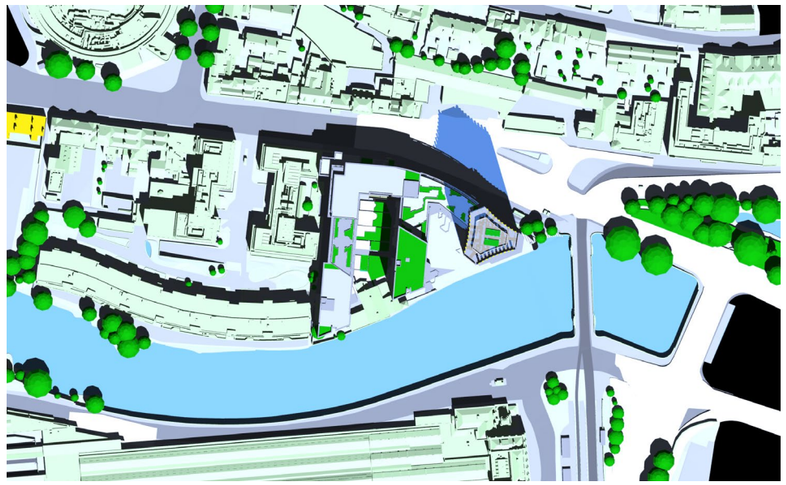
Parkgate St – Block A



Daylight & Sunlight Analysis

IN2 Project No. D1861

11/06/2021

PLANNING

Revision History

Date	Revision	Description
29/04/2021	00	Initial issue for review
11/06/2021	01	Revised for comments

Table of Contents

1.0 Executive Summary

This report compiles the daylight and sunlight analysis as undertaken by IN2 Engineering Design Partnership for the Proposed development at Parkgate Street, Dublin 8.

The report summarises the analysis undertaken, and conclusions determined for the current arrangements.

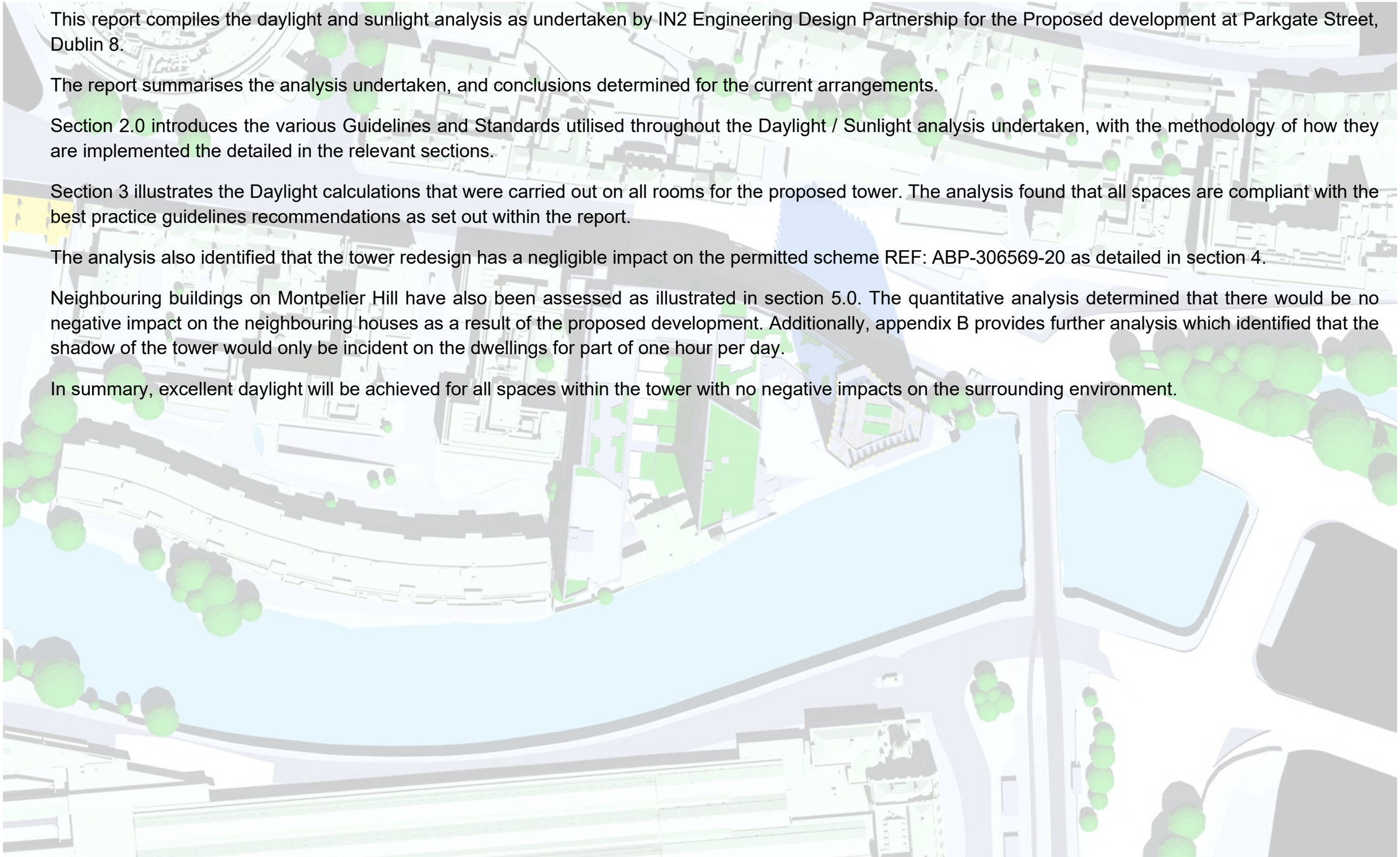
Section 2.0 introduces the various Guidelines and Standards utilised throughout the Daylight / Sunlight analysis undertaken, with the methodology of how they are implemented the detailed in the relevant sections.

Section 3 illustrates the Daylight calculations that were carried out on all rooms for the proposed tower. The analysis found that all spaces are compliant with the best practice guidelines recommendations as set out within the report.

The analysis also identified that the tower redesign has a negligible impact on the permitted scheme REF: ABP-306569-20 as detailed in section 4.

Neighbouring buildings on Montpelier Hill have also been assessed as illustrated in section 5.0. The quantitative analysis determined that there would be no negative impact on the neighbouring houses as a result of the proposed development. Additionally, appendix B provides further analysis which identified that the shadow of the tower would only be incident on the dwellings for part of one hour per day.

In summary, excellent daylight will be achieved for all spaces within the tower with no negative impacts on the surrounding environment.



2.0 Standards and Guidelines

The following standards and guidance documents have been consulted when compiling this report to ensure compliance with the various Daylight and Sunlight requirements as applicable and relevant:

a) Sustainable Urban Housing: Design Standards for New Apartments (December 2020) (the **"2020 Apartment Guidelines").** These are guidelines issued under section 28 of the 2000 Planning and Development Act.

b) The Building Research Establishment's (BRE) Site Layout Planning for Daylight and Sunlight: A guide to good practice (BRE 209) (2nd edition) (the **"BRE Guide").**

c) British Standard BS 8206-2:2008 – "Lighting for Buildings – Part 2: Code of Practice for Daylighting" (the "**2008 British Standard**").

d) British Standard BS EN 17037:2018 – Daylight in Buildings (the "**2018 British EN Standard**").

e) Irish Standard IS EN 17037:2018 (the "**2018 Irish EN Standard**").

It should be noted at the outset that the 2008 British Standard has been superseded by the 2018 British Standard. This is the UK implementation of EN 17037:2018, which was approved by the CEN on 29 July 2018. In Ireland, EN 17037:2018 has been implemented by the 2018 Irish Standard. The texts of the 2018 British Standard and the 2018 Irish Standard are the same, with one exception. The exception is that the 2018 British Standard contains an additional "National Annex" which specifically sets out requirements within dwellings, to ensure some similarity to the now superseded 2008 British Standard.

The 2020 Apartment Guidelines state:

"[6.5] The provision of acceptable levels of natural light in new apartment developments is an important planning consideration as it contributes to the liveability and amenity enjoyed by apartment residents. In assessing development proposals, planning authorities must however weigh up the overall quality of the design and layout of the scheme and the measures proposed to maximise daylight provision with the location of the site and the need to ensure an appropriate scale of urban residential development.

[6.6] Planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2:2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting' when undertaken by development proposers which offer the capability to satisfy minimum standards of daylight provision.

[6.7] Where an applicant cannot fully meet all of the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, which planning authorities should apply their discretion in accepting taking account of its assessment of specific. This may arise due to a design constraints associated with the site or location and the balancing of that assessment against the desirability of achieving wider planning objectives. Such objectives might include securing comprehensive urban regeneration and or an effective urban design and streetscape solution."

It can be noted from this section that the 2020 Apartment Guidelines continue to refer to the BRE Guide (published in 2011) and to the 2008 British Standard. They do not take into account of the 2018 British Standard and/or the 2018 Irish Standard and as the BRE Guide is still current and applicable, the 2011 edition will therefore provide the basis for the assessments detailed within this report.

The BRE Guide

The BRE Guide describes its purpose in the following terms in the "Summary" section (v):

> *"This guide gives advice on site layout planning to achieve good sunlighting and daylighting both within buildings and in the open spaces between them. It is intended to be used in conjunction with the interior daylight recommendations in the [2008] British Standard… It contains guidance on site layout to provide good natural lighting within a new development; safeguarding of daylight and sunlight within existing buildings nearby; and the protection of daylighting of adjoining land for future development."*

The BRE Guide also notes that:

> *"It (the guide) is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location. Appendix F explains how this can be done in a logical way, while retaining consistency with the British Standard recommendations on interior daylighting."*

> *"The guide is intended for building designers and their clients, consultants and planning officials. The advice given here is not mandatory and the guide should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design (see Section 5). In special circumstances the developer or planning authority may wish to use different target values. For example, in a historic city centre, or in an area with modern high rise buildings, a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing buildings."*

Therefore, if the situation arises where the targets identified within the Guide are not achieved, these should be highlighted and either justified in the context of the development / site or where relevant and applicable, compensatory measure will be proposed. In the context of this report, any deviations from the Guides recommendations have therefore been identified, with an approach throughout to ensure that good quality daylight/sunlight in achieved through analysis and design improvements as far a s practicable and viable as detailed in the report as relevant.

The main sections in the guide that the assessments within in this report will reference (as applicable) are:

1. Light from the Sky (Daylight) – *Based on a theoretical mathematical uniform sky (CIE overcast sky) which does not alter based on orientation.*
    - 1.1. New Development – Within this section the guide sets values for internal Average Daylight Factors (ADF) for various space types and relevant calculation methodologies.
    - 1.2. Existing Buildings – The guide sets a quantitative assessment method for determining the impact of new developments on light from the sky (VSC) on existing neighbouring buildings.
2. Sunlighting – *Based on site location, longitude and latitude, and solar azimuths. i.e. buildings south of a site will not be impacted for sunlight in the northern hemisphere.*
    - 2.1. New Development – This topic is addressed in the 2020 Apartment Guidelines under the issue of dual aspect units and is not covered within this report.
    - 2.2. Existing Buildings – The guide sets a quantitative assessment for determining the impact of sunlight on existing neighbouring buildings.
    - 2.3. Gardens and open spaces – The amenity criteria set out is used for both proposed new amenity and the impact on existing neighbouring amenities.

The specific methodology for each topic (as relevant) is detailed in the relevant section in the body of this report.

The 2008 British Standard

The BRE guide specifically refers to this standard and most of the quantitative criteria set out have already been mentioned in relation to the BRE Guide above. However the BRE guide provides more detail as to context and implementation. In relation to average daylight factor (ADF), the standard states the following:

> *"The average daylight factor… is used as the measure of general illumination from skylight. It is considered good practice to ensure that rooms in dwellings and in most other buildings have a predominantly daylit appearance. In order to achieve this the average daylight factor should be at least 2%."*

However, the standard then acknowledges that lower lighting levels may be applicable for dwellings, offering minimum ADFs for different room types within dwellings, i.e. 1% for bedrooms; 1.5% for living rooms; and 2% for kitchens (Table 2), and notes that:

> *"Where one room serves more than one purpose, the minimum average daylight factor should be that for the room type with the highest value. For example, in a space which combines a living room and a kitchen the minimum average daylight factor should be 2%."*

Whilst specifically applicable to houses, it should be noted that there is no specific reference within the British Standard to apartment internal galley type kitchens as recognised in the BRE Guide which states:

> *"2.1.14 Non-daylit internal kitchens should be avoided wherever possible, especially if the kitchen is used as a dining area too. If the layout means that a small internal galley-type kitchen is inevitable, it should be directly linked to a well daylit living room."*

The standard's guidance on loss of daylight and sunlight to existing buildings is similar to, but less extensive or detailed than, that contained in the BRE Guide, and in particular Appendix F of the BRE Guide.

The 2018 British and Irish Versions of the EN Standards

The EN 17037:2018 standard—which is the basis of both the 2018 British EN Standard and the 2018 Irish EN Standard—approaches the assessment of daylight provision on a different basis from that utilised in the 2008 British Standard and the BRE Guide. Instead of **average** daylight factors the standard assess a new metric based on **median** daylight, in order to ensure both extent and a degree of uniformity of daylight.

> *"A space is considered to provide adequate daylight if a target illuminance level is achieved across a fraction of the reference plane within a space for at least half of the daylight hours."*

EN 17037:2018 also address other aspects in addition to daylight - including sunlight, glare and quality of view, which are not addressed in the context of this report.

The National Annex

As is noted above, the 2018 British Standard includes a "National Annex", containing "Further recommendations and data for daylight provision in the UK and Channel Islands". This is referenced further in the appendix of this report. As there is no equivalent in the 2018 Irish Standard the 2018 British Standard National Annex will be referenced, which states:

> *"NA.1 Introduction: The UK committee supports the recommendations for daylight in buildings given in BS EN 17037:2018; however, it is the opinion of the UK committee that the recommendations for daylight provision in a space (see Clause A.2) may not be achievable for some buildings, particularly dwellings. The UK committee believes this could be the case for dwellings with basement rooms or those with significant external obstructions (for example, dwellings situated in a dense urban area or with tall trees outside), or for existing buildings being refurbished or converted into dwellings. This National Annex therefore provides the UK committee's guidance on minimum daylight provision in all UK dwellings."*

NA.2 addresses minimum daylight provision in UK dwellings. It contains a table, in which target illuminance, ET (lx), levels are recommended for different room types. These are: bedroom at 100 lx; living room at 150 lx; and kitchen at 200 lx, which may be compared to EN 17037's recommendation of 300 lux (irrespective of room application). The commentary is as follows:

> *"Even if a predominantly daylit appearance is not achievable for a room in a UK dwelling, the UK committee recommends that the target illuminance values given in Table NA.1 are exceeded over at least 50% of the points on a reference plane 0.85 m above the floor, for at least half of the daylight hours."*

3.0 Daylight Analysis

3.0 Methodology

Daylighting analysis was undertaken for the proposed residential development using radiance lighting software to determine Average Daylight Factors (ADF's) in accordance with BRE 209 and BS. 8206-2, as referenced in the Sustainable Urban Housing: Design Standards for New Apartments (December 2020), as well as an assessment comparison to BS EN 17037 (National Annex). These guidelines and standards have been outlined in section 2.0.

ADF's were determined for a CIE Overcast Sky equivalent to providing an external, unobstructed ground illumination level of 10,000 Lux. CIE Overcast skies are theoretical sky models, with brightness highest at the zenith and reducing to the horizon, but also unidirectional (as illustrated in Figure 3.0.1); therefore ADF's do not differ for façade orientation, with North facing rooms achieving identical metric performance to South facing, (all else being equal), as results account for diffuse natural light only and exclude any direct sunlight effects.

The daylight analysis accounted for all aspects that can potentially restrict natural light availability including any adjacent / opposing buildings, along with explicitly modelling Building Details as illustrated in Figure 3.0.2 such as balcony structures, window frames, reveal and cill depth etc. in accordance with the architectural design.

The daylighting models were calculated based on the following assumptions regarding transmittance and reflectance (based on measured manufacturer's test data):

- Glazing Transmission = 70%
- Ceilings: 82% reflectance (BS 00E55 White)
- Walls: 62% reflectance (BS 10C31 Ivory)
- Floors: 36% reflectance (BS 00A05 Platinum Grey)

Daylight Factors for each space were then calculated for a working plane height of 0.85m on a 0.25 x 0.25m grid basis to enable a detailed calculation within each room, the average of which was then determined to calculate ADF.

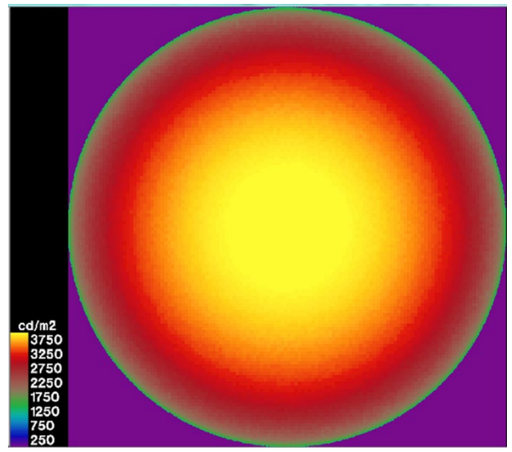


Fig 3.0.1 - CIE Overcast sky as viewed from below.

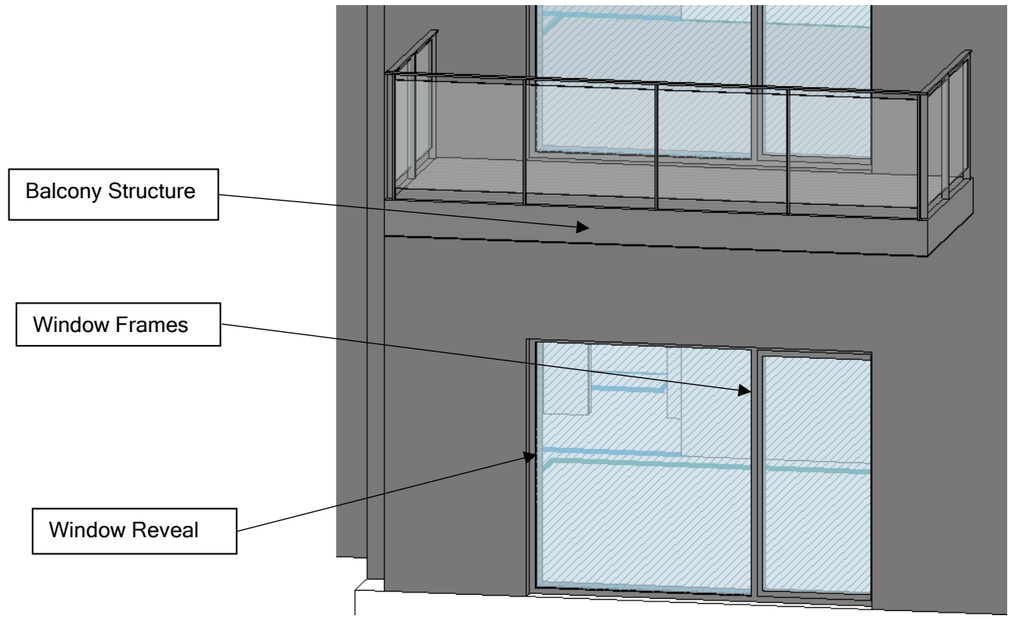


Fig 3.0.2 – Building Details included within Daylight Analysis

3.0 Methodology (Cont'd)

In relation to daylight, the BRE Guide suggest that:

> *"Daylight provision in new rooms may be checked using the average daylight factor (ADF). The ADF is a measure of the overall amount of daylight in a space… [The 2008 British Standard] recommends an ADF of 5% for a well daylit space and 2% for a partly daylit space. Below 2% the room will look dull and electric lighting is likely to be turned on. In* ***housing*** *[the 2008 British Standard] also gives minimum values of ADF of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms." (emphasis added)*

These daylighting targets (as also utilised within BS.8206-2) were originally introduced in British Standards Code of Practice CP3 Chapter 1 Part 1 released in 1964 and were based on surveys undertaken of UK dwellings in preceding years.

The higher ADF target for Kitchens was in recognition of the task-based nature of lighting requirements- as opposed to environmental considerations, in particular "Opinions were recorded for the kitchen in relation to the work centres at the stove, sink and work-table"[1] in the surveying that informed this target, which was based on achieving an illuminance level of 200 Lux at these task based areas for an assumed 10,000 Lux sky (hence 2% ADF). It may be noted that this surveying was also undertaken at a time that artificial lighting within kitchens would have been rudimentary- i.e. predating cooker-hood lighting etc.

With reference to living and cooking areas, the BRE Guide states:

> *"2.1.13 Living rooms and kitchens need more daylight than bedrooms, so where there is a choice it is best to site the living room or kitchen away from obstructions…"*

However additionally, and with specific relevance for apartments, the BRE guide states:

> *"2.1.14 Non-daylit internal kitchens should be avoided wherever possible, especially if the kitchen is used as a dining area too. If the layout means that a small internal galley-type kitchen is inevitable, it should be directly linked to a well daylit living room."*

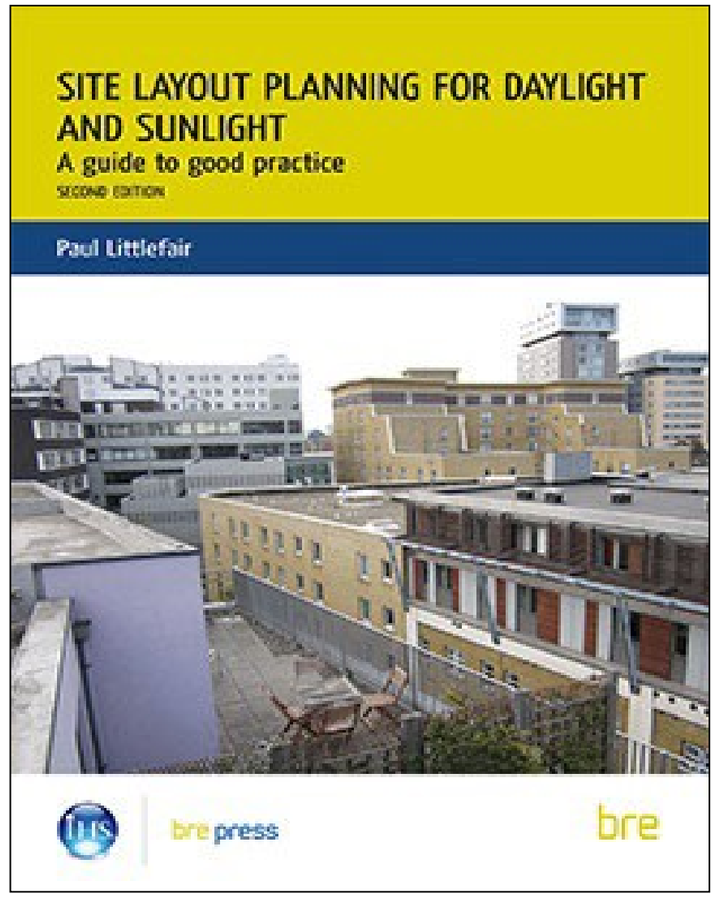


Fig 3.0.3 – The BRE Guide

[1] National Research Council of Canada – Performance Standards for Space and Site Planning for Residential Development- 1968

3.0 Methodology (Cont'd)

It may be noted therefore that for the purpose of analysis, and allowing that there is no other specific guidelines within BRE 209 for **apartment** typologies (in particular Kitchen / Living / Dining (KLD) areas), the Kitchenettes to Apartments have been excluded as these types of galley kitchens do not provide dining/sitting area.

The associated requirement within BS.8206-2 for "Kitchens" (ADF>2.0%) was developed for residential **housing** where the kitchen would be an identifiable separate room with seating and where occupants would be expected to eat and spend time as well as being generally present throughout the day.

As the daylight analysis has been undertaken to ensure good continual **environmental** performance for the apartments, analysis has been undertaken assessing the Living/Dining areas of the KLD's, excluding the kitchenette where **task-based** lighting is required on an intermittent basis. Whilst BRE 209 does not specifically reference Dining areas, these have been included within the zone of analysis allowing for the benefit of maximising daylight availability to the table space for envisaged variety of uses in addition to eating where, light would be beneficial – i.e. work from home, school / college homework, reading, writing etc..

The delineation of a typical spaces for this scheme is illustrated in Figs 3.04-05 setting out the assessed areas (green) and excluded spaces (yellow). Zones of analysis can also be clearly seen in presented results of calculated contours of predicted daylight availability.

With regard to the above, the minimum values targeted for relevant spaces are:

- > 1.5% for Living/ Dining Areas
- > 1.0% for Bedrooms

Notwithstanding the above, it may be noted that these are minimum targets, and that the vast majority of spaces were determined to comfortably exceed the values, as summarised in the results section below. In addition, sub-standard daylighting performance has been avoided wherever viable and practical with the following design enhancements applied to maximise natural light availability and therefore internal environments:

- Maximise glazing,
- Minimise / offset balcony structures,
- Increase glazing / floor heights.

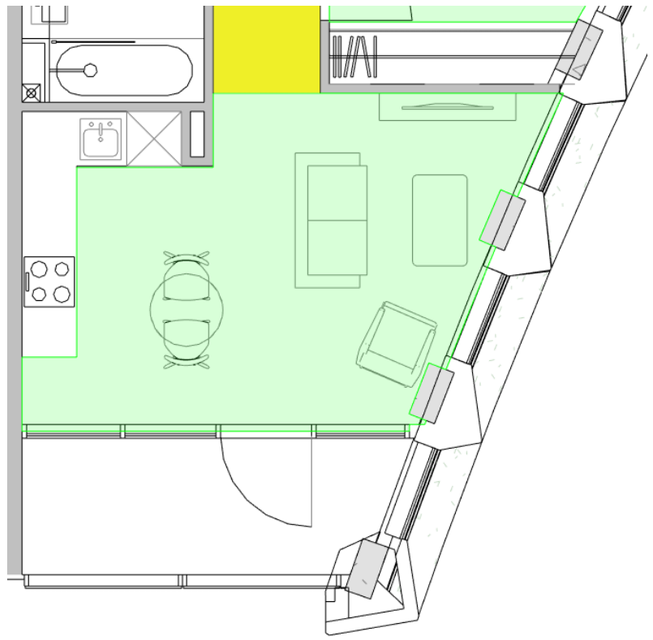


Fig 3.0.4 – Sample analysis space for Living \ Dining Space

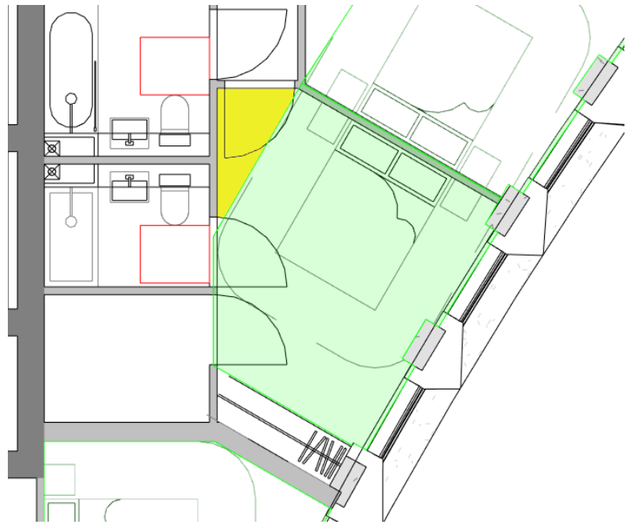


Fig 3.0.5 – Sample analysis space for Bedroom

3.1 Results

The results determined an excellent level of daylight was achieved for all spaces within the development with no spaces below the BRE minimum values.

It was determined that an ADF of 2% or higher would be provided for all KLD spaces across the development with 50% (i.e. median) of the units achieving an ADF in excess of 4.5% as illustrated in figure 3.1.1.

Similarly, the median ADF for bedrooms is in excess of 3.5% as per figure 3.1.2

Due to the specific topology of this site, it can be further noted that no combined Kitchen / Living / Dining (KLD) achieved an average daylight factor of less than 2.3%.

In this particular instance the tower form of the building (relative shallow plan and maximisation of dual aspect) has enabled a space layout that result in the Kitchenettes with adjacency to the façade which have enable all KLD in the entirety of the tower to achieve in excess of a 2% for the KLD spaces. This is a performance as originally envisaged for housing in the BS Guide i.e 2.0% for combine multi-purpose spaces.

