

Large Scale Residential Development (LRD) at the site of the former DELL EMC premises, Innishmore, Ballincollig, Cork

Daylight & Sunlight Assessment

Project Ref: 20746

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BUILDING PERFORMANCE CONSULTING

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Contents

Glossary.....	iv
1 Executive Summary	1
2 Introduction.....	3
3 Site Description	4
3.1 Location & Context	4
3.2 Proposed Development	5
3.3 Sensitive Receptors	7
4 Methodology & Assessment Criteria	9
4.1 Existing Buildings	9
4.1.1 Light from the Sky	9
4.1.2 Sun lighting	11
4.1.3 Sunlight to Existing Gardens & Open Spaces	12
4.1.4 Impact Classification	13
4.2 New Buildings	14
4.2.1 Light from the Sky	14
4.2.2 Sun lighting	16
4.2.3 Sunlight to Proposed Open Spaces	17
5 Analysis.....	18
5.1 Overview of Computational Models.....	18
5.2 Existing Buildings	23
5.2.1 25 Degree Line Test.....	23

5.2.2	VSC Analysis.....	24
5.3	Proposed Development.....	27
5.3.1	Daylight Analysis for Proposed Development	27
5.3.2	Sunlight Analysis for Proposed Development	43
5.3.3	Sunlight to Proposed Amenity Spaces.....	49
6	Conclusion.....	52
Appendix A	Proposed Illuminance Contours (with Room & Window Legends)	53
A.1	Proposed Residential Apartment.....	53
A.2	Proposed Duplex Houses (DP-01-02)	58
A.3	Proposed Duplex Houses (DP-03-04)	61
A.4	Proposed Duplex Houses (DP-05-06)	64
A.5	Proposed Duplex Houses (DP-07-08-09).....	67
A.6	Proposed Duplex Houses (DP-10-11)	70
Appendix B	Shadow Images.....	73
B.1	March 21 st	74
B.2	June 21 st	79
7	Bibliography	85

Glossary

Illuminance

A measure of the amount of light falling on a surface, usually measured in lux.

Target illuminance (E_T)

Illuminance from daylight that should be achieved for at least half of annual daylight hours across a specified fraction of the reference plane in a daylit space.

Minimum target illuminance (E_{TM})

Illuminance from daylight that should be achieved for at least half of annual daylight hours across 95% of the reference plane in spaces with vertical and/or inclined daylight apertures.

Daylight factor (D)

Ratio of total daylight illuminance at a reference point on the working plane within a space to outdoor illuminance on a horizontal plane due to an unobstructed CIE standard overcast sky. Thus a 1% DF would mean that the indoor illuminance at that point in the space would be one hundredth the outdoor unobstructed horizontal illuminance.

Daylight, natural light

Part of global solar radiation capable of causing a visual sensation. (CIE, 2020) (Combined skylight and sunlight.)

No sky line

The outline on the working plane of the area from which no sky can be seen.

Obstruction Angle

The angular altitude of the top of an obstruction above the horizontal, measured from a reference point in a vertical plane in a section perpendicular to the vertical plane.

Skylight

Part of *diffuse* sky radiation capable of causing a visual sensation. (CIE, 2020)

Sunlight

Part of direct solar radiation capable of causing a visual sensation. (CIE, 2020)

Winter Probable Sunlight Hours (WPSH)

The long-term average of the total number of hours between the 21st of September and the 21st of March in which direct sunlight reaches the unobstructed ground (when clouds are considered).

Vertical Sky Component (VSC)

Ratio of that part of illuminance, at a point on a given vertical plane, that is received directly from a sky of assumed or known luminance distribution (usually CIE standard overcast sky), to illuminance on a horizontal plane due to an unobstructed hemisphere of this sky. Usually the 'given vertical plane' is the outside of a window wall. The VSC does not include reflected light, either from the ground or from other buildings.

Reference plane or working plane

Horizontal, vertical or inclined plane in which a visual task lies. Normally the working plane may be taken to be horizontal, 0.85 m above the floor in houses and factories, 0.7 m above the floor in offices.

Spatial Daylight Autonomy (sDA)

Spatial Daylight Autonomy (sDA) is a metric describing annual sufficiency of ambient daylight levels in interior environments. It is defined as the percent of an analysis area that meets a minimum daylight illuminance level for a specified fraction of the operating/daylight hours per year. The sDA value is expressed as a percentage of area.

1 Executive Summary

This report provides information on the daylight and sunlight analysis undertaken for the proposed development at the site of the former DELL EMC premises, Innishmore, Ballincollig, Cork.

To address the items raised in Cork City Council's Request for Further Information (RFI) in relation to Planning Application Ref. No. CCC Reg. Ref. 26/44538, the proposed development has been revised as follows.

- The upper floor of the western apartment block has been omitted, resulting in a reduction of 6 no. apartment units and a revised total of 124 no. units. The overall gross floor area of the proposed development is now c. 12,8022 sq m.
- A setback has been introduced at the fifth-floor level, consistent with the treatment previously proposed for the sixth storey.
- The Fire Safety Strategy has been revised following the omission of the upper floor. This has resulted in the reconfiguration and incorporation of an additional escape stair on the north elevation of each apartment building, together with minor internal amendments to address smoke-control and escape-distance requirements.
- The proposed car parking provision has also been revised in response to the RFI.

For an in-depth overview of the changes as part of this Response to Further Information, please refer to the enclosed documentation prepared by Meitheal Architects.

The analysis and assessments in this report have been carried in line with the recommendations of BRE's "Site Layout Planning for daylight and sunlight, a Guide to good practice" (BRE Building Technology Group, 2022) and BS EN 17037.

The BRE Guide provides useful recommendations to ensure adequate levels of daylight and sunlight in the proposed development. However, it has relevance to the impact of the proposed development on existing neighbouring dwellings also. The Guidelines make it clear that levels of daylight and sunlight cannot be expected to be as high in dense urban locations as would be the case in suburban or rural ones. It should be noted that whilst widely used, these are guidelines, and they do not have a statutory or mandatory basis.

There is no significant impact from the proposed development on surrounding buildings and therefore the proposed development will not affect:

- access to skylight to existing neighbouring buildings,
- access to sunlight to existing neighbouring buildings, and
- sunlight to gardens/open spaces to existing neighbouring buildings.

In terms of internal daylight levels within the proposed development, the results show that 95% of all rooms meet or exceed the BRE's minimum recommendations for internal daylight provision in dwellings. The rooms that fall below one or more of the recommended daylight criteria have been carefully considered in the context of the overall design quality of the scheme. These units benefit from a range of compensatory design measures and mitigating factors, including generous glazing provision, favourable room layouts, good levels of outlook, access to private amenity space, and the high overall daylight performance achieved across the majority of the development. Furthermore, the design has been informed by broader planning and urban design objectives, including the efficient use of a sustainable and accessible site, the delivery of much-needed housing, and the creation of a high-quality residential environment.

Accordingly, where full compliance with every BRE daylight criterion has not been achieved, the departures are limited in extent, have been transparently identified, and are considered acceptable when assessed against the overall quality of the

accommodation provided and the wider planning benefits of the proposal. On balance, the proposed development delivers a high standard of residential amenity and aligns with national and local planning policy objectives that seek to promote sustainable, well-designed, and liveable residential development.

In order to maximise available light, glazing to all habitable rooms is in excess of 20%. The design team have developed the proposed building using the principles of the BREs "Site Layout Planning for Daylight and Sunlight, A guide to good practice (2022)".

In terms of the amenity spaces provided the results show the open spaces that receive greater than 2 hours of sunlight on March 21st. The cumulative area of the spaces exceeds the recommended criteria for sunlight. It should be noted that the amenity area is in excess of the required area for such a scheme.

Overall, the development has been designed with due consideration for sunlight and daylight and meets the recommendations as set out in the BRE Guide – BR 209 "Site Layout Planning for Daylight and Sunlight, A guide to good practice (2022)."

2 Introduction

Site layout planning to achieve good daylighting and sun lighting, within buildings and in the open spaces around them is an important aspect in designing new buildings or developments. Daylight animates an interior and makes it attractive and interesting, as well as providing light to work or read by. Good daylight and sunlight can contribute to making a building energy-efficient; they can reduce the need for electric lighting, while winter solar gain can reduce heating requirements.

This report provides information on the daylight and sunlight analysis undertaken for the proposed development.

The analysis and assessments in this report have been carried in line with the recommendations of BRE's "Site Layout Planning for daylight and sunlight, a Guide to good practice" (BRE Building Technology Group, 2022) and BS EN 17037. The aforementioned BRE guide is also known as BRE Guide BR 209 and may be referenced as such or simply as the "BRE Guide" hereafter in this document.

This report will assess the proposed development's impact on daylight and sunlight to the existing buildings by the following means:

- Obstruction Angle Check (25-degree Line test)
- Vertical Sky Component (VSC)
- Sunlight to Gardens/Open Spaces

The report also assesses access to sunlight for the proposed development by means of sunlight to gardens/open spaces

Additionally, Appendix AB provides shadow images for the proposed development.

3 Site Description

3.1 Location & Context

The site located to the north of Mechterstadt road.



Figure 1: Site Plan of Proposed Site (source: Meitheal Architects drawing ref: 231064-MA-ZZ-00-DR-A-1004-P07 Proposed Site Layout Plan)



Figure 2: Aerial View of Site (Courtesy Google Maps) [Site boundary is only indicative. Refer to architectural drawings for accurate site boundary details.]

3.2 Proposed Development

The following images provide details of the proposed apartment and duplex blocks within the development and illustrate the revised elevations prepared by Meitheal Architects in response to Cork City Council's Request for Further Information (CCC Reg. Ref. 26/44538). This assessment has been undertaken based on these revised elevations and the associated revised scheme.



Figure 3: Revised Residential Apartment East & South Elevation (source: Meitheal Architects elevational drawings)

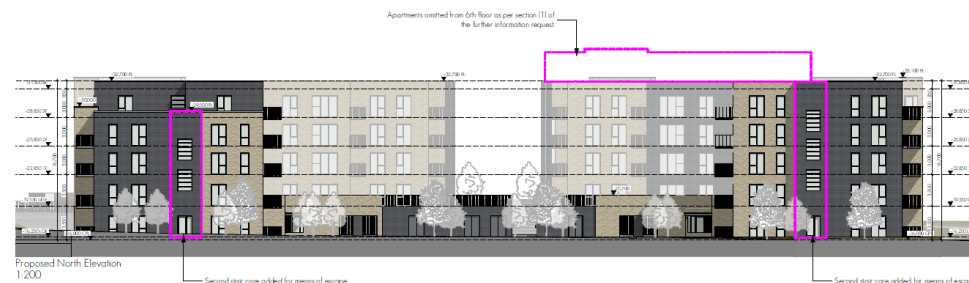


Figure 4: Revised Residential Apartment West & North Elevation (source: Meitheal Architects elevational drawings)



Figure 5: Revised Residential Apartment East & West Courtyard Elevation (source: Meitheal Architects elevational drawings)

3.3 Sensitive Receptors

The BRE guide states that when assessing the potential effects of a proposed development on existing buildings, only those windows and rooms that have a 'reasonable expectation' of daylight and sunlight need to be considered. Windows and rooms which meet these criteria are considered to be 'sensitive receptors'. Paragraph 2.2.2 of the BRE guide clarifies what are considered sensitive receptors with respect to sunlight and daylight as follows:

"The guidelines given here are intended for use for rooms in adjoining dwellings where daylight is required, including living rooms, kitchens and bedrooms. Windows to bathrooms, toilets, storerooms, circulation areas and garages need not be analysed."

The guidelines may also be applied to any existing non-domestic building where the occupants have a reasonable expectation of daylight; this would normally include schools, hospitals, hotels and hostels, small workshops and some offices."

Outdoor amenity spaces which have a reasonable expectation of sunlight, whether they are private gardens, communal open spaces or outdoor public amenity areas, are also considered sensitive receptors.

Sensitive receptors that may be affected by the proposed development are highlighted in Table 1 below.

Table 1: Sensitive Receptors

Sensitive Receptors Image/Map	Legend
 (Background Image/Map credit: https://www.eircode.ie/)	— Site Boundary ● Potential Sensitive Receptors
	Notes: 1. Properties highlighted in blue will not definitely be impacted by the proposed development. This is just an initial indication of properties that will be assessed.

4 Methodology & Assessment Criteria

The analyses and assessments are based on the guidelines set out in the BRE guide (BR 209) “Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice” (BRE Building Technology Group, 2022). This guide is intended to be used in conjunction with interior lighting recommendations in BS EN 17037 Daylight in buildings, and in the CIBSE publication LG 10 Daylighting – a guide for designers.

It should also be noted that although the BRE guide gives numerical guidelines, “*these should be interpreted flexibly since natural lighting is only one of many factors in site layout design.*” (BRE Building Technology Group, 2022)

Advanced lighting simulation software is used to perform the analysis. The software combines 3D modelling capabilities with a suite of programs which employ advanced raytracing. The software fully meets all relevant guidelines set out in the BRE Guide BR209. The software has the ability to perform annual simulations based on hourly climatic data. This type of simulation is used for the assessment of internal daylight provision in new buildings (discussed in section 4.2.)

Throughout this report an effort will be made to differentiate between metrics used to assess skylight only, sunlight only or a combination of both - daylight. As defined in the glossary of the BRE Guide, “Daylight” is an umbrella term that includes both skylight and sunlight—the diffuse and direct components of light from the sky respectively. Unfortunately, the terms daylight and skylight are often used interchangeably but this report will aim to specify when daylight specifically refers to skylight or when it also encompasses sunlight.

The following sub-sections outline the methodology and assessment criteria used.

4.1 Existing Buildings

The impact of the proposed development on the existing buildings (sensitive receptors only) with respect to daylight is assessed using the following methodologies. The

methodologies are grouped into sub-sections based on whether they are “Light from the sky” analysis or “Sun lighting” analysis.

4.1.1 Light from the Sky

4.1.1.1 Obstruction Angle Check

The BRE guide states that:

“Loss of light to existing windows need not be analysed if the distance of each part of the proposed development from the existing window is three or more times its height above the centre of the existing window. In these cases, the loss of light will be small.” (BRE Building Technology Group, 2022)

Therefore, if the distance s_1 was at least 3 times greater than h_1 , loss of light to the existing windows would not need to be analysed.

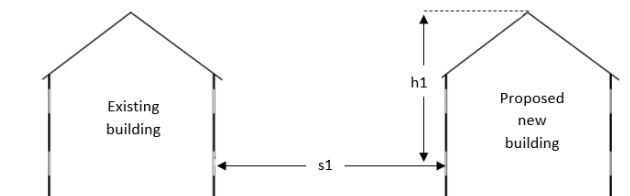


Figure 6: Spacing-to-Height Ratio

If the development is taller or closer than this, then the obstruction angle of the new development can be checked, where the obstruction angle is the angle subtended by the new development at the level of the centre of the lowest window in the existing building.

“If this angle is less than 25° for the whole of the development then it is unlikely to have a substantial effect on the diffuse skylight enjoyed by the existing building.” (BRE Building Technology Group, 2022)

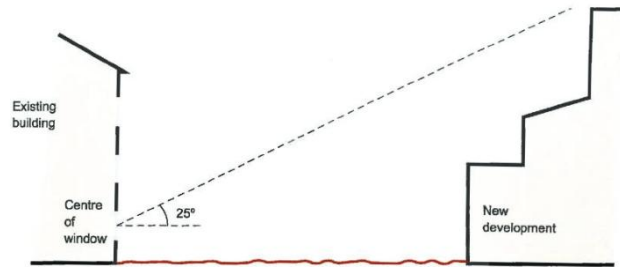


Figure 7: Obstruction Angle Check (25 Degree Line Test)

The obstruction angle is measured from the 3D CAD model. This check is suitable for existing windows where the proposed development is directly opposite an existing window, i.e. proposed development is cut by a vertical section drawn perpendicular to the window.

If, for any part of the new development, this angle is more than 25°, a more detailed check is needed to find the loss of skylight to the existing building. This may also be required in cases where the existing windows are not opposite the proposed development.

4.1.1.2 Vertical Sky Component (VSC)

Any reduction in the total amount of skylight for the existing properties can be calculated by finding the VSC at the centre of each main window. The Vertical Sky Component (VSC) is the ratio of the direct sky illuminance at the vertical reference point, to the simultaneous illuminance on an unobstructed horizontal plane. Reflected light is not included.

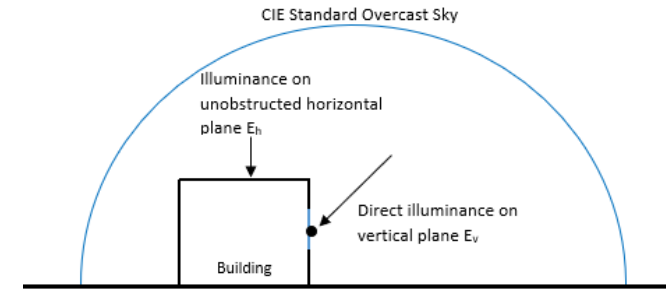


Figure 8: Vertical Sky Component

In the case of a floor-to-ceiling window such as a patio door, a point 1.6 m above ground (or balcony level for an upper storey) on the centre line of the window is used. The reference point is in the external plane of the window wall. Windows to bathrooms, toilets, storerooms, circulation areas and garages are not analysed.

Note that because the CIE standard overcast sky model is used, VSC is independent of orientation and location. (It is a *skylight* metric.)

The diffuse daylighting of any existing building may be adversely affected if:

“the VSC measured at the centre of an existing main window [or 1.6m above bottom of glazed door] is less than 27%, and less than 0.8 times its former value.” (BRE Building Technology Group, 2022)

4.1.1.3 No Skyline

While VSC provides an indication of skylight availability, it does provide any information on the distribution of light within a space. In addition to external obstructions, the distribution of daylight within a space is dependent on window sizes and positioning, and room layouts. The no skyline divides points on the working plane which can and cannot see the sky.

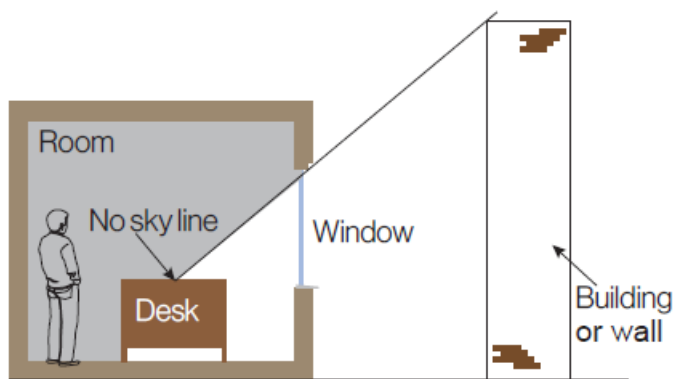


Figure 9: No Skyline [courtesy (BRE Building Technology Group, 2022)]

Areas beyond the no skyline, since they receive no direct daylight, usually look dark and gloomy compared with the rest of the room.

Where room layouts are known, the impact on the daylighting distribution in the existing building should be found by plotting the no sky line in each of the main rooms.

The diffuse daylighting of an existing building may be adversely affected if:

“the area of the working plane in a room which can receive direct skylight is reduced to less than 0.80 times its former value.” (BRE Building Technology Group, 2022)

(Room layouts for neighbouring buildings are often not readily available, hence VSC is often the only analysis performed.)

4.1.2 Sun lighting

“In designing a new development or extension to a building, care should be taken to safeguard the access to sunlight both for existing dwellings, and for any nearby non-domestic buildings where there is a particular requirement for sunlight.” (BRE Building Technology Group, 2022)

Obstruction to sunlight may become an issue if:

- Some part of a new development is situated within 90° of due south of a main window wall of an existing building.
- In the section drawn perpendicular to this existing window wall, the new development subtends an angle greater than 25° to the horizontal measured from the centre of the lowest window to a main living room.

