

# Residential Development Kilbarry, Cork

## Daylight, Sunlight & Overshadowing Assessment

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**Report by:**

Building Performance Consulting Engineers



BUILDING PERFORMANCE CONSULTING

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## Glossary

### Average Daylight Factor (ADF)

Ratio of total daylight flux incident on the working plane area to the area of the working plane, expressed as a percentage of outdoor illuminance on a horizontal plane due to an unobstructed sky of assumed or known luminance distribution, usually CIE standard overcast sky.

### Daylight

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

### 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)

### 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.

### 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) metric which assesses how much of a space receives sufficient daylight on a working plane during daylight hours on an annual basis. It is a "dynamic daylight metric", meaning it assesses daylight over time, as opposed to a discrete point-in-time metric such as ADF. The recommendation is that the target illuminance values in Table 12 are exceeded over at least 50% of the points on a reference plane 0.85m above the floor, for at least half of *daylight* hours.

# 1 Executive Summary

The analysis shows that the proposed development will have minimal impact on surrounding buildings in terms of access to skylight. There are no neighbouring gardens/amenity spaces in close enough proximity to the proposed development to be affected in terms of availability of sunlight.

The development itself is expected to experience good levels of internal daylight, with all rooms exceeding the minimum recommendations of the BRE Guide (BR 209).

The open spaces associated with the development are expected to experience good levels of sunlight and should appear adequately sunlit throughout the year.

The analyses and assessments in the main body of the report 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" (Paul Littlefair, 2022 Third Edition) as this was the current guide when the analysis was initially completed. The third edition of the BR209 guide was published on 13 June 2022. In accordance with the new guide, Internal daylight provision is to now be assessed based on the advice and guidance in BS EN 17037:2018 *Daylight in buildings*. BS EN 17037 supersedes BS 8206 Part 2 "Code of practice for daylighting", which contained a method of assessment based on Average Daylight Factor, which is now no longer recommended. We have assessed daylight provision based on target illuminances from daylight to be achieved over specified fractions of the reference plane (a plane at table top height covering the room) for at least half of the daylight hours in a typical year as outlined in BS EN 17037. The analysis shows that all rooms exceed the minimum recommended daylight provision.

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

## 2 Introduction

Site layout planning to achieve good daylighting and sunlighting, 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 at Kilbarry, Co. Cork.

The subject site is located approximately 2km north of Blackppol Cork, immediately west of Delanys Rovers GAA Club. The proposed development involves the construction of 319no. residential dwellings comprising of a mix of houses, duplexes and apartments.

Housing Quality and Standards objective 11.3 (d) relates to daylight and sunlight where it states:

“The design of developments should provide sufficient daylight and sunlight to new and surrounding housing that is appropriate for its context, whilst, minimising overshadowing and maximising the useability of outdoor amenity space.”

*The Building Research Establishment (BRE) guidelines ‘Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice (2022) and BS EN 17037 - provide useful guidance on avoiding unacceptable loss of light and ensuring developments provide minimum standards of daylight for new units.’*

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” (PJ Littlefair), 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 assesses the proposed developments impact on daylight/sunlight to the nearest existing buildings by the following means:

- Vertical Sky Component
- Sunlight to private open spaces

The report also analyses the daylight/sunlight provision for the proposed development by means of:

- Spatial Daylight Autonomy (sDA) metric assesses how much of a space receives sufficient daylight
- Overshadowing (Sunlight to Amenity)

Additionally, Appendix B provides shadow plots for the proposed scenarios.

## 3 Site Description

### 3.1 Location & Context

Kilbarry is a townland on northside of Cork City which is located approximately 2km north of Blackpool, Cork. There is an IDA business park located to the south of the site.

The proposed development involves the construction of 319no. residential dwellings comprising of a mix of houses, duplexes and apartments.

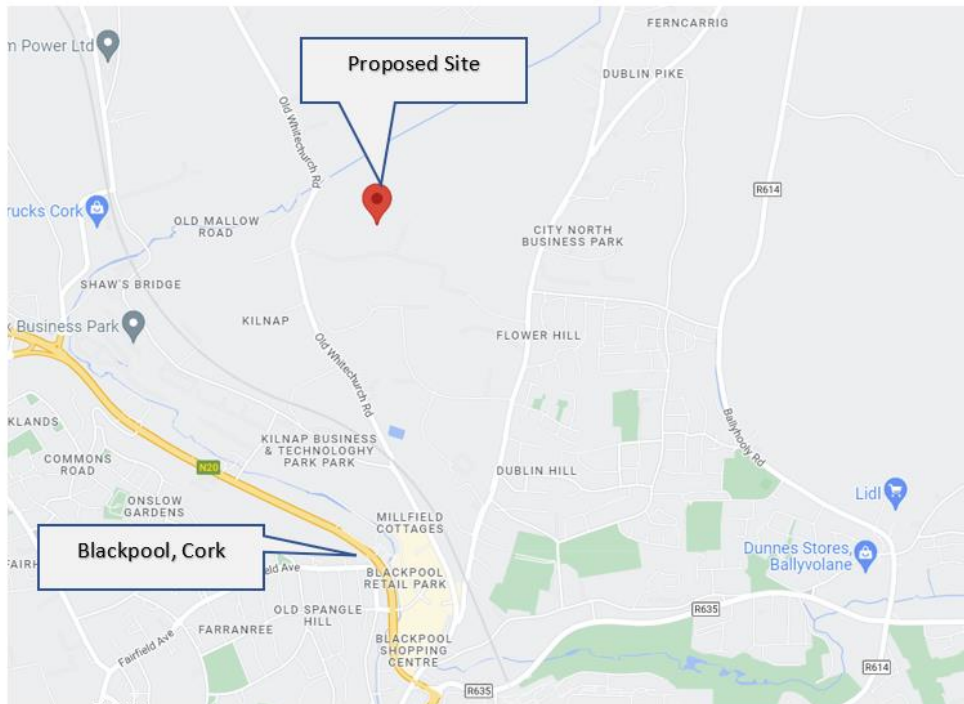


Figure 1: Site Location

The site is predominantly an undeveloped greenfield state which also includes a disused factory.

Figure 2 shows the site context and the orientation of the site.



Figure 2: Site Context



## 3.2 Proposed Development

The proposed development will consist of a strategic housing development of 319no. residential dwellings comprising of 85no. semi-detached units (comprising of 17no. 4-bed units and 68no. 3-bed units), 118no. terraced units (comprising of 8no. 4-bed units, 60no. 3-bed units and 50no. 2-bed units), 53no. duplex units (comprising of 26no. 1-bed units, 24no. 2-bed units and 2no. 3-bed units) and 63no. apartments (in 3no. part 4 storey and part 5-storey blocks and comprising 15no. 1-bed units and 48no. 2-bed units). The development also includes the provision of a crèche facility (519sqm) and a riverside amenity park to the north and northeast of the site. The proposed total gross floor area is 33,718.35sqm.

The proposed development will also consist of the demolition of a disused hurley manufacturing factory and associated out buildings, the removal and replacement of the southern and eastern boundary treatments, as well the creation of formalised walking paths to replace the informal walking paths located to the north of the site, a new through road from the proposed site access on the Old Whitechurch Road to Delaney's GAA Grounds and accessing the Upper Dublin Hill Road, with associated new boundary treatments at Delaney's GAA club, all associated ancillary site development and hard and soft landscaping works, to include the provision of private, communal and public open space, waste storage areas, bicycle, motorcycle and car parking, including EV and disabled parking, esb substations, groundworks, foul drainage works, stormwater drainage proposals including directional drilling for the stormwater outfall, water supply proposals, public lighting, and all new boundary treatments.

## 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 this 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 nondomestic building where the occupants have a reasonable expectation of daylight; this would normally include schools, hospitals, hotels and hostels, small workshops and some offices."*

The properties highlighted below were identified as sensitive receptors that may be affected by the proposed development.

Sensitive Receptors



Nearest Neighbouring houses which were analysed

## 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” (Paul Littlefair, 2022 Third Edition). This guide is intended to be used in conjunction with recommendations in BS EN 17037, and in CIBSE Lighting guide (LG10): daylighting and window design.

The UK National Annex published as part of BS EN 17037:2018, which is also relevant to Ireland, recommends minimum indoor lighting levels derived from the previous BS 8206-2:2008 targets.

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.*” (Littlefair, 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 ray-tracing. The software fully meets all relevant guidelines set out in Building Research Establishment (BRE) document “Site Layout Planning for Daylight and Sunlight – A Guide to Good Practice” by P J Littlefair.

Throughout this report an effort will be made to differentiate between metrics used to assess skylight versus sunlight. 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, as can be seen from the title of the BRE Guide itself, “Site Layout Planning for *Daylight and Sunlight*” and the BS EN 17037 standard, 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.

#### 4.1.1 Vertical Sky Component (VSC)

Any reduction in the total amount of skylight for the existing properties is 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.

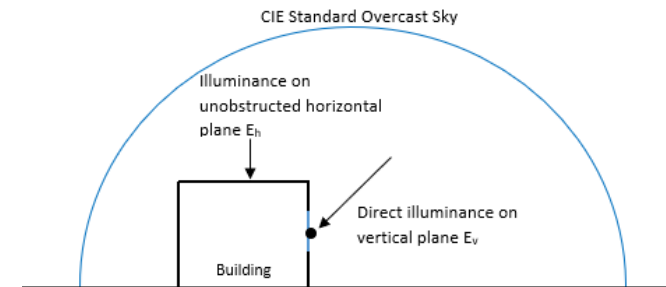


Figure 3: Vertical Sky Component

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.

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.” (Littlefair, 2022)*

### 4.1.2 Sunlight to 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.” (Littlefair, 2022)*

We have completed this analysis on the rear garden of houses which we have referenced as number 1-3 due to these being the nearest gardens to the proposed development.

### 4.1.3 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.”*

'Before' and 'after' shadow plots are used to show the difference that 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 overshadowing of a space is to be expected.

Shadow plots were created for March 21<sup>st</sup>, June 21<sup>st</sup> and December 21<sup>st</sup>. March 21<sup>st</sup> is the equinox and as such provides the average level of shadowing that can be

expected. June 21<sup>st</sup> is a summertime plot and represents the best case for shadow. December 21<sup>st</sup> is the winter solstice and 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) and are shown in Appendix B.

## 4.2 New Buildings

The quantity and quality of daylight was also checked for the proposed development.

The new British Standard “BS EN 17037:2018 Daylight in buildings” based on the European Standard EN 17037 was officially adopted in May 2019 and supersedes the previous standard “BS 8206-2:2008 Lighting for buildings – Part 2: Code of practice for Daylighting”.

A daylight assessment has also been performed based on the recommendations of the UK national Annex to BS EN 17037:2018. This is the new standard referenced in the latest BRE BR209 guide which was published on 13 June 2022.

The new standard uses a Spatial Daylight Autonomy (sDA) metric which assesses how much of a space receives sufficient daylight on a working plane during daylight hours on an annual basis. It is a “dynamic daylight metric”, meaning it assesses daylight over time, as opposed to a discrete point-in-time metric such as ADF. The recommendation is that the target illuminance values in Table 12 are exceeded over at least 50% of the points on a reference plane 0.85m above the floor, for at least half of *daylight* hours.

Table 1: Values of target illuminance

Room Type	Target illuminance $E_T$ (lux)
Bedroom	100
Living Room	150
Kitchen	200

Where one room in a dwelling serves more than a single purpose, it's 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.*” (CEN, 2019) Clause A.2 of the standard recommends that a target illuminance level should be achieved across the entire (i.e. 95%) fraction of the

reference plane. Based on the UK Annex, this recommendation need not be applied to rooms in dwellings. The analysis uses climatic weather data specific to the project location, in this case, Dublin “.epw” weather file was used. The illuminance levels therefore vary over the course and each day and year. The median levels of illuminance for Dublin are shown in Table 13.

Table 2: Dublin Median Sky Illuminances

Location	Median External Diffuse Illuminance (Lux)	Global External Diffuse Illuminance (Lux)
Dublin	14,900	18,200

It is worth noting that the median diffuse sky illuminance for the climate based calculations is considerably higher than the discrete illuminance figure at the zenith of the CIE overcast sky that is used for the ADF calculation which is slightly over 11,000 lux.

The model settings, including surface reflectance and glazing transmittance, are as per the settings previously detailed for the ADF analysis in section 5.4.1. As per BS EN 17037:2018, the area of the grid points within each room excludes a band of 0.5m from the walls. This is because the illuminances can be excessively high (near windows) or excessively low next to opaque walls. The area assessed (excluding the perimeter band) is known as the “Effective Area”.

The settings used in the computational model for the calculation of the sDA are outlined below:

- The working plane is taken to be 0.85m above the floor.
- Window frame factor is set to 17.5% (This is an estimate based on the size of the window openings and the average area of framing.)
- The glazing transmittance (normal) was set to 0.70.
- The glazing maintenance factor is set to 92% (This accounts for the reduction in glazing transmittance due to dirt.)
- See Table 3 below for reflectance values adopted for different building elements.

Table 3: Surface Reflectances

Surface Type	Reflectance
Interior Wall	0.68
Exterior Wall	0.40
Interior Floor	0.40
Interior Ceiling	0.81
Balconies	0.45
Landscape Hard (e.g. paving)	0.2
Landscape Soft (e.g. Grass/Vegetation)	0.1

### 4.3 Impact Classification

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

Surrounding Buildings/Walls	0.40
Surrounding Roads	0.14

Table 4: Balcony Glazing Properties

Surface Type	Properties
Balcony Glazing	Transmittance: 0.80 (Transmissivity: 0.8715) Refractive Index: 1.52

#### 4.2.1 Sunlight to Proposed Amenity Areas

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.”*

There is a number of communal/public open spaces provided throughout the proposed development. All areas are assessed against the above criterion.

