Daylight & Sunlight Assessments of a Residential Development at Oldtown Mill, Celbridge, Co. Kildare.

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1. Introduction

Permission is sought for a residential development of 40 No. houses and 20 No. duplex units, and all associated works as described in statutory notices.

1.1 Executive Summary

This report assesses the impact of the proposed development for Daylight and Sunlight on the neighbouring buildings and the quality of daylight and sunlight within the proposed development. This analysis is carried out based on the drawings of McCrossan O'Rourke Manning Architects.

1.1.1 Assessment of Potential Impact to Daylight and Sunlight Availability on Adjacent Properties.

There will be a small reduction to the available daylight and sunlight levels to the adjacent dwellings. The majority of the windows retain a VSC level greater than 27% or they will not be reduced below 80% of the existing value. Where there is a reduction below 27% VSC the average ratio in excess of 80% is maintained when additional windows to the same room are included. The reduction to available daylight will be minor and any impact will be negligible.

There will be no reduction in sunlight availability to the windows of the surrounding properties.

There will be no perceptible reduction in sunlight to private or communal amenity spaces. The proposed development meets the recommendations of the BRE guidelines.

1.1.2 Assessment of the Quality of the Proposed Development.

The houses and duplex units were designed in line with the recommendations of the BRE guidelines. A number of design iterations were conducted to improve the daylight and sunlight within in the proposed development. The guidelines clearly state that the they are recommendations only and flexibility is required when setting and interpreting the targets.

BR209:2022 recommends assessment methods set out in BS EN 17037 for daylight provision. BS EN 17037 contains a National Annex (NA1) which sets out minimum daylight levels to be achieved in the UK and channel Islands. Ireland has a similar latitude and climate to the UK. The National Annex in BS EN 17037 states that the target values set out in Table A1 may be hard to achieve in the UK and as a result sets alternative minimum values for rooms to dwellings. The minimum illuminance levels set out in BS EN17037:2018+A1:2021 are: Kitchens and living spaces containing a kitchen 200lux (1.3%DF). Living rooms 150lux (1%DF) and Bedrooms 100lux (DF0.7%).

There are no existing mature trees within the vicinity of any of the proposed units that would influence the daylight levels and the assessment is carried out without any trees.

1.1.3 Assessment of Daylight in Accordance with BR209:2022 and BS EN 17037:2018+A1:2021.

100% of the Living, Dining, Kitchen and Bedroom spaces within the proposed development achieve the target values set out in BS EN 17037:2018+A1:2021 section NA1. These are the minimum room specific target values to be achieved in habitable rooms and they meet the recommendations of the BRE guidelines.

1.1.4 Sunlight within the Proposed Development

This scheme is well designed for sunlight with 70% of the duplex units meeting the minimum recommended 1.5 direct sunlight hours.

All of the proposed communal amenity spaces achieve sunlight levels that exceed 2 hours sunlight over 50% of the amenity space on the 21st March. The proposed development has been well designed for sunlight. All the houses and duplex that have ground level amenity space achieve the target sunlight hours set out in BR209:2022 (third edition). The proposed development meets the recommendations of the BRE guidelines.

1.1.5 Supplementary Information - Assessment of daylight in accordance with IS EN 17037:2018.

EN 17037:2018 sets out values for target illuminance, minimum target illuminance and fractions of reference plane to be achieved. The target and minimum target levels set out in EN17037:2018 are for any type of building and they do not take into account room use or make allowance for rooms that have a lesser requirement for daylight. The results for this assessment indicate a high level of compliance for minimum target level of 100% and target level of 92.1% of rooms achieving the minimum target for each metric. Appendix B identifies any rooms which do not achieve the target illuminance levels.

To date there is no guidance from Irish local authorities or governmental bodies on the use or interpretation of IS EN 17038:2018. The local authorities guidelines and apartment guidelines refer to BR209 Site layout planning for daylight and sunlight which in turn references BS EN 17037. BS EN17037:2018+A1:2021 is the same as IS EN 17037:2018, with the addition of a National Annex (NA1). The annex sets room specific values for dwellings in the UK and Channel Islands.

2. Methodology

2.1 Standards and Guidelines

Ministerial guidance is provided in Sustainable and Compact Settlements: Guidelines for Planning Authorities (2024) Section 5.3.7(b).

> *"In cases where a technical assessment of daylight performance is considered by the planning authority to be necessary regard should be had to quantitative performance approaches to daylight provision outlined in guides like A New European Standard for Daylighting in Buildings IS EN17037:2018, UK National Annex BS EN17037:2019 and the associated BRE Guide 209 2022 Edition (June 2022), or any relevant future standards or guidance specific to the Irish context."*

This is accordance with Section 6.6 of the Sustainable Urban Housing: Design Standards for New Apartments (2023), and Section 3.2 of the Urban Development and Building Heights Guidelines for Planning Authorities (2018).

The Daylight and Sunlight assessments included in this report demonstrates the level of compliance with these three documents:

- BR209:2022 Site Layout Planning for Daylight and Sunlight (Third edition), also referred to as the BRE guidelines.
- BS EN 17037:2018+A1:2021 Daylight in Buildings, also referred to as the UK Annex.
- IS EN 17037:2018 Daylight in Buildings.

2.2 BRE Guidance Document BR209:2022 - Site Layout Planning for Daylight and Sunlight (3rd edition).

The BRE guidelines (2022) state at the outset that "It is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location." The recommendations of the BRE guidelines (2022) are not suitable for rigid application to all developments in all contexts and this is of particular importance in the context of national and local policies for the consolidation and densification of urban areas.

BR209 2022 sets out the assessment metrics to be applied when assessing the potential impact of a development on the daylight and sunlight of neighbouring properties. The metrics for assessing impact to adjacent buildings in the areas of Daylight is the Vertical Sky Component (VSC) and Sunlight is the Annual Probable Sunlight Hours (APSH). Sunlight to adjacent amenity space is assessed through the measurement of sunlight availability on the 21st March and the plotting of shadow diagrams.

The BRE guidelines (2022) recommend the use of BS EN 17037:2018 for assessing the quality of interior spaces in proposed developments. BS EN 17037 sets out assessment methods for daylight provision and access to sunlight. It states that "The guidance here is intended for use in the United Kingdom and in the Republic of Ireland, though recommendations in the Irish Standard IS EN 17037 may vary from those in BS EN17037."

EN 17037 is a unified daylighting standard published by the European Committee for Standardization (CEN) in 2018. It is applicable across all countries within the EU including Ireland with the Irish edition IS EN17037:2018. The standard is enacted in Britain under BS EN 17037:2018+A1:2021 with a UK National Annex for regional assessments. The daylight and sunlight assessment methods for internal daylight and sunlight provision are common to both the Irish Standard Version and the UK version.

The UK National Annex (NA) provides further recommendations for daylight provision in the UK and Channel Islands. NA.1 states that the UK committee supports the recommendations for daylight in buildings given in BS EN17037:2018. The annex states that the daylight target levels in Clause A.2 may be hard to achieve in buildings in the UK and in particular dwellings in urban areas with significant obstructions or tall trees outside. NA.2 sets out minimum daylight provision to be achieved in UK dwellings.

The UK National Annex A1 sets out room specific minimum values to be achieved in the UK and Channel Islands. All the rooms achieve the minimum DF factor levels set out in A1 for Bedrooms (DF0.7%), Living Rooms (1%DF) and Kitchens and Living Spaces containing a Kitchen(1.3%). The Daylight Factor percentage values are derived from minimum room specific illiminance levels set out in NA+1 and the Median External Diffuse Illuminance ($E_{v,d,med}$) for Dublin from Table A.3 EN17037:2018. The illuminance levels and corresponding DF% are given in Table 5 below.

2.3 Daylight to Existing Dwellings

BRE guidance document (2022) "Site layout planning for daylight and sunlight" relates to daylight and sunlight to potential impact in neighbouring buildings. As set out above, this is broadly in line with the previous version of the BRE guidelines (2011). The metrics are the same for assessing impact in the areas of Daylight (VSC) and Sunlight (APSH) to adjacent buildings. Sunlight to adjacent amenity space is assessed through the measurement of sunlight availability on the 21st March.

A proposed development could potentially have a negative effect on the level of daylight that a neighbouring property receives, if the obstructing building is large in relation to their distance from the existing dwelling. To ensure a neighbouring property is not adversely affected, the Vertical Sky Component (also referred to as VSC) is calculated and assessed. VSC can be defined as the amount of skylight that falls on a vertical wall or window.

BRE guidelines (2022) recommend that: "*Loss of light to existing windows need not be assessed 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 window."
The diffuse light of the existing building may be adversely affected if part of a new building measured in a vertical section perpendicular to the main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25º to the horizontal. If a window falls within a 45° angle both in plan and elevation with a new development in place then the window may be affected and should be assessed.

The guidelines sets out which rooms need to be assessed for daylight in Section 2.2:

> *"The guidelines 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";*

For loss of daylight the BRE guidelines (2022) recommends calculation of the Vertical Sky Component. This is the ratio of direct sky illuminance falling on the outside window, to the simultaneous horizontal illuminance under an unobstructed sky. The standard CIE Overcast Sky is used and the ratio is usually expressed as a percentage. The maximum value is just under 40% for a completely unobstructed vertical wall. The Vertical Sky Component on a window is a good measure of the amount of daylight entering it.

The BRE guidelines (2022) recommend one of two criteria is met when assessing for the Vertical Sky Component:

a) Where the Vertical Sky Component at the centre of the existing window exceeds 27% with the new development in place then enough sky light should still be reached by the existing window.

b) Where the Vertical Sky Component with the new development in place is both less than 27% and less than 0.8 times its former value, then the area lit by the window is likely to appear more gloomy, and electric light will be needed more of the time.

The BRE guidelines (2022) state that if the VSC is:

- At least 27%, then conventional window design will usually give reasonable results;
- Between 15% and 27%, then special measures (larger windows, changes to room layout) are usually needed to provide adequate daylight;
- Between 5% and 15%, then it is very difficult to prove adequate daylight unless very large windows are used;
- Less than 5%, then it is often impossible to achieve reasonable daylight, even if the whole window wall is glazed

This report assesses the percentage of direct sky illuminance that falls on the centre point of neighbouring windows that could be affected by the proposed development through the Vertical Sky Component (VSC) as per the methodologies contained in the BRE guidelines (2022).

2.4 Sunlight to Existing Buildings

The BRE guidelines (2022) recommend assessing the main living rooms and conservatories if they have a window wall facing within 90° of due south. Kitchens and bedrooms are less important but care should be taken not to block too much sun. If the proposed development is fully north of the existing window then sunlight need not be assessed.

The Annual Probable Sunlight Hours (APSH) is used to assess the quantity of sunlight for a given location. This is the total amount of sunshine for a given location on an unobstructed horizontal surface taking cloud cover into account. Statistical data from the Irish Meteorological Service is used to assess the APSH and the Winter Probable Sunlight Hours (taken to fall between the 21st of September and the 21st of March).
Table 1 below shows the average sunlight hours for each month and the maximum possible without any cloud cover. This gives the factor of possible sunlight hours for each month.

Met Éireann Sunlight Hours Data Set 1991-2020													
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Average Sunlight Hours/ Day	1:54	2:54	3:42	5:24	6:24	6:00	5:17	5:00	4:24	3:24	2:24	1:42	
Average Sunlight Hours/ Month	58:54	81:12	114:42	162:00	198:24	180:00	163:47	155:00	132:00	105:24	72:00	52:42	1449.1
Total Available Sunlight Hours	252	265	358	412	483	485	496	451	375	320	250	236	4383
Probable Sunlight Hours Ratio	23.4%	30.6%	32.9%	39.3%	41.1%	37.1%	33.0%	34.4%	35.2%	32.9%	16.8%	22.3%	33.1%

Table 1: Average monthly sunlight hours recorded at Dublin Airport - Data set 1991-2020

The BRE guidelines (2022) recommend that the centre of a window or 1.6m above ground for a door be assessed and it should receive at least 25% of the APSH and it should receive at least 5% during the period of 21st September to 21st March. If the available APSH is less than this then it should not be reduced below 0.8 times its former value or noticeable loss of sunlight may occur.

2.5 Sunlight to Gardens and Open Spaces

For calculations of sunlight analysis it is general practice to use March 21st. The BRE guidelines (2022) states:

> *"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. If a detailed calculation cannot be carried out, it is recommended that the centre of the area should receive at least two hours of sunlight on 21 March."*

2.6 Calculations of Trees & Hedges

Trees are not usually included in the assessments of impact on neighbouring properties, unless specified otherwise. In relation to the effects of trees and hedges the BRE guidelines (2022) states:

> *"It is generally more difficult to calculate the effects of trees on daylight because of their irregular shape and because some light will generally penetrate through the crown. Where the effects of a new building on existing buildings nearby is being analysed, it is usual to ignore the effects of existing trees. This is because daylight is at its scarcest and most valuable in winter when most trees will not be in leaf."*

BR209:2022 recommends that sometimes trees should be taken into account for the proposed development where the new development is proposed near large existing trees. This needs to be done by modelling a representative of the existing trees. Reflectance and transparency should be taken into account. Table G1 in BR209:2022 gives values for transparencies of tree crowns in summer and winter for deciduous trees, dense evergreen can be assessed as opaque. Table G2 gives general reflectance values for shades of trees.

2.7 BRE Guidelines (2022) Appendix H: Environmental Impact Assessment

The BRE guidelines sets out criteria for classification for assessment of impact where a new development affects a number of existing buildings or open spaces in relation to an Environmental Impact Assessment. The guide does not give a specific range or percentages but sets out parameters set out below.

> *"Where the loss of skylight or sunlight fully meets the guidelines in this book, the impact is assessed as negligible or minor adverse. Where the loss of light is well within the guidelines, or only a small number of windows or limited area of open space lose light (within the guidelines), a classification of negligible impact is more appropriate. Where the loss of light is only just within the guidelines, and a larger number of windows or open space area are affected, a minor adverse impact would be more appropriate, especially if there is a particularly strong requirement for daylight and sunlight in the affected building or open space.*
>
> *Where the loss of skylight or sunlight does not meet the guidelines in this book, the impact is assessed as minor, moderate or major adverse. Factors tending towards a minor adverse impact include:*
> - *only a small number of windows or limited area of open space are affected*
> - *the loss of light is only marginally outside the guidelines*
> - *an affected room has other sources of skylight or sunlight*
> - *the affected building or open space only has a low level requirement for skylight or sunlight*
> - *there are particular reasons why an alternative, less stringent, guideline should be applied.*
>
> *Factors tending towards a major adverse impact include:*
> - *a large number of windows or large area of open space are affected*
> - *the loss of light is substantially outside the guidelines*
> - *all the windows in a particular property are affected*
> - *the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight, eg a living room in a dwelling or a children's playground.*
>
> *Beneficial impacts occur when there is a significant increase in the amount of skylight and sunlight reaching an existing building where it is required, or in the amount of sunlight reaching an open space.*
>
> *Beneficial impacts should be worked out using the same principles as adverse impacts. Thus a tiny increase in light would be classified as a negligible impact, not a minor beneficial impact."*

A flexible approach should be taken when assessing the impact with daylight and sunlight being one of many factors that influence the environment when planning a new development.

The guideline does not set out a specific value range for the different classification of impact level of Minor, Moderate and Major to each window. For the purpose of this report one of five classification levels will be applied:

1. Imperceptible: There is no reduction in the VSC levels or where the levels are 99% of the existing value.
2. No substantial change: A reduction in the VSC level but it retains a VSC >27% or <27% but >80% of the existing value
3. Minor reduction: A reduction below <27%VSC and <80% of the existing value but greater than 20% VSC.
4. Moderate reduction: A reduction below <20%VSC and <80% of the existing value but greater than 10% VSC.
5. Major reduction: A reduction below <10%VSC and <80% of the existing value.

The evaluation of the impact should be considered in conjunction with other factors when determining the overall impact level to a property.

2.8 Daylight in the Proposed Development.

BR209 (2022) Appendix C sets out interior daylight recommendations. The guideline sets out the that: "BS EN 17037 supersedes BS8206 Part 2 'Code of practice for daylighting' which contained a method of assessment based on Average Daylight Factor, which is now no longer recommended.

BS EN 17037:2018+A1 sets out two methods for assessing daylight provision in proposed buildings. One method is called the **Illuminance method**. This is based on Target illuminances for daylight to be achieved across specified fractions of a reference plane at working plane height (0.85m) for half the daylight hours in a year. The Illuminance Method requires the use of a suitable weather file with local climate conditions and takes into account the orientation of the space.

The alternative method is called the **Daylight Factor Method.** This method is based on calculating the daylight factors achieved over specific fractions of a reference plane. The Daylight factor is the illuminance at a point on a reference plane in a space, divided by the illuminance on an unobstructed horizontal surface outdoors. This method uses an overcast sky for calculation and the assessment of the space is orientation independent. BS EN 17037 gives the Median External Diffuse Illuminance ($E_{v,d,med}$) for the capital cities throughout Europe to account for external local illuminance levels.

The UK National Annex (NA) sets out additional minimum room specific Target Daylight Factor values for the UK where the target values in A2 are hard to achieve. NA.2 sets out illuminance values to be exceeded over at least 50% of the points on a reference plane 0.85m above the floor for at least half the daylight hours. The UK committee formed the opinion that the Target Illuminance recommendations in Clause A.2 of BS EN 17037 may not be achievable for some buildings, particularly dwellings. The UK committee believes this could be the case for dwellings with basement rooms or those with significant external obstructions.

BR209 (2022) recommends surface reflectances should represent real conditions and where reflectance values have not been measured or specified default values are set out in Table C4 of the guidance document. The surface reflectances have been specified and are set out in Table 2 below. This table also shows the input values for material used and additional assessment model input parameters.

Input Values for Assessment Model			
Surface Reflectance			
Element	Reflectance	Transmittance	Material Description
Internal walls	80%	0%	White Painted Walls
Internal ceiling	80%	0%	White Painted Ceiling
Floor - light wood	40%	0%	Light wood Flooring
External walls - proposed development	50%	0%	Brick
External walls - outside site	50%	0%	CIBSE
External ground	20%	0%	CIBSE
Glass		68%	Triple glazed clear glass
Maintenance Factor for Glass		Assessment Plane	
Suburban Vertical no overhang	0.96	Sensor Grid spacing	0.3m
Suburban Vertical sheltered by balcony or overhang	0.88	Sensor grid inset	0.35m
Framing Factor: Patio Doors	0.77	Minimum inset	0.3m
		Work plane offset	0.85m

Table 2: Surface reflectance parameters and input values for model calculations

The EN17037:2018 Standard deals exclusively with new developments and does not give guidance or metrics on loss of light or sunlight to existing properties. EN 17037:2018 sets out values for Minimum and Target levels to be achieved with a minimum, medium and high compliance level for each. The guideline recommends that the minimum level should be achieved for both

target levels but it does not give guidance on the number of units or fraction within a multiple residential unit development that should achieve these values. Additionally it does not differentiate between room use and weighted targets for rooms which would have a lesser requirement. The UK National annex sets out factors for UK specific settings where it is difficult to achieve natural daylighting.

The compliance calculation is based on an annual, climate-based simulation of interior illuminance distributions. BR209 refers to this method as the Illuminance Method. For each hour of the year, the percentage of the floor area achieving minimum and target illuminance thresholds are measured on a room-by-room basis. Two target types are set with the following criteria:

- Target Illuminance: 300 lux over 50% of floor area for at least 50% of daylight hours.
- Minimum Illuminance: 100 lux over 95% of floor area for at least 50% of daylight hours.

BS EN 17037 gives three levels of recommendation for daylight provision in an interior space: Minimum, Medium and High. BR209:2022 Section C3 recommends for compliance with the standard, a space should achieve the Minimum level.

Daylight hours are defined as the 4380 hours with the most diffuse horizontal illuminance in the weather file. In addition to this baseline (Mminimum) requirement, rooms can achieve Medium and High levels of compliance by meeting higher illuminance thresholds, as outlined in the table below:

Target Illuminance from Daylight over at least half the daylight hours		
Level of recommendation	Target illuminance E_T(lx) for half of the assessment grid	Minimum illuminance E_{TM}(lx) for 95% of the assessment grid
Minimum	300 lux	100 lux
Medium	500 lux	300 lux
High	750 lux	500 lux

Table 3: IS / BS EN 17037:2018 Target Illuminance from Daylight over at least half the daylight hours.

Target Daylight Factor (D) for Dublin*		
Level of recommendation	Target daylight factor D for half of the assessment grid	Minimum daylight factor D for 95% of the assessment grid
Minimum	2%	0.7%
Medium	3.5%	2%
High	5%	3.5%

Table 4: IS / BS EN 17037:2018 Target Daylight Factor (D) for Dublin.

Target Minimum Daylight Factor (D) for Dublin* based UK National Annex		
Room Type	Target illuminance E_T(lx) for half of the assessment grid	Target daylight factor D from Table A.3 EN17037 $E_{v,d,med}$ for Dublin -14,900
Bedroom	100 lux	0.7%
Living Room	150 lux	1%
Kitchen	200 lux	1.3%

* EN17037 uses the latitude of the capital city of each European country to set individual values for daylight and sunlight metrics for use in setting the target levels to be achieved in a particular country.

Table 5: BS EN 17037:2018+A1:2021 Target Illuminance levels and Daylight Factor (D) for Dublin.