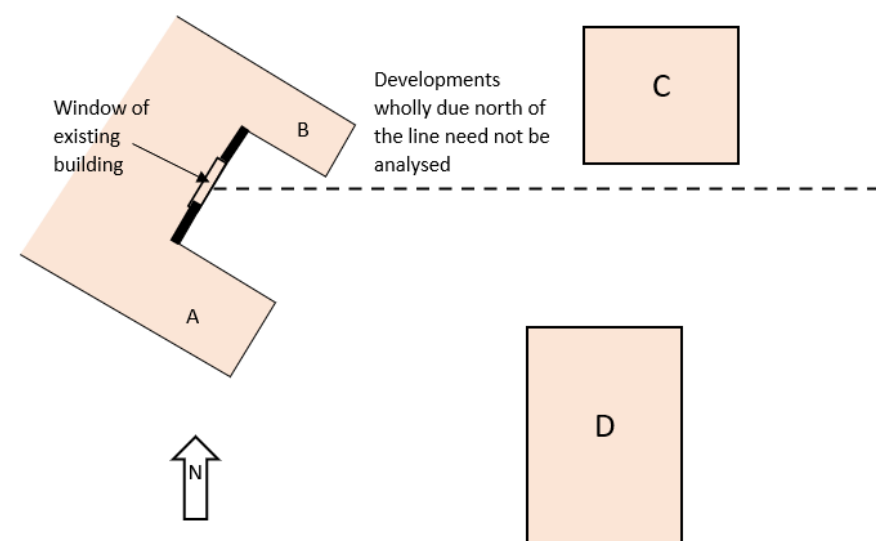


Figure 10: Sunlight Analysis Scenarios for Existing Buildings

No sunlight check is required on the existing window for proposed extension B and new building C, as they lie within 90° of due north of the window. The impact on sunlight to the existing window should be checked for proposed extension A, and new building D if it subtends more than 25° to the horizontal, measured in section from the centre of the window.

To assess loss of sunlight to an existing building, it is suggested that all main living rooms of dwellings, and conservatories, should be checked if they have a window facing within 90° of due south.

4.1.2.1 Probable Sunlight Hours

To calculate the loss of sunlight to an existing building over the year, the annual probable sunlight hours (APSH) metric can be used. *“Here ‘probable sunlight hours’ means the total number of hours in the year that the sun is expected to shine on unobstructed ground, allowing for average levels of cloudiness for the location in question (based on sunshine probability data). The sunlight reaching a window is quantified as a percentage of this unobstructed annual total.”* (BRE Building Technology Group, 2022)

Sunlight to an existing dwelling may be adversely affected if the centre of a main living room window (which faces within 90° of due south):

- receives less than 25% of annual probable sunlight hours (APSH) and less than 0.80 times its former annual value.
- or less than 5% of annual probable sunlight hours between 21 September and 21 March (often referred to as winter probable sunlight hours - WPSH) and less than 0.80 times its former value during that period.
- and has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.

4.1.2.2 Basic Assessment

It is not always necessary to do a full calculation using Annual Probable Sunlight Hours APSH (section 4.1.2.1). The same “spacing-to-height ratio” and “obstruction angle” checks discussed in section 4.1.1.1 can be used to determine if a more detailed calculation is necessary or not. Additionally, depending on the VSC and orientation of the existing windows an APSH assessment may not be required. The recommendation for safeguarding sunlight to existing neighbouring buildings will be met if:

- *“the distance of each part of the new development from the existing window is three or more times its height above the centre of the existing (note: obstructions within 90° of due north of the existing window need not count here).*
- *The window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal. Again, obstructions within 90° of due north of the existing window need not be counted.*
- *The window wall faces within 20° of due south and the reference point has a VSC of 27% or more.”* (BRE Building Technology Group, 2022)

4.1.3 Sunlight to Existing Gardens & Open Spaces

Good site layout planning for daylight and sunlight should not limit itself to providing natural lighting inside buildings. Sunlight in the spaces between buildings has an important impact on the overall appearance and ambience of a development.

“It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable.” (BRE Building Technology Group, 2022)

4.1.3.1 Shadow Plots

The BRE guide states:

“Where a large building is proposed which may affect a number of gardens or open spaces it is often illustrative to plot a shadow plan showing the location of shadows at different times of day and year.”

4.1.4 Impact Classification

Appendix H of the BRE Guide – “Environmental Impact Assessment” states that the impact of a new building on its surroundings can be classified as negligible, minor, moderate or major adverse. Where the loss of skylight or sunlight fully meets the guidelines in the BRE guide, the impact is assessed as negligible or minor adverse.

Table 2: Environmental Impact Assessment: Impact Classification

<i>Negligible impact</i>	• <i>Loss of light well within guidelines, or</i> • <i>only a small number of windows losing light (within the guidelines) or</i> • <i>limited area of open space losing light (within the guidelines)</i>
<i>Minor adverse impact (a)</i>	• <i>Loss of light only just within guidelines and</i> ○ <i>a larger number of windows are affected or</i> ○ <i>larger area of open space is affected (within the guidelines)</i>
<i>Minor adverse impact (b)</i>	• <i>only a small number of windows or limited open space areas are affected</i> • <i>the loss of light is only marginally outside the guidelines</i> • <i>an affected room has other sources of skylight or sunlight</i> • <i>the affected building or open space only has a low-level requirement for skylight or sunlight</i> • <i>there are particular reasons why an alternative, less stringent, guideline should be applied</i>
<i>Major adverse impact</i>	• <i>large number of windows or large open space areas are affected</i> • <i>the loss of light is substantially outside the guidelines</i> • <i>all the windows in a particular property are affected</i> • <i>the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight (living rooms / playground)</i>

Where the loss of skylight or sunlight does not meet the BRE guidelines, the impact is assessed as minor, moderate or major adverse.

Table 2 provides a more detailed description of the impact classification.

A moderate adverse impact falls somewhere between the criteria for “Minor Adverse Impact (b)” and “Major Adverse Impact”.

4.2 New Buildings

The daylight provision was also checked for the proposed development.

4.2.1 Light from the Sky

Section 2.1.8 of the BRE Guide states that:

“Daylight provision in new rooms may be checked using either of the methods in BS EN 17037 Daylight in Buildings: direct prediction of illuminance levels using hourly climate data, or the use of the daylight factor (D)”.

Both methods are measures of the overall amount of daylight in a space.

The daylight factor (D) method addresses daylight provision as a ratio of unobstructed external illuminance under overcast sky conditions. This method involves calculating the daylight factor (D) that would be exceeded over half of the room, i.e. the median daylight factor (this is not the same as the average daylight factor used in the previous standard, BS8206-2). The recommended daylight factor values are location specific. This method will not be discussed in any more detail in this report as the illuminance method is the preferred option.

4.2.1.1 Illuminance Method (Target Illuminance E_T)

The illuminance method *“involves using climatic data for the location of the site (via the use of an appropriate, typical or average year, weather file within the software) to calculate the illuminance from daylight at each point on an assessment grid on the reference plane at an at least hourly interval for a typical year.”* (BRE Building Technology Group, 2022)

“A target illuminance (E_T) should be achieved across at least half of the reference plane in a daylit space for at least half of the daylight hours. Another target illuminance (E_{TM}) should also be achieved across 95% of the reference plane for at least half of the daylight hours; this is the minimum target illuminance to be achieved towards the back of the room.” (BRE Building Technology Group, 2022)

(Note that since hourly climatic data is used based on the location of the site, location and orientation are accounted for. The target illuminance can therefore be considered a *daylight* metric, i.e. incorporating both skylight and sunlight.)

BS EN 17037 gives three levels of recommendation for daylight provision in interior spaces: minimum, medium and high. For compliance with the standard, a daylit space should achieve the minimum level of recommendation.

Table 3 gives the target illuminances for side lit rooms. Different targets, given in Table A2 of BS EN 17037, apply in spaces with horizontal rooflights.

Table 3: EN 17037 Target Illuminances

Level of recommendation	Target illuminance E_T (lx) for half of assessment grid	Target illuminance E_{TM} (lx) for 95% of assessment grid
Minimum	300	100
Medium	500	300
High	750	500

The guidance contained in BR 209 is intended to be used with BS EN 17037 and its UK National Annex. The UK National Annex gives specific minimum recommendations for habitable rooms in dwellings in the UK. Although Ireland adopted EN17037 directly as IS EN EN17037, it is expected that all councils in Ireland will adopt the UK National Annex recommendations. The Dublin City Council Development Plan 2022-2028 states:

“is important to note that no amendments were made to [the IS EN 17037] document and unlike BS EN 17037, it does not contain a national annex. It offers only a single target for new buildings (there are no space-by-space targets – e.g. a kitchen would have the same target as a warehouse or office). [...] These limitations make it unsuitable for use in planning policy or during planning applications. BR 209 must still be used for this purpose.”

Even if a predominantly daylit appearance is not achievable for a room in a dwelling, the National Annex NA recommends that the target illuminance values given in Table 4 are exceeded over 50% of the points on a reference plane 0.85 m above the floor, for at least half of the daylight hours.

Table 4: BS EN 17037 NA Target Illuminances for dwellings

Room type	Target illuminance E_T (lx)
Bedroom	100
Living Room	150
Kitchen	200

Where one room in a dwelling serves more than a single purpose, it is recommended that the target illuminance is that for the room type with the highest value – for example, in a space that combines a living room and a kitchen the target illuminance is recommended to be 200 lx.

However, it is recommended that local authorities use discretion here. For example: *“the target for a living room could be used for a combined living/dining/kitchen area if the kitchens are not treated as habitable spaces..”* (BRE Building Technology Group, 2022). This may be appropriate in instances where small internal kitchens are unavoidable in apartment developments.

The minimum target illuminance level to be achieved across 95% of the reference plane within a space need not be applied to rooms in dwellings.

To avoid any confusion, the targets in Table 4 are those used for the purposes of this analysis.

The illuminance method is detailed and calculation intensive. It can take some time to process depending on the software, detail of the calculation model and the available

computing power hence why the daylight factor (D) method may be preferred by some. However, it can provide additional information beyond the limits of the Daylight Factor method due to the use of hourly climate data.

There are a few ways the results of this type of analysis can be presented. One method is to report the % area of the reference plane exceeding the target illuminance E_T (for half of the daylight hours.) (This area should be greater than 50% to meet the BS EN 17037 recommendations.) This is equivalent to Spatial Daylight Autonomy (sDA). BR209 recommends reporting the median illuminance (exceeded over 50% of the reference plane) as this enables comparison with the different recommendations in BS EN 17037. It says that *“As an optional extra, the proportional area of the reference plane exceeding a particular target value may be presented”*. It should be noted that the calculation methodology and results are the same in both instances. It is only the *presented* result that differs. For completeness, the results will be presented in both ways, i.e. both of the below metrics will be presented:

- The **median illuminance** (the illuminance exceeded over 50% of the reference plane).
- The **% area** of the reference plane exceeding a particular target illuminance (lux).

The settings used in the computational model for the illuminance calculations are outlined below:

- The reference/working plane is taken to be 0.85m above the floor.

The settings used in the computational model for the illuminance calculations are outlined below:

- The reference/working plane is taken to be 0.85m above the floor.
- The grid spacing is 0.1m.
- A band of 0.3m from the walls is excluded from the grid.

- Window frame factor is set to 20% (This is based on the size of the window openings and the area of the window which is framing.)
- The glazing transmittance (normal) was set to 0.70.
- The glazing maintenance factor is set to 96% (This accounts for the reduction in glazing transmittance due to dirt; 4% loss of daylight compared with clean glazing.)
- The illuminance calculations take account of light which has been reflected from both external and internal surfaces. In the absence of detailed information on surface reflectances the recommended default reflectances from BR209 2022 have been used. These are detailed in Table 5 below.

Table 5: Surface Reflectances

Surface Type	Reflectance
Interior walls	0.50
Floors	0.20
Ceilings	0.70
Exterior walls and obstructions	0.20
Exterior Ground	0.20

Table 6: Balcony Glazing Properties

Surface Type	Properties
Balcony Glazing	Transmittance: 0.80 Refractive Index: 1.52

4.2.2 Sun lighting

For interiors, access to sunlight can be quantified based on the methodology set out in BS EN 17037.

"In general, a dwelling, or non-domestic building that has a particular requirement for sunlight, will appear reasonably sunlit provided:

- *at least one main window wall faces within 90° of due south and*
- *a habitable room, preferably a main living room, can receive a total of at least 1.5 hours of sunlight on 21 March. This is assessed at the inside centre of the window(s); sunlight received by different windows can be added provided they occur at different times and sunlight hours are not double counted.*

Where groups of dwellings are planned, site layout design should aim to maximise the number of dwellings with a main living room that meets the above recommendations." (BRE Building Technology Group, 2022)

There are 3 levels of recommendation provided in EN 17037 relating to sunlight to a room:

- 1.5 hours is the minimum level,
- 3 hours is the medium level, and
- 4 hours is the high level

For dwellings, as outlined above, at least one habitable room, preferably a main living room, should meet at least the minimum criterion.

4.2.3 Sunlight to Proposed Open Spaces

The BRE Guide recommends:

“That for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March.”

The communal open spaces and amenity space are analysed and assessed against the above criterion.

5 Analysis

5.1 Overview of Computational Models

3D models of the existing the proposed scenarios were created. The site plans and 2D drawings provided by the architect were used to correctly position the surrounding buildings relative to the existing and proposed buildings.

3D models of the existing the proposed schemes were created. The existing and analysed (surrounding) models are based on 2D drawings provided by the architect

supplemented by Google Street Maps and OS maps. The proposed model is based on the 2D CAD drawings provided by the architect:

In the following figures the building colours correspond to the following:

- Beige/buff elements represent the existing surrounding buildings that are analysed
- The blue elements are the buildings in the proposed development.



Figure 11: Existing Model (Plan View)



Figure 12: Existing Model (Perspective view looking North)



Figure 13: Revised Proposed Model (Plan View)



Figure 14: Revised Proposed Model (Perspective view looking North)

5.2 Existing Buildings

5.2.1 25 Degree Line Test

The obstruction angle was checked for the closest properties to the site that have windows directly opposite the proposed development. The assessment and associated 3D modelling are based on the revised development scheme prepared in response to Cork City Council's Request for Further Information (CCC Reg. Ref. 26/44538).

25-degree planes were drawn from the centre of the closest windows of the neighbouring properties. As these windows are the closest to the proposed development, if they are not adversely impacted, then it follows that the other adjacent neighbouring properties will not be adversely impacted.

The results of the 25-degree line test, based on the revised scheme, are shown in the following figures. The 25-degree planes are illustrated in red.

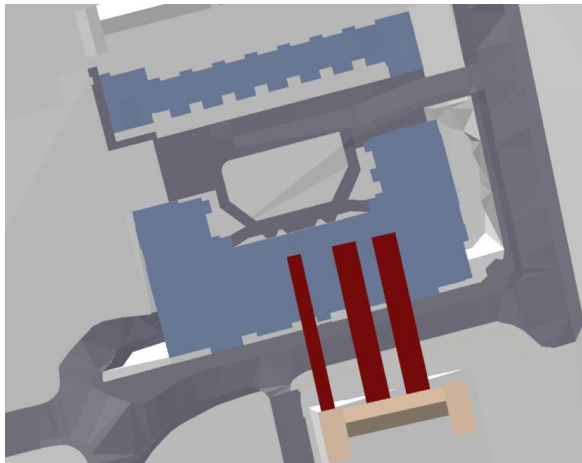


Figure 16: 25 Degree Planes Plan View

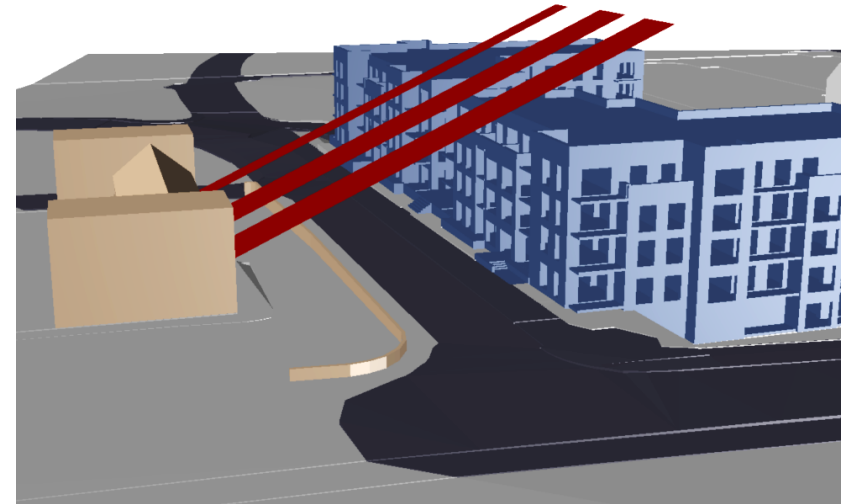


Figure 15: 25 Degree Planes Perspective View (looking from East)

The analysis shows that none of the 25-degree planes cut the proposed development. That is to say, the obstruction angle is less than 25 degrees for all of the properties/windows tested. Therefore, the proposed development will have a negligible impact on the skylight enjoyed by the existing neighbouring dwellings (See Table 1 Sensitive Receptors for building labels).

5.2.2 VSC Analysis

The 25-degree plane test shows that the development will have a negligible impact on the existing neighbouring houses. However, not all neighbouring properties are directly opposite the proposed development, so VSC analysis has been performed for the remaining neighbouring properties. These are labelled in Table 1 Sensitive Receptors as:

1. 31 Westview Ballincollig
2. 32 Westview Ballincollig
3. 33 Westview Ballincollig
4. 34 Westview Ballincollig
5. 35 Westview Ballincollig
6. 36 Westview Ballincollig
7. 37-38-39 Westview Ballincollig

Some assumptions had to be made for window positions at the rear of these properties where information could not be gleaned from Google Street View or otherwise. Where assumptions must be made, multiple VSC points are spaced evenly across each facade facing the proposed development. The VSC points for each property are shown in the following figures.

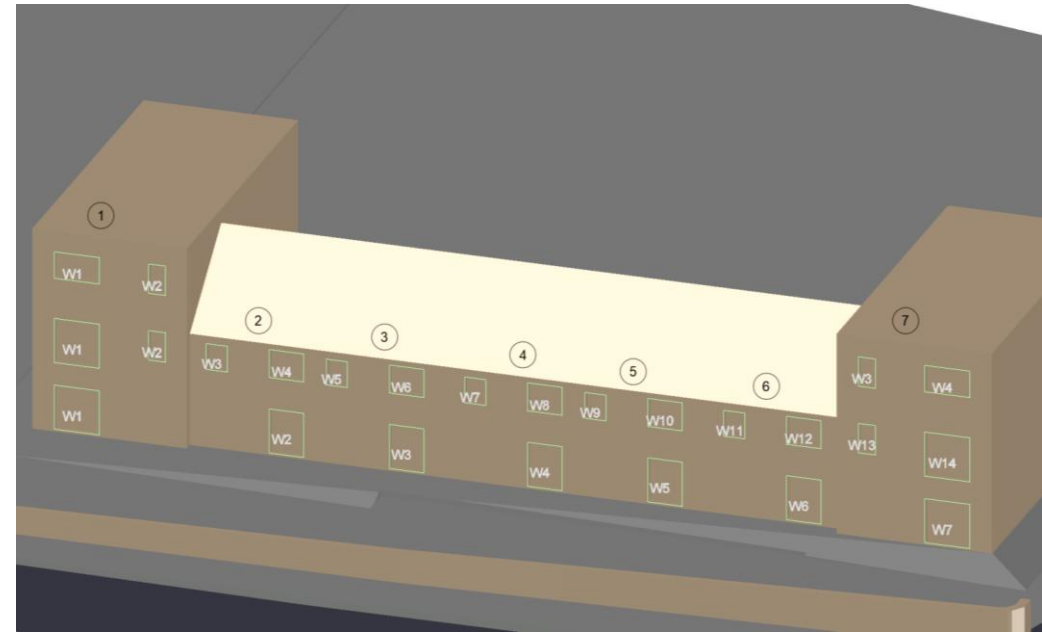


Figure 17: 31-39 Westview Ballincollig

Table 7: VSC Results

Floor Ref.	Window Ref.	VSC	Pr/Ex	Meets BRE Criteria
31-39 WESTVIEW BALLINCOLLIG				
Ground	W1	Existing 39.20 Proposed 31.77	0.81	YES
	W2	Existing 39.01 Proposed 30.51	0.78	YES
	W3	Existing 39.05 Proposed 30.34	0.78	YES
	W4	Existing 39.05 Proposed 30.34	0.78	YES
	W5	Existing 39.01 Proposed 30.48	0.78	YES
	W6	Existing 38.04 Proposed 29.55	0.78	YES
	W7	Existing 39.03 Proposed 30.07	0.77	YES
	W1	Existing 39.55 Proposed 33.81	0.85	YES
	W2	Existing 39.55 Proposed 33.60	0.85	YES
	W3	Existing 38.46 Proposed 32.15	0.84	YES
	W4	Existing 39.42 Proposed 32.91	0.83	YES
	W5	Existing 39.47 Proposed 32.82	0.83	YES
	W6	Existing 39.48 Proposed 32.81	0.83	YES
	W7	Existing 39.50 Proposed 32.76	0.83	YES

Table 8: VSC Results

Floor Ref.	Window Ref.	VSC	Pr/Ex	Meets BRE Criteria
31-39 WESTVIEW BALLINCOLLIG				
First	W8	Existing 39.50 Proposed 32.82	0.83	YES
	W9	Existing 39.50 Proposed 32.82	0.83	YES
	W10	Existing 39.49 Proposed 32.94	0.83	YES
	W11	Existing 39.40 Proposed 32.85	0.83	YES
	W12	Existing 38.55 Proposed 32.01	0.83	YES
	W13	Existing 39.53 Proposed 33.01	0.84	YES
	W14	Existing 39.51 Proposed 32.58	0.82	YES
	W1	Existing 39.62 Proposed 36.09	0.91	YES
	W2	Existing 39.62 Proposed 35.77	0.90	YES
	W3	Existing 39.62 Proposed 35.43	0.89	YES
	W4	Existing 39.62 Proposed 35.38	0.89	YES

Table 9: VSC Summary Results

Property	Number of Windows Tested	Windows that meet BRE Guidelines	
		No.	%
31-39 WESTVIEW BALLINCOLLIG	25	25	100%
Total	25	25	100%

All windows tested have VSC values greater than 27% with the proposed development in place. Therefore, these windows will still receive adequate amounts of skylight after the proposed development is built and the impact to all windows will be negligible.

