

MMU LIBRARY

Daylight, Sunlight and Overshadowing Impact Assessments

1044B-BHE-XX-XX-RP-M-000003

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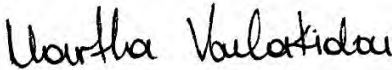
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date 

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Glossary

Term	Definition
VSC	Vertical Sky Component
APSH	Annual Probable Sunlight Hours
WPSH	Winter Probable Sunlight Hours
BRE	Building Research Establishment

1 Introduction

The proposed development is located in the centre of Manchester Metropolitan University in Manchester. It is to be a new library and educational facility with the main mass of the building providing being the new library. The development consists of one building block with a tower on the eastern wing.

Due to the proximity of the proposed development to existing dwellings and amenity spaces, an assessment has been undertaken to determine the impact of the proposed development on access to daylight and sunlight experienced by adjacent dwellings and amenity spaces.

2 Methodology

2.1 Assessment Approach

The assessment had been carried out following the methodology of BRE updated report BR209, “Site Layout Planning for Daylight and Sunlight”, 2022.

This assessment identifies the potential impacts of the Proposed Development on existing adjacent buildings and open spaces. This report highlights the sensitivity of receptors adjacent to the Site and gives an indication of the level of impact these receptors are likely to receive.

The issues considered as part of the Daylight, Sunlight and Overshadowing Assessment include the following:

- Identification of any existing buildings and open space likely to be impacted by the Proposed Development with respect to a loss of daylight and sunlight (desktop study)
- If there is overshadowing and therefore a reduction of daylight and sunlight to existing properties and open spaces, detailed modelling has been undertaken to determine the level of reduction due to the Proposed Development with a comparison made of the post-development daylight and sunlight availability against numerical targets stated by BRE Guidelines (quantitative study)

The following approaches have been undertaken to assess the impact on surrounding properties when the Proposed Development is completed:

- Assess the impact of the proposed development on access to light from the sky at adjacent dwellings by calculating Vertical Sky Component (VSC) values at window locations.
- Assess the impact of the proposed development on access to direct sunlight at adjacent dwellings by calculating Probable Sunlight Hours (PSH) at sensitive receptor locations, i.e. windows of habitable rooms facing within 90° of south.
- Transient Overshadowing

2.1.1 Vertical Sky Component

The VSC is the ratio of the direct sky illuminance falling on the vertical wall at a reference point, to the simultaneous horizontal illuminance under an unobstructed sky. The VSC does not include reflected light, either from the ground or from other buildings.

To maintain good levels of daylight, the VSC of a window is recommended in BR209 to be at 27% or greater, however within urban environments it is recognised that a lower VSC is acceptable given site constraints and a figure of 15% is typically considered to have the potential to provide acceptable daylight within an urban setting in line with the internal layouts. Where windows are affected and a VSC of less than 15% is calculated, a comparison of existing and proposed VSC levels has been made. Where possible, the post-development VSC should not be less than 80% of the pre-development VSC.

2.1.2 Sunlight Analysis – Probable Sunlight Hours

The following methodology was used to carry out the sunlight assessments. The methodology is based on the guidelines set out in the BRE report “Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice” (Littlefair, 2022).

Probable Sunlight Hours relates to the long-term average of the total number of hours during a year in which direct sunlight reaches the unobstructed ground (when cloud cover is considered). A Probable Sunlight Hours (PSH) assessment is carried out when:

- There is an obstruction within the 25° line, calculated from the centre of the window; and
- The proposed development is situated within 90° of south of the window.

As noted in the BR209 guide - If a living room of an existing dwelling has a main window which faces within 90° of due south, and any part of a new development subtends an angle of 25° to the horizontal (measured from the centre of the window in a vertical section perpendicular to the window) then the sun lighting of the existing dwelling may be adversely affected if the centre of the window:

- Receives less than the 25% of Annual Probable Sunlight Hours (APSH);
- Or less than 5% of the PSH during winter (21st September and the 21st March) (WPSH);
- Receives less than 0.8 times its former sunlight hours during either period; and
- Has a reduction in sunlight received over the whole year greater than 4% of APSH.

Therefore, the APSH assessment states that living room windows should ideally receive at least:

- 25% of annual probable sunlight hours throughout the year;
- 5% of annual probable sunlight hours during the winter months (September – March); and
- The difference between the APSH is not less than 0.8 times its former value.

As is often the case, it is not possible to determine the room uses within each of the neighbouring properties, nor it is clear which window should be considered as the main window. Therefore, regardless of use, all the rooms with windows facing the site and within 90 degrees of due south have been considered in the assessment.

2.1.3 Transient Overshadowing

Open spaces should retain a reasonable amount of sunlight throughout the year. The BR209 guide recommends that to appear adequately sunlit throughout the year, at least 50% of a garden or amenity area should receive at least two hours of sunlight on the 21st of March. If a detailed calculation cannot be carried out it is recommended that the centre of the area should receive at least two hours of sunlight on the 21st of March. Existing open spaces should receive at least two hours of sunlight on the 21st of March on at least 50% of their area, or at least 0.8 times the former area should receive two hours of sunlight.

September 21st (Autumn Equinox) provides the same overshadowing images as March 21st (Spring Equinox) as the sun follows the same path at these corresponding times of year.

The overshadowing is calculated at hourly intervals throughout the day from 08:00 to 19:00.

3 Daylight and Sunlight Impact on Surrounding Properties

In order to understand the potential daylight and sunlight impact of the proposed development on the windows of the surrounding properties a desktop study had been undertaken to investigate the variety of uses in close proximity to the site and their sensitivity to natural light. Properties in close proximity to the site had been considered as they are most likely to be affected by the proposed development.

3.1 Qualitative Assessment

BRE Guidelines are mainly intended to be used for residential buildings. However, the guidelines may also be applied to any existing non-domestic building where occupants have a reasonable expectation of daylight. This would normally include schools, hospitals, hotel and hostels, small workshops and some offices. The criteria used to assess receptor sensitivity is described in the table below:

Table 3—1 Sensitivity of receptors

Sensitivity	Criteria
High	Viewers likely to feel the immediate impact to their surroundings and notice a significant reduction in the amount of natural light to their environment.
Moderate	Viewers with everyday access to this environment but perhaps with less expectations as they are spending shorter periods of time in the space or are within an office environment. They may have previously used the space and therefore will be aware of the change, but it would affect them less.
Low	Small number or low sensitivity of viewers assumed. Viewers with a passing interest in their surroundings and momentary viewing periods. Infrequent users of open spaces around the proposed development.

The results of the desktop study are mark up in the image below. As it seems the majority of the properties has educational use, whilst only a small number of buildings has been identified as residential and student accommodation. It should be considered that only the residential properties in close to proximity to the south-east of the site should be considered as high sensitivity receptors and will need a further study to estimate the level of daylight and sunlight input from the proposed development. The likely buildings that are to be impacted are detailed in the figure below.



Figure 3-1 Nearby Building Typologies

Those that would be most sensitive to the new proposed development due to their typologies would be the Residential buildings to the East on Oxford Road and the student accommodations to the South West on Higher Chatham St and Higher Cambridge St.



Figure 3-2 Buildings sensitive to the new MMU Library development

3.2 Qualitative Assessment

For the properties that have been identified in the desktop study with a higher sensitivity, a daylight and sunlight impact quantitative assessment will be undertaken to estimate the impact of the proposed scheme to the light access on the surrounding properties. In particular, the following studies will be undertaken:

- Assess the impact of the proposed development on access to light from the sky at adjacent dwellings by calculating Vertical Sky Component (VSC) values at window locations.
- Assess the impact of the proposed development on access to direct sunlight at adjacent dwellings by calculating Probable Sunlight Hours (PSH) at sensitive receptor locations, i.e. windows of habitable rooms facing within 90° of south.
- Changes in calculated values of buildings' VSC and PSH values and the extent of solar exposure on amenity areas from the baseline condition will be rated against impact significance criteria derived from BR209 and industry standard practice.
- Potential mitigation measures to reduce the impact of the proposed development will be considered to determine the residual effects of the proposed development on its surroundings.