2.9 Sunlight within Proposed Developments

The BRE guidelines (2022) recommend that for large residential developments the overall sunlight potential can be initially assessed by counting the number of windows facing south, east and west and the aim should be to minimise the number of living rooms facing solely north, north-east or north-west unless there is some compensating factor such as an appealing view to the north. The guideline acknowledges that it may not be possible to have every living room facing within 90° of south in large developments, however, it recommends maximising the number of units with a southerly aspect.

The BRE guidelines (2022) state that BS EN 17037 should be used to assess for interior access to direct sunlight and that the assessment of APSH should no longer be used. BS EN 17037 sets recommendations for access to sunlight and notes three levels of achievement; Minimum, Medium and High. In dwellings at least one habitable room, preferably a living room, should achieve the Minimum of 1.5 direct hours on a specified date between 1st February and 21st March, with a cloudless sky. This assessment uses the 21st March. The guidelines recommend a time step of 5 minutes or less for the assessment interval. The Minimum level to achieve is 1.5, the Medium level is 3 hours and the High level is 4 hours direct sunlight.

3. Daylight to Adjacent Buildings.

3.1 Site Overview

The site is a greenfield in Celbridge, Co. Kildare. It is bounded by Oldtown Road to the east and green fields to the west. There is a housing estate ‘The Orchard’ to the south and a housing estate ‘Manor Mill View’ nearing completion to the north. The site slopes gently from the south-west to the north east.

Figure 1: View taken from Google Maps.

3.2 Preliminary Assessment of Adjoining Dwellings

The BRE guidelines recommend that loss of light to existing windows need not be assessed 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 window. The zone of influence 3 times the height of the proposed development is plotted in Figure 2 in yellow.

Section planes perpendicular to the window wall of the adjacent properties facing the proposed development are indicated in blue in Figure 2. The planes at locations A - E extend and if they intersect the proposed development, they are plotted in figure 3 below.

The document also states that if part of a new building measured in a vertical section perpendicular to the main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25º to the horizontal, then the diffuse light of the existing building may be adversely affected. If a window falls within a 45° angle both in plan and elevation with a new development in place then the window may be affected and should be assessed.

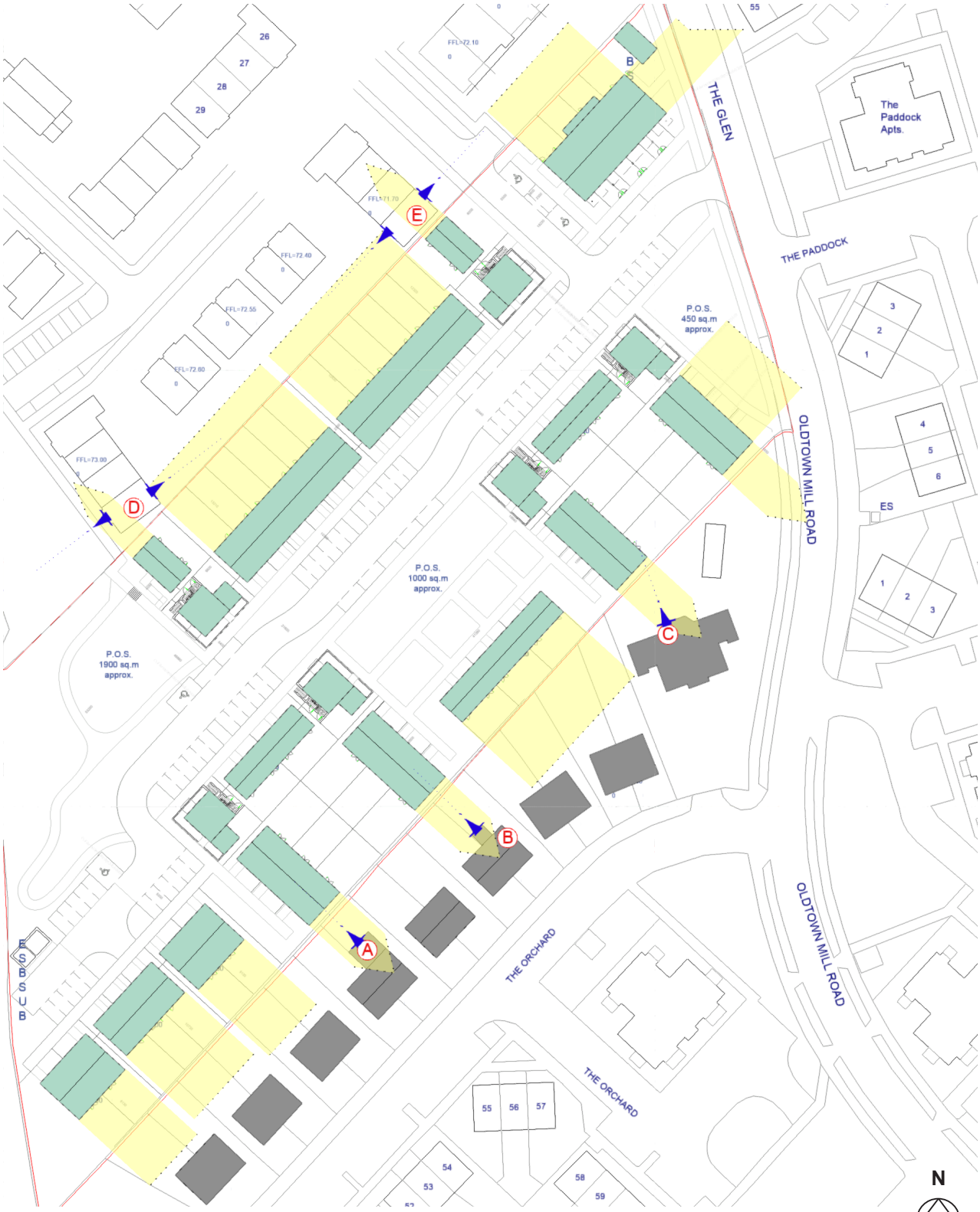


Figure 2: Proposed site plan showing the zone of influence (3 times the height of the proposed building) and direction of the window wall of adjacent residential properties.

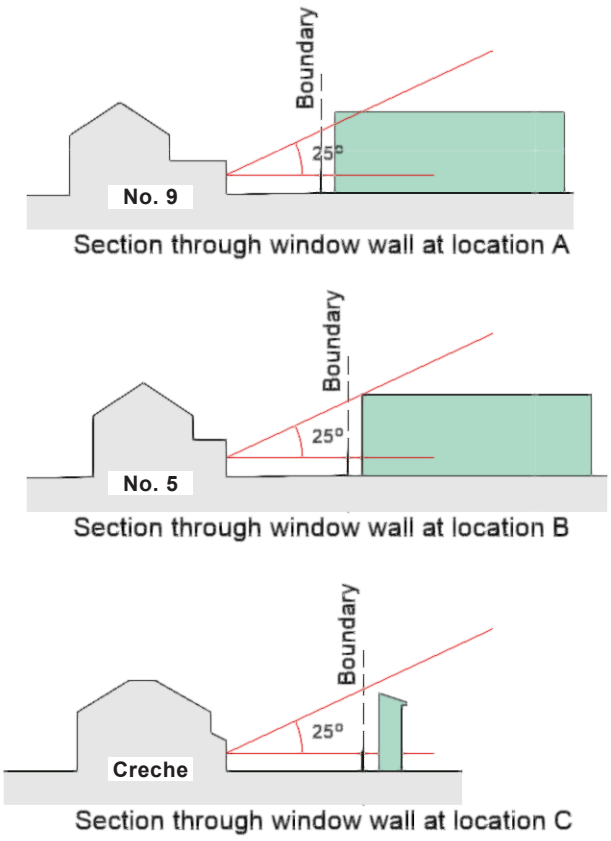


Figure 3: Section perpendicular to window wall at locations indicated in Figure 2.

3.3 Comment on Preliminary Assessment

Location A through No.9 The Orchard: The 25º line would be subtended by the proposed development. These windows were selected for further assessment.

Location A through No.5 The Orchard: The 25º line would be subtended by the proposed development. These windows were selected for further assessment.

Location C through the creche building: The windows in this building are oblique to the proposed houses. The 25º line would not be subtended by the proposed development, indicating any reduction in available daylight is likely to be negligible.

Locations D & E, through the houses in Manor Mill View: The windows to the front and rear of the house do not face the proposed development, indicating any reduction in available daylight is likely to be negligible.

3.4 Detailed Assessment to Adjoining Dwellings

The BRE guide recommends assessing the Vertical Sky Component (VSC) to adjacent properties, where the layouts are not known. Annual Probable Sunlight Hours will also be assessed where that is relevant.

The BRE guideline recommends that if a window retains a VSC in excess of 27% with the proposed development in place then it will still receive enough daylight. If the existing VSC is below 27% or is reduced below 27% and below 0.8 times its former value then the diffuse light maybe adversely affected.

Test points representing windows in the adjacent dwellings at locations identified in the preliminary analysis are indicated in Figure 4. The results are shown in Table 6 below.

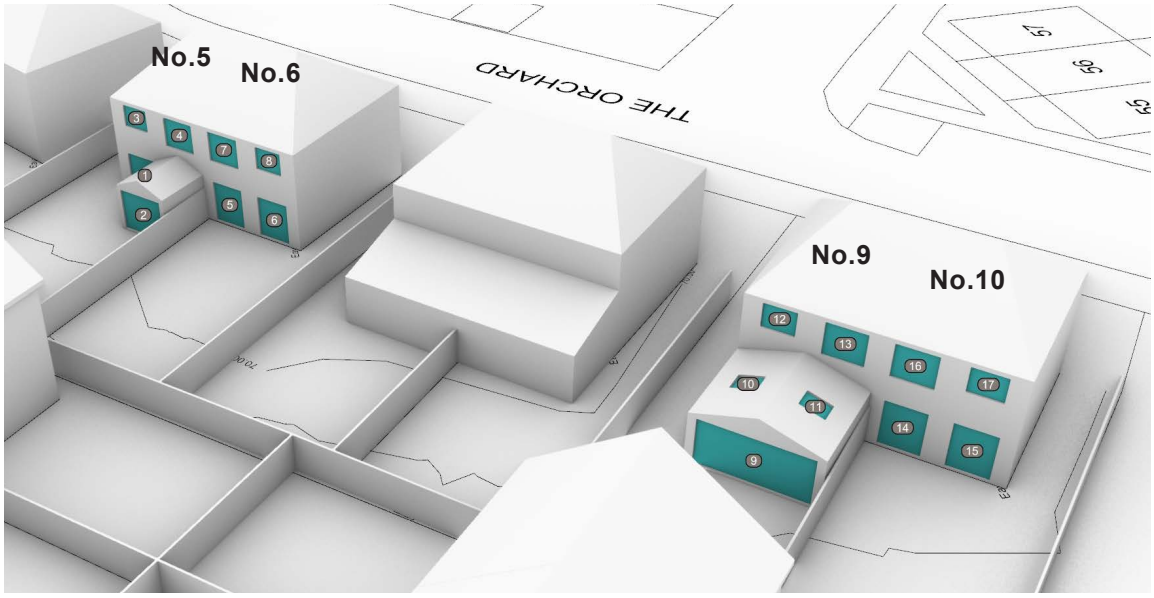


Figure 4: Rear of No. 5, 6 & 9, 10 The Orchard: View of model locating VSC test points.

Vertical Sky Component				
Location	Vertical Sky Component Recommended Value > 27%		Ratio: Proposal to Existing Recommended > 80%	Meets criteria if >27% VSC or <27% but >80% Existing Value
	Existing %	Proposed %		
1	29.9	25.7	86.0%	Y
2	35.4	28.2	79.6%	Y
3	37.9	34.5	91.1%	Y
4	38.2	34.5	90.3%	Y
5	31.9	26.9	84.4%	Y
6	36.0	30.7	85.1%	Y
7	38.2	34.5	90.3%	Y
8	37.9	34.6	91.3%	Y
9	36.6	26.0	71.1%	N
12	38.0	34.3	90.3%	Y
13	38.4	34.6	90.1%	Y
14	31.4	27.4	87.3%	Y
15	35.9	31.1	86.7%	Y
16	38.4	34.9	90.9%	Y
17	38.0	34.9	91.7%	Y

Table 6: Vertical sky component for windows in The Orchard.

3.4.1 Roof-lights

The extension to the rear of No. 9 The Orchard has two roof-lights. The assessment of windows that are not in the vertical plane differs from the Vertical Sky Component (VSC) assessment which has a maximum achievable percentage of under 40% and skylights and windows in a non vertical plane can be assessed with the Sky Component which can be up to 100%. The BRE guidelines do not set a minimum target Sky Component but recommend the ratio of proposed to existing values exceed 80% of the existing value.

The BRE guidelines state:

> *"If the value with the new development in place is less than 0.80 times the value before, there would be a noticeable reduction in the light entering the roof-light."*

Sky Component (Roof Lights) - No.9 The Orchard				
Test Point	Sky Component		Ratio: Recommended > 80%	Meets criteria
	Existing	Proposed	Proposed to Existing	
10	87.0	85.7	98.5%	Y
11	85.1	83.7	98.4%	Y

Table 7: Sky component for roof light windows

3.5 Conclusion of Potential Impact to Existing Houses

All the windows assessed to the rear of the houses at The Orchard will retain a VSC level in excess of 27% or will not be reduced below 80% of the existing value except for window ID 9. Window ID 9 has a reduced VSC of 26.1% which is marginally below the recommended 27%. This window belongs to and extension of house no.9 and there are 2 roof lights to this room also. These roof lights have high levels of Sky Component in excess of 80% and the weighted average of the 3 windows exceeds the 80% ratio and any noticeable loss of daylight will be negligible.

There will be a reduction in the available daylight to some of the windows but all bar one, retain a VSC in excess of 27% or are not reduced below 80% of the existing value. There is a reduction in the VSC level to one window at No.9 The Orchard marginally below the recommended 27% VSC level but this room is served by 2 additional roof lights and any impact will be minor.

4. Assessment of Sunlight to Adjoining Properties

4.1 Sunlight the Neighbouring Dwellings (Annual Probable Sunlight Hours)

The BRE guidelines recommend assessing window walls for the APSH that face within 90º of due south. The guidelines state that:

> *" In housing the main requirement for sunlight is living rooms, where it is valued at any time of day, but especially in the afternoon. Sunlight is also required in conservatories. It is viewed as less important in bedrooms and in kitchens, where people prefer it in the morning rather than the afternoon."*

For a proposed development to have a noticeable impact on the annual Probable Sunlight Hours the value needs to be reduced below the recommended 25% annual or 5% in the winter period from September to March. If the value is either below this to begin with or is reduced below this then it should not be reduced below 0.8 times its former value.

4.2 Conclusion

The relevant windows in The Orchard do not face within 90º of due south and need not be assessed.

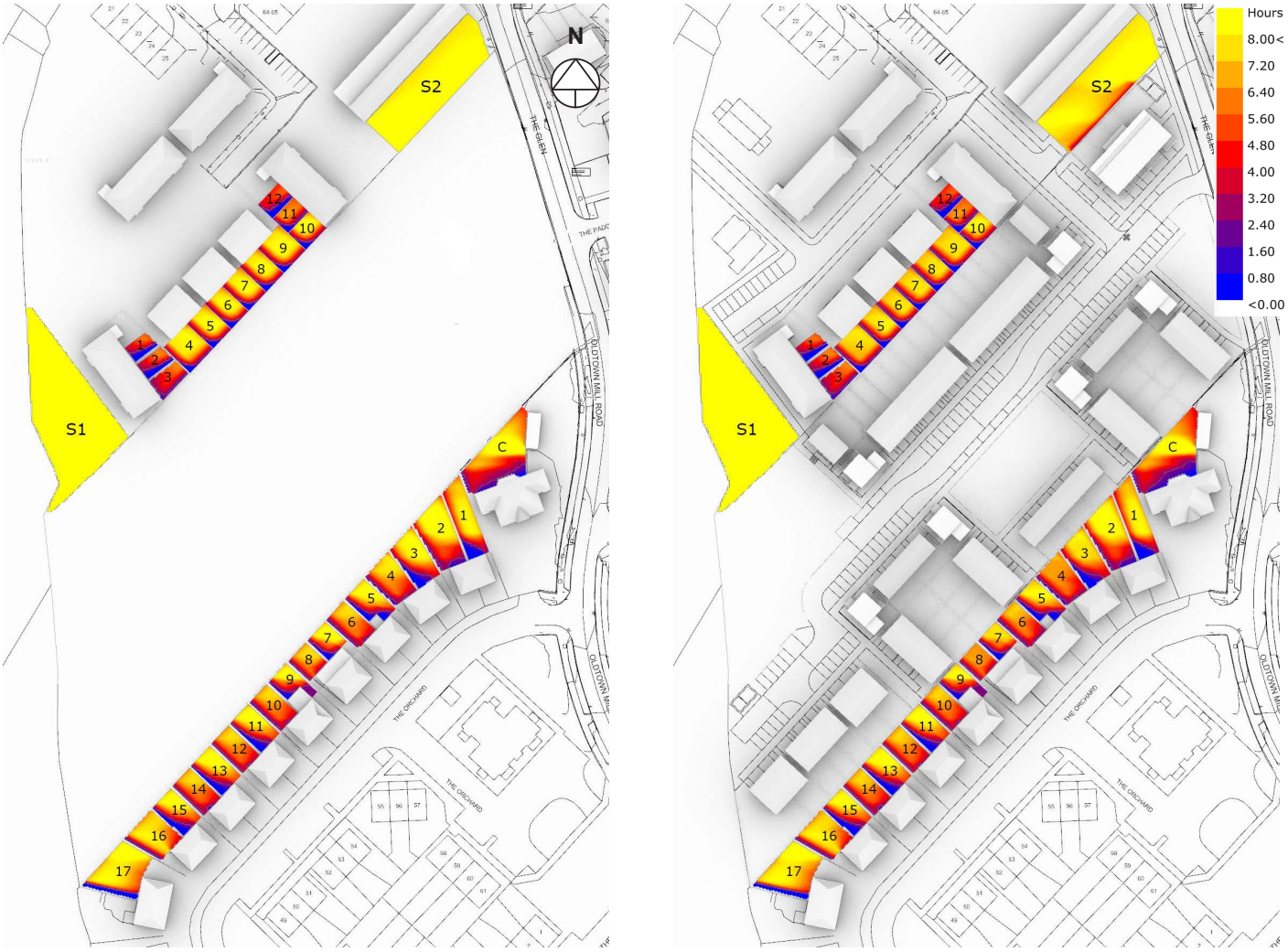
The houses to the north in Manor Mill View, within the zone of influence, do not face the proposed development and any impact on available sunlight to be negligible.

5. Sunlight to Gardens and Open Spaces

The BRE document indicates that for an amenity area to have good quality sunlight throughout the year, 50% should receive in excess of 2 hours sunlight on the 21st March. It also states that front gardens need not be assessed for sunlight. Amenity spaces which are entirely south of the proposed development would not perceive an impact from it.

5.1 Amenity Space to Neighbouring Properties.

The private amenity spaces of the adjacent houses in Manor Mill View and The Orchard have been assessed for a potential loss of sunlight to their amenity space. The existing and proposed generated analysis are shown in Figure 5, the results are shown in Table 8 below.



Existing Proposed

Figure 5: Existing & Proposed Radiation map of amenity areas, showing available sunlight on 21st March. The scale represents the percentage of daylight received from 0 - 8 hrs.

Sunlight on the ground - Adjacent properties					
Id No.	Location	% Area receiving 2 hours sunlight on 21st March		Ratio	Meets criteria of >50% area Or if <50% then target >80% Existing Value
		Existing	Proposed	Proposed: Existing	
	Manor Mill View				
S1	Public open space	100.0%	100.0%	100%	Y
S2	Public open space	100.0%	97.6%	98%	Y
1	Private amenity	62.2%	62.2%	100%	Y
2	Private amenity	65.4%	65.4%	100%	Y
3	Private amenity	89.5%	86.2%	96%	Y
4	Private amenity	90.3%	87.3%	97%	Y
5	Private amenity	90.9%	87.0%	96%	Y
6	Private amenity	90.3%	86.7%	96%	Y
7	Private amenity	83.5%	83.5%	100%	Y
8	Private amenity	94.1%	94.1%	100%	Y
9	Private amenity	92.4%	89.0%	96%	Y
10	Private amenity	87.5%	84.5%	97%	Y
11	Private amenity	81.3%	81.3%	100%	Y
12	Private amenity	68.0%	68.0%	100%	Y
	The Orchard				
C	Creche	88.9%	82.4%	93%	Y
1	1 The Orchard	86.5%	86.5%	100%	Y
2	2 The Orchard	92.6%	92.0%	99%	Y
3	3 The Orchard	81.8%	81.8%	100%	Y
4	4 The Orchard	92.1%	92.1%	100%	Y
5	5 The Orchard	77.1%	76.9%	100%	Y
6	6 The Orchard	92.8%	92.8%	100%	Y
7	7 The Orchard	78.3%	78.3%	100%	Y
8	8 The Orchard	93.4%	93.4%	100%	Y
9	9 The Orchard	72.9%	72.6%	100%	Y
10	10 The Orchard	92.8%	92.8%	100%	Y
11	11 The Orchard	79.8%	79.8%	100%	Y
12	12 The Orchard	93.0%	93.0%	100%	Y
13	13 The Orchard	80.3%	80.3%	100%	Y
14	14 The Orchard	91.9%	91.9%	100%	Y
15	15 The Orchard	77.5%	77.5%	100%	Y
16	16 The Orchard	95.5%	95.5%	100%	Y
17	17 The Orchard	88.1%	88.1%	100%	Y

Table 8: Calculation of Sun on the Ground to adjacent amenity areas

5.2 Conclusion

All public and private amenity spaces to the surrounding properties were assessed for sunlight in accordance with the recommendations set out in BR209:2022. The existing gardens and amenity spaces will retain 2 hours sunlight over 50% of the area or will not be reduced below 80% of the existing levels when assessed on 21st March. The proposed development meets the recommendations of the BRE guidelines (2022).