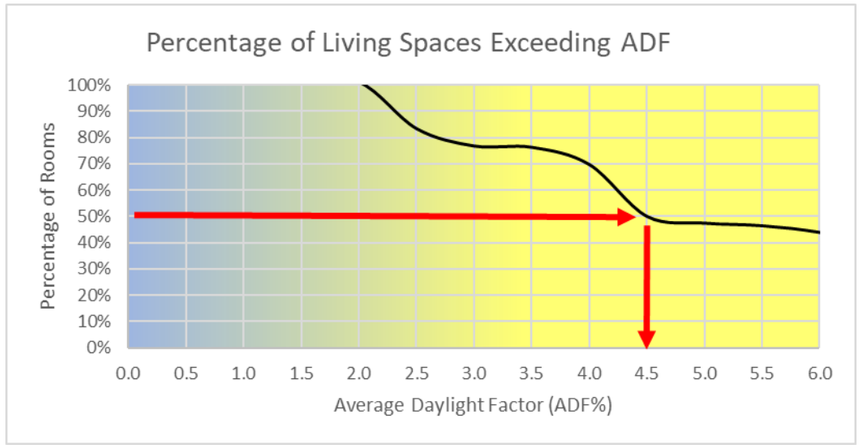


Fig 3.1.1 – Frequency Graph for Living \ Dining Spaces

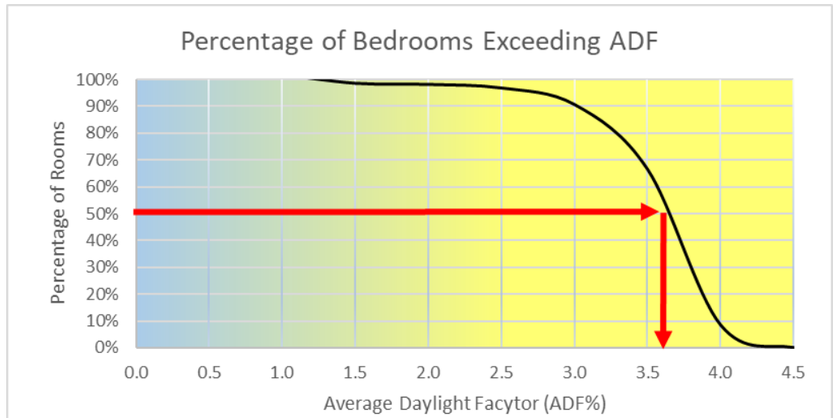
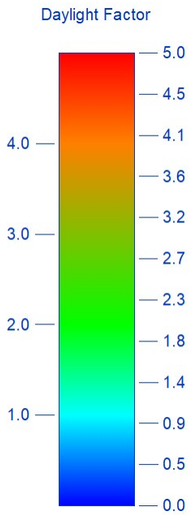
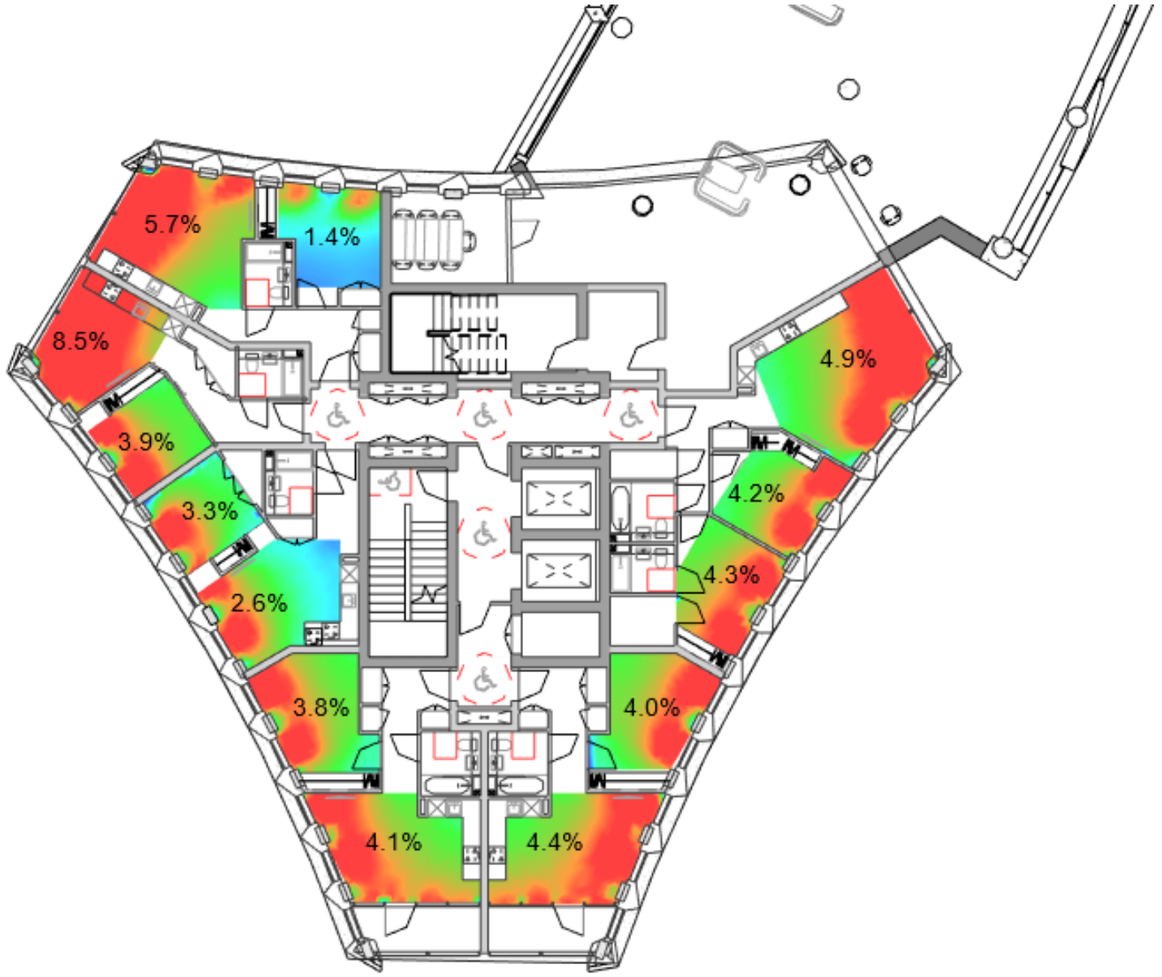


Fig 3.1.2 – Frequency Graph Bedrooms

3.2 Results First Floor

First floor analysis determined that all space were compliant with the Guidelines.

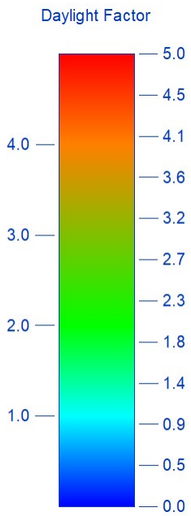


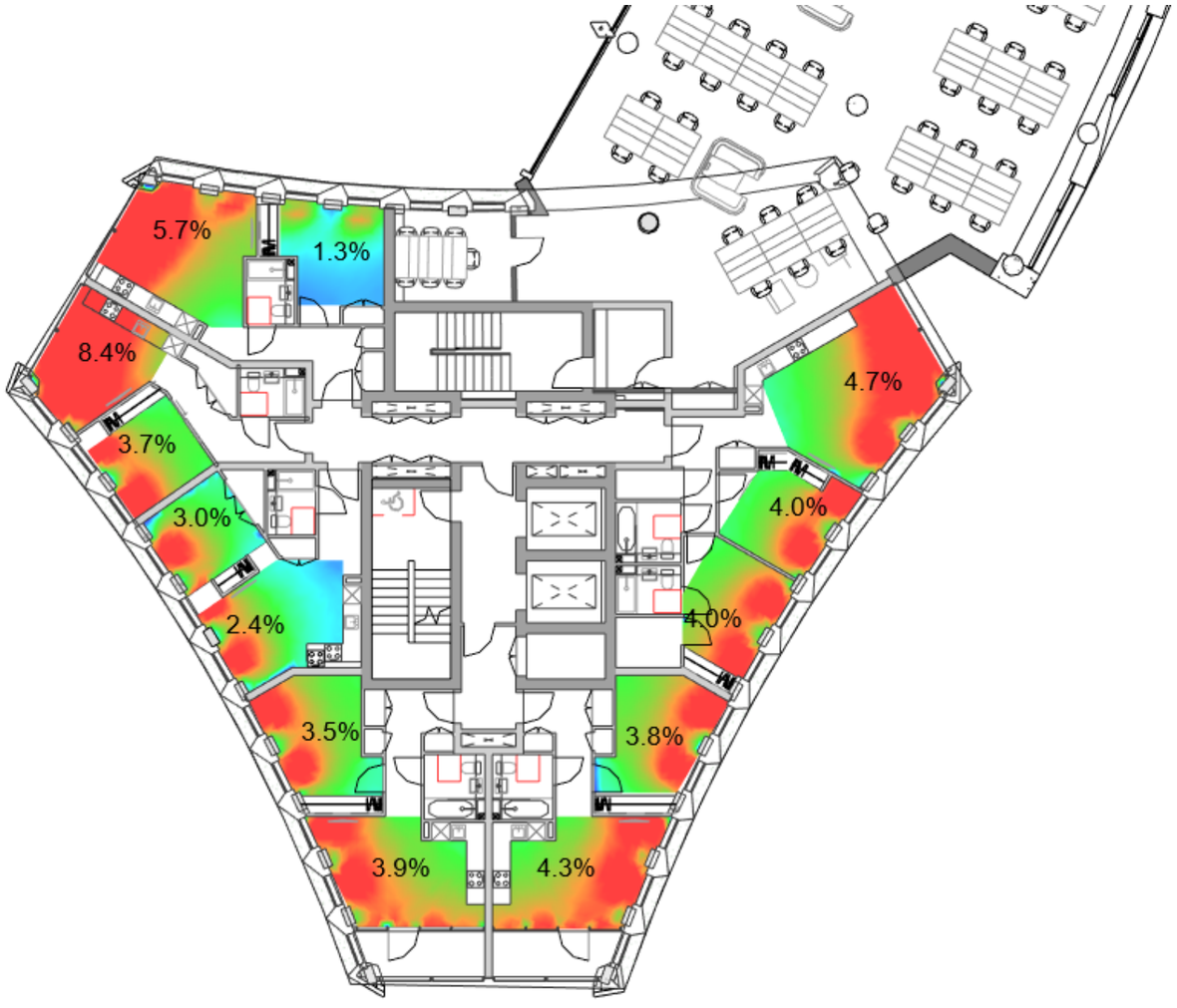


Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

3.3 Second Floor

Second floor analysis determined that all space were compliant with the Guidelines.



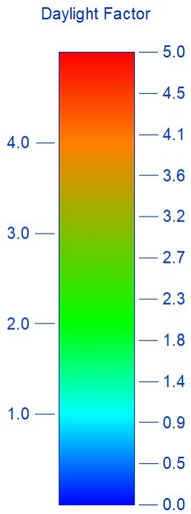


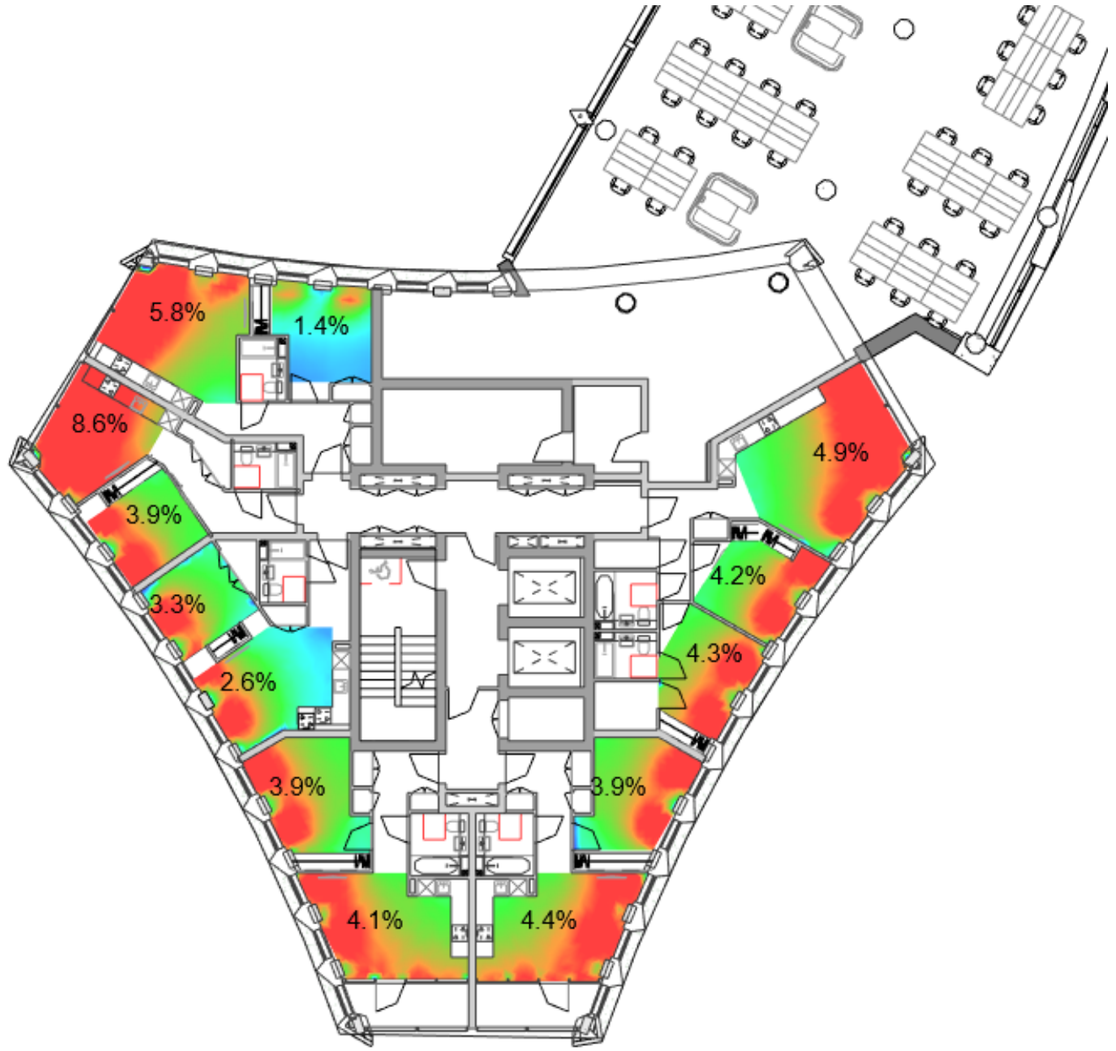
Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

3.4 Third Floor

Third floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

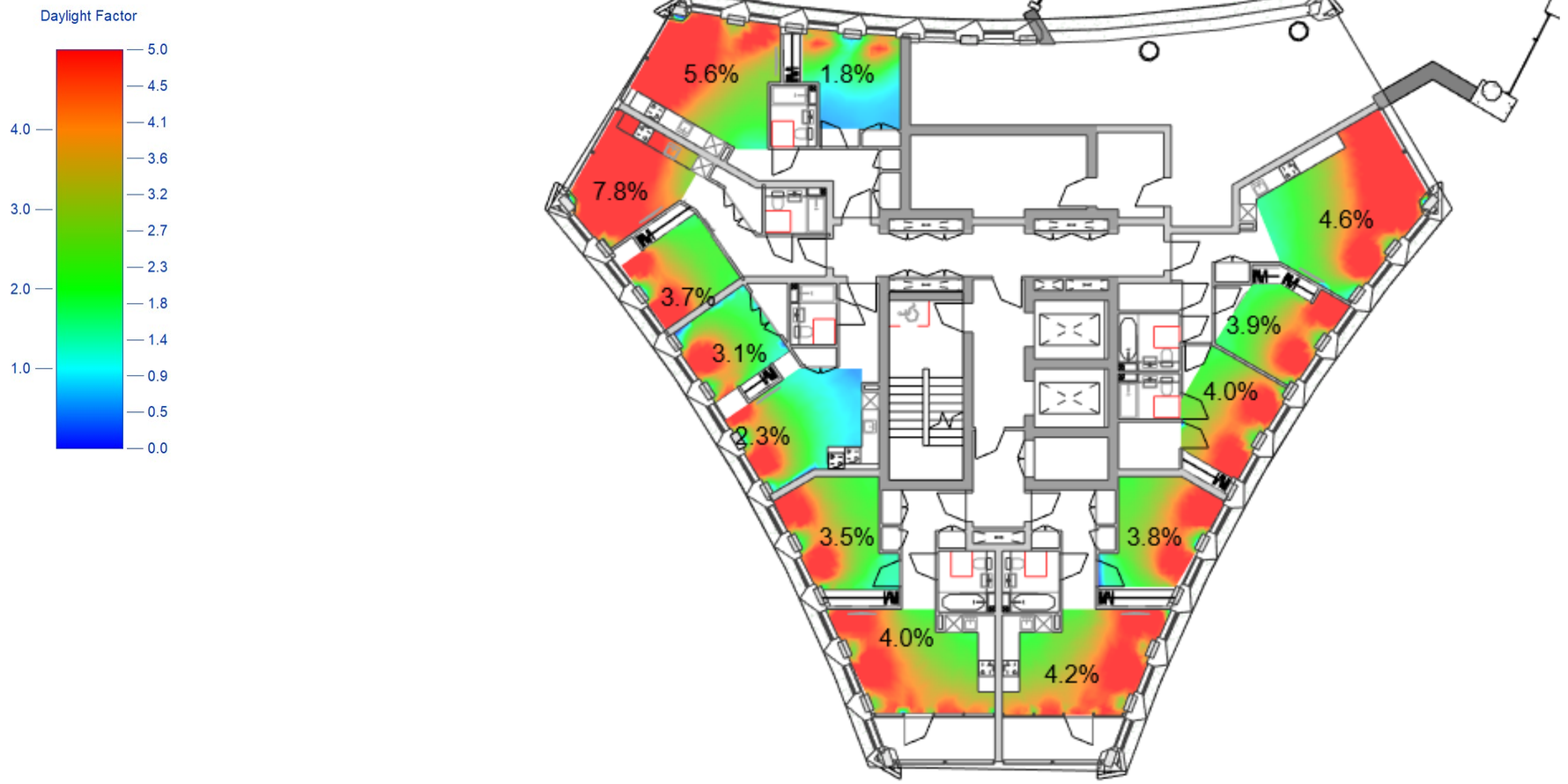




3.4 Fourth Floor

Fourth floor analysis determined that all space were compliant with the Guidelines.

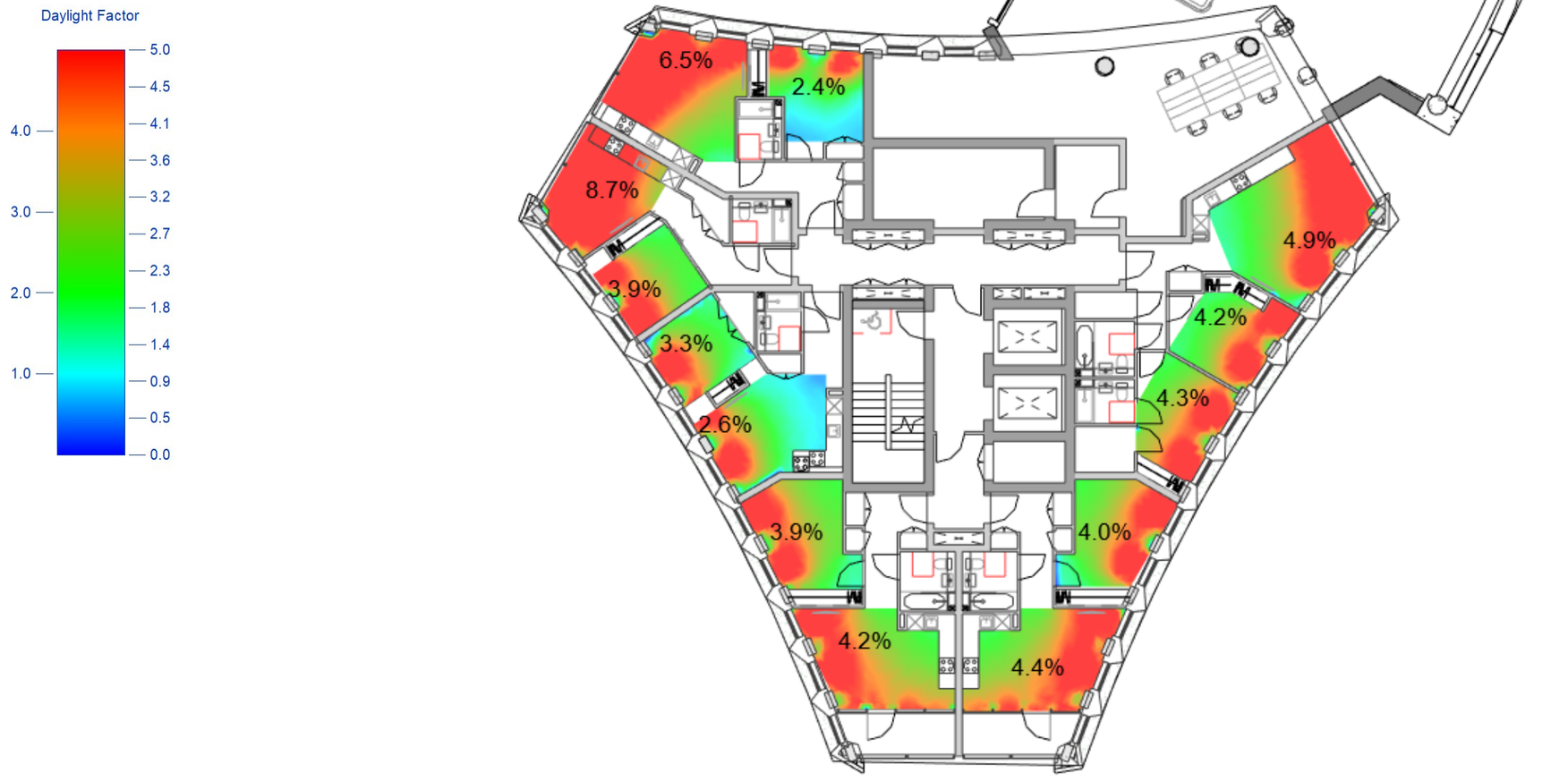
Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%



3.5 Fifth Floor

Fifth floor analysis determined that all space were compliant with the Guidelines.

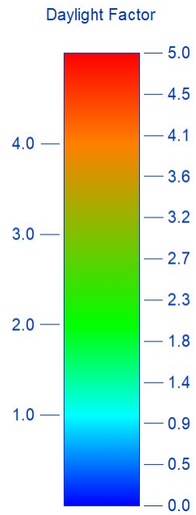
Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%



3.6 Sixth Floor

Sixth floor analysis determined that all space were compliant with the Guidelines.

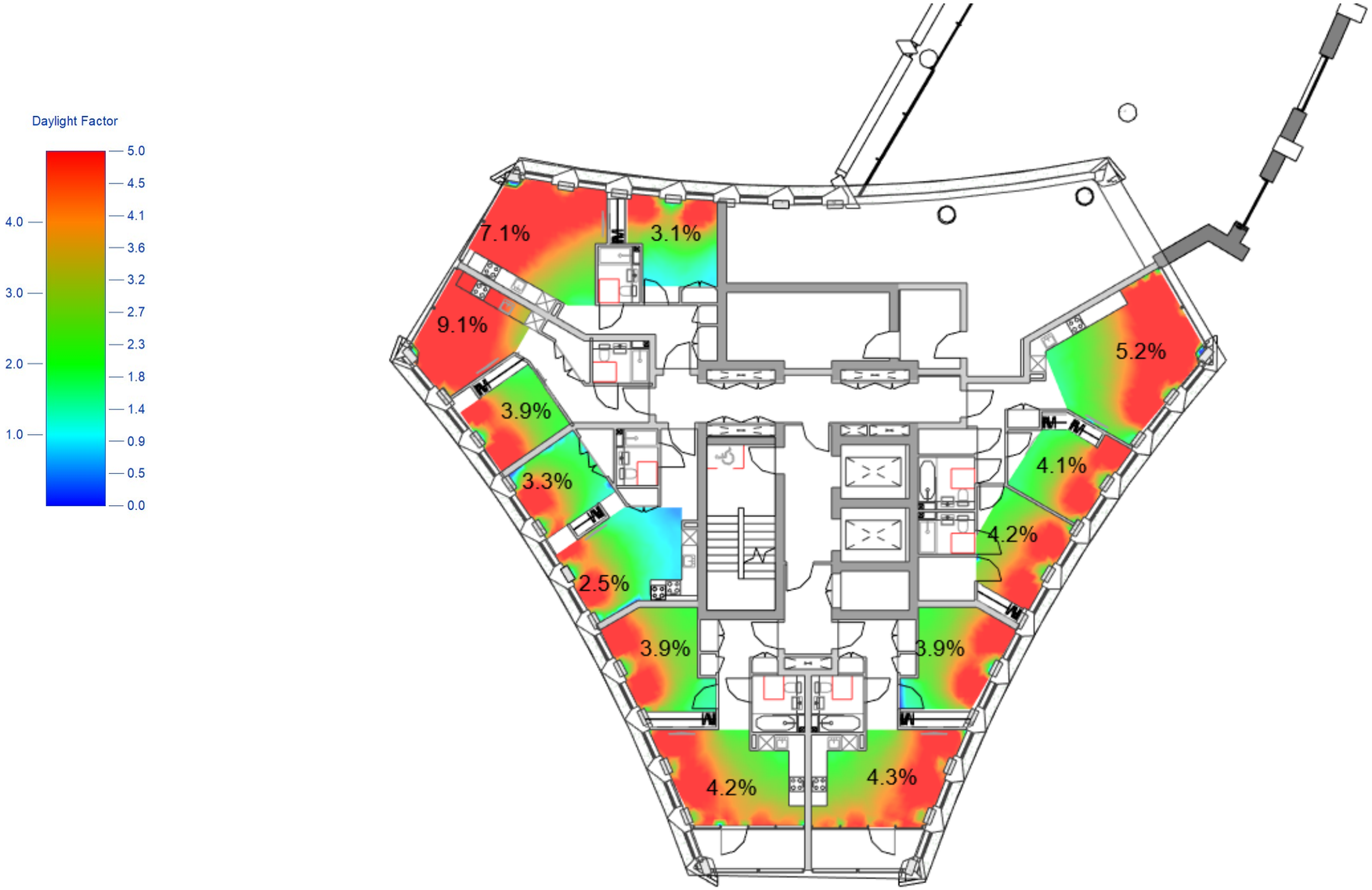
Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%



3.7 Seventh Floor

Seventh floor analysis determined that all space were compliant with the Guidelines.

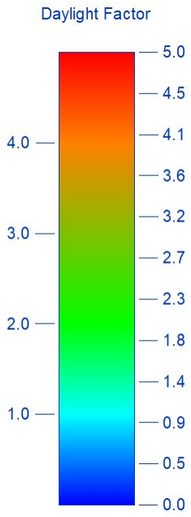
Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%



3.8 Eighth Floor

Eighth floor analysis determined that all space were compliant with the Guidelines.