The results meet the recommendations of the BRE Guide and show that the proposed development will have a negligible impact on skylight to the neighbouring dwelling.

5.3 Proposed Development

5.3.1 Daylight Analysis for Proposed Development

The daylight provision in the apartments and duplex units in the proposed development was checked using the target illuminance (E_T) method. The results are presented in the following tables.

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
Resi. Apartment									
Lower Ground	R1	Bedroom	267	100%	100	50%	50%	4380	YES
	R2	LKD	217	55%	200	50%	50%	4380	YES
	R3	Bedroom	263	100%	100	50%	50%	4380	YES
	R4	LKD	409	94%	200	50%	50%	4380	YES
	R5	LKD	344	72%	200	50%	50%	4380	YES
	R6	Bedroom	322	100%	100	50%	50%	4380	YES
	R7	Bedroom	332	100%	100	50%	50%	4380	YES
	R8	Bedroom	174	99%	100	50%	50%	4380	YES
	R9	LKD	203	50%	200	50%	50%	4380	YES
	R10	Bedroom	167	99%	100	50%	50%	4380	YES
	R11	LKD	195	49%	200	50%	50%	4380	NO
	R12	LKD	215	52%	200	50%	50%	4380	YES
	R13	Bedroom	212	100%	100	50%	50%	4380	YES
	R14	Bedroom	269	100%	100	50%	50%	4380	YES
	R15	Bedroom	381	100%	100	50%	50%	4380	YES
	R16	Bedroom	401	100%	100	50%	50%	4380	YES
	R17	LKD	373	72%	200	50%	50%	4380	YES
	R18	LKD	328	80%	200	50%	50%	4380	YES
	R19	Bedroom	235	100%	100	50%	50%	4380	YES
	R20	Bedroom	177	87%	100	50%	50%	4380	YES

Table 10: Illuminance Results – Resi. Apartment Lower Ground Floor

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
Resi. Apartment									
Ground	R1	Bedroom	187	93%	100	50%	50%	4380	YES
	R2	Bedroom	159	84%	100	50%	50%	4380	YES
	R3	LKD	113	32%	200	50%	50%	4380	NO
	R4	Bedroom	300	100%	100	50%	50%	4380	YES
	R5	LKD	247	60%	200	50%	50%	4380	YES
	R6	Bedroom	295	100%	100	50%	50%	4380	YES
	R7	LKD	482	99%	200	50%	50%	4380	YES
	R8	LKD	397	78%	200	50%	50%	4380	YES
	R9	Bedroom	349	100%	100	50%	50%	4380	YES
	R10	Bedroom	360	100%	100	50%	50%	4380	YES
	R11	Bedroom	192	99%	100	50%	50%	4380	YES
	R12	LKD	229	55%	200	50%	50%	4380	YES
	R13	Bedroom	187	99%	100	50%	50%	4380	YES
	R14	LKD	227	55%	200	50%	50%	4380	YES
	R15	Bedroom	199	100%	100	50%	50%	4380	YES
	R16	Bedroom	196	100%	100	50%	50%	4380	YES
	R17	LKD	203	51%	200	50%	50%	4380	YES
	R18	Bedroom	237	100%	100	50%	50%	4380	YES
	R19	Bedroom	296	100%	100	50%	50%	4380	YES
	R20	LKD	534	93%	200	50%	50%	4380	YES
	R21	LKD	136	31%	200	50%	50%	4380	NO
	R22	Bedroom	87	40%	100	50%	50%	4380	NO
	R23	LKD	235	55%	200	50%	50%	4380	YES
	R24	Bedroom	235	100%	100	50%	50%	4380	YES
	R25	Bedroom	430	100%	100	50%	50%	4380	YES
	R26	Bedroom	464	100%	100	50%	50%	4380	YES
	R27	LKD	359	82%	200	50%	50%	4380	YES
	R28	LKD	402	82%	200	50%	50%	4380	YES
	R29	Bedroom	490	100%	100	50%	50%	4380	YES
	R30	Bedroom	444	100%	100	50%	50%	4380	YES

Table 11: Illuminance Results – Resi. Apartment Ground Floor

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
Resi. Apartment									
Ground	R31	Bedroom	270	100%	100	50%	50%	4380	YES
	R32	LKD	283	63%	200	50%	50%	4380	YES
	R33	Bedroom	96	48%	100	50%	50%	4380	NO
	R34	LKD	135	31%	200	50%	50%	4380	NO
	R35	LKD	634	96%	200	50%	50%	4380	YES
	R36	Bedroom	377	100%	100	50%	50%	4380	YES
	R37	Bedroom	293	100%	100	50%	50%	4380	YES
	R38	LKD	242	58%	200	50%	50%	4380	YES
	R39	Bedroom	222	100%	100	50%	50%	4380	YES
	R40	Bedroom	251	100%	100	50%	50%	4380	YES
	R41	LKD	227	54%	200	50%	50%	4380	YES
	R42	Bedroom	221	100%	100	50%	50%	4380	YES
	R43	Bedroom	277	100%	100	50%	50%	4380	YES
	R44	Bedroom	396	100%	100	50%	50%	4380	YES
	R45	Bedroom	420	100%	100	50%	50%	4380	YES
	R46	LKD	418	78%	200	50%	50%	4380	YES
	R47	LKD	373	90%	200	50%	50%	4380	YES
	R48	Bedroom	238	100%	100	50%	50%	4380	YES
	R49	Bedroom	218	98%	100	50%	50%	4380	YES
	R50	LKD	106	30%	200	50%	50%	4380	NO
	R51	Bedroom	144	77%	100	50%	50%	4380	YES
	R52	Bedroom	176	90%	100	50%	50%	4380	YES
	R53	Bedroom	182	80%	100	50%	50%	4380	YES
	R54	LKD	325	76%	200	50%	50%	4380	YES
	R55	LKD	433	98%	200	50%	50%	4380	YES
	R56	Bedroom	170	100%	100	50%	50%	4380	YES
	R57	Bedroom	176	100%	100	50%	50%	4380	YES
	R58	LKD	443	99%	200	50%	50%	4380	YES
	R59	LKD	341	77%	200	50%	50%	4380	YES
	R60	Bedroom	190	85%	100	50%	50%	4380	YES

Table 12: Illuminance Results – Resi. Apartment Ground Floor

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
Resi. Apartment									
First	R1	Bedroom	217	99%	100	50%	50%	4380	YES
	R2	Bedroom	189	99%	100	50%	50%	4380	YES
	R3	LKD	148	39%	200	50%	50%	4380	NO
	R4	Bedroom	344	100%	100	50%	50%	4380	YES
	R5	LKD	245	60%	200	50%	50%	4380	YES
	R6	Bedroom	335	100%	100	50%	50%	4380	YES
	R7	LKD	515	99%	200	50%	50%	4380	YES
	R8	LKD	426	84%	200	50%	50%	4380	YES
	R9	Bedroom	377	100%	100	50%	50%	4380	YES
	R10	Bedroom	384	100%	100	50%	50%	4380	YES
	R11	Bedroom	174	99%	100	50%	50%	4380	YES
	R12	LKD	240	57%	200	50%	50%	4380	YES
	R13	Bedroom	112	63%	100	50%	50%	4380	YES
	R14	LKD	232	57%	200	50%	50%	4380	YES
	R15	Bedroom	182	100%	100	50%	50%	4380	YES
	R16	Bedroom	181	100%	100	50%	50%	4380	YES
	R17	LKD	216	53%	200	50%	50%	4380	YES
	R18	Bedroom	258	100%	100	50%	50%	4380	YES
	R19	Bedroom	328	100%	100	50%	50%	4380	YES
	R20	LKD	560	99%	200	50%	50%	4380	YES
	R21	Bedroom	215	100%	100	50%	50%	4380	YES
	R22	Bedroom	214	100%	100	50%	50%	4380	YES
	R23	LKD	257	58%	200	50%	50%	4380	YES
	R24	LKD	306	64%	200	50%	50%	4380	YES
	R25	Bedroom	175	100%	100	50%	50%	4380	YES
	R26	Bedroom	465	100%	100	50%	50%	4380	YES
	R27	Bedroom	495	100%	100	50%	50%	4380	YES
	R28	LKD	364	86%	200	50%	50%	4380	YES
	R29	LKD	441	92%	200	50%	50%	4380	YES
	R30	Bedroom	465	100%	100	50%	50%	4380	YES
	R31	Bedroom	458	100%	100	50%	50%	4380	YES

Table 13: Illuminance Results – Resi. Apartment First Floor

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
Resi. Apartment									
First	R32	Bedroom	177	100%	100	50%	50%	4380	YES
	R33	LKD	324	67%	200	50%	50%	4380	YES
	R34	LKD	276	62%	200	50%	50%	4380	YES
	R35	Bedroom	236	100%	100	50%	50%	4380	YES
	R36	Bedroom	219	100%	100	50%	50%	4380	YES
	R37	LKD	630	100%	200	50%	50%	4380	YES
	R38	Bedroom	382	100%	100	50%	50%	4380	YES
	R39	Bedroom	302	100%	100	50%	50%	4380	YES
	R40	LKD	249	59%	200	50%	50%	4380	YES
	R41	Bedroom	200	100%	100	50%	50%	4380	YES
	R42	Bedroom	229	100%	100	50%	50%	4380	YES
	R43	LKD	234	55%	200	50%	50%	4380	YES
	R44	Bedroom	200	100%	100	50%	50%	4380	YES
	R45	Bedroom	255	100%	100	50%	50%	4380	YES
	R46	Bedroom	421	100%	100	50%	50%	4380	YES
	R47	Bedroom	448	100%	100	50%	50%	4380	YES
	R48	LKD	422	79%	200	50%	50%	4380	YES
	R49	LKD	404	96%	200	50%	50%	4380	YES
	R50	Bedroom	280	100%	100	50%	50%	4380	YES
	R51	Bedroom	259	100%	100	50%	50%	4380	YES
	R52	LKD	139	37%	200	50%	50%	4380	NO
	R53	Bedroom	177	95%	100	50%	50%	4380	YES
	R54	Bedroom	203	98%	100	50%	50%	4380	YES
	R55	Bedroom	204	87%	100	50%	50%	4380	YES
	R56	LKD	401	86%	200	50%	50%	4380	YES
	R57	LKD	478	99%	200	50%	50%	4380	YES
	R58	Bedroom	194	100%	100	50%	50%	4380	YES
	R59	Bedroom	199	98%	100	50%	50%	4380	YES
	R60	LKD	490	100%	200	50%	50%	4380	YES
	R61	LKD	409	86%	200	50%	50%	4380	YES
	R62	Bedroom	206	92%	100	50%	50%	4380	YES

Table 14: Illuminance Results – Resi. Apartment First Floor

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
Resi. Apartment									
Second	R1	Bedroom	234	100%	100	50%	50%	4380	YES
	R2	Bedroom	212	100%	100	50%	50%	4380	YES
	R3	LKD	168	44%	200	50%	50%	4380	NO
	R4	Bedroom	369	100%	100	50%	50%	4380	YES
	R5	LKD	269	63%	200	50%	50%	4380	YES
	R6	Bedroom	360	100%	100	50%	50%	4380	YES
	R7	LKD	617	100%	200	50%	50%	4380	YES
	R8	LKD	495	90%	200	50%	50%	4380	YES
	R9	Bedroom	382	100%	100	50%	50%	4380	YES
	R10	Bedroom	391	100%	100	50%	50%	4380	YES
	R11	Bedroom	176	99%	100	50%	50%	4380	YES
	R12	LKD	245	58%	200	50%	50%	4380	YES
	R13	Bedroom	172	99%	100	50%	50%	4380	YES
	R14	LKD	245	58%	200	50%	50%	4380	YES
	R15	Bedroom	185	100%	100	50%	50%	4380	YES
	R16	Bedroom	184	100%	100	50%	50%	4380	YES
	R17	LKD	221	54%	200	50%	50%	4380	YES
	R18	Bedroom	265	100%	100	50%	50%	4380	YES
	R19	Bedroom	335	100%	100	50%	50%	4380	YES
	R20	LKD	573	99%	200	50%	50%	4380	YES
	R21	Bedroom	226	100%	100	50%	50%	4380	YES
	R22	Bedroom	227	100%	100	50%	50%	4380	YES
	R23	LKD	274	61%	200	50%	50%	4380	YES
	R24	LKD	280	63%	200	50%	50%	4380	YES
	R25	Bedroom	185	100%	100	50%	50%	4380	YES
	R26	Bedroom	486	100%	100	50%	50%	4380	YES
	R27	Bedroom	518	100%	100	50%	50%	4380	YES
	R28	LKD	392	91%	200	50%	50%	4380	YES
	R29	LKD	494	99%	200	50%	50%	4380	YES
	R30	Bedroom	480	100%	100	50%	50%	4380	YES
	R31	Bedroom	468	100%	100	50%	50%	4380	YES

Table 15: Illuminance Results – Resi. Apartment Second Floor

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
Resi. Apartment									
Second	R32	Bedroom	182	100%	100	50%	50%	4380	YES
	R33	LKD	299	67%	200	50%	50%	4380	YES
	R34	LKD	282	63%	200	50%	50%	4380	YES
	R35	Bedroom	238	100%	100	50%	50%	4380	YES
	R36	Bedroom	228	100%	100	50%	50%	4380	YES
	R37	LKD	636	100%	200	50%	50%	4380	YES
	R38	Bedroom	385	100%	100	50%	50%	4380	YES
	R39	Bedroom	322	100%	100	50%	50%	4380	YES
	R40	LKD	253	59%	200	50%	50%	4380	YES
	R41	Bedroom	202	100%	100	50%	50%	4380	YES
	R42	Bedroom	231	100%	100	50%	50%	4380	YES
	R43	LKD	237	55%	200	50%	50%	4380	YES
	R44	Bedroom	201	100%	100	50%	50%	4380	YES
	R45	Bedroom	257	100%	100	50%	50%	4380	YES
	R46	Bedroom	426	100%	100	50%	50%	4380	YES
	R47	Bedroom	452	100%	100	50%	50%	4380	YES
	R48	LKD	431	80%	200	50%	50%	4380	YES
	R49	LKD	429	97%	200	50%	50%	4380	YES
	R50	Bedroom	311	100%	100	50%	50%	4380	YES
	R51	Bedroom	282	100%	100	50%	50%	4380	YES
	R52	LKD	156	40%	200	50%	50%	4380	NO
	R53	Bedroom	206	99%	100	50%	50%	4380	YES
	R54	Bedroom	217	100%	100	50%	50%	4380	YES
	R55	Bedroom	221	88%	100	50%	50%	4380	YES
	R56	LKD	418	87%	200	50%	50%	4380	YES
	R57	LKD	519	100%	200	50%	50%	4380	YES
	R58	Bedroom	253	100%	100	50%	50%	4380	YES
	R59	Bedroom	268	100%	100	50%	50%	4380	YES
	R60	LKD	532	100%	200	50%	50%	4380	YES
	R61	LKD	434	88%	200	50%	50%	4380	YES
	R62	Bedroom	234	93%	100	50%	50%	4380	YES

Table 16: Illuminance Results – Resi. Apartment Second Floor

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
Resi. Apartment									
Third	R1	Bedroom	273	100%	100	50%	50%	4380	YES
	R2	Bedroom	288	100%	100	50%	50%	4380	YES
	R3	LKD	219	54%	200	50%	50%	4380	YES
	R4	Bedroom	315	100%	100	50%	50%	4380	YES
	R5	LKD	595	94%	200	50%	50%	4380	YES
	R6	LKD	417	84%	200	50%	50%	4380	YES
	R7	Bedroom	261	100%	100	50%	50%	4380	YES
	R8	Bedroom	287	100%	100	50%	50%	4380	YES
	R9	LKD	124	30%	200	50%	50%	4380	NO
	R10	Bedroom	311	100%	100	50%	50%	4380	YES
	R11	Bedroom	273	100%	100	50%	50%	4380	YES
	R12	LKD	215	52%	200	50%	50%	4380	YES
	R13	Bedroom	286	100%	100	50%	50%	4380	YES
	R14	Bedroom	267	100%	100	50%	50%	4380	YES
	R15	LKD	751	100%	200	50%	50%	4380	YES
	R16	LKD	145	37%	200	50%	50%	4380	NO
	R17	Bedroom	175	97%	100	50%	50%	4380	YES
	R18	Bedroom	410	100%	100	50%	50%	4380	YES
	R19	LKD	383	71%	200	50%	50%	4380	YES
	R20	Bedroom	461	100%	100	50%	50%	4380	YES
	R21	Bedroom	493	100%	100	50%	50%	4380	YES
	R22	Bedroom	688	100%	100	50%	50%	4380	YES
	R23	LKD	777	99%	200	50%	50%	4380	YES
	R24	LKD	643	100%	200	50%	50%	4380	YES
	R25	Bedroom	452	100%	100	50%	50%	4380	YES
	R26	Bedroom	450	100%	100	50%	50%	4380	YES
	R27	Bedroom	397	100%	100	50%	50%	4380	YES
	R28	LKD	368	73%	200	50%	50%	4380	YES
	R29	Bedroom	404	100%	100	50%	50%	4380	YES
	R30	Bedroom	191	99%	100	50%	50%	4380	YES
	R31	LKD	139	35%	200	50%	50%	4380	NO