Table 5: Environmental Impact Assessment: Impact Classification

<p><i>Negligible adverse impact</i></p>	<ul style="list-style-type: none"> <li>• <i>Loss of light well within guidelines, <b>or</b></i></li> <li>• <i>only a small number of windows losing light (within the guidelines) <b>or</b></i></li> <li>• <i>limited area of open space losing light (within the guidelines)</i></li> </ul>
<p><i>Minor adverse impact (a)</i></p>	<ul style="list-style-type: none"> <li>• <i>Loss of light only just within guidelines <b>and</b></i> <ul style="list-style-type: none"> <li>○ <i>a larger number of windows are affected <b>or</b></i></li> <li>○ <i>larger area of open space is affected (within the guidelines)</i></li> </ul> </li> </ul>
<p><i>Minor adverse impact (b)</i></p>	<ul style="list-style-type: none"> <li>• <i>only a small number of windows or limited open space areas are affected</i></li> <li>• <i>the loss of light is only marginally outside the guidelines</i></li> <li>• <i>an affected room has other sources of skylight or sunlight</i></li> <li>• <i>the affected building or open space only has a low level requirement for skylight or sunlight</i></li> <li>• <i>there are particular reasons why an alternative, less stringent, guideline should be applied</i></li> </ul>
<p><i>Major adverse impact</i></p>	<ul style="list-style-type: none"> <li>• <i>large number of windows or large open space areas are affected</i></li> <li>• <i>the loss of light is substantially outside the guidelines</i></li> <li>• <i>all the windows in a particular property are affected</i></li> <li>• <i>the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight (living rooms / playground)</i></li> </ul>



## 5 Analysis

### 5.1 Overview of Computational Models

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

The images below illustrate the proposed model used for the sunlight/daylight analysis.

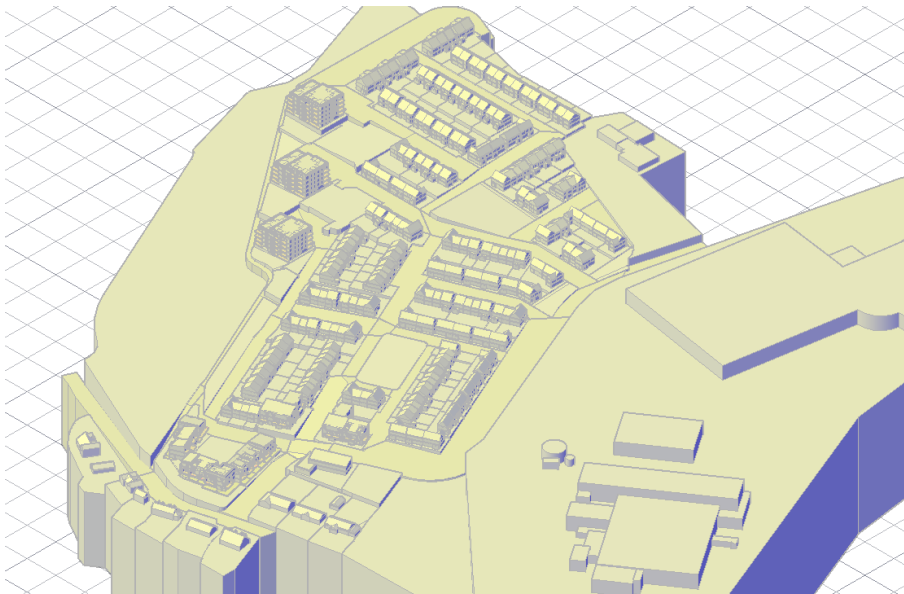


Figure 4: Proposed Model (View from southwest)

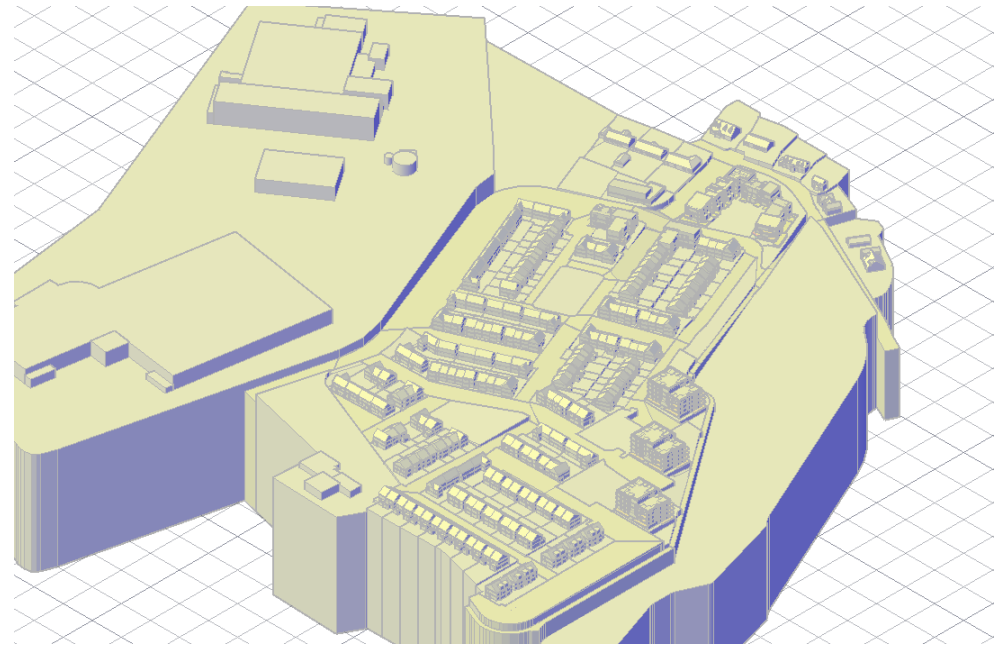


Figure 5: Proposed Model (View from northeast)



## 5.2 Existing Neighbouring Buildings

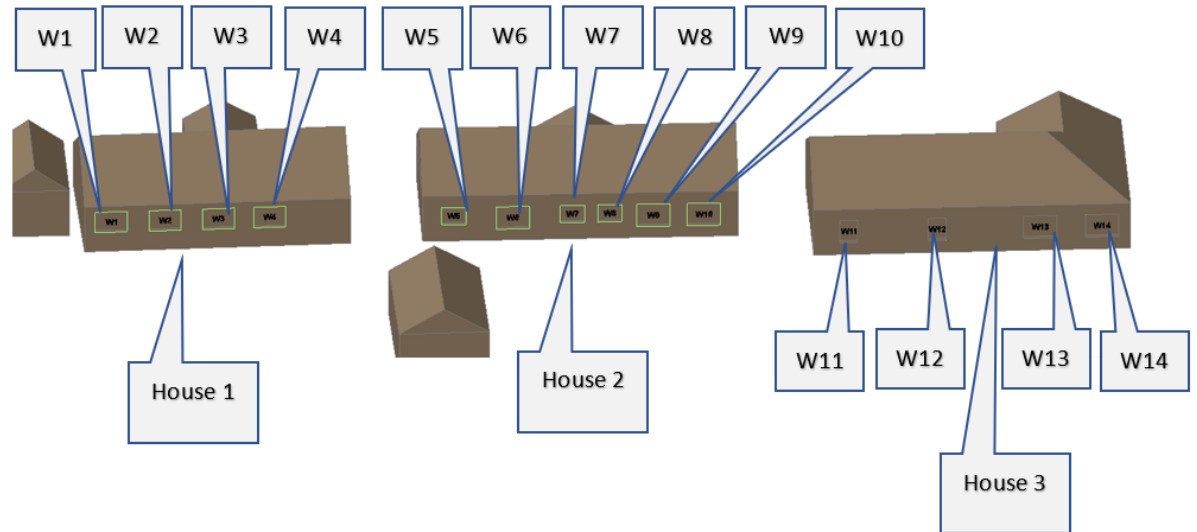
### 5.2.1 Neighbouring Properties Details

As described in Section 4, the impact on the nearest neighbouring buildings' access to skylight was assessed by means of VSC. We have completed this analysis on the rear

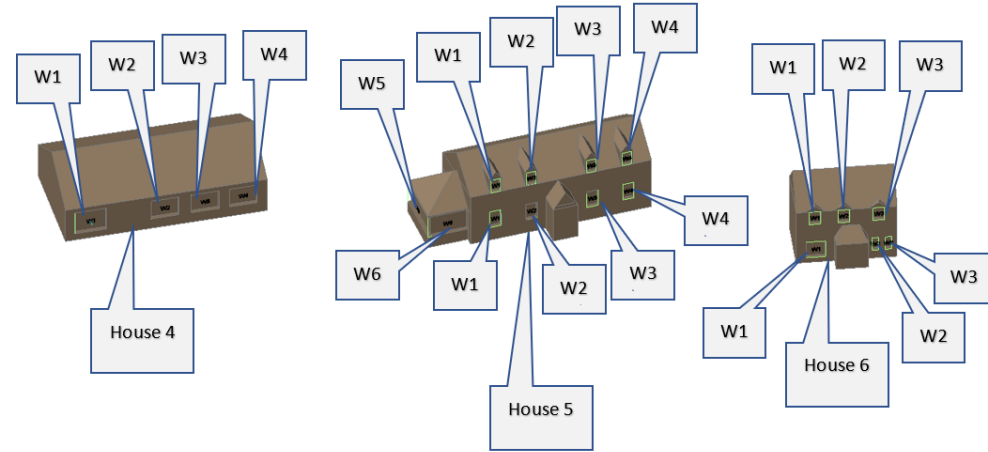
garden of houses which we have referenced as number 1-3 due to these being the nearest gardens to the proposed development.

The specific windows assessed are identified in the images below and labelled for reference later

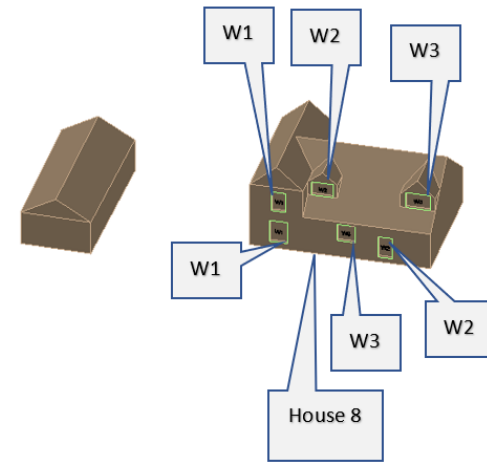
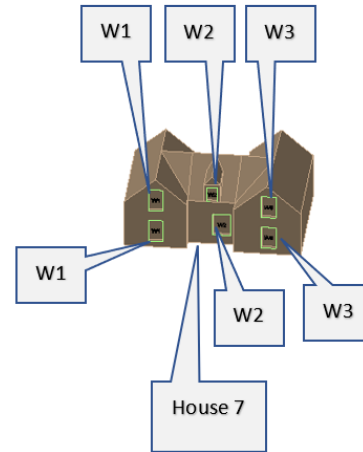
House 1-3



House 4-6



House 7-8



## 5.2.2 VSC Analysis

### 5.2.2.1 Results

The results of the VSC analysis are shown in Table 6 below.

Table 6: VSC Results House 1-3

Building Ref	Floor Ref	Window Ref	VSC			
			Existing	Proposed	Pr/Ex	Exceeds BRE Criteria
House 1	Ground Floor	W1	38.07	36.81	0.97	YES
		W2	38.05	36.82	0.97	YES
		W3	37.90	36.73	0.97	YES
		W4	37.72	36.63	0.97	YES
Building Ref	Floor Ref	Window Ref	VSC			
			Existing	Proposed	Pr/Ex	Exceeds BRE Criteria
House 2	Ground Floor	W5	37.22	35.60	0.96	YES
		W6	37.61	35.50	0.94	YES
		W7	38.08	35.65	0.94	YES
		W8	38.23	35.71	0.93	YES
		W9	38.27	35.64	0.93	YES
		W10	38.31	35.62	0.93	YES
Building Ref	Floor Ref	Window Ref	VSC			
			Existing	Proposed	Pr/Ex	Exceeds BRE Criteria
House 3	Ground Floor	W11	38.80	35.39	0.91	YES
		W12	38.92	35.35	0.91	YES
		W13	38.99	35.29	0.91	YES
		W14	39.03	35.04	0.90	YES

Table 7: VSC Results House 4-6

Building Ref	Floor Ref	Window Ref	VSC			
			Existing	Proposed	Pr/Ex	Exceeds BRE Criteria
House 4	Ground Floor	W1	38.37	35.85	0.93	YES
		W2	38.56	35.75	0.93	YES
		W3	38.62	35.68	0.92	YES
		W4	38.54	35.48	0.92	YES
Building Ref	Floor Ref	Window Ref	VSC			
			Existing	Proposed	Pr/Ex	Exceeds BRE Criteria
House 5	Ground Floor	W1	38.64	33.48	0.87	YES
		W2	33.43	28.37	0.85	YES
		W3	36.10	31.38	0.87	YES
		W4	38.55	34.05	0.88	YES
		W5	35.30	34.73	0.98	YES
		W6	37.91	32.83	0.87	YES
	First Floor	W1	39.21	35.29	0.90	YES
		W2	39.23	35.40	0.90	YES
		W3	39.26	35.68	0.91	YES
		W4	39.28	35.88	0.91	YES
Building Ref	Floor Ref	Window Ref	VSC			
			Existing	Proposed	Pr/Ex	Exceeds BRE Criteria
House 6	Ground Floor	W1	36.53	30.66	0.84	YES
		W2	29.86	25.85	0.87	YES
		W3	35.40	30.11	0.85	YES
	First Floor	W1	39.13	34.27	0.88	YES
		W2	39.14	34.44	0.88	YES
		W3	39.14	34.62	0.88	YES

Table 8: VSC Results House 7-8

Building Ref	Floor Ref	Window Ref	VSC			
			Existing	Proposed	Pr/Ex	Exceeds BRE Criteria
House 7	Ground Floor	W1	38.76	30.51	0.79	YES
		W2	32.56	25.99	0.80	YES
		W3	38.80	30.53	0.79	YES
	First Floor	W1	38.82	31.96	0.82	YES
		W2	38.36	31.92	0.83	YES
		W3	38.87	31.96	0.82	YES
Building Ref	Floor Ref	Window Ref	VSC			
			Existing	Proposed	Pr/Ex	Exceeds BRE Criteria
House 8	Ground Floor	W1	38.74	33.47	0.86	YES
		W2	38.84	34.29	0.88	YES
		W3	38.83	34.18	0.88	YES
	First Floor	W1	38.85	34.22	0.88	YES
		W2	35.71	32.39	0.91	YES
		W3	38.89	35.34	0.91	YES

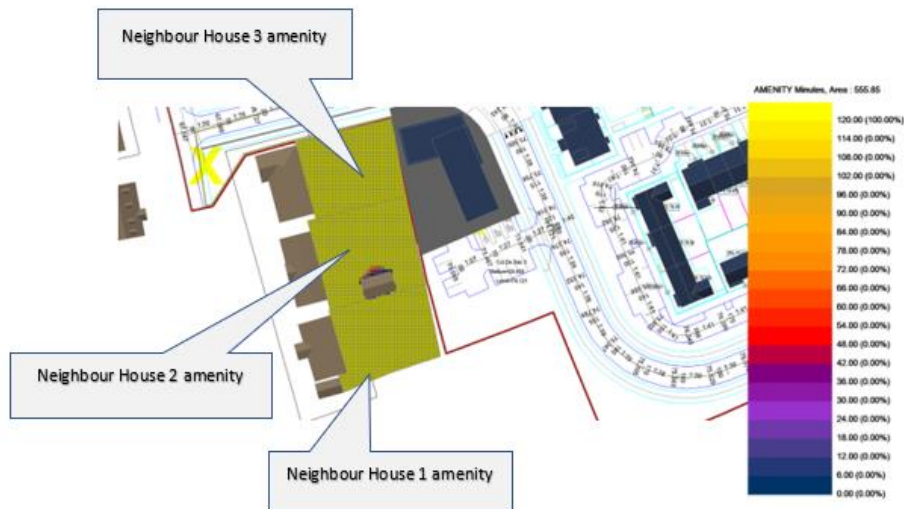
### 5.2.2.2 Discussion

The results meet the recommendations of the BRE Guide and show that the proposed development will have minimal impact on the neighbouring buildings. Therefore, the neighbouring buildings should enjoy a similar level of skylight after the proposed development is built.