For the purpose of the quantitative analysis a total of 64 windows serving 8 properties were assessed for daylight and sunlight. The results of the study has been listed below for daylight and sunlight. In relation to daylight, five of the windows have minor impact due to the proposed development. Respective for sunlight, there is a negligible impact to all windows assessed for both APSH and WPSH.

4 Results

4.1 Daylight Results

For the purpose of the quantitative analysis a total of 64 windows serving 8 properties were assessed for daylight and sunlight. In relation to daylight, only five of the windows have minor impact due to the proposed development.

Table 4—1 Summary of Daylight Impact

Windows	BRE criteria met	-	Minor effect significance	-	Moderate effect significance	-	Major effect significance	-
Num	Num	%	Num	%	Num	%	Num	%
64	59	92.2	5	7.8	0	0	0	0

As can be seen in Windows 1, 3, 9, 10, and 11 belonging to 111 to 113 Oxford Rd building, are minor impacted by the proposed building.

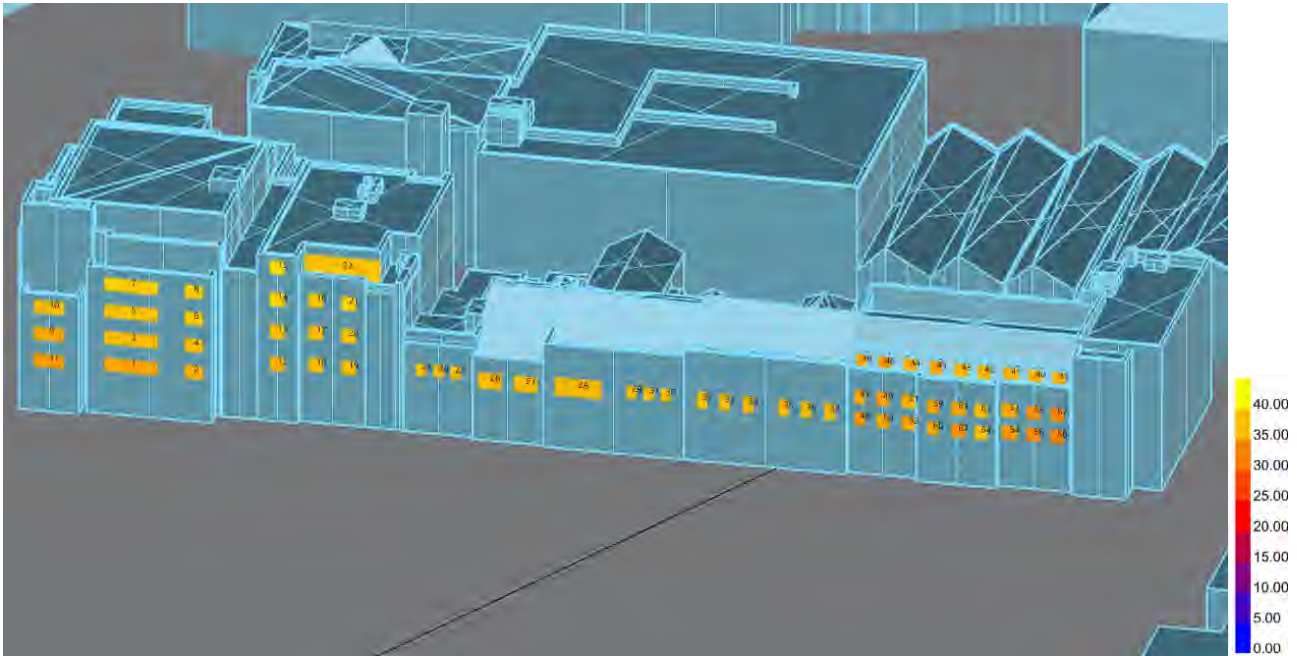


Figure 4-1 VSC results within the existing context.

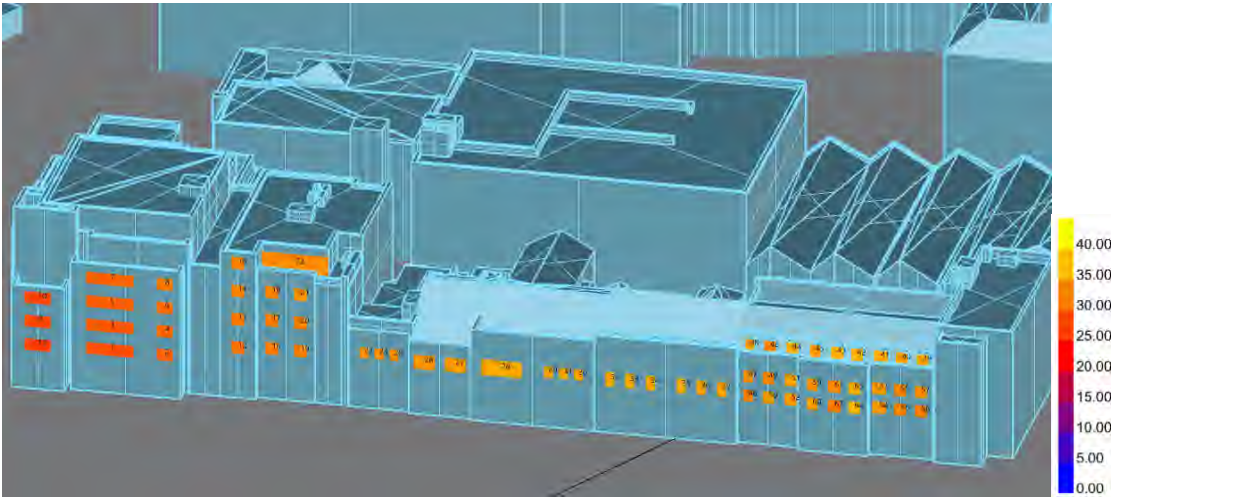


Figure 4-2 VSC results within the proposed context.

Respective for sunlight, there is a negligible impact to all windows assessed for both APSH and WPSH. Figure 4-3 and Figure 4-4 show the APSH results for the existing and proposed context, respectively.

Table 4—2 Summary of Sunlight Impact

Windows	BRE criteria met	-	Minor effect significance	-	Moderate effect significance	-	Major effect significance	-
Num	Num	%	Num	%	Num	%	Num	%
64	64	100	0	0	0	0	0	0

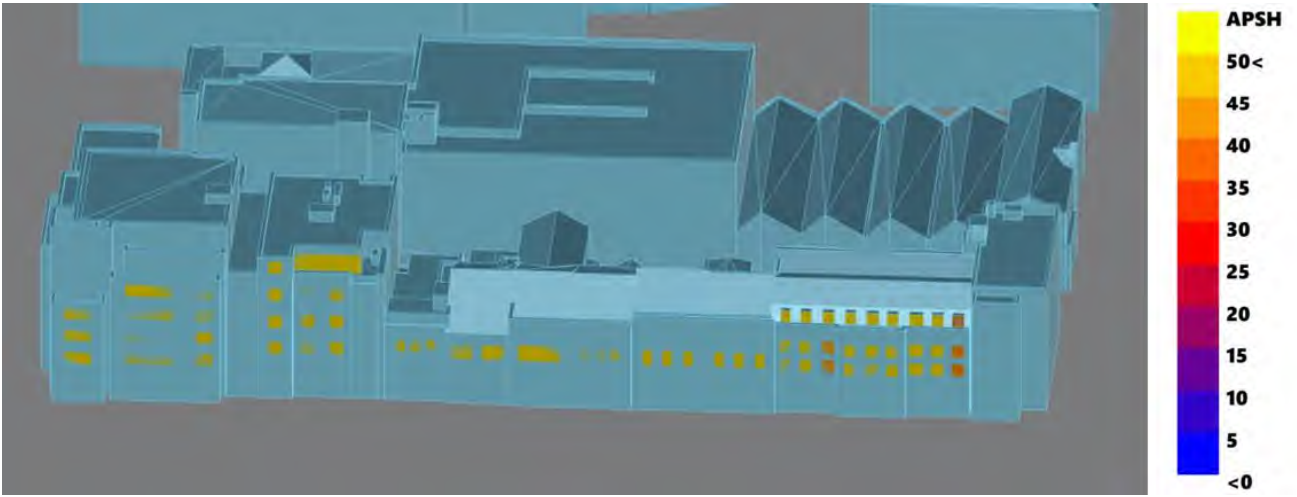


Figure 4-3 APSH results within the existing context.