Table 17: Illuminance Results – Resi. Apartment Third Floor

Floor Ref	Room Ref	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
Resi. Apartment									
Third	R32	LKD	840	100%	200	50%	50%	4380	YES
	R33	Bedroom	287	100%	100	50%	50%	4380	YES
	R34	Bedroom	321	100%	100	50%	50%	4380	YES
	R35	LKD	290	65%	200	50%	50%	4380	YES
	R36	Bedroom	288	100%	100	50%	50%	4380	YES
	R37	Bedroom	357	100%	100	50%	50%	4380	YES
	R38	Bedroom	331	100%	100	50%	50%	4380	YES
	R39	Bedroom	153	91%	100	50%	50%	4380	YES
	R40	LKD	258	60%	200	50%	50%	4380	YES
	R41	Bedroom	330	100%	100	50%	50%	4380	YES
	R42	Bedroom	290	100%	100	50%	50%	4380	YES
	R43	LKD	564	94%	200	50%	50%	4380	YES
	R44	LKD	501	99%	200	50%	50%	4380	YES
	R45	Bedroom	334	100%	100	50%	50%	4380	YES
	R46	Bedroom	308	100%	100	50%	50%	4380	YES
	R47	LKD	200	50%	200	50%	50%	4380	YES
	R48	Bedroom	237	100%	100	50%	50%	4380	YES
	R49	Bedroom	247	100%	100	50%	50%	4380	YES
	R50	Bedroom	261	93%	100	50%	50%	4380	YES
	R51	LKD	496	93%	200	50%	50%	4380	YES
	R52	LKD	637	100%	200	50%	50%	4380	YES
	R53	Bedroom	316	100%	100	50%	50%	4380	YES
	R54	Bedroom	328	100%	100	50%	50%	4380	YES
	R55	LKD	659	100%	200	50%	50%	4380	YES
	R56	LKD	518	93%	200	50%	50%	4380	YES
	R57	Bedroom	271	95%	100	50%	50%	4380	YES

Table 18: Illuminance Results – Resi. Apartment Third Floor

Floor Ref	Room Ref	Property Type	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
DP-01-02										
Ground	R1	Residential	LKD	461	100%	200	50%	50%	4380	YES
	R2	Residential	Bedroom	158	99%	100	50%	50%	4380	YES
	R3	Residential	LKD	279	64%	200	50%	50%	4380	YES
	R4	Residential	Bedroom	347	100%	100	50%	50%	4380	YES
First	R1	Residential	LKD	307	85%	200	50%	50%	4380	YES
	R2	Residential	LKD	330	72%	200	50%	50%	4380	YES
Second	R1	Residential	Bedroom	645	100%	100	50%	50%	4380	YES
	R2	Residential	Bedroom	301	100%	100	50%	50%	4380	YES
	R3	Residential	Bedroom	506	100%	100	50%	50%	4380	YES
	R4	Residential	Bedroom	195	83%	100	50%	50%	4380	YES
	R5	Residential	Bedroom	273	100%	100	50%	50%	4380	YES

Table 19: Illuminance Results DP-01-02

Floor Ref	Room Ref	Property Type	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
DP-03-04										
Ground	R1	Residential	LKD	310	71%	200	50%	50%	4380	YES
	R2	Residential	LKD	294	68%	200	50%	50%	4380	YES
	R3	Residential	Bedroom	291	100%	100	50%	50%	4380	YES
	R4	Residential	Bedroom	408	100%	100	50%	50%	4380	YES
	R5	Residential	Bedroom	283	99%	100	50%	50%	4380	YES
	R6	Residential	Bedroom	357	100%	100	50%	50%	4380	YES
First	R1	Residential	LKD	173	43%	200	50%	50%	4380	NO
	R2	Residential	LKD	189	48%	200	50%	50%	4380	NO
Second	R1	Residential	Bedroom	625	100%	100	50%	50%	4380	YES
	R2	Residential	Bedroom	166	94%	100	50%	50%	4380	YES
	R3	Residential	Bedroom	241	100%	100	50%	50%	4380	YES
	R4	Residential	Bedroom	642	100%	100	50%	50%	4380	YES
	R5	Residential	Bedroom	170	94%	100	50%	50%	4380	YES
	R6	Residential	Bedroom	241	100%	100	50%	50%	4380	YES

Table 20: Illuminance Results DP-03-04

Floor Ref	Room Ref	Property Type	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
DP-05-06										
Ground	R1	Residential	LKD	306	74%	200	50%	50%	4380	YES
	R2	Residential	LKD	299	73%	200	50%	50%	4380	YES
	R3	Residential	Bedroom	295	100%	100	50%	50%	4380	YES
	R4	Residential	Bedroom	417	100%	100	50%	50%	4380	YES
	R5	Residential	Bedroom	295	100%	100	50%	50%	4380	YES
	R6	Residential	Bedroom	417	100%	100	50%	50%	4380	YES
First	R1	Residential	LKD	197	50%	200	50%	50%	4380	YES
	R2	Residential	LKD	205	51%	200	50%	50%	4380	YES
Second	R1	Residential	Bedroom	644	100%	100	50%	50%	4380	YES
	R2	Residential	Bedroom	178	95%	100	50%	50%	4380	YES
	R3	Residential	Bedroom	644	100%	100	50%	50%	4380	YES
	R4	Residential	Bedroom	260	100%	100	50%	50%	4380	YES
	R5	Residential	Bedroom	177	95%	100	50%	50%	4380	YES
	R6	Residential	Bedroom	253	100%	100	50%	50%	4380	YES

Table 21: Illuminance Results DP-05-06

Floor Ref	Room Ref	Property Type	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
DP-07-08-09										
Ground	R1	Residential	LKD	311	74%	200	50%	50%	4380	YES
	R2	Residential	LKD	303	72%	200	50%	50%	4380	YES
	R3	Residential	LKD	281	67%	200	50%	50%	4380	YES
	R4	Residential	Bedroom	289	100%	100	50%	50%	4380	YES
	R5	Residential	Bedroom	420	100%	100	50%	50%	4380	YES
	R6	Residential	Bedroom	298	100%	100	50%	50%	4380	YES
	R7	Residential	Bedroom	423	100%	100	50%	50%	4380	YES
	R8	Residential	Bedroom	298	100%	100	50%	50%	4380	YES
	R9	Residential	Bedroom	423	100%	100	50%	50%	4380	YES
First	R1	Residential	LKD	207	51%	200	50%	50%	4380	YES
	R2	Residential	LKD	211	54%	200	50%	50%	4380	YES
	R3	Residential	LKD	197	49%	200	50%	50%	4380	NO
Second	R1	Residential	Bedroom	648	100%	100	50%	50%	4380	YES
	R2	Residential	Bedroom	180	94%	100	50%	50%	4380	YES
	R3	Residential	Bedroom	256	100%	100	50%	50%	4380	YES
	R4	Residential	Bedroom	641	100%	100	50%	50%	4380	YES
	R5	Residential	Bedroom	179	94%	100	50%	50%	4380	YES
	R6	Residential	Bedroom	252	100%	100	50%	50%	4380	YES
	R7	Residential	Bedroom	637	100%	100	50%	50%	4380	YES
	R8	Residential	Bedroom	151	81%	100	50%	50%	4380	YES
	R9	Residential	Bedroom	261	100%	100	50%	50%	4380	YES

Table 22: Illuminance Results DP-07-08-09

Floor Ref	Room Ref	Property Type	Room Use	Median Lux	% of Area Meeting Req Lux	Req Lux	Req % of Effective Area	Req % of Daylight Hours	Daylight Hours	Meets Criteria
DP-10-11										
Ground	R1	Residential	LKD	399	99%	200	50%	50%	4380	YES
	R2	Residential	Bedroom	283	100%	100	50%	50%	4380	YES
	R3	Residential	LKD	222	56%	200	50%	50%	4380	YES
	R4	Residential	Bedroom	131	78%	100	50%	50%	4380	YES
First	R1	Residential	LKD	282	72%	200	50%	50%	4380	YES
	R2	Residential	LKD	290	69%	200	50%	50%	4380	YES
Second	R1	Residential	Bedroom	401	100%	100	50%	50%	4380	YES
	R2	Residential	Bedroom	692	100%	100	50%	50%	4380	YES
	R3	Residential	Bedroom	243	100%	100	50%	50%	4380	YES
	R4	Residential	Bedroom	177	78%	100	50%	50%	4380	YES
	R5	Residential	Bedroom	390	100%	100	50%	50%	4380	YES

Table 23: Illuminance Results DP-10-11

Table 24: Illuminance Results Summary

Property	Number of Rooms Tested	Rooms satisfying Criteria		Rooms not satisfying Criteria
		No.	%	
Resi. Apartment	261	247	95%	14
DP-01-02	11	11	100%	0
DP-03-04	14	12	86%	2
DP-05-06	14	14	100%	0
DP-07-08-09	21	20	95%	1
DP-10-11	11	11	100%	0
Total	332	315	95%	17

A summary of the daylight assessment results for the proposed residential units is provided above. The assessment demonstrates that 95% of all habitable rooms meet or exceed the BRE recommended minimum standards for internal daylight provision, indicating a strong overall level of daylight performance across the development.

While a small proportion of rooms do not fully satisfy all of the BRE daylight recommendations, these instances have been clearly identified within the assessment. In such cases, it is important to recognise that the BRE guidelines are advisory rather than mandatory and should be applied flexibly, particularly within the context of higher-density urban development where achieving full compliance across every room may not always be feasible.

The rooms that fall below one or more of the recommended daylight criteria have been carefully considered in the context of the overall design quality of the scheme. These units benefit from a range of compensatory design measures and mitigating factors, including generous glazing provision, favourable room layouts, good levels of outlook, access to private amenity space, and the high overall daylight performance achieved across the majority of the development. Furthermore, the design has been informed by broader planning and urban design objectives, including the efficient use of a sustainable and accessible site, the delivery of much-needed housing, and the creation of a high-quality residential environment.

Accordingly, where full compliance with every BRE daylight criterion has not been achieved, the departures are limited in extent, have been transparently identified, and are considered acceptable when assessed against the overall quality of the accommodation provided and the wider planning benefits of the proposal. On balance, the proposed development delivers a high standard of residential amenity and aligns with national and local planning policy objectives that seek to promote sustainable, well-designed, and liveable residential development.

5.3.2 Sunlight Analysis for Proposed Development

The access to sunlight for duplex and apartment units in the proposed development was checked based on the guidance and recommendations in BR209 and EN 17037. (With respect to the overall site, visual analysis of the units and site layout shows that the majority of units have a main window wall facing within 90° of due south.)

EN 17037 recommends that a habitable room, preferably a main living room, can receive a total of at least 1.5 hours of sunlight on 21 March. Sunlight received by different windows can be added provided they occur at different times and sunlight hours are not double counted. (Note that although it is preferable that a main living room meets the criterion, the criterion is also met if any habitable room, e.g. kitchen or bedroom, meets the criterion.) All duplex and apartment units were tested against the above criterion. A summary of the results is shown in the following table

Property	Unit	Number of Rooms Tested	Rating				No. of Rooms Satisfying Criteria	Meets Criteria
			High	Medium	Minimum	Failed		
Resi. Apartment	0_LG_UNIT-1	2	0	0	2	0	2	YES
	0_LG_UNIT-2	2	0	1	1	0	2	YES
	0_LG_UNIT-3	3	0	0	2	1	2	YES
	0_LG_UNIT-4	2	0	1	0	1	1	YES
	0_LG_UNIT-5	2	0	1	0	1	1	YES
	0_LG_UNIT-6	3	1	0	2	0	3	YES
	0_LG_UNIT-7	3	2	0	1	0	3	YES
	0_LG_UNIT-8	3	0	0	0	3	0	NO
Resi. Apartment	0_UG_UNIT-1	3	0	0	1	2	1	YES
	0_UG_UNIT-2	2	0	2	0	0	2	YES
	0_UG_UNIT-3	2	1	0	1	0	2	YES
	0_UG_UNIT-4	3	0	0	2	1	2	YES
	0_UG_UNIT-5	2	0	1	0	1	1	YES
	0_UG_UNIT-6	2	0	1	0	1	1	YES
	0_UG_UNIT-7	3	0	1	1	1	2	YES
	0_UG_UNIT-8	3	1	0	2	0	3	YES
	0_UG_UNIT-9	2	1	0	1	0	2	YES
	0_UG_UNIT-10	2	1	0	1	0	2	YES
	0_UG_UNIT-11	3	3	0	0	0	3	YES
	0_UG_UNIT-12	3	3	0	0	0	3	YES
	0_UG_UNIT-13	2	1	0	1	0	2	YES
	0_UG_UNIT-14	2	1	0	1	0	2	YES
	0_UG_UNIT-15	3	3	0	0	0	3	YES
	0_UG_UNIT-16	3	1	0	2	0	3	YES
	0_UG_UNIT-17	3	1	0	2	0	3	YES
	0_UG_UNIT-18	3	2	0	1	0	3	YES
	0_UG_UNIT-19	6	0	1	2	3	3	YES
	0_UG_UNIT-20	3	0	0	0	3	0	NO
	0_UG_UNIT-21	2	0	0	0	2	0	NO
	0_UG_UNIT-22	2	0	0	0	2	0	NO
	0_UG_UNIT-23	2	0	0	0	2	0	NO
	0_UG_UNIT-24	2	0	0	0	2	0	NO

Table 25: Summary of Sunlight Exposure Resi. Apartment (lower to upper ground)

Property	Unit	Number of Rooms Tested	Rating				No. of Rooms Satisfying Criteria	Meets Criteria
			High	Medium	Minimum	Failed		
Resi. Apartment	01_FF_UNIT-1	3	0	0	2	1	2	YES
	01_FF_UNIT-2	2	1	0	1	0	2	YES
	01_FF_UNIT-3	2	2	0	0	0	2	YES
	01_FF_UNIT-4	3	0	0	2	1	2	YES
	01_FF_UNIT-5	2	0	1	0	1	1	YES
	01_FF_UNIT-6	2	0	1	0	1	1	YES
	01_FF_UNIT-7	3	0	1	1	1	2	YES
	01_FF_UNIT-8	3	1	0	2	0	3	YES
	01_FF_UNIT-9	3	1	0	1	1	2	YES
	01_FF_UNIT-10	2	1	0	0	1	1	YES
	01_FF_UNIT-11	3	3	0	0	0	3	YES
	01_FF_UNIT-12	3	2	1	0	0	3	YES
	01_FF_UNIT-13	2	1	0	0	1	1	YES
	01_FF_UNIT-14	3	1	0	1	1	2	YES
	01_FF_UNIT-15	3	3	0	0	0	3	YES
	01_FF_UNIT-16	3	1	0	2	0	3	YES
	01_FF_UNIT-17	3	1	0	2	0	3	YES
	01_FF_UNIT-18	3	2	0	1	0	3	YES
	01_FF_UNIT-20	3	0	0	0	3	0	NO
	01_FF_UNIT-21	2	0	0	0	2	0	NO
	01_FF_UNIT-22	2	0	0	0	2	0	NO
	01_FF_UNIT-23	2	0	0	0	2	0	NO
	01_FF_UNIT-24	2	0	0	0	2	0	NO

Table 26: Summary of Sunlight Exposure Resi. Apartment (First Floor)

Property	Unit	Number of Rooms Tested	Rating				No. of Rooms Satisfying Criteria	Meets Criteria
			High	Medium	Minimum	Failed		
Resi. Apartment	02_SF_UNIT-1	3	0	0	2	1	2	YES
	02_SF_UNIT-2	2	1	0	1	0	2	YES
	02_SF_UNIT-3	2	2	0	0	0	2	YES
	02_SF_UNIT-4	3	0	0	2	1	2	YES
	02_SF_UNIT-5	2	0	1	0	1	1	YES
	02_SF_UNIT-6	2	0	1	0	1	1	YES
	02_SF_UNIT-7	3	0	1	1	1	2	YES
	02_SF_UNIT-8	3	1	0	2	0	3	YES
	02_SF_UNIT-9	3	1	0	1	1	2	YES
	02_SF_UNIT-10	2	1	0	0	1	1	YES
	02_SF_UNIT-11	3	3	0	0	0	3	YES
	02_SF_UNIT-12	3	2	1	0	0	3	YES
	02_SF_UNIT-13	2	1	0	0	1	1	YES
	02_SF_UNIT-14	3	1	0	1	1	2	YES
	02_SF_UNIT-15	3	3	0	0	0	3	YES
	02_SF_UNIT-16	3	1	0	2	0	3	YES
	02_SF_UNIT-17	3	1	0	2	0	3	YES
	02_SF_UNIT-18	3	2	0	1	0	3	YES
	02_SF_UNIT-19	3	0	1	2	0	3	YES
	02_SF_UNIT-20	3	0	0	0	3	0	NO
	02_SF_UNIT-21	2	0	0	0	2	0	NO
	02_SF_UNIT-22	2	0	0	0	2	0	NO
	02_SF_UNIT-23	2	0	0	0	2	0	NO
	02_SF_UNIT-24	2	0	0	0	2	0	NO

Table 27: Summary of Sunlight Exposure Resi. Apartment(Second Floor)

Property	Unit	Number of Rooms Tested	Rating				No. of Rooms Satisfying Criteria	Meets Criteria
			High	Medium	Minimum	Failed		
Resi. Apartment	03_TF_UNIT-1	3	2	0	0	1	2	YES
	03_TF_UNIT-2	2	2	0	0	0	2	YES
	03_TF_UNIT-3	2	0	0	2	0	2	YES
	03_TF_UNIT-4	2	0	0	2	0	2	YES
	03_TF_UNIT-5	3	0	1	1	1	2	YES
	03_TF_UNIT-6	3	1	0	2	0	3	YES
	03_TF_UNIT-7	3	3	0	0	0	3	YES
	03_TF_UNIT-8	2	2	0	0	0	2	YES
	03_TF_UNIT-9	3	3	0	0	0	3	YES
	03_TF_UNIT-10	3	3	0	0	0	3	YES
	03_TF_UNIT-11	2	2	0	0	0	2	YES
	03_TF_UNIT-12	3	3	0	0	0	3	YES
	03_TF_UNIT-13	3	3	0	0	0	3	YES
	03_TF_UNIT-14	3	2	0	1	0	3	YES
	03_TF_UNIT-15	3	2	1	0	0	3	YES
	03_TF_UNIT-16	3	3	0	0	0	3	YES
	03_TF_UNIT-17	3	0	1	2	0	3	YES
	03_TF_UNIT-18	3	0	0	1	2	1	YES
	03_TF_UNIT-19	2	0	0	0	2	0	NO
	03_TF_UNIT-20	2	0	0	0	2	0	NO
	03_TF_UNIT-21	2	0	1	1	0	2	YES
	03_TF_UNIT-22	2	0	0	0	2	0	NO
Total		261	93	22	70	76	185	

Table 28: Summary of Sunlight Exposure Resi. Apartment(Second Floor)

When applying the 1.5 hours of direct sunlight on 21st March guideline to residential units, there is no strict numerical threshold set by EN 17037 for what percentage of units must meet the criteria. However, in practice and policy, a target is often adopted based on best practices and planning standards.

The density and orientation of buildings can impact sunlight availability. We believe for this development, a target value of 60–70% as reasonable, given the remaining units have other compensating quality factors (like good daylight or views). Given that 71% of the proposed units meet the 1.5-hour direct sunlight guideline on 21st March, this level of compliance is considered acceptable for a development of this nature.

5.3.3 Sunlight to Proposed Amenity Spaces

The BRE guide recommends:

“That for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March.”

