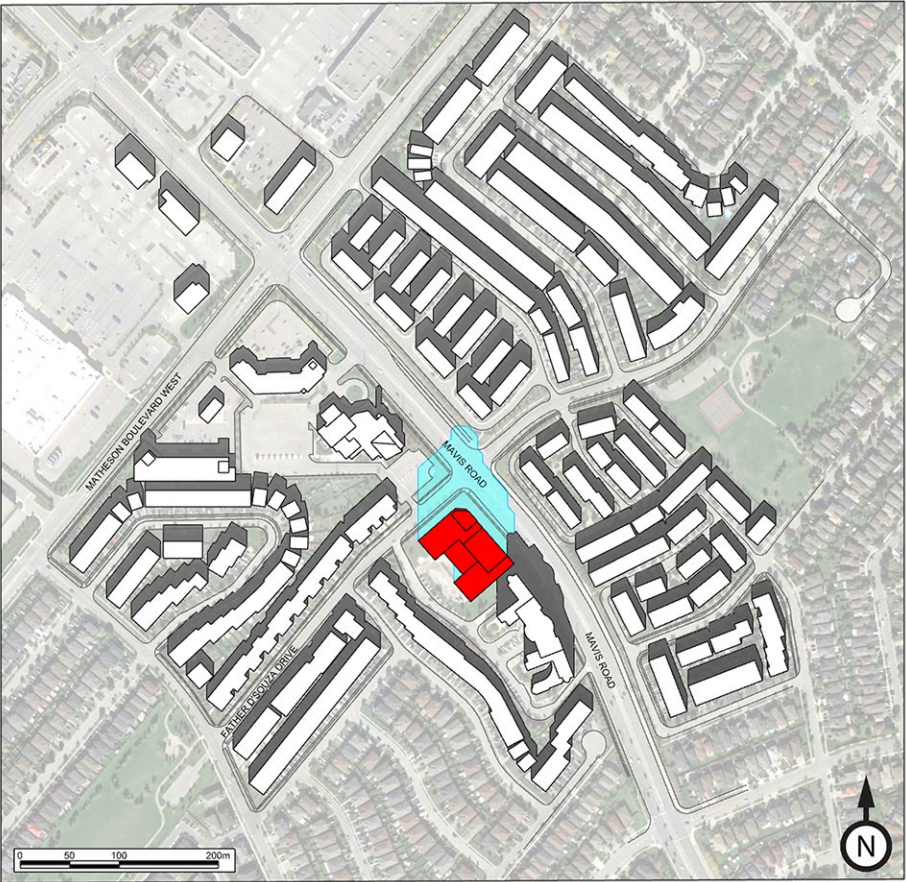
Project #1801419

Figure 30

Scale: Refer to Bar

Date: July 24th, 2018



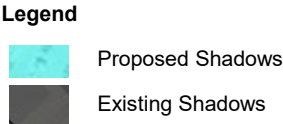
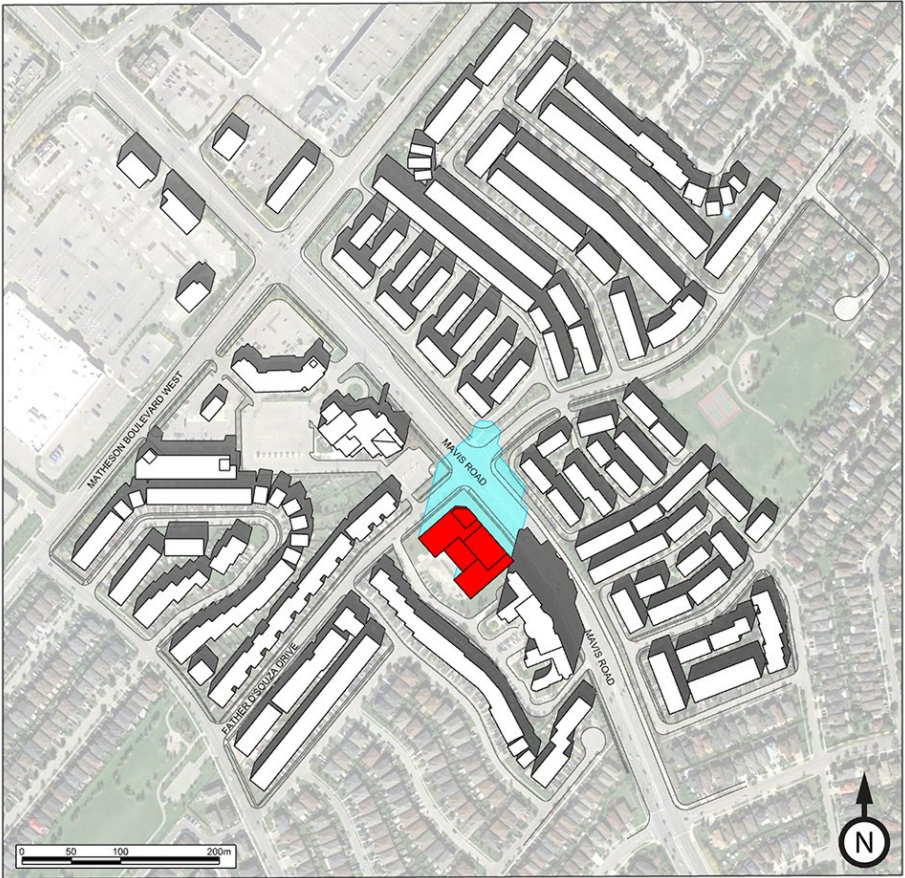