6. Daylight Availability to the Proposed Residential Units.

All habitable rooms within the units were assessed for daylight provision by illuminance method. The Illuminance method assesses the daylight levels over at least 50% daylight hours in the year and uses a weather file data set. These methods take into account the orientation of the space. They provide an accurate representation of the daylight provision to a specific room in the context of the proposed environment.

Compliance is demonstrated by a calculation of Daylight Provision with the illuminance method under BS EN 17037:2018+A1:2021. A summary of the results are presented in Table 9 below and a complete set of room results are shown in Appendix A.

For supplementary information, an assessment of Daylight Provision with the illuminance method under IS /BS EN 17037:2018 is undertaken. A summary of the results are presented in Table 10 below and a complete set of room results are shown in Appendix B.

6.1 Assessment for Daylight Provision BS EN 17037:2018+A1:2021

The UK National Annex (A1) contains minimum room specific target values for dwellings in the UK. The UK committee fully supports the recommendations of EN17037:2018 but considers the target daylight levels may be hard to achieve in UK dwellings, in particular in urban areas and areas with mature trees. The Target and Minimum levels set out in IS / BS EN17037:2018 do not take into account room use or make allowance for rooms that have a lesser requirement for daylight. The UK National Annex A1 in BS EN17037:2018+A1:2021 sets out room specific minimum values to be achieved in the UK and Channel Islands. These target values are set to achieve similar minimum daylight levels as the superseded Average Daylight Factor method (ADF) in BS8206-2 2008.

Minimum daylight provision UK NA.1 - BS EN 17037:2018+A1:2021					
	Room Use	Number of rooms	Target illuminance E_T(lx) for half of the assessment grid	Number of rooms to achieve target Lux over 50% of the assessment grid	Percentage of rooms achieving Target
All rooms	LKD/ KD	60	200	60	100.0%
	Liv	40	150	40	100.0%
	Bedrooms	129	100	129	100.0%
Total		229		229	100.0%

Table 9: Summary of room for Target Illuminance compliance with BS EN 17037:2018+A1:2021. Individual room results can be viewed in Appendix A.

6.2 Conclusion

BR209:2022 recommends assessment methods set out in BS EN 17037 for daylight provision. 100% of the Living, Dining, Kitchen and Bedroom spaces achieve the target values set out in BS EN 17037:2018+A1:2021 section NA1. This is the minimum specific room type values to be achieved in habitable rooms.

6.3 Supplementary Information - Assessment for Daylight Provision IS / BS EN 17037:2018

A summary of Minimum and Target Illuminance levels under IS EN 17037:2018 Annex A Table A1 are set out in the table below.

Daylight provision illuminance method IS EN 17037:2018						
		Below Target	Minimum	Medium	High	Percentage of rooms achieving Target
Overall total	Target Illuminance	7.9%	36.2%	48.0%	7.9%	92.1%
	Minimum Illuminance	0.0%	41.9%	54.1%	3.9%	100.0%

Table 10: Percentage of rooms at each level to IS/BS EN 17037:2018. Individual room results can be viewed in Appendix B.

The results indicate a high level of daylight provision, with 100% of rooms achieving Minimum Illuminance and 92.1% achieving Target Illuminance. The rooms will be bright and pleasant spaces.

The recommendations for Daylight provision in Table A1 are not specific for dwellings and do not make allowance for specific room use. BS EN 17037:2018+A1:2021 addresses this with the National Annex NA.1 which sets out room specific targets for dwellings and compliance for this is presented in Section 6.1.

7. Sunlight hours in Habitable Rooms.

7.1 Sunlight Hours

BR209:2022 (third edition) and BS EN 17037 set out recommendations for sunlight hours to be achieved preferably in a main living space. The guidelines recommend the sunlight hours should be assessed preferably on the 21st March over the course of the day. The guidelines set three levels of achievement. Minimum 1.5h, Medium 3h and High 4h.

Appendix C details the results per habitable room in the duplex units, indicating if this room has a relevant South facing window. A summary of these results are displayed in the table below.

Sunlight Hours Summary Table									
	Total Units	Rooms with a window within 90° South		Below recommendation <1.5 hours	Minimum >1.5 hours	Medium >3 Hours	High >4 Hours	Number meets criteria	Ratio meets criteria
		No.	Ratio						
Duplex units	20	13	65.0%	6	2	0	12	14	70.0%

Table 11: Summary of results of assessment of Sunlight Hours

7.2 Comment on EN 17037 Sunlight Hours

The BRE Guidelines recommend maximising the amount of units that have a window within 90° due South but do not have set targets. The guidelines acknowledge that for large developments with site constraints it is not possible to achieve south facing windows to all main living spaces. All of the duplex units were assessed, 13 no. (65%) have window to a Living room or Kitchen/ Dining room which face within 90° South.

Windows with an aspect of greater than 90° due South to the north west or north east will still receive sunlight, but it is likely to be lesser amounts especially in the winter period. 14 (70%) of units have a living space which achieve the minimum recommended 1.5 direct sunlight hours.

7.3 Conclusion

This scheme is well designed for sunlight, with 70% of units meeting the minimum recommended 1.5 direct sunlight hours. This meets the recommendations of the BRE guidelines (2022).

8. Sunlight to Gardens and Open Spaces

The BRE document indicates that for an amenity area to have good quality sunlight throughout the year, 50% should receive in excess of 2 hours sunlight on the 21st March.

8.1 Sunlight to Amenity Within the Proposed Development

The amenity areas within this proposal have been assessed with a calculation of Sun on the Ground on the 21st March. Generated analysis is shown in Figure 6 and the results are set out in Table 12 below.

Figure 6: Radiation map of amenity within the Proposed Development, showing available sunlight on 21st March. The scale represents the percentage of daylight received from 0 - 8 hrs.

Sunlight on the ground within development			
No.	Use	Proposed	Meets criteria of >50% area
S3	Public Open Space	100.0%	Y
S4	Public Open Space	100.0%	Y
S5	Public Open Space	100.0%	Y

Table 12: Calculation of Sun on the Ground to amenity area within the proposed development.

8.2 Comment on Public Open Space

The communal amenity space is well oriented for sunlight and will achieve 2 hours sunlight on the 21st March in excess of 50% of the amenity area.

8.3 Assessment of Private Amenity Spaces

In developments there are many factors and design constraints that influence the layout of buildings and often it is not possible for all private amenity spaces to achieve the recommend values for sunlight. All private amenity spaces at ground level were assessed. The full schedule of spaces are shown in Appendix D, a summary of the results are shown in Table 13 below.

Duplex Type A units, at ground level, have amenity spaces to the front and rear, both of which are in excess of 5m2. In all cases these units achieve the target values for sun on the ground in at least one of these spaces, as noted in Appendix D.

Sunlight on the Ground - Private amenity within the development		
Total number of ground level private amenity spaces	Number of gardens that Proposed receiving in excess 2 hours sunlight on 21st March >50% of Area	Percentage that achieve target
50	50	100%

Table 13: Calculation of Sun on the Ground to ground level private amenity spaces of the houses and duplex units

8.4 Conclusion

All public open spaces and communal amenity spaces exceed 2 hours sunlight over 50% of the amenity space on the 21st March. The proposed development has been well designed for sunlight. All of the houses and duplex that have ground level amenity space achieve the target sunlight hours. The proposed development meets the recommendations of the BRE guidelines for gardens and open spaces.

9. Shadow Diagrams

9.1 BRE Guidance on Shadow Studies

Shadow diagrams are a visual aid to understand where possible shading may occur. The BRE guidelines recommend using the March Equinox due the equal length of the day and night time. It states:

> *"If a space is used all year round, the equinox (21 March) is the best date for which to prepare shadow plots as it gives an average level of shadowing. Lengths of shadows at the autumn equinox (21 September) will be the same as those for 21 March, so a separate set of plots for September is not required."*

June 21st and December 21st are provided below for information but it should be noted that the summer solstice is the best case scenario with shadows at their shortest. The Summer Solstice diagrams are included here with the Daylight Saving Time (UTC+1) applied. In Winter even low buildings will cast long shadows and it is common for large areas of the ground to be in shadow throughout the day especially in a built up area and sun barely rises above an altitude of 10° during the course of the day. The guidelines recommends that Sunlight at an altitude of 10° or less does not count. Below are the times for the Equinox and Solstice that the sun is above 10° altitude rounded to the nearest half hour.

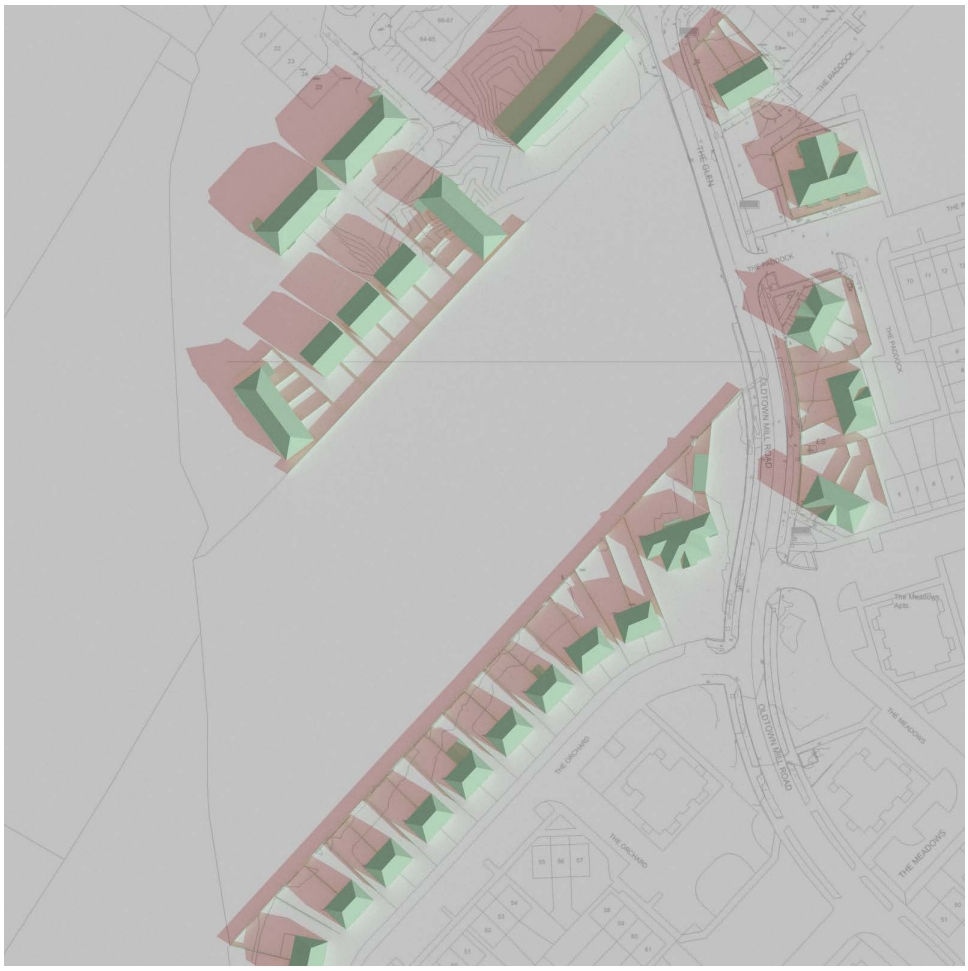
Equinox: between 8:30 and 17:30
Summer Solstice: Between 6:30 and 20:00
Winter Solstice: Between 10:30 and 14:00

Section 9.2 shows the existing and proposed shadow diagrams for the Equinox on the 21st March at 2 hourly intervals during the day between 09:00 and 17:00.
Section 9.3 shows the existing and proposed shadow diagrams for the Summer Solstice on the 21st June at 2 hourly intervals during the day between 09:00 and 19:00.
Section 9.4 shows the existing and proposed shadow diagrams for the Winter Solstice on the 21st December at 2 hourly intervals during the day between 09:00 and 15:00.

The site is a greenfield site, there is no shadow cast from any structures in the existing scenario. Shadow diagrams are a visual aid to understand where possible shading may occur. The use of shadow diagrams as an assessment method should be taken over the course of the day and not a specific time due to the transient nature of the sun and the shade caused by obstructions.

9.2 Shadow Casting diagrams March Equinox

Existing



N

Proposed

Figure 7: Shadow diagrams 21 March 09:00 UTC

Existing

N

Proposed

Figure 8: Shadow diagrams 21 March 11:00 UTC

Existing

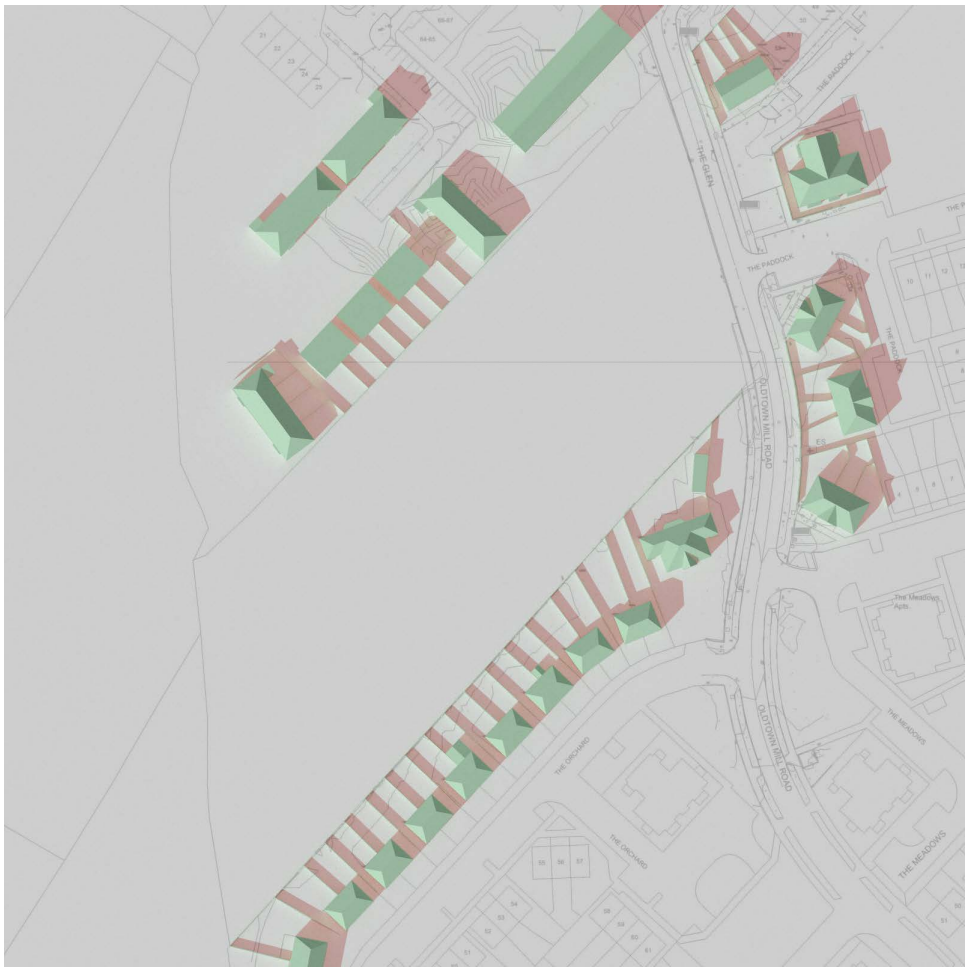
N

Proposed

Figure 9: Shadow diagrams 21 March 13:00 UTC

Existing

N



Proposed

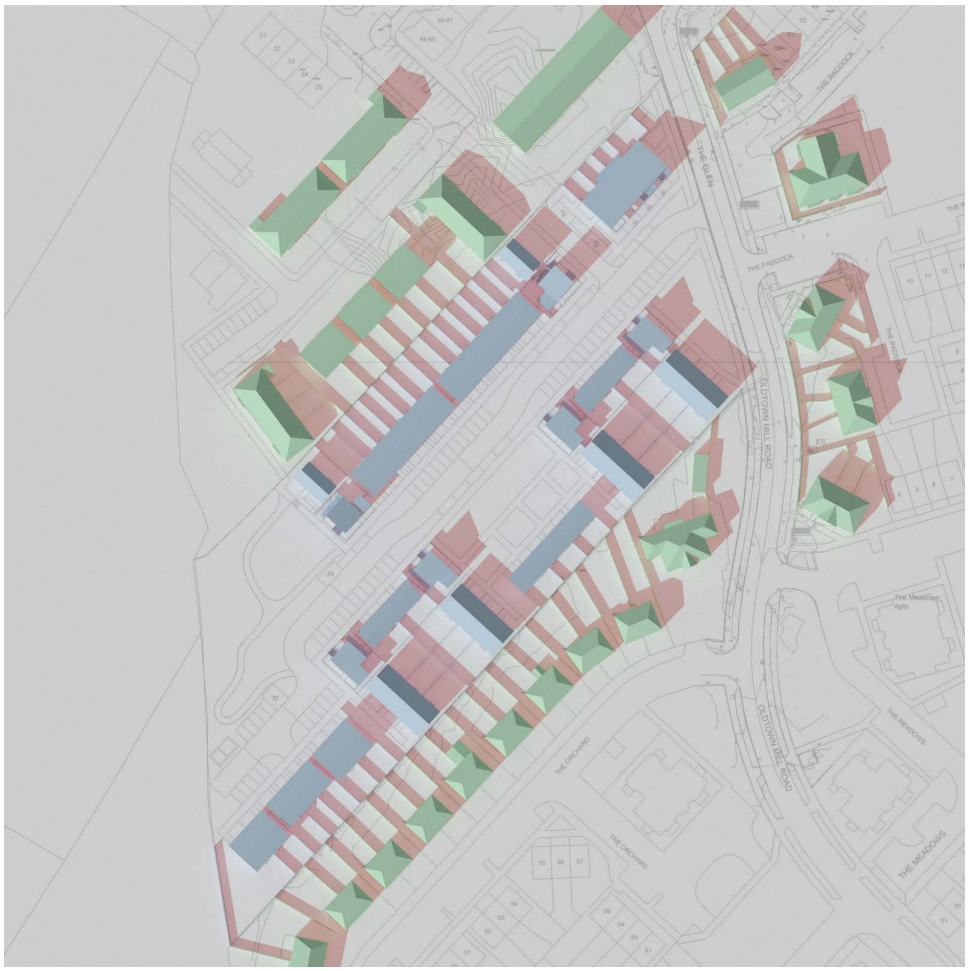
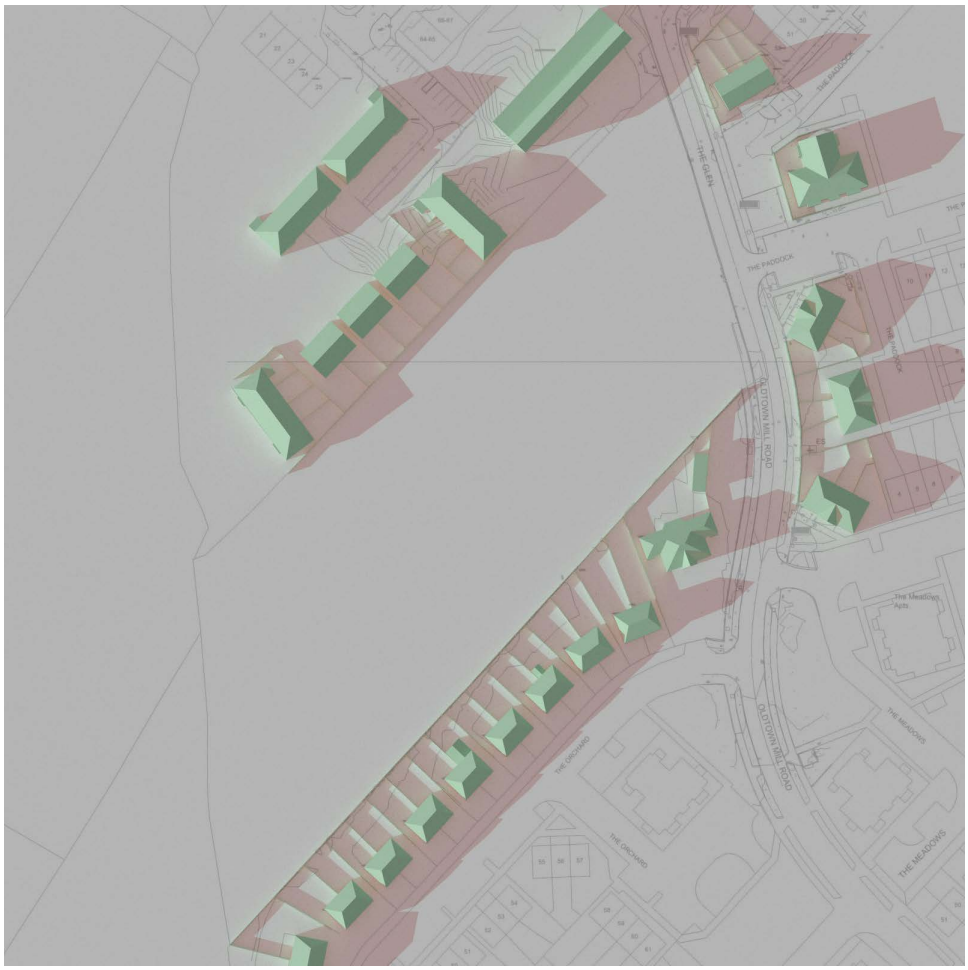