The main communal open spaces and the open space was analysed. These areas are identified in the following figures and labelled for reference in the results Table 29

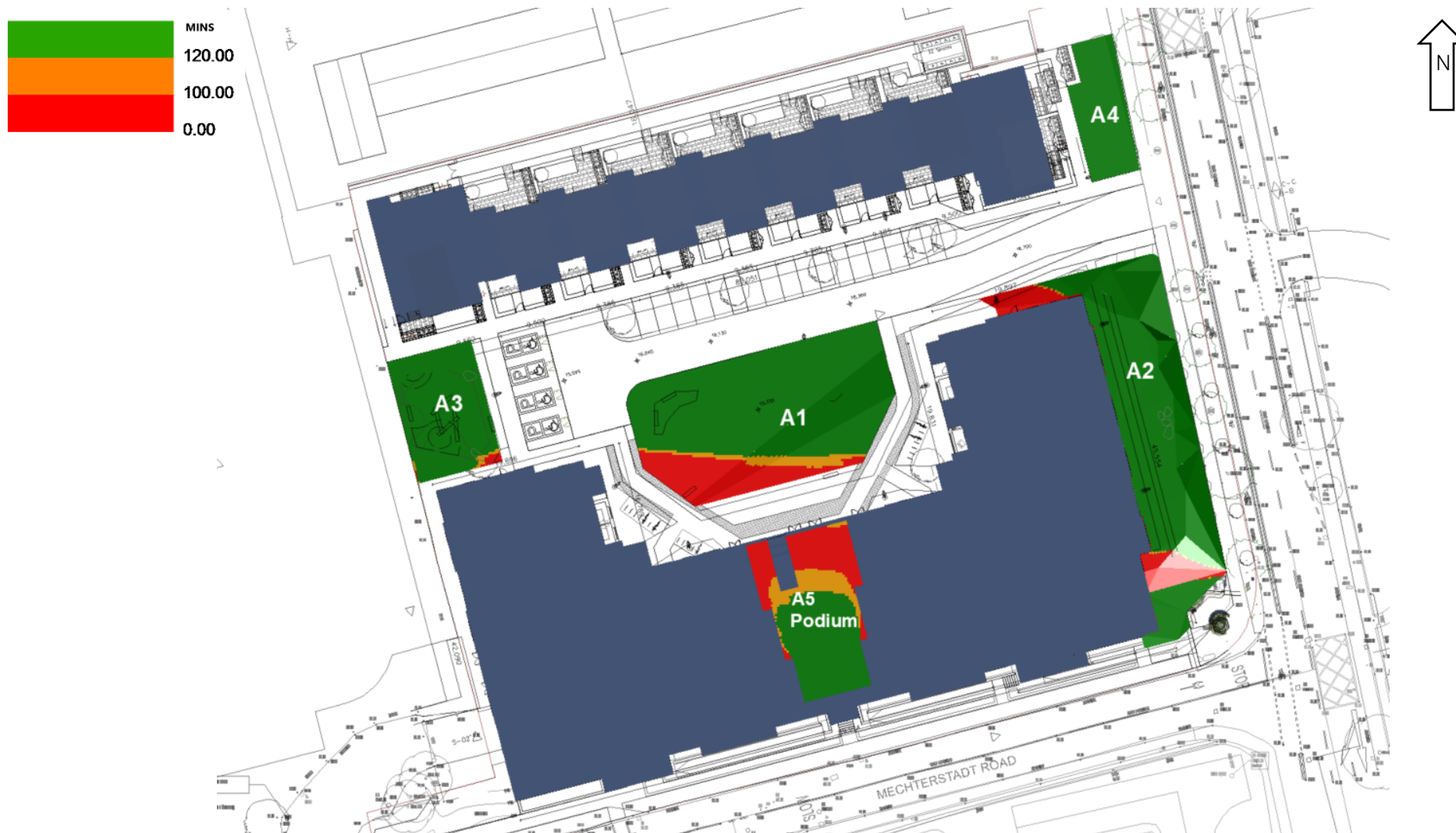


Figure 18: Proposed Resi. APT Amenity Space, 2hr Sunlight Test

Table 29: Open Spaces 2hr Sunlight Test Results

Open Space	Area (m ²)	2hr Sun Area (m ²)	% Area	Meets Criteria
Amenity A1	565.42	446.52	78.97%	YES
Amenity A2	570.94	486.63	85.23%	YES
Amenity A3	189.47	183.61	96.90%	YES
Amenity A4	117.61	117.61	100.00%	YES
Amenity A5 Podium	236.15	129.50	54.84%	YES
Total	1679.59	1363.87	81.20%	YES

The results show the open spaces that receive greater than 2 hours of sunlight on March 21st. The cumulative area of the spaces exceeds the recommended criteria for sunlight. It should be noted that the amenity area is in excess of the required area for such a scheme.

6 Conclusion

The analysis and assessments in this report have been carried out in line with the recommendations of BRE's "Site Layout Planning for daylight and sunlight, a Guide to good practice" (BRE Building Technology Group, 2022) and BS EN 17037.

There is no significant impact from the proposed development on surrounding buildings and therefore the proposed development will not affect:

- access to skylight to existing neighbouring buildings,
- access to sunlight to existing neighbouring buildings, and
- sunlight to gardens/open spaces to existing neighbouring buildings.

In terms of internal daylight levels within the proposed development, the results show that 95% of all rooms meet or exceed the BRE's minimum recommendations for internal daylight provision in dwellings. Therefore, we believe the proposed development

performs at a high level for a scheme of this scale and aligns to national policy to ensure high quality sustainable development.

In order to maximise available light, glazing to all habitable rooms is in excess of 20%. The design team have developed the proposed building using the principles of the BREs "Site Layout Planning for Daylight and Sunlight, A guide to good practice".

In terms of the amenity spaces provided the results show the open spaces that receive greater than 2 hours of sunlight on March 21st. The cumulative area of the spaces exceeds the recommended criteria for sunlight. It should be noted that the amenity area is in excess of the required area for such a scheme.

Overall, the development has been designed with due consideration for sunlight and daylight and meets the recommendations as set out in the BRE Guide – BR 209 "Site Layout Planning for Daylight and Sunlight, A guide to good practice (2022)."

Appendix A Proposed Illuminance Contours (with Room & Window Legends)

A.1 Proposed Residential Apartment

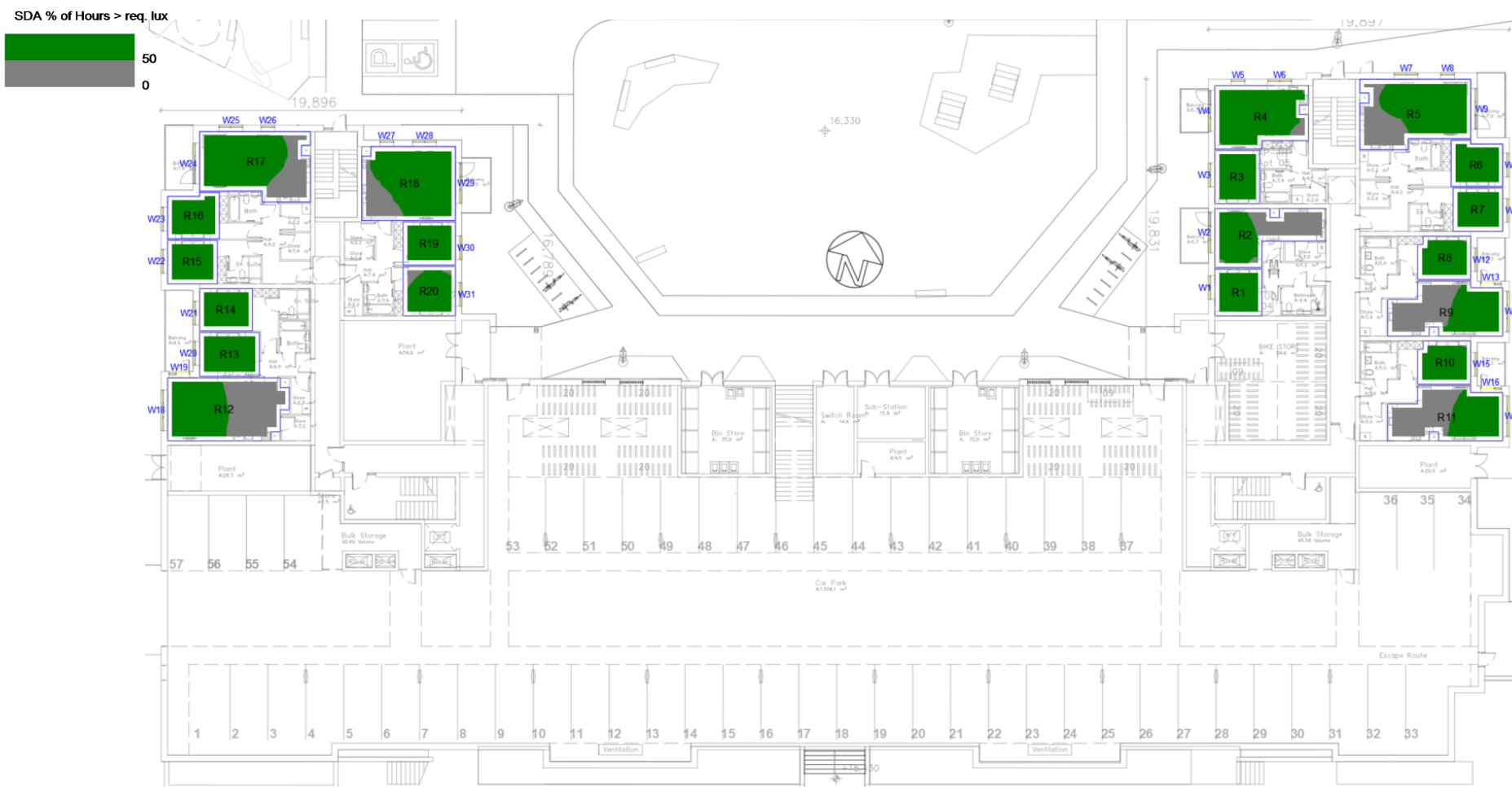


Figure 19: Resi. Apartment Lower Ground Floor sDA Contours

SDA % of Hours > req. lux



Figure 20: Resi. Apartment Ground Floor sDA Contours

SDA % of Hours > req. lux

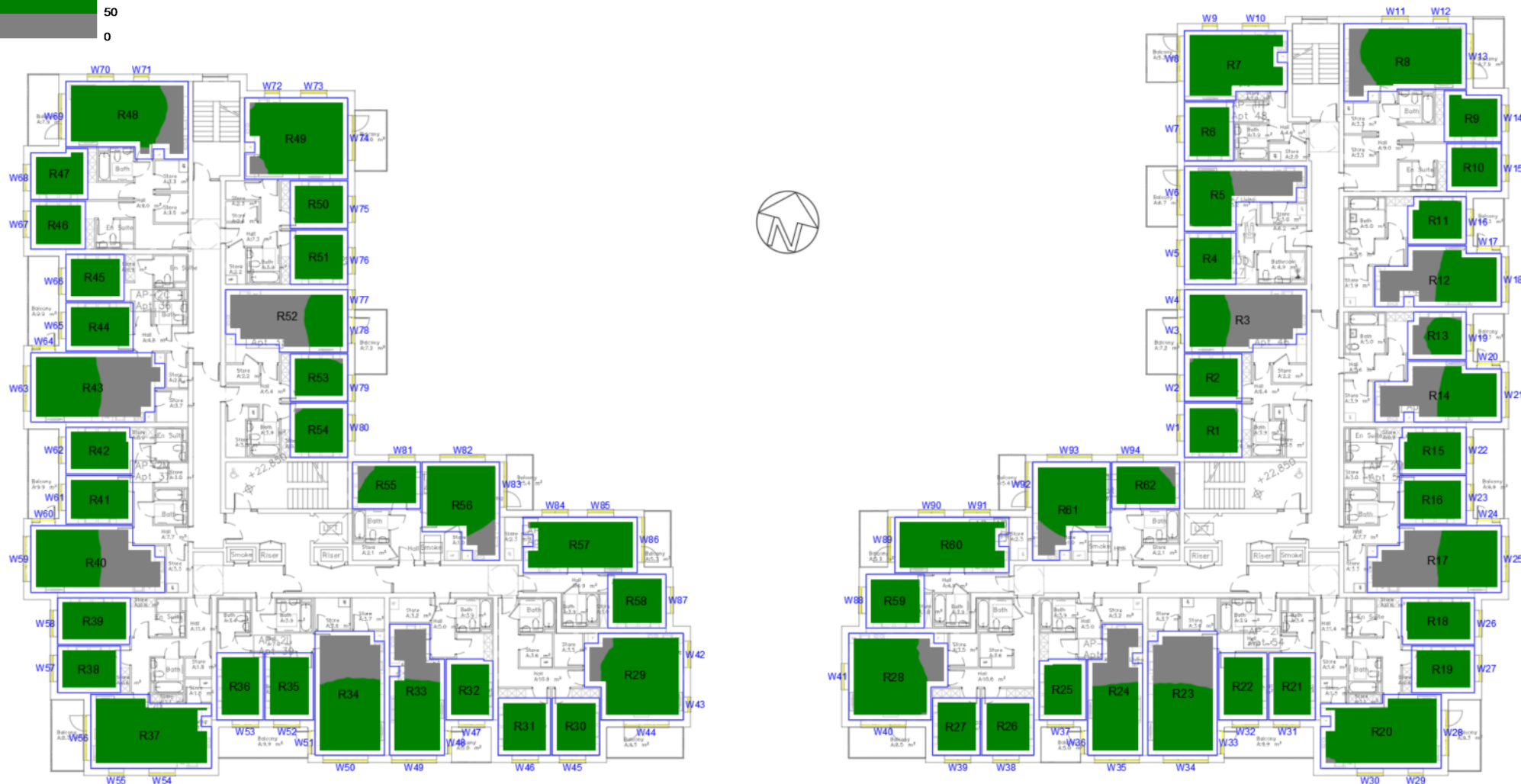


Figure 21: Resi. Apartment First Floor sDA Contours

SDA % of Hours > req. lux

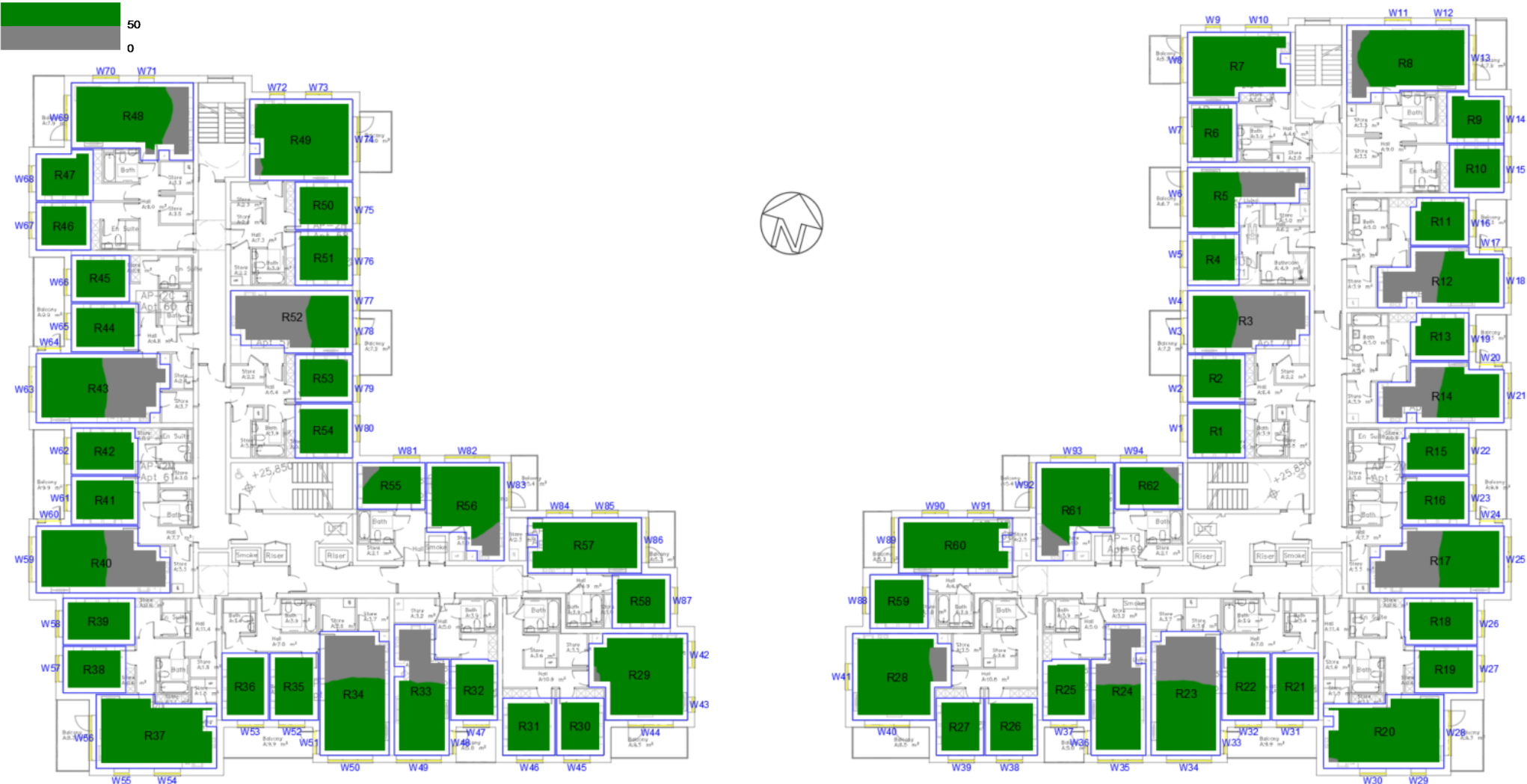


Figure 22: Resi. Apartment Second Floor sDA Contours

SDA % of Hours > req. lux

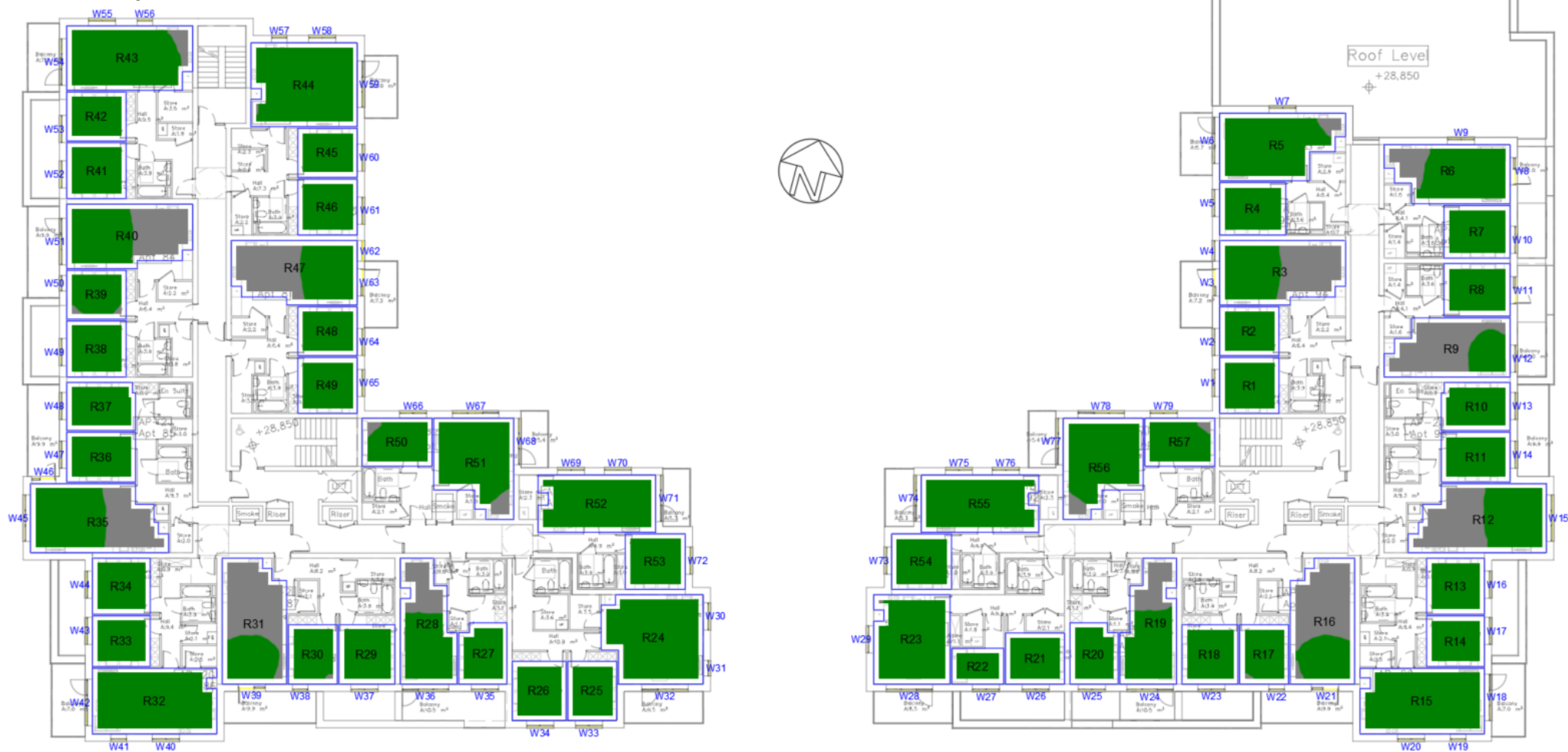


Figure 23: Resi. Apartment Third Floor sDA Contours

A.2 Proposed Duplex Houses (DP-01-02)