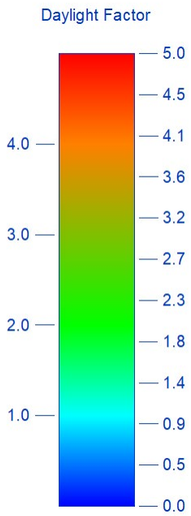
Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

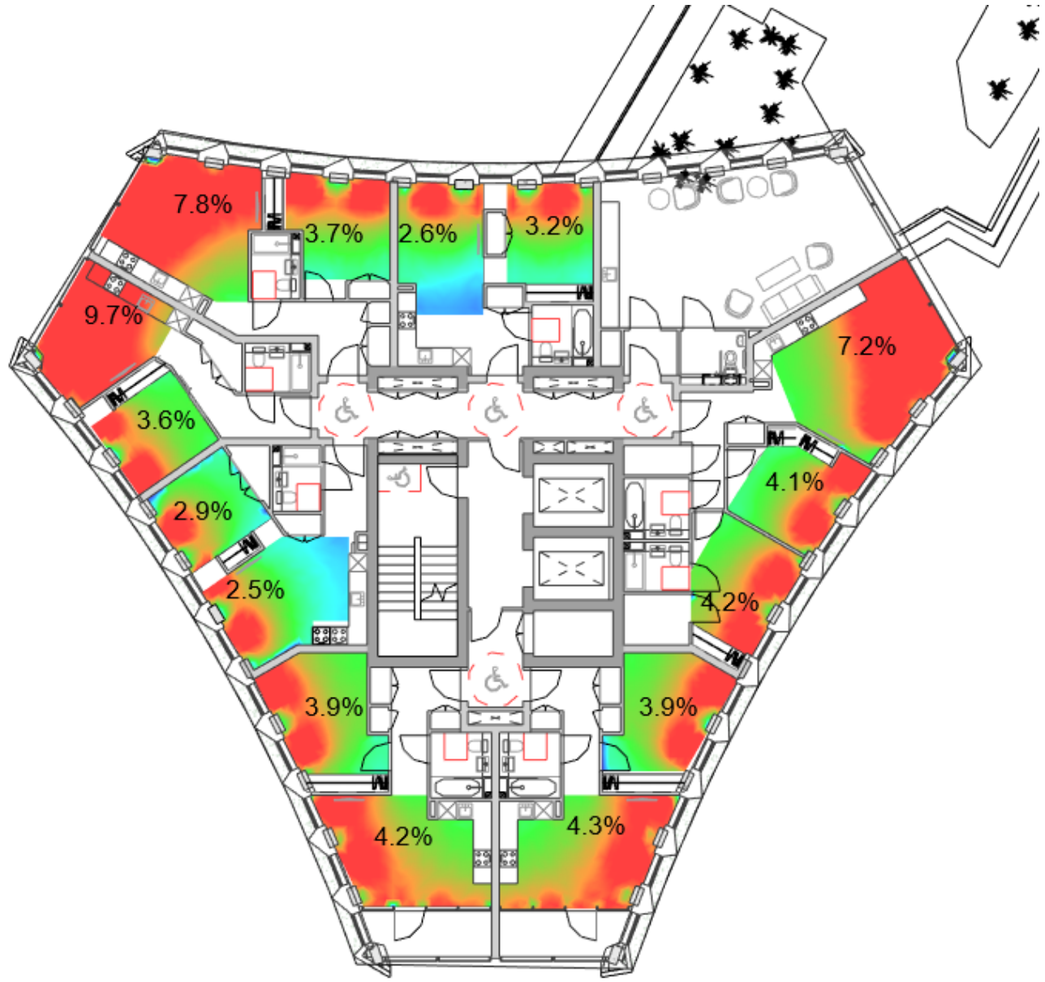


3.9 Ninth Floor

Ninth floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

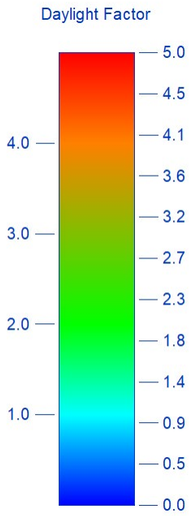


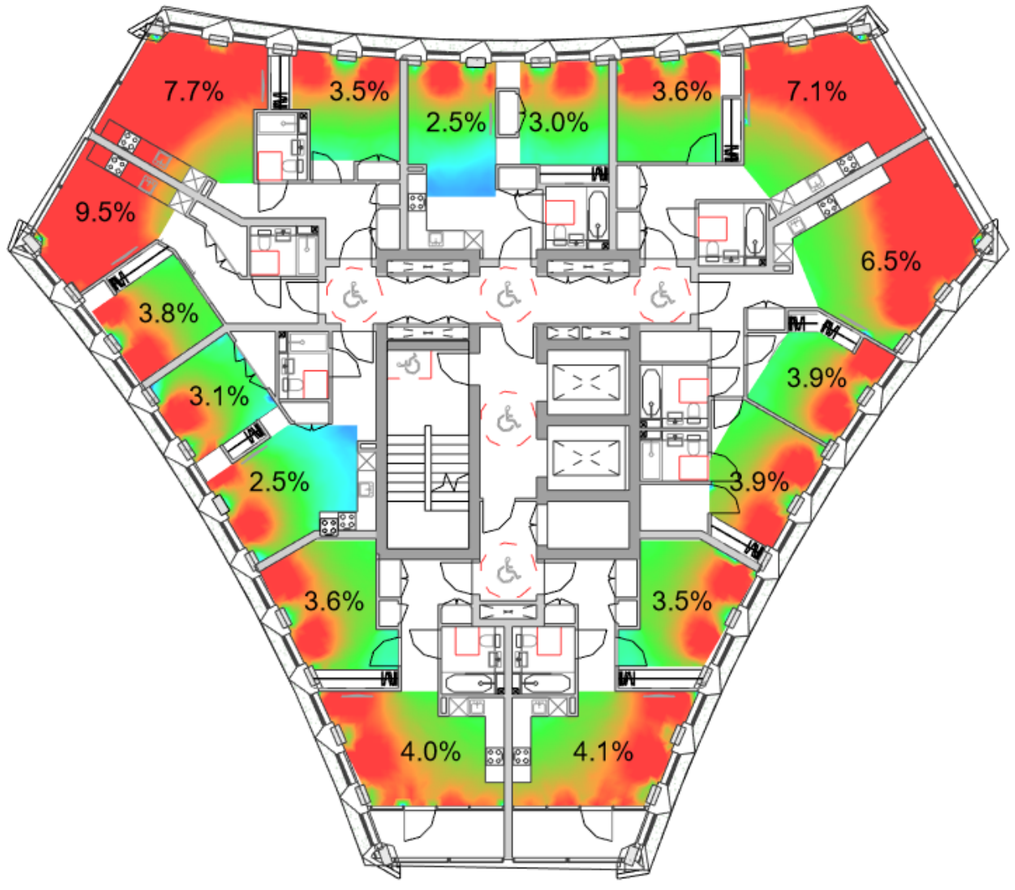


3.10 Tenth Floor

Tenth floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

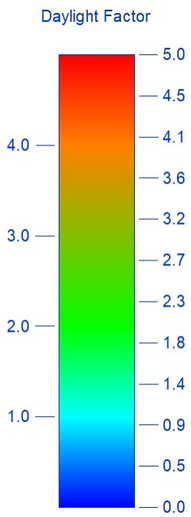


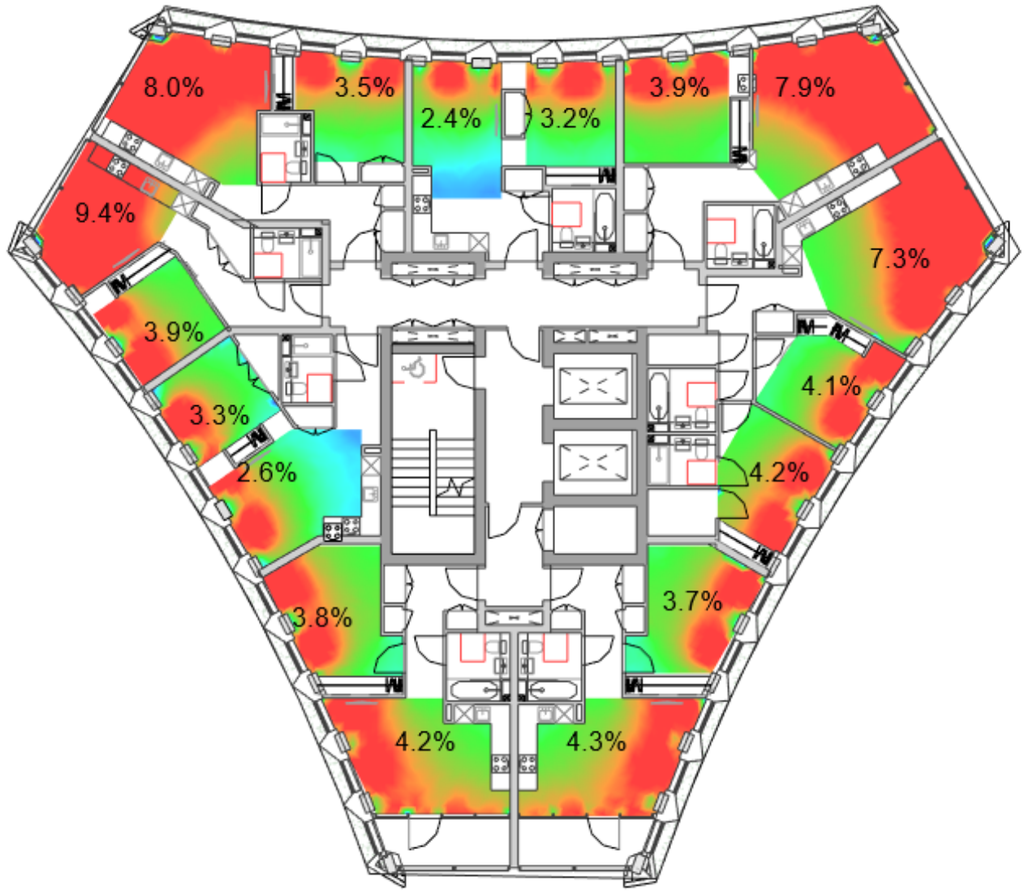


3.11 Eleventh Floor

Eleventh floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

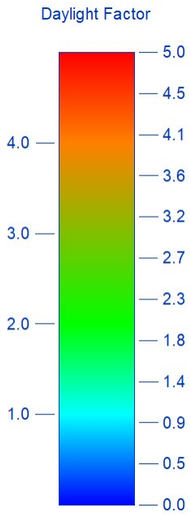


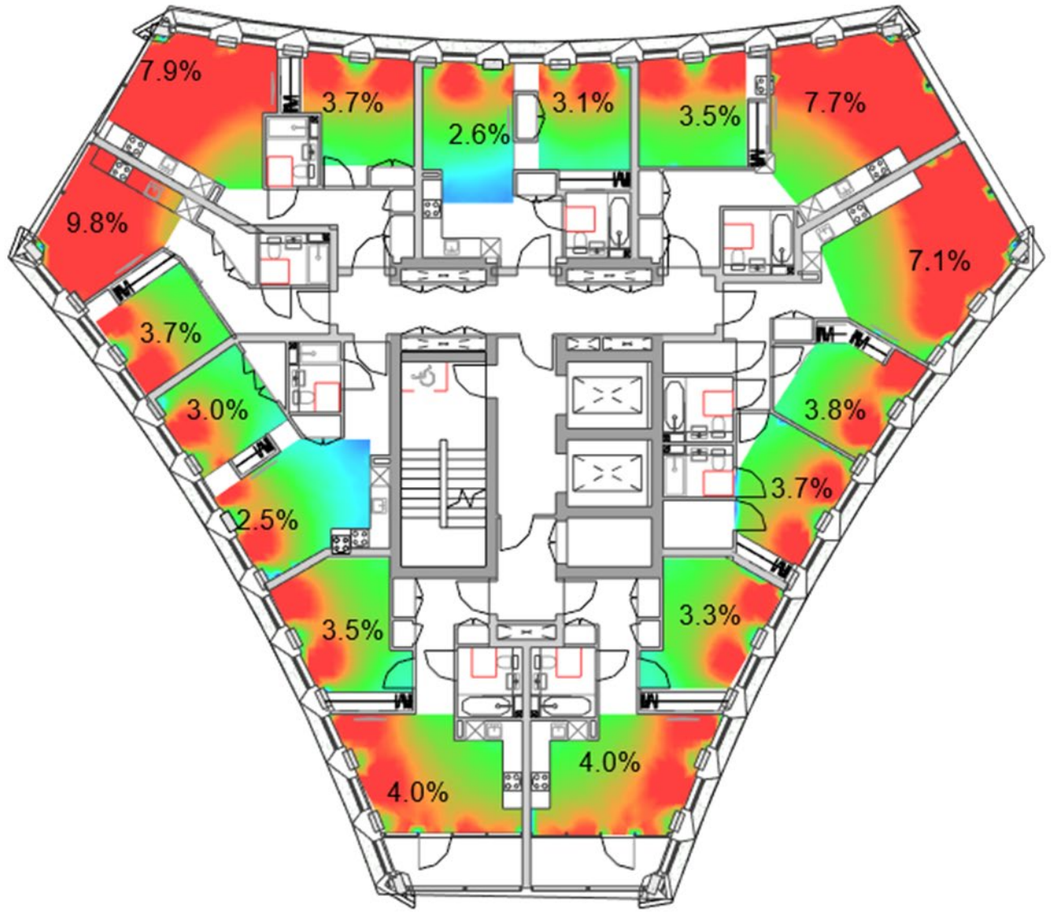


3.12 Twelfth Floor

Twelfth floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

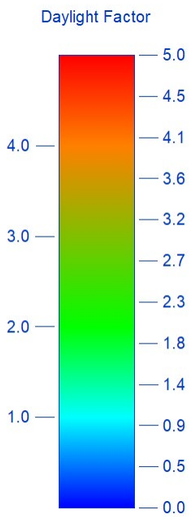


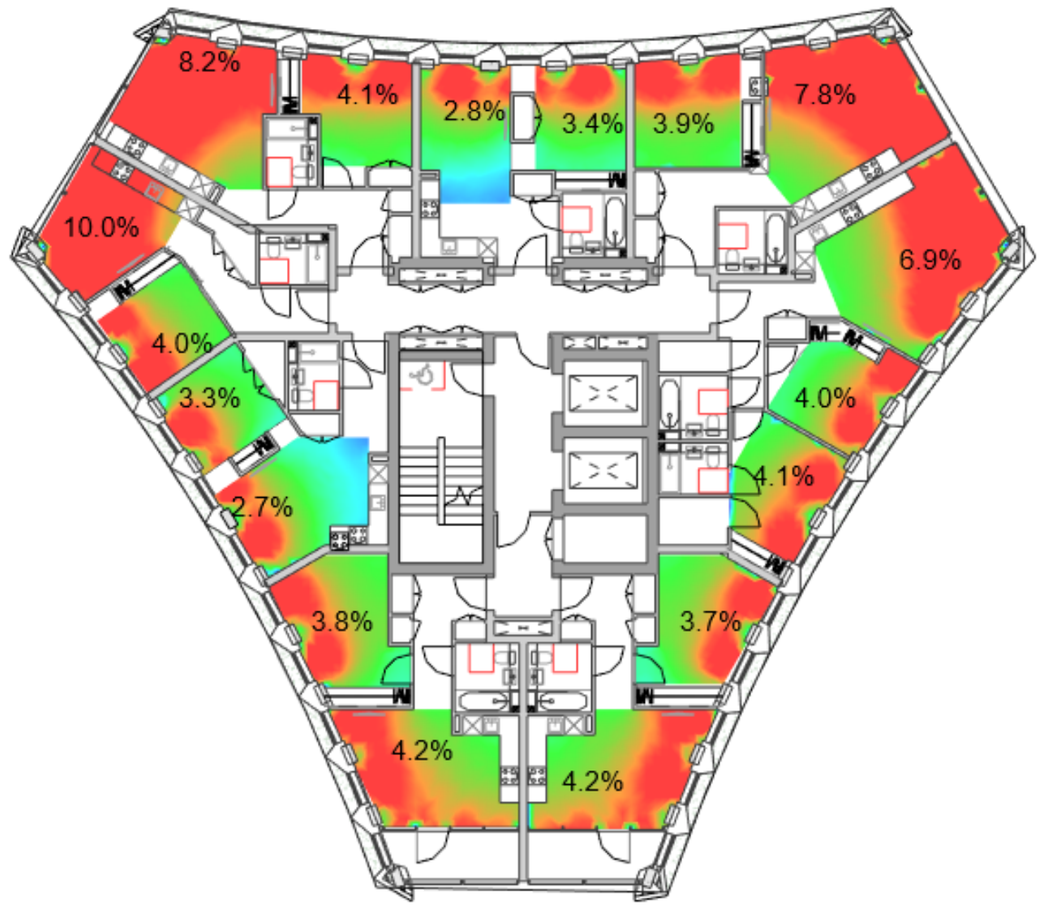


3.13 Thirteenth Floor

Thirteenth floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

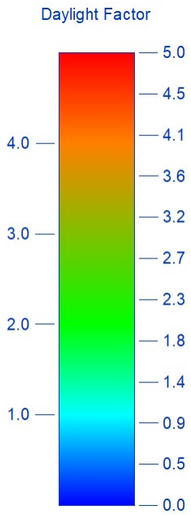


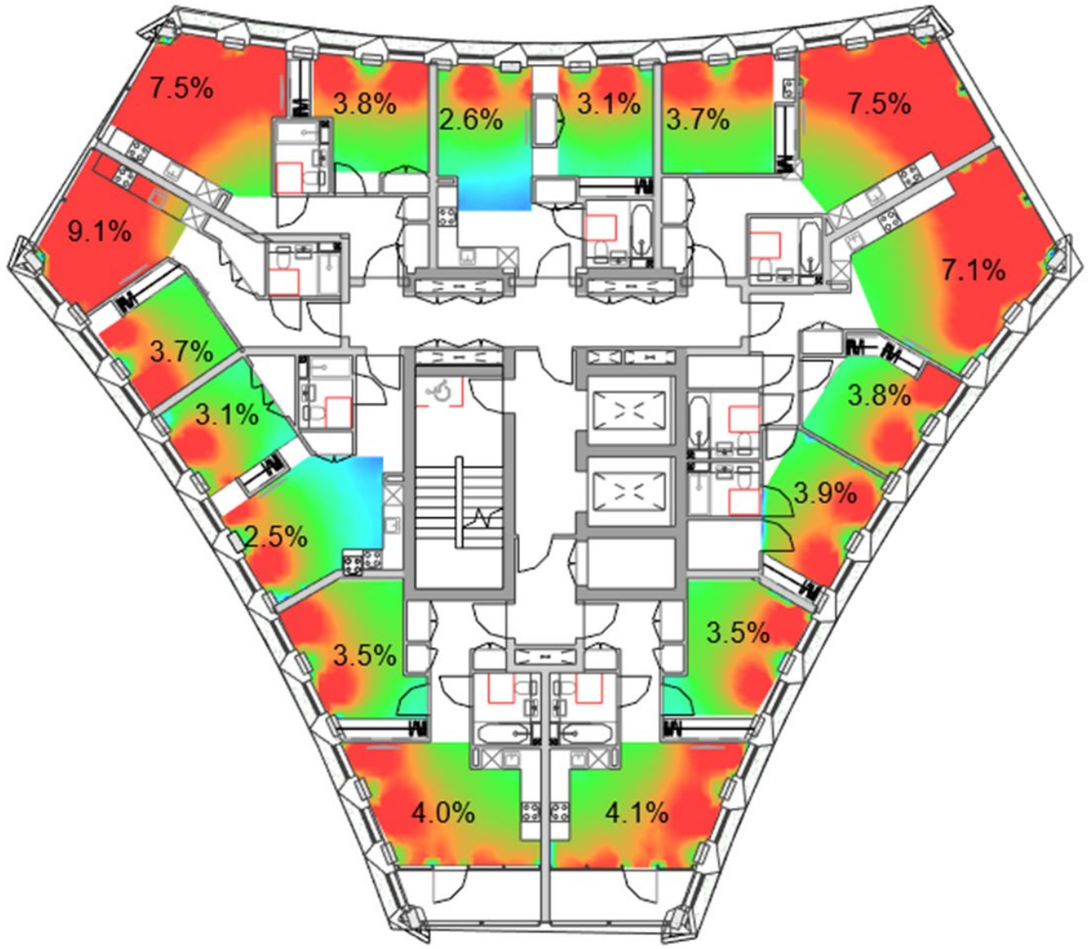


3.14 Fourteenth Floor

Fourteenth floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

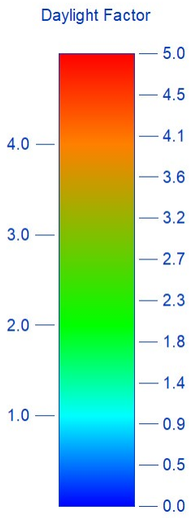


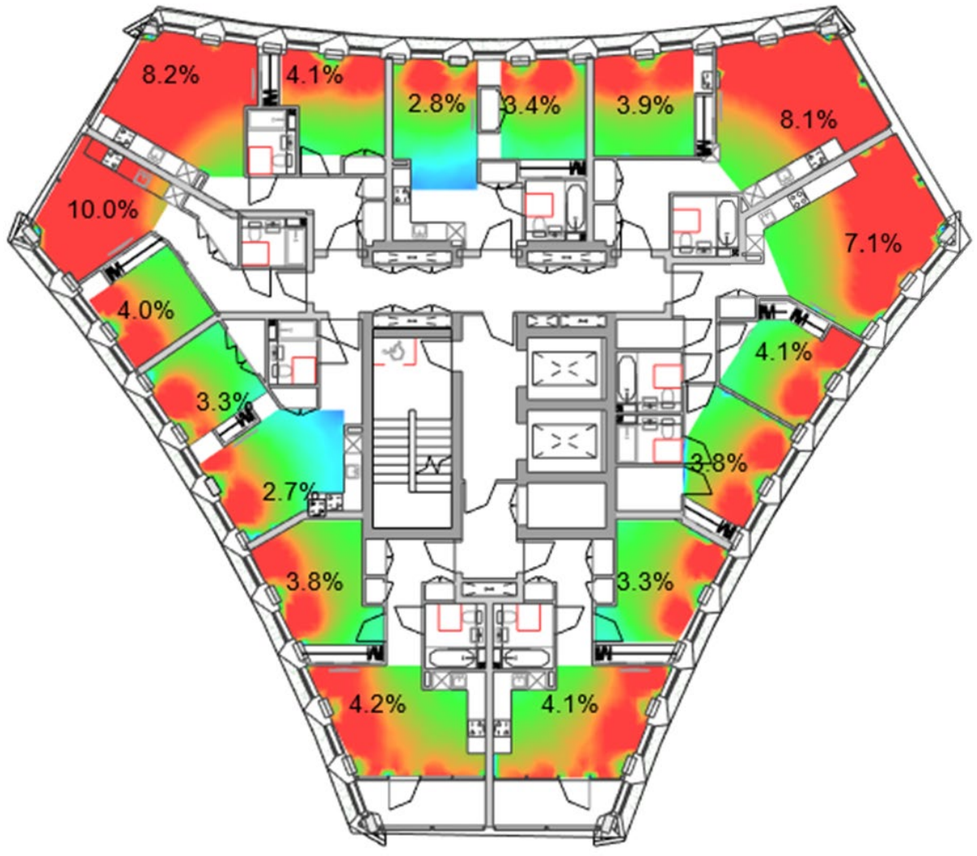


3.15 Fifteenth Floor

Fifteenth floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

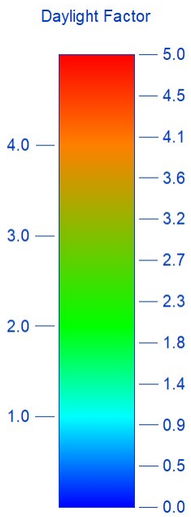


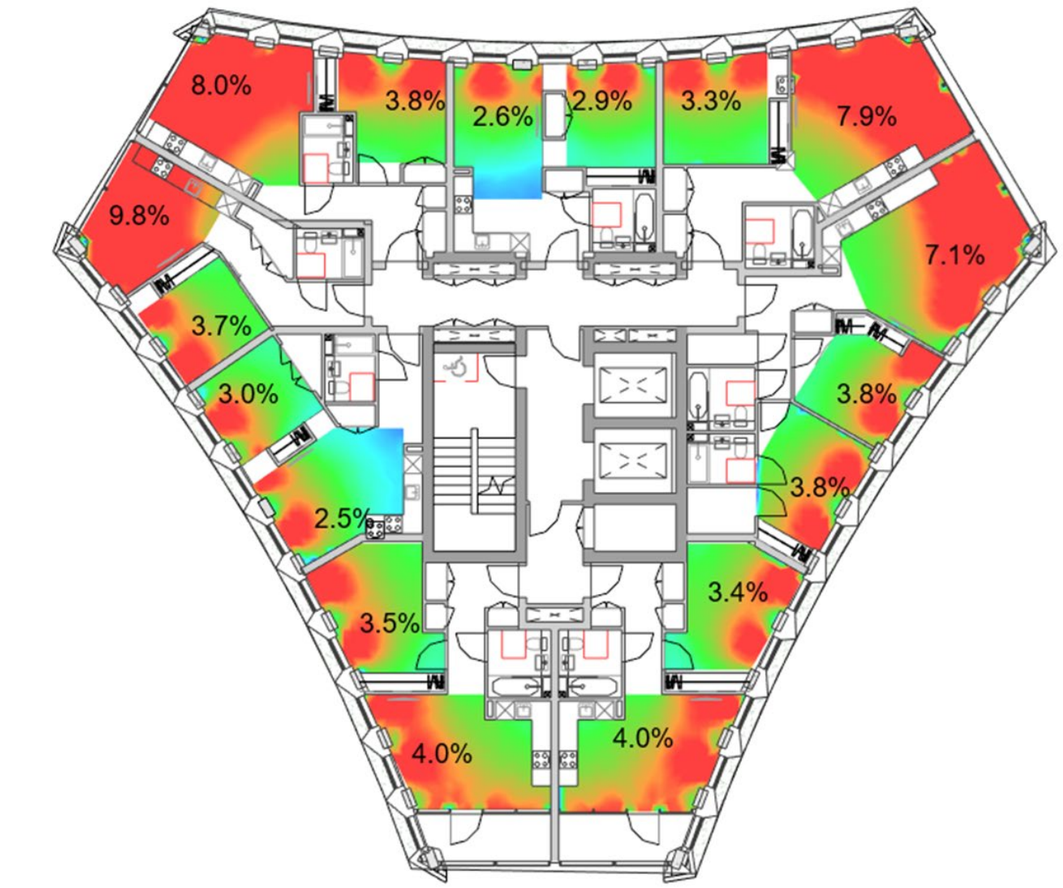


3.16 Sixteenth Floor

Sixteenth floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

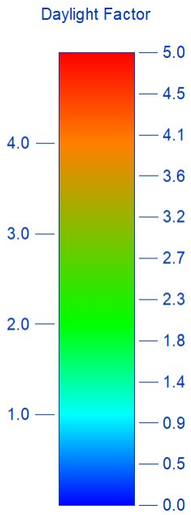


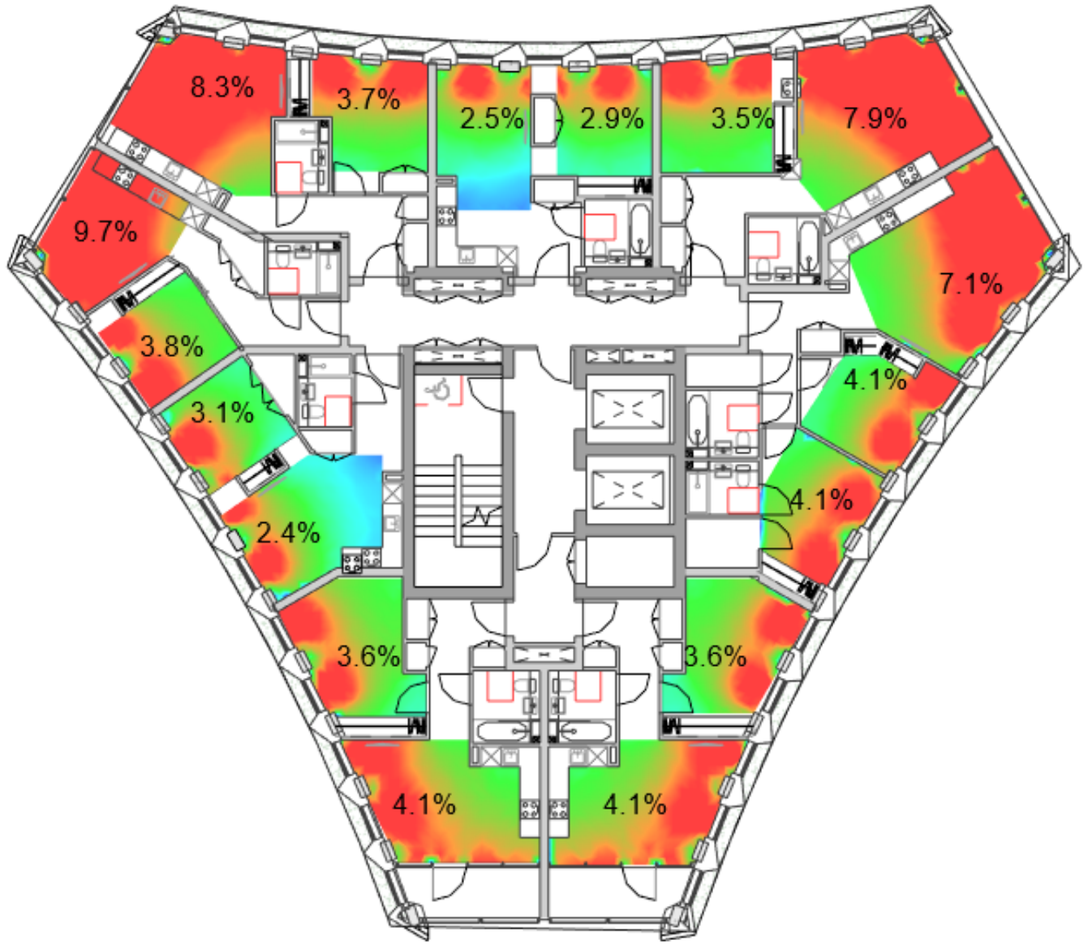


3.17 Seventeenth Floor

Seventeenth floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

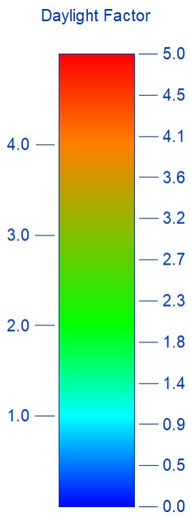


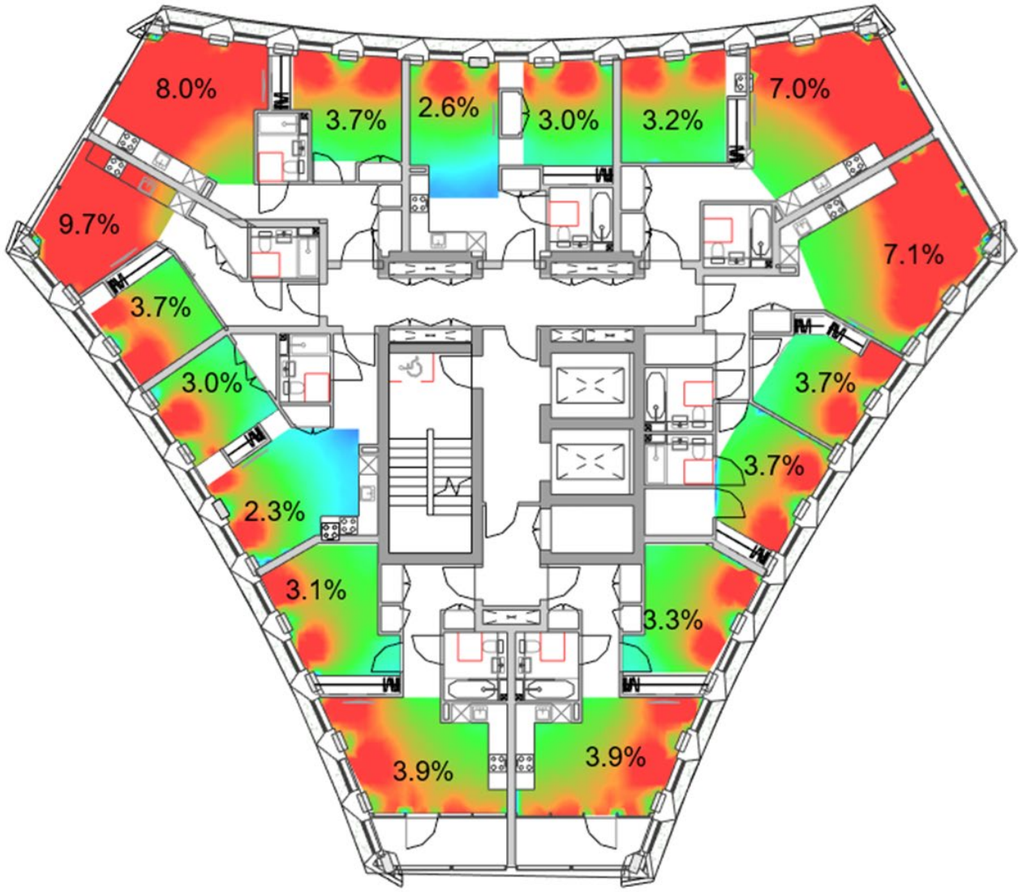


3.18 Eighteenth floor

Eighteenth floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

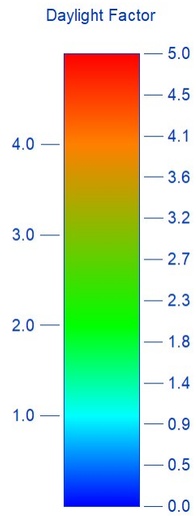


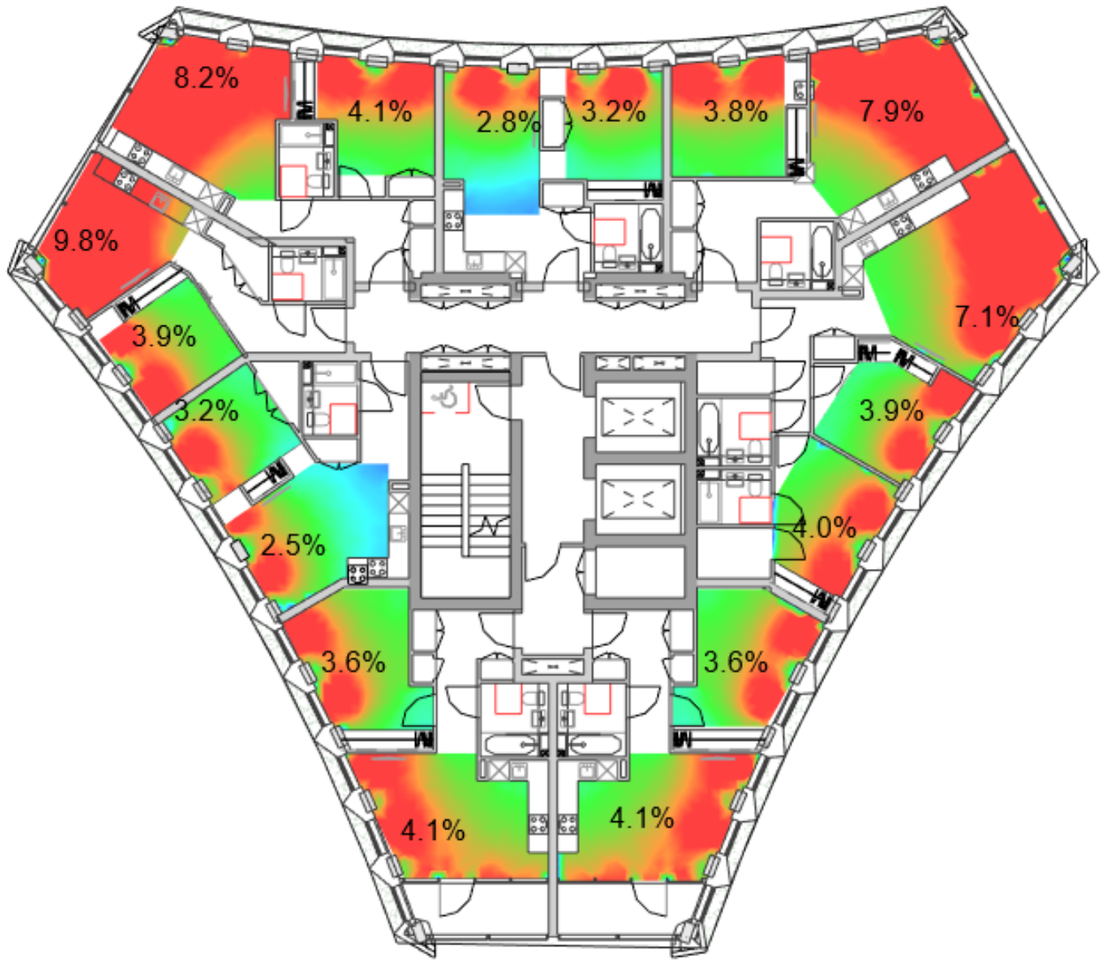


3.19 Nineteenth Floor

Nineteenth floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

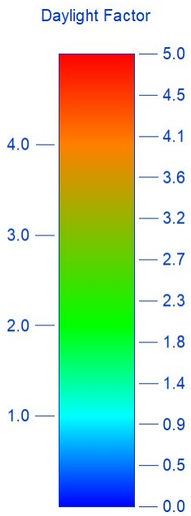


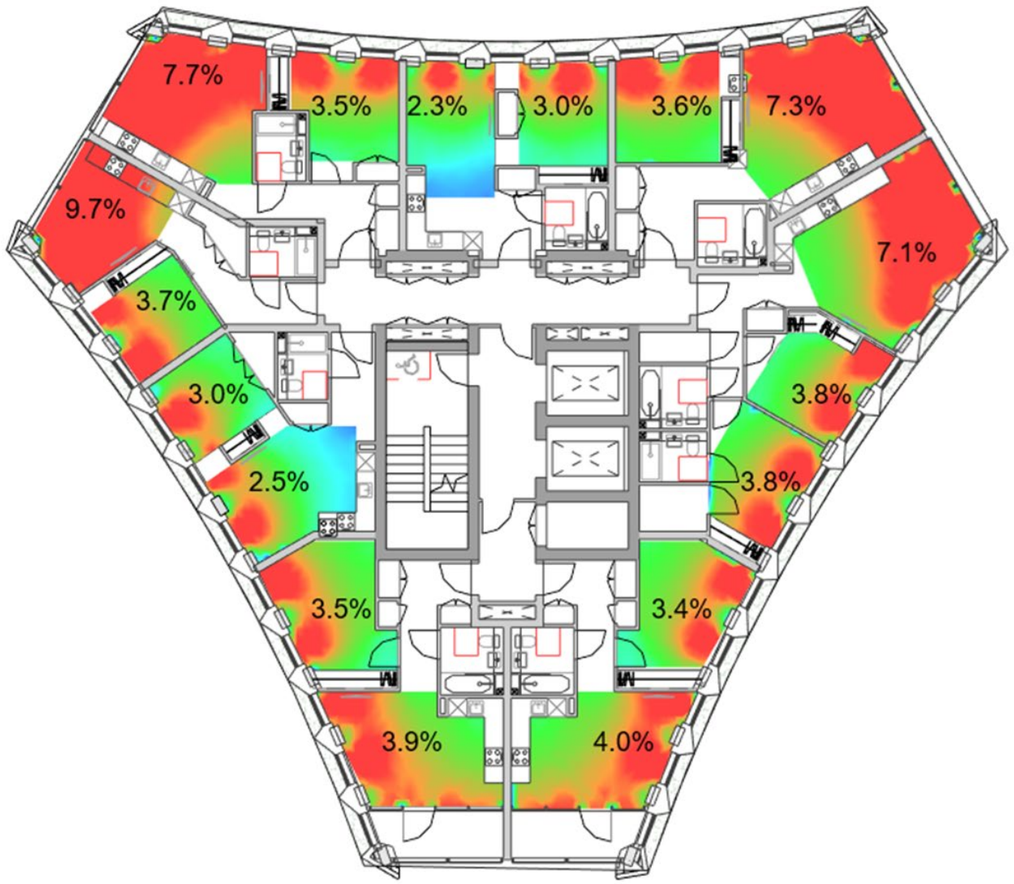


3.20 Twentieth Floor

Twentieth floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

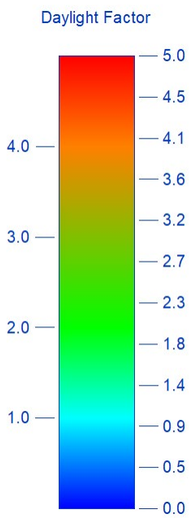


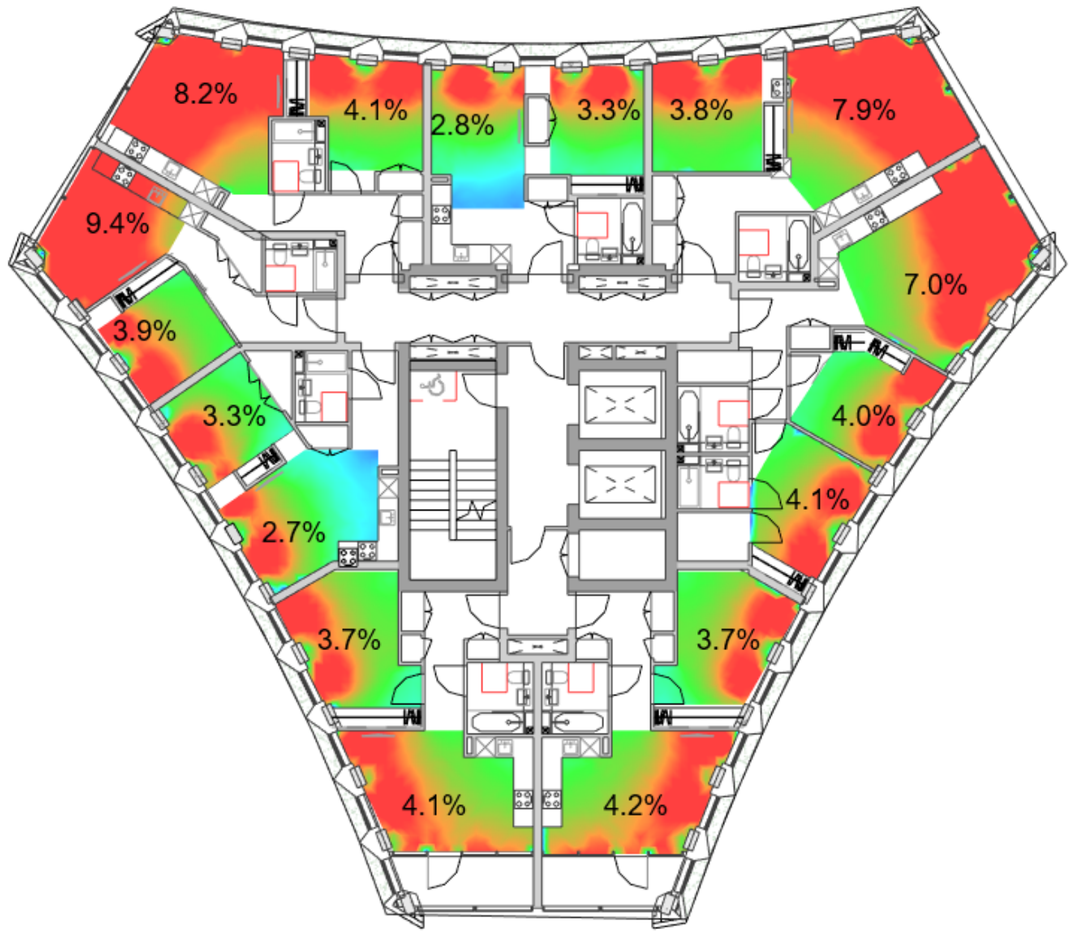


3.21 Twenty First Floor

Twenty first floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

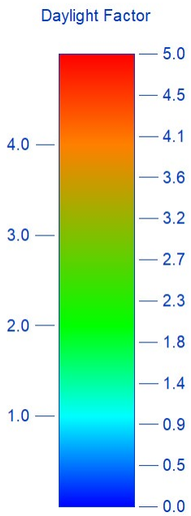


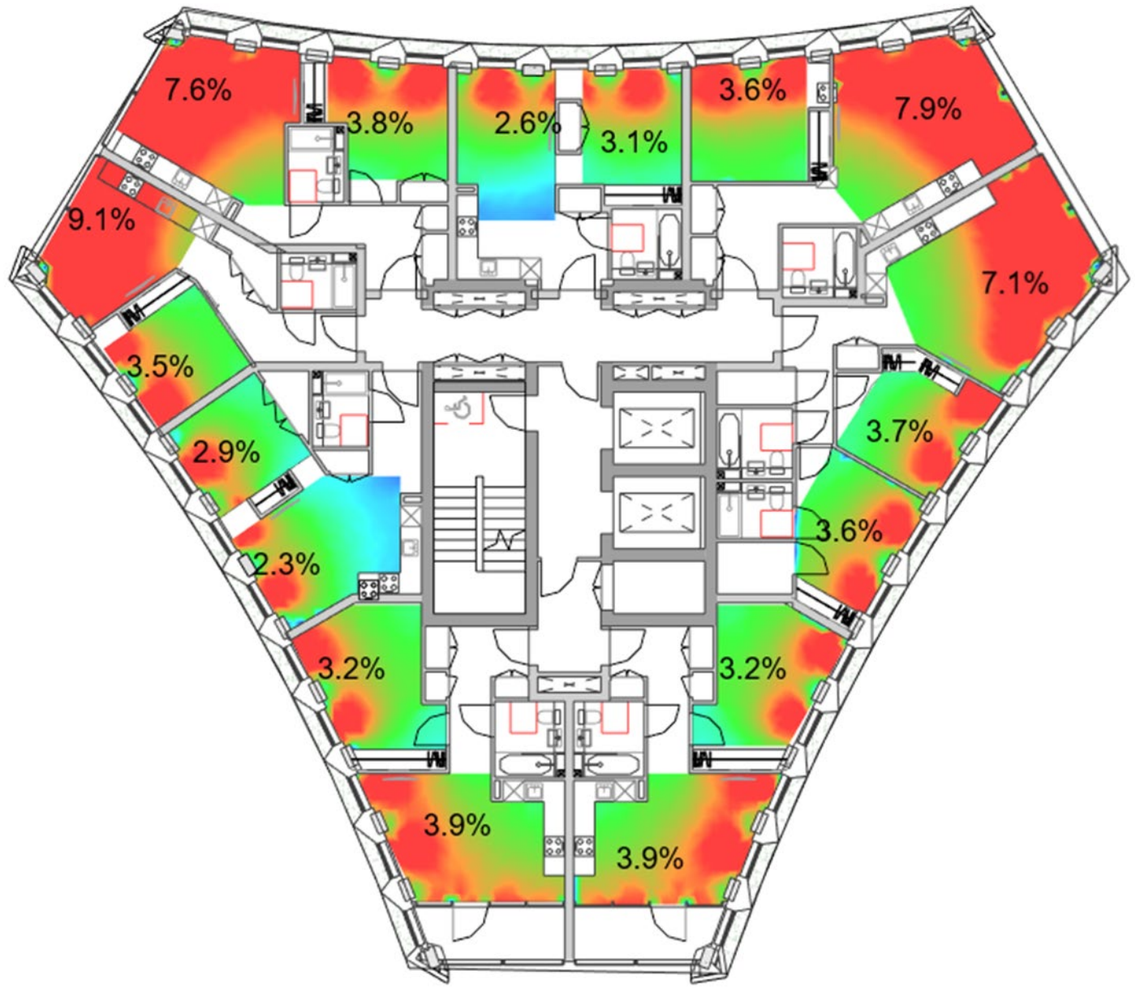


3.22 Twenty Second Floor

Twenty second floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

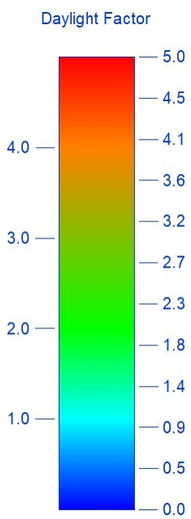


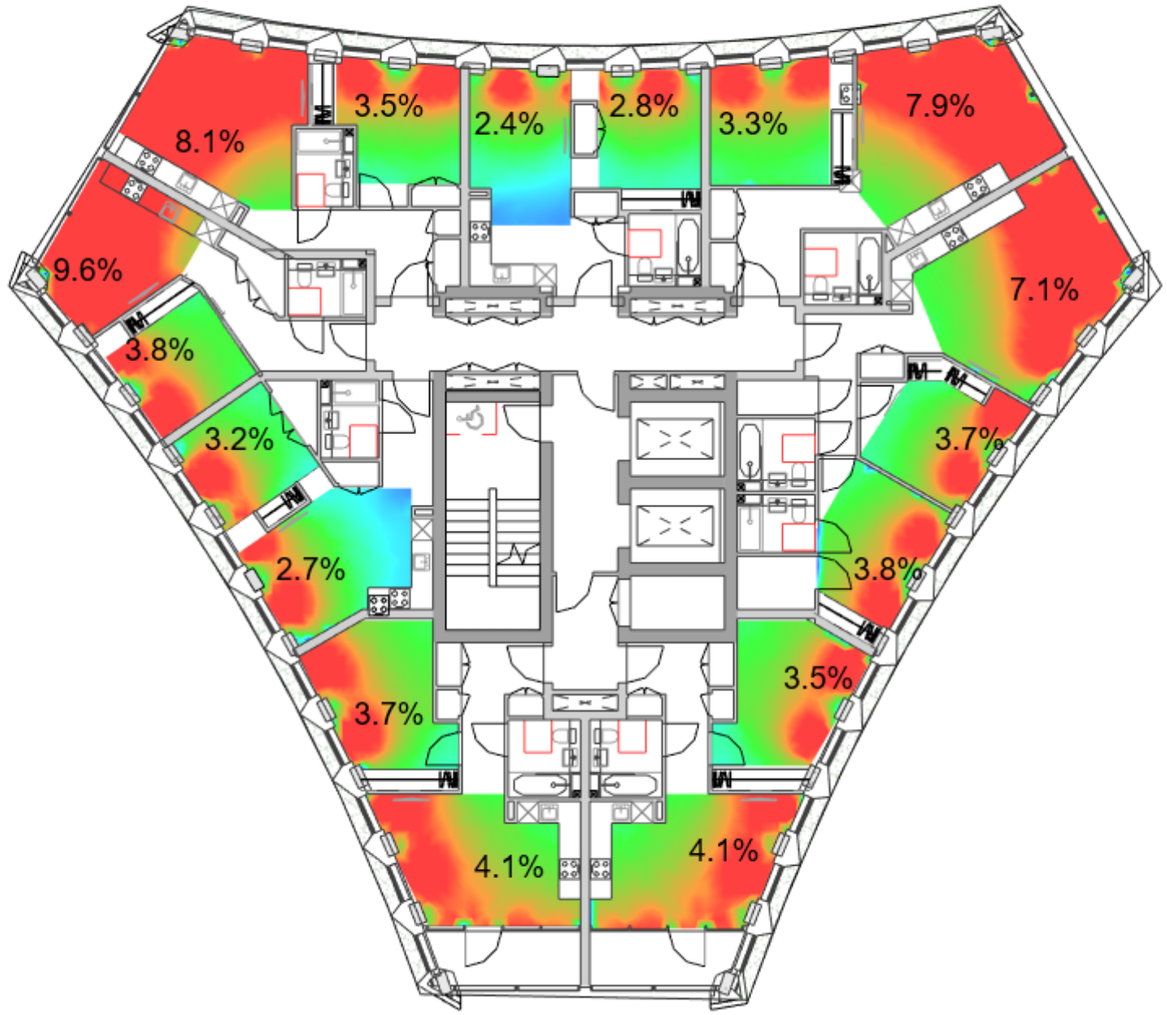


3.23 Twenty Third Floor

Twenty third floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

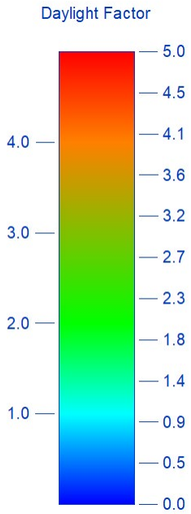


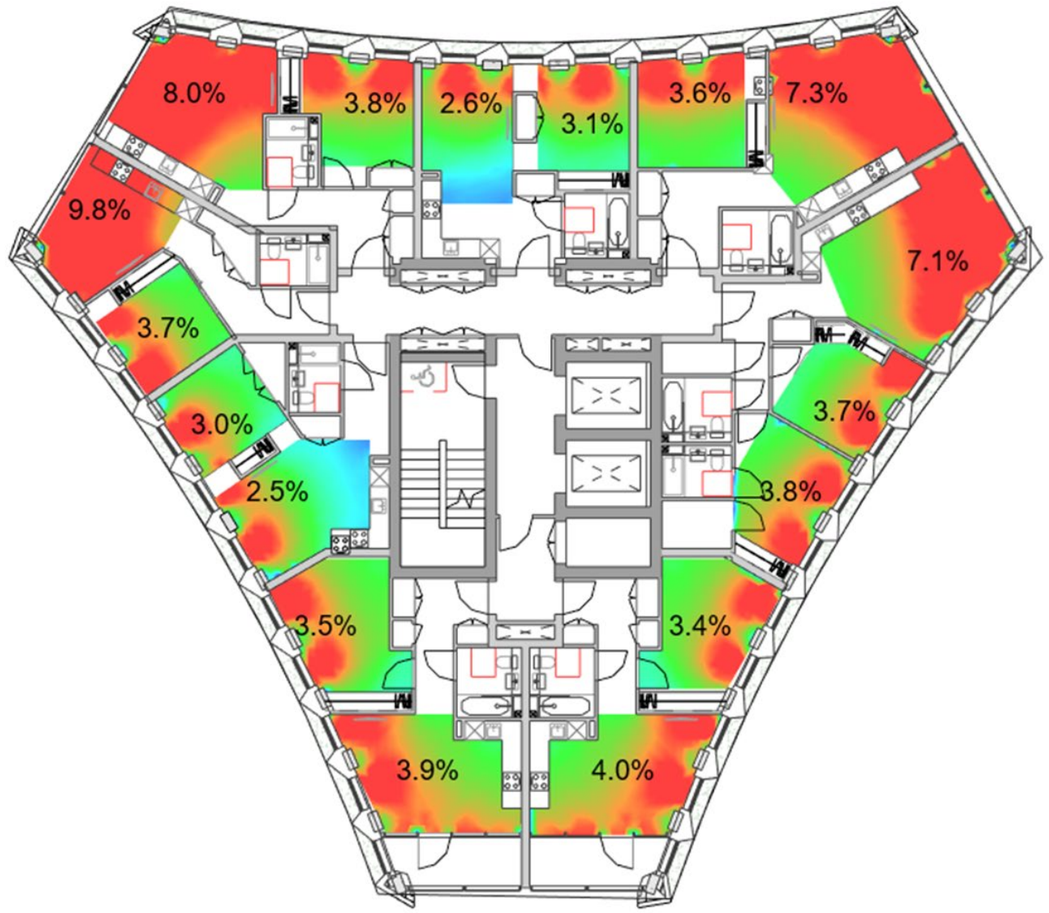


3.24 Twenty Fourth Floor

Twenty fourth floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

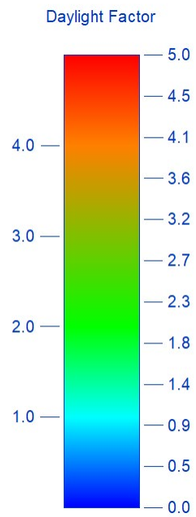


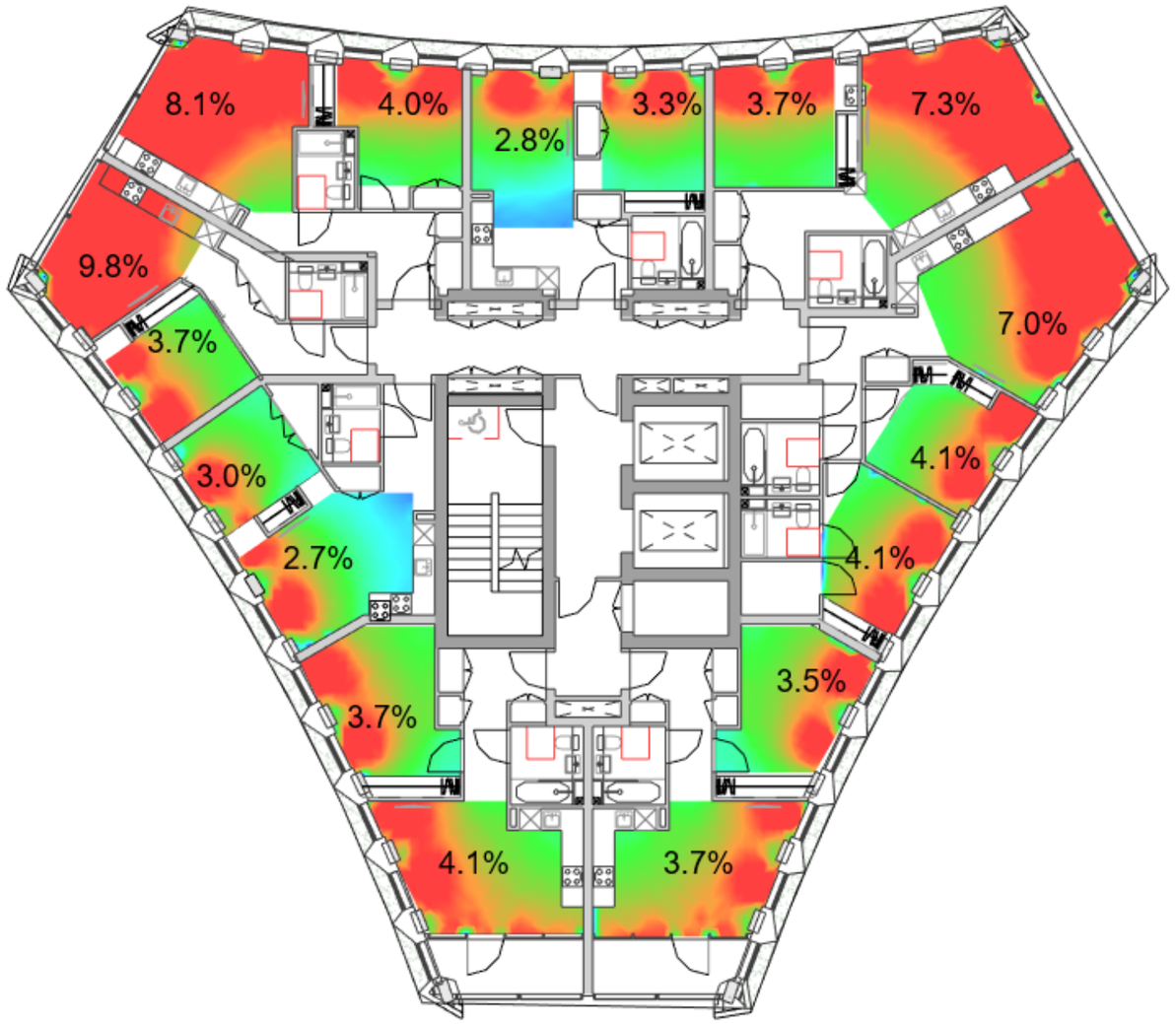


3.25Twenty Fifth Floor

Twenty fifth floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

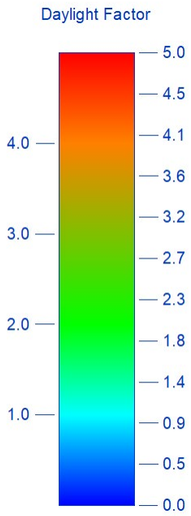


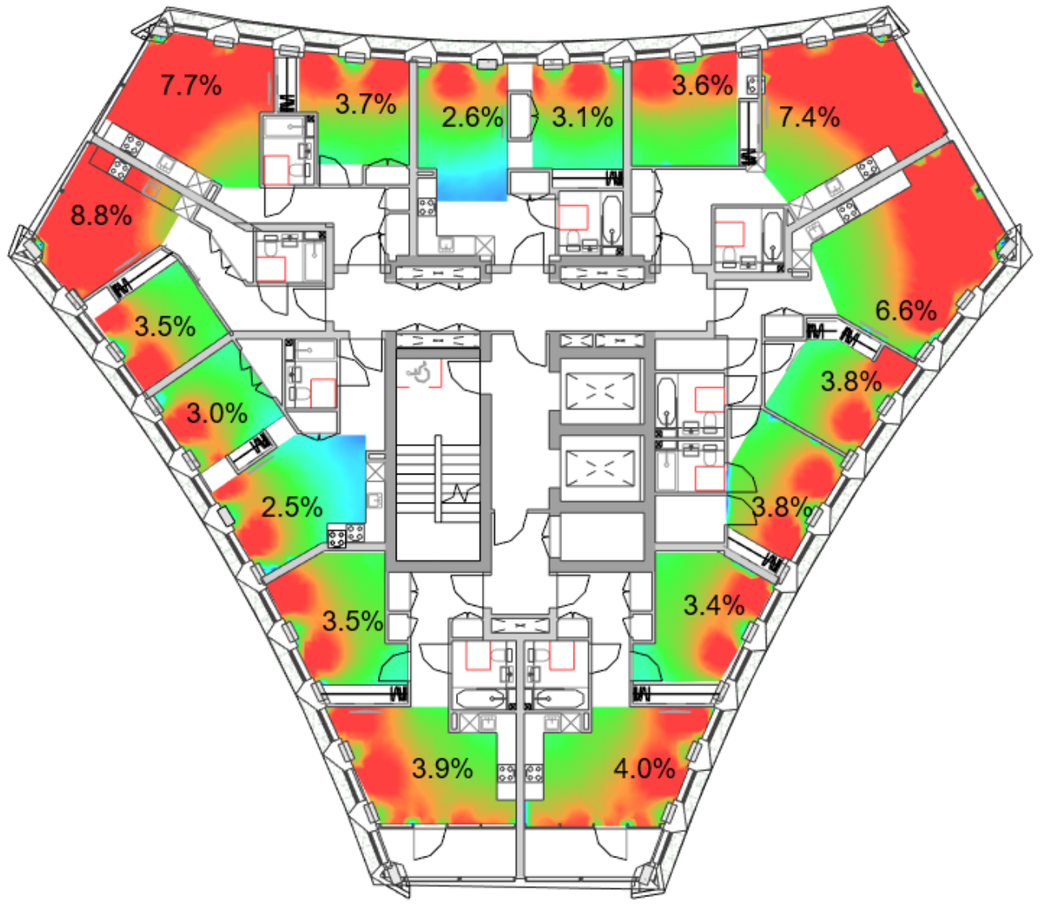


3.26 Twenty Sixth Floor

Twenty sixth floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%

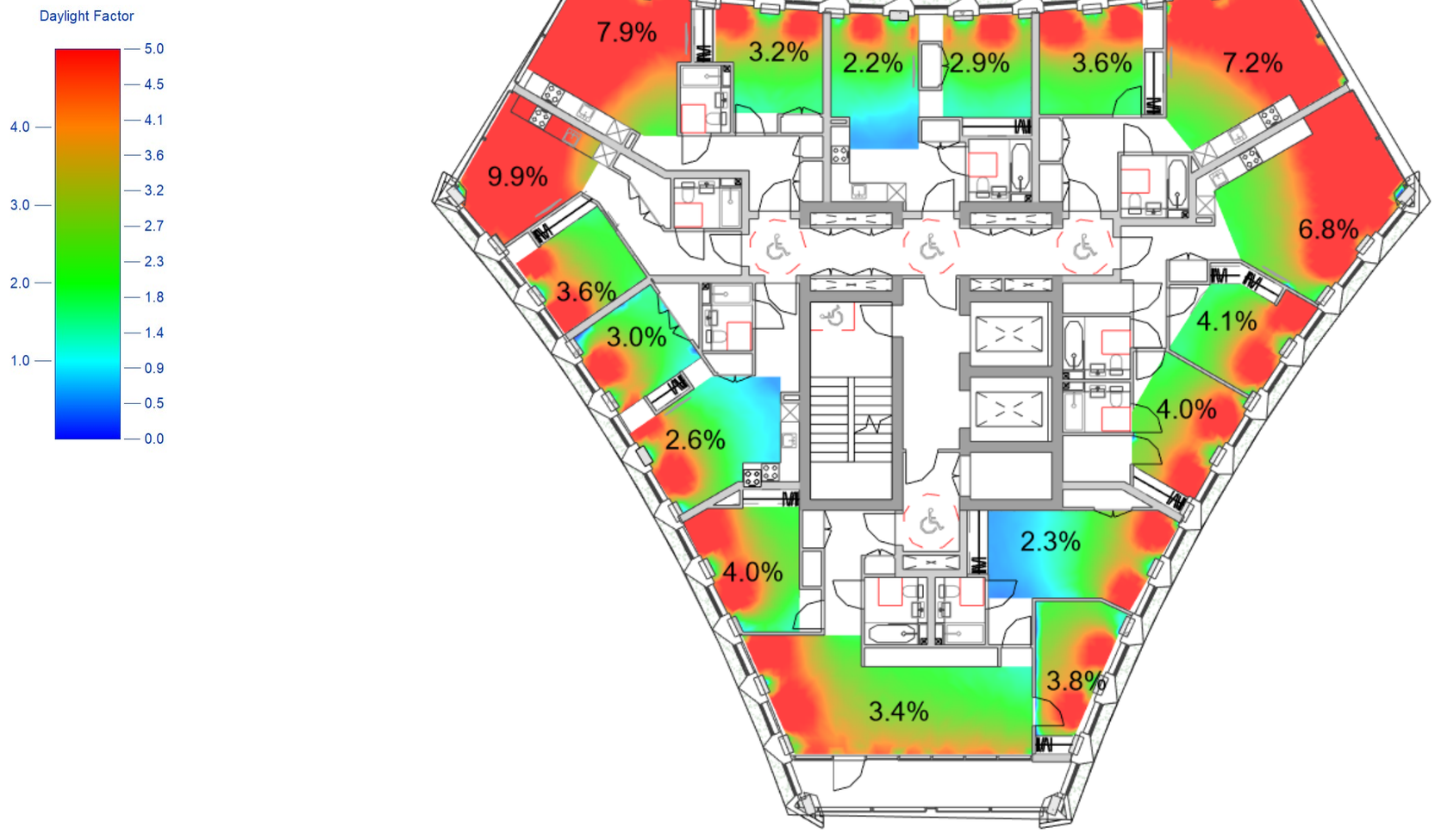




3.27 Twenty Seventh Floor

Twenty seventh floor analysis determined that all space were compliant with the Guidelines.

Space	Pass
Bedroom	>1%
Living \ Dining	>1.5%



4.0 Impact on Permitted scheme

As the tower massing has been altered since the original assessment provided with the original planning documentation, an assessment of the impact of the new tower on the adjacent permitted units was carried out.

As the tower is located to the north east of the site, there is no impact to the permitted sunlight availability to the amenity areas which are located to the south, as the site is located in the northern hemisphere, as shown in Figure 4.0.1. There is also no impact to Parkgate Place to the south west of the tower.

In relation to daylight availability, the mezzanine and first floors were assessed as they were identified to be the floors with the greatest potential impact. Any decision to test floors above those levels was contingent on the outcome of the assessments on the mezzanine and first floor. The areas assessed are highlighted in figure 4.0.2, for both VSC and ADF, as set out in the BRE Guide Appendix F which notes the following:

"F6 In assessing the loss of light to an existing building, the VSC is generally recommended as the appropriate parameter to use. This is because the VSC depends only on obstruction, and is therefore a measure of the daylit environment as a whole. The average daylight factor (ADF) (Appendix C) also depends on the room and window dimensions, the reflectances of interior surfaces and the type of glass, as well as the obstructions outside. It is an appropriate measure to use in new buildings because most of these factors are within the developer's control.

F7 Use of the ADF for loss of light to existing buildings is not generally recommended. The use of the ADF as a criterion tends to penalise well-daylit existing buildings, because they can take a much bigger and closer obstruction and still remain above the minimum ADFs recommended in [the 2008 British Standard]. Because [the 2008 British Standard] quotes a number of recommended ADF values for different qualities of daylight provision, such a reduction in light would still constitute a loss of amenity to the room. Conversely if the ADF in an existing building were only just over the recommended minimum, even a tiny reduction in light from a new development would cause it to go below the minimum, restricting what could be built nearby."