Figure 10: Shadow diagrams 21 March 15:00 UTC

Existing

N



Proposed

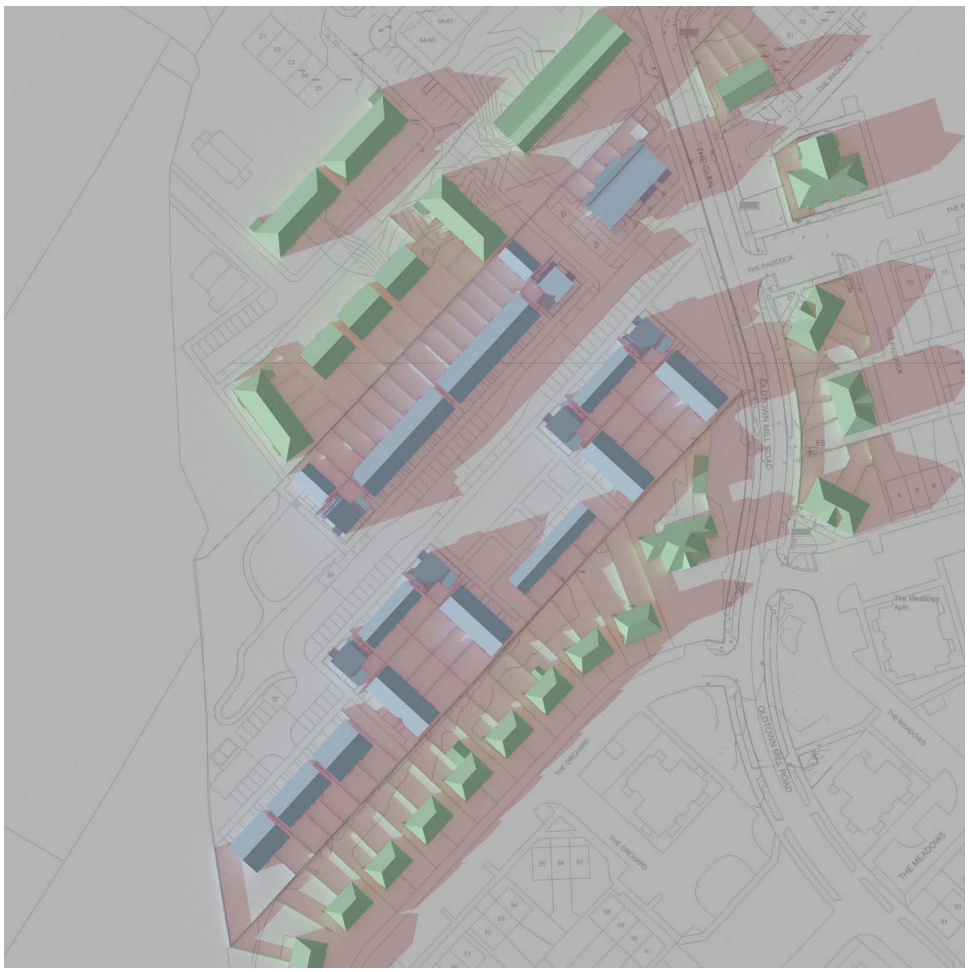


Figure 11: Shadow diagrams 21 March 17:00 UTC

9.3 Shadow Casting diagrams June Solstice

Existing

N

Proposed

Figure 12: Shadow diagrams 21 June 09.00 UTC +1

Existing

N

Proposed

Figure 13: Shadow diagrams 21 June 11:00 UTC +1

Existing

N

Proposed

Figure 14: Shadow diagrams 21 June 13:00 UTC +1

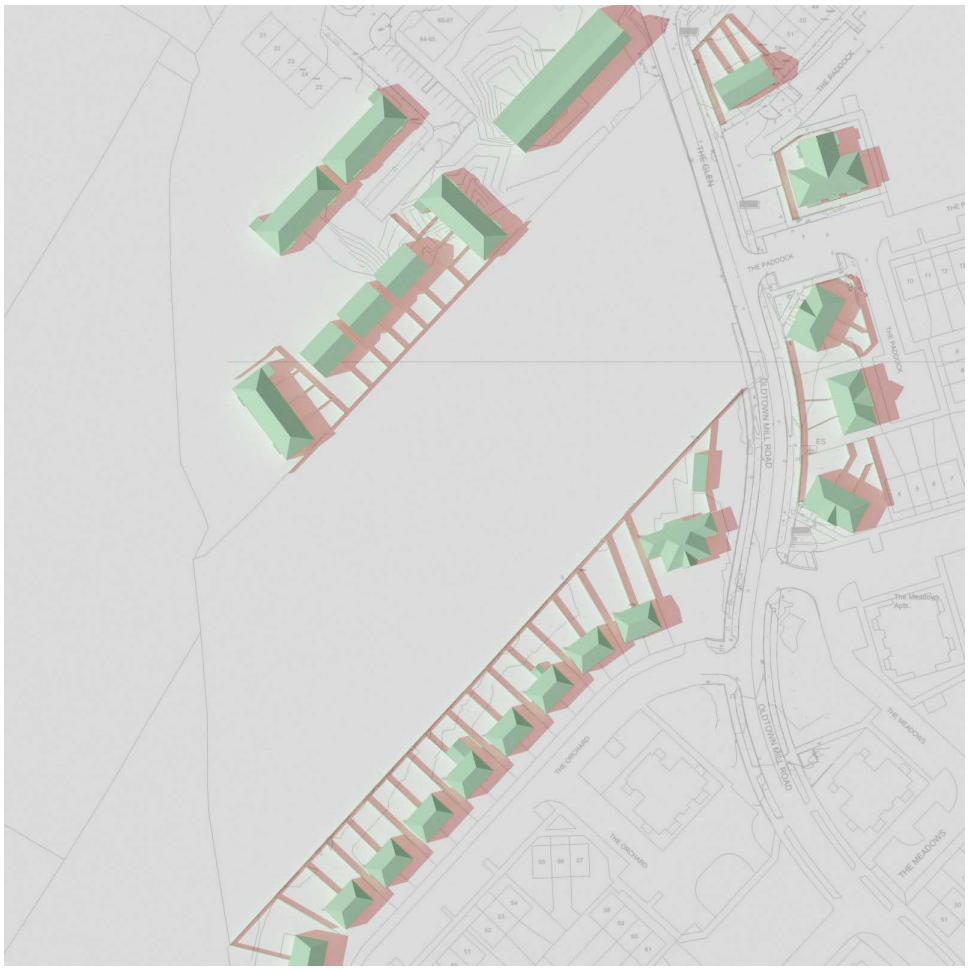
Existing

N

Proposed

Figure 15: Shadow diagrams 21 June 15:00 UTC +1

Existing



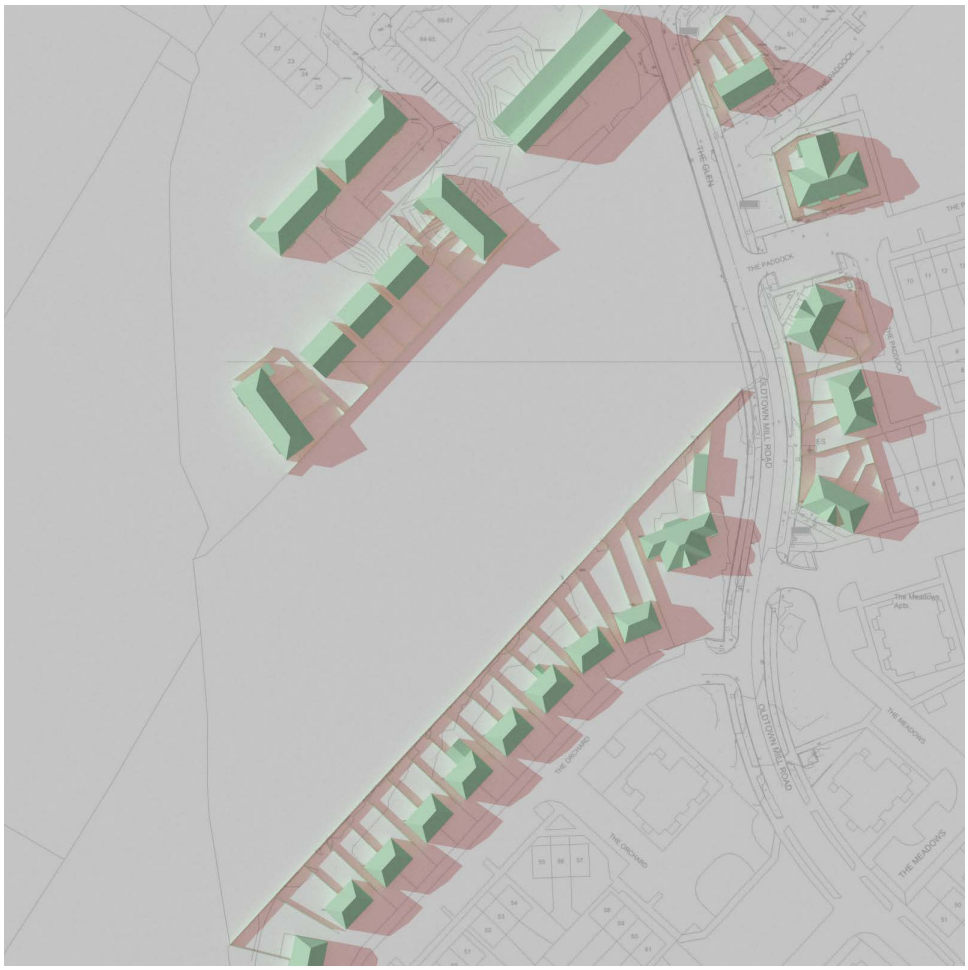
N

Proposed

Figure 16: Shadow diagrams 21 June 17:00 UTC +1

Existing

N



Proposed

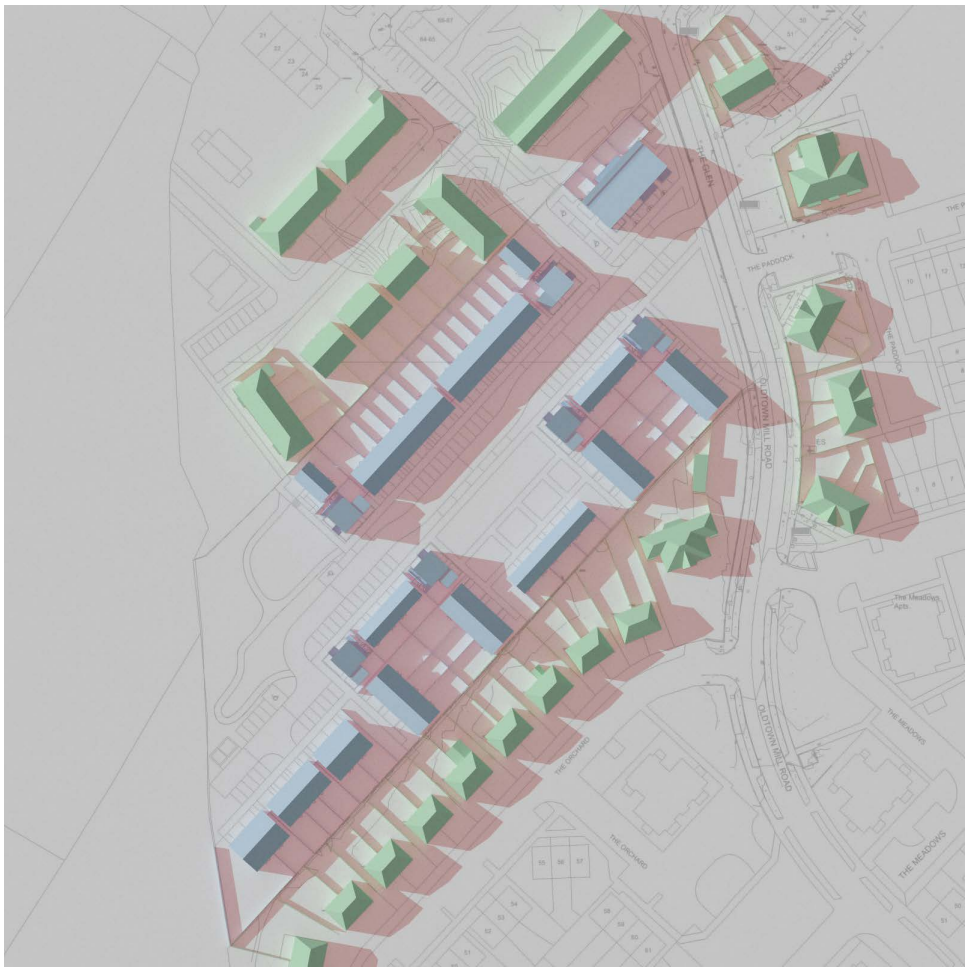
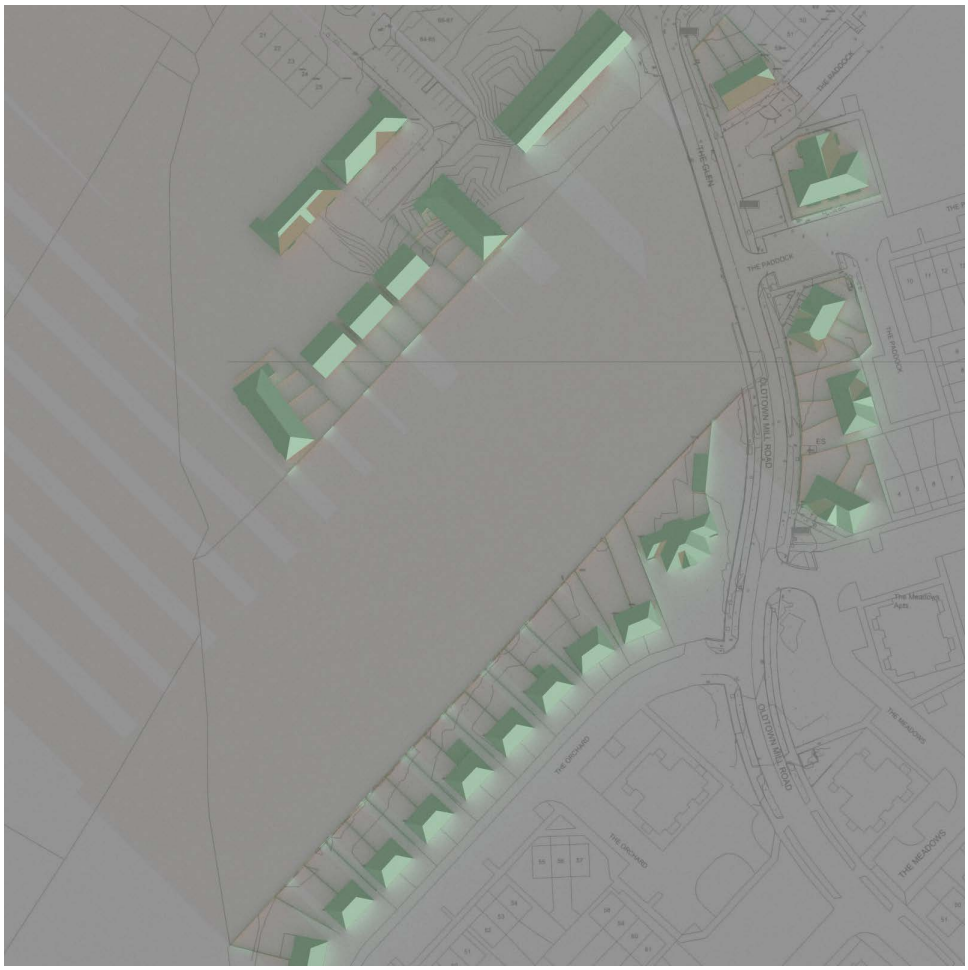


Figure 17: Shadow diagrams 21 June 19:00 UTC +1

9.4 Shadow Casting diagrams December Solstice

Existing

N



Proposed

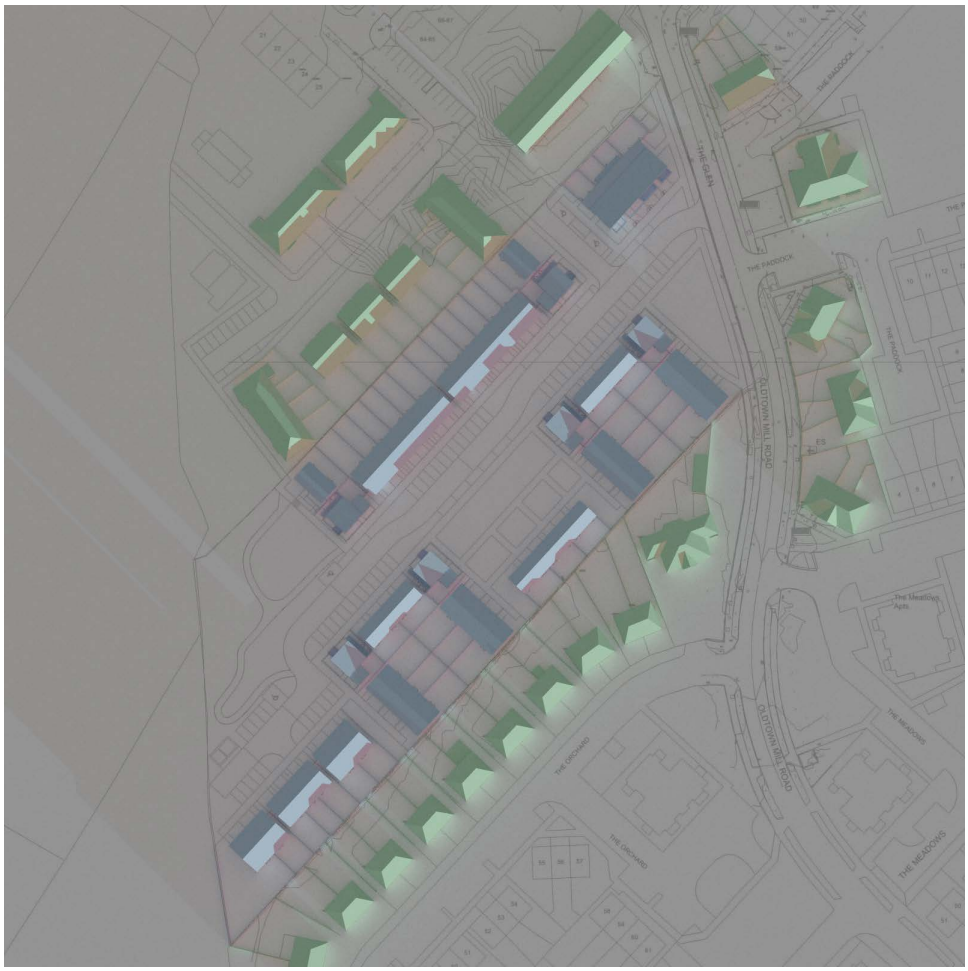
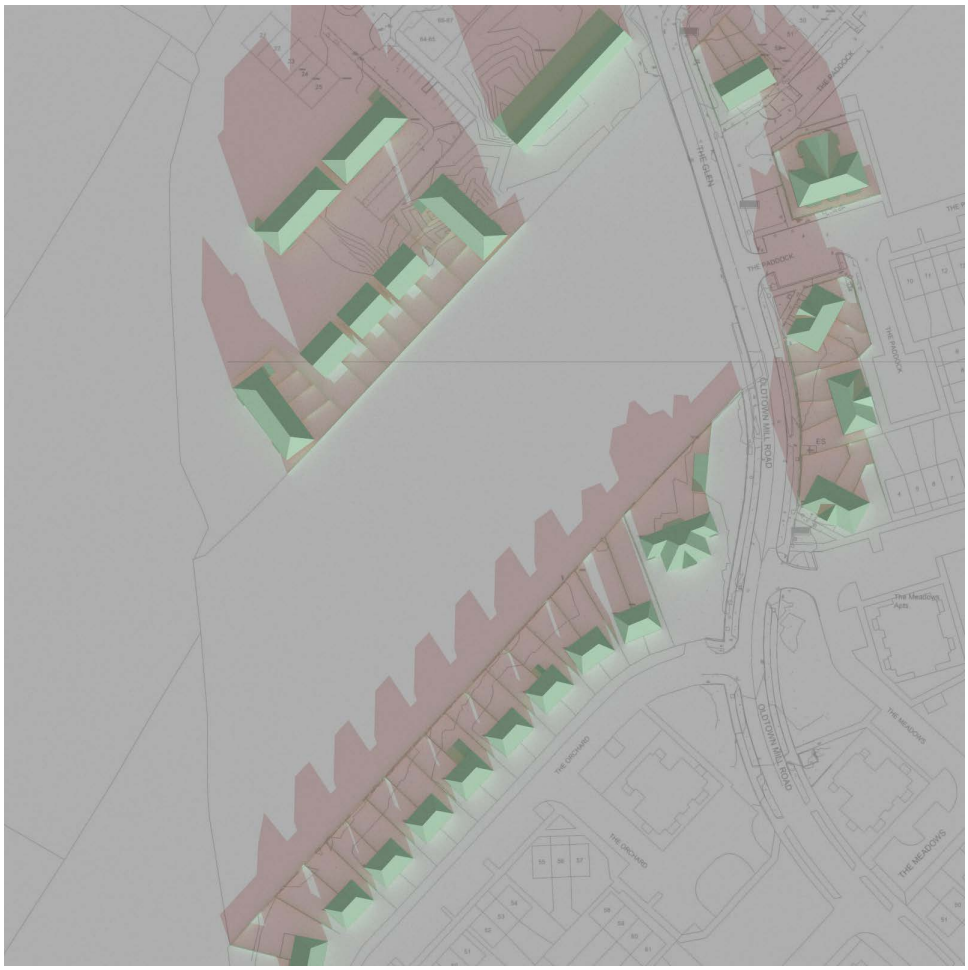