Figure 24: DP-01-02 Ground Floor sDA Contours

SDA % of Hours > req. lux

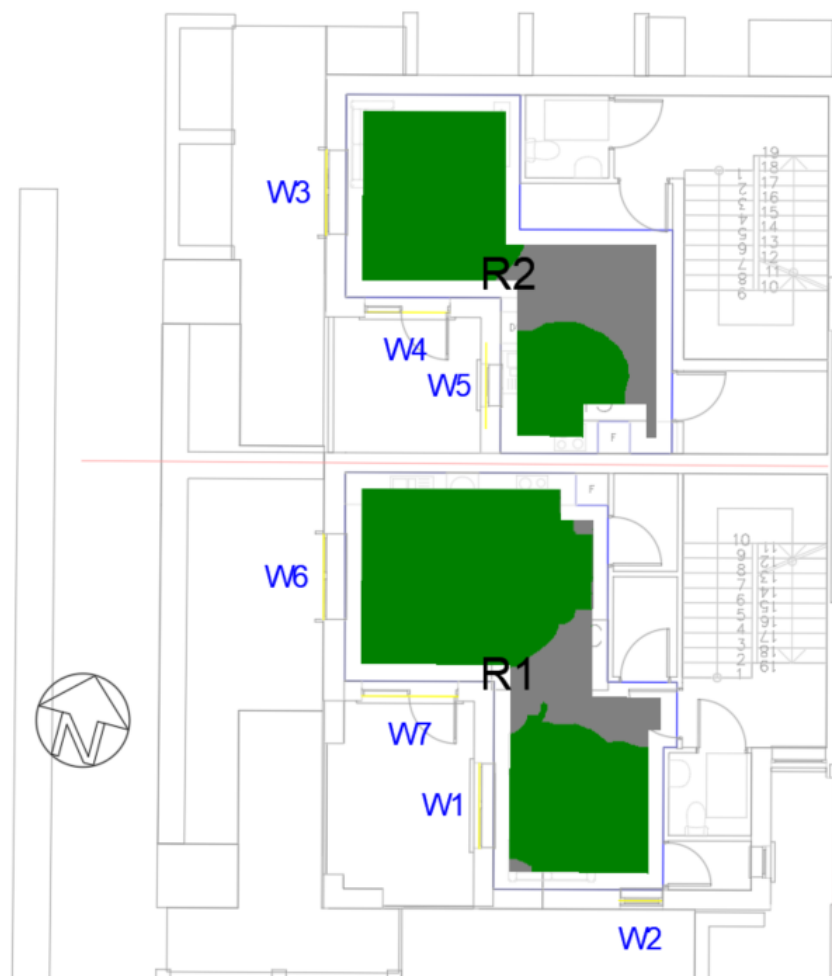


Figure 25: DP-01-02 First Floor sDA Contours

SDA % of Hours > req. lux



Figure 26: DP-01-02 Second Floor sDA Contours

A.3 Proposed Duplex Houses (DP-03-04)

SDA % of Hours > req. lux



Figure 27: DP-03-04 Ground Floor sDA Contours

SDA % of Hours > req. lux



Figure 28: DP-03-04 First Floor sDA Contours

SDA % of Hours > req. lux

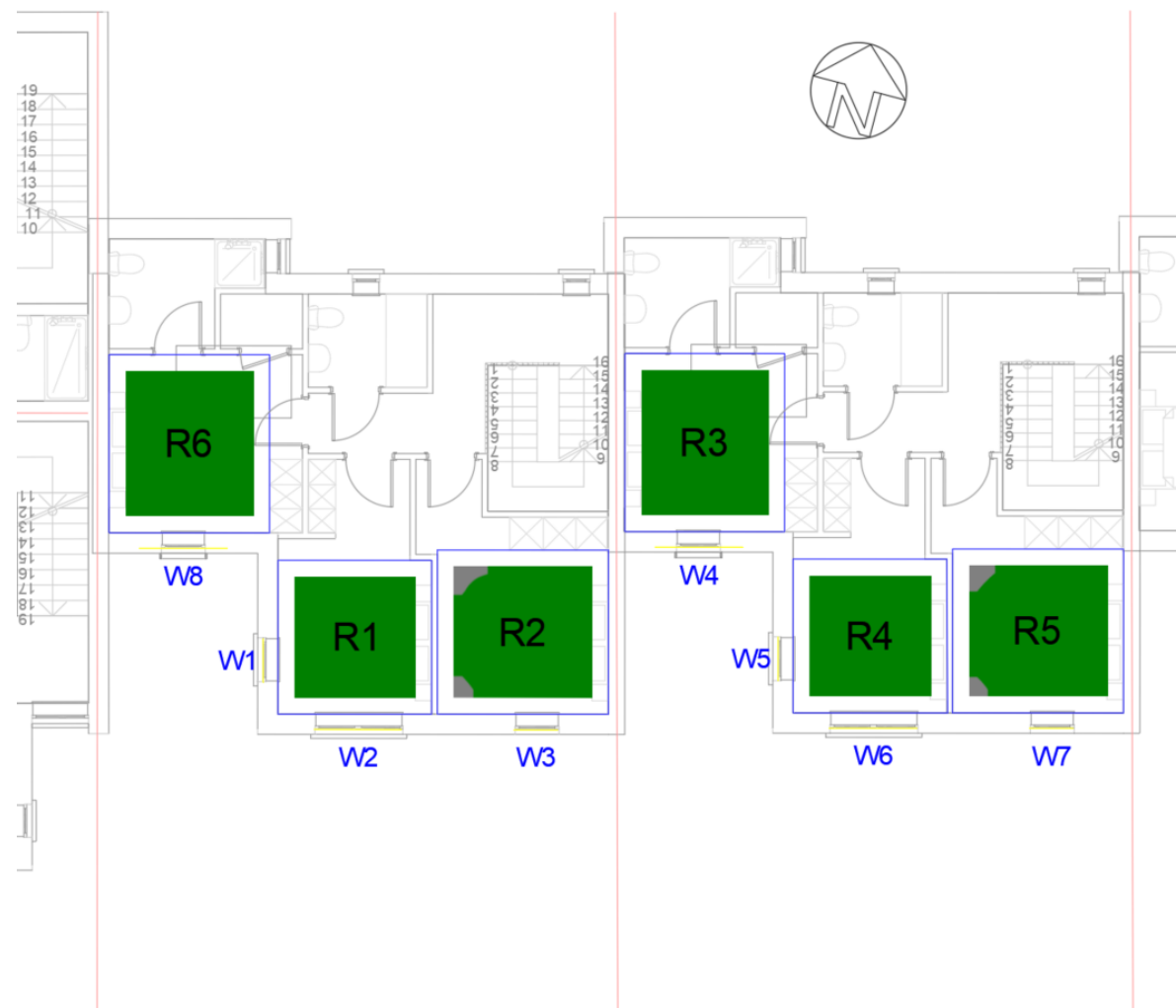


Figure 29: DP-03-04 Second Floor sDA Contours

A.4 Proposed Duplex Houses (DP-05-06)

SDA % of Hours > req. lux

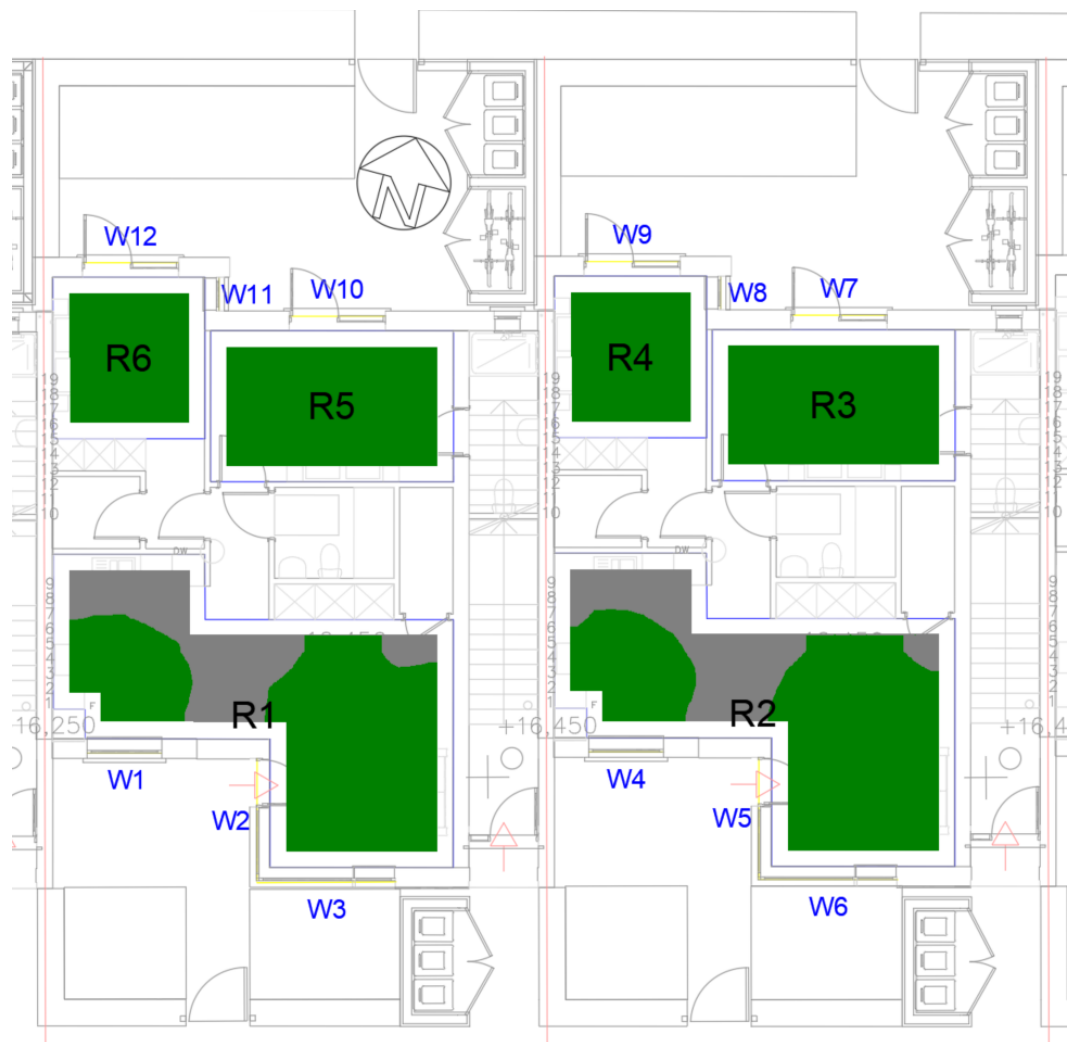


Figure 30: DP-05-06 Ground Floor sDA Contours

SDA % of Hours > req. lux



Figure 31: DP-05-06 First Floor sDA Contours

SDA % of Hours > req. lux

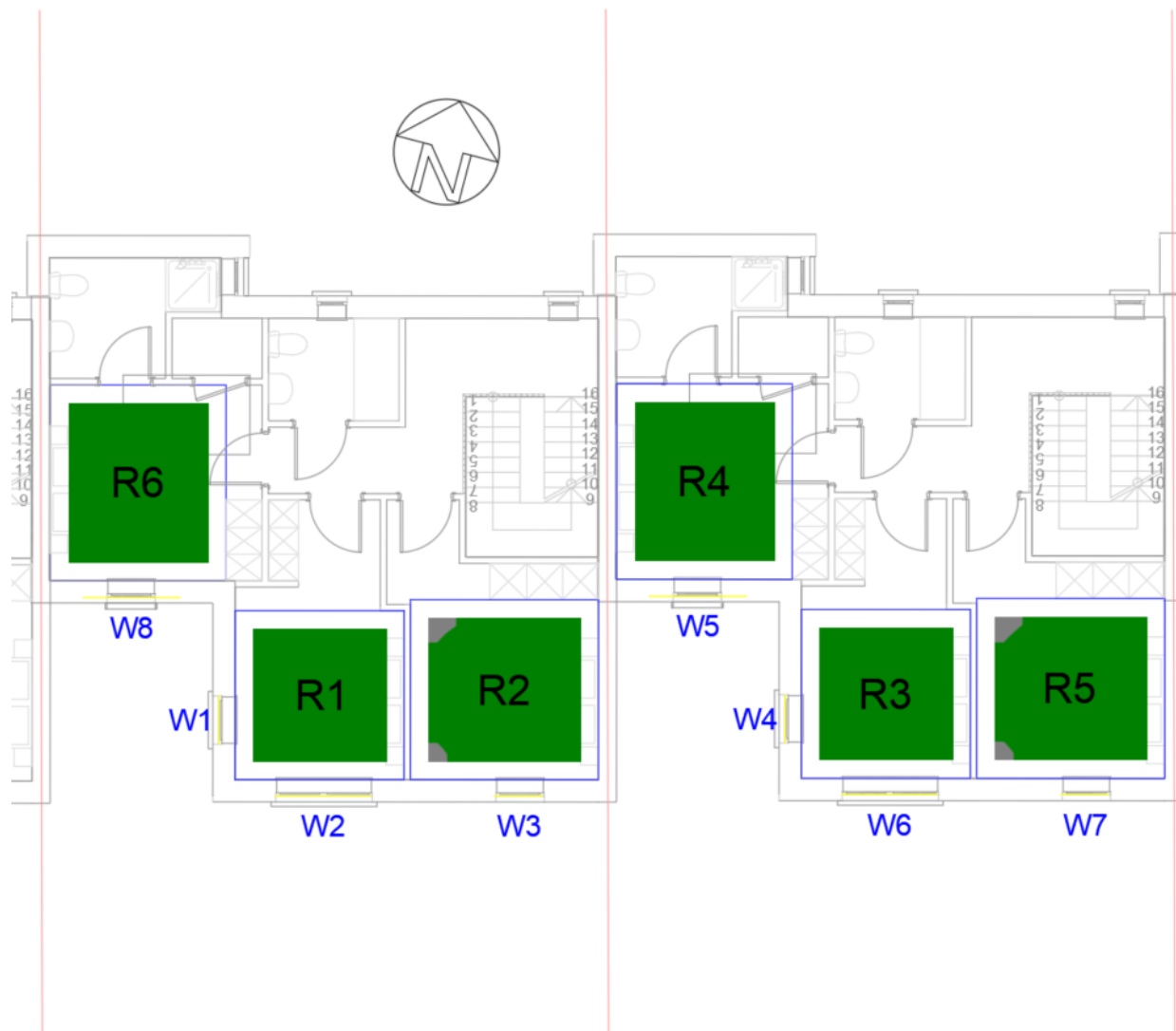


Figure 32: DP-05-06 Second Floor sDA Contours

A.5 Proposed Duplex Houses (DP-07-08-09)