"F8 However, there are some situations where meeting a set ADF target value with the new development in place could be appropriate as a criterion for loss of light:

(i) where the existing building is one of a series of new buildings that are being built one after another, and each building has been designed as part of the larger group

(ii) as a special case of (i), where the existing building is proposed but not built. A typical situation might be where the neighbouring building has received planning permission but not yet been constructed".

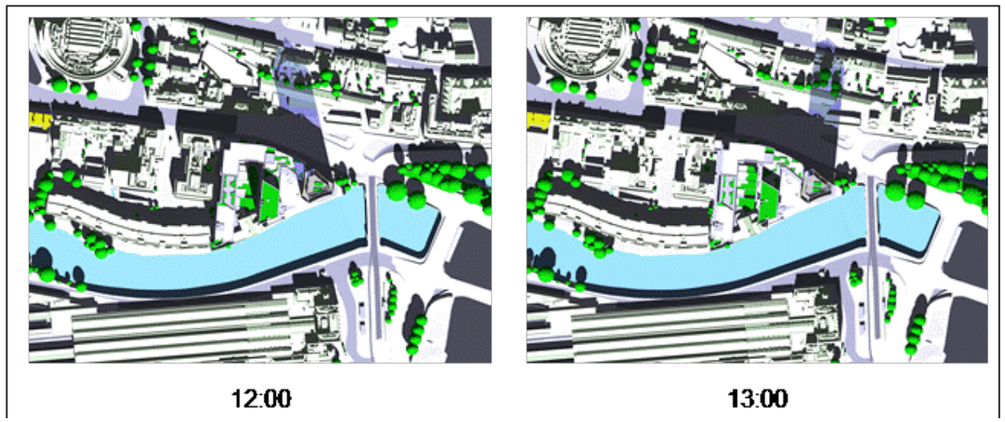


Fig 4.0.1 – New Tower Shadow at 12:00 and 13:00 on 21st March showing no overshadowing to permitted amenity space.

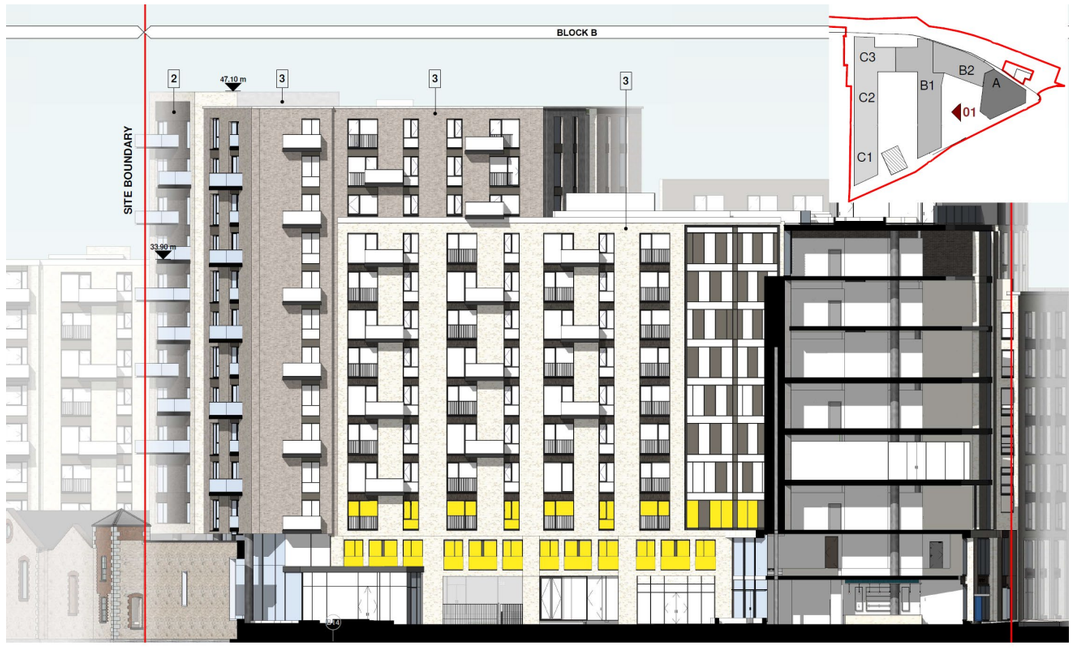


Fig 4.0.2 – Sample Units on Mezzanine and First Floor of Permitted scheme that have been assessed for impact due to new tower massing.

Results

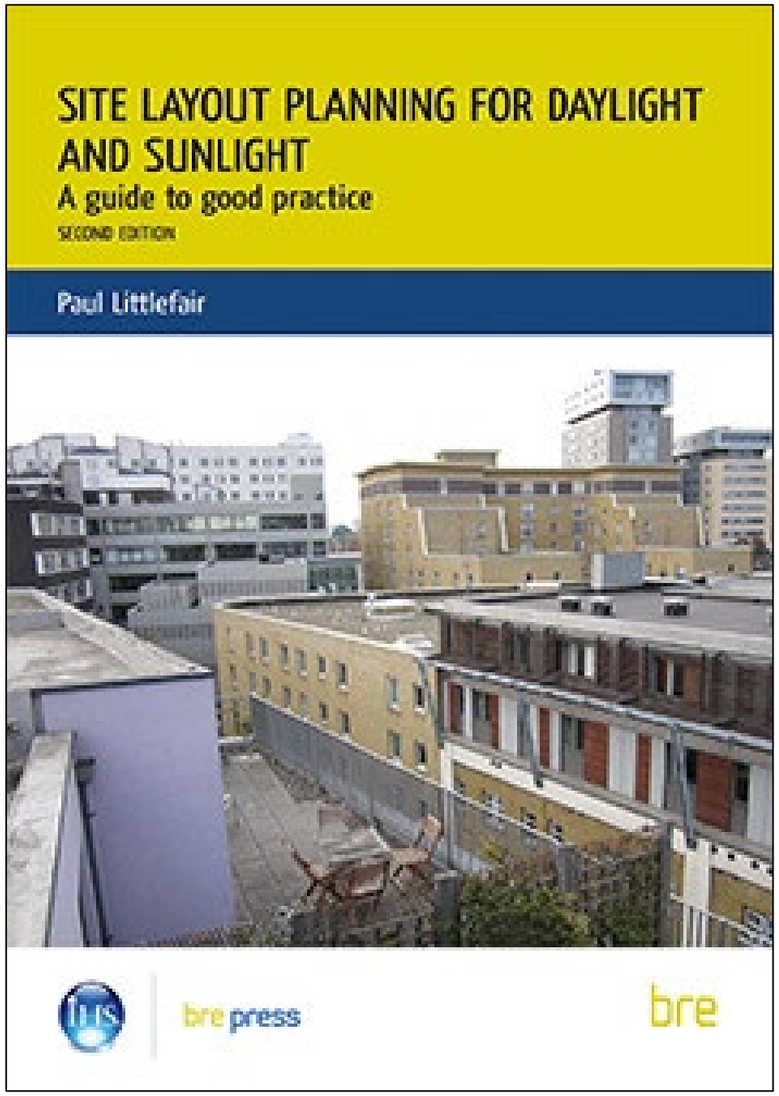
Assessment was carried out on selected units on the mezzanine and first floors to provide an understanding of the impact of any potential impact. The results determined that whilst there would be some reduction in VSC availability, the works carried out on the previously permitted scheme to ensure good daylight availability to the units has resulted in the ADF being relatively consistent with previous results, with most space still achieving ADF's above the BRE minimum guidance. One bedroom has greater than 0.8 times its previous value for ADF (and 98% it's VSC) yet it can be noted that this unit was also failing to meet the minimum guidance in the permitted scheme. Therefore, due to these results for the lower floors and an understanding that daylight will improve on the upper floors, it is concluded that the new tower has only negligible impact on permitted scheme, however it is put forward that the architectural merits of the proposal in the round present a higher quality scheme that mitigates these minor to moderate impacts.

ID	Room Ref	VSC Permitted (%)	VSC Proposed (%)	VSC Proposed / Permitted	Daylight Permitted (%)	Daylight Proposed (%)	Daylight Proposed / Permitted	Comments
MB1	Mezz B Bed 1	6.84	6.13	90%	1.3	1.0	77%	Bedroom still has ADF above BRE minimum guidance
ML1	Mezz B Living 1	7.53	7.06	94%	1	1.0	100%	No material change in results (rounded to 0.1)
MB1	Mezz B Bed 2	10.29	9.67	94%	1.8	1.5	83%	Bedroom still has ADF above BRE minimum guidance
ML1	Mezz B Living 2	12.98	12.44	96%	1.4	1.4	100%	No material change in results (rounded to 0.1)
MB1	Mezz B Bed 3	14.94	14.34	96%	2.5	2.2	88%	Bedroom still has ADF above BRE minimum guidance
ML1	Mezz B Living 3	17.92	17.42	97%	2	2.0	100%	No material change in results (rounded to 0.1)
MB1	Mezz B Bed 4	20.13	19.38	96%	3.4	2.8	82%	Bedroom still has ADF above BRE minimum guidance
ML1	Mezz B Living 4	21.73	21.44	99%	2.5	2.5	100%	No material change in results (rounded to 0.1)
1B1	1st B Bed 1	5.65	5.35	95%	2.0	1.0	50%	Bedroom still has ADF above BRE minimum guidance
1B1	1st B Bed 2	7.25	7	97%	2.0	1.8	90%	Bedroom still has ADF above BRE minimum guidance
1L1	1st B Living 1	9.9	9.77	99%	1.2	1.0	83%	Minor reduction
1B1	1st B Bed 3	10.67	10.47	98%	0.9	0.7	78%	Moderate reduction. However, space did not achieve BRE minimum guidance as permitted
1L1	1st B Living 2	13.52	13.27	98%	1.6	1.4	88%	Minor reduction
1B1	1st B Bed 4	15.17	14.93	98%	1.3	1.0	77%	Bedroom still has ADF above BRE minimum guidance
1L1	1st B Living 3	18.48	18.05	98%	2.2	1.9	86%	Minor reduction
1B1	1st B Bed 5	20.68	20.29	98%	1.6	1.4	88%	Bedroom still has ADF above BRE minimum guidance
1L1	1st B Living 4	23.24	22.91	99%	2.7	2.7	100%	No material change in results (rounded to 0.1)

5.0 Impact on Neighbouring Buildings

5.0 Guidance

As set out within the introduction, the impact on existing buildings has been assessed utilising quantitative assessment method as detailed in the BRE publication “Site Layout Planning for Daylight and Sunlight – A guide to good Practice (Second Edition)”



BRE Guidelines state:

Light from the Sky

“If any part of a new building or extension, measured in a vertical section perpendicular to a main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25° to the horizontal, then the diffuse daylighting of the existing building may be adversely affected. This will be the case if either:

The VSC (Vertical Sky Component) measured at the centre of an existing main window is less than 27%, and less than 0.8 times its former value.

The analysis is based on measuring the VSC at the existing main windows. Main windows included, living rooms, kitchens, and bedrooms. Existing windows with VSC above 27% after proposed development are considered to still receive good daylight availability.

Sunlighting

If a living room of an existing dwelling has a main window facing within 90° of due south, and any part of a new development subtends an angle of more than 25° to the horizontal measured from the centre of the window in a vertical section perpendicular to the window, then the Sunlighting of the existing dwelling may be adversely affected. This will be the case if the centre of the window:

- *receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between 21 September and 21 March and*
- *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 annual probable sunlight hours.*

5.1 Methodology

The analysis therefore looked at existing windows for both daylight and sunlight.

The following neighbouring buildings were assessed.

- Montpelier Hill (as indicated)

Analysis was undertaken by calculating sunlight availability pre and post-development for indicative window locations centred on the façade of each dwelling as illustrated in Figure 5.1.1 below. It can be noted from the google maps image, fig 5.1.2, that the existing mature trees would have significant impact on the daylight and sunlight to the dwellings on Montpelier Hill, however, for the purpose of the analysis these trees have been excluded from this assessment as per BRE guide recommendations.