Figure 18: Shadow diagrams 21 December 09:00 UTC

Existing

N



Proposed

Figure 19: Shadow diagrams 21 December 11:00 UTC

Existing

N

Proposed

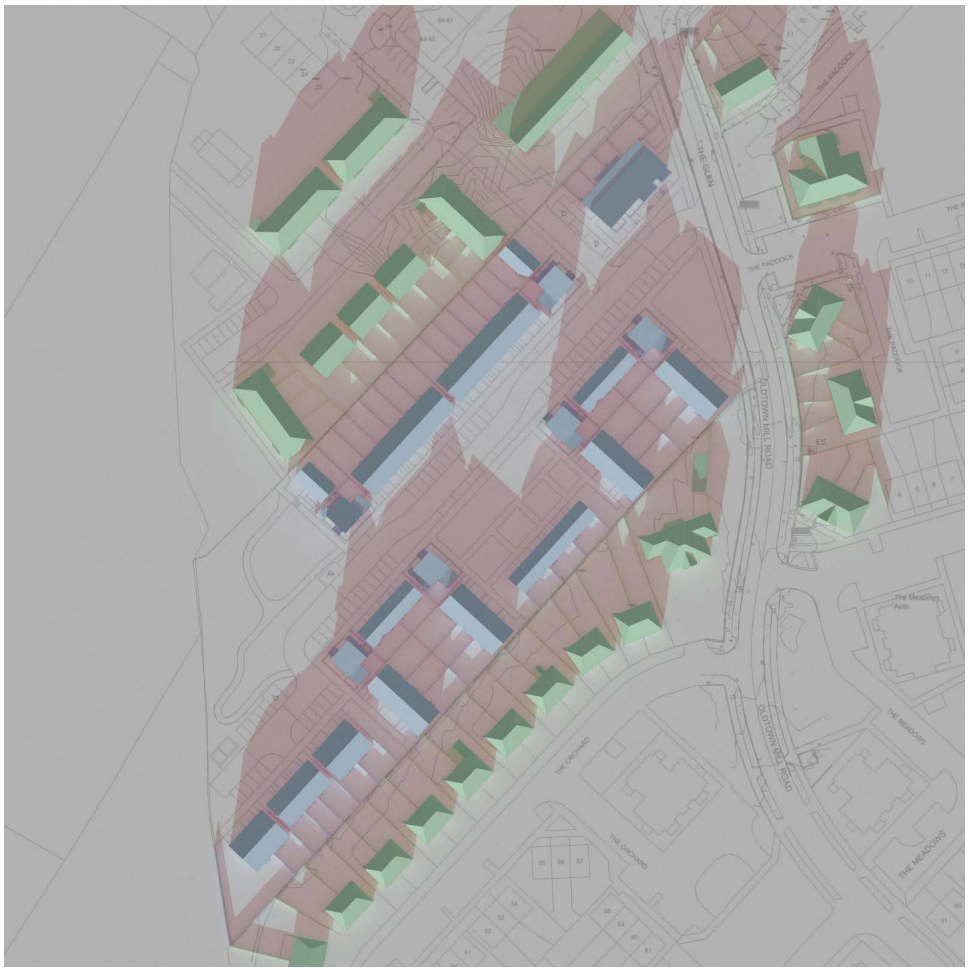
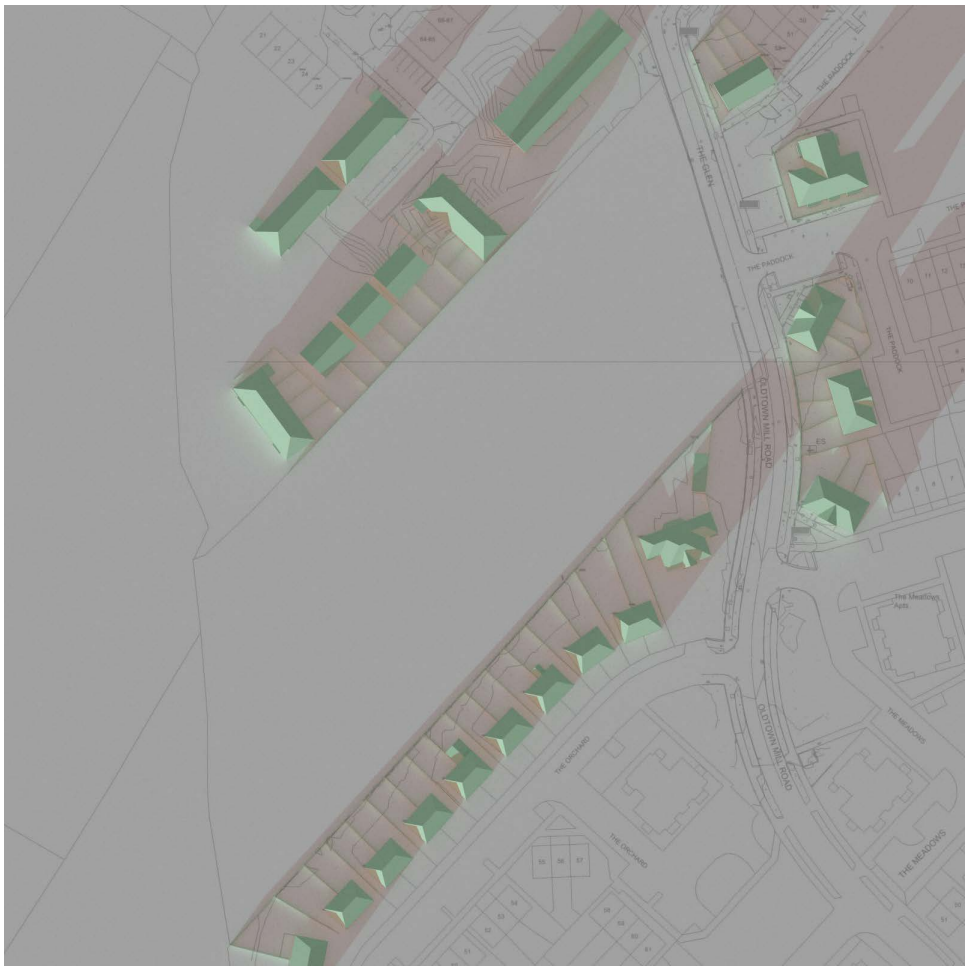


Figure 20: Shadow diagrams 21 December 13:00 UTC

Existing

N



Proposed

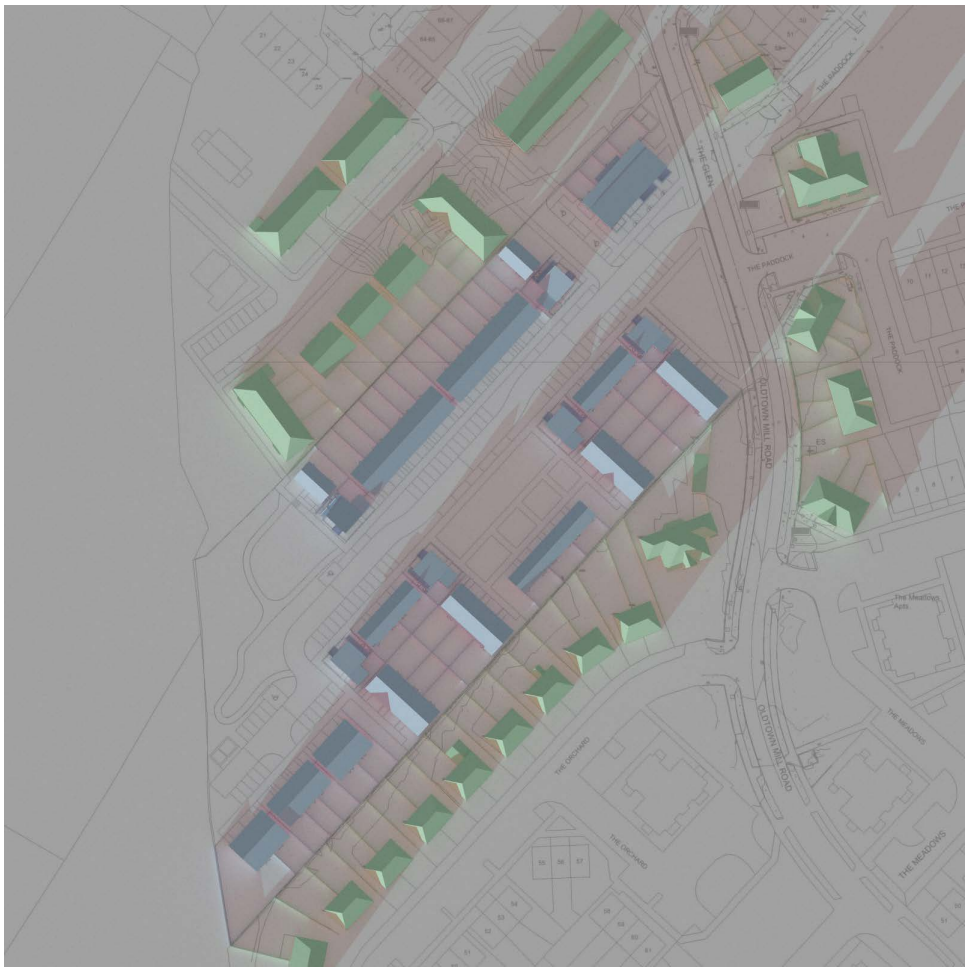


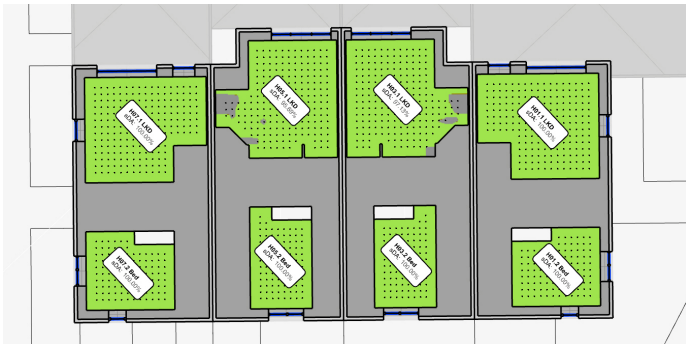
Figure 21: Shadow diagrams 21 December 15:00 UTC

Appendix A -BS EN17037:2021+A1 Minimum room specific Daylight Provision in accordance with UK National Annex Table NA.1.

Unit No.s 1 - 8

First Floor

Ground Floor



Unit No.s 9 - 17

First Floor

Ground Floor

Figure 22: Floor plans indicating Daylight Provision to BS EN17037:2021+A1 Table NA.1

Minimum illuminance levels from BS EN17037:2018+A1:2021 - Table NA.1							
Space ID	Use	Area m2	Sensor Count	Target Lux	Mean Lux	% of grid target exceeded: Minimum 50% of grid	Meets Criteria
H01.1	LKD	23.7	208	200	763	100.0%	Y
H01.2	Bed	13.1	108	100	716	100.0%	Y
H02.1	LKD	23.5	213	200	1730	100.0%	Y
H02.2	Bed	10.0	80	100	646	100.0%	Y
H03.1	LKD	24.1	209	200	559	97.1%	Y
H03.2	Bed	11.8	99	100	776	100.0%	Y
H04.1	LKD	23.5	213	200	1668	100.0%	Y
H04.2	Bed	10.0	80	100	617	100.0%	Y
H05.1	LKD	24.1	209	200	575	95.7%	Y
H05.2	Bed	11.8	99	100	761	100.0%	Y
H06.1	LKD	23.5	213	200	1643	100.0%	Y
H06.2	Bed	10.0	80	100	613	100.0%	Y
H07.1	LKD	23.7	208	200	944	100.0%	Y
H07.2	Bed	13.1	108	100	1164	100.0%	Y
H08.1	LKD	23.5	213	200	1928	100.0%	Y
H08.2	Bed	10.0	80	100	1436	100.0%	Y
H09.1	KD	14.5	126	200	1260	100.0%	Y
H09.2	L	20.6	187	150	1006	100.0%	Y
H09.3	Bed	13.1	112	100	572	100.0%	Y
H09.4	Bed	7.4	49	100	292	100.0%	Y
H09.5	Bed	11.8	93	100	631	100.0%	Y
H10.1	LKD	25.0	220	200	1168	100.0%	Y
H10.2	Bed	11.5	88	100	634	100.0%	Y
H11.1	LKD	23.6	202	200	904	100.0%	Y
H11.2	Bed	11.5	88	100	1169	100.0%	Y
H12.1	KD	12.2	96	200	1363	100.0%	Y
H12.2	L	16.9	156	150	626	100.0%	Y
H12.3	Bed	12.5	112	100	1453	100.0%	Y
H12.4	Bed	10.4	84	100	774	100.0%	Y
H13.1	KD	12.2	96	200	1363	100.0%	Y
H13.2	L	16.9	156	150	642	100.0%	Y
H13.3	Bed	12.5	112	100	1473	100.0%	Y
H13.4	Bed	10.4	84	100	763	100.0%	Y
H14.1	KD	12.2	96	200	1368	100.0%	Y
H14.2	L	16.9	156	150	629	100.0%	Y
H14.3	Bed	12.5	112	100	1478	100.0%	Y
H14.4	Bed	10.4	84	100	771	100.0%	Y
H15.1	KD	12.2	96	200	1393	100.0%	Y
H15.2	L	16.9	156	150	638	100.0%	Y
H15.3	Bed	12.5	112	100	1461	100.0%	Y
H15.4	Bed	10.4	84	100	785	100.0%	Y
H16.1	KD	12.2	96	200	1457	100.0%	Y
H16.2	L	16.9	156	150	634	100.0%	Y
H16.3	Bed	12.5	112	100	1499	100.0%	Y
H16.4	Bed	10.4	84	100	755	100.0%	Y
H17.1	KD	12.2	96	200	1458	100.0%	Y
H17.2	L	16.9	156	150	645	100.0%	Y
H17.3	Bed	12.5	112	100	1497	100.0%	Y
H17.4	Bed	10.4	84	100	743	100.0%	Y

Table 14: Minimum Daylight Provision BS EN17037:2018+A1:2021 Table NA.1 compliance for habitable rooms

Unit No.s 18 - 26

First Floor

Ground Floor

Figure 23: Floor plans indicating Daylight Provision to BS EN17037:2021+A1 Table NA.1

Minimum illuminance levels from BS EN17037:2018+A1:2021 - Table NA.1

Space ID	Use	Area m2	Sensor Count	Target Lux	Mean Lux	% of grid target exceeded Minimum 50% of grid	Meets Criteria
H18.1	KD	12.2	96	200	1477	100.0%	Y
H18.2	L	16.9	156	150	647	100.0%	Y
H18.3	Bed	12.5	112	100	1499	100.0%	Y
H18.4	Bed	10.4	84	100	756	100.0%	Y
H19.1	KD	12.2	96	200	1451	100.0%	Y
H19.2	L	16.9	156	150	641	100.0%	Y
H19.3	Bed	12.5	112	100	1501	100.0%	Y
H19.4	Bed	10.4	84	100	759	100.0%	Y
H20.1	KD	12.2	96	200	1450	100.0%	Y
H20.2	L	16.9	156	150	611	100.0%	Y
H20.3	Bed	12.5	112	100	1493	100.0%	Y
H20.4	Bed	10.4	84	100	758	100.0%	Y
H21.1	KD	12.2	96	200	1468	100.0%	Y
H21.2	L	16.9	156	150	640	100.0%	Y
H21.3	Bed	12.5	112	100	1501	100.0%	Y
H21.4	Bed	10.4	84	100	748	100.0%	Y
H22.1	KD	12.2	96	200	1430	100.0%	Y
H22.2	L	16.9	156	150	621	100.0%	Y
H22.3	Bed	12.5	112	100	1479	100.0%	Y
H22.4	Bed	10.4	84	100	762	100.0%	Y
H23.1	KD	12.2	96	200	1392	100.0%	Y
H23.2	L	16.9	156	150	608	100.0%	Y
H23.3	Bed	12.5	112	100	1483	100.0%	Y
H23.4	Bed	10.4	84	100	734	100.0%	Y
H24.1	LKD	25.0	220	200	1648	100.0%	Y

Minimum illuminance levels from BS EN17037:2018+A1:2021 - Table NA.1							
Space ID	Use	Area m2	Sensor Count	Target Lux	Mean Lux	% of grid target exceeded Minimum 50% of grid	Meets Criteria
H24.2	Bed	11.5	88	100	624	100.0%	Y
H25.1	LKD	23.6	202	200	1712	100.0%	Y
H25.2	Bed	11.5	88	100	1216	100.0%	Y
H26.1	KD	14.5	126	200	1621	100.0%	Y
H26.2	L	20.6	187	150	1266	100.0%	Y
H26.3	Bed	11.8	93	100	1557	100.0%	Y
H26.4	Bed	7.4	49	100	806	100.0%	Y
H26.5	Bed	13.1	112	100	1370	100.0%	Y

Table 15: Minimum Daylight Provision BS EN17037:2018+A1:2021 Table NA.1 compliance for habitable rooms

Unit No.s 27 - 38

First Floor

Ground Floor

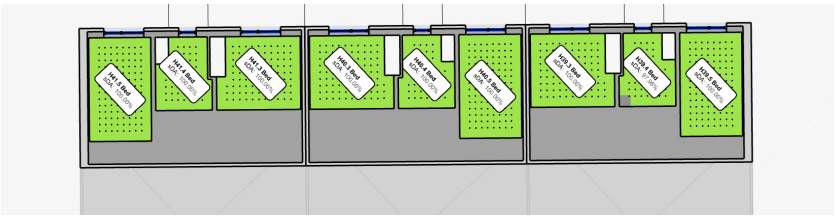
Figure 24: Floor plans indicating Daylight Provision to BS EN17037:2021+A1 Table NA.1

Minimum illuminance levels from BS EN17037:2018+A1:2021 - Table NA.1							
Space ID	Use	Area m2	Sensor Count	Target Lux	Mean Lux	% of grid target exceeded Minimum 50% of grid	Meets Criteria
H27.1	KD	19.3	159	200	1560	100.0%	Y
H27.2	L	14.8	121	150	695	100.0%	Y
H27.3	Bed	6.6	48	100	346	100.0%	Y
H27.4	Bed	12.7	108	100	582	100.0%	Y
H27.5	Bed	11.5	91	100	1555	100.0%	Y
H28.1	KD	19.3	159	200	1498	100.0%	Y
H28.2	L	14.8	121	150	696	100.0%	Y
H28.3	Bed	6.6	48	100	359	100.0%	Y
H28.4	Bed	12.7	108	100	571	100.0%	Y
H28.5	Bed	11.5	91	100	1540	100.0%	Y
H29.1	KD	19.3	159	200	1470	100.0%	Y
H29.2	L	14.8	121	150	695	100.0%	Y
H29.3	Bed	6.6	48	100	353	100.0%	Y
H29.4	Bed	12.7	108	100	573	100.0%	Y
H29.5	Bed	11.5	91	100	1546	100.0%	Y
H30.1	LKD	25.0	220	200	820	100.0%	Y
H30.2	Bed	11.5	88	100	591	100.0%	Y
H31.1	LKD	23.6	202	200	733	100.0%	Y
H31.2	Bed	11.5	88	100	581	100.0%	Y
H32.1	KD	14.5	126	200	1157	100.0%	Y
H32.2	L	20.6	187	150	1138	100.0%	Y
H32.3	Bed	11.8	93	100	641	100.0%	Y
H32.4	Bed	7.4	49	100	293	100.0%	Y
H32.5	Bed	13.1	112	100	583	100.0%	Y
H33.1	KD	14.5	126	200	1126	100.0%	Y
H33.2	L	20.6	187	150	1099	100.0%	Y
H33.3	Bed	11.8	93	100	630	100.0%	Y
H33.4	Bed	7.4	49	100	311	100.0%	Y
H33.5	Bed	13.1	112	100	571	100.0%	Y
H34.1	LKD	25.0	220	200	1299	100.0%	Y
H34.2	Bed	11.5	88	100	720	100.0%	Y
H35.1	LKD	23.6	202	200	946	100.0%	Y
H35.2	Bed	11.5	88	100	1280	100.0%	Y
H36.1	KD	14.8	121	200	1431	100.0%	Y
H36.2	L	19.3	159	150	664	100.0%	Y
H36.3	Bed	6.6	48	100	903	100.0%	Y
H36.4	Bed	12.7	108	100	1348	100.0%	Y
H36.5	Bed	11.5	91	100	682	100.0%	Y
H37.1	KD	14.8	121	200	1327	100.0%	Y
H37.2	L	19.3	159	150	679	100.0%	Y
H37.3	Bed	6.6	48	100	875	100.0%	Y
H37.4	Bed	12.7	108	100	1300	100.0%	Y
H37.5	Bed	11.5	91	100	683	100.0%	Y
H38.1	KD	14.8	121	200	1473	100.0%	Y
H38.2	L	19.3	159	150	698	100.0%	Y
H38.3	Bed	6.6	48	100	914	100.0%	Y
H38.4	Bed	12.7	108	100	1351	100.0%	Y
H38.5	Bed	11.5	91	100	678	100.0%	Y