The closest houses to the proposed development were tested and as the further adjacent buildings will perform better than these tested we did not need to expand our analysis further.

### 5.3 Impact to Sunlight in Existing Neighbouring Gardens.

We have completed sunlight analysis on the rear garden of houses which we have referenced as number 1-3 due to these being the nearest gardens to the proposed development.



The results above show all existing neighbouring amenity spaces should receive at least 2 hours of sunlight on March 21<sup>st</sup> to at least 50% of their amenity space. Therefore, the existing neighbouring amenity spaces exceeds the BRE 's recommendation for sunlight to open spaces and should appear adequately sunlit throughout the year.

	Percentage of existing neighbour amenity area receiving 2 hours of sunlight (%)	Percentage of existing neighbour amenity area receiving 2 hours of sunlight after proposed development (%)	Exceeds BRE Criteria
House 1	100	100	YES
House 2	90.43	90.43	YES
House 3	100	100	YES

## 5.4 Proposed Development

### 5.4.1 Daylight Analysis for Proposed Development

The daylight provision in the proposed development was checked using the methodology as outlined in the UK national Annex to BS EN 17037:2018 and the results are compared against BRE BR209 V03 guide's recommendations.

The new standard uses a Spatial Daylight Autonomy (sDA) metric which assesses how much of a space receives sufficient daylight on a working plane during daylight hours on an annual basis.

Table 9: sDA Results – Apartment Unit Ground Floor

Floor	Room Ref.	Room Use	sDA				Meets Criteria
			Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
Ground	R1	LKD	200	50	50	100%	YES
	R2	Bedroom	100	50	50	100%	YES
	R3	Bedroom	100	50	50	100%	YES
	R4	LKD	200	50	50	83%	YES
	R5	Bedroom	100	50	50	100%	YES
	R6	Bedroom	100	50	50	100%	YES
	R7	LKD	200	50	50	100%	YES
	R8	Bedroom	100	50	50	100%	YES

Table 10: sDA Results – Apartment Unit First Floor

Floor	Room Ref.	Room Use	sDA				Meets Criteria
			Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
First	R1	LKD	200	50	50	100%	YES
	R2	LKD	200	50	50	100%	YES
	R3	Bedroom	100	50	50	100%	YES
	R4	Bedroom	100	50	50	100%	YES
	R5	LKD	200	50	50	86%	YES
	R6	Bedroom	100	50	50	100%	YES
	R7	Bedroom	100	50	50	100%	YES
	R8	LKD	200	50	50	100%	YES
	R9	Bedroom	100	50	50	100%	YES
	R10	LKD	200	50	50	100%	YES
	R11	Bedroom	100	50	50	100%	YES
	R12	Bedroom	100	50	50	100%	YES
	R13	Bedroom	100	50	50	100%	YES
	R14	Bedroom	100	50	50	100%	YES

Table 11: sDA Results – Apartment Unit Second Floor

Floor	Room Ref.	Room Use	sDA				Meets Criteria
			Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
Second	R1	LKD	200	50	50	100%	YES
	R2	LKD	200	50	50	100%	YES
	R3	Bedroom	100	50	50	100%	YES
	R4	Bedroom	100	50	50	100%	YES
	R5	LKD	200	50	50	86%	YES
	R6	Bedroom	100	50	50	100%	YES
	R7	Bedroom	100	50	50	100%	YES
	R8	LKD	200	50	50	100%	YES
	R9	Bedroom	100	50	50	100%	YES
	R10	LKD	200	50	50	100%	YES
	R11	Bedroom	100	50	50	100%	YES
	R12	Bedroom	100	50	50	100%	YES
	R13	Bedroom	100	50	50	100%	YES
	R14	Bedroom	100	50	50	100%	YES

Table 12: sDA Results – Apartment Unit Third Floor

Floor	Room Ref.	Room Use	sDA				Meets Criteria
			Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
Third	R1	LKD	200	50	50	100%	YES
	R2	LKD	200	50	50	100%	YES
	R3	Bedroom	100	50	50	100%	YES
	R4	Bedroom	100	50	50	100%	YES
	R5	LKD	200	50	50	87%	YES
	R6	Bedroom	100	50	50	100%	YES
	R7	Bedroom	100	50	50	100%	YES
	R8	LKD	200	50	50	100%	YES
	R9	Bedroom	100	50	50	100%	YES
	R10	LKD	200	50	50	100%	YES
	R11	Bedroom	100	50	50	100%	YES
	R12	Bedroom	100	50	50	100%	YES
	R13	Bedroom	100	50	50	100%	YES
	R14	Bedroom	100	50	50	100%	YES

Table 13: sDA Results – Apartment Unit Fourth Floor

Floor	Room Ref.	Room Use	sDA				Meets Criteria
			Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
Fourth	R1	LKD	200	50	50	100%	YES
	R2	Bedroom	100	50	50	100%	YES
	R3	Bedroom	100	50	50	100%	YES
	R4	LKD	200	50	50	100%	YES
	R5	Bedroom	100	50	50	100%	YES
	R6	LKD	200	50	50	100%	YES
	R7	Bedroom	100	50	50	100%	YES
	R8	Bedroom	100	50	50	100%	YES

Table 14: sDA Results – Duplex Unit BA Ground Floor

Floor	Level Ref	Room Ref.	Room Use	sDA				Meets Criteria
				Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
Ground	BA1	R1	Bedroom	100	50	50	100%	YES
		R2	LKD	200	50	50	80%	YES
	BA2	R1	LKD	200	50	50	100%	YES
		R2	LKD	200	50	50	79%	YES
		R3	Bedroom	100	50	50	100%	YES
		R4	Bedroom	100	50	50	100%	YES
	BA3	R1	Bedroom	100	50	50	100%	YES
		R2	LKD	200	50	50	91%	YES
		R3	LKD	200	50	50	100%	YES
		R4	Bedroom	100	50	50	100%	YES
	BA4	R1	LKD	200	50	50	100%	YES
		R2	LKD	200	50	50	100%	YES
		R3	Bedroom	100	50	50	100%	YES
		R4	Bedroom	100	50	50	100%	YES
	BA5	R1	LKD	200	50	50	100%	YES
		R2	LKD	200	50	50	100%	YES
		R3	Bedroom	100	50	50	100%	YES
		R4	Bedroom	100	50	50	100%	YES
	BA6	R1	LKD	200	50	50	100%	YES
		R2	LKD	200	50	50	100%	YES
R3		Bedroom	100	50	50	100%	YES	
R4		Bedroom	100	50	50	100%	YES	



Table 15: sDA Results – Duplex Unit BA First Floor

Floor	Level Ref	Room Ref.	Room Use	sDA				Meets Criteria
				Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
First	BA1	R1	KD	200	50	50	100%	YES
		R2	Living Room	150	50	50	100%	YES
	BA2	R1	LKD	200	50	50	100%	YES
		R2	LKD	200	50	50	69%	YES
	BA3	R1	LKD	200	50	50	100%	YES
		R2	LKD	200	50	50	100%	YES
	BA4	R1	LKD	200	50	50	97%	YES
		R2	LKD	200	50	50	100%	YES
	BA5	R1	LKD	200	50	50	100%	YES
		R2	LKD	200	50	50	100%	YES
	BA6	R1	LKD	200	50	50	100%	YES
		R2	LKD	200	50	50	100%	YES

Table 16: sDA Results – Duplex Unit BA Second Floor

Floor	Level Ref	Room Ref.	Room Use	sDA				Meets Criteria
				Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
Second	BA1	R1	Bedroom	100	50	50	100%	YES
		R2	Bedroom	100	50	50	100%	YES
	BA2	R1	Bedroom	100	50	50	100%	YES
		R2	Bedroom	100	50	50	100%	YES
		R3	Bedroom	100	50	50	100%	YES
		R4	Bedroom	100	50	50	100%	YES
	BA3	R1	Bedroom	100	50	50	100%	YES
		R2	Bedroom	100	50	50	100%	YES
		R3	Bedroom	100	50	50	100%	YES
		R4	Bedroom	100	50	50	100%	YES
		R5	Bedroom	100	50	50	100%	YES
		R6	Bedroom	100	50	50	100%	YES
	BA4	R1	Bedroom	100	50	50	100%	YES
		R2	Bedroom	100	50	50	100%	YES
		R3	Bedroom	100	50	50	100%	YES
		R4	Bedroom	100	50	50	100%	YES
	BA5	R1	Bedroom	100	50	50	100%	YES
		R2	Bedroom	100	50	50	100%	YES
		R3	Bedroom	100	50	50	100%	YES
		R4	Bedroom	100	50	50	100%	YES
	BA6	R1	Bedroom	100	50	50	100%	YES
		R2	Bedroom	100	50	50	100%	YES
		R3	Bedroom	100	50	50	100%	YES
		R4	Bedroom	100	50	50	100%	YES

Table 17: sDA Results – Duplex Unit BB Ground Floor

Floor	Level Ref	Room Ref.	Room Use	sDA				Meets Criteria
				Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
Ground	BA1	R1	Bedroom	100	50	50	100%	YES
		R2	Bedroom	100	50	50	100%	YES
	BA2	R1	Bedroom	100	50	50	100%	YES
		R2	Bedroom	100	50	50	100%	YES
		R3	Bedroom	100	50	50	100%	YES
		R4	Bedroom	100	50	50	100%	YES
	BA3	R1	Bedroom	100	50	50	100%	YES
		R2	Bedroom	100	50	50	100%	YES

Table 18: sDA Results – Duplex Unit BB First Floor

Floor	Level Ref	Room Ref.	Room Use	sDA				Meets Criteria
				Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
First	BA1	R1	LKD	200	50	50	100%	YES
		R1	LKD	200	50	50	100%	YES
	BA2	R2	LKD	200	50	50	100%	YES
		R1	LKD	200	50	50	100%	YES
	BA3	R1	LKD	200	50	50	100%	YES
		R2	LKD	200	50	50	97%	YES

Table 19: sDA Results – Duplex Unit BB Second Floor

Floor	Level Ref	Room Ref.	Room Use	sDA				Meets Criteria
				Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
Second	BA1	R1	Bedroom	100	50	50	100%	YES
		R2	LKD	200	50	50	100%	YES
	BA2	R1	Bedroom	100	50	50	100%	YES
		R2	Bedroom	100	50	50	100%	YES
		R3	LKD	200	50	50	100%	YES
		R4	LKD	200	50	50	100%	YES
	BA3	R1	Bedroom	100	50	50	100%	YES
		R2	Bedroom	100	50	50	100%	YES
		R3	LKD	200	50	50	100%	YES
		R4	Bedroom	100	50	50	100%	YES

Table 20: sDA Results – Duplex Unit BC Ground Floor

Floor	Room Ref.	Room Use	sDA				Meets Criteria
			Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
Ground	R1	LKD	200	50	50	74%	YES
	R2	LKD	200	50	50	68%	YES
	R3	LKD	200	50	50	100%	YES
	R4	Bedroom	100	50	50	100%	YES
	R5	LKD	200	50	50	98%	YES
	R6	LKD	200	50	50	98%	YES
	R7	Bedroom	100	50	50	100%	YES
	R8	Bedroom	100	50	50	100%	YES
	R9	Bedroom	100	50	50	100%	YES
	R10	Bedroom	100	50	50	52%	YES

Table 21: sDA Results – Duplex Unit BC First Floor

Floor	Room Ref.	Room Use	sDA				Meets Criteria
			Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
First	R1	LKD	200	50	50	95%	YES
	R2	LKD	200	50	50	71%	YES
	R3	LKD	200	50	50	100%	YES
	R4	LKD	200	50	50	99%	YES
	R5	LKD	200	50	50	100%	YES

Table 22: sDA Results – Duplex Unit BC Second Floor

Floor	Room Ref.	Room Use	sDA				Meets Criteria
			Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
Second	R1	Bedroom	100	50	50	100%	YES
	R2	Bedroom	100	50	50	100%	YES
	R3	Bedroom	100	50	50	100%	YES
	R4	Bedroom	100	50	50	100%	YES
	R5	Bedroom	100	50	50	100%	YES
	R6	Bedroom	100	50	50	100%	YES
	R7	Bedroom	100	50	50	100%	YES
	R8	Bedroom	100	50	50	100%	YES
	R9	Bedroom	100	50	50	100%	YES
	R10	Bedroom	100	50	50	100%	YES

Table 23: sDA Results – Duplex Unit BD Ground Floor

Floor	Room Ref.	Room Use	sDA				Meets Criteria
			Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
Ground	R1	LKD	200	50	50	94%	YES
	R2	LKD	200	50	50	79%	YES
	R3	LKD	200	50	50	100%	YES
	R4	Bedroom	100	50	50	100%	YES
	R5	Bedroom	100	50	50	100%	YES
	R6	LKD	200	50	50	100%	YES
	R7	Bedroom	100	50	50	100%	YES
	R8	Bedroom	100	50	50	100%	YES
	R9	LKD	200	50	50	93%	YES
	R10	Bedroom	100	50	50	100%	YES
	R11	Bedroom	100	50	50	97%	YES
	R12	LKD	200	50	50	82%	YES

Table 24: sDA Results – Duplex Unit BD First Floor

Floor	Room Ref.	Room Use	sDA				Meets Criteria
			Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
First	R1	LKD	200	50	50	100%	YES
	R2	LKD	200	50	50	100%	YES
	R3	LKD	200	50	50	100%	YES
	R4	LKD	200	50	50	100%	YES
	R5	LKD	200	50	50	100%	YES
	R6	LKD	200	50	50	100%	YES

Table 25: sDA Results – Duplex Unit BD Second Floor

Floor	Room Ref.	Room Use	sDA				Meets Criteria
			Req Lux	Req % of Space	Req % of Hours	% Area Meeting Criteria	
Second	R1	Bedroom	100	50	50	100%	YES
	R2	Bedroom	100	50	50	100%	YES
	R3	Bedroom	100	50	50	100%	YES
	R4	Bedroom	100	50	50	100%	YES
	R5	Bedroom	100	50	50	100%	YES
	R6	Bedroom	100	50	50	100%	YES
	R7	Bedroom	100	50	50	100%	YES
	R8	Bedroom	100	50	50	100%	YES
	R9	Bedroom	100	50	50	100%	YES
	R10	Bedroom	100	50	50	100%	YES
	R11	Bedroom	100	50	50	100%	YES
	R12	Bedroom	100	50	50	100%	YES

### 5.4.1.1 Results

Table 26: sDA Results Summary

Space	Result Summary					Total	Passing	Pass %
	Rooms Tested							
	Apartment	Duplex Unit BA	Duplex Unit BB	Duplex Unit BC	Duplex Unit BD			
Bedroom	37	35	14	15	18	119	119	100
Living/Kitchen/Dining	21	21	9	10	12	73	73	100
Kitchen/Dining	-	1	-	-	-	1	1	100
Living	-	1	-	-	-	1	1	100
<b>Total</b>	<b>58</b>	<b>58</b>	<b>23</b>	<b>25</b>	<b>30</b>	<b>194</b>	<b>194</b>	<b>100</b>

### 5.4.1.2 Discussion

The results show that all rooms meet/exceed the BRE’s recommendations for daylight provision. Therefore each apartment can be expected to enjoy adequate levels of natural light.