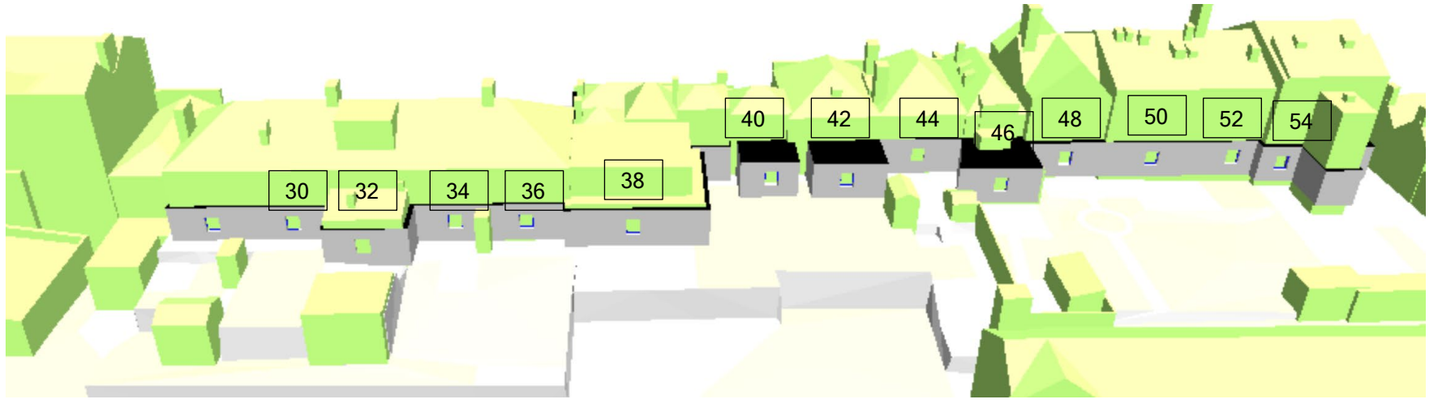


Fig 5.1.1 – Indicative Window Locations assessed for adjacent dwellings at Montpelier Hill North of Proposed Development

Fig 5.1.2 – Google Maps Image for Neighboring Dwellings on Montpelier Hill

5.2 Results – VSC (Daylight)

Room Reference	VSC Existing (%)	VSC Proposed (%)	Proposed/Existing	
Montpelier 28	30.13	28.19	0.94	PASS
Montpelier 30	27.66	25.14	0.91	PASS
Montpelier 32	30.55	27.89	0.91	PASS
Montpelier 34	26.61	23.5	0.88	PASS
Montpelier 36	30.71	27.85	0.91	PASS
Montpelier 38	31.37	27.91	0.89	PASS
Montpelier 40	30.01	26.75	0.89	PASS
Montpelier 42	30.18	26.89	0.89	PASS
Montpelier 44	27.62	24.6	0.89	PASS
Montpelier 46	31.25	28.12	0.9	PASS
Montpelier 48	30.47	27.52	0.9	PASS
Montpelier 50	31.8	28.97	0.91	PASS
Montpelier 52	28.86	25.71	0.89	PASS
Montpelier 54	21.02	18.35	0.87	PASS

Fig 5.2.1 – Predicted VSC Results

The analysis indicated that all existing residences on Montpelier Hill assessed for daylight impact were found to achieve full compliance with BRE recommendations, as VSC values were predicted to be either remain above 27% and or any reduction was less than 20%. These dwellings would therefore not be adversely affected by the proposed new development in terms of receipt of natural light.

5.3 Results - Sunlight

Room Reference	Annual Ex (%)	Annual Pr (%)	Pr/Ex	Winter Ex (%)	Winter Pr (%)	Winter Pr/Ex	Total Potential Annual Sunny Hours	Room Annual Ex (%)	Room Annual Pr (%)	Room Winter Ex (%)	Room Winter Pr (%)	
Montpelier 28	79	74	0.94	27	23	0.83	1832	79	74	27	23	Pass
Montpelier 30	64	60	0.93	20	16	0.78	1832	64	60	20	16	Pass
Montpelier 32	82	77	0.94	30	25	0.84	1832	82	77	30	25	Pass
Montpelier 34	63	59	0.93	21	17	0.78	1832	63	59	21	17	Pass
Montpelier 36	76	70	0.92	28	22	0.79	1832	76	70	28	22	Pass
Montpelier 38	81	76	0.94	30	25	0.84	1832	81	76	30	25	Pass
Montpelier 40	77	72	0.94	29	24	0.83	1832	77	72	29	24	Pass
Montpelier 42	75	70	0.94	23	19	0.81	1832	75	70	23	19	Pass
Montpelier 44	65	60	0.93	18	13	0.74	1832	65	60	18	13	Pass
Montpelier 46	82	77	0.94	30	25	0.84	1832	82	77	30	25	Pass
Montpelier 48	80	76	0.95	30	26	0.87	1832	80	76	30	26	Pass
Montpelier 50	78	74	0.96	29	25	0.88	1832	78	74	29	25	Pass
Montpelier 52	59	56	0.95	22	19	0.88	1832	59	56	22	19	Pass
Montpelier 54	44	41	0.93	14	12	0.8	1832	44	41	14	12	Pass

Fig 5.3.1 – Predicted ASHP Results

Similarly, analysis undertaken for sunlight availability determined BRE compliance with regards to all existing dwellings assessed on Montpelier Hill, confirming their currently received sunlight would not be adversely affected by the proposed new development.

APPENDIX A - Daylight Standards

The Daylight Analysis section of the report assesses the Average Daylight Factors in accordance with the BRE 209 guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition). This guide is specifically referenced within Section 6.6 of The Department of Housing, Planning and Local Government document – Sustainable Urban Housing: Design Standards for New Apartments (2018) which advises that:

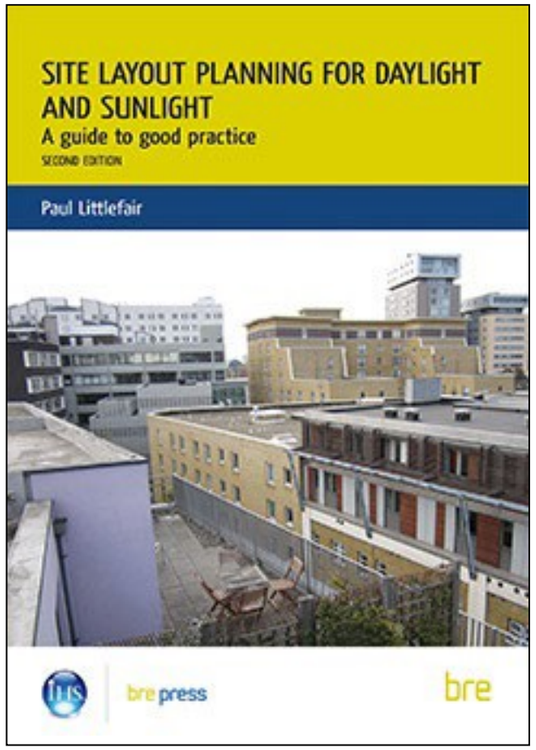
Planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting' when undertaken by development proposers which offer the capability to satisfy minimum standards of daylight provision.

Subsequent to this guidance, a new European Standard for Daylight in Buildings (EN 17037) was released in 2018 and adopted as IS EN 17037 in January 2019. This standard does not fall under any *mandatory* directive of the EU or any Irish Statutory Instrument and therefore remains *advisory*.

On release of the EN standard within the UK, the BRE confirmed their intention to provide a National Annex, which will subsequently inform an updated and revised BRE209 document. The rational for this Annex was that the Median Daylight Factor methodology applied within EN 17037 do not differentiate between residential and non- residential applications, with the standard stipulating a minimum target illuminance of 300 lux for all Building Applications. However, it is recognised by BRE that Dwellings have lower natural light requirements compared to non-domestic buildings (i.e. BS. 8602-2 has Average Daylight Factors of 1.0-2.0% for dwellings, as opposed to Average Daylight Factors of 2.0-5.0% for non-residential). Furthermore, providing higher daylight level in residential applications may in some instances be counter-productive in that excessive glazing provision may promote overheating.

This Annex, which was included in the British Standard version of EN 17037 identifies the target illuminances for dwellings that should be exceeded for over at least 50% of a room, and for at least half of annual daylight hours (i.e. Median). Utilising the Median External Illuminance of 14,900 Lux for Dublin (EN 17037 Table A.3) the following Median Daylight Factors may therefore be applied, adopting the methodology used in BS.EN 17037 Annex NA:

Room type	**Target illuminance** E_T (lx)	**Median Daylight Factors**
Bedroom	100	0.7%
Living room	150	1.0%



A compliance comparison was then made for the Living/ Dining Rooms between the existing B.S.8206-2008 (as referenced within BRE.209, DoHPLG Planning Guidelines and used for analysis within this report) and the BS EN.17037:2018 Annex NA (as understood to be introduced in forthcoming BRE.209 Guidelines).

Figure A.2 compares for each Living/ Dining space sampled:

Average Daylight Factor (ADF) as per BS.8206-2 (horizontal axis), with rooms deemed compliant where ADF exceeds 1.5%

Extent of room where Daylight Factor exceeds BS.EN.17037 Annex NA target of 1.0% (vertical axis), with rooms deemed compliant where extent exceeds 50% (i.e. Median Daylight Factor or MDF).