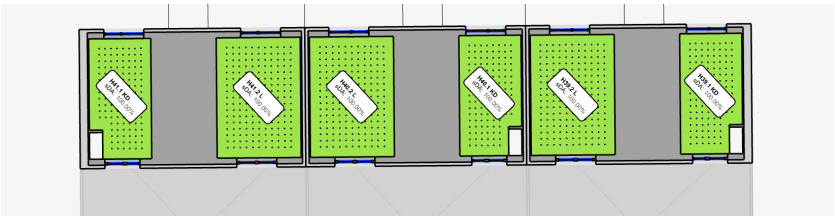
Table 16: Minimum Daylight Provision BS EN17037:2018+A1:2021 Table NA.1 compliance for habitable rooms

Unit No.s 39 - 41

First Floor



Ground Floor



Unit No.s 41 - 53

First Floor

Ground Floor

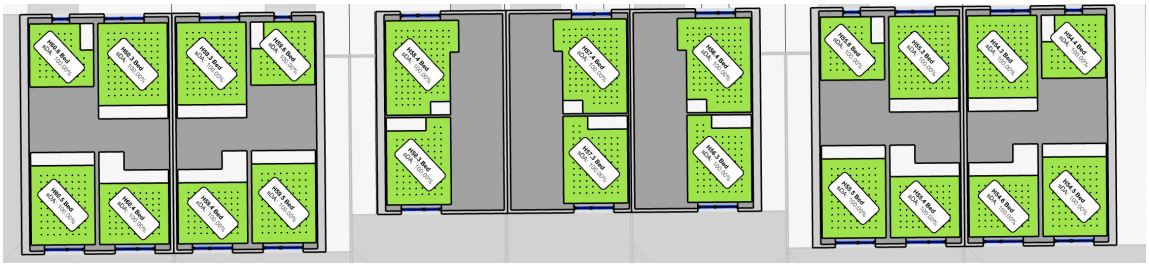
Figure 25: Daylight Provision and Annual Average Illuminance to all habitable rooms

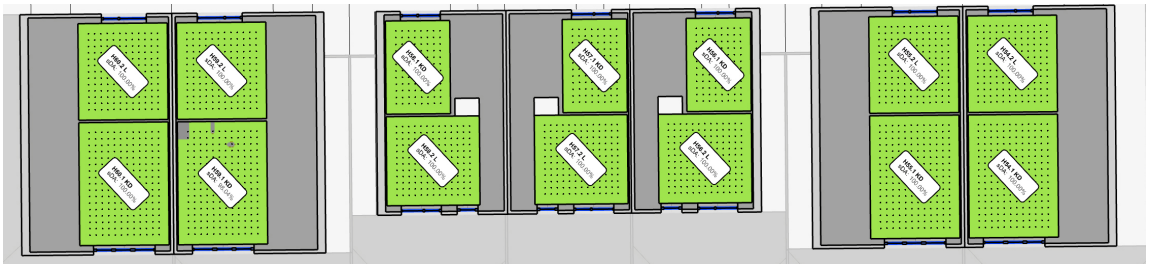
Minimum illuminance levels from BS EN17037:2018+A1:2021 - Table NA.1							
Space ID	Use	Area m2	Sensor Count	Target Lux	Mean Lux	% of grid target exceeded Minimum 50% of grid	Meets Criteria
H39.1	KD	14.5	126	200	1296	100.0%	Y
H39.2	L	20.6	187	150	1154	100.0%	Y
H39.3	Bed	11.8	93	100	633	100.0%	Y
H39.4	Bed	7.4	49	100	304	98.0%	Y
H39.5	Bed	13.1	112	100	585	100.0%	Y
H40.1	KD	14.5	126	200	1261	100.0%	Y
H40.2	L	20.6	187	150	1159	100.0%	Y
H40.3	Bed	11.8	93	100	641	100.0%	Y
H40.4	Bed	7.4	49	100	297	100.0%	Y
H40.5	Bed	13.1	112	100	575	100.0%	Y
H41.1	KD	14.5	126	200	1215	100.0%	Y
H41.2	L	20.6	187	150	1132	100.0%	Y
H41.3	Bed	11.8	93	100	634	100.0%	Y
H41.4	Bed	7.4	49	100	303	100.0%	Y
H41.5	Bed	13.1	112	100	549	100.0%	Y
H42.1	KD	19.3	159	200	1541	100.0%	Y
H42.2	L	14.8	121	150	670	100.0%	Y
H42.3	Bed	6.6	48	100	353	100.0%	Y
H42.4	Bed	12.7	108	100	593	100.0%	Y
H42.5	Bed	11.5	91	100	1540	100.0%	Y
H43.1	KD	19.3	159	200	1483	100.0%	Y
H43.2	L	14.8	121	150	667	100.0%	Y
H43.3	Bed	6.6	48	100	350	100.0%	Y
H43.4	Bed	12.7	108	100	589	100.0%	Y
H43.5	Bed	11.5	91	100	1537	100.0%	Y
H44.1	KD	19.3	159	200	1505	100.0%	Y
H44.2	L	14.8	121	150	668	100.0%	Y
H44.3	Bed	6.6	48	100	338	100.0%	Y
H44.4	Bed	12.7	108	100	571	100.0%	Y
H44.5	Bed	11.5	91	100	1532	100.0%	Y
H45.1	LKD	25.0	220	200	822	100.0%	Y
H45.2	Bed	11.5	88	100	589	100.0%	Y
H46.1	LKD	23.6	202	200	757	100.0%	Y
H46.2	Bed	11.5	88	100	578	100.0%	Y
H47.1	KD	14.5	126	200	1187	100.0%	Y
H47.2	L	20.6	187	150	1128	100.0%	Y
H47.3	Bed	11.8	93	100	648	100.0%	Y
H47.3	Bed	11.8	93	100	638	100.0%	Y
H47.4	Bed	7.4	49	100	298	100.0%	Y
H47.4	Bed	7.4	49	100	301	100.0%	Y
H47.5	Bed	13.1	112	100	569	100.0%	Y
H47.5	Bed	13.1	112	100	576	100.0%	Y
H48.1	KD	14.5	126	200	1127	100.0%	Y
H48.2	L	20.6	187	150	1114	100.0%	Y
H49.1	LKD	25.0	220	200	1314	100.0%	Y
H49.2	Bed	11.5	88	100	707	100.0%	Y
H50.1	LKD	23.6	202	200	941	100.0%	Y
H50.2	Bed	11.5	88	100	1280	100.0%	Y
H51.1	KD	19.3	159	200	662	100.0%	Y
H51.2	L	14.8	121	150	1194	100.0%	Y
H51.3	Bed	6.6	48	100	862	100.0%	Y

Minimum illuminance levels from BS EN17037:2018+A1:2021 - Table NA.1							
Space ID	Use	Area m2	Sensor Count	Target Lux	Mean Lux	% of grid target exceeded Minimum 50% of grid	Meets Criteria
H51.4	Bed	12.7	108	100	1262	100.0%	Y
H51.5	Bed	11.5	91	100	660	100.0%	Y
H52.1	KD	19.3	159	200	667	100.0%	Y
H52.2	L	14.8	121	150	1300	100.0%	Y
H52.3	Bed	6.6	48	100	846	100.0%	Y
H52.4	Bed	11.5	91	100	685	100.0%	Y
H52.4	Bed	12.7	108	100	1312	100.0%	Y
H53.1	KD	19.3	159	200	692	100.0%	Y
H53.2	L	14.8	121	150	1503	100.0%	Y
H53.3	Bed	6.6	48	100	911	100.0%	Y
H53.4	Bed	12.7	108	100	1372	100.0%	Y
H53.5	Bed	11.5	91	100	664	100.0%	Y

Table 17: Minimum Daylight Provision BS EN17037:2018+A1:2021 Table NA.1 compliance for habitable rooms

First Floor





Ground Floor

Unit No.s 54 - 60

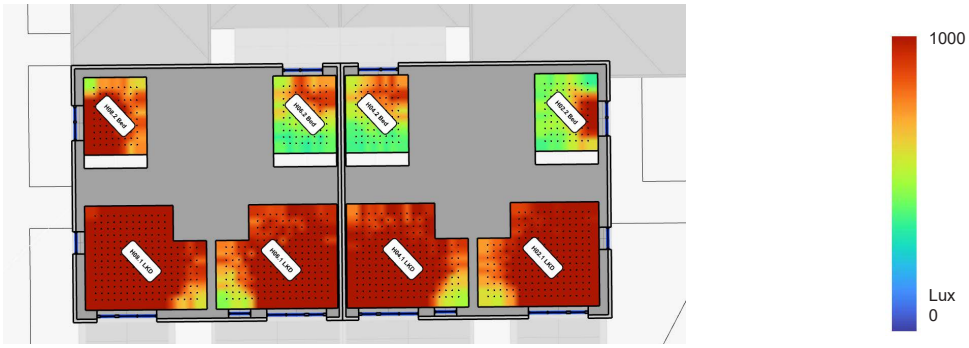
Figure 26: Daylight Provision and Annual Average Illuminance to all habitable rooms

Minimum illuminance levels from BS EN17037:2018+A1:2021 - Table NA.1							
Space ID	Use	Area m2	Sensor Count	Target Lux	Mean Lux	% of grid target exceeded Minimum 50% of grid	Meets Criteria
H54.1	KD	22.4	204	200	1115	100.0%	Y
H54.2	L	17.6	156	150	616	100.0%	Y
H54.3	Bed	11.7	99	100	607	100.0%	Y
H54.4	Bed	7.6	56	100	326	100.0%	Y
H54.5	Bed	10.4	80	100	1518	100.0%	Y
H54.6	Bed	8.7	72	100	1739	100.0%	Y
H55.1	KD	22.4	204	200	1199	100.0%	Y
H55.2	L	17.6	156	150	612	100.0%	Y
H55.3	Bed	11.7	99	100	629	100.0%	Y
H55.4	Bed	8.7	72	100	1768	100.0%	Y
H55.5	Bed	10.4	80	100	1511	100.0%	Y
H55.6	Bed	7.6	56	100	316	100.0%	Y
H56.1	KD	12.2	96	200	679	100.0%	Y
H56.2	L	16.9	156	150	1440	100.0%	Y
H56.3	Bed	10.4	84	100	1760	100.0%	Y
H56.4	Bed	12.5	112	100	669	100.0%	Y
H57.1	KD	12.2	96	200	685	100.0%	Y
H57.2	L	16.9	156	150	1441	100.0%	Y
H57.3	Bed	10.4	84	100	1718	100.0%	Y
H57.4	Bed	12.5	112	100	664	100.0%	Y
H58.1	KD	12.2	96	200	695	100.0%	Y
H58.2	L	16.9	156	150	1434	100.0%	Y
H58.3	Bed	10.4	84	100	1731	100.0%	Y
H58.4	Bed	12.5	112	100	671	100.0%	Y
H59.1	KD	22.4	204	200	1125	98.0%	Y
H59.2	L	17.6	156	150	617	100.0%	Y
H59.3	Bed	11.7	99	100	613	100.0%	Y
H59.4	Bed	8.7	72	100	1773	100.0%	Y
H59.5	Bed	10.4	80	100	1518	100.0%	Y
H59.6	Bed	7.6	56	100	325	100.0%	Y
H60.1	KD	22.4	204	200	1192	100.0%	Y
H60.2	L	17.6	156	150	624	100.0%	Y
H60.3	Bed	11.7	99	100	621	100.0%	Y
H60.4	Bed	8.7	72	100	1786	100.0%	Y
H60.5	Bed	10.4	80	100	1578	100.0%	Y
H60.6	Bed	7.6	56	100	326	100.0%	Y

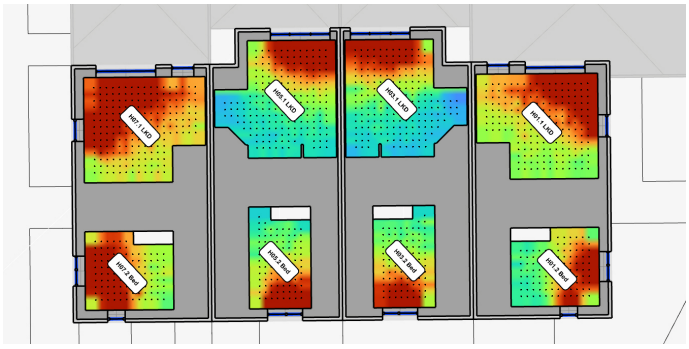
Table 18: Minimum Daylight Provision BS EN17037:2018+A1:2021 Table NA.1 compliance for habitable rooms

Appendix B - Supplementary Information
EN17037:2018 Table A.1 Daylight Provision Room Results

First Floor



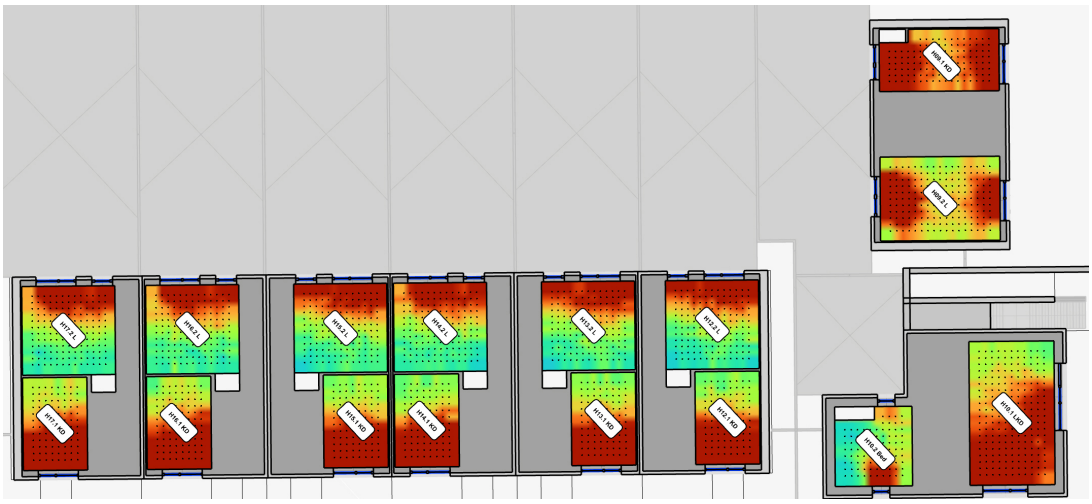
Ground Floor



Unit No.s 1 - 8

First Floor

Ground Floor



Unit No.s 9 - 17

Figure 27: Daylight Provision and Annual Average Illuminance to all habitable rooms

EN17037:2018 Table A.1 Daylight Provision Room Schedule											
Space ID	Description	Area m^2	Sensor Count	Target Illuminance	300lux_50	500lux_50	750lux_50	Minimum Target Illuminance	100lux_95	300lux_95	500lux_95
H01.1	LKD	23.7	208	Medium	72.8%	56.8%	42.6%	Medium	83.1%	56.6%	38.3%
H01.2	Bed	13.1	108	Minimum	66.7%	49.0%	27.4%	Minimum	78.7%	46.9%	20.7%
H02.1	LKD	23.5	213	High	77.3%	67.4%	55.0%	Medium	85.3%	65.8%	49.2%
H02.2	Bed	10.0	80	Minimum	67.4%	48.8%	26.7%	Medium	83.2%	54.4%	28.9%
H03.1	LKD	24.1	209	Minimum	54.0%	34.4%	12.4%	Minimum	68.9%	24.7%	1.8%
H03.2	Bed	11.8	99	Minimum	57.8%	38.1%	25.6%	Minimum	73.5%	40.3%	22.1%
H04.1	LKD	23.5	213	Medium	73.4%	61.9%	48.4%	Medium	83.3%	62.0%	45.4%
H04.2	Bed	10.0	80	Medium	69.8%	51.8%	33.7%	Medium	80.5%	51.0%	26.2%
H05.1	LKD	24.1	209	Minimum	55.0%	36.6%	17.7%	Minimum	70.8%	30.3%	6.0%
H05.2	Bed	11.8	99	Minimum	58.2%	38.0%	24.8%	Minimum	72.6%	37.4%	20.5%
H06.1	LKD	23.5	213	Medium	73.4%	61.8%	48.1%	Medium	83.2%	61.1%	42.5%
H06.2	Bed	10.0	80	Medium	68.9%	51.2%	33.0%	Minimum	79.8%	49.7%	24.7%
H07.1	LKD	23.7	208	Medium	73.3%	59.7%	45.0%	Medium	83.8%	60.4%	41.5%
H07.2	Bed	13.1	108	Medium	67.9%	55.9%	42.5%	Medium	77.9%	52.9%	35.8%
H08.1	LKD	23.5	213	High	78.0%	68.9%	58.8%	High	85.7%	68.1%	54.4%
H08.2	Bed	10.0	80	Medium	70.6%	57.5%	44.0%	Medium	82.3%	59.5%	42.0%
H09.1	KD	14.5	126	Medium	74.9%	62.8%	49.2%	Medium	85.8%	67.1%	49.8%
H09.2	L	20.6	187	Medium	70.9%	55.5%	40.3%	Medium	83.5%	58.2%	39.3%
H09.3	Bed	13.1	112	Minimum	61.3%	40.7%	15.2%	Minimum	74.8%	36.0%	4.4%
H09.4	Bed	7.4	49	Fail	36.6%	4.8%	1.2%	Minimum	60.0%	3.4%	0.0%
H09.5	Bed	11.8	93	Minimum	68.1%	49.3%	27.7%	Medium	81.5%	51.8%	24.4%
H10.1	LKD	25.0	220	Medium	74.1%	62.4%	48.4%	Medium	83.3%	59.3%	38.3%
H10.2	Bed	11.5	88	Minimum	56.1%	37.0%	20.4%	Minimum	70.4%	32.2%	9.5%
H11.1	LKD	23.6	202	Medium	72.3%	58.2%	40.9%	Medium	84.2%	60.9%	39.1%
H11.2	Bed	11.5	88	Medium	67.3%	52.6%	35.4%	Medium	80.3%	55.2%	32.7%
H12.1	KD	12.2	96	Medium	68.2%	54.2%	39.1%	Minimum	77.3%	48.2%	28.0%
H12.2	L	16.9	156	Minimum	63.7%	44.5%	23.3%	Minimum	76.1%	39.7%	15.3%
H12.3	Bed	12.5	112	Medium	71.0%	58.0%	43.3%	Medium	79.6%	54.8%	31.7%
H12.4	Bed	10.4	84	Medium	72.0%	55.7%	40.4%	Medium	82.5%	54.2%	31.6%
H13.1	KD	12.2	96	Medium	68.3%	54.3%	39.6%	Medium	77.9%	50.1%	29.6%
H13.2	L	16.9	156	Minimum	65.1%	46.3%	24.6%	Minimum	77.7%	42.5%	17.3%
H13.3	Bed	12.5	112	Medium	70.6%	57.4%	42.7%	Medium	80.4%	55.9%	34.7%
H13.4	Bed	10.4	84	Medium	72.9%	57.1%	41.3%	Medium	82.4%	54.7%	31.6%
H14.1	KD	12.2	96	Medium	69.5%	55.3%	40.8%	Minimum	77.3%	48.7%	28.8%
H14.2	L	16.9	156	Minimum	65.0%	46.0%	22.7%	Minimum	77.9%	42.8%	17.1%
H14.3	Bed	12.5	112	Medium	70.9%	58.2%	43.7%	Medium	80.4%	55.7%	33.2%
H14.4	Bed	10.4	84	Medium	71.3%	54.7%	38.7%	Medium	82.1%	54.3%	31.6%
H15.1	KD	12.2	96	Medium	69.1%	55.3%	39.8%	Medium	78.3%	51.2%	30.3%
H15.2	L	16.9	156	Minimum	64.8%	45.9%	24.6%	Minimum	77.8%	42.9%	17.0%
H15.3	Bed	12.5	112	Medium	71.2%	58.0%	44.1%	Medium	79.8%	55.3%	33.6%
H15.4	Bed	10.4	84	Medium	72.1%	56.0%	40.0%	Medium	82.3%	54.4%	32.1%
H16.1	KD	12.2	96	Medium	69.4%	55.7%	40.8%	Medium	79.3%	53.1%	32.0%
H16.2	L	16.9	156	Minimum	65.9%	47.1%	25.4%	Minimum	77.9%	42.7%	16.9%
H16.3	Bed	12.5	112	Medium	70.9%	58.3%	43.9%	Medium	80.9%	56.9%	33.7%
H16.4	Bed	10.4	84	Medium	73.4%	57.8%	41.9%	Medium	82.5%	55.5%	33.4%
H17.1	KD	12.2	96	Medium	71.0%	57.8%	43.0%	Medium	80.2%	54.8%	33.7%
H17.2	L	16.9	156	Minimum	65.2%	46.6%	25.5%	Minimum	77.1%	42.4%	18.5%
H17.3	Bed	12.5	112	Medium	72.4%	59.7%	46.1%	Medium	81.5%	57.4%	36.1%
H17.4	Bed	10.4	84	Medium	72.1%	55.7%	39.7%	Medium	82.1%	53.9%	32.1%

Table 19: Daylight Provision individual values for all habitable rooms to EN 17037 Table A.1.