Legend

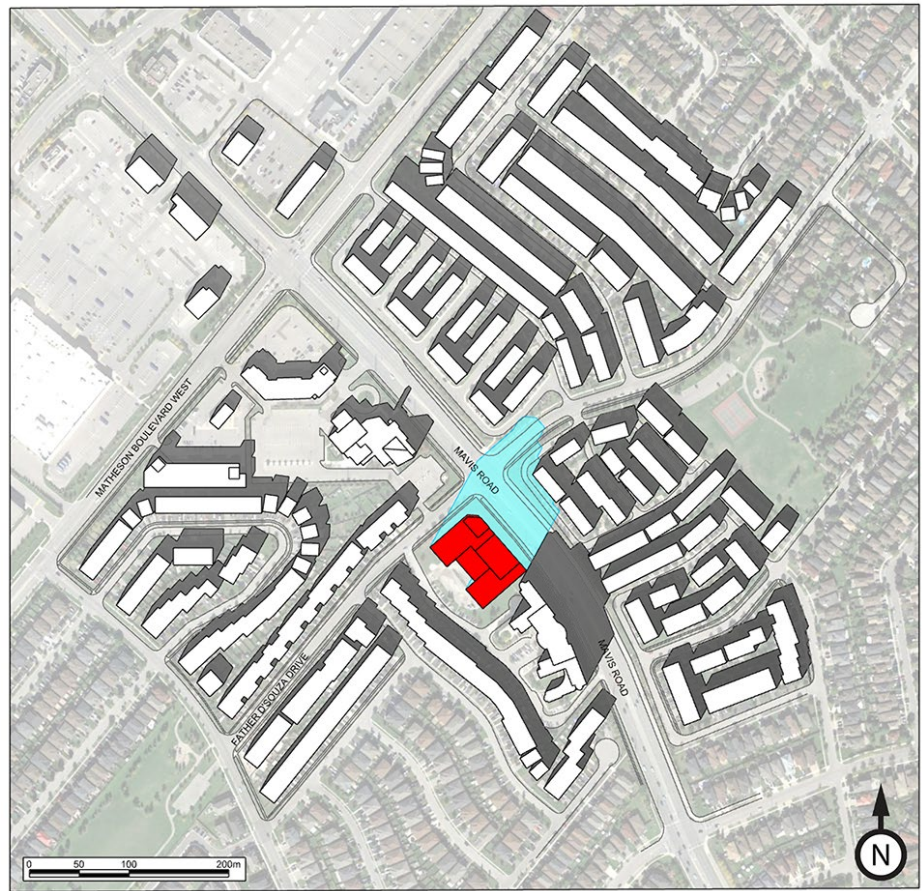
Proposed Shadows

Existing Shadows

Sun Shadow Simulation December 21st 12.17hrs EDT Yee Hong Centre for Geriatric Care – Mississauga, ON	Figure 31	
	Scale: Refer to Bar	
	Date: July 24th, 2018	



<p>Sun Shadow Simulation December 21st 13.17hrs EDT</p> <p>Yee Hong Centre for Geriatric Care – Mississauga, ON</p>	Figure 32	
	Scale: Refer to Bar	
	Date: July 24th, 2018	