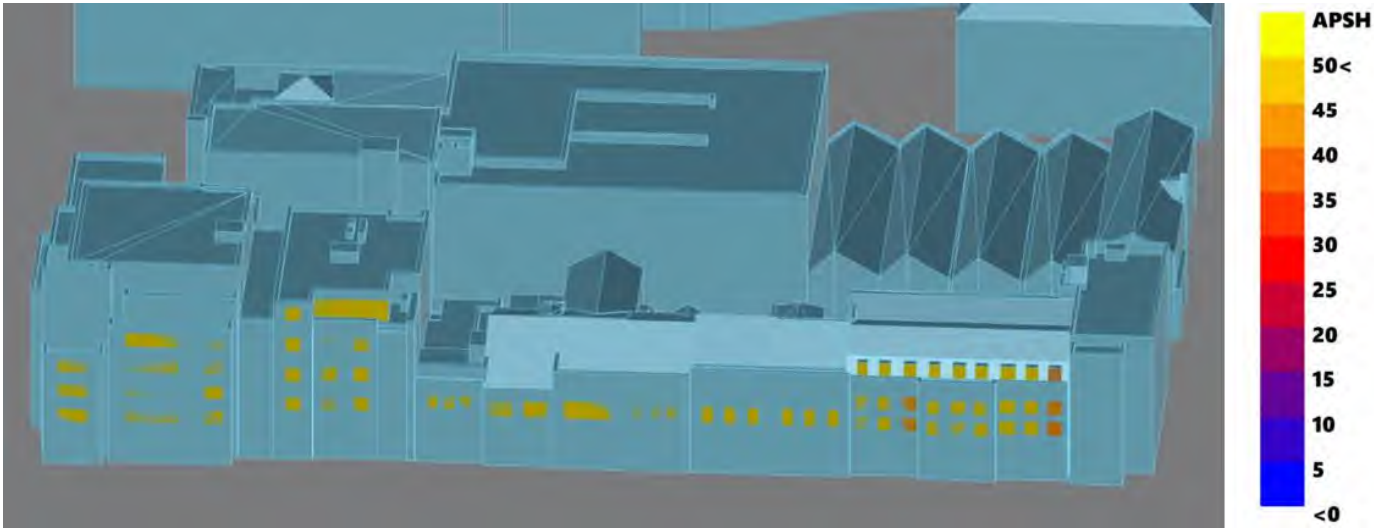


Figure 4-4 APSH results within the proposed context.

Figure 4-5 and Figure 4-6 show the WSPH results for the existing and proposed context, respectively.

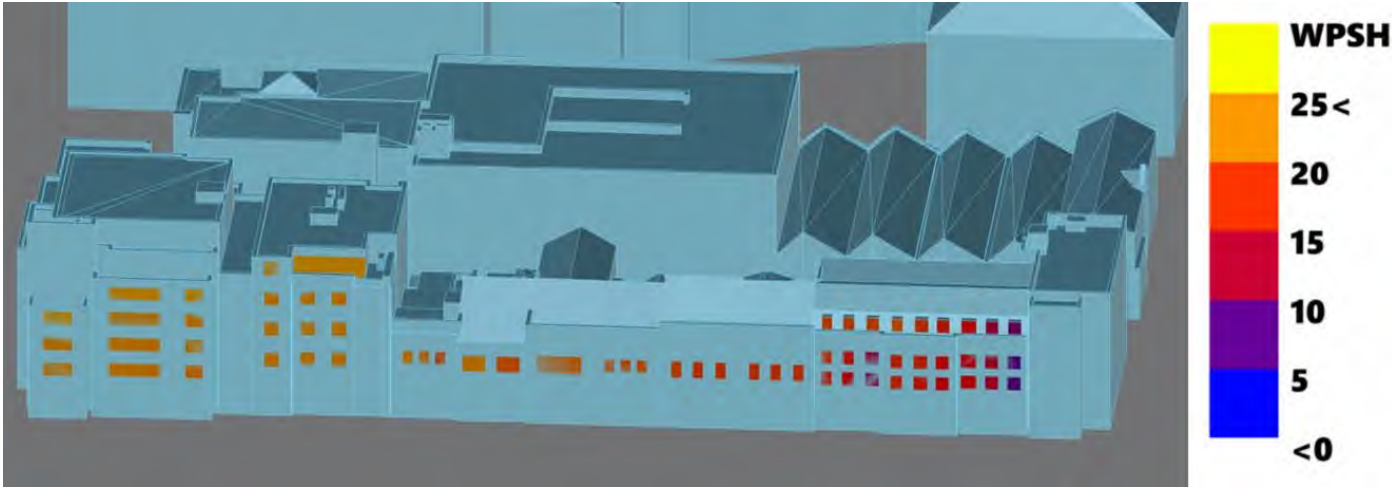


Figure 4-5 WSPH results within the existing context.

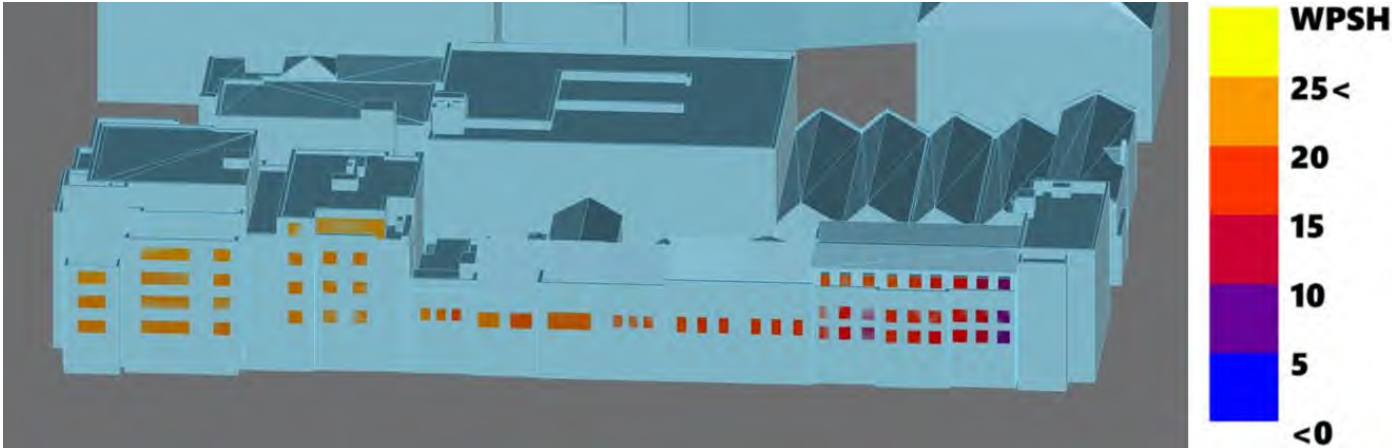


Figure 4-6 WSPH results within the proposed context.

4.2 Overshadowing

In order to estimate the sunlight impact of the proposed development to surrounding open spaces a desktop assessment of the local parks, green spaces and other amenities was undertaken to ascertain whether there were any spaces that might be impacted by the MMU library development. The All Saints Park to the south of the MMU library was the only open amenity area identified in the close proximity to the proposed development.