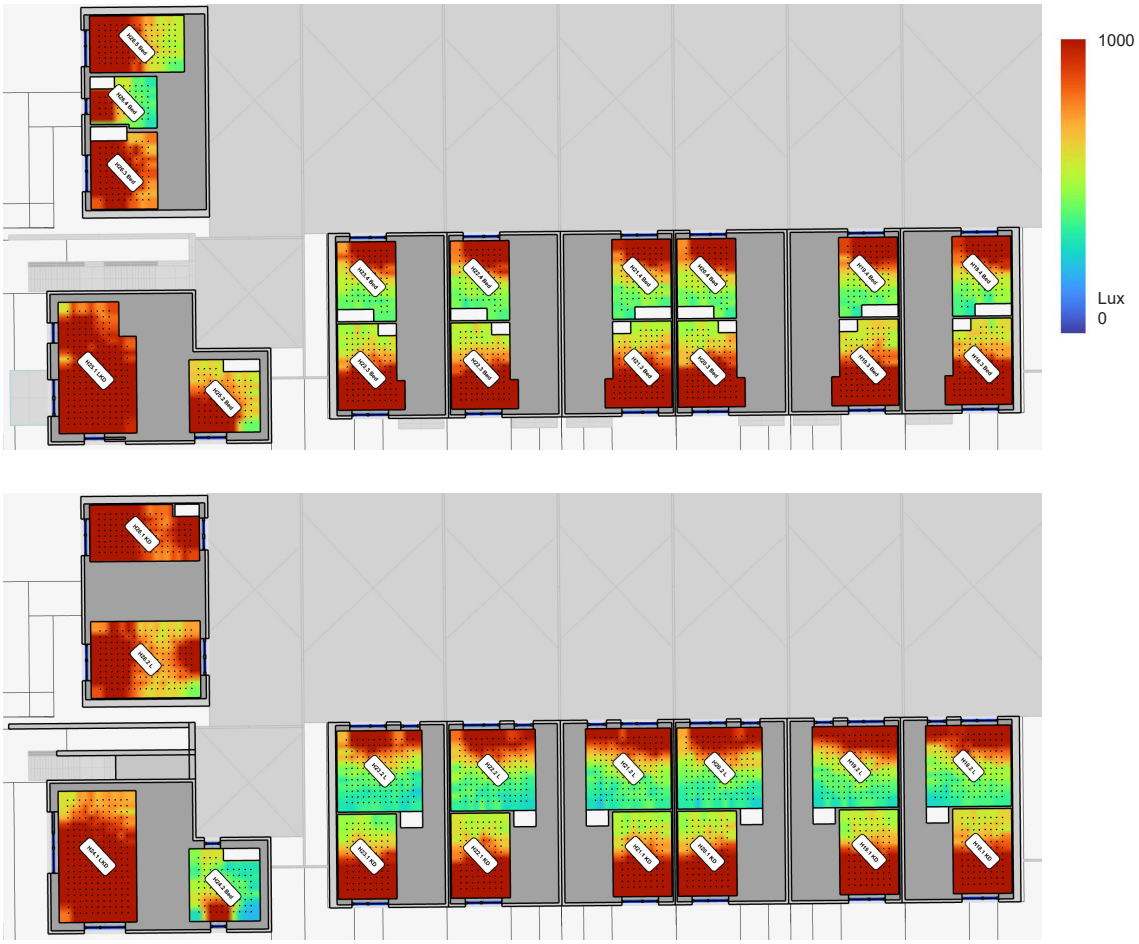


Figure 28: Daylight Provision and Annual Average Illuminance to all habitable rooms

EN17037:2018 Table A.1 Daylight Provision Room Schedule

Space ID	Description	Area m2	Sensor Count	Target Illuminance	300lux_50	500lux_50	750lux_50	Minimum Target Illuminance	100lux_95	300lux_95	500lux_95
H18.1	KD	12.2	96	Medium	70.5%	56.9%	42.8%	Medium	81.7%	57.7%	37.7%
H18.2	L	16.9	156	Minimum	65.0%	46.6%	25.7%	Minimum	78.3%	45.8%	20.1%
H18.3	Bed	12.5	112	Medium	72.7%	59.2%	46.1%	Medium	81.5%	57.8%	36.8%
H18.4	Bed	10.4	84	Medium	72.7%	57.0%	41.1%	Medium	81.3%	53.2%	28.5%
H19.1	KD	12.2	96	Medium	70.0%	56.0%	42.1%	Medium	79.9%	53.6%	32.9%
H19.2	L	16.9	156	Minimum	66.8%	48.2%	27.1%	Minimum	77.9%	44.0%	18.9%
H19.3	Bed	12.5	112	Medium	72.2%	59.2%	45.7%	Medium	81.9%	58.2%	37.9%
H19.4	Bed	10.4	84	Medium	72.3%	55.8%	40.2%	Medium	81.9%	53.5%	31.1%
H20.1	KD	12.2	96	Medium	70.8%	57.1%	42.6%	Medium	80.2%	54.6%	33.9%
H20.2	L	16.9	156	Minimum	65.5%	46.6%	24.1%	Minimum	77.8%	42.4%	15.2%
H20.3	Bed	12.5	112	Medium	71.9%	59.3%	45.1%	Medium	80.7%	56.2%	33.9%
H20.4	Bed	10.4	84	Medium	71.4%	55.0%	38.8%	Medium	82.5%	55.3%	32.7%
H21.1	KD	12.2	96	Medium	69.4%	55.3%	40.3%	Medium	79.1%	52.9%	32.1%
H21.2	L	16.9	156	Minimum	65.8%	47.4%	25.6%	Minimum	77.8%	42.8%	17.2%
H21.3	Bed	12.5	112	Medium	71.2%	58.3%	43.8%	Medium	80.6%	56.4%	34.7%
H21.4	Bed	10.4	84	Medium	72.8%	56.0%	40.2%	Medium	82.4%	54.7%	30.9%
H22.1	KD	12.2	96	Medium	70.3%	56.5%	41.8%	Medium	80.4%	55.0%	33.7%
H22.2	L	16.9	156	Minimum	65.2%	45.7%	23.4%	Minimum	77.8%	42.0%	14.6%
H22.3	Bed	12.5	112	Medium	71.1%	58.4%	43.6%	Medium	81.1%	56.6%	33.9%
H22.4	Bed	10.4	84	Medium	72.1%	55.2%	39.0%	Medium	83.1%	55.3%	32.6%
H23.1	KD	12.2	96	Medium	70.3%	56.5%	41.4%	Medium	78.8%	52.2%	30.7%
H23.2	L	16.9	156	Minimum	61.8%	42.3%	19.5%	Minimum	77.8%	41.6%	13.2%
H23.3	Bed	12.5	112	Medium	71.8%	59.0%	44.5%	Medium	80.0%	54.5%	32.2%
H23.4	Bed	10.4	84	Medium	71.6%	54.5%	38.0%	Medium	83.2%	55.5%	33.0%

EN17037:2018 Table A.1 Daylight Provision Room Schedule											
Space ID	Description	Area m2	Sensor Count	Target Illuminance	300lux_50	500lux_50	750lux_50	Minimum Target Illuminance	100lux_95	300lux_95	500lux_95
H24.1	LKD	25.0	220	High	77.0%	66.4%	57.4%	High	83.8%	63.7%	50.6%
H24.2	Bed	11.5	88	Minimum	57.6%	35.4%	19.2%	Minimum	70.6%	29.1%	11.8%
H25.1	LKD	23.6	202	High	75.4%	64.2%	53.9%	High	85.0%	66.5%	52.6%
H25.2	Bed	11.5	88	Medium	68.1%	53.9%	37.8%	Medium	81.6%	57.4%	37.0%
H26.1	KD	14.5	126	High	77.0%	66.1%	55.2%	High	86.8%	71.5%	57.1%
H26.2	L	20.6	187	Medium	73.1%	59.2%	45.1%	Medium	84.7%	63.4%	46.1%
H26.3	Bed	11.8	93	Medium	71.6%	57.6%	44.4%	Medium	82.9%	60.4%	43.1%
H26.4	Bed	7.4	49	Minimum	51.2%	32.2%	22.2%	Minimum	70.6%	34.6%	19.2%
H26.5	Bed	13.1	112	Medium	67.5%	53.4%	38.8%	Medium	78.7%	51.5%	32.8%

Table 20: Daylight Provision individual values for all habitable rooms to EN 17037 Table A.1.

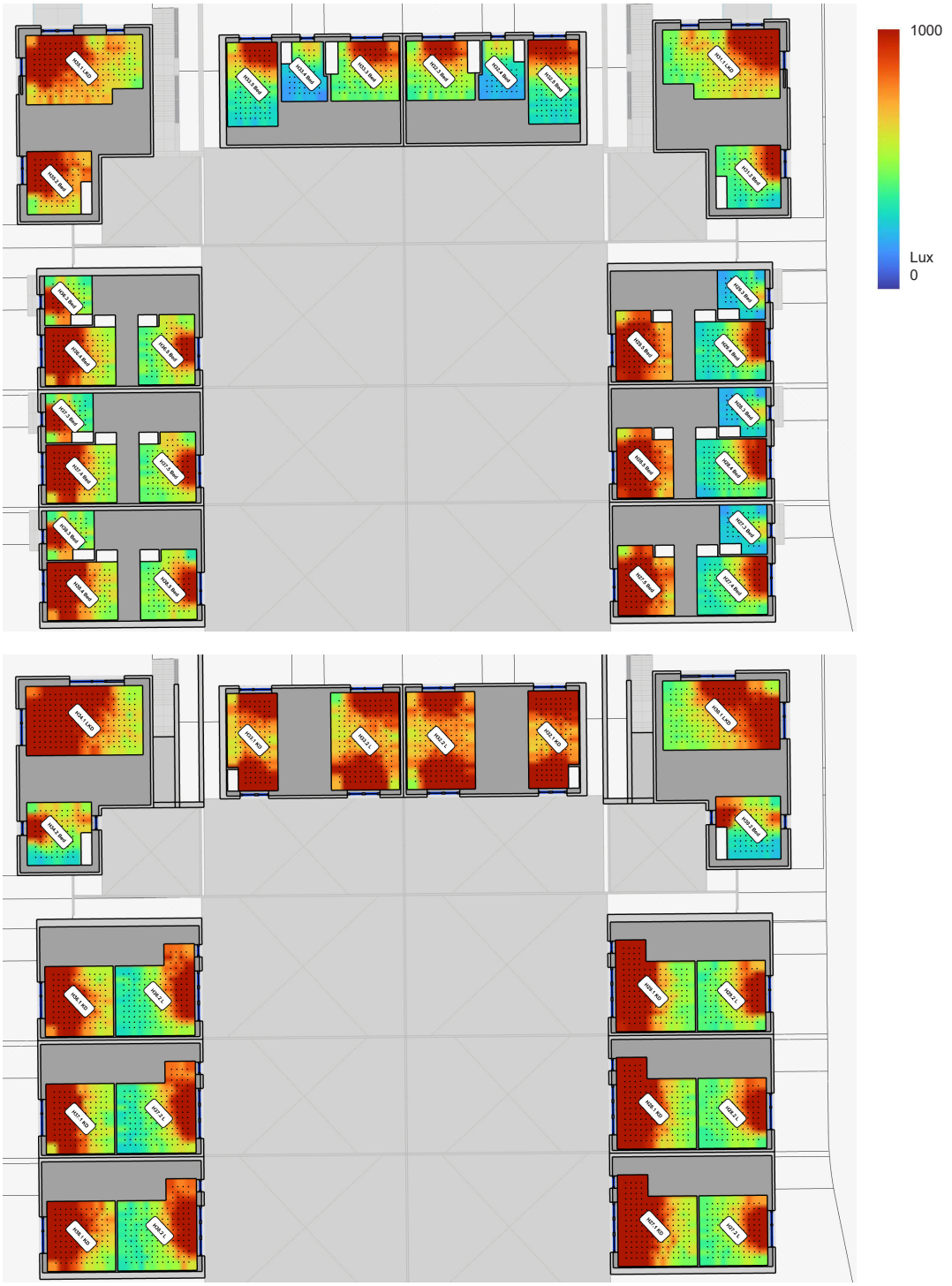
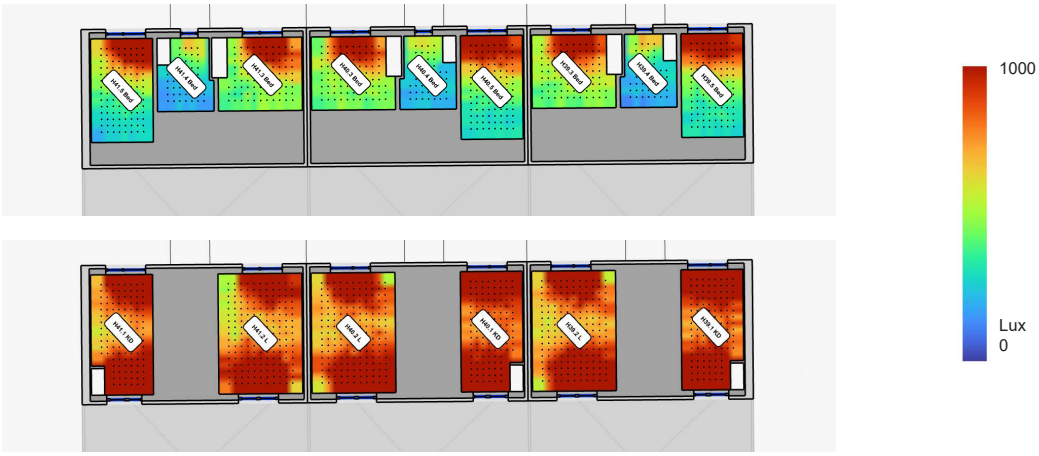


Figure 29: Daylight Provision and Annual Average Illuminance to all habitable rooms

EN17037:2018 Table A.1 Daylight Provision Room Schedule											
Space ID	Description	Area [m^2]	Sensor Count	Target Illuminance	300lux_50	500lux_50	750lux_50	Minimum Target Illuminance	100lux_95	300lux_95	500lux_95
H27.1	KD	19.3	159	Medium	71.6%	58.8%	46.1%	Medium	79.6%	53.9%	35.0%
H27.2	L	14.8	121	Minimum	68.0%	48.9%	27.0%	Medium	83.1%	54.0%	29.0%
H27.3	Bed	6.6	48	Fail	43.8%	13.2%	2.3%	Minimum	72.0%	21.3%	0.9%
H27.4	Bed	12.7	108	Minimum	64.4%	43.7%	17.9%	Minimum	78.3%	44.5%	12.8%
H27.5	Bed	11.5	91	Medium	72.9%	60.2%	48.0%	Medium	83.3%	60.7%	43.4%
H28.1	KD	19.3	159	Medium	70.4%	57.3%	43.7%	Medium	78.0%	50.4%	31.6%
H28.2	L	14.8	121	Minimum	68.4%	49.6%	27.4%	Medium	83.0%	53.7%	28.0%
H28.3	Bed	6.6	48	Fail	44.0%	14.0%	2.7%	Minimum	67.5%	13.5%	0.8%
H28.4	Bed	12.7	108	Minimum	63.9%	42.3%	16.4%	Minimum	78.3%	42.9%	12.9%
H28.5	Bed	11.5	91	Medium	71.9%	59.1%	45.8%	Medium	82.8%	60.6%	43.3%
H29.1	KD	19.3	159	Medium	69.5%	56.3%	42.1%	Minimum	76.9%	48.3%	29.8%
H29.2	L	14.8	121	Minimum	68.3%	49.2%	27.3%	Medium	83.1%	53.5%	27.6%
H29.3	Bed	6.6	48	Fail	45.8%	15.3%	3.0%	Minimum	69.5%	18.0%	1.1%
H29.4	Bed	12.7	108	Minimum	62.9%	40.7%	15.5%	Minimum	78.6%	43.4%	11.3%
H29.5	Bed	11.5	91	Medium	71.7%	59.2%	45.7%	Medium	83.2%	60.8%	43.1%
H30.1	LKD	25.0	220	Medium	75.6%	61.6%	46.3%	Medium	83.8%	57.7%	37.9%
H30.2	Bed	11.5	88	Minimum	58.5%	39.4%	19.4%	Minimum	70.4%	30.3%	5.4%
H31.1	LKD	23.6	202	Medium	72.1%	55.5%	39.5%	Medium	84.1%	57.8%	36.6%
H31.2	Bed	11.5	88	Minimum	63.0%	42.0%	18.6%	Minimum	79.3%	45.6%	16.5%
H32.1	KD	14.5	126	Medium	74.2%	61.8%	48.8%	Medium	85.5%	66.2%	49.3%
H32.2	L	20.6	187	Medium	72.3%	59.5%	45.6%	Medium	85.2%	63.9%	46.3%
H32.3	Bed	11.8	93	Minimum	67.5%	49.7%	29.7%	Medium	82.4%	54.6%	30.3%
H32.4	Bed	7.4	49	Fail	38.2%	7.1%	1.6%	Minimum	63.7%	7.2%	0.3%
H32.5	Bed	13.1	112	Minimum	61.8%	42.2%	18.3%	Minimum	75.6%	38.0%	5.9%
H33.1	KD	14.5	126	Medium	73.4%	59.5%	46.2%	Medium	85.3%	64.2%	46.1%
H33.2	L	20.6	187	Medium	72.1%	58.7%	44.2%	Medium	84.3%	62.2%	44.1%
H33.3	Bed	11.8	93	Minimum	67.5%	49.6%	29.7%	Medium	82.1%	53.0%	28.7%
H33.4	Bed	7.4	49	Fail	38.8%	7.2%	1.2%	Minimum	61.1%	5.8%	0.0%
H33.5	Bed	13.1	112	Minimum	62.0%	42.6%	19.8%	Minimum	75.4%	36.9%	4.5%
H34.1	LKD	25.0	220	High	75.4%	63.8%	51.6%	Medium	83.0%	60.5%	42.6%
H34.2	Bed	11.5	88	Minimum	60.5%	43.3%	27.3%	Minimum	70.3%	33.6%	13.2%
H35.1	LKD	23.6	202	Medium	72.8%	59.2%	44.3%	Medium	84.4%	62.2%	42.0%
H35.2	Bed	11.5	88	Medium	67.5%	53.7%	38.2%	Medium	80.9%	56.3%	37.5%
H36.1	KD	14.8	121	Medium	69.8%	56.3%	41.4%	Medium	80.9%	57.1%	36.3%
H36.2	L	19.3	159	Minimum	66.1%	47.5%	27.2%	Minimum	76.5%	40.8%	14.7%
H36.3	Bed	6.6	48	Minimum	57.3%	38.7%	25.8%	Minimum	73.1%	38.4%	19.9%
H36.4	Bed	12.7	108	Medium	68.1%	54.0%	37.7%	Medium	79.8%	53.2%	32.0%
H36.5	Bed	11.5	91	Minimum	67.8%	49.2%	30.1%	Medium	81.5%	52.1%	26.0%
H37.1	KD	14.8	121	Medium	68.4%	55.4%	40.1%	Medium	80.1%	54.2%	34.1%
H37.2	L	19.3	159	Minimum	66.8%	48.1%	27.2%	Minimum	76.7%	40.8%	13.5%
H37.3	Bed	6.6	48	Minimum	57.4%	37.8%	26.2%	Minimum	68.9%	31.9%	13.9%
H37.4	Bed	12.7	108	Medium	66.4%	52.7%	36.3%	Medium	78.3%	51.5%	30.0%
H37.5	Bed	11.5	91	Minimum	67.9%	49.8%	30.6%	Medium	82.4%	53.7%	29.0%
H38.1	KD	14.8	121	Medium	69.3%	56.1%	42.1%	Medium	80.6%	56.4%	37.8%
H38.2	L	19.3	159	Minimum	67.4%	49.0%	29.4%	Minimum	77.7%	44.2%	18.7%
H38.3	Bed	6.6	48	Minimum	56.6%	37.4%	25.3%	Minimum	72.5%	38.2%	19.0%
H38.4	Bed	12.7	108	Medium	67.9%	54.5%	38.5%	Medium	78.9%	52.9%	32.3%
H38.5	Bed	11.5	91	Medium	68.8%	51.3%	32.9%	Medium	83.4%	56.0%	31.6%

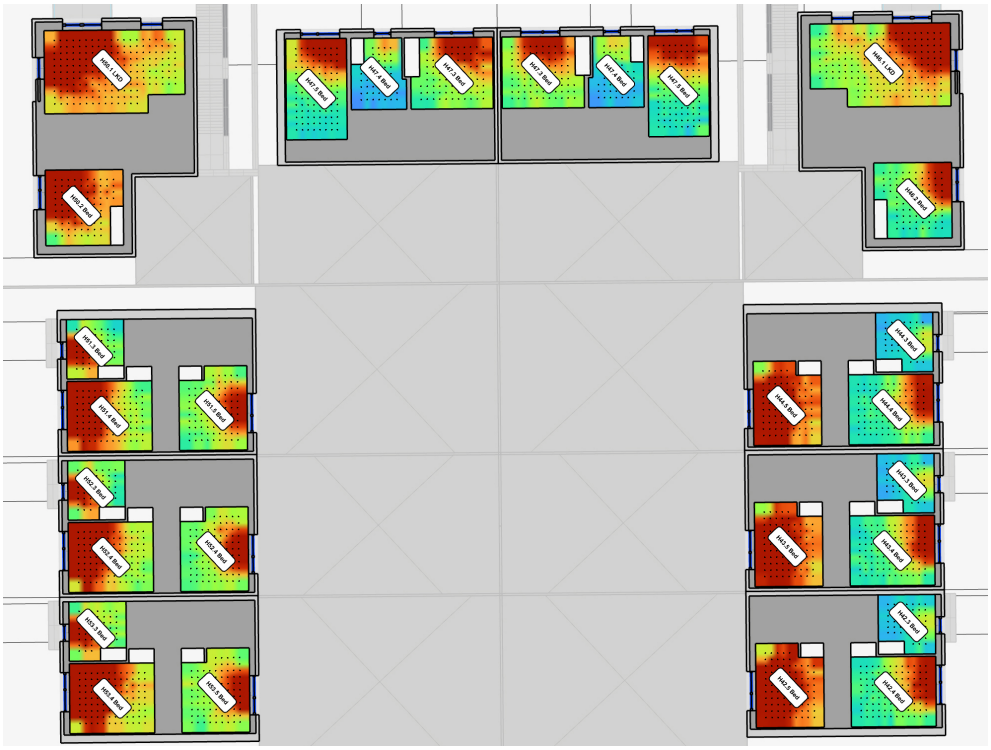
Table 21: Daylight Provision individual values for all habitable rooms to EN 17037 Table A.1.