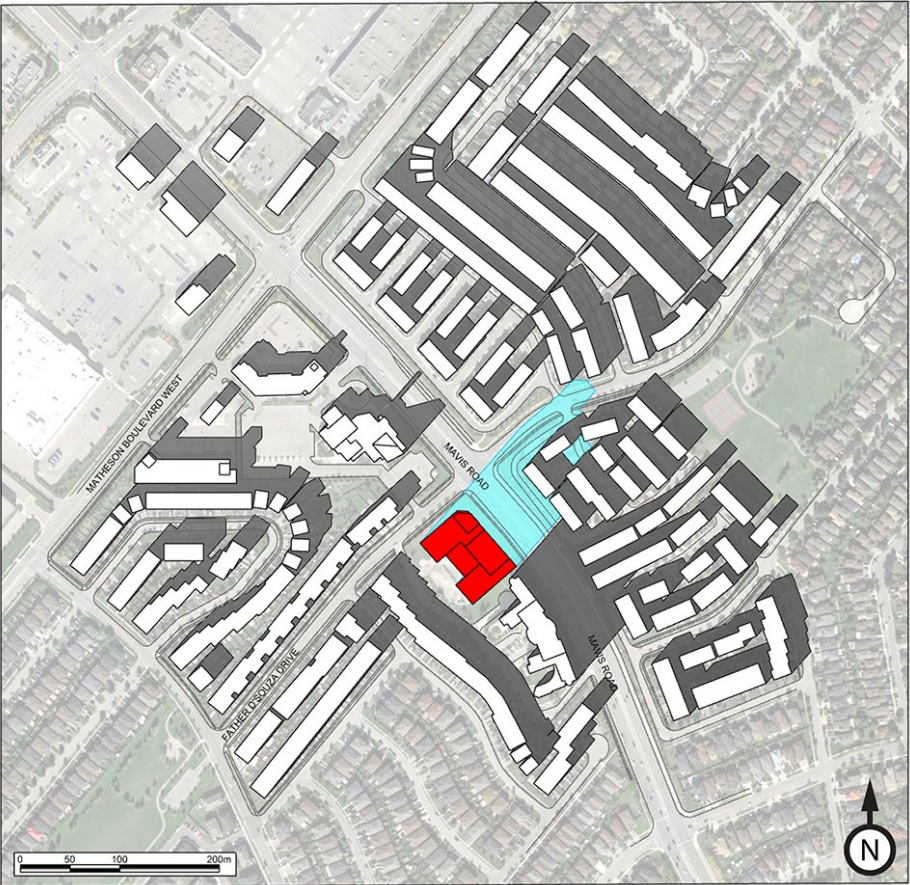


Legend

Proposed Shadows

Existing Shadows

Sun Shadow Simulation December 21st 14.17hrs EDT Yee Hong Centre for Geriatric Care – Mississauga, ON	Figure 33	
	Scale: Refer to Bar	
	Date: July 24th, 2018	



Legend

Proposed Shadows

Existing Shadows

Sun Shadow Simulation December 21st 15.15hrs EDT		Figure 34	
		Scale: Refer to Bar	
		Date: July 24th, 2018	
Yee Hong Centre for Geriatric Care – Mississauga, ON	Project #1801419		

6. SUMMARY



The shadow plots provided in this report illustrate the shadows cast by the proposed Yee Hong Centre for Geriatric Care on the 21st days of June, September and December. Based on the review on the shadow plots and the applicable criteria, this development, breaches Criterion 3.3 and 3.5 as laid out in “*Urban Design Terms of Reference - Standards for Shadow Studies*” for Mississauga.

7. APPLICABILITY OF RESULTS



The results presented in this report pertain to the model of the proposed Yee Hong Centre for Geriatric Care generated using the architectural design drawings listed in Appendix A. Should there be any design changes that deviate from this list of drawings, the results presented may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on sun shadow conditions.