Figure 4-7 Public Amenity Spaces

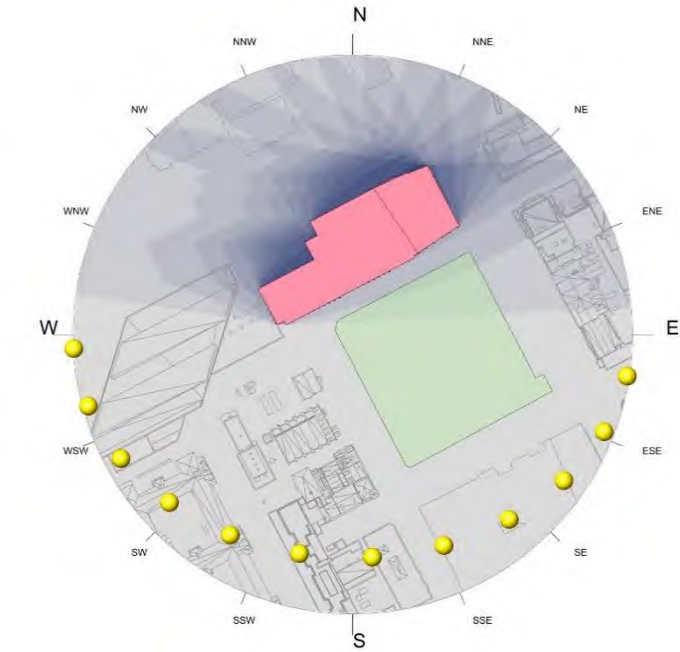


Figure 4-8 Shadow analysis

By observing the shadow analysis for the March equinox, it can be seen that the risk of overshadowing from the new MMU library proposal to the park is low and partial shading only occurs during the last hour of the day. A full

overshadowing study of All Saints Park will still be undertaken to assess the impact of the proposed development on access to direct sunlight at All Saints Park by calculating hours of sunlight received on the March equinox based on BS 209 BRE 2022 Guidelines.



Figure 4-9 Overshadowing BRE Compliance for the All Saints Park 21st March within the existing context



Figure 4-10 Overshadowing BRE Compliance for the All Saints Park 21st March within the proposed context

5 Conclusion

The Daylight, Sunlight and Overshadowing assessment analyses the impact of the scheme in its immediate surroundings.

In order to assess the impact of the proposed development to its adjacent buildings and amenity areas a two steps analysis has been undertaken as follow:

- Identification of any existing buildings and open space likely to be impacted by the Proposed Development with respect to a loss of daylight and sunlight (desktop study)
- If there is overshadowing and therefore a reduction of daylight and sunlight to existing properties and open spaces, detailed modelling has been undertaken to determine the level of reduction due to the Proposed Development with a comparison made of the post-development daylight and sunlight availability against numerical targets stated by BRE Guidelines (quantitative study)

Two scenarios have been assessed to understand the impact of the proposed development on the surrounding properties and amenity areas:

- Baseline Scenario – existing site in the context of existing surrounding buildings and amenity areas
- Proposed Scenario – Proposed development in the context of existing surrounding buildings and amenity areas

The Proposed Development overall shows no significant impact on the levels of daylight and sunlight access for the adjacent building and external amenity areas.

Overall, the proposed scheme has negligible negative impact on the adjacent properties and amenity areas. Any localised instance of further reduction of natural light access are considered acceptable within the urban context of the site and the existing underdeveloped situation and therefore, no mitigation strategies are required.

Appendix A

A.1 Daylight Results

Window	Baseline	Proposed	Ratio of impact	BRE compliance	Effect significance
Num	%	%	-	-	-
1	33	26	0.79	VSC below target	Minor
2	33.7	27.3	0.81	VSC meets target	Negligible
3	34.6	26.9	0.78	VSC below target	Minor
4	34.8	28	0.81	VSC meets target	Negligible
5	35.1	27.4	0.78	VSC meets target	Negligible
6	35.5	28.6	0.81	VSC meets target	Negligible
7	35.7	27.9	0.78	VSC meets target	Negligible
8	36	29.5	0.82	VSC meets target	Negligible
9	33.3	25.6	0.77	VSC below target	Minor
10	34.7	25.4	0.73	VSC below target	Minor
11	32.3	25	0.77	VSC below target	Minor
12	33.8	28.8	0.85	VSC meets target	Negligible
13	34.9	29.4	0.84	VSC meets target	Negligible
14	36.4	30.6	0.84	VSC meets target	Negligible
15	36.9	30.6	0.83	VSC meets target	Negligible
16	34.7	29.6	0.86	VSC meets target	Negligible
17	34.8	29.6	0.85	VSC meets target	Negligible
18	35.6	30.1	0.85	VSC meets target	Negligible
19	34.5	30.6	0.89	VSC meets target	Negligible
20	35.6	30.5	0.86	VSC meets target	Negligible
21	36.2	31.6	0.87	VSC meets target	Negligible
22	35.1	30.8	0.88	VSC meets target	Negligible
23	35.3	31.3	0.89	VSC meets target	Negligible
24	35.3	31.4	0.89	VSC meets target	Negligible
25	34.7	31.2	0.9	VSC meets target	Negligible
26	34.3	31.5	0.92	VSC meets target	Negligible
27	34.6	32.2	0.93	VSC meets target	Negligible
28	34.5	33.1	0.96	VSC meets target	Negligible
29	35	32.7	0.93	VSC meets target	Negligible
30	34.8	32.8	0.94	VSC meets target	Negligible
31	34.9	32.7	0.94	VSC meets target	Negligible
32	35.2	32.9	0.93	VSC meets target	Negligible
33	34.7	33.6	0.97	VSC meets target	Negligible
34	34.4	32.9	0.96	VSC meets target	Negligible
35	34.4	33.6	0.98	VSC meets target	Negligible
36	34.6	33	0.95	VSC meets target	Negligible
37	34.2	32.9	0.96	VSC meets target	Negligible

Window	Baseline	Proposed	Ratio of impact	BRE compliance	Effect significance
Num	%	%	-	-	-
38	33.1	31.7	0.96	VSC meets target	Negligible
39	33.6	32.7	0.97	VSC meets target	Negligible
40	33.9	32.4	0.96	VSC meets target	Negligible
41	34.1	33.1	0.97	VSC meets target	Negligible
42	34	33.4	0.98	VSC meets target	Negligible
43	34.5	33.8	0.98	VSC meets target	Negligible
44	33.7	32.8	0.97	VSC meets target	Negligible
45	33	31.7	0.96	VSC meets target	Negligible
46	31.8	30.7	0.96	VSC meets target	Negligible
47	32.6	31.1	0.95	VSC meets target	Negligible
48	31.6	30.2	0.95	VSC meets target	Negligible
49	32	30.3	0.95	VSC meets target	Negligible
50	33.3	32.5	0.98	VSC meets target	Negligible
51	33.8	32.7	0.97	VSC meets target	Negligible
52	32.8	32.4	0.99	VSC meets target	Negligible
53	33.3	32.2	0.97	VSC meets target	Negligible
54	32.3	31.9	0.99	VSC meets target	Negligible
55	31.3	30.5	0.97	VSC meets target	Negligible
56	31	30.8	0.99	VSC meets target	Negligible
57	30.4	31	1.02	VSC meets target	Negligible
58	30.5	29.9	0.98	VSC meets target	Negligible
59	33	31.6	0.96	VSC meets target	Negligible
60	33.3	32.2	0.97	VSC meets target	Negligible
61	32.6	31	0.95	VSC meets target	Negligible
62	31	29.7	0.96	VSC meets target	Negligible
63	35	33.4	0.96	VSC meets target	Negligible
64	35.2	34.1	0.97	VSC meets target	Negligible