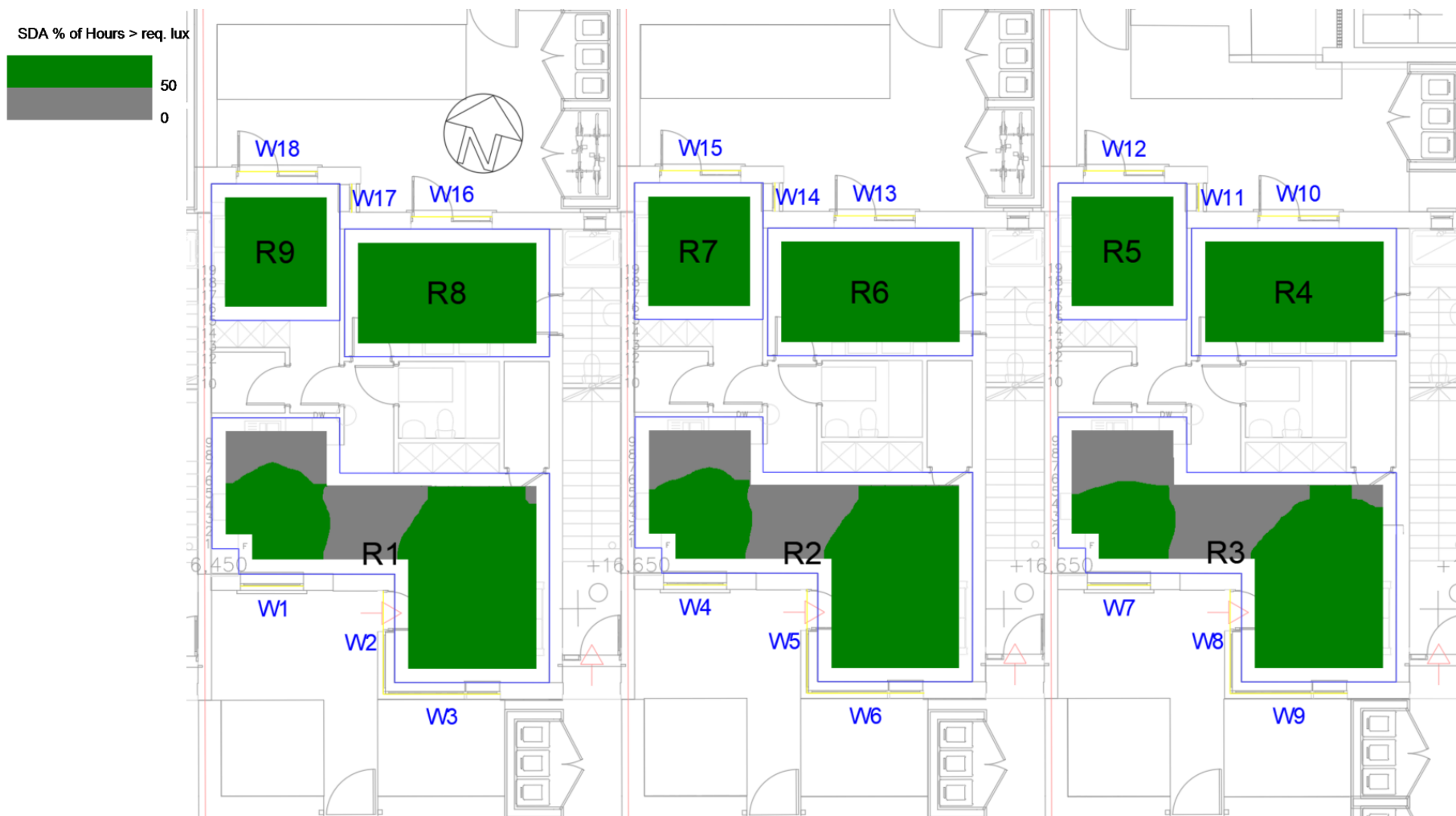


Figure 33: DP-07-08-09 Ground Floor sDA Contours

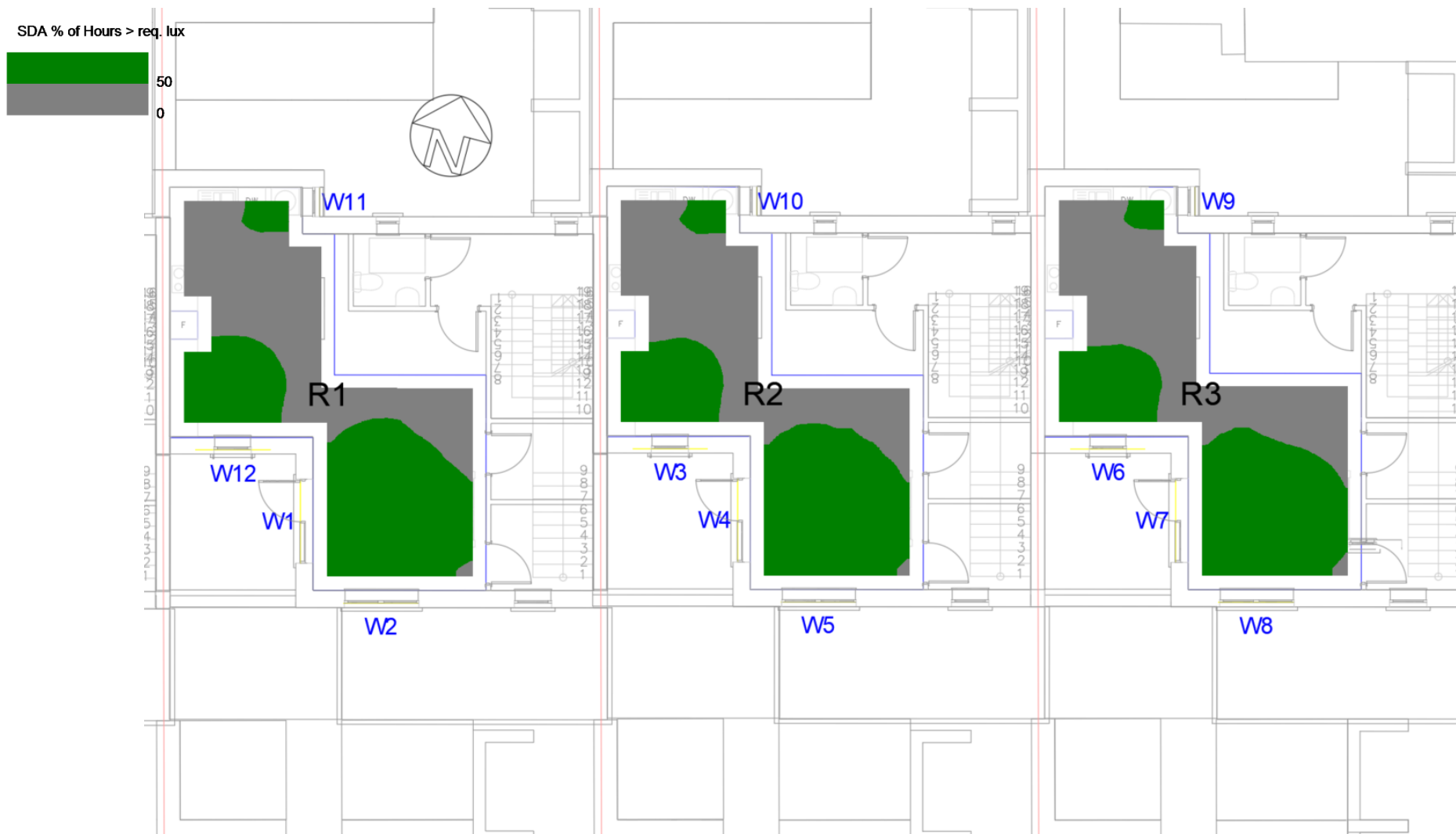


Figure 34: DP-07-08-09 First Floor sDA Contours

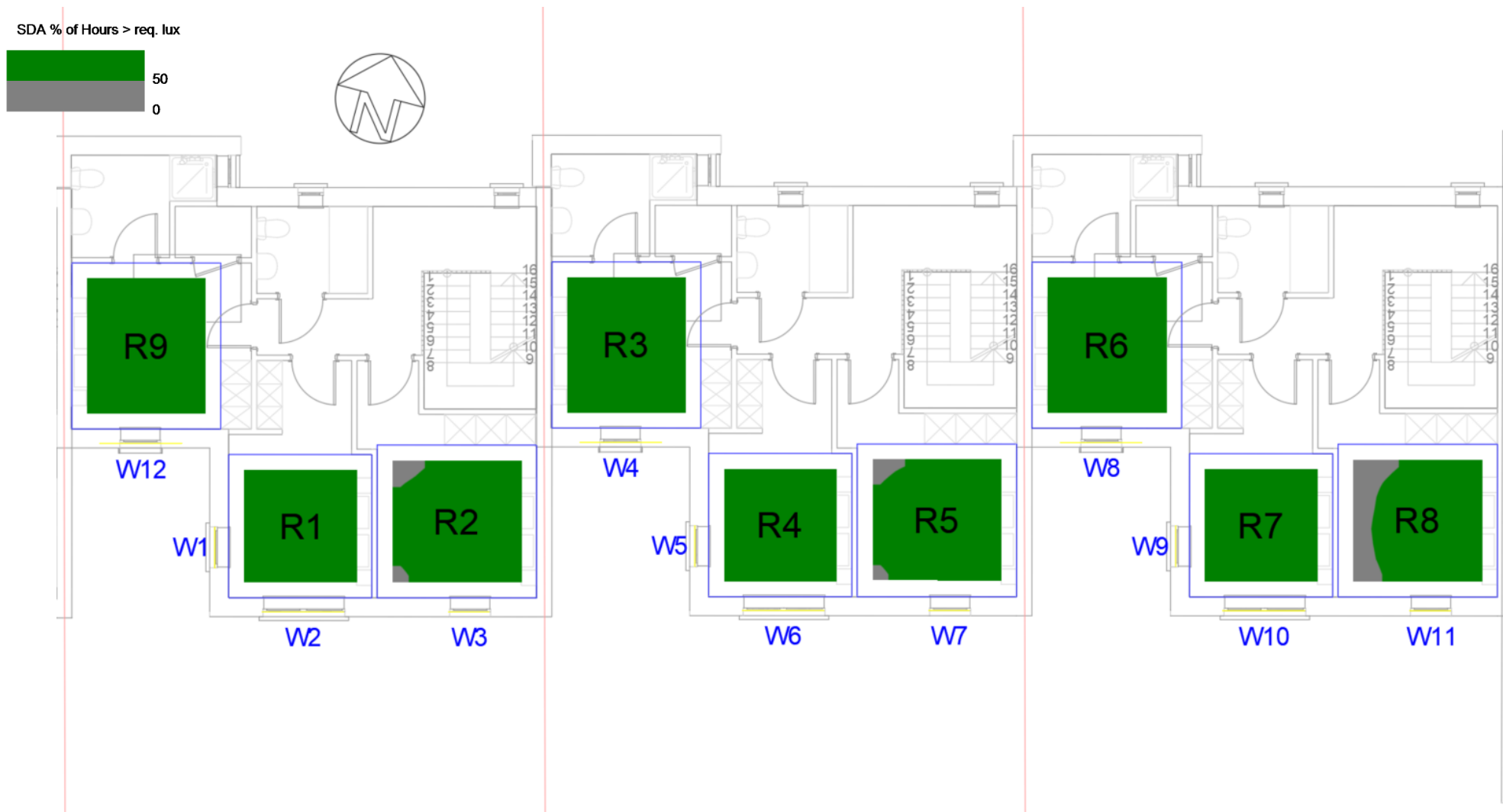


Figure 35: DP-07-08-09 Second Floor sDA Contours

A.6 Proposed Duplex Houses (DP-10-11)

SDA % of Hours > req. lux

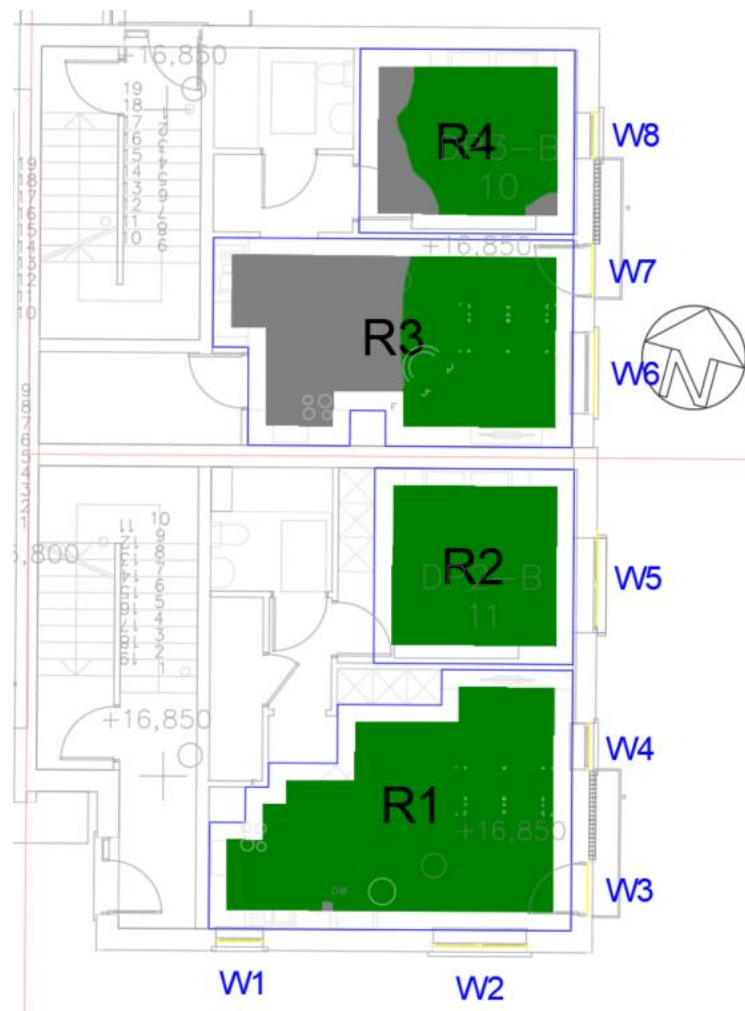


Figure 36: DP-10-11 Ground Floor sDA Contours

SDA % of Hours > req. lux

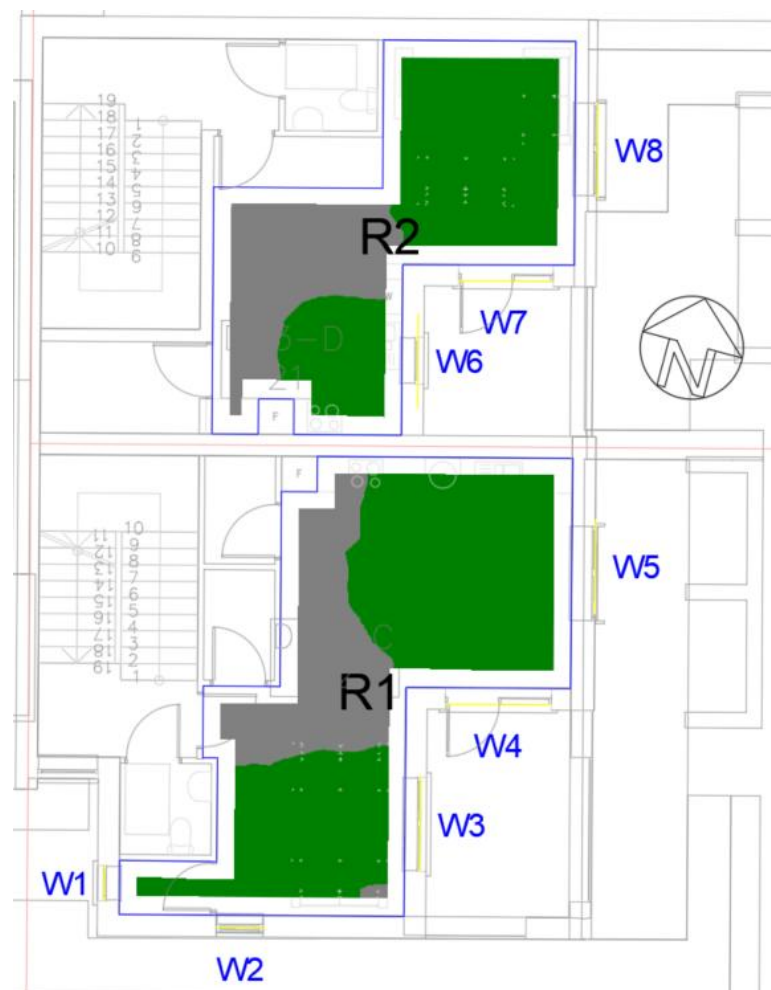


Figure 37: DP-10-11 First Floor sDA Contours

SDA % of Hours > req. lux

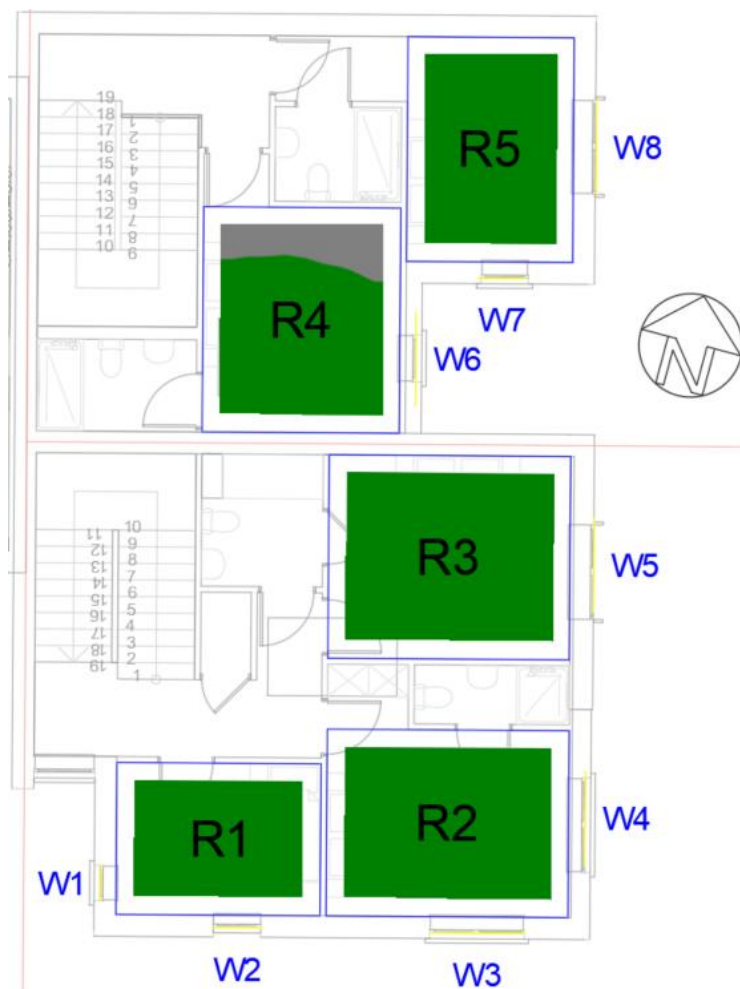


Figure 38: DP-10-11 Second Floor sDA Contours

Appendix B Shadow Images

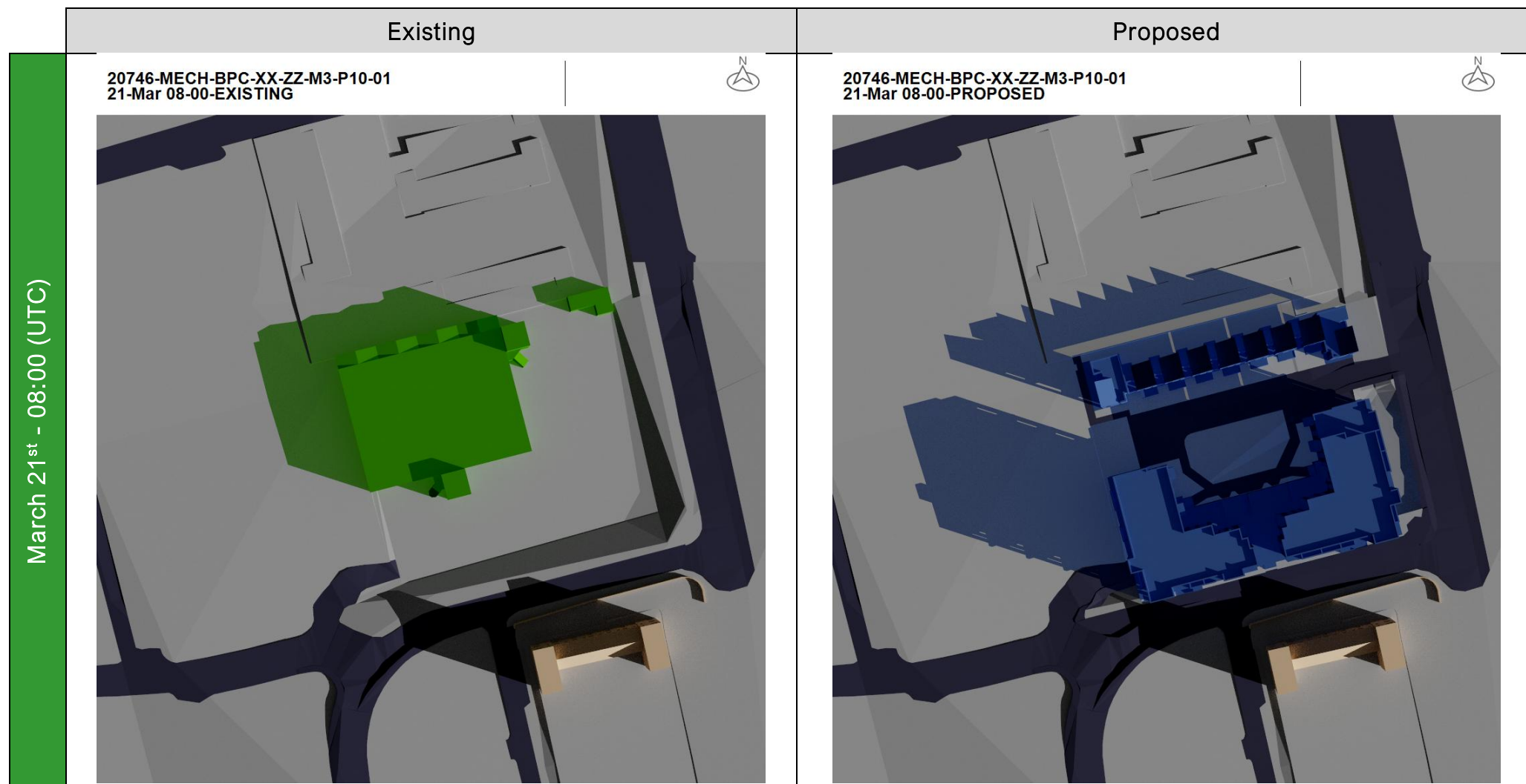
Shadow plots are used to show the shadows which the proposed building makes. *“In interpreting the impact of such differences, it must be borne in mind that nearly all structures will create areas of new shadow, and some degree of transient overshadowing of a space is to be expected.”* (BRE Building Technology Group, 2022)

Shadow plots were created for March 21st and June 21st. March 21st is the equinox and as such provides the average level of shadowing that can be expected. June 21st

is a summertime plot and represents the best case for shadow. (December 21st has not been plotted as at this time of year even low buildings will cast long shadows. In a built-up area, it is common for large areas of the ground to be in shadow in December.)

The shadow plots are purely illustrative (as opposed to other quantitative or quantitative metrics used in the analysis).