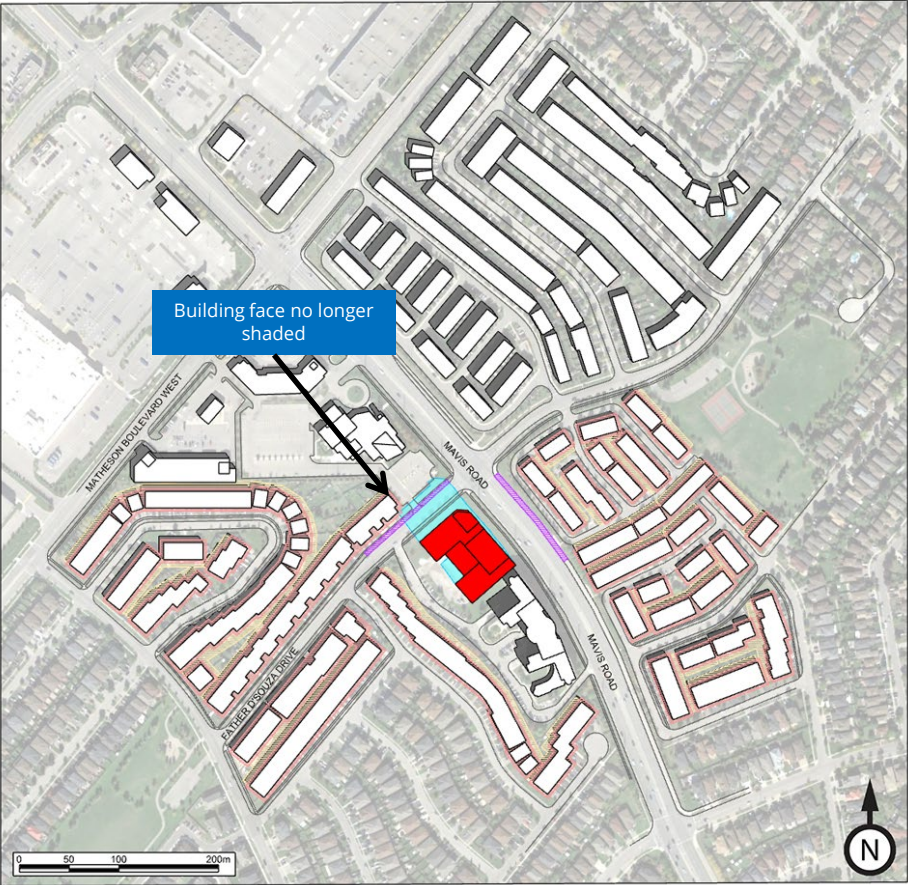
APPENDIX A: DRAWING LIST FOR MODELLING



The drawings and information listed below were received from CXT Architects and were used to construct the scale model of the proposed Yee Hong Centre for Geriatric Care. Should there be any design changes that deviate from this list of drawings, the results may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on the pedestrian wind conditions presented in this report.

File Name	File Type	Date Received (dd/mm/yyyy)
As of right	Sketchup	26/06/2018

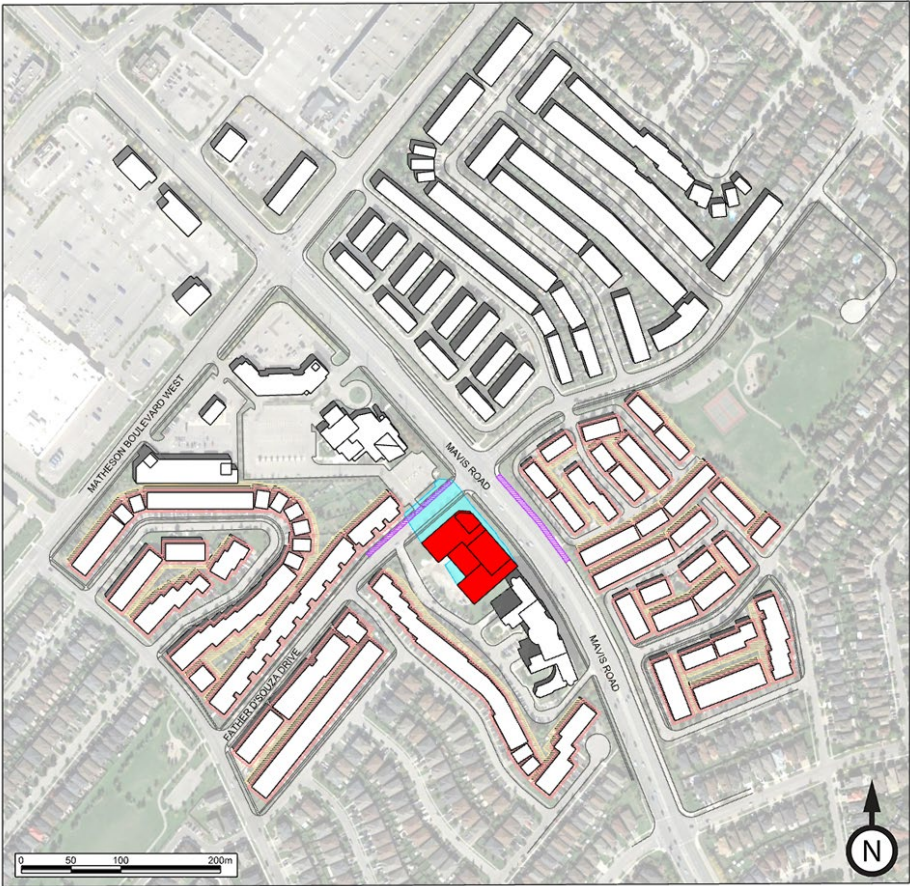
APPENDIX B: ADDITIONAL RUNS FOR SEPTEMBER 21