A.2 Sunlight Results

Window	APSH baseline	APSH proposed	APSH ratio of impact	WPSH baseline	WPSH proposed	WPSH ratio of impact	Absolute reduction	Effect significance	BRE compliance
Num	%	%	-	%	%	-	%	-	-
1	59	54	0.92	21	21	1	5	Above	Negligible
2	61	54	0.89	20	20	1	7	Above	Negligible
3	62	54	0.87	21	21	1	8	Above	Negligible
4	62	55	0.89	21	21	1	7	Above	Negligible
5	65	54	0.83	21	21	1	11	Above	Negligible
6	65	55	0.85	21	21	1	10	Above	Negligible
7	66	55	0.83	22	22	1	11	Above	Negligible
8	66	56	0.85	22	22	1	10	Above	Negligible
9	60	50	0.83	21	21	1	10	Above	Negligible
10	65	51	0.78	22	22	1	14	Above	Negligible
11	59	50	0.85	21	21	1	9	Above	Negligible
12	62	58	0.94	21	21	1	4	Above	Negligible
13	63	58	0.92	21	21	1	5	Above	Negligible
14	65	58	0.89	21	21	1	7	Above	Negligible
15	66	59	0.89	22	22	1	7	Above	Negligible
16	62	60	0.97	21	21	1	2	Above	Negligible
17	63	60	0.95	21	21	1	3	Above	Negligible
18	65	60	0.92	21	21	1	5	Above	Negligible
19	62	60	0.97	21	21	1	2	Above	Negligible
20	63	60	0.95	21	21	1	3	Above	Negligible
21	65	60	0.92	21	21	1	5	Above	Negligible
22	66	61	0.92	22	22	1	5	Above	Negligible
23	63	61	0.97	21	21	1	2	Above	Negligible
24	62	60	0.97	20	20	1	2	Above	Negligible
25	56	54	0.96	17	17	1	2	Above	Negligible
26	63	62	0.98	21	21	1	1	Above	Negligible
27	57	57	1	18	18	1	0	Above	Negligible
28	62	61	0.98	19	19	1	1	Above	Negligible
29	61	60	0.98	18	18	1	1	Above	Negligible
30	61	61	1	18	18	1	0	Above	Negligible
31	61	60	0.98	18	18	1	1	Above	Negligible
32	53	53	1	9	9	1	0	Above	Negligible
33	57	57	1	13	13	1	0	Above	Negligible
34	58	58	1	14	14	1	0	Above	Negligible
35	60	60	1	16	16	1	0	Above	Negligible
36	63	63	1	18	18	1	0	Above	Negligible
37	61	62	1.02	17	18	1.06	1	Above	Negligible
38	57	57	1	13	13	1	0	Above	Negligible
39	60	60	1	16	16	1	0	Above	Negligible
40	43	43	1	9	9	1	0	Above	Negligible
41	51	52	1.02	10	11	1.1	1	Above	Negligible

Window	APSH baseline	APSH proposed	APSH ratio of impact	WPSH baseline	WPSH proposed	WPSH ratio of impact	Absolute reduction	Effect significance	BRE compliance
42	55	56	1.02	12	13	1.08	1	Above	Negligible
43	41	42	1.02	4	5	1.25	1	Above	Negligible
44	59	59	1	15	15	1	0	Above	Negligible
45	59	59	1	15	15	1	0	Above	Negligible
46	57	58	1.02	13	14	1.08	1	Above	Negligible
47	54	54	1	12	12	1	0	Above	Negligible
48	57	57	1	14	14	1	0	Above	Negligible
49	42	42	1	8	8	1	0	Above	Negligible
50	51	51	1	10	10	1	0	Above	Negligible
51	55	55	1	12	12	1	0	Above	Negligible
52	41	41	1	4	4	1	0	Above	Negligible
53	58	58	1	14	14	1	0	Above	Negligible
54	59	59	1	15	15	1	0	Above	Negligible
55	56	56	1	12	12	1	0	Above	Negligible
56	38	38	1	6	6	1	0	Above	Negligible
57	61	62	1.02	17	18	1.06	1	Above	Negligible
58	62	63	1.02	17	18	1.06	1	Above	Negligible
59	61	60	0.98	17	17	1	1	Above	Negligible
60	60	59	0.98	16	16	1	1	Above	Negligible
61	60	59	0.98	16	16	1	1	Above	Negligible
62	60	59	0.98	16	16	1	1	Above	Negligible
63	60	60	1	16	16	1	0	Above	Negligible
64	60	60	1	16	16	1	0	Above	Negligible

Appendix B Solar Glare Study

MMU LIBRARY

Solar Glare Study

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Revision P01

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P01	Final Version	FH/LC	16/10/2023	MV

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Fred Hagley/ Laura Uribe Cadena

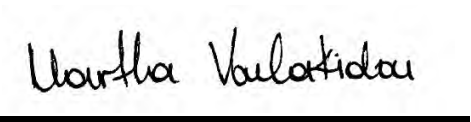
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Martha Voulakidou

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1 Introduction

The proposed development is in the centre of Manchester Metropolitan University in Manchester. It is to be a new library and educational facility with the main mass of the building developed being the new library. The development consists of one building block with a tower on the eastern wing.

Due to the potential proximity of the proposed development to existing dwellings and amenity spaces, a qualitative assessment has been undertaken to determine the sensitivity of existing nearby buildings to sunlight and daylight impacts. For those buildings which are deemed as sensitive to the development, assess whether the impact of the proposed development experienced is sufficient to require further analysis.

2 Methodology

2.1 Disability Glare

Glare is a phenomenon occurring in the eye that is caused by the presence of bright light sources within the visual field. It can lead to visual discomfort and, if the glare source is very bright compared to its surrounding, even be disabling in the sense that objects become hard or impossible to see. This is because they are cloaked by the high intensity glare source, whose light gets scattered within the eye.

The CIE 146:2002 Collection on Glare expresses the latter type of glare more formally as: “Disability glare is glare that impairs vision (CIE, 1987). It is caused by scattering of light inside the eye [...]. The veiling luminance of scattered light will have a significant effect on visibility when intense light sources are present in the peripheral visual field and the contrast of objects to be seen is low. ”

“Disability glare is most often of importance at night when contrast sensitivity is low and there may well be one or more bright light sources near to the line of sight, such as headlights, streetlights or floodlights. But even in daylight conditions disability glare may be of practical significance: think of traffic lights when the sun is close to them, or the difficulty in viewing paintings hanging next to windows.”

Glare is of particular concern if it affects drivers of motor vehicles or trains, since it might impair the visibility of signals and traffic signs, potentially putting the driver, passengers, or other parties at risk.

2.2 Assessment Criteria

Glare is a phenomenon caused by a bright source of light that inhibits the ability to view a task or scene, due to an uncomfortable or even blinding effect on the viewer. In the built environment glare or dazzle can occur when sunlight is reflected from a reflective facade onto an observer on roads, trains, buildings, and pedestrian areas. The problem can occur when buildings incorporate large areas of reflective material (glazed elements or specular metal cladding) and when the bright area caused by the incident sunlight is within the observer’s field of view. Solar reflections off buildings are particularly important in train lines where glare can cause temporary blinding on drivers. When the level of discomfort due to glare prompts evasive action, such as turning away from the reflection or shielding the eyes, this is called disability glare. Disability glare is a frequent occurrence when drivers drive directly into the sun when the sun is at a lower altitude and within the field of view.

At this stage, no statutory rules are available regarding the sunlight disability glare phenomenon in the UK. However, in 2017 the City of London produced a Planning Guidance, that requires developers and architects to consider Best Practice Design in relation to glare (“Guidance and best practice for assessing solar glare in the City of London – A planning advice note”).

The guidance above provides clarity on potential microclimate impact arising from developments and how they need to be considered as part of the planning process.

Furthermore, the guidance suggests that: “Solar glare impact should be assessed as part of development proposals at the planning stage; this will enable applicants and architects to address the potential for solar glare at an early phase of design and will avoid the need to retrospectively address unforeseen impacts. [...] key objectives to protect amenity, maintain a high-quality public realm and ensure safety on the highways.”

3 Solar Glare Desktop Study

To analyse the risks of glare to nearby transport and traffic, the surrounding area was assessed to identify any train lines or traffic signals that might be affected by the new MMU building. Two traffic signals on Oxford Road are expected to be at risk of glare from the new proposal. Due to the distance away from the new MMU development and the heights of buildings in between, there is not expected to be any risk of glare to the nearby train line.