This graph illustrates that the results are generally aligned under both methodologies, with rooms where compliance in accordance with B.S.8206-2 within this report has been confirmed were also generally found to be compliant to BS.EN.17037 Annex NA (green markers) and the converse non-compliances also true (red markers). There were only some isolated rooms found compliant to BS.8206-2 deemed (borderline) non-compliant to the EN.17037 methodology assessed.

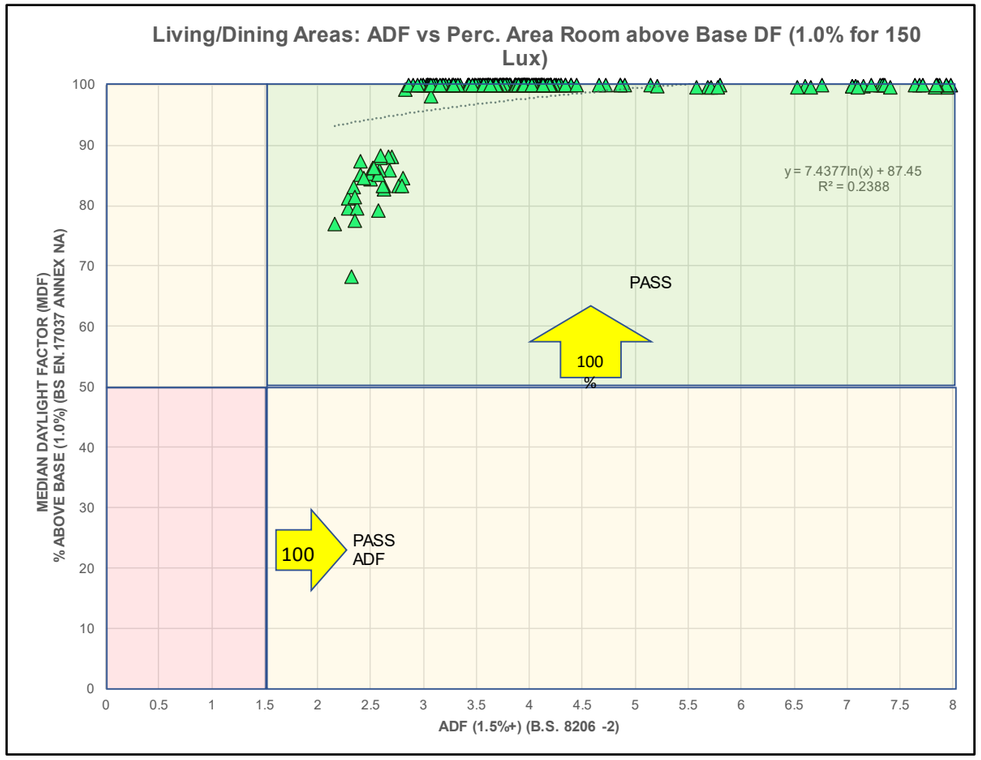


Fig A.2: Compliance Comparison: ADF-v-MDF

APPENDIX B – Site Shading Diagrams

Equinox March 21st

Extent of Existing Shadow	
Extent of Additional Shadow	

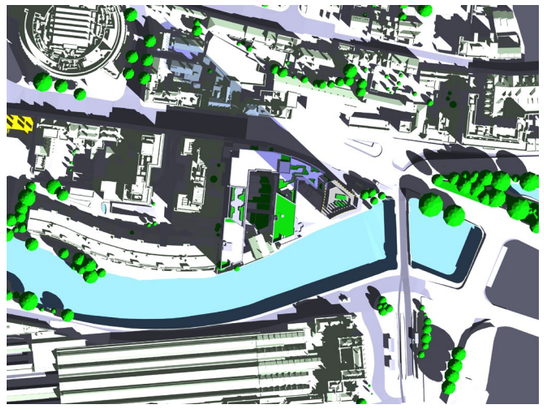
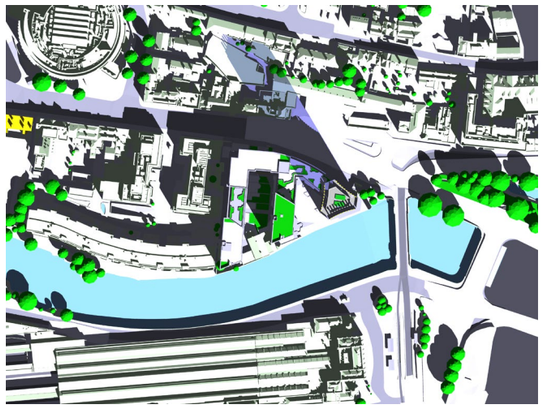
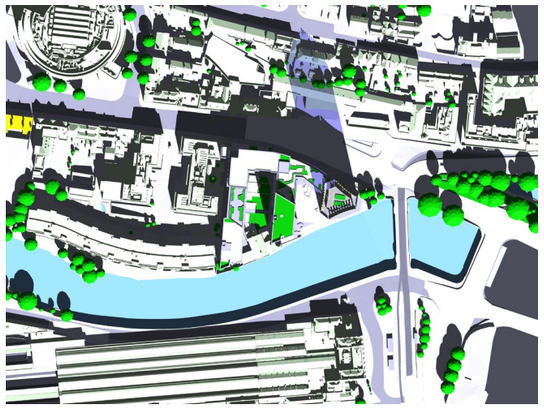
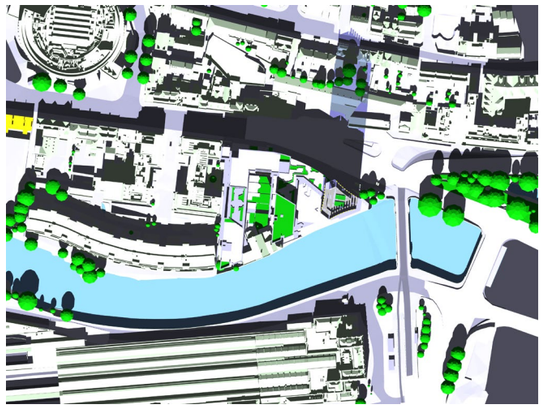
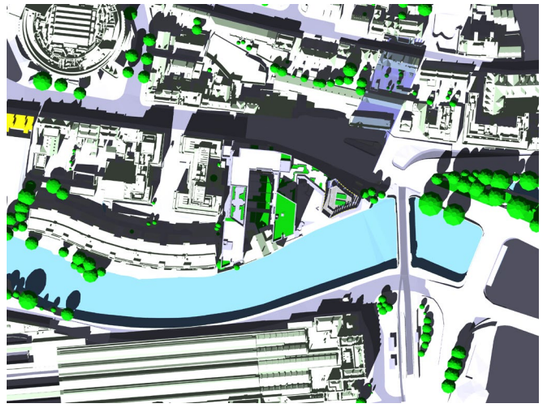
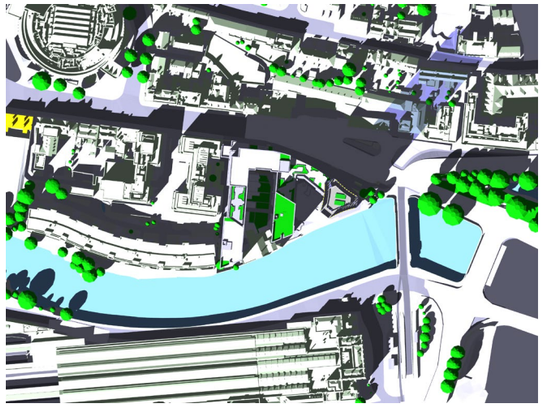
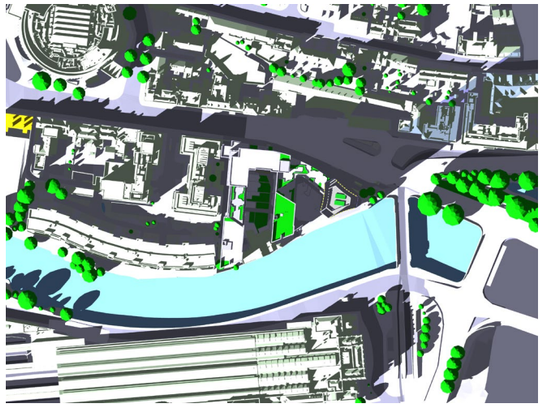
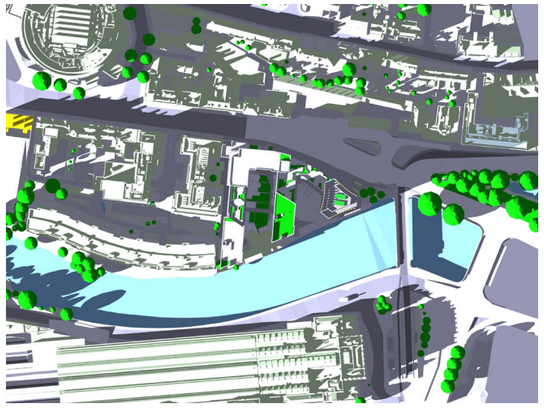
			
10:00	11:00	12:00	13:00
			
14:00	15:00	16:00	17:00

Fig B1: Sunlight and Site Shading Diagrams - Equinox (March 21st): 10:00-17:00 hrs

Extent of Existing Shadow
Extent of Additional Shadow

Summer Solstice June 21st

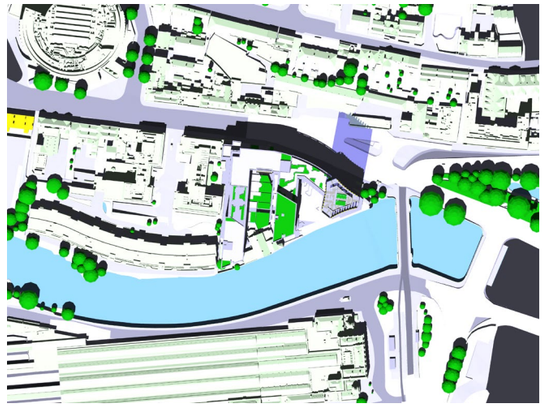
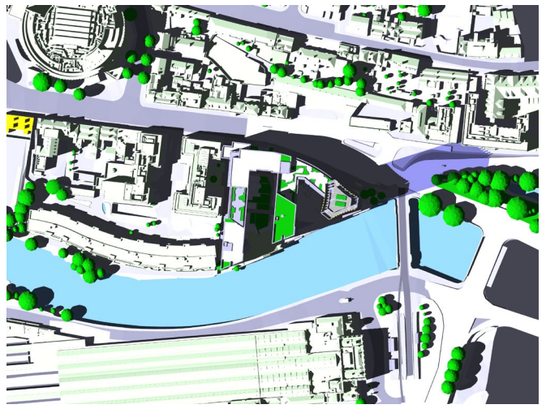
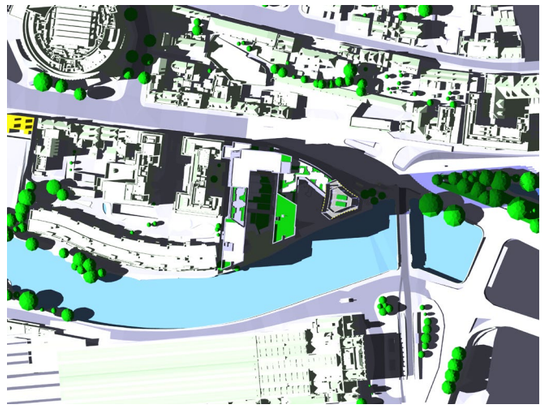
			
10:00	11:00	12:00	13:00
			
14:00	15:00	16:00	17:00

Fig B1: Sunlight and Site Shading Diagrams – Summer Solstice (June 21st): 10:00-17:00 hrs

Winter Solstice December 21st

Extent of Existing Shadow	
Extent of Additional Shadow	

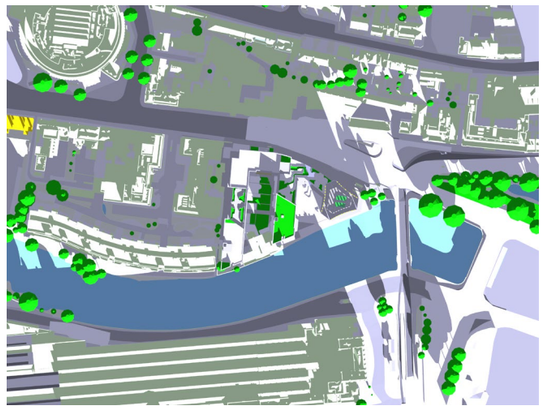
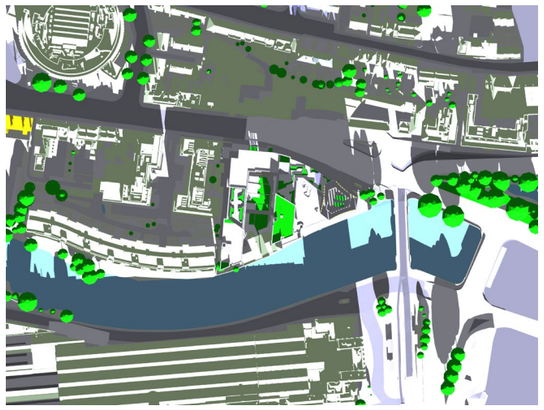
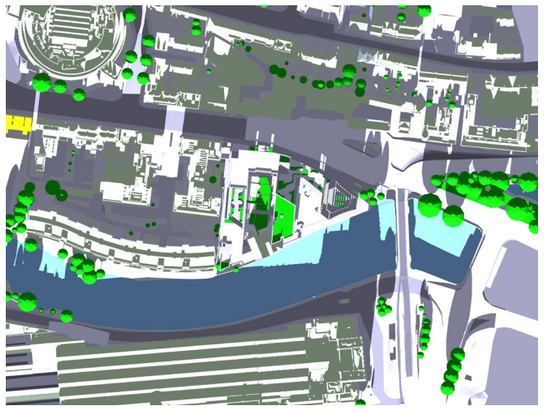
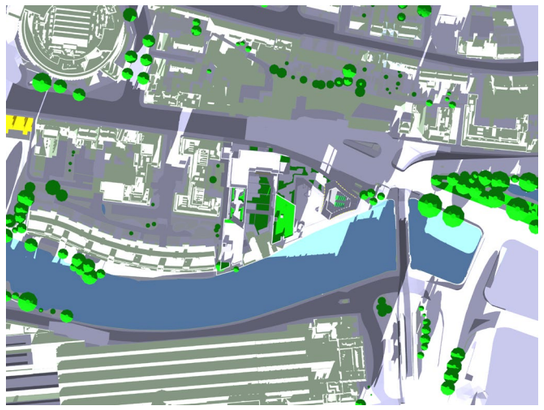
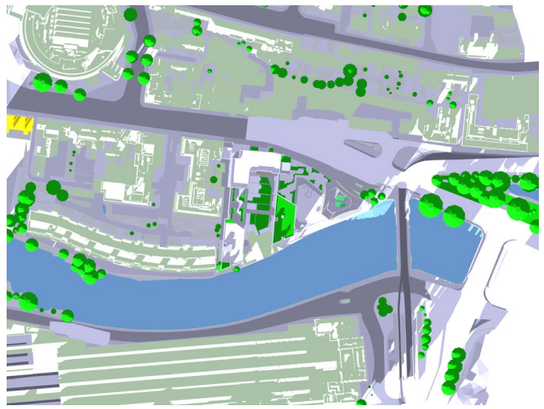
			
10:00	11:00	12:00	13:00
			
14:00	15:00	16:00	17:00

Fig B3: Sunlight and Site Shading Diagrams - Winter Solstice (December 21st): 10:00-17:00 hrs

Whilst both winter and summer Solstices have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

Shadow Analysis Montpelier Hill

The images below illustrate the predicted shadowing of the local environs as a result of inclusion of the massing of the tower on the 21st March (Solar Equinox: Sun's annual mean height in the sky) for the concurrent four hours when the tower shadow is in proximity to the dwellings on Montpelier Hill.

As can be seen from the image, the shadow of the tower, shown as blue, will shade the dwellings on Montpelier Hill, however this will only be for part of one hour.

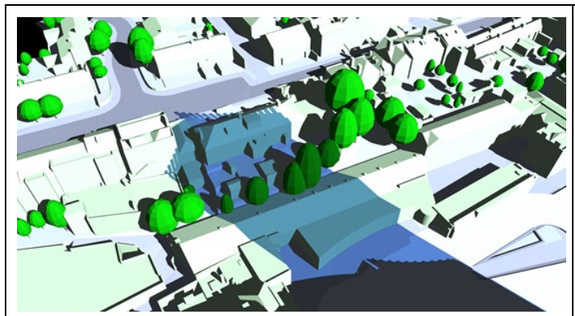
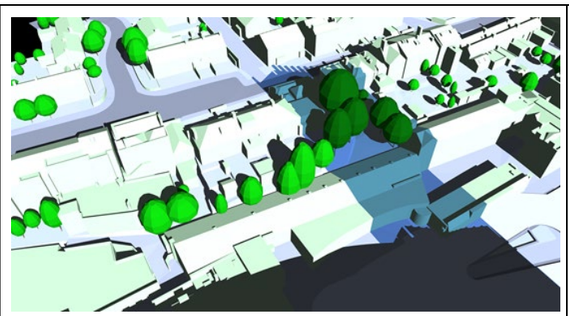
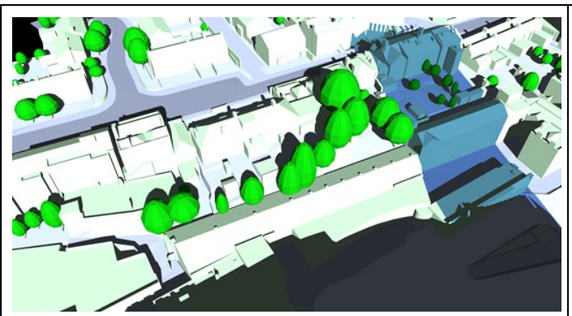
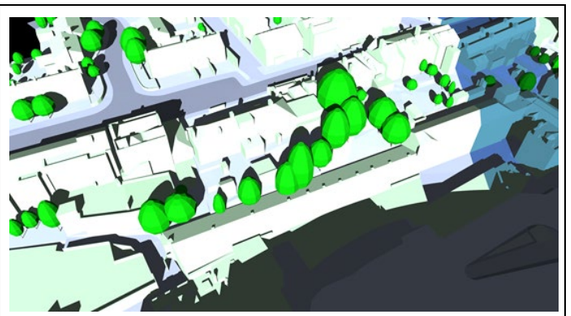
			
21st March @ 12:00	21st March @ 13:00	21st March @ 14:00	21st March @ 15:00

Fig B4 - Shadow Diagram - March 21st @ 12:00,13:00,14:00 & 15:00

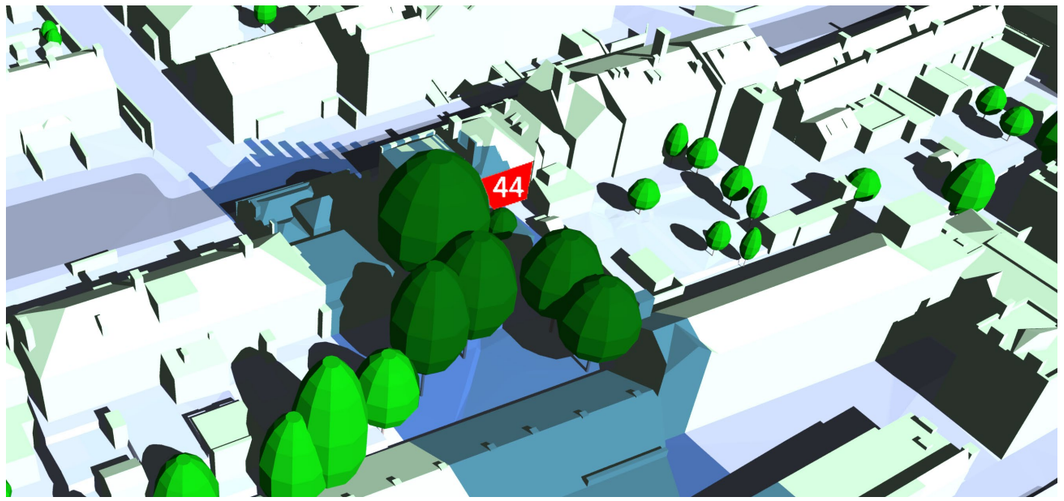
Extent of Existing Shadow	
Extent of Additional Shadow	

Fig B5 Area of Assessment

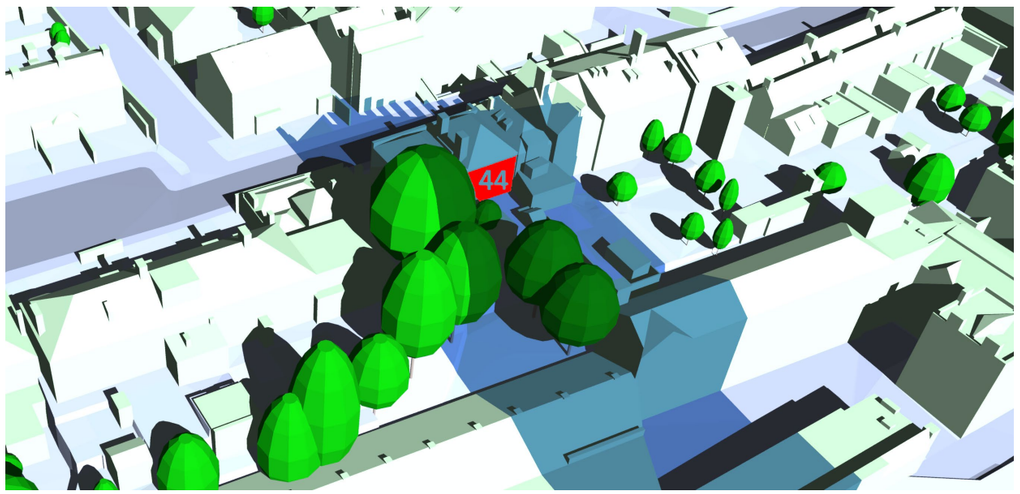
Part of one Hour Shadow Analysis

Extent of Existing Shadow	
Extent of Additional Shadow	

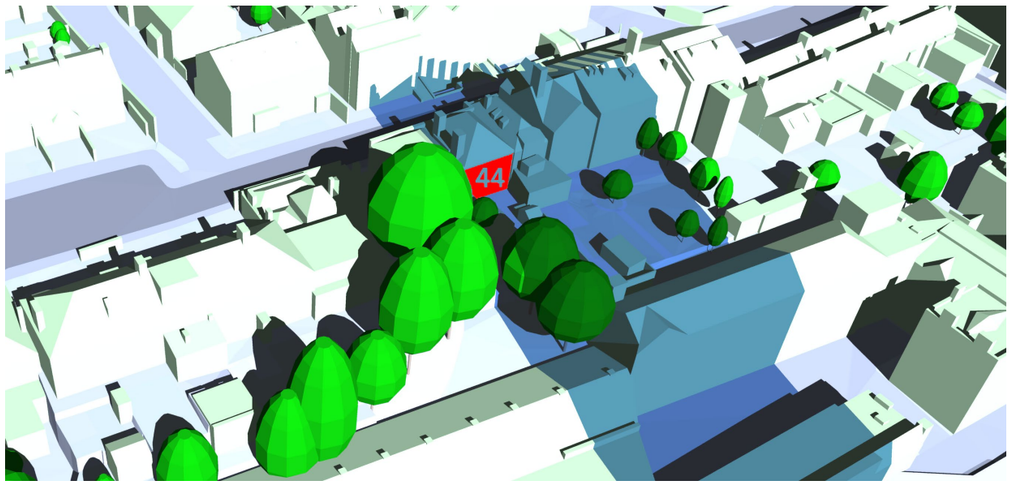
The images below illustrate the incident shadow on the receiving area on the 21st of March from 13:00 to 14:00 in 20-minute intervals with emphasis on number 44.



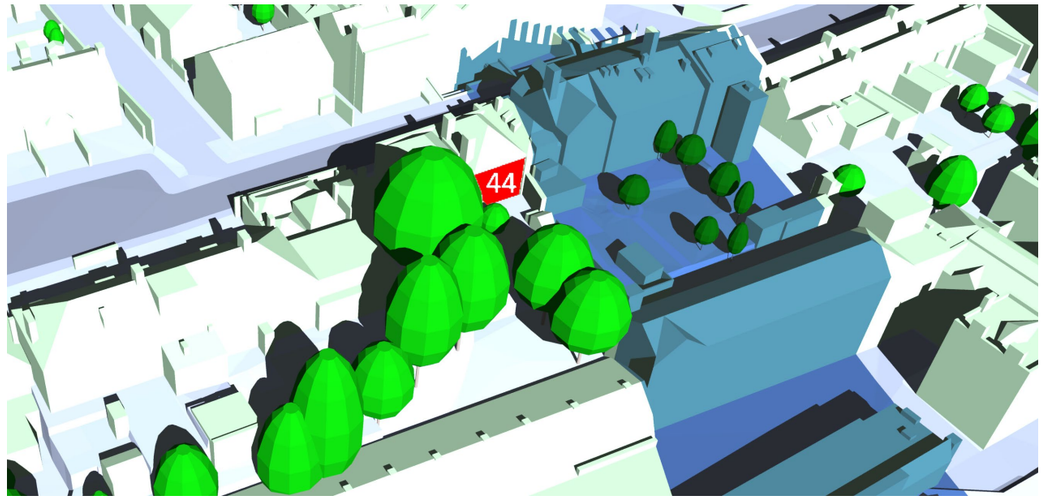
13:00



13:20



13:40

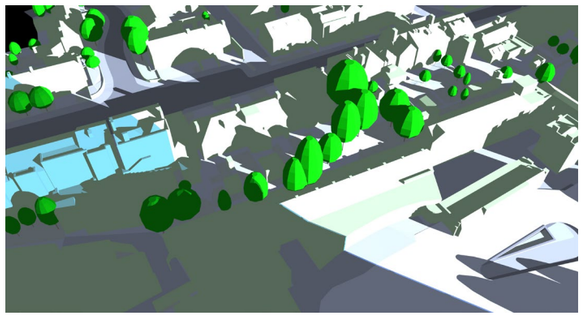
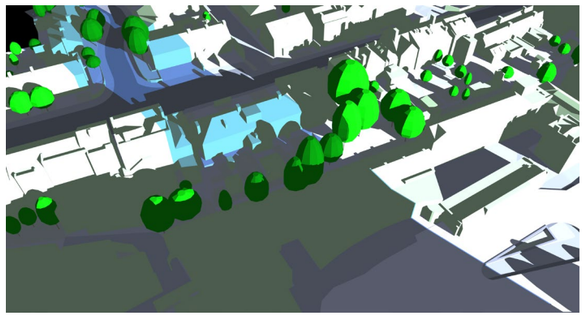
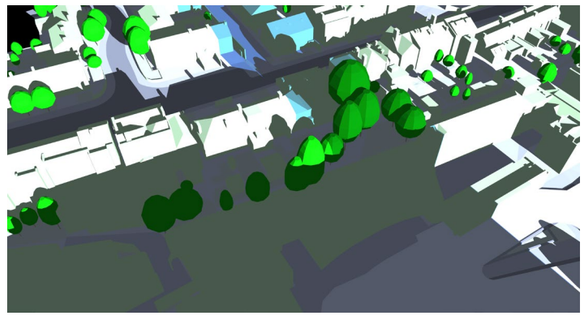
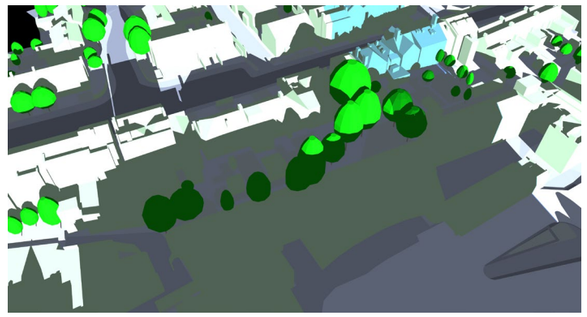
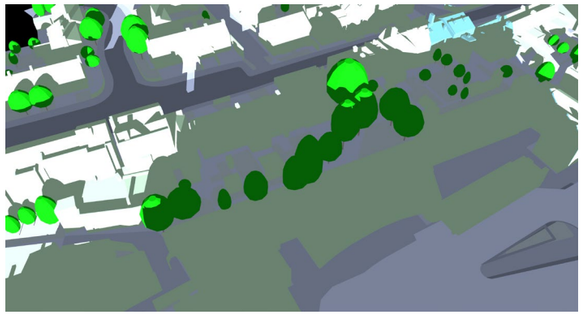
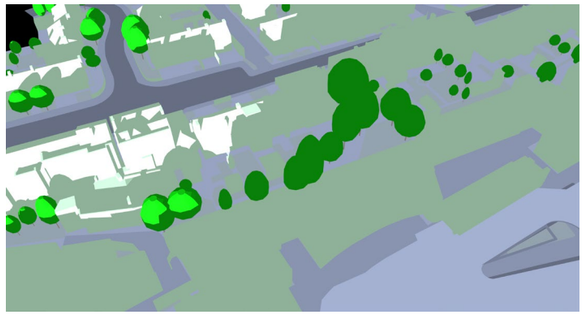
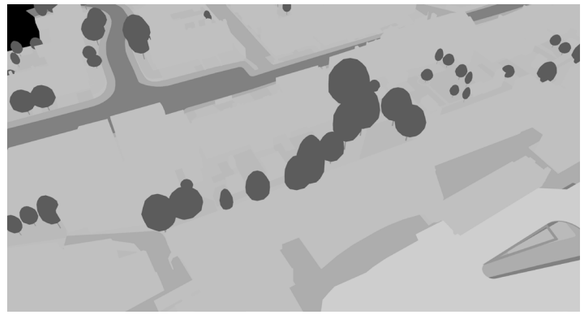
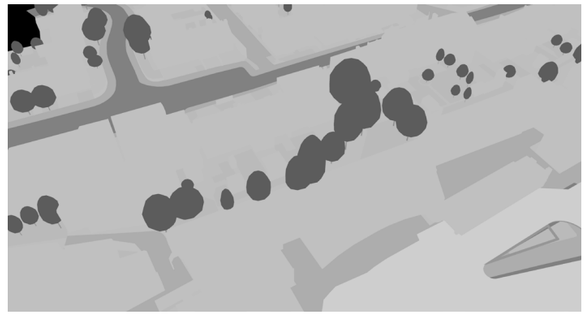


14:00

Monthly Shadow Analysis

Extent of Existing Shadow	
Extent of Additional Shadow	

The images below illustrate the incident shadow on the receiving area on the 21st of January.