The higher levels of natural daylight should meet the occupant light requirements for more of the year. Therefore, the spaces will rely less on electric lighting.

### 5.4.2 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 communal/public open spaces within the proposed development were assessed against the above criterion and all exceed the BRE’s recommendation.



Figure 6: Amenity Areas 2hr Sunlight Test

## 6 Conclusion

The results show that the proposed development will have minimal impact on surrounding buildings in terms of access to skylight. There are no neighbouring gardens/amenity spaces in close enough proximity to the proposed development to be affected in terms of availability of sunlight.

The development itself is expected to experience good levels of internal daylight, with all rooms exceeding the minimum recommendations of the BRE Guide.

The open spaces associated within the proposed development are expected to experience good levels of sunlight and should appear adequately sunlit throughout the year.

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 (Paul Littlefair, 2022 Third Edition).”

## Appendix A: Proposed Spatial Daylight Autonomy (sDA) & Room Legend

### A1: Apartment

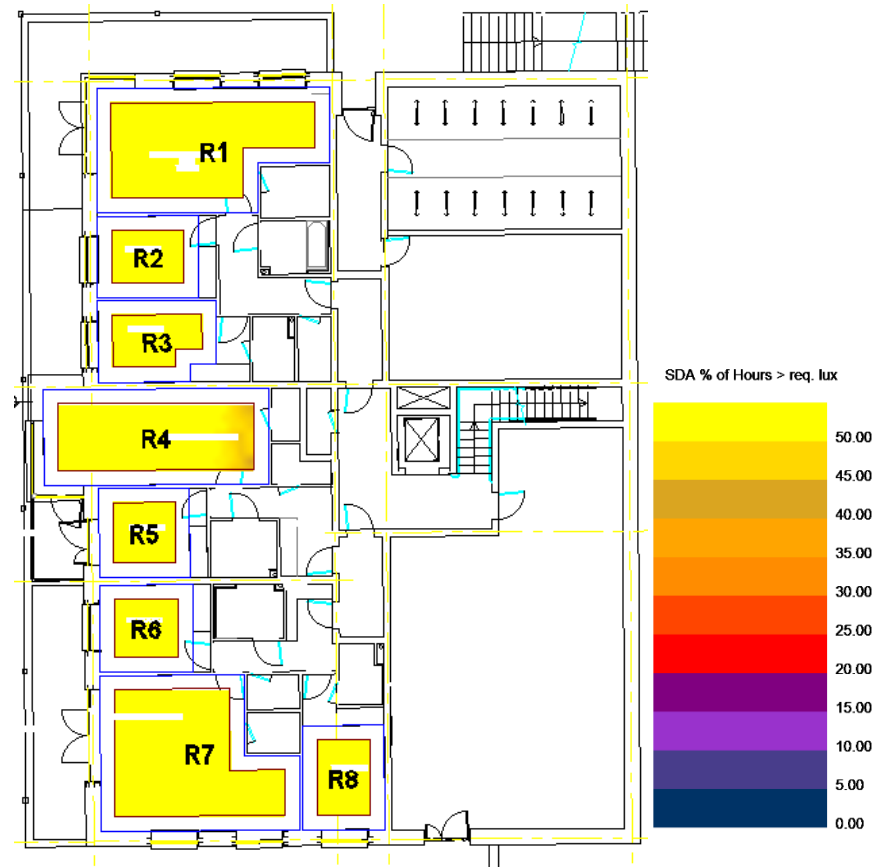


Figure 13: sDA Contours and Legend – Apartment Ground Floor

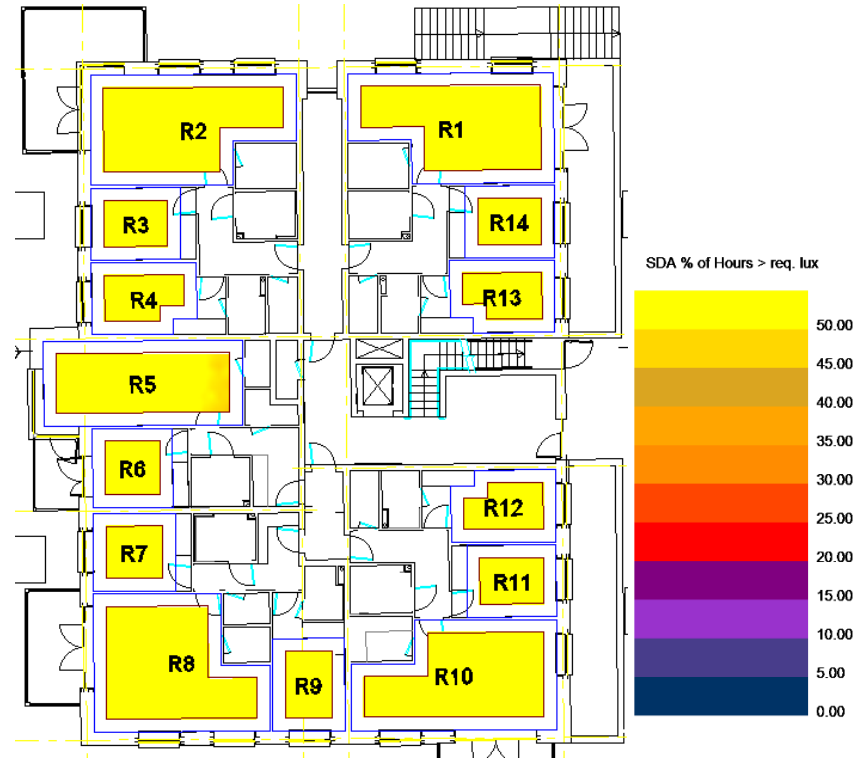


Figure 14: sDA Contours and Legend – Apartment First Floor

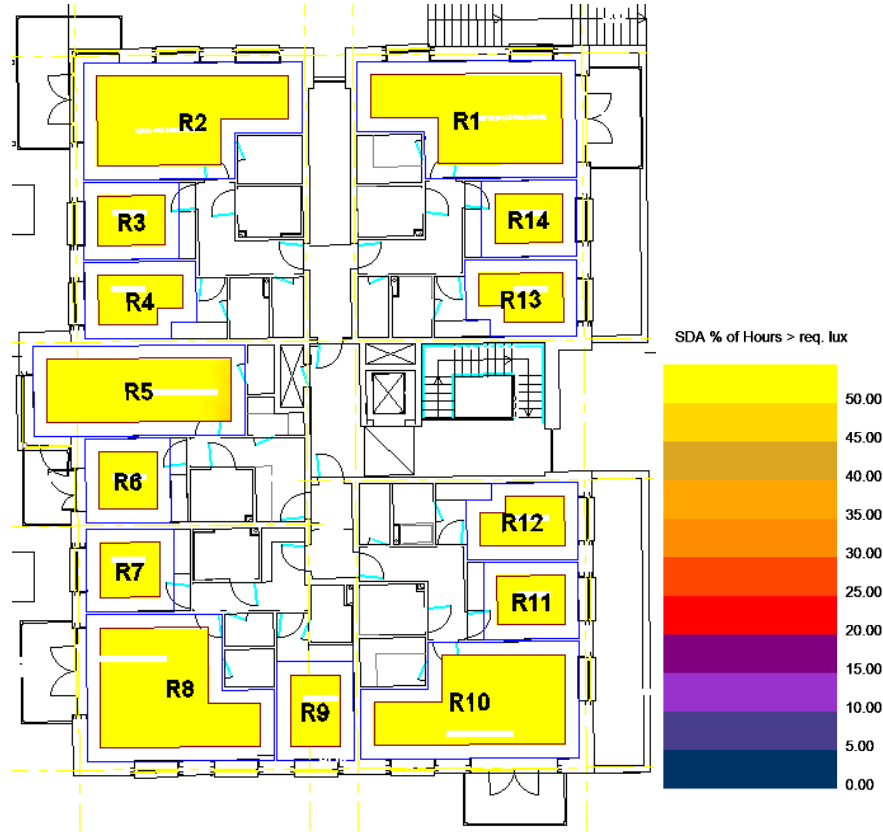


Figure 15: sDA Contours and Legend – Apartment Second Floor





Figure 16: sDA Contours and Legend – Apartment Third Floor



Figure 17: sDA Contours and Legend – Apartment Fourth Floor