Figure 1 Transport glare risks

Traffic signals that are expected to be impacted are those identified at 1 and 2 whilst driving northwards along Oxford Road which can be seen in the images below. The selected viewpoints aim to represent some of the most likely sensitive receptors on the road for drivers,



Figure 2 View from Traffic light 1 travelling North, existing building



Figure 3 View from Traffic light 1 travelling North, proposed building



Figure 4 View from Traffic light 2 travelling north, existing building

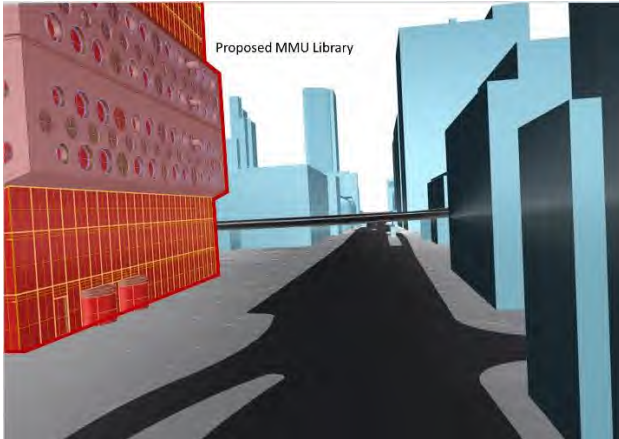


Figure 5 View from Traffic light 2 travelling north, proposed building

4 Qualitative Study

The detailed results are illustrated in the Appendix of this report.

This glare study uses traffic signal 1 to represent some of the most sensitive receptors close to the new MMU development. This location is behind the traffic signals at a 12-metre distance. This is due to the typical stopping distances for vehicles at the roads indicated speed limit of 20mph. The selected viewpoint on the road was placed at a height of 1.8 meters above the road representing a bus drivers eye level due to the Road having a high volume of bus traffic and the respective importance of the safety of the driver and vehicle occupants. The study analyses the critical field of view of the driver which is up to 30 Degrees. At this point, any discomfort or disability glare would pose the greatest risk to safety.

4.1 Assessment Methodology

An initial assessment was made of the following days at 2-hour intervals to ascertain an understanding of potential risk to the indicative viewpoint:

- December 21st (winter solstice),
- September 21st (equinox), and
- June 21st (summer solstice)

The assessment uses Daylight Glare Potential to analyse the level of risk:

Daylight Glare Potential:

- <35% Imperceptible Glare
- 35-40% Perceptible Glare
- 40-45% Disturbing Glare
- >45% Intolerable Glare

4.2 Modelling Assumption

Reflectivity Assumptions

Element	Reflectivity
Ground (typical of asphalt)	0.1
Walls (typical of concrete)	0.4
Glass	0.5 LTV, 0.5 specular reflectivity
Grass/vegetation	0.25

4.3 Analysis Results

Changes between the existing MMU building and the new development were observed to act as an indicator of the level of risk of additional glare to the signals from the new development. Changes observed are indicated in the tables below and show a slight reduction in glare in summer which is most likely due to reduction in overall sky visibility, but are not considered to be statistically significant:

Winter					Summer					Equinox				
Time	Existing	Proposed	Change		Existing	Proposed	Change			Existing	Proposed	Change		
8	0	0	0		8	44	44	0		8	35	35	0	
10	20	20	0		10	60	59	-1		10	50	49	-1	
12	27	27	0		12	55	53	-2		12	52	52	0	
14	25	25	0		14	49	47	-2		14	45	44	-1	
16	6	6	0		16	42	40	-2		16	40	38	-2	
18	0	0	0		18	25	25	0		18	20	19	-1	

5 Conclusions

The preliminary solar glare study has been carried out in relation to MMU Library development in Manchester. The aim of the study was to investigate potential solar glare instances from the proposed development that could cause disability glare issues to car drivers and the potential times during the day that the reflections may occur.

This preliminary study has been based on a desktop analysis to establish if sunlight may be reflected by the façades of the proposed development towards critical viewpoints at specific times throughout the year.

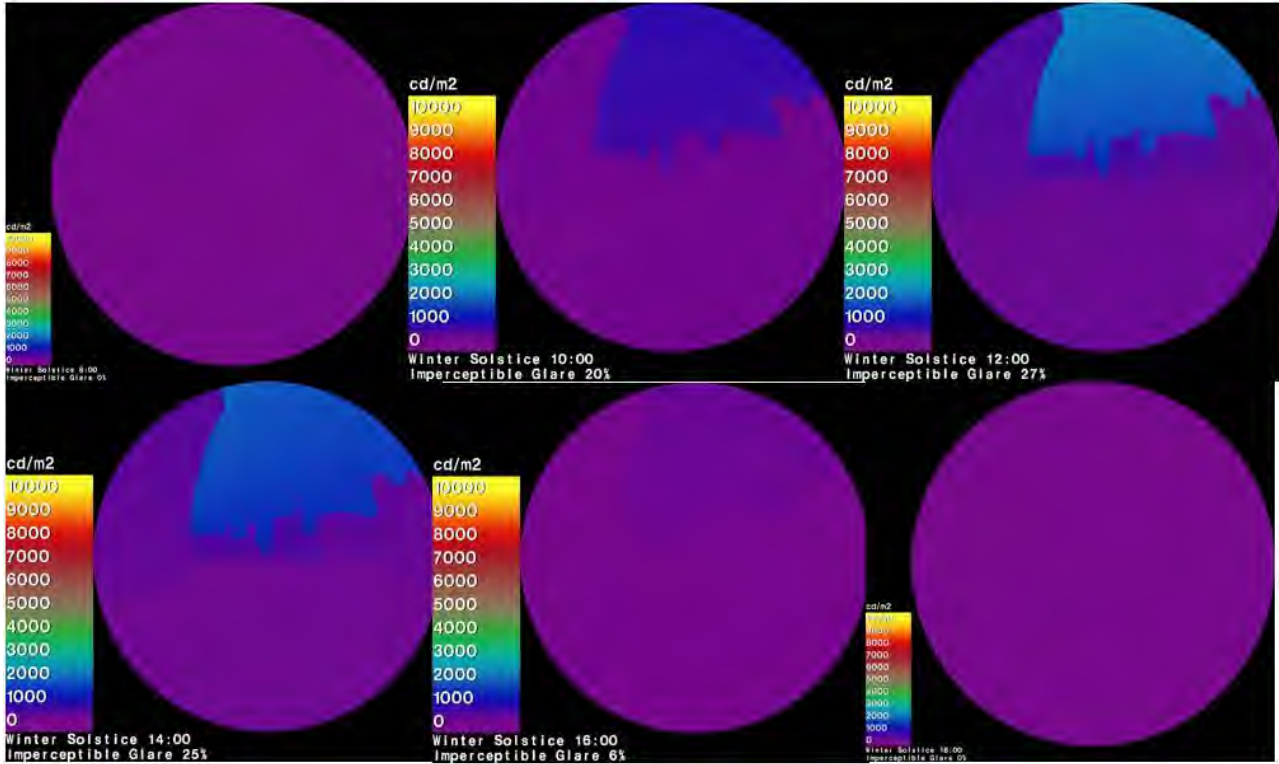
It is anticipated from the study that there is a low risk of increasing glare to the traffic signals from the new development when compared to the existing building. However, non-reflective or Matte finishes should be specified wherever possible to keep any risk to a minimum. Any increases to the reflectivity of glazing should be further studied for their impacts.

Opportunities for fritted glass had also been proposed to reduce risk of disability glare. It is expected that the application of frit patterns will have a minor positive effect to reducing external glare by diffusing direct sunlight and therefore strong glare effect on the drivers. However, it is recommended that the most effective method of reducing risk to external recipients would be to lower the reflectance and specular properties of the façade glazing and solid materials.