- Legend**
- Building Faces for Solar Energy (3 m Perimeter)
 - Private Outdoor Amenity (7.5m no impact zone)
 - Opposite Boulevards
 - Proposed Shadows
 - Existing Shadows

Sun Shadow Simulation September 21st 11.27hrs EDT Yee Hong Centre for Geriatric Care – Mississauga, ON	Figure 35	
	Scale: Refer to Bar	
	Date: Oct 18, 2018	

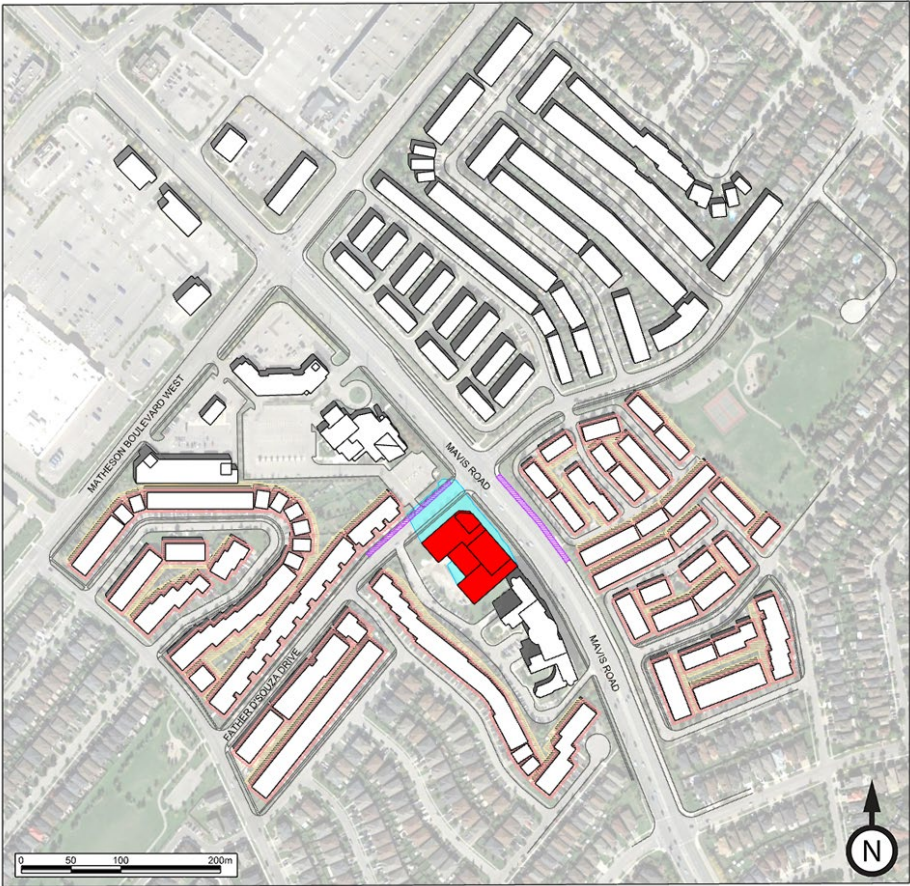
APPENDIX B: ADDITIONAL RUNS FOR SEPTEMBER 21



- Legend**
- Building Faces for Solar Energy (3 m Perimeter)
 - Private Outdoor Amenity (7.5m no impact zone)
 - Opposite Boulevards
 - Proposed Shadows
 - Existing Shadows

Sun Shadow Simulation September 21st 11.42hrs EDT Yee Hong Centre for Geriatric Care – Mississauga, ON	Figure 36	
	Scale: Refer to Bar	
	Date: Oct 18, 2018	

APPENDIX B: ADDITIONAL RUNS FOR SEPTEMBER 21



- Legend**
- Building Faces for Solar Energy (3 m Perimeter)
 - Private Outdoor Amenity (7.5m no impact zone)
 - Opposite Boulevards
 - Proposed Shadows
 - Existing Shadows

Sun Shadow Simulation September 21st 11.57hrs EDT Yee Hong Centre for Geriatric Care – Mississauga, ON	Figure 37	
	Scale: Refer to Bar	
	Date: Oct 18, 2018	