## A2: Duplex Unit BA



Figure 18: Overview of Unit Referencing

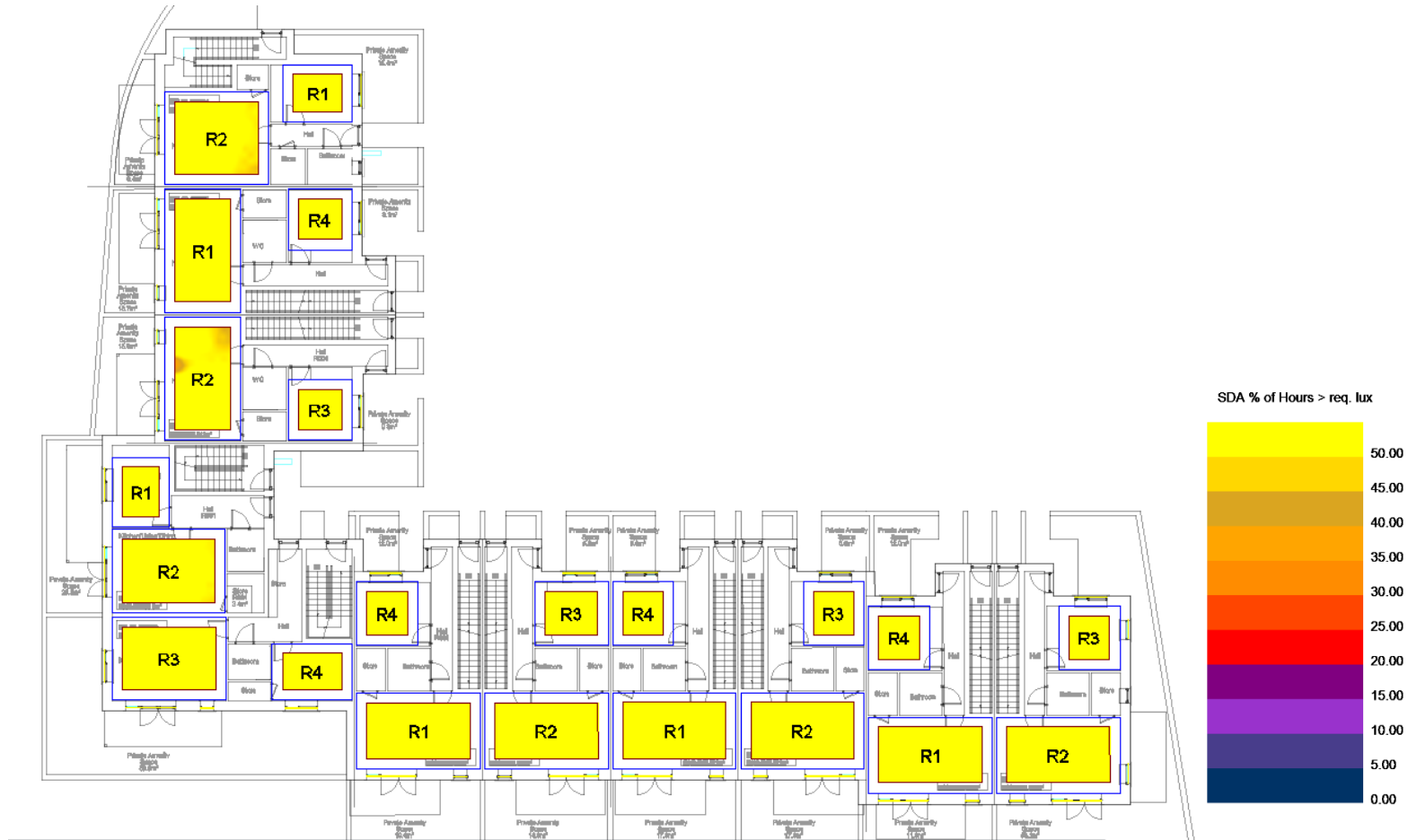


Figure 19: sDA Contours and Legend – Duplex Unit BA Ground Floor

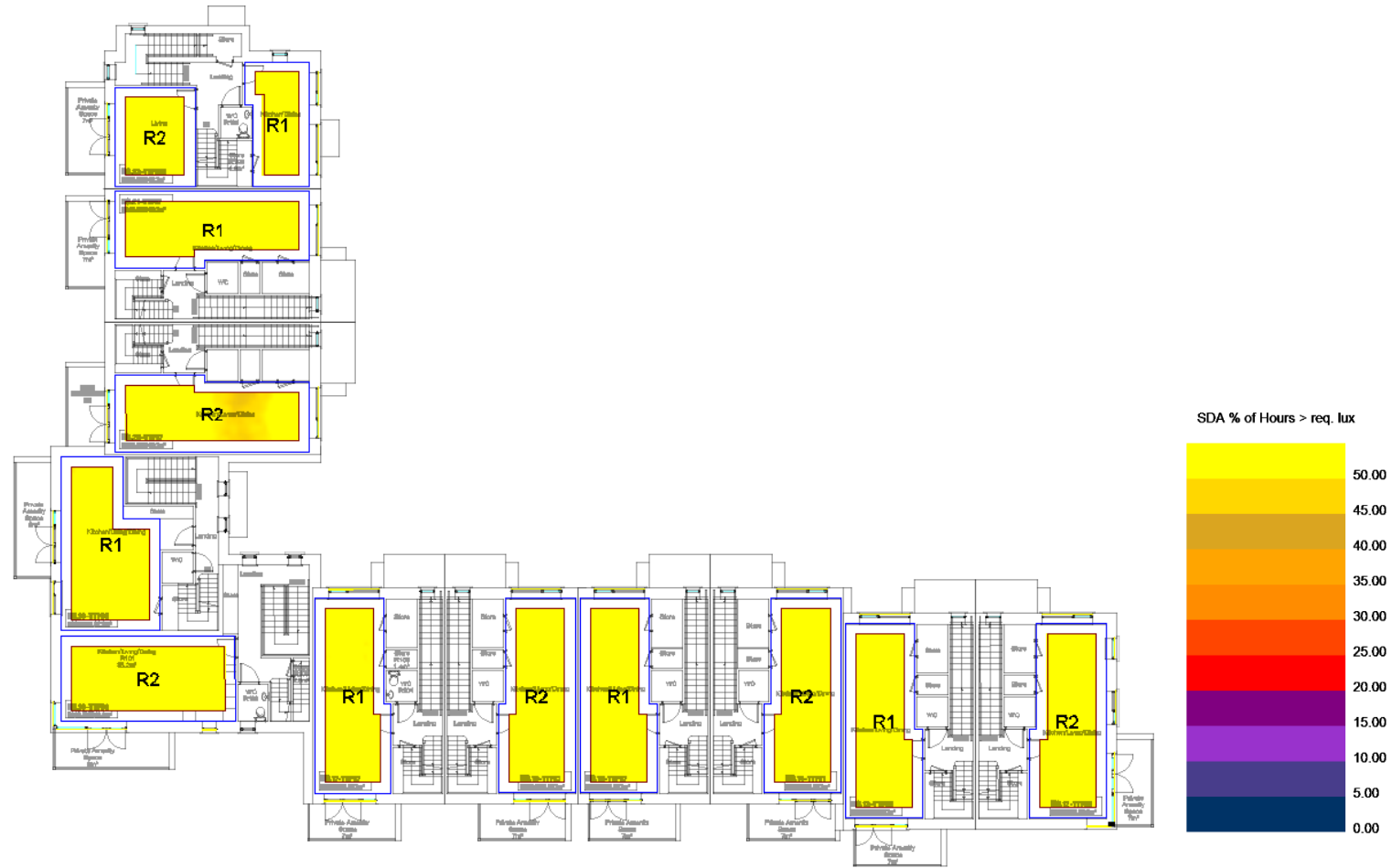


Figure 20: sDA Contours and Legend – Duplex Unit BA First Floor

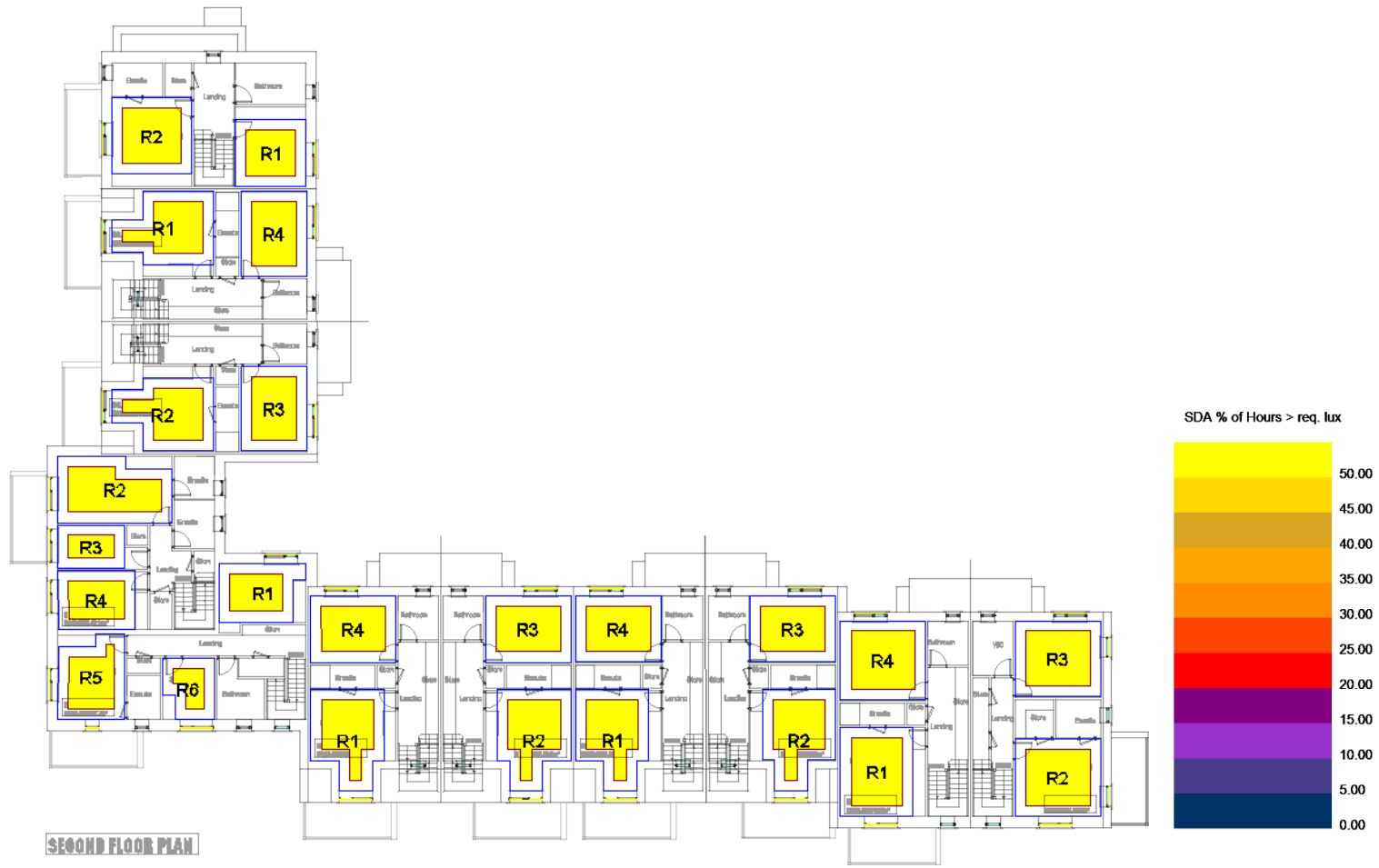


Figure 21: sDA Contours and Legend – Duplex Unit BA Second Floor

A3: Duplex Unit BB



Figure 22: Overview of Unit Referencing

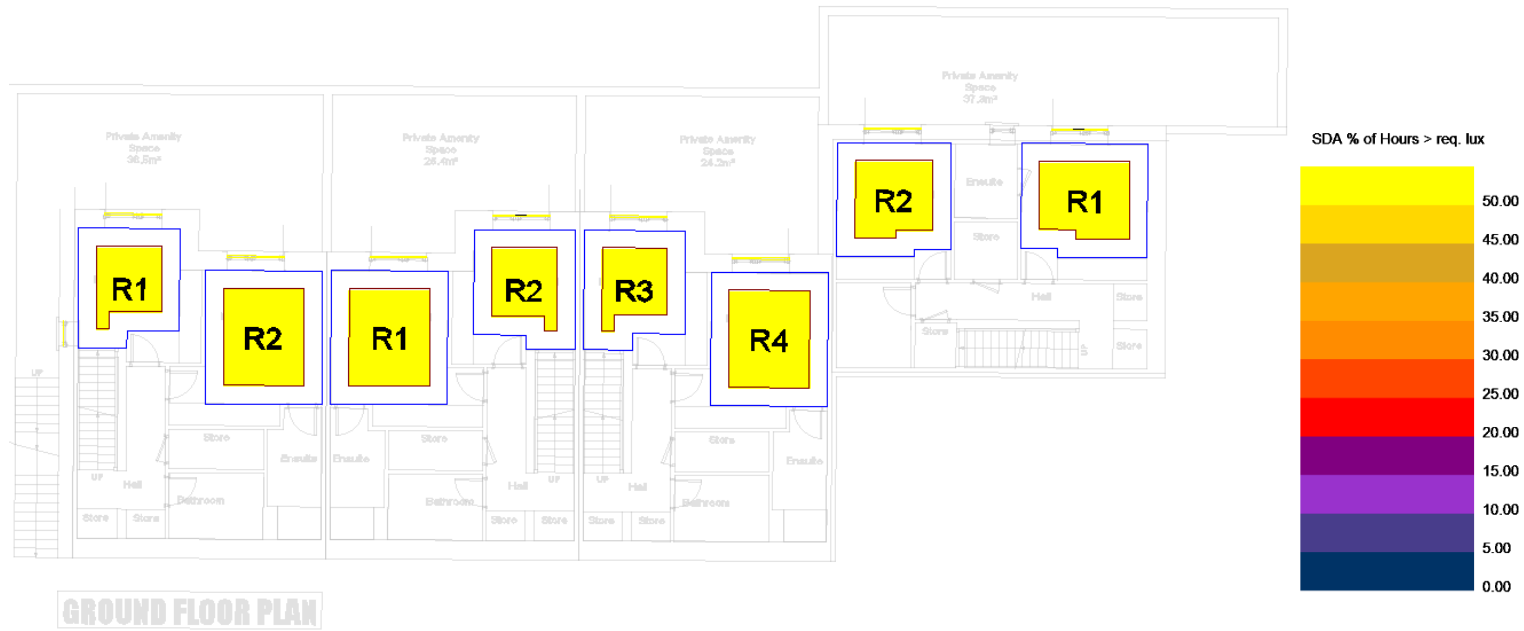


Figure 23: sDA Contours and Legend – Duplex Unit BB Ground Floor



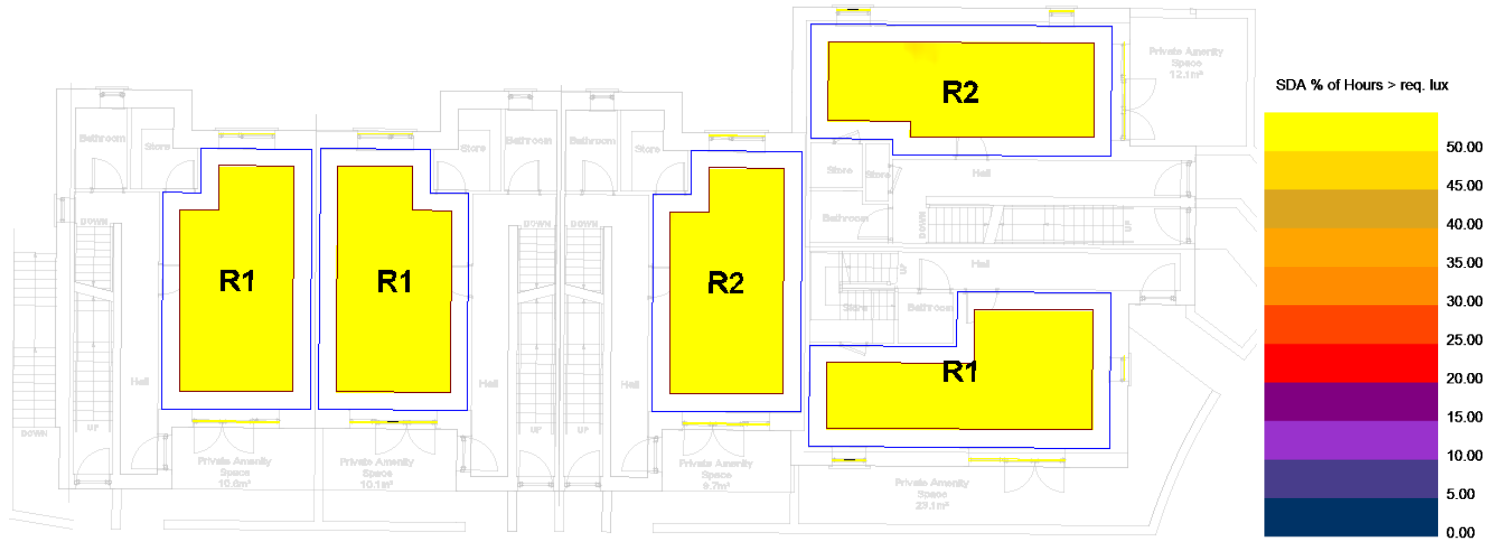


Figure 24: sDA Contours and Legend – Duplex Unit BB First Floor

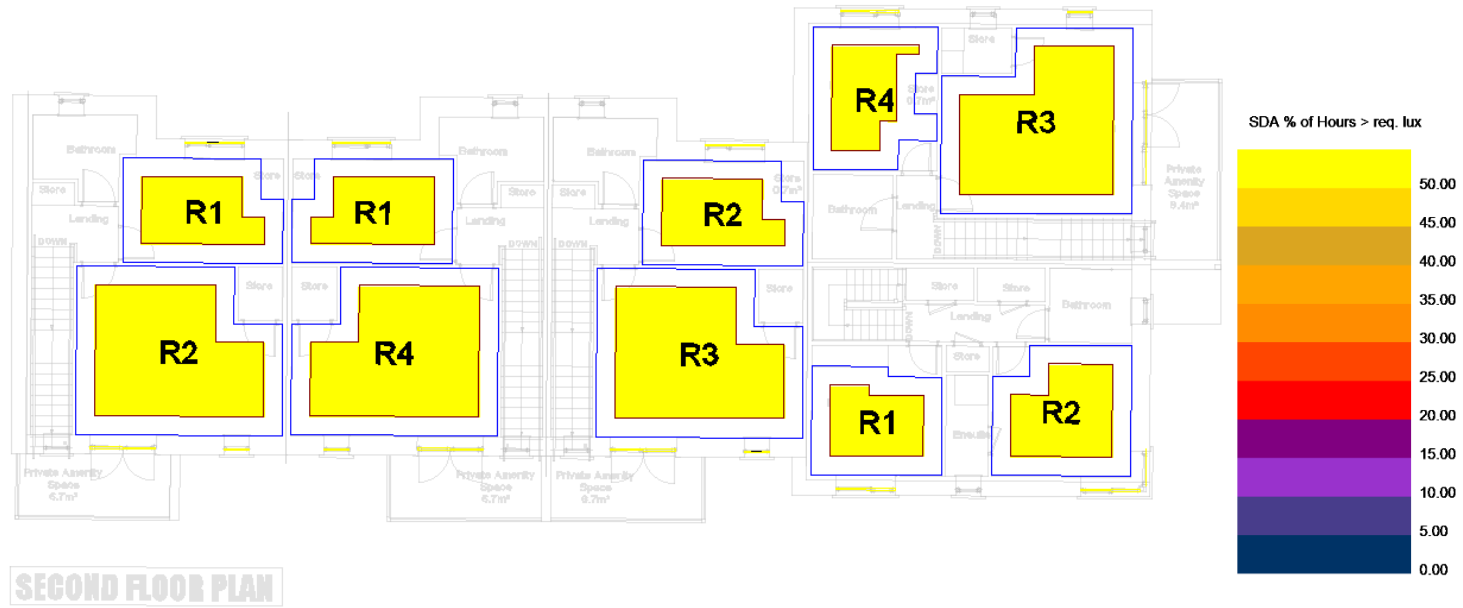


Figure 25: sDA Contours and Legend – Duplex Unit BB Second Floor

### A4: Duplex Unit BC

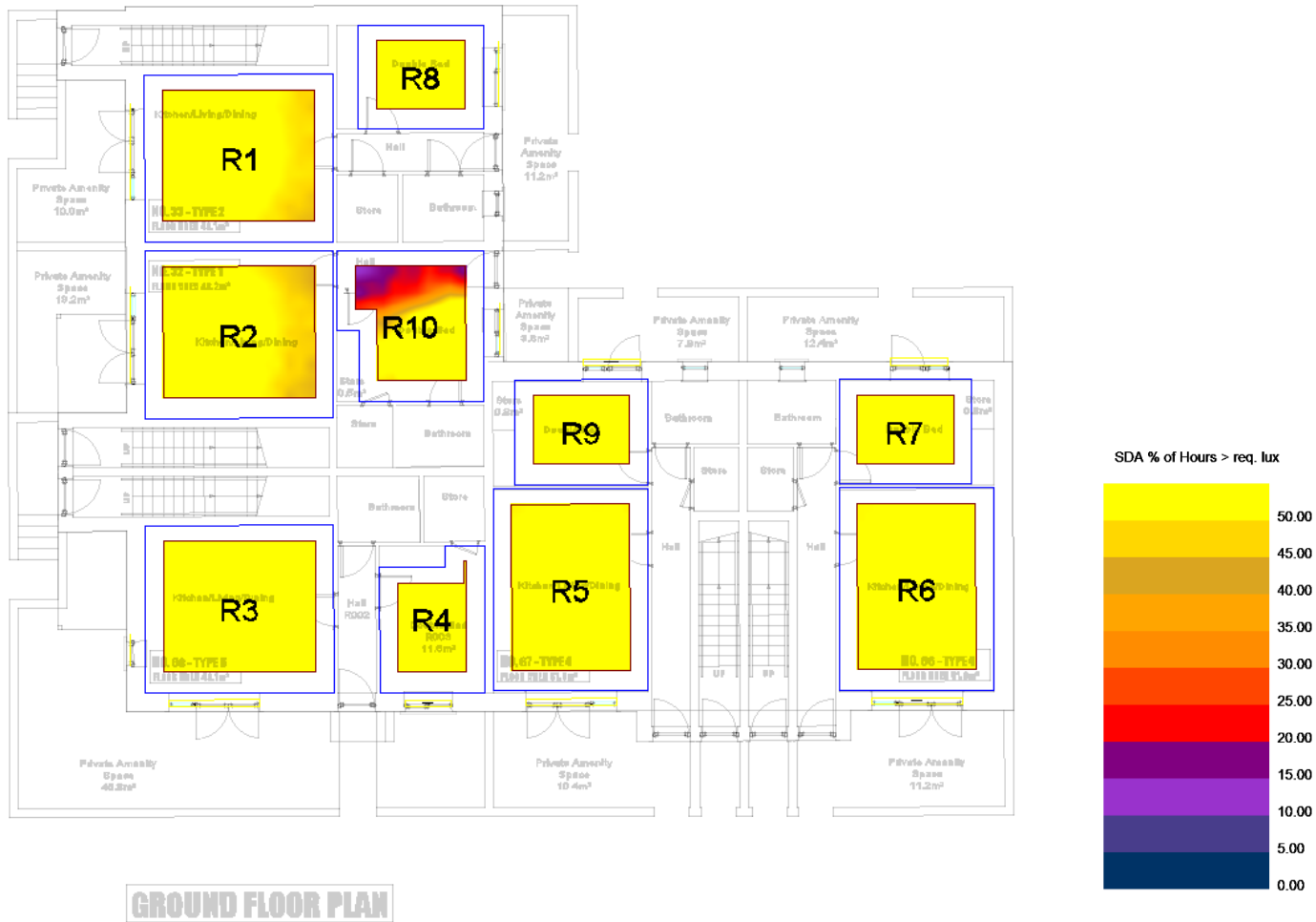