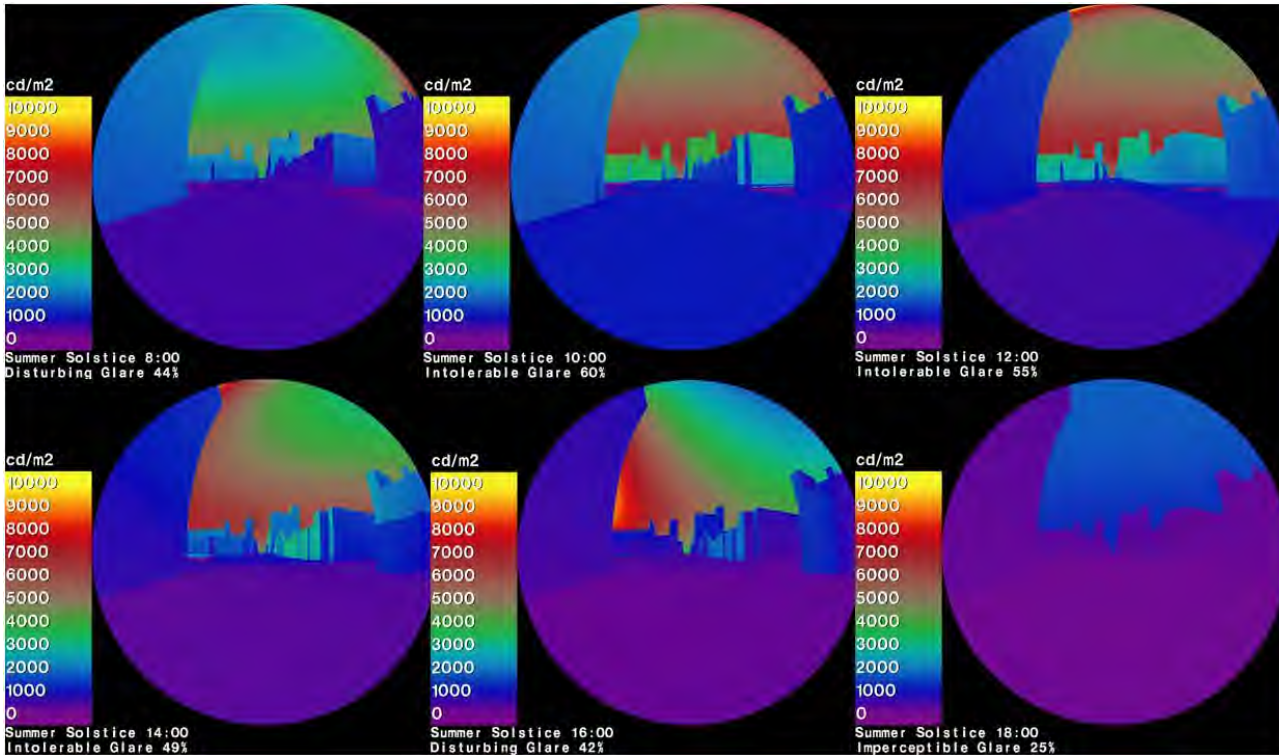
computational analysis is recommended to confirm the possibility of disability glare from each of these reflections on an annual basis. The computational analysis will determine the magnitude and the general duration of these reflections. If the sunlight reflections from the facades to the key points are inside the driver field of view (25°-30°), this would inform the extent of mitigation measures to be considered. Thus, the next steps of analysis should also consider key site obstructions and other characteristics of the surrounding environment, façade glazing properties and Manchester’s annual weather can also reduce the sunlight rays that are reflected from conditions through software modelling.