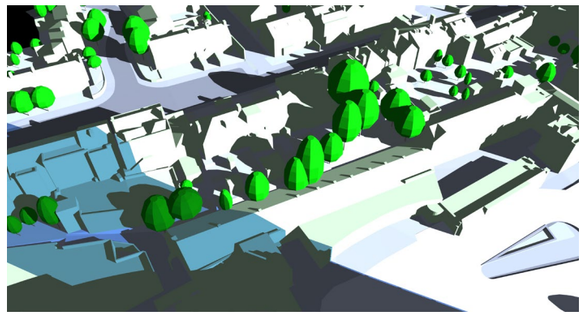
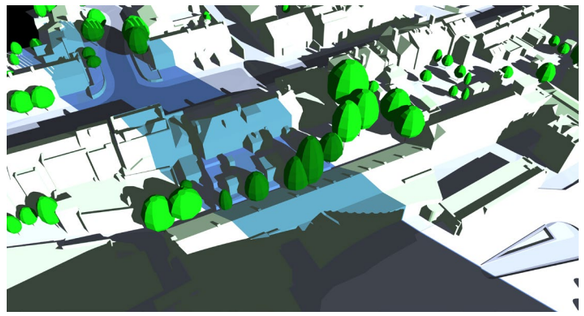
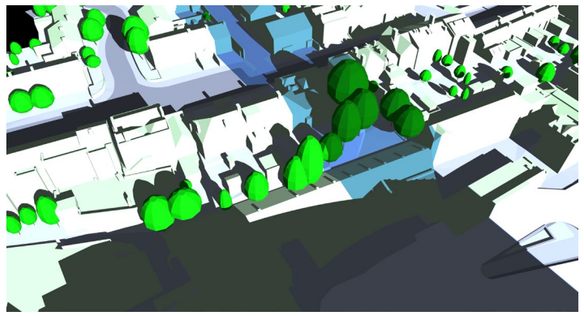
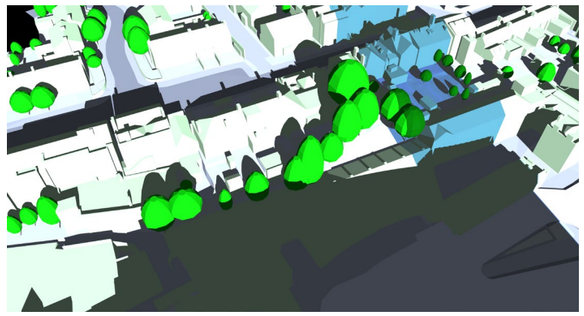
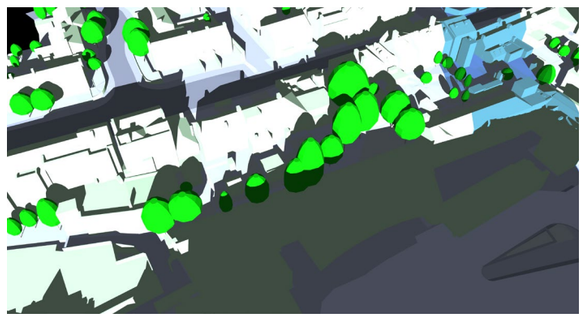
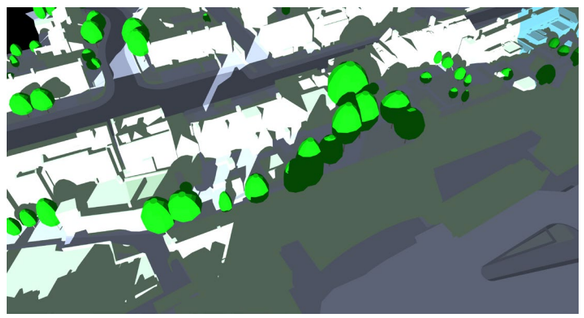
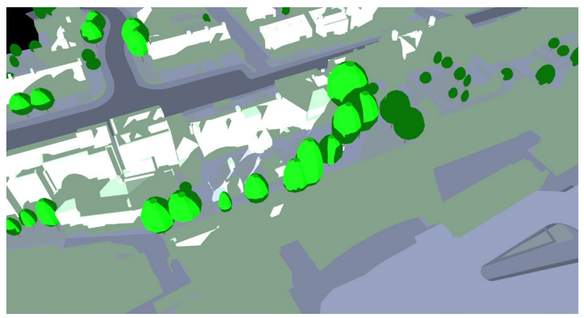
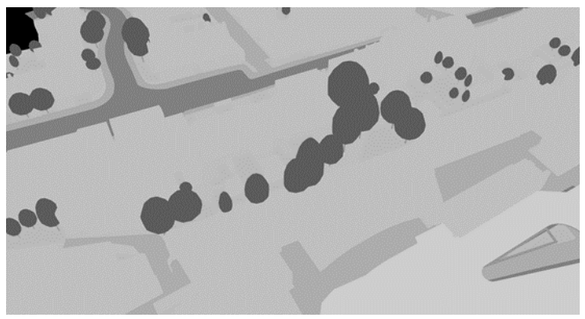
			
10:00	11:00	12:00	13:00
			
14:00	15:00	16:00	17:00

Whilst both winter and summer months have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

Monthly Shadow Analysis

Extent of Existing Shadow	
Extent of Additional Shadow	

The images below illustrate the incident shadow on the receiving area on the 21st of February.

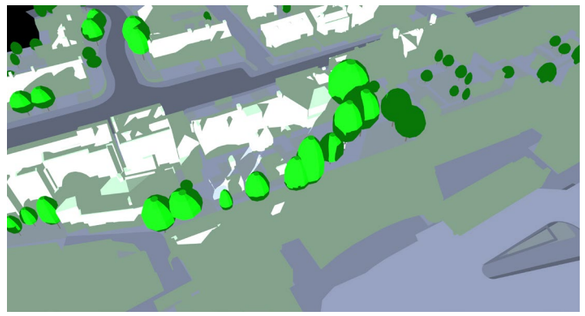
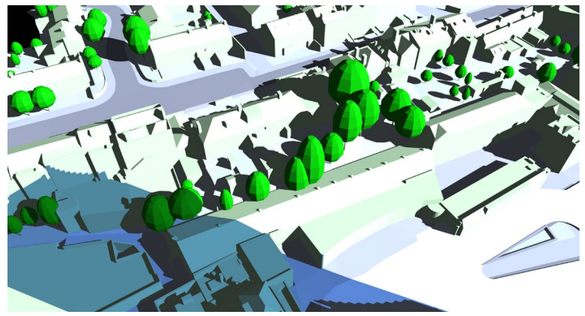
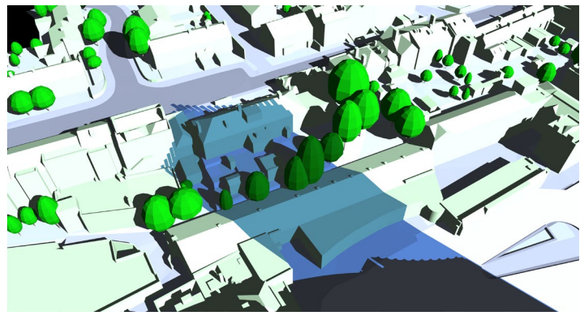
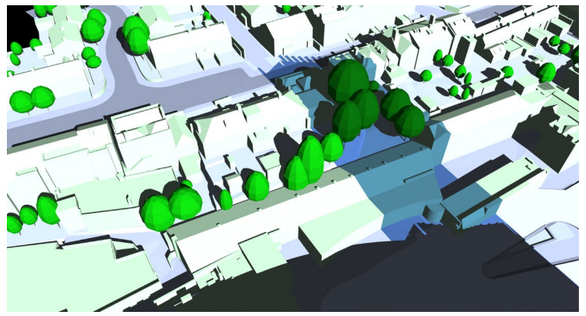
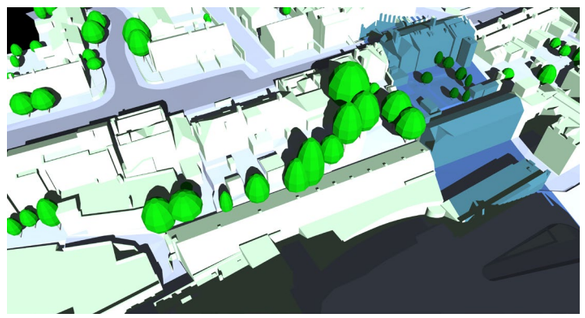
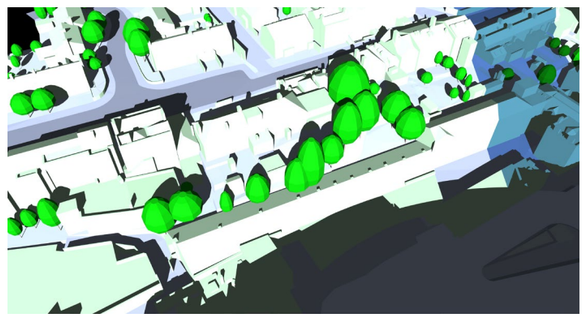
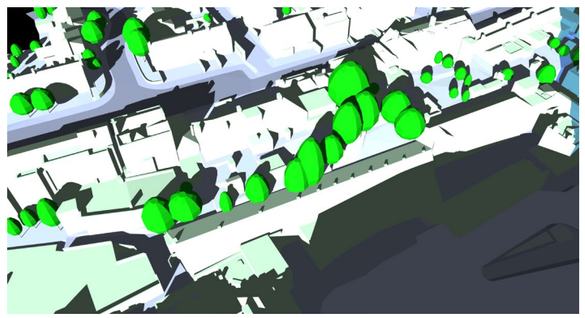
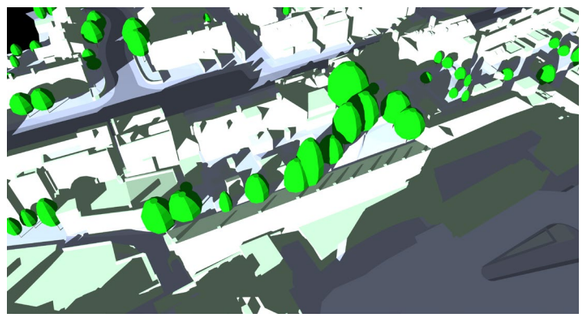
			
10:00	11:00	12:00	13:00
			
14:00	15:00	16:00	17:00

Whilst both winter and summer months have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

Monthly Shadow Analysis

Extent of Existing Shadow	
Extent of Additional Shadow	

The images below illustrate the incident shadow on the receiving area on the 21st of March. (Note change due to daylight savings).

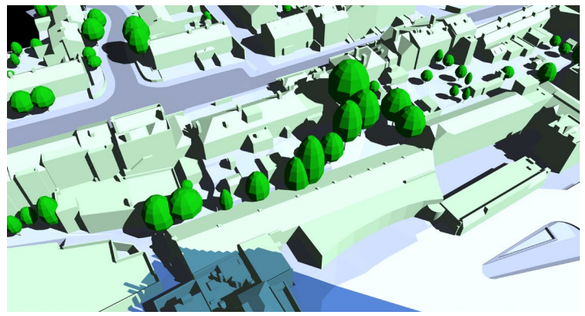
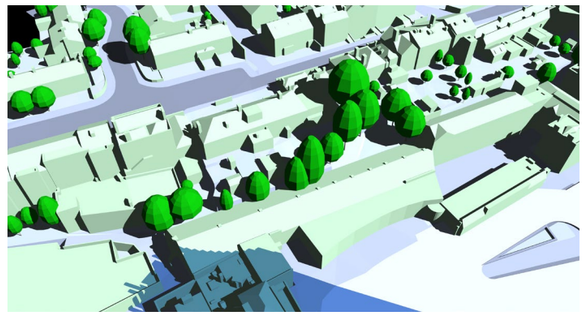
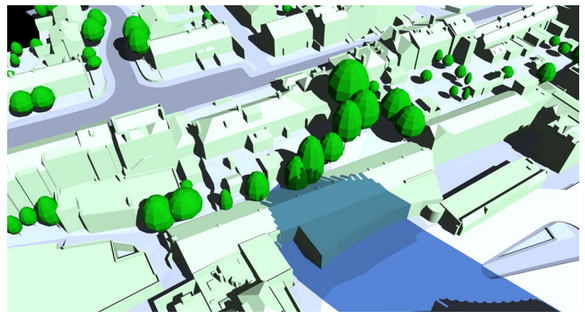
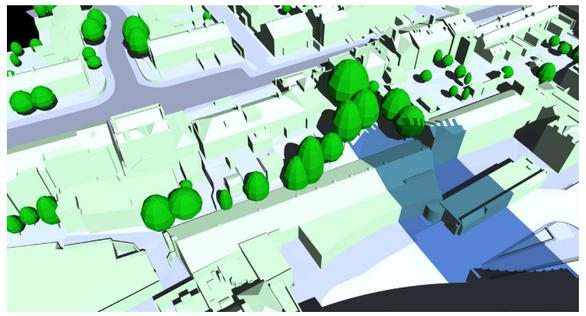
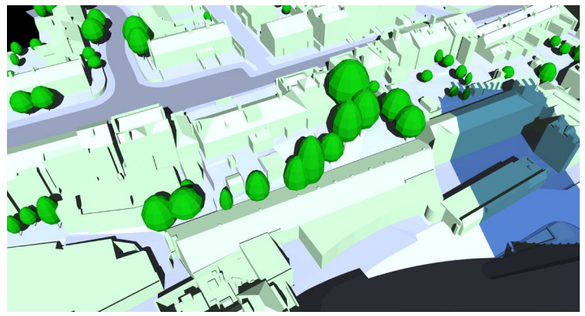
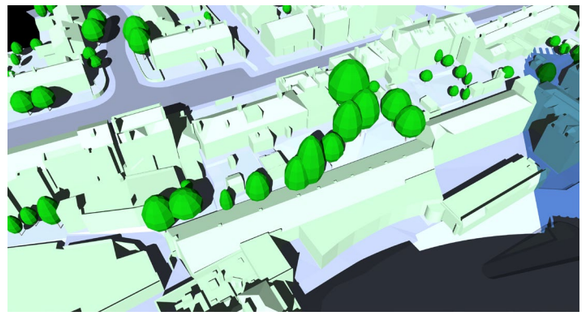
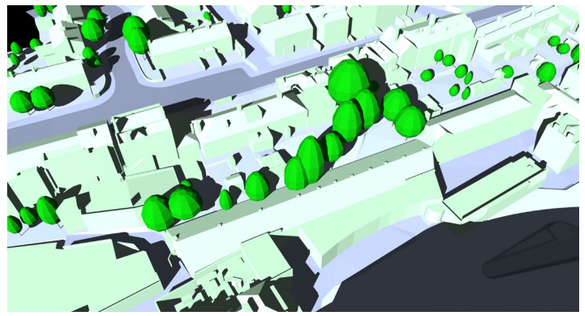
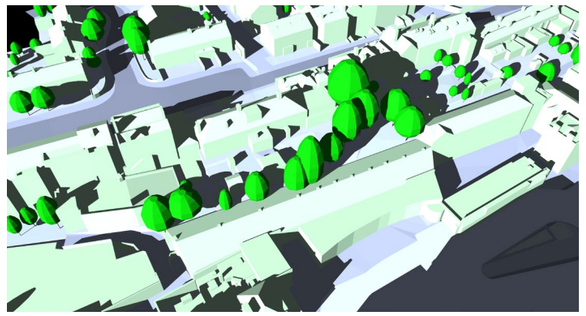
			
10:00	11:00	12:00	13:00
			
14:00	15:00	16:00	17:00

Whilst both winter and summer months have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

Monthly Shadow Analysis

Extent of Existing Shadow	
Extent of Additional Shadow	

The images below illustrate the incident shadow on the receiving area on the 21st of April.

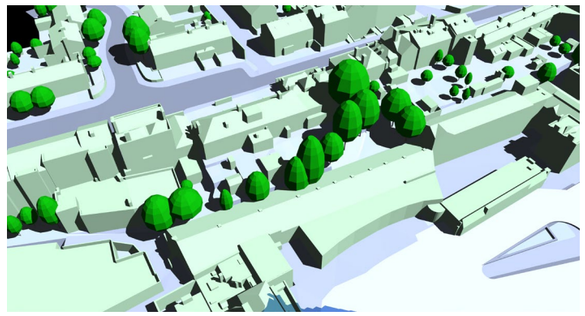
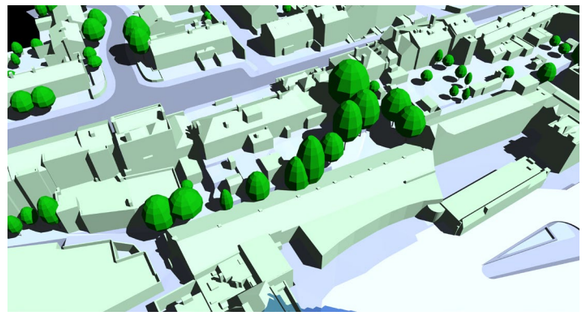
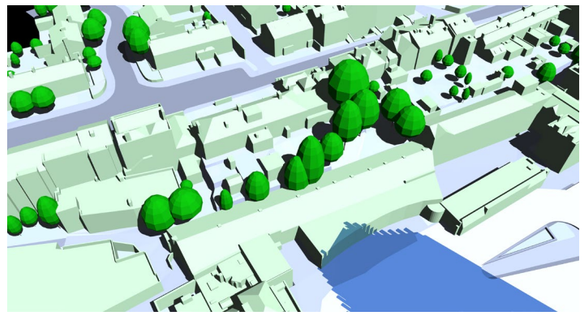
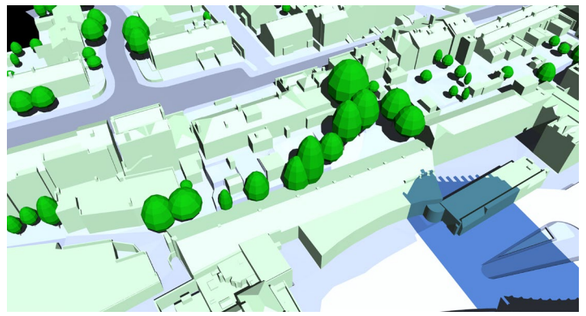
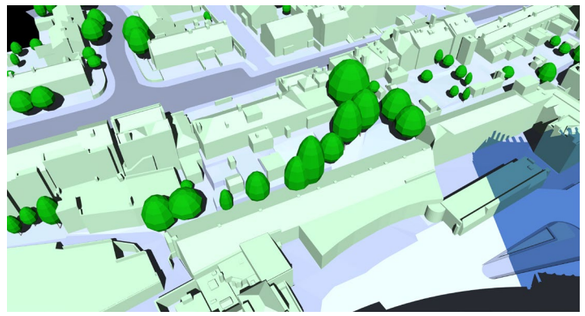
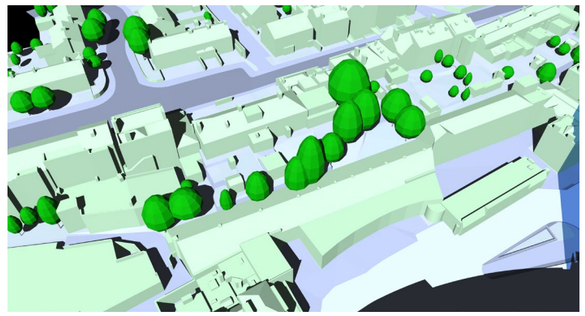
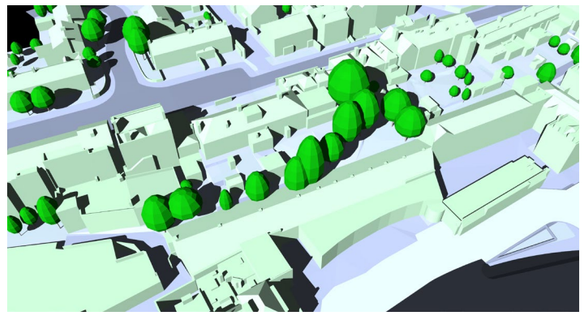
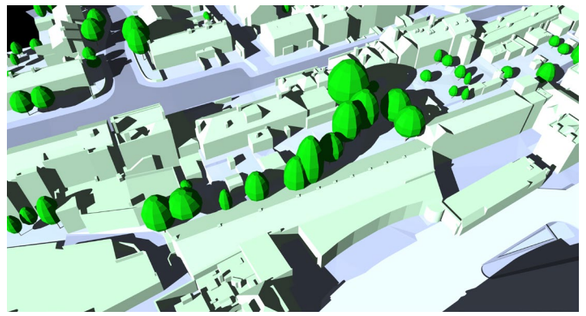
			
10:00	11:00	12:00	13:00
			
14:00	15:00	16:00	17:00

Whilst both winter and summer months have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

Monthly Shadow Analysis

Extent of Existing Shadow	
Extent of Additional Shadow	

The images below illustrate the incident shadow on the receiving area on the 21st of May.

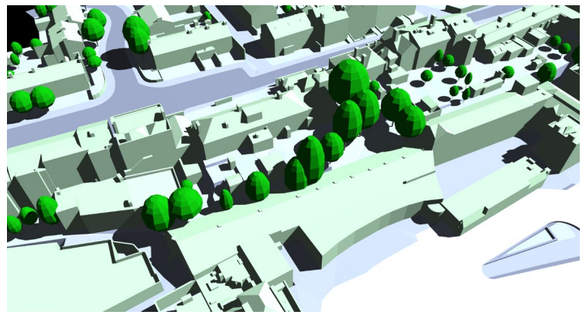
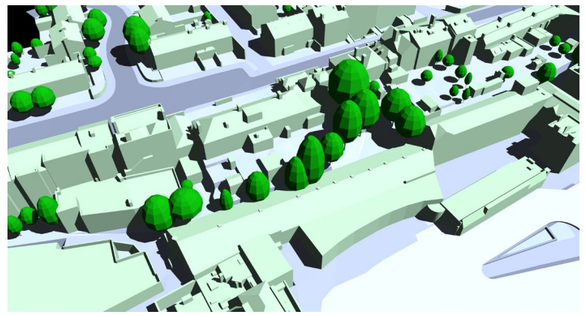
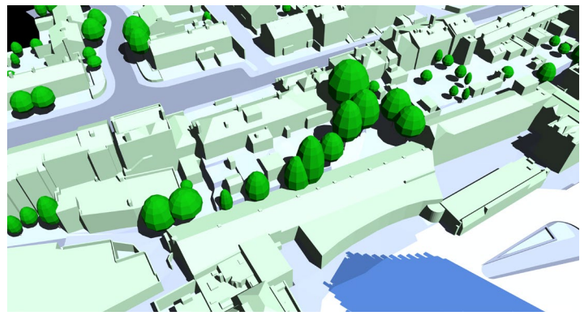
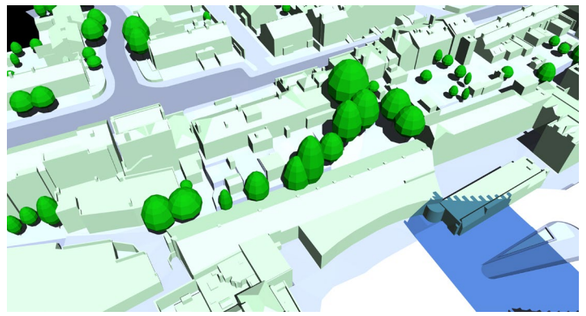
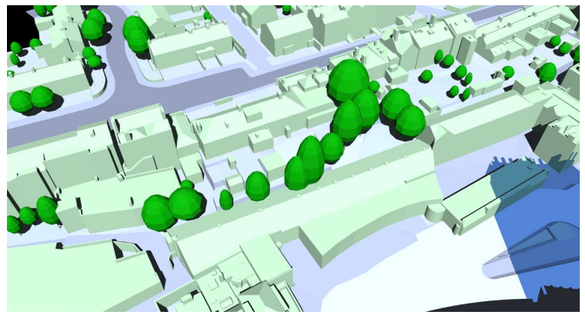
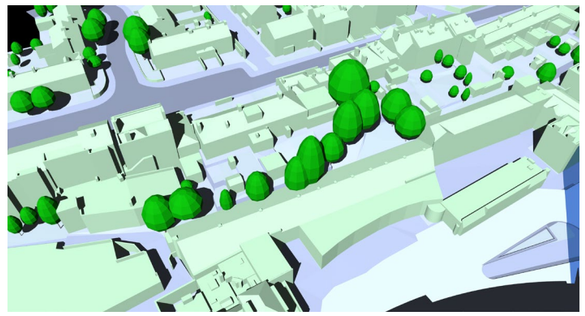
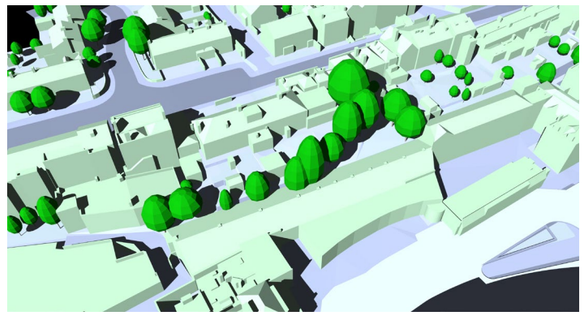
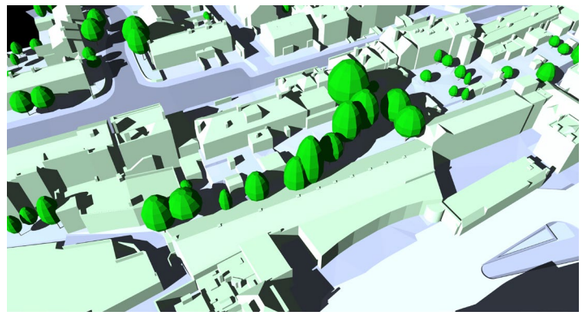
10:00	11:00	12:00	13:00
			
14:00	**15:00**	**16:00**	**17:00**
			

Whilst both winter and summer months have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

Monthly Shadow Analysis

Extent of Existing Shadow	
Extent of Additional Shadow	

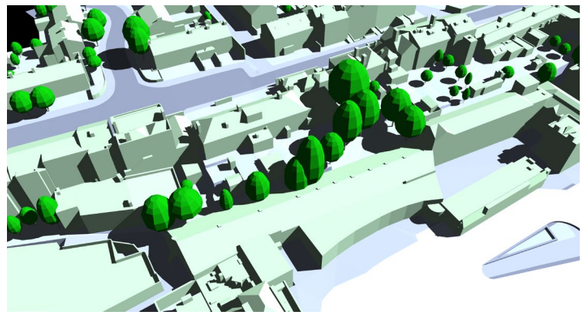
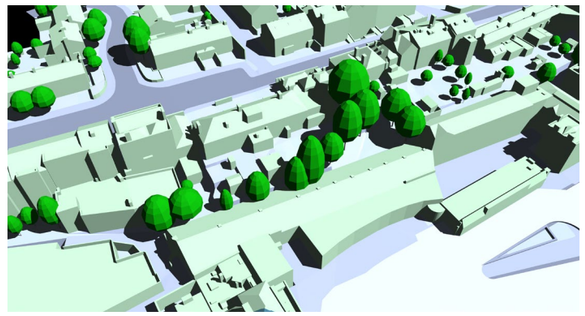
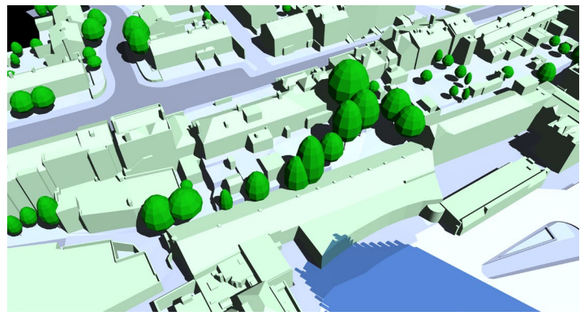
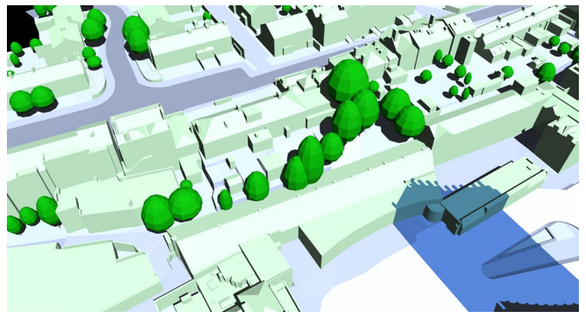
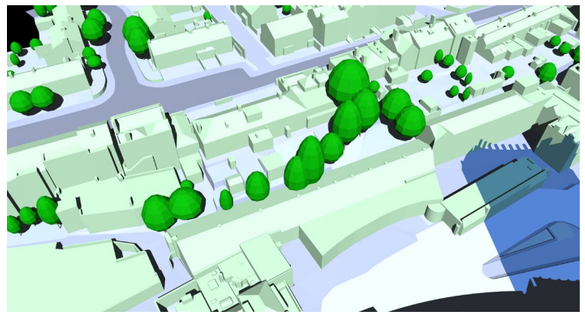
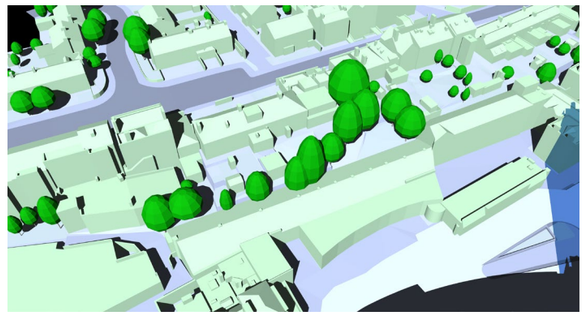
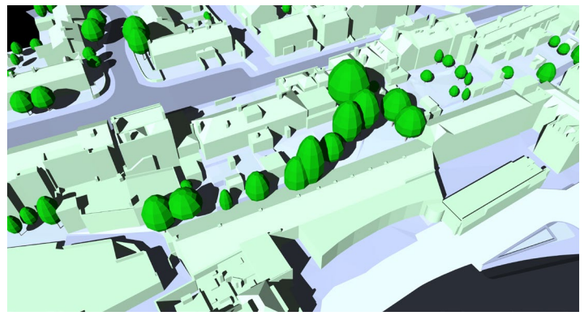
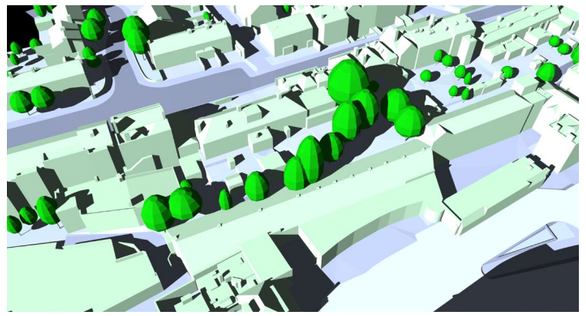
The images below illustrate the incident shadow on the receiving area on the 21st of June.