Figure 26: sDA Contours and Legend – Duplex Unit BC Ground Floor

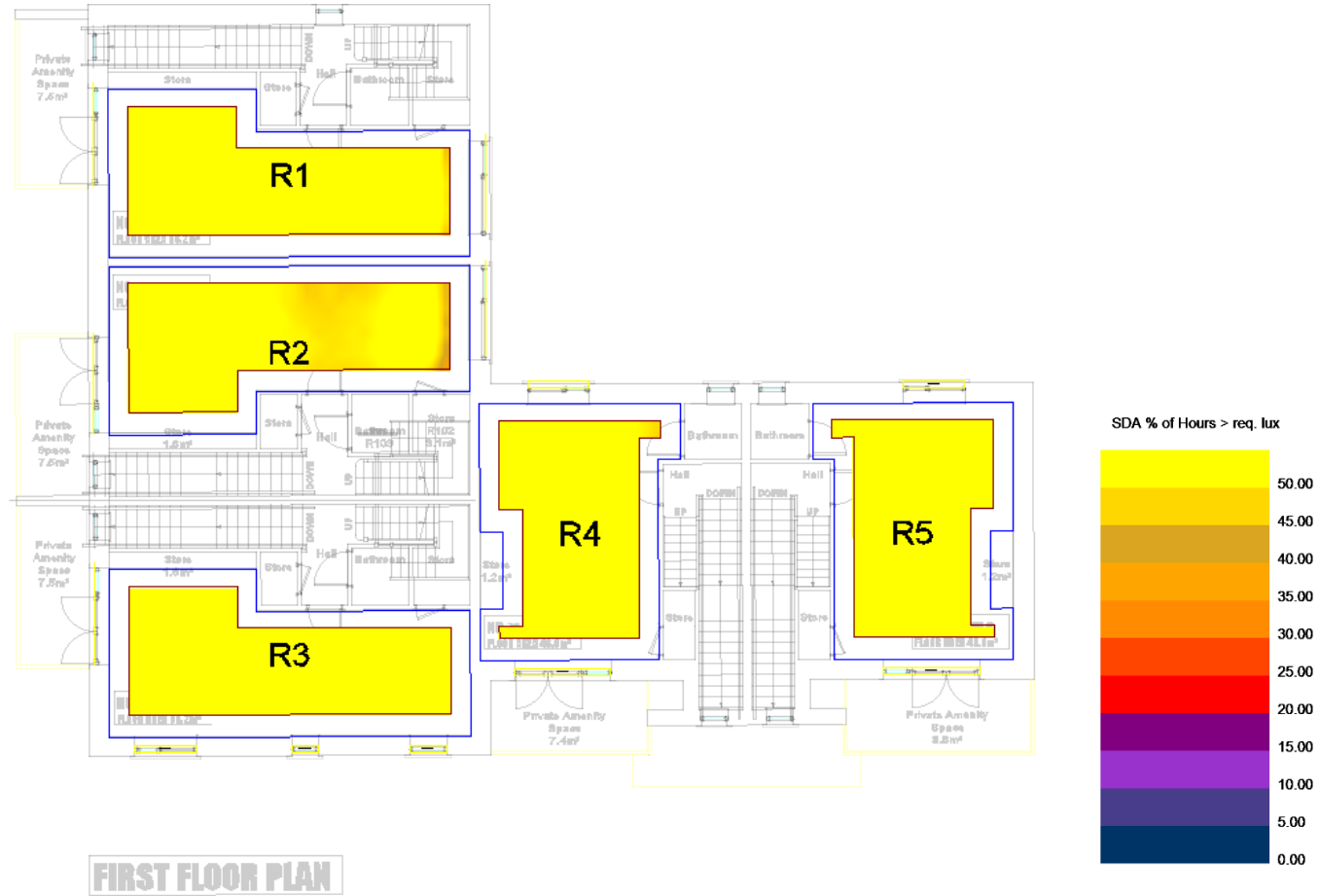


Figure 27: sDA Contours and Legend – Duplex Unit BC First Floor

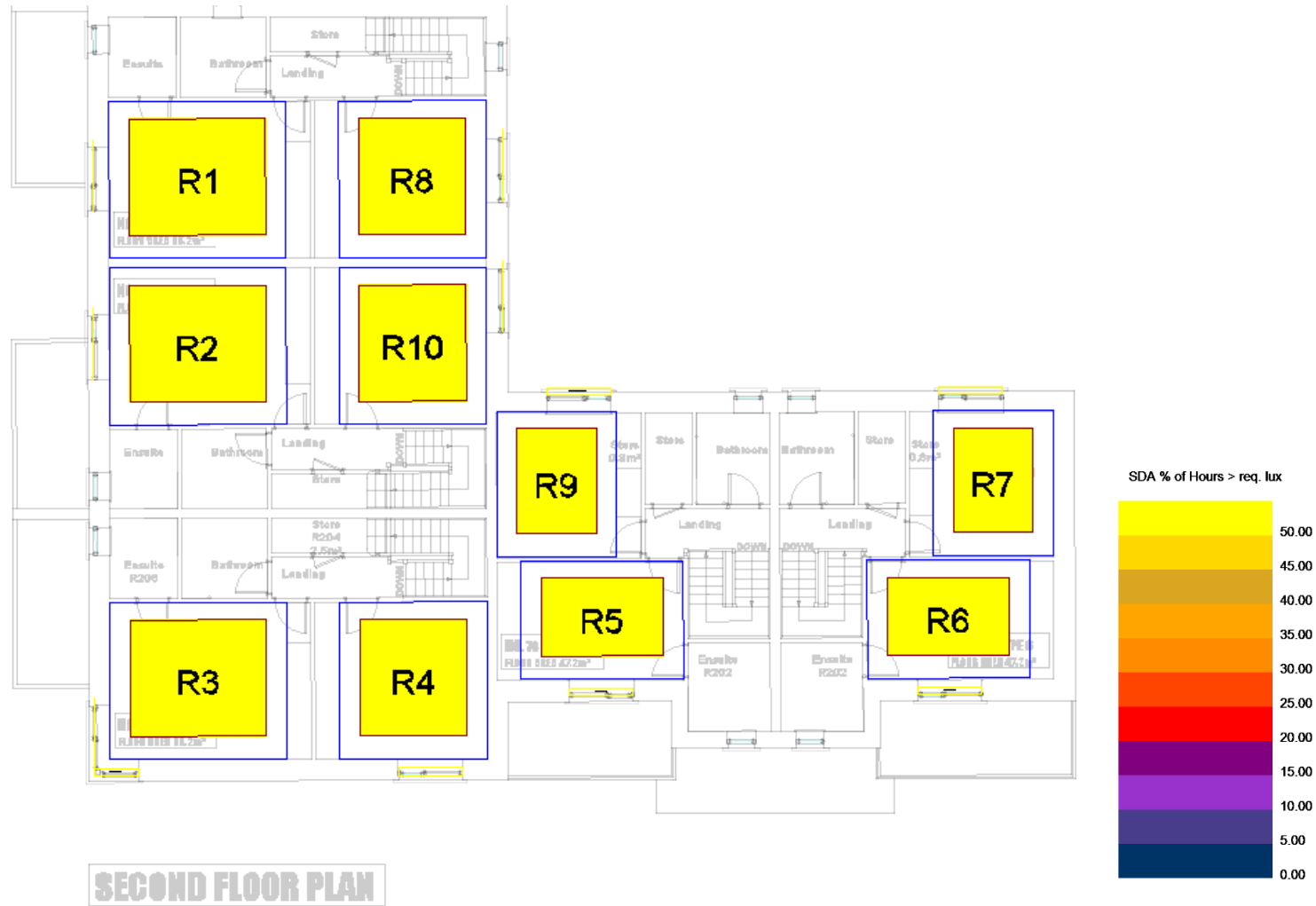


Figure 28: sDA Contours and Legend – Duplex Unit BC Second Floor

A5: Duplex Unit BD

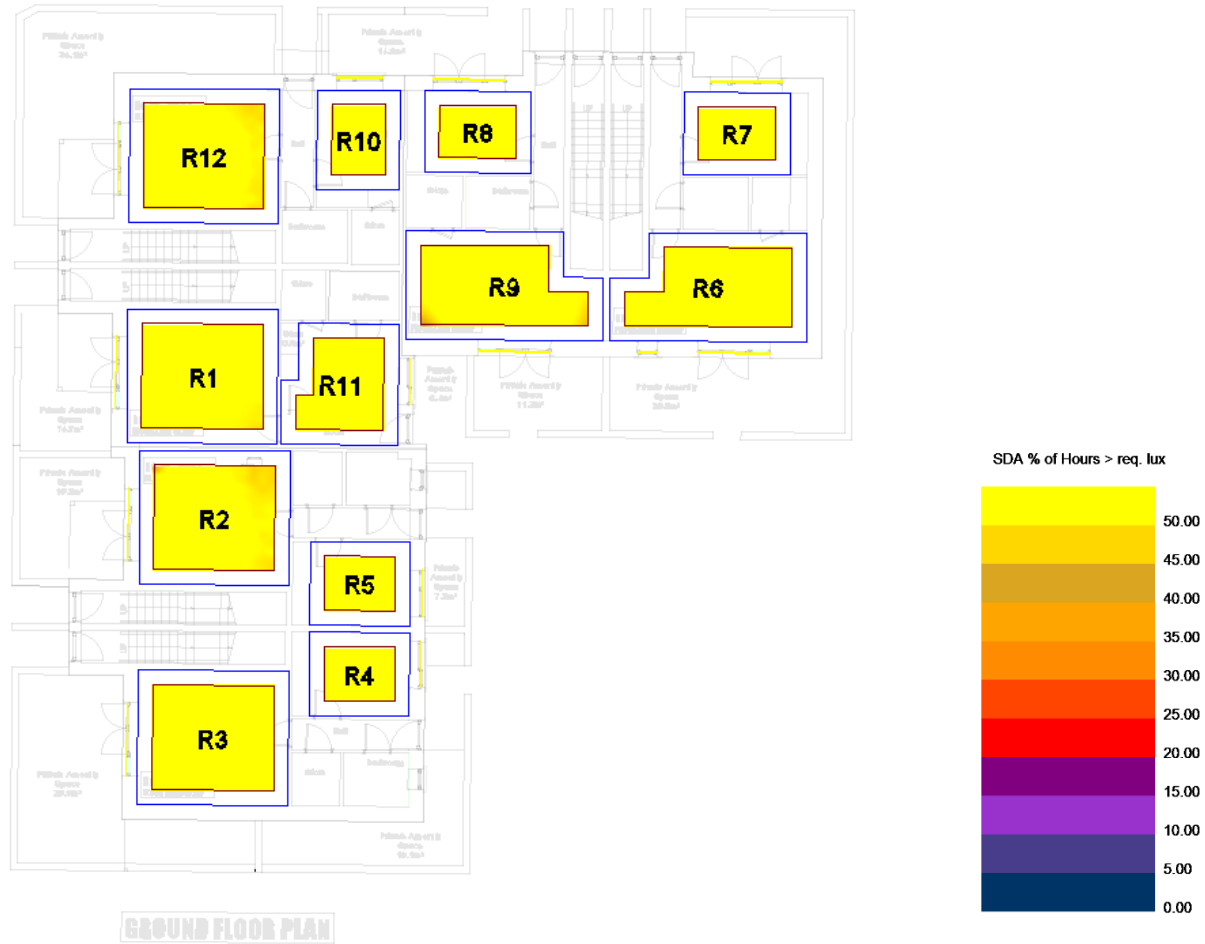


Figure 29: sDA Contours and Legend – Duplex Unit BD Ground Floor



Figure 30: sDA Contours and Legend – Duplex Unit BD First Floor

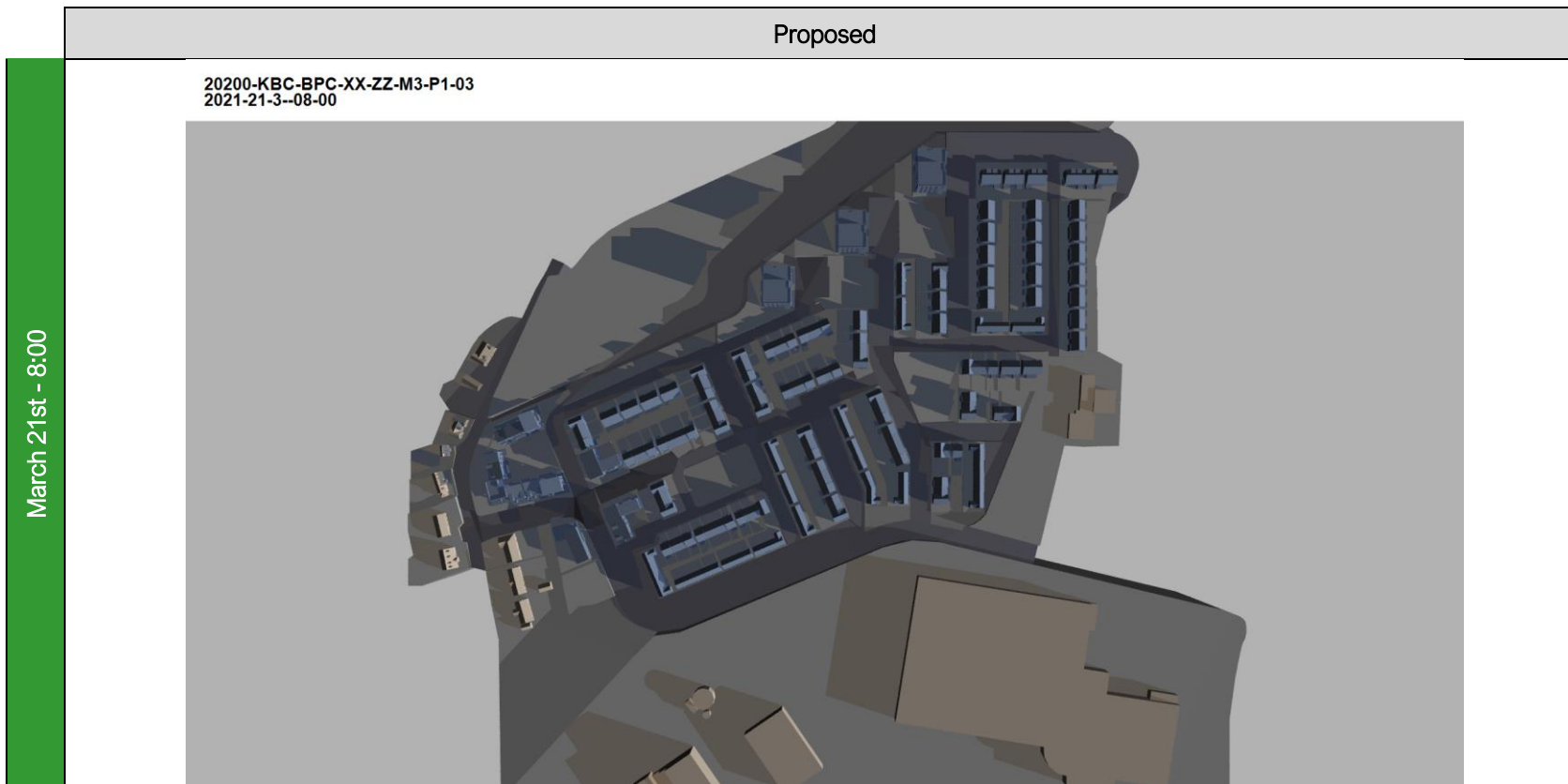


Figure 31: sDA Contours and Legend – Duplex Unit BD Second Floor



## Appendix B: Shadow Images

### B.1 March 21<sup>st</sup>



March 21<sup>st</sup> - 10:00

2020-KBC-BPC-XX-ZZ-M3-P1-03  
2021-21-3--10-00



March 21<sup>st</sup> - 12:00

20200-KBC-BPC-XX-ZZ-M3-P1-03  
2021-21-3--12-00



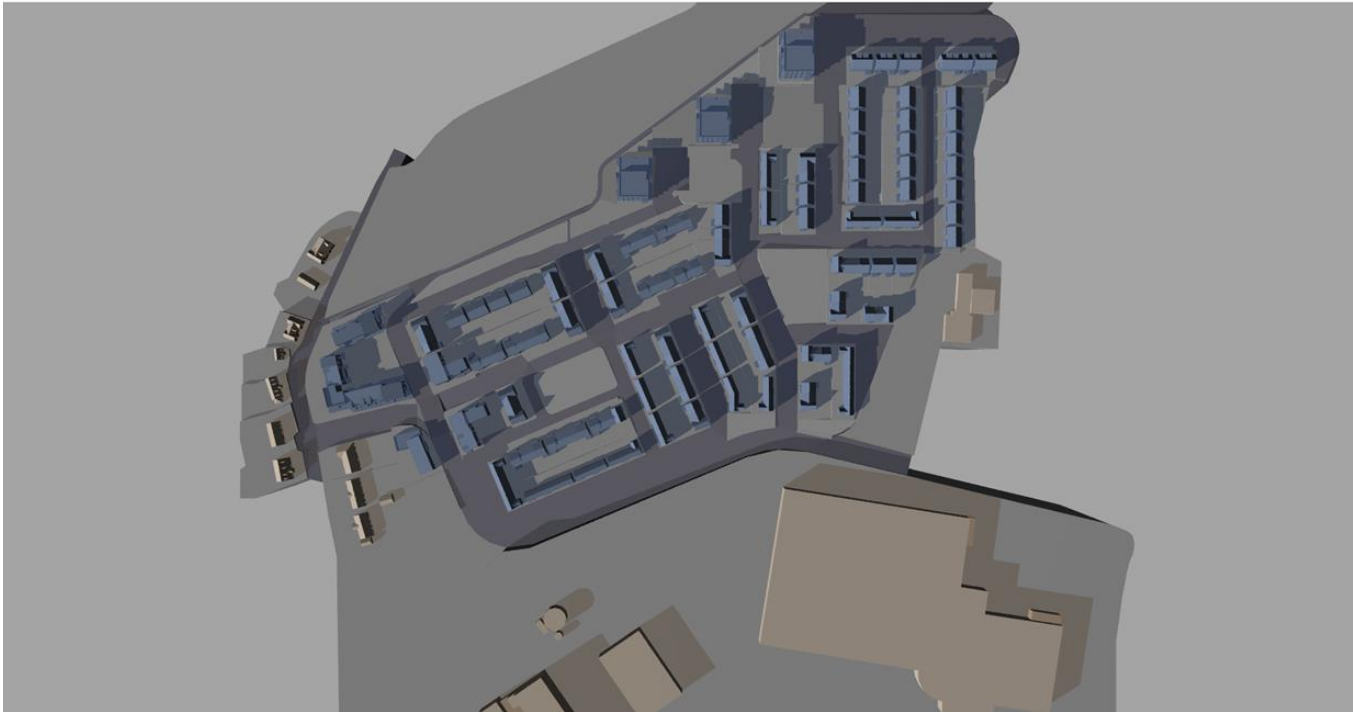
March 21<sup>st</sup> - 14:00