Appendix A Glare Results

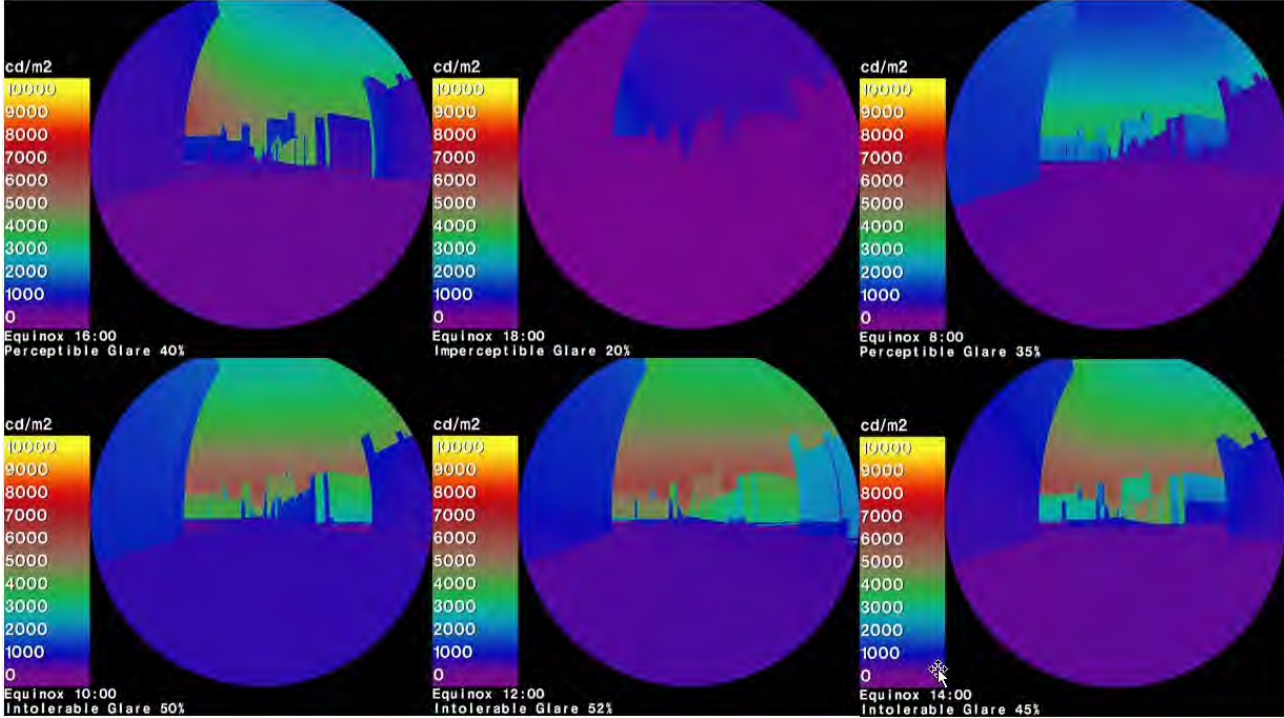
A.1 Existing Winter



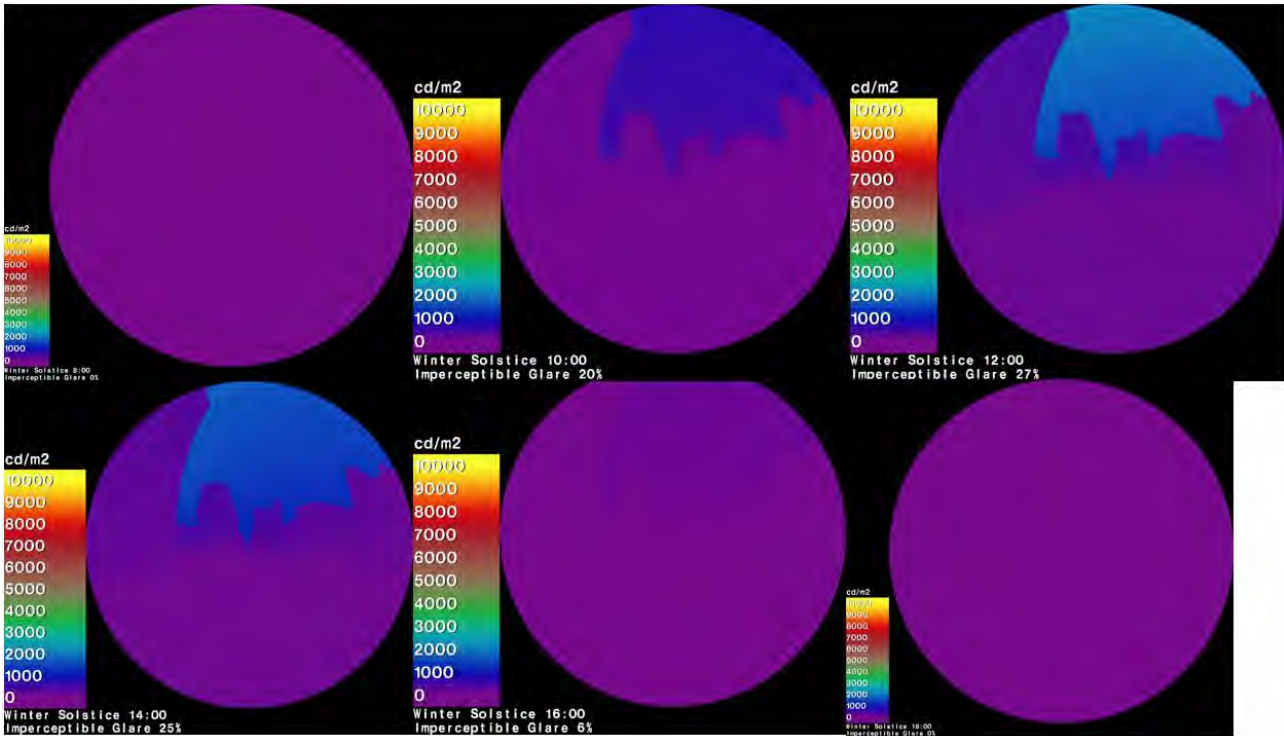
A.2 Existing Summer



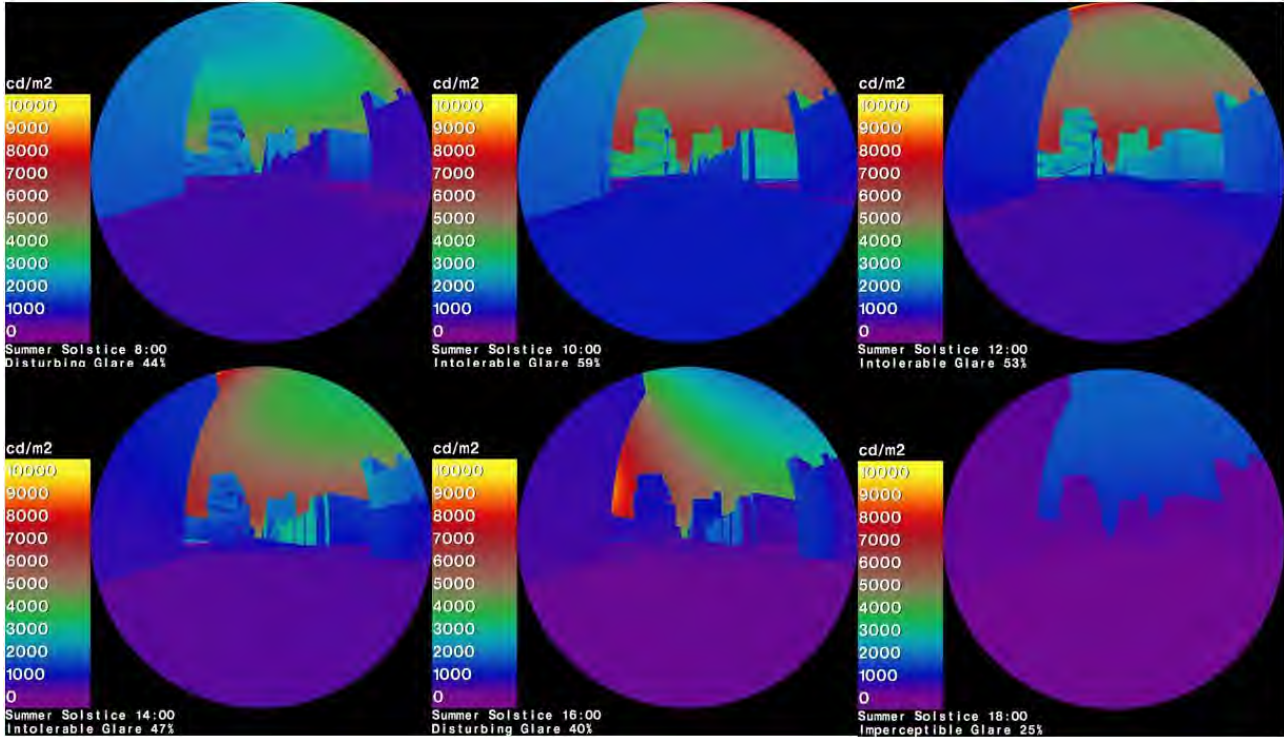
A.3 Existing Equinox



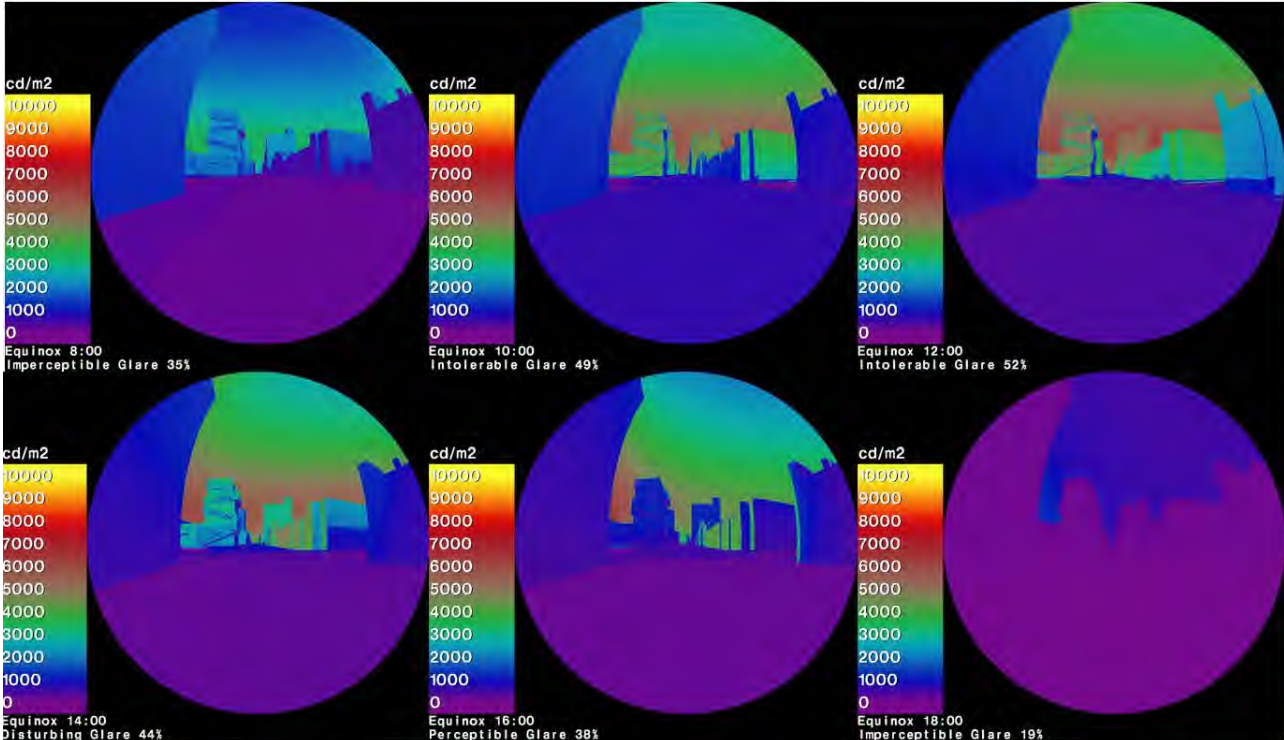
A.4 Proposed Winter



A.5 Proposed Summer



A.6 Proposed Equinox



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