			
10:00	11:00	12:00	13:00
			
14:00	15:00	16:00	17:00

Monthly Shadow Analysis

Extent of Existing Shadow	
Extent of Additional Shadow	

The images below illustrate the incident shadow on the receiving area on the 21st of July.

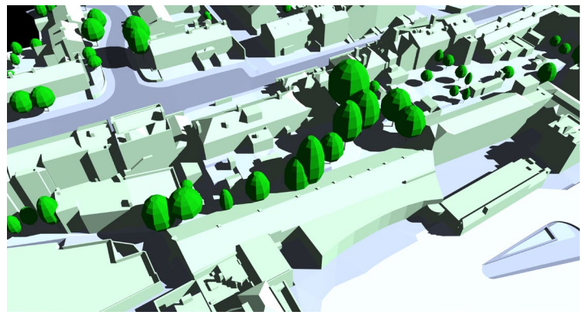
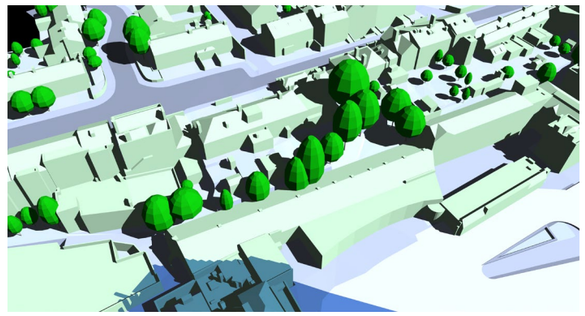
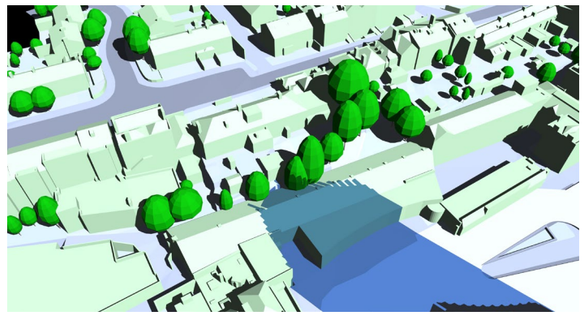
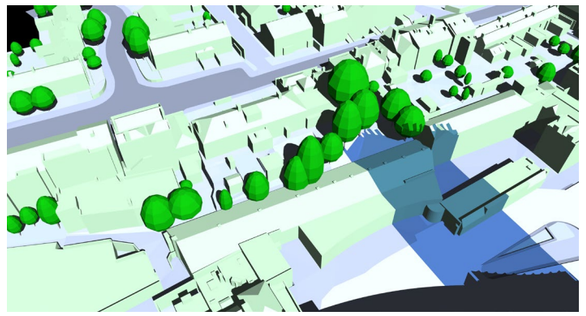
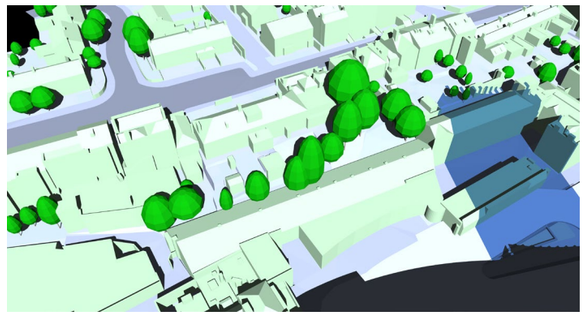
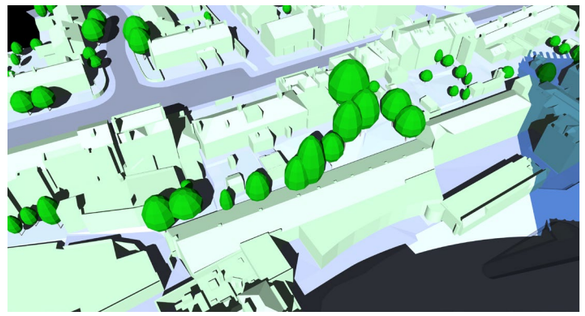
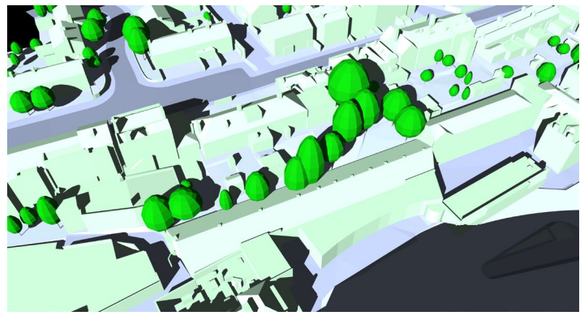
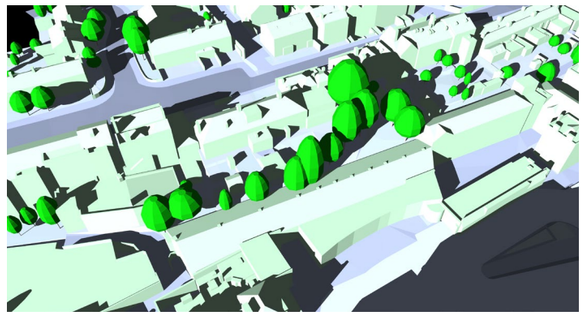
			
10:00	11:00	12:00	13:00
			
14:00	15:00	16:00	17:00

Whilst both winter and summer months have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

Monthly Shadow Analysis

Extent of Existing Shadow	
Extent of Additional Shadow	

The images below illustrate the incident shadow on the receiving area on the 21st of August.

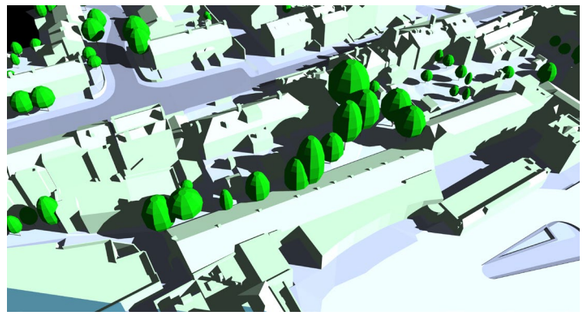
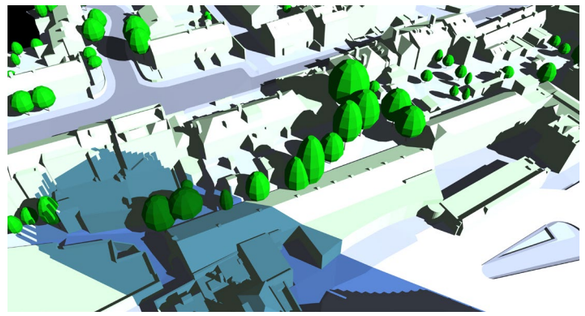
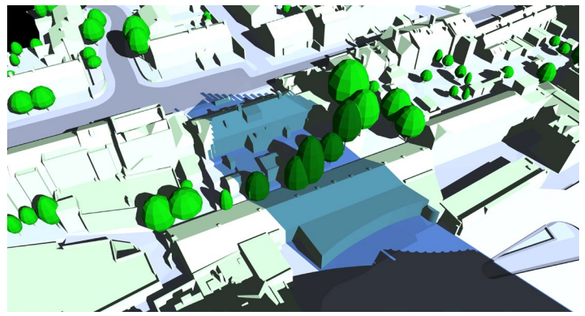
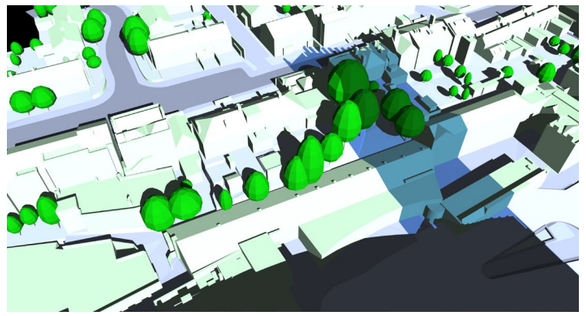
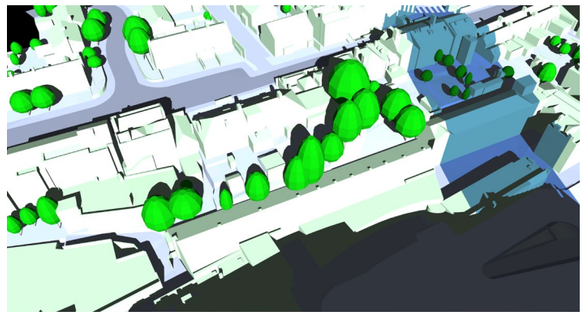
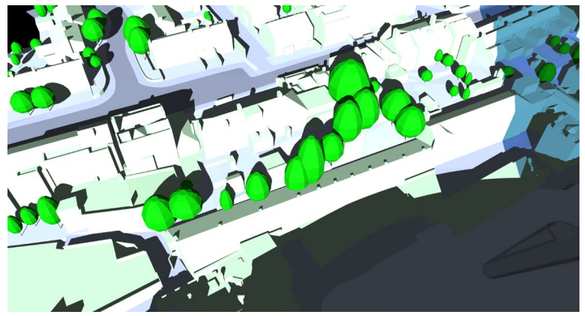
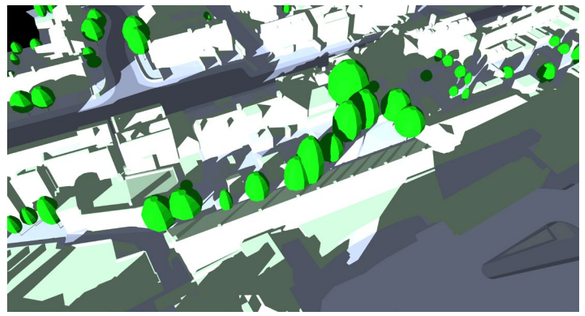
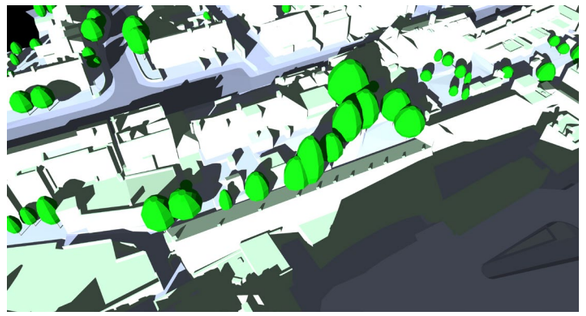
			
10:00	11:00	12:00	13:00
			
14:00	15:00	16:00	17:00

Whilst both winter and summer months have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

Monthly Shadow Analysis

Extent of Existing Shadow	
Extent of Additional Shadow	

The images below illustrate the incident shadow on the receiving area on the 21st of September.

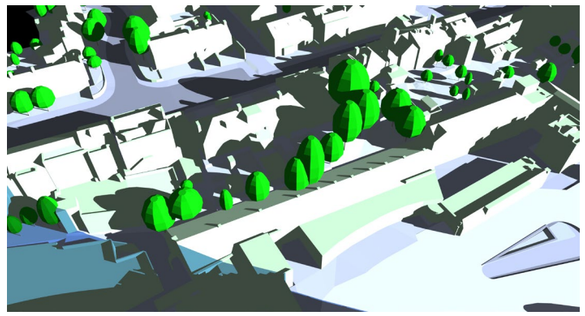
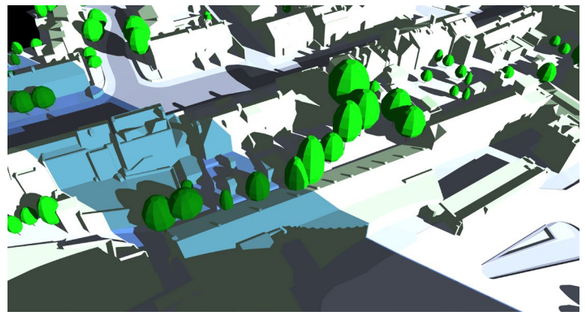
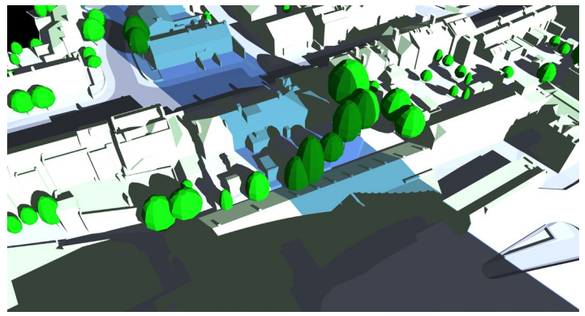
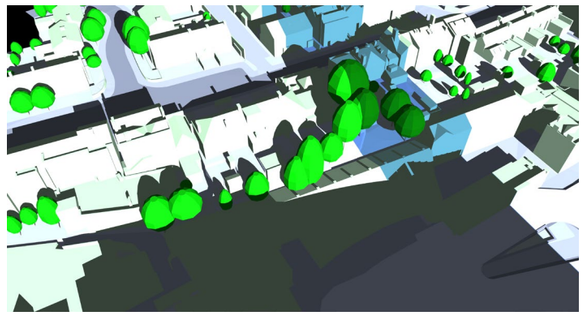
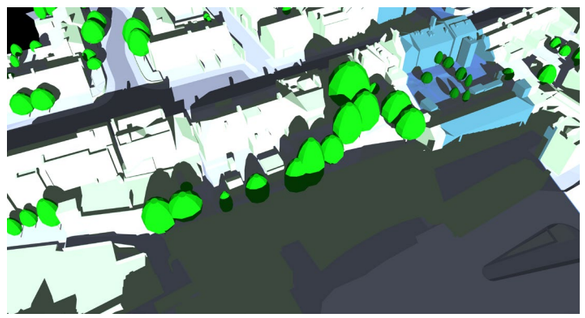
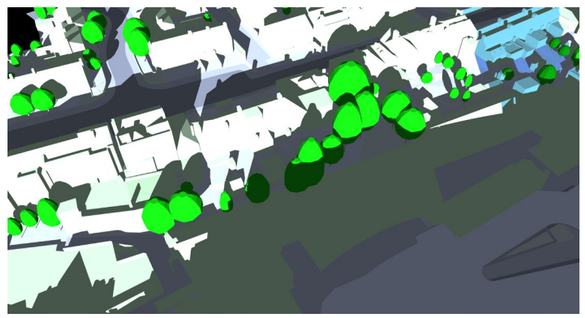
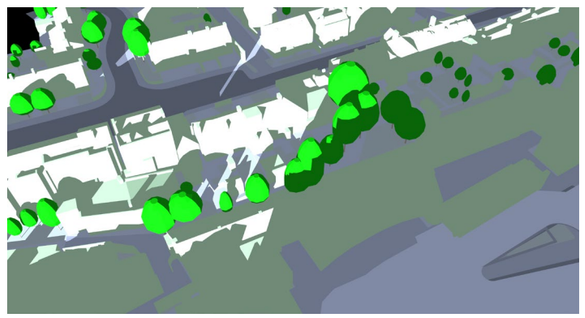
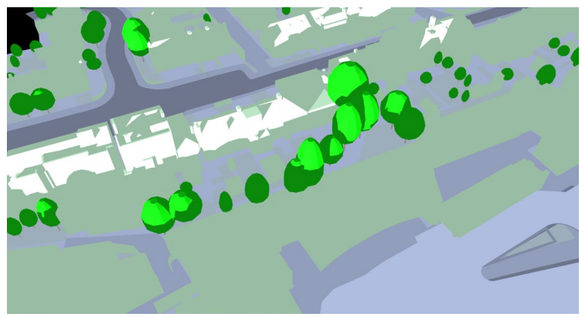
			
10:00	11:00	12:00	13:00
			
14:00	15:00	16:00	17:00

Whilst both winter and summer months have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

Monthly Shadow Analysis

Extent of Existing Shadow	
Extent of Additional Shadow	

The images below illustrate the incident shadow on the receiving area on the 21st of October.

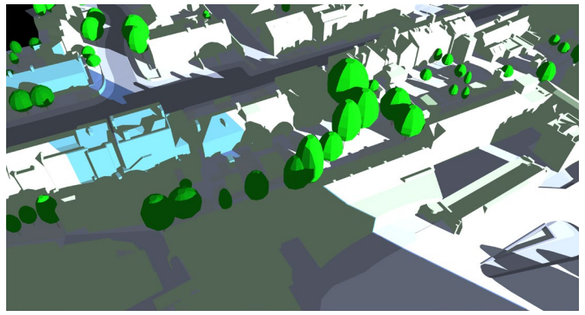
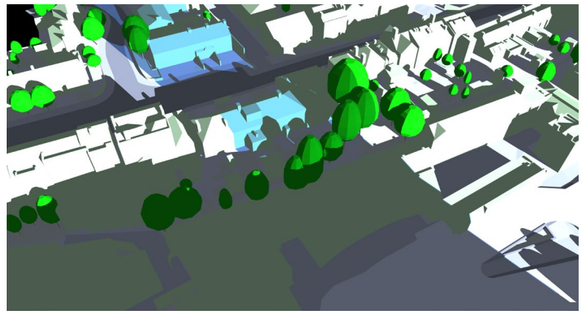
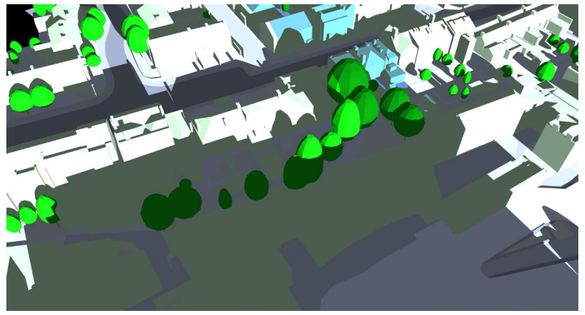
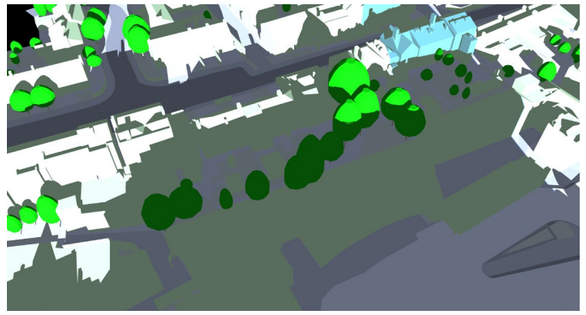
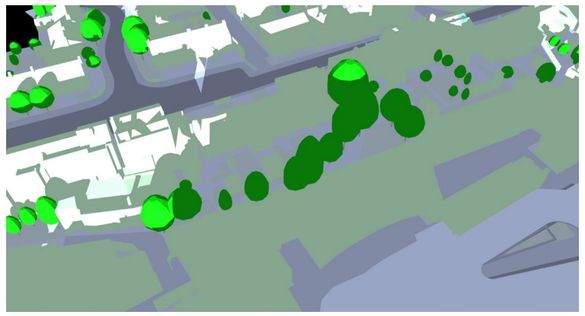
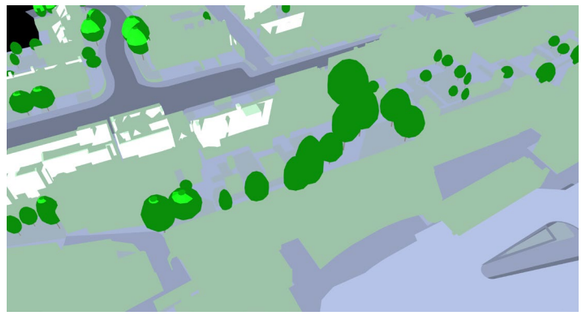
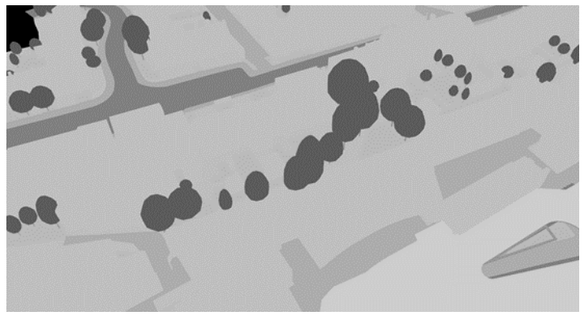
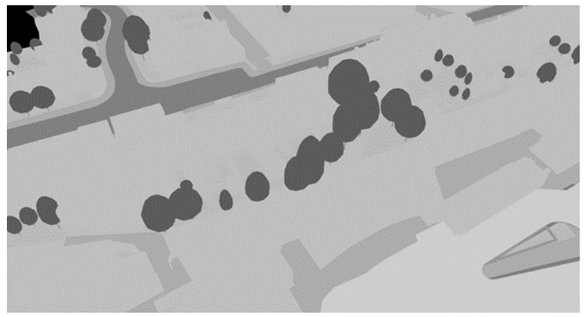
			
10:00	11:00	12:00	13:00
			
14:00	15:00	16:00	17:00

Whilst both winter and summer months have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

Monthly Shadow Analysis

Extent of Existing Shadow	
Extent of Additional Shadow	

The images below illustrate the incident shadow on the receiving area on the 21st of November.

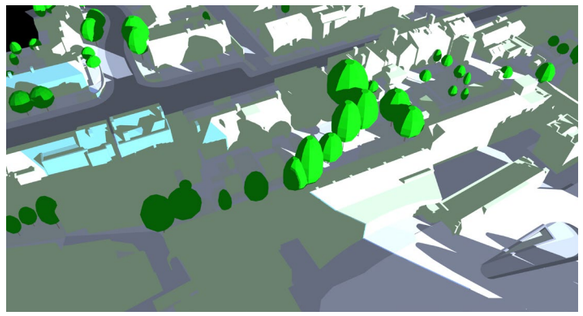
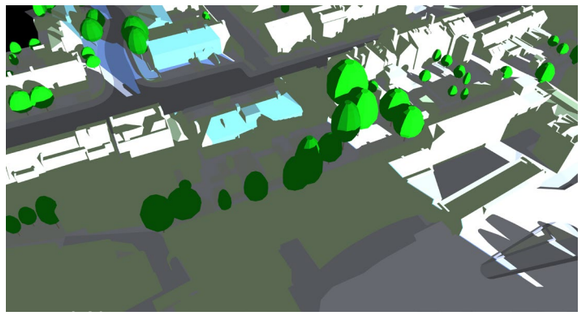
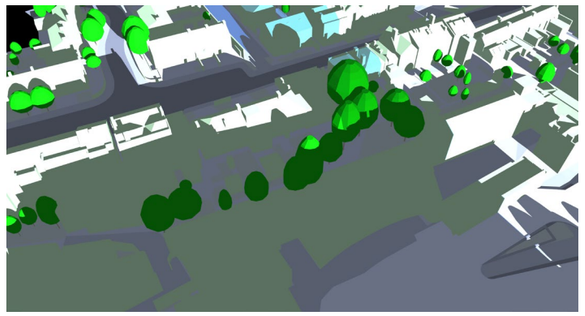
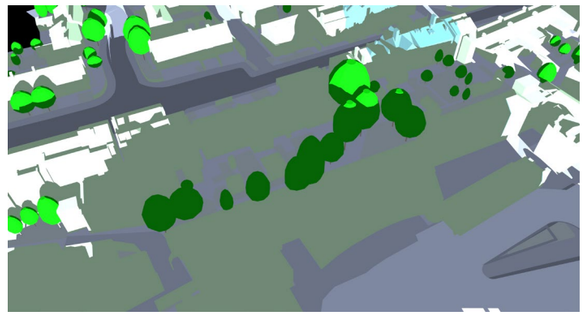
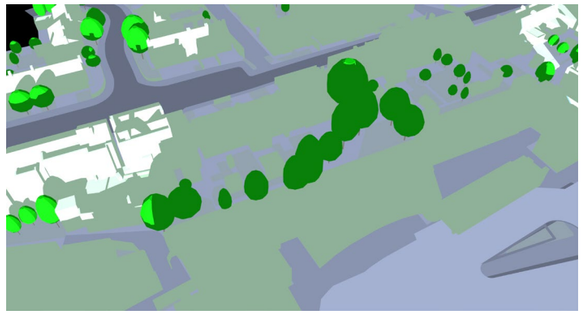
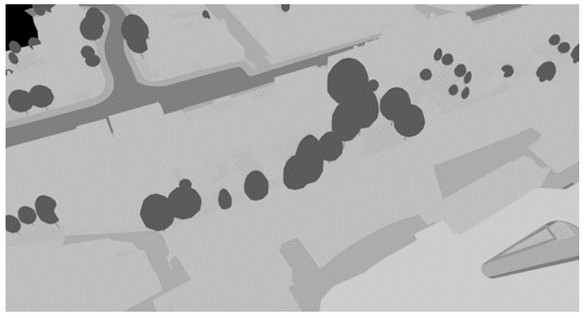
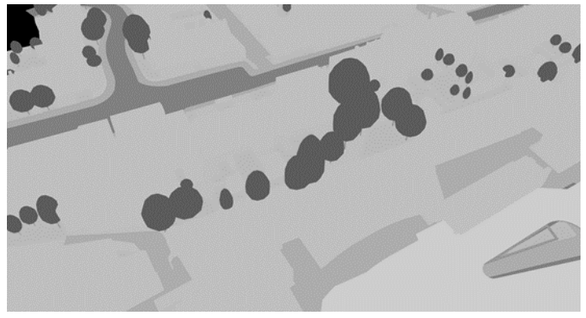
			
10:00	11:00	12:00	13:00
			
14:00	15:00	16:00	17:00

Whilst both winter and summer months have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

Monthly Shadow Analysis

Extent of Existing Shadow	
Extent of Additional Shadow	

The images below illustrate the incident shadow on the receiving area on the 21st of December.

			
10:00	11:00	12:00	13:00
			
14:00	15:00	16:00	17:00

Whilst both winter and summer months have been included, it should be noted that the statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day (i.e. only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.4 hours of sunlight our of a potential 16.7 hours each day received by Dublin during June (i.e. 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid-winter, the shadow environment in all urban and suburban areas are generally dense tending to make the images confusing and superfluous.

IN2 Engineering Design
Unit E&F
Mount Pleasant Business Park
Upper Mount Pleasant Avenue
Dublin 6
(01) 496 0900

info@in2.ie