2020-KBC-BPC-XX-ZZ-M3-P1-03  
2021-21-3--14-00

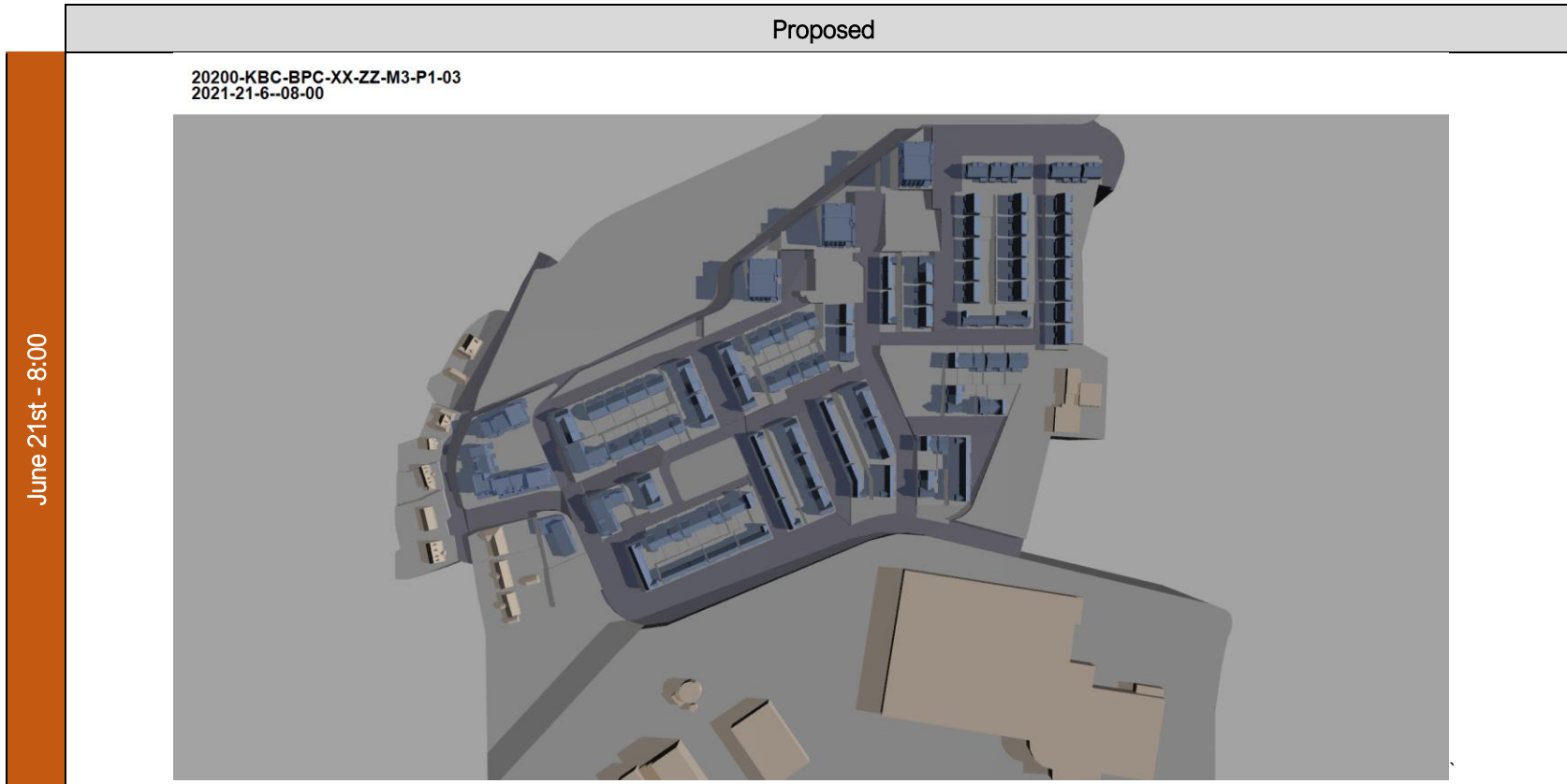


March 21<sup>st</sup> - 16:00

2020-KBC-BPC-XX-ZZ-M3-P1-03  
2021-21-3--16-00



B.2 June 21<sup>st</sup>







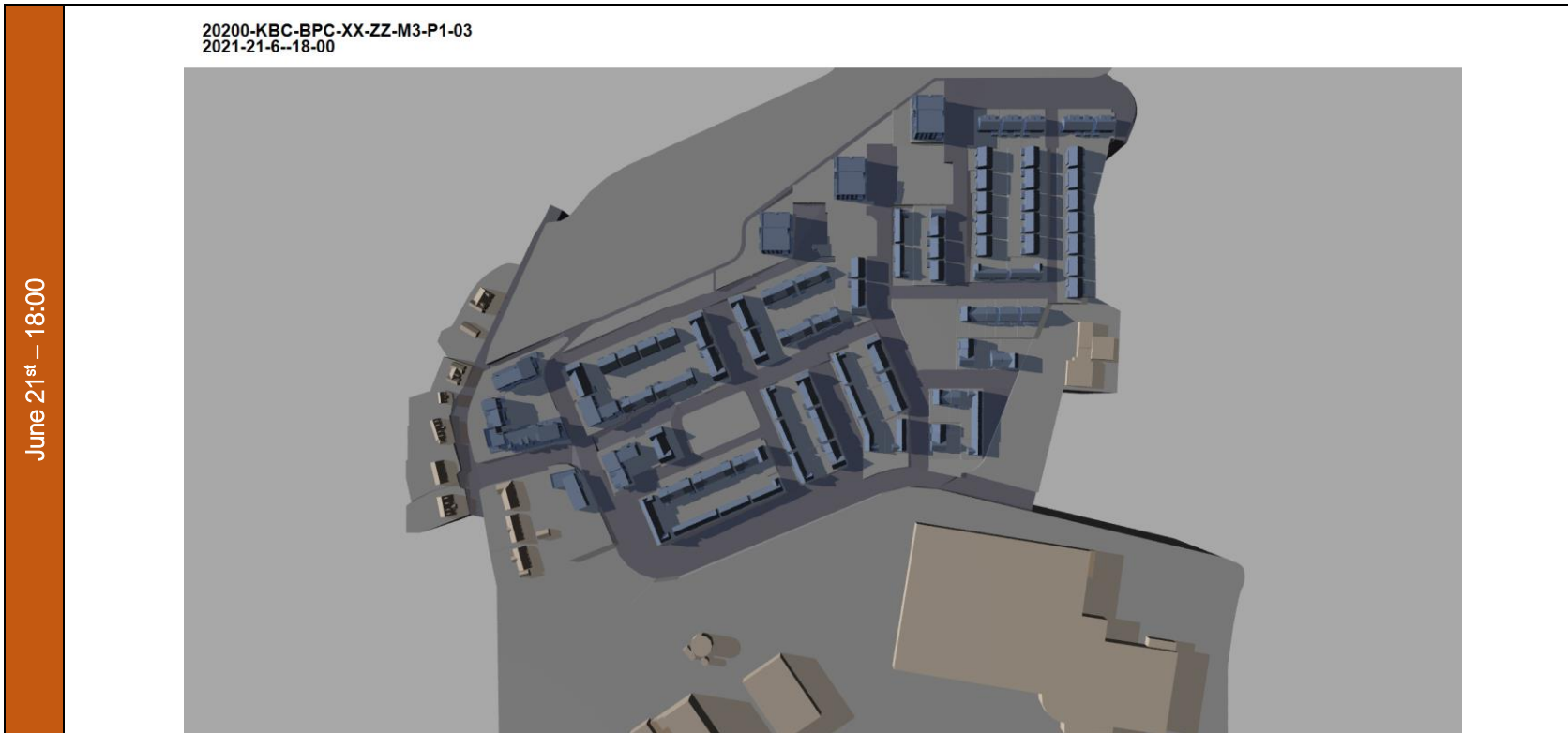




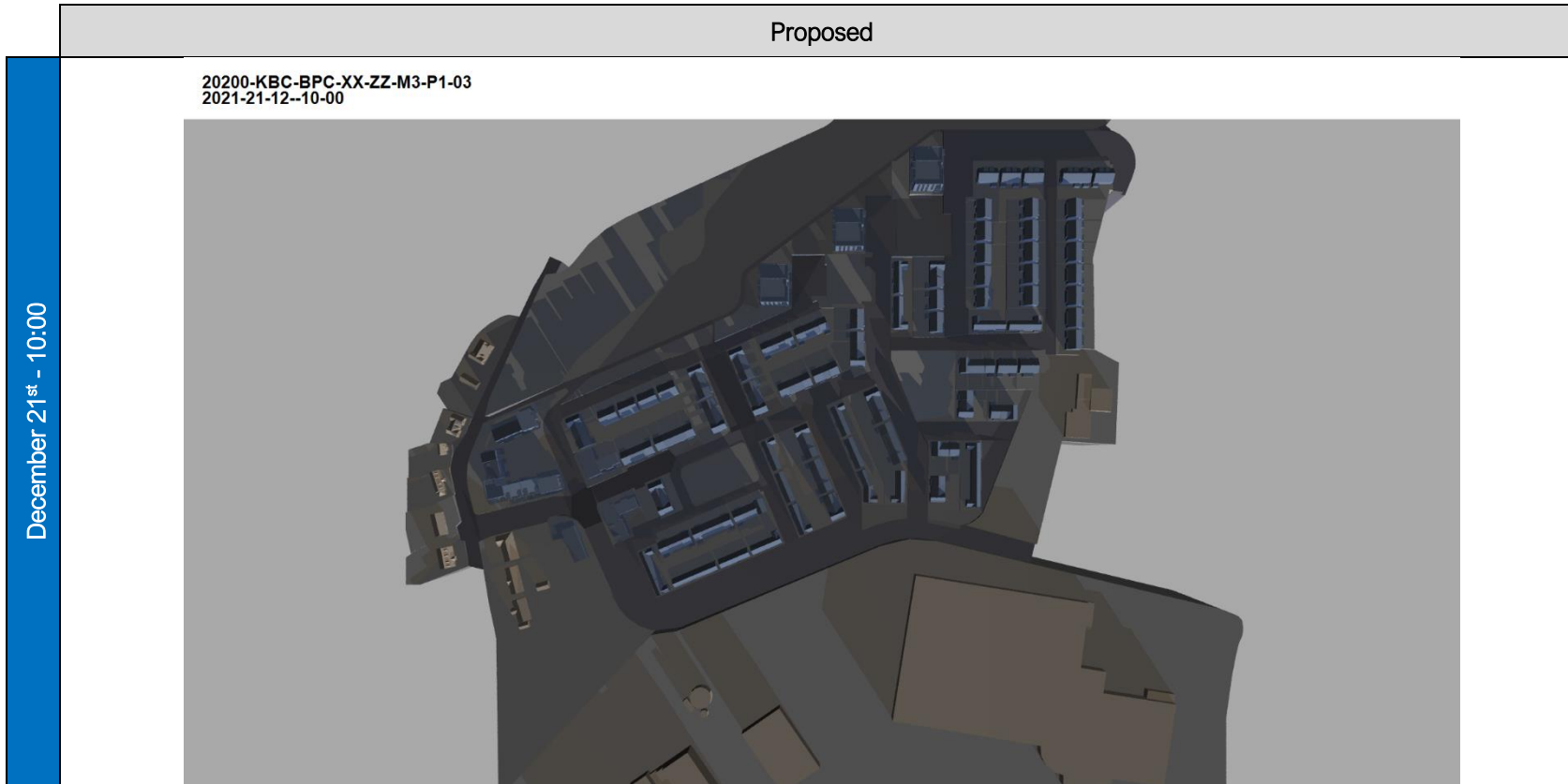
20200-KBC-BPC-XX-ZZ-M3-P1-03  
2021-21-6--16-00

June 21<sup>st</sup> - 16:00



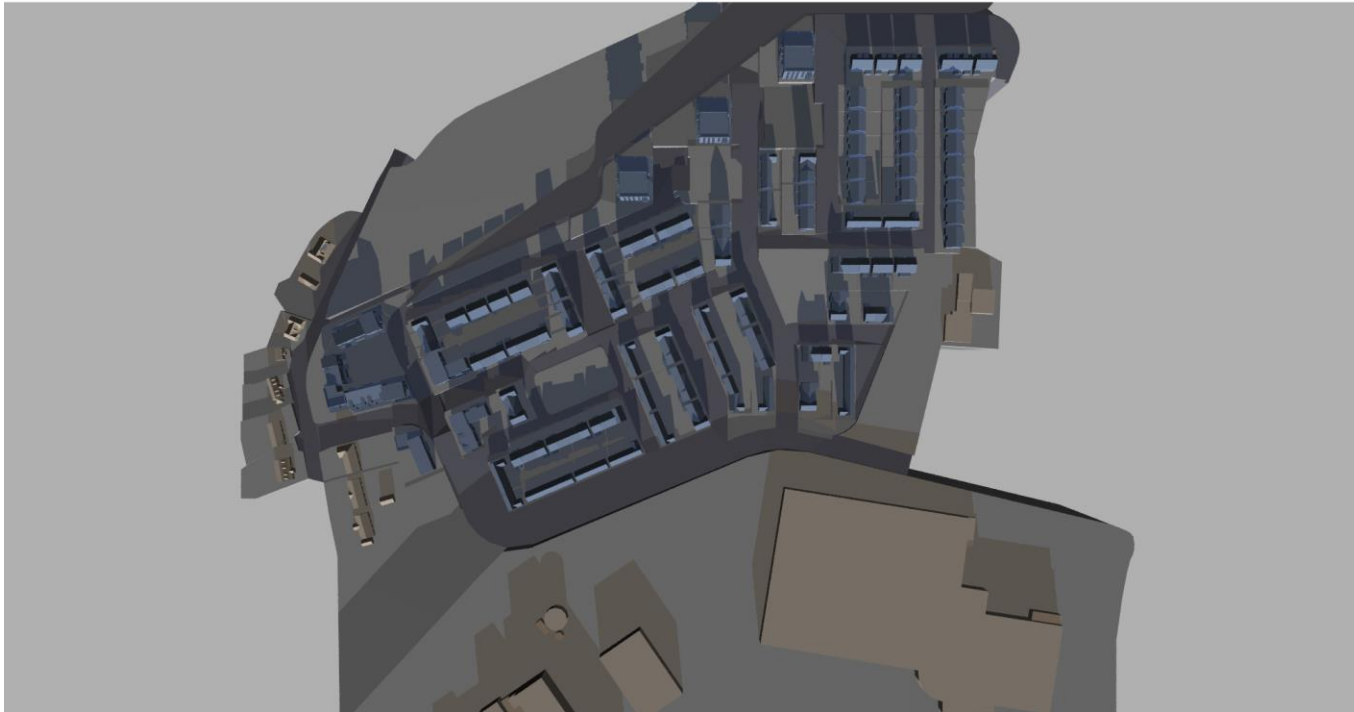


### B.3 December 21<sup>st</sup>



20200-KBC-BPC-XX-ZZ-M3-P1-03  
2021-21-12--12-00

December 21<sup>st</sup> – 12:00



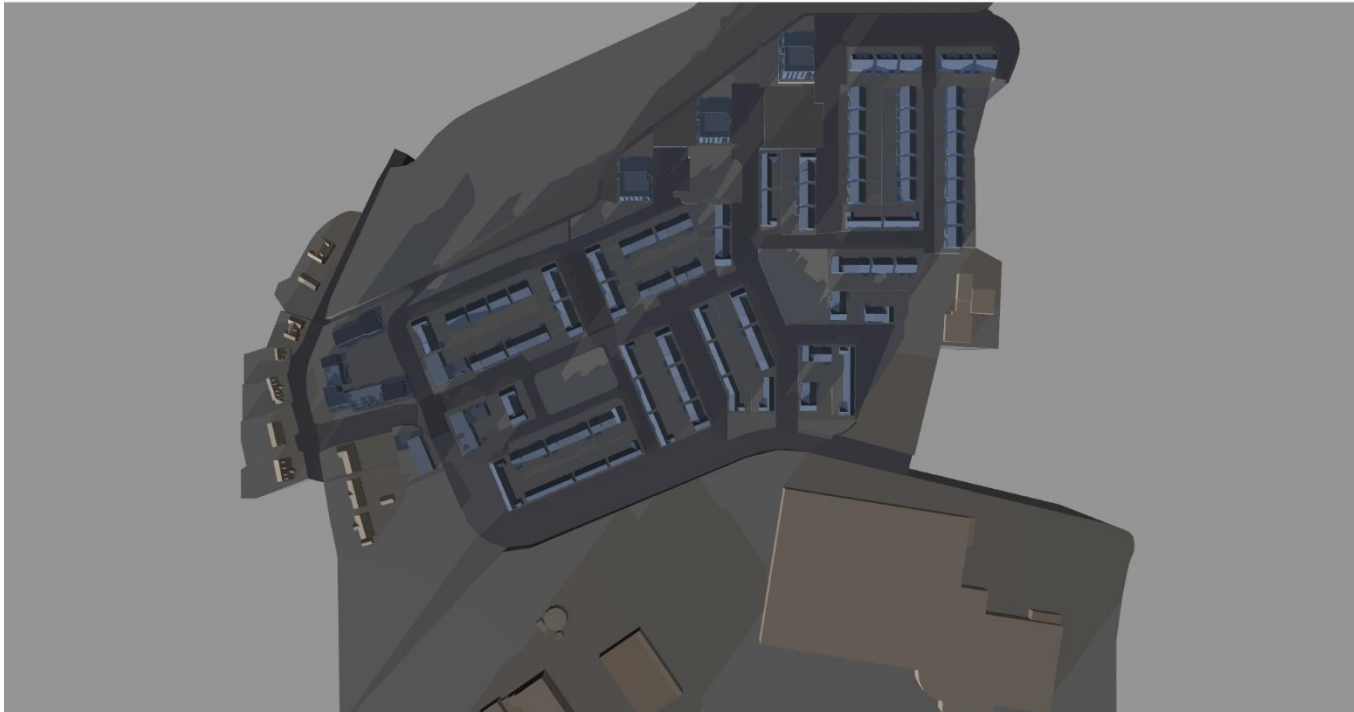
20200-KBC-BPC-XX-ZZ-M3-P1-03  
2021-21-12--14-00

December 21<sup>st</sup> - 14:00



20200-KBC-BPC-XX-ZZ-M3-P1-03  
2021-21-12--15-00

December 21<sup>st</sup> – 15:00

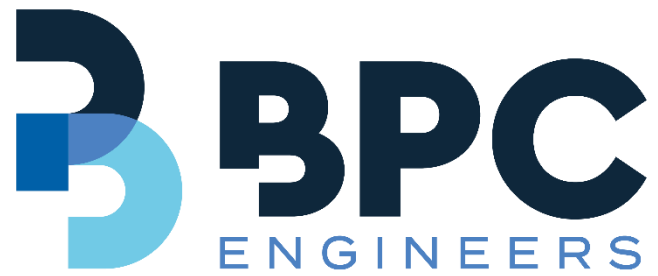


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