B.1 March 21st

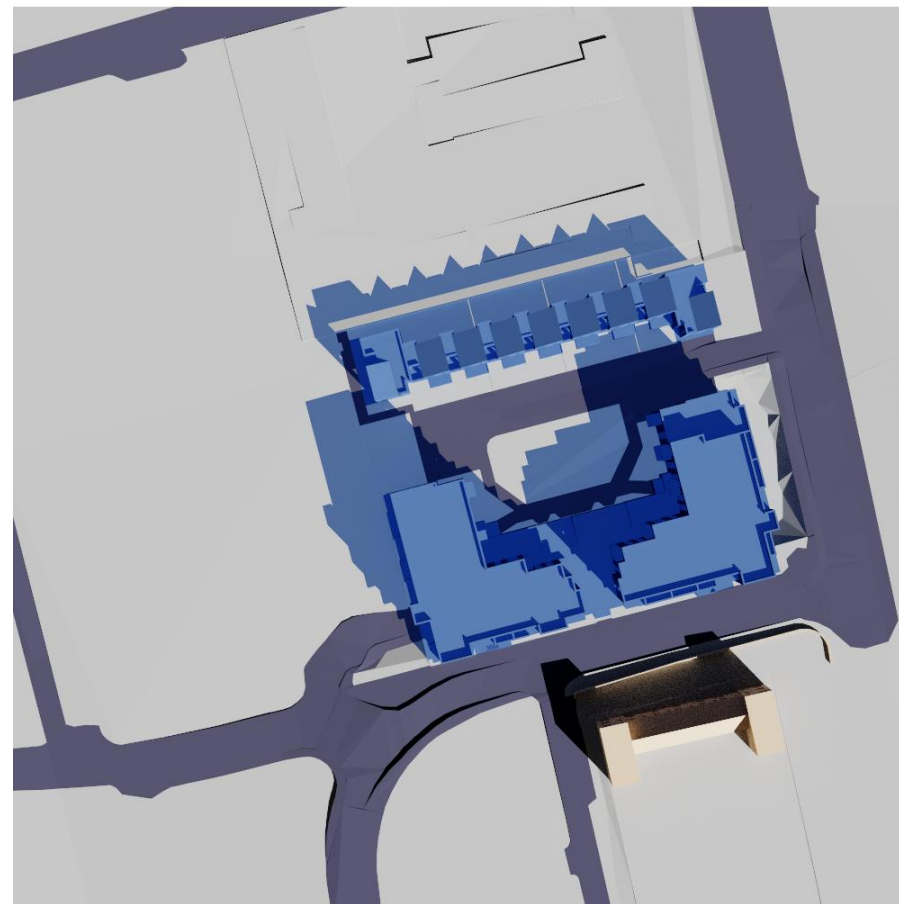


March 21st – 10:00 (UTC)

20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Mar 10-00-EXISTING

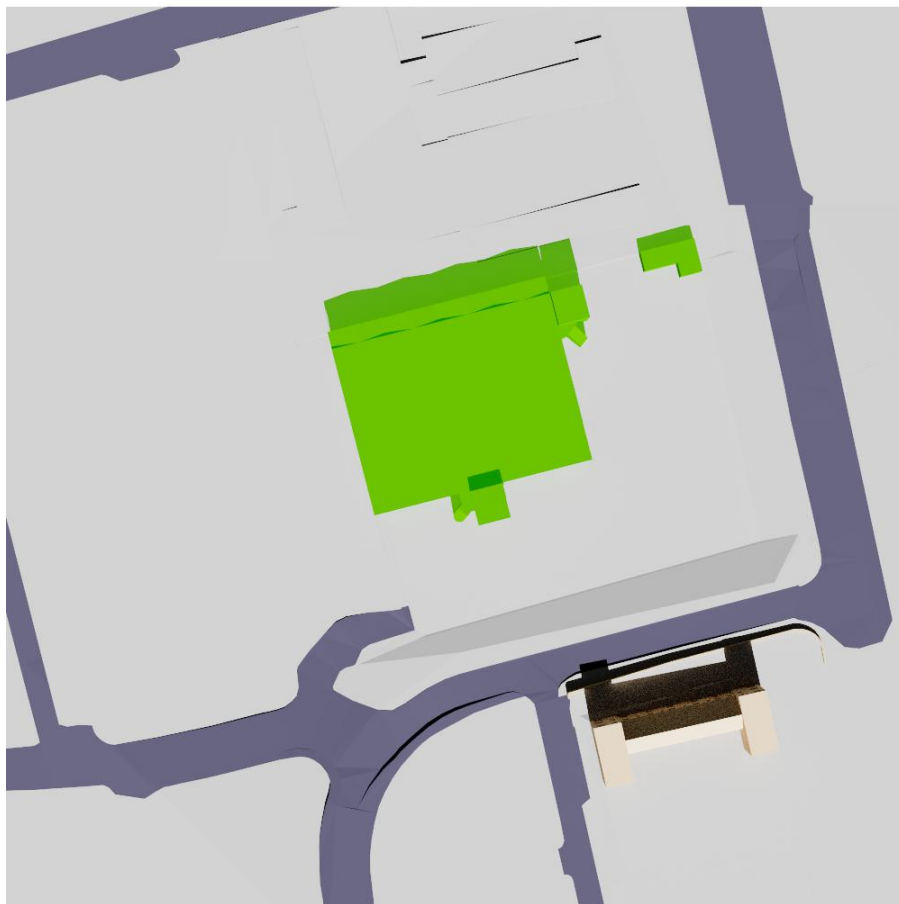


20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Mar 10-00-PROPOSED

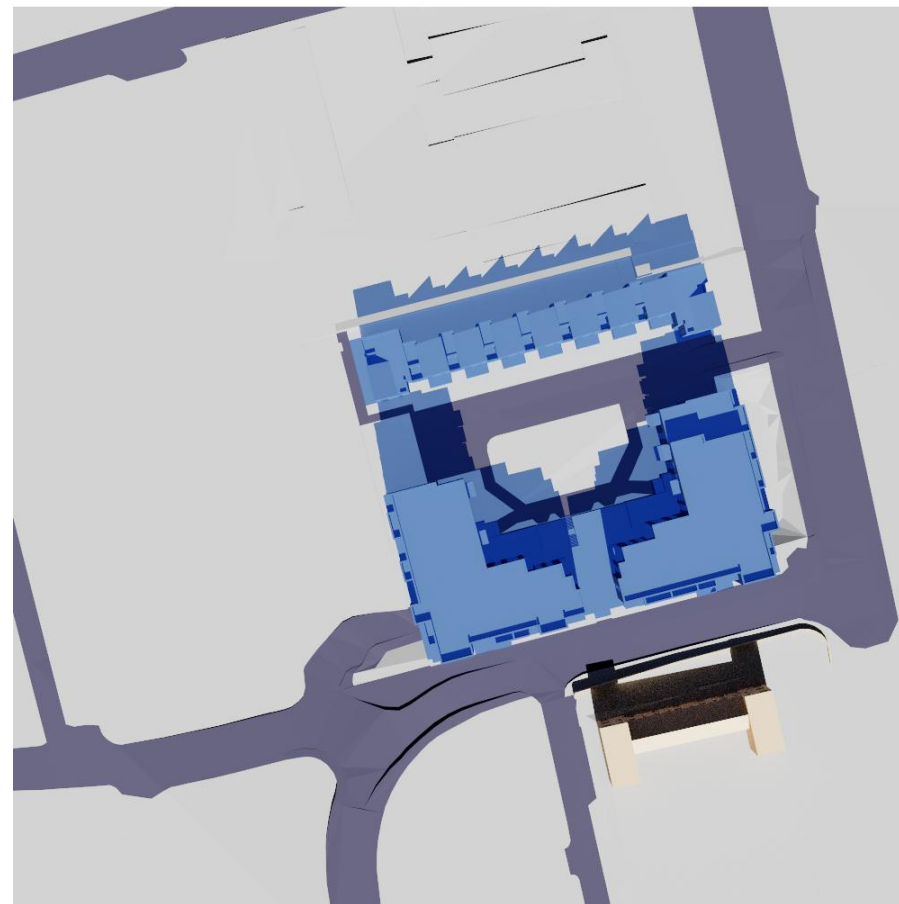


March 21st - 12:00 (UTC)

20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Mar 12-00-EXISTING



20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Mar 12-00-PROPOSED

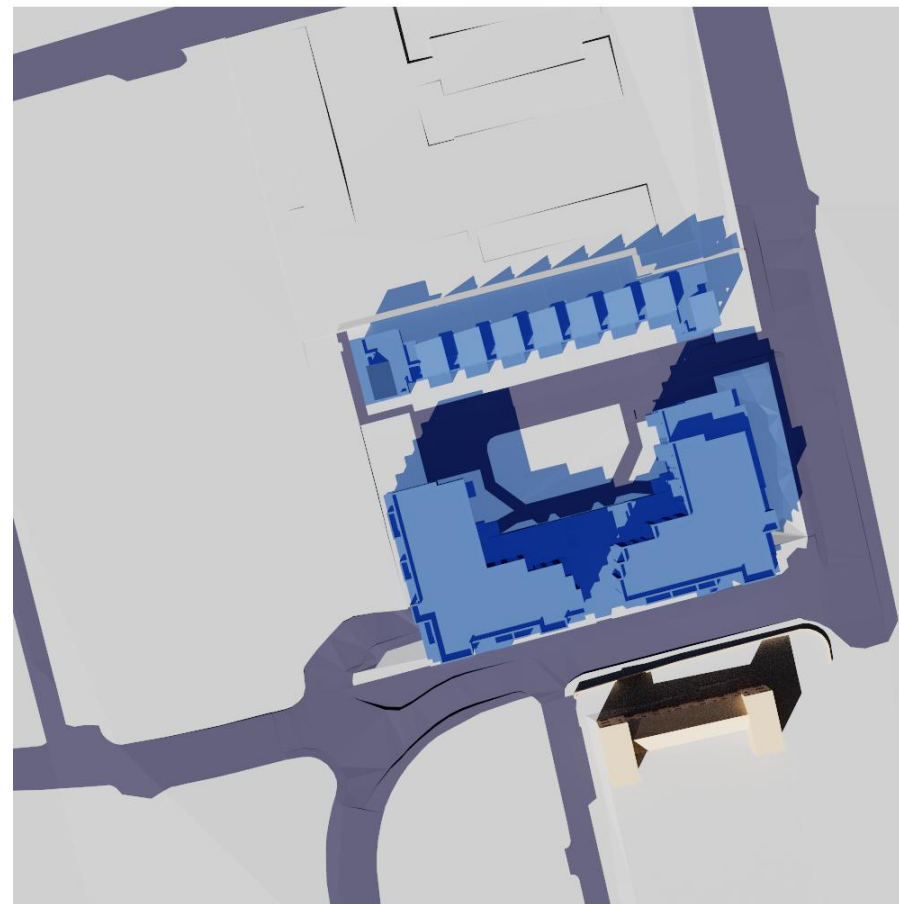


March 21st - 14:00 (UTC)

20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Mar 14-00-EXISTING



20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Mar 14-00-PROPOSED

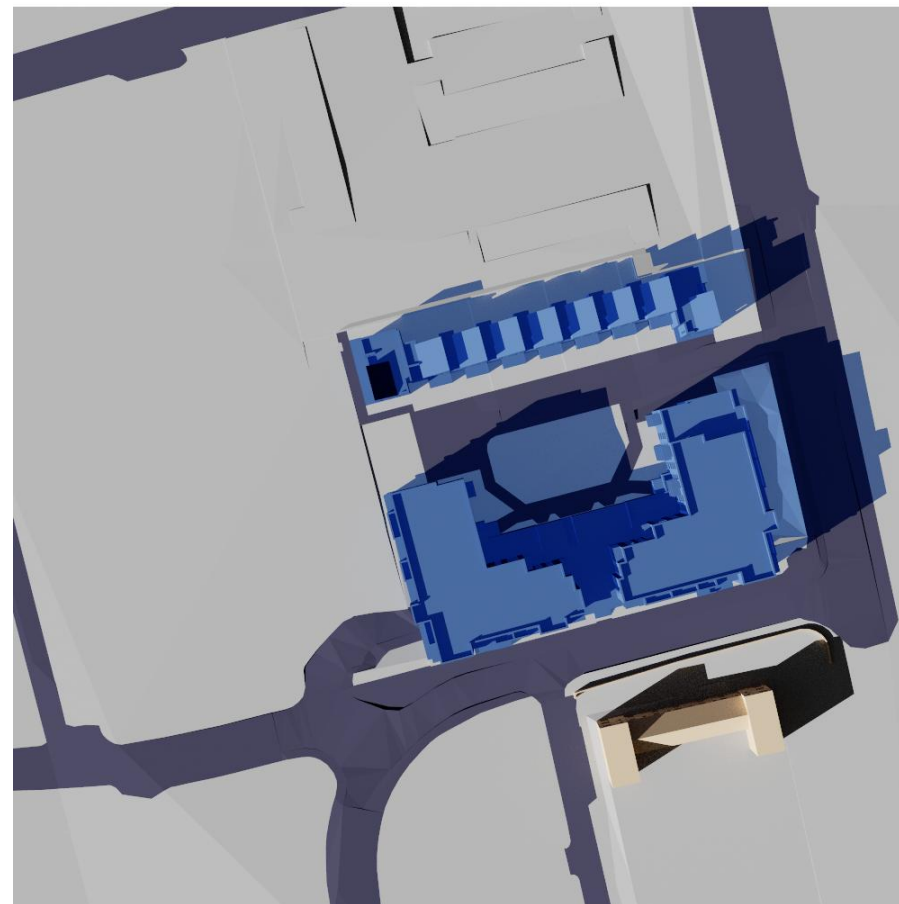


March 21st - 16:00 (UTC)

20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Mar 16-00-EXISTING



20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Mar 16-00-PROPOSED



B.2 June 21st

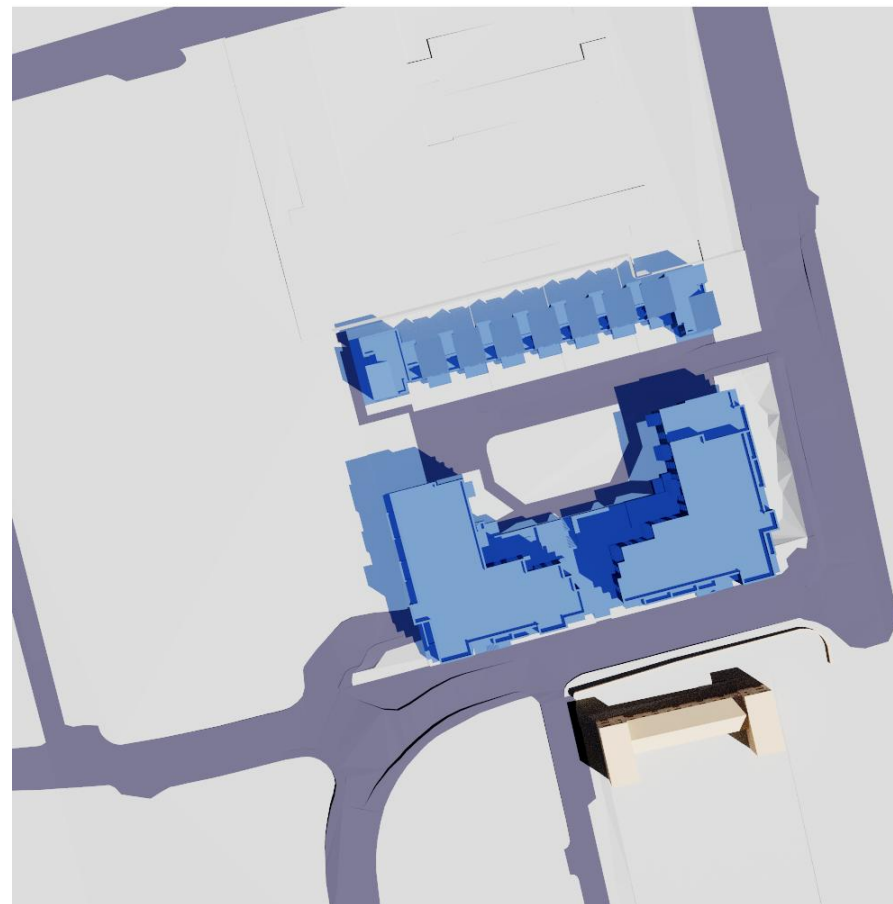


June 21st - 10:00 (UTC+1)

20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Jun 10-00-EXISTING



20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Jun 10-00-PROPOSED

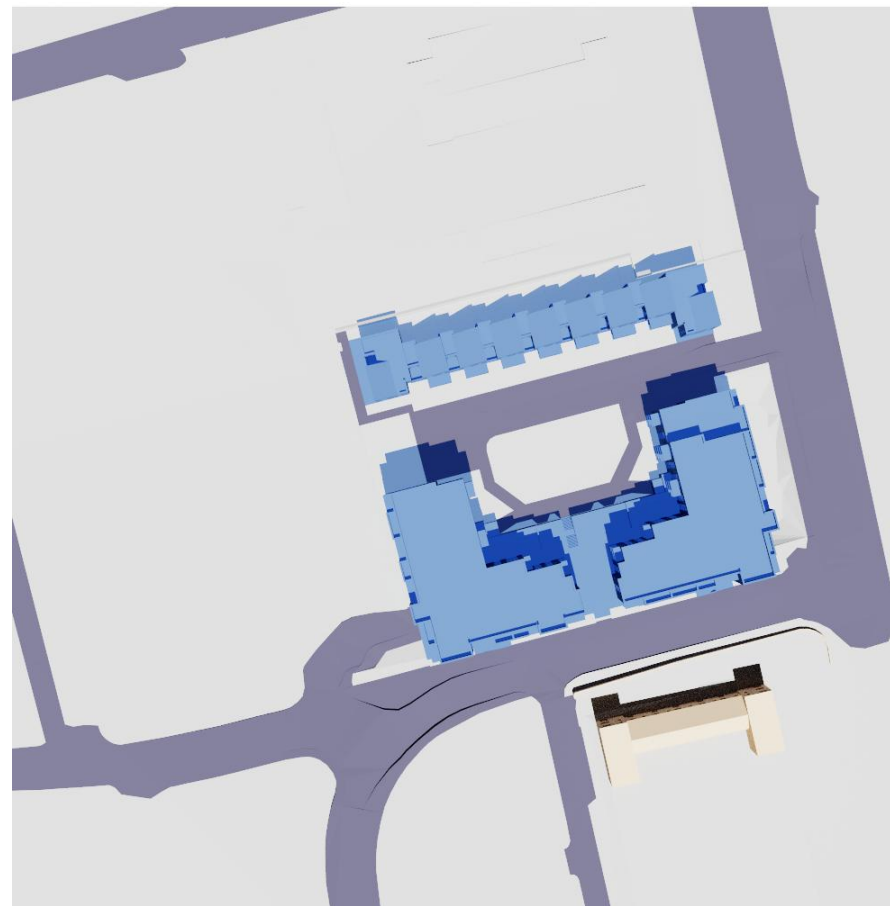


June 21st - 12:00 (UTC+1)

20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Jun 12-00-EXISTING



20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Jun 12-00-PROPOSED



June 21st - 14:00 (UTC+1)

20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Jun 14-00-EXISTING



20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Jun 14-00-PROPOSED



June 21st - 16:00 (UTC+1)

20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Jun 16-00-EXISTING



20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Jun 16-00-PROPOSED

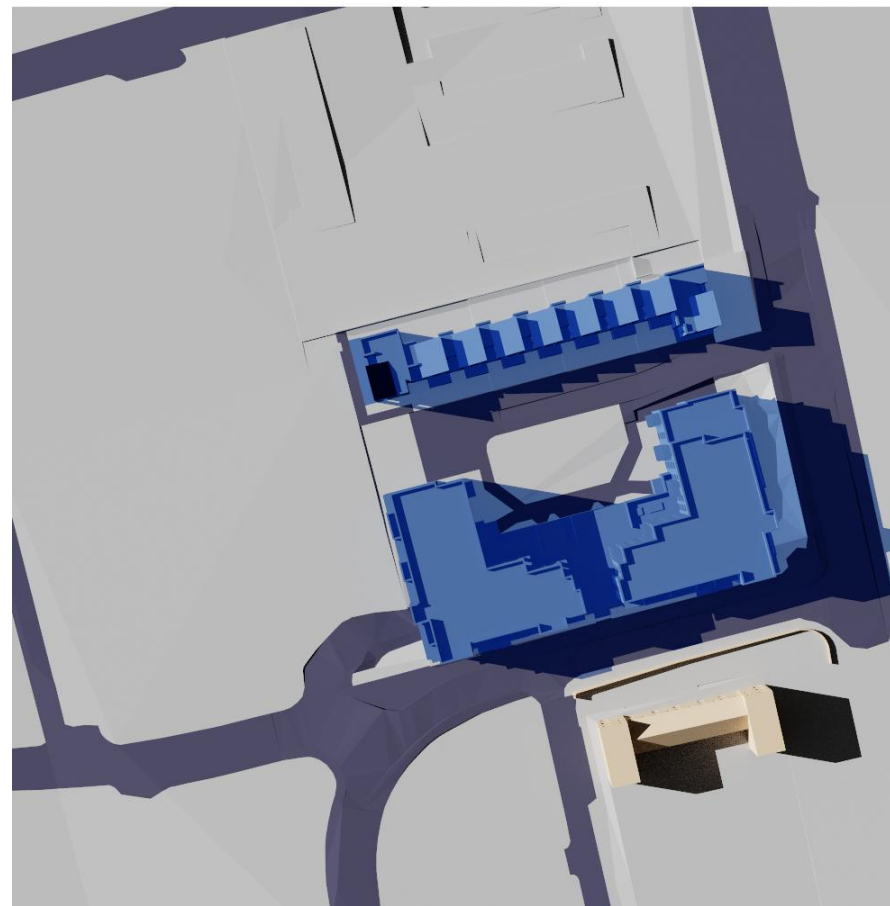


June 21st – 18:00 (UTC+1)

20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Jun 18-00-EXISTING



20746-MECH-BPC-XX-ZZ-M3-P10-01
21-Jun 18-00-PROPOSED



7 Bibliography

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