First Floor



Ground Floor
Unit No.s 39 - 41

First Floor



Ground Floor
Unit No.s 41 - 53

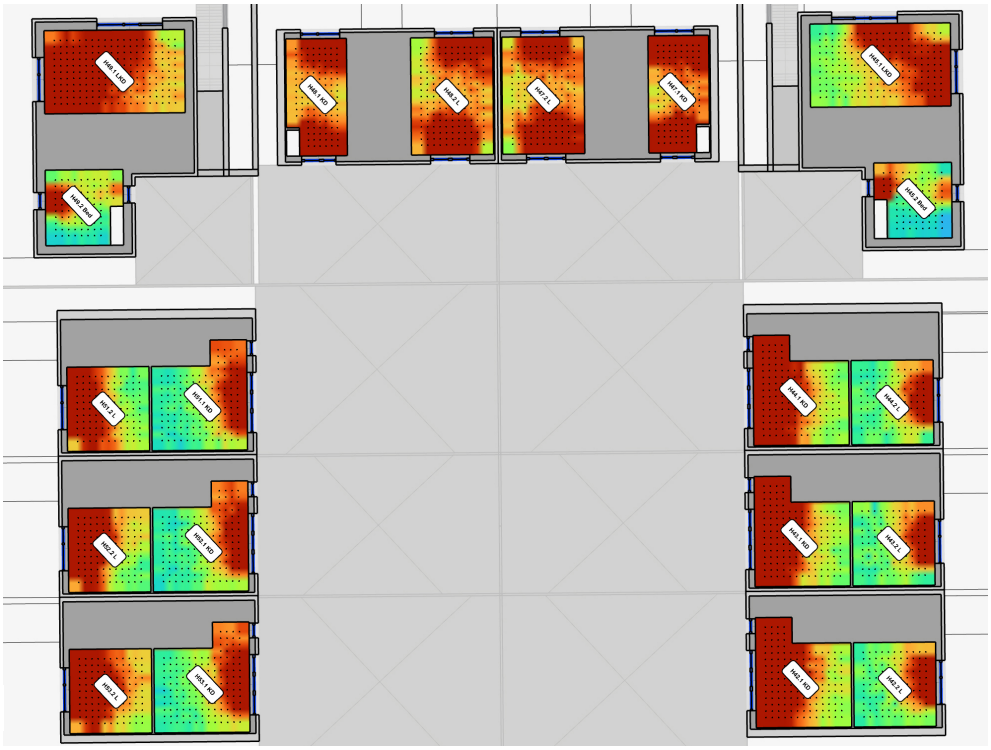


Figure 30: Daylight Provision and Annual Average Illuminance to all habitable rooms

EN17037:2018 Table A.1 Daylight Provision Room Schedule

Space ID	Description	Area m^2	Sensor Count	Target Illuminance	300lux_50	500lux_50	750lux_50	Minimum Target Illuminance	100lux_95	300lux_95	500lux_95
H39.1	KD	14.5	126	High	76.7%	66.0%	53.7%	High	86.2%	69.1%	53.4%
H39.2	L	20.6	187	Medium	73.5%	60.6%	47.5%	Medium	85.4%	65.5%	47.7%
H39.3	Bed	11.8	93	Minimum	67.9%	49.8%	29.8%	Medium	82.7%	55.0%	30.5%
H39.4	Bed	7.4	49	Fail	36.2%	8.3%	2.2%	Minimum	63.4%	7.5%	0.0%
H39.5	Bed	13.1	112	Minimum	61.6%	41.9%	20.2%	Minimum	76.7%	39.3%	8.5%
H40.1	KD	14.5	126	High	76.2%	65.1%	53.0%	High	86.3%	70.0%	54.8%
H40.2	L	20.6	187	Medium	73.9%	60.9%	48.0%	Medium	85.7%	66.4%	48.8%
H40.3	Bed	11.8	93	Minimum	67.5%	48.9%	27.2%	Medium	82.4%	54.4%	28.8%
H40.4	Bed	7.4	49	Fail	37.6%	7.6%	2.1%	Minimum	64.5%	13.9%	0.9%
H40.5	Bed	13.1	112	Minimum	62.2%	42.4%	19.7%	Minimum	76.3%	38.2%	8.4%
H41.1	KD	14.5	126	High	75.6%	63.6%	50.6%	High	86.2%	68.3%	50.9%
H41.2	L	20.6	187	Medium	72.9%	60.0%	46.6%	Medium	85.2%	64.7%	47.4%
H41.3	Bed	11.8	93	Minimum	68.0%	49.4%	28.9%	Medium	82.4%	53.5%	28.2%
H41.4	Bed	7.4	49	Fail	35.8%	5.9%	1.6%	Minimum	62.3%	5.3%	0.0%
H41.5	Bed	13.1	112	Minimum	62.6%	42.3%	17.6%	Minimum	75.0%	35.3%	3.7%
H42.1	KD	19.3	159	Medium	70.2%	57.3%	44.0%	Medium	79.3%	53.2%	34.7%
H42.2	L	14.8	121	Minimum	64.8%	46.2%	25.3%	Minimum	78.4%	46.5%	20.6%
H42.3	Bed	6.6	48	Fail	47.4%	16.8%	1.9%	Minimum	69.7%	21.1%	0.7%
H42.4	Bed	12.7	108	Minimum	62.8%	43.4%	20.0%	Minimum	77.5%	43.9%	13.6%
H42.5	Bed	11.5	91	Medium	71.9%	58.6%	45.9%	Medium	82.6%	60.3%	42.5%
H43.1	KD	19.3	159	Medium	71.0%	57.7%	44.1%	Medium	77.9%	50.4%	30.8%
H43.2	L	14.8	121	Minimum	64.8%	46.4%	28.0%	Minimum	78.0%	45.3%	20.2%
H43.3	Bed	6.6	48	Fail	47.7%	16.3%	1.4%	Minimum	69.1%	15.6%	0.6%
H43.4	Bed	12.7	108	Minimum	63.2%	43.7%	20.7%	Minimum	76.4%	42.0%	9.6%
H43.5	Bed	11.5	91	Medium	71.3%	58.5%	45.0%	Medium	82.8%	60.6%	41.9%
H44.1	KD	19.3	159	Medium	69.3%	56.2%	42.4%	Minimum	77.2%	49.6%	30.6%
H44.2	L	14.8	121	Minimum	66.6%	47.5%	26.9%	Minimum	80.0%	47.9%	21.4%
H44.3	Bed	6.6	48	Fail	46.0%	15.5%	2.0%	Minimum	69.3%	19.7%	0.3%
H44.4	Bed	12.7	108	Minimum	61.1%	40.8%	15.5%	Minimum	78.1%	42.8%	10.9%
H44.5	Bed	11.5	91	Medium	71.8%	59.2%	45.8%	Medium	83.2%	60.5%	43.1%
H45.1	LKD	25.0	220	Medium	74.8%	60.7%	45.8%	Medium	82.9%	56.0%	36.3%
H45.2	Bed	11.5	88	Minimum	57.0%	37.2%	15.7%	Minimum	70.5%	30.1%	6.2%
H46.1	LKD	23.6	202	Medium	72.4%	56.0%	40.0%	Medium	84.3%	59.4%	38.4%
H46.2	Bed	11.5	88	Minimum	61.4%	41.1%	17.7%	Minimum	78.2%	43.4%	14.9%
H47.1	KD	14.5	126	High	75.3%	63.8%	50.6%	High	85.6%	67.2%	50.2%
H47.2	L	20.6	187	Medium	73.5%	60.8%	47.1%	Medium	84.9%	64.3%	46.0%
H47.3	Bed	11.8	93	Medium	68.7%	50.3%	29.4%	Medium	82.3%	54.1%	28.0%
H47.3	Bed	11.8	93	Minimum	68.2%	49.4%	29.5%	Medium	82.8%	54.2%	29.2%
H47.4	Bed	7.4	49	Fail	37.3%	9.0%	2.3%	Minimum	61.8%	6.6%	0.0%
H47.4	Bed	7.4	49	Fail	36.5%	7.6%	2.4%	Minimum	65.6%	11.0%	0.9%
H47.5	Bed	13.1	112	Minimum	61.7%	40.6%	16.6%	Minimum	76.8%	39.6%	9.0%
H47.5	Bed	13.1	112	Minimum	62.2%	42.6%	18.1%	Minimum	76.0%	38.2%	8.3%
H48.1	KD	14.5	126	Medium	75.3%	62.3%	48.1%	Medium	86.1%	67.9%	49.5%
H48.2	L	20.6	187	Medium	73.8%	60.9%	46.4%	Medium	85.4%	65.2%	46.9%
H49.1	LKD	25.0	220	High	76.9%	65.2%	52.2%	Medium	84.9%	64.2%	46.3%
H49.2	Bed	11.5	88	Minimum	60.0%	42.0%	24.5%	Minimum	71.0%	33.4%	15.1%
H50.1	LKD	23.6	202	Medium	73.2%	58.4%	41.5%	Medium	84.6%	62.3%	41.4%
H50.2	Bed	11.5	88	Medium	67.5%	53.2%	38.0%	Medium	80.9%	56.1%	36.5%
H51.1	KD	19.3	159	Minimum	65.9%	47.3%	26.3%	Minimum	76.3%	40.1%	14.2%
H51.2	L	14.8	121	Medium	66.1%	51.6%	36.1%	Minimum	77.0%	48.7%	28.3%

EN17037:2018 Table A.1 Daylight Provision Room Schedule											
Space ID	Description	Area m^2	Sensor Count	Target Illuminance	300lux_50	500lux_50	750lux_50	Minimum Target Illuminance	100lux_95	300lux_95	500lux_95
H51.3	Bed	6.6	48	Minimum	55.2%	34.9%	24.0%	Minimum	70.3%	33.7%	16.0%
H51.4	Bed	12.7	108	Medium	65.3%	51.5%	34.4%	Minimum	77.6%	50.0%	28.0%
H51.5	Bed	11.5	91	Medium	68.2%	50.3%	31.4%	Medium	81.9%	52.6%	27.4%
H52.1	KD	19.3	159	Minimum	66.8%	48.0%	26.8%	Minimum	76.1%	39.9%	12.9%
H52.2	L	14.8	121	Medium	67.4%	53.7%	39.0%	Medium	77.8%	51.8%	30.7%
H52.3	Bed	6.6	48	Minimum	54.7%	35.6%	23.4%	Minimum	70.7%	33.3%	14.2%
H52.4	Bed	11.5	91	Minimum	67.0%	48.5%	28.5%	Medium	81.9%	53.0%	28.0%
H52.4	Bed	12.7	108	Medium	65.4%	51.5%	34.8%	Medium	78.1%	51.0%	29.5%
H53.1	KD	19.3	159	Minimum	68.1%	50.0%	30.3%	Minimum	77.4%	44.9%	19.1%
H53.2	L	14.8	121	Medium	68.9%	54.8%	40.6%	Medium	81.1%	56.9%	38.1%
H53.3	Bed	6.6	48	Minimum	55.9%	37.2%	25.5%	Minimum	73.7%	38.4%	20.7%
H53.4	Bed	12.7	108	Medium	68.1%	54.4%	38.9%	Medium	80.0%	55.0%	34.3%
H53.5	Bed	11.5	91	Medium	68.0%	50.0%	31.8%	Medium	83.1%	54.4%	30.9%

Table 22: Daylight Provision individual values for all habitable rooms to EN 17037 Table A.1.

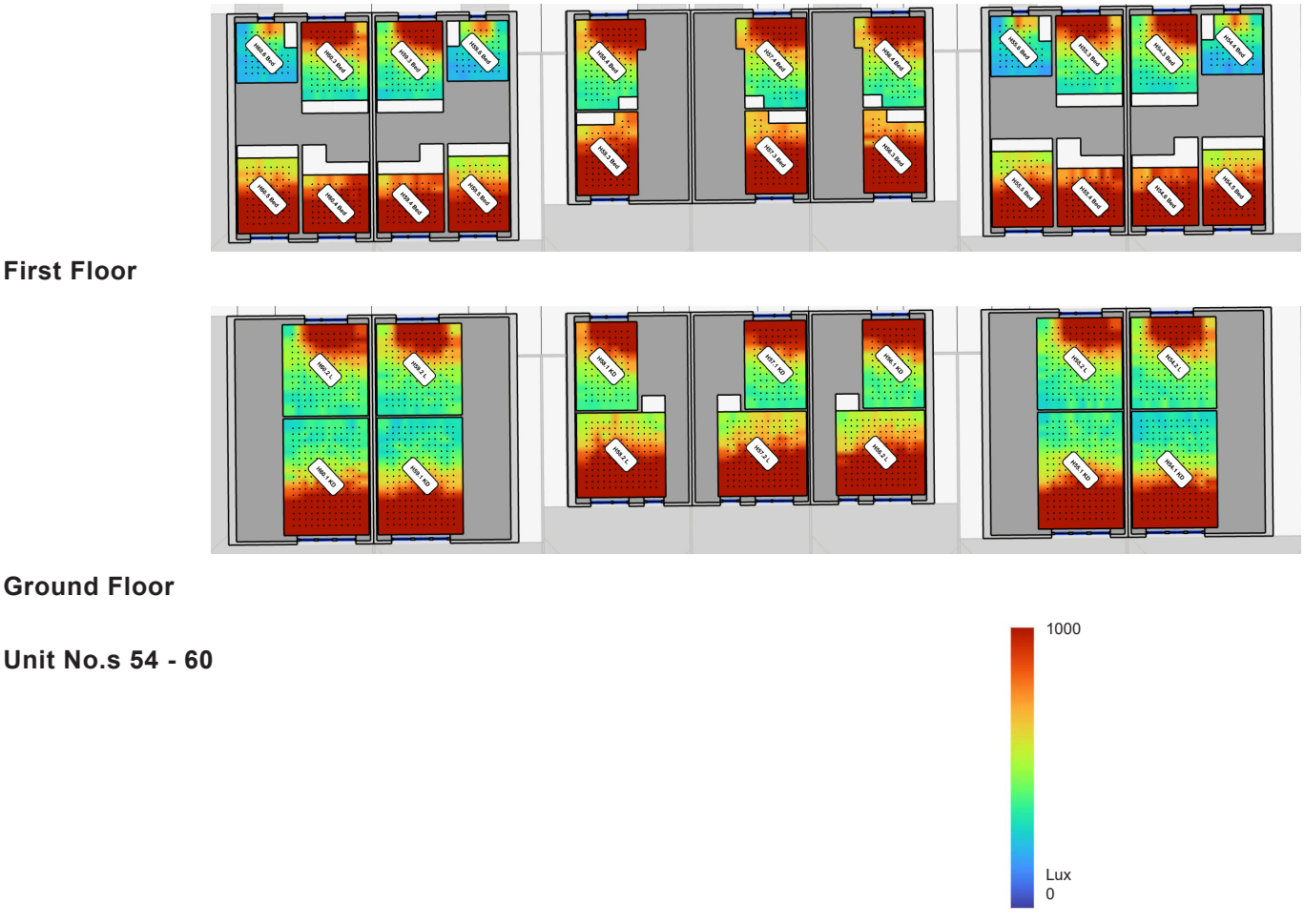


Figure 31: Daylight Provision and Annual Average Illuminance to all habitable rooms

EN17037:2018 Table A.1 Daylight Provision Room Schedule											
Space ID	Description	Area [m^2]	Sensor Count	Target Illuminance	300lux_50	500lux_50	750lux_50	Minimum Target Illuminance	100lux_95	300lux_95	500lux_95
H54.1	KD	22.4	204	Minimum	60.1%	43.0%	28.1%	Minimum	69.7%	30.7%	14.1%
H54.2	L	17.6	156	Minimum	63.7%	42.7%	19.7%	Minimum	79.3%	46.6%	19.1%
H54.3	Bed	11.7	99	Minimum	64.0%	43.7%	21.2%	Minimum	78.5%	44.5%	15.6%
H54.4	Bed	7.6	56	Fail	43.5%	13.5%	4.0%	Minimum	67.4%	14.8%	0.8%
H54.5	Bed	10.4	80	Medium	72.4%	60.0%	47.2%	Medium	81.6%	58.0%	36.7%
H54.6	Bed	8.7	72	High	75.6%	65.0%	53.0%	High	85.4%	66.2%	50.6%
H55.1	KD	22.4	204	Minimum	62.9%	47.9%	33.2%	Minimum	72.8%	39.7%	22.8%
H55.2	L	17.6	156	Minimum	63.0%	41.8%	19.0%	Minimum	79.0%	45.0%	16.7%
H55.3	Bed	11.7	99	Minimum	63.7%	43.5%	20.8%	Minimum	78.7%	44.7%	16.5%
H55.4	Bed	8.7	72	High	75.6%	65.5%	53.2%	Medium	85.1%	65.7%	48.9%
H55.5	Bed	10.4	80	Medium	72.2%	60.0%	46.7%	Medium	80.3%	56.2%	33.7%
H55.6	Bed	7.6	56	Fail	40.3%	11.2%	2.7%	Minimum	69.4%	15.8%	0.6%
H56.1	KD	12.2	96	Minimum	68.7%	49.2%	27.8%	Medium	81.6%	51.1%	23.9%
H56.2	L	16.9	156	Medium	70.3%	56.7%	43.4%	Medium	80.1%	54.4%	34.4%
H56.3	Bed	10.4	84	High	75.3%	64.6%	52.5%	Medium	84.2%	63.7%	46.8%
H56.4	Bed	12.5	112	Medium	69.4%	50.6%	30.5%	Minimum	80.6%	49.5%	22.6%
H57.1	KD	12.2	96	Minimum	67.5%	47.7%	25.9%	Minimum	80.8%	49.4%	21.8%
H57.2	L	16.9	156	Medium	70.5%	57.2%	43.3%	Medium	80.2%	54.8%	34.2%
H57.3	Bed	10.4	84	High	74.8%	63.8%	51.0%	Medium	83.6%	62.6%	45.1%
H57.4	Bed	12.5	112	Medium	68.7%	50.1%	29.7%	Minimum	79.7%	47.4%	20.4%
H58.1	KD	12.2	96	Medium	70.6%	51.9%	31.6%	Medium	82.4%	52.6%	26.0%
H58.2	L	16.9	156	Medium	71.0%	57.6%	43.3%	Medium	80.1%	54.4%	33.4%
H58.3	Bed	10.4	84	High	74.3%	63.0%	50.7%	Medium	84.2%	64.0%	47.4%
H58.4	Bed	12.5	112	Medium	70.3%	51.6%	32.2%	Minimum	81.0%	49.6%	21.8%
H59.1	KD	22.4	204	Minimum	61.1%	44.2%	28.5%	Minimum	70.4%	31.8%	15.8%
H59.2	L	17.6	156	Minimum	64.0%	42.9%	19.9%	Minimum	79.2%	46.3%	17.4%
H59.3	Bed	11.7	99	Minimum	65.8%	45.4%	23.1%	Minimum	78.7%	44.6%	13.7%
H59.4	Bed	8.7	72	High	75.0%	64.5%	52.2%	Medium	84.9%	65.3%	49.2%
H59.5	Bed	10.4	80	Medium	72.0%	59.6%	45.7%	Medium	80.2%	55.9%	33.6%
H59.6	Bed	7.6	56	Fail	38.9%	10.9%	3.4%	Minimum	66.8%	12.1%	0.6%
H60.1	KD	22.4	204	Minimum	63.2%	49.0%	32.0%	Minimum	72.3%	37.9%	20.0%
H60.2	L	17.6	156	Minimum	64.4%	43.4%	20.7%	Minimum	79.2%	46.6%	18.8%
H60.3	Bed	11.7	99	Minimum	65.6%	46.0%	23.5%	Minimum	78.3%	44.1%	15.0%
H60.4	Bed	8.7	72	High	75.5%	65.3%	53.2%	Medium	84.5%	64.7%	48.8%
H60.5	Bed	10.4	80	Medium	72.5%	61.0%	48.0%	Medium	81.9%	59.2%	38.3%
H60.6	Bed	7.6	56	Fail	39.0%	9.9%	3.0%	Minimum	69.8%	17.1%	2.1%

Table 23: Daylight Provision individual values for all habitable rooms to EN 17037 Table A.1.

Appendix C - Sunlight Hours for Living Spaces

Sunlight Hours			
Unit ID	LKD window within 90° South	No. sunlight hours on 21st March	Compliance
H01.1	No	1.5	Minimum
H02.1	Yes	6.8	High
H03.1	No	0.7	Below criteria
H04.1	Yes	7.1	High
H05.1	No	1.2	Below criteria
H06.1	Yes	7.3	High
H07.1	Yes	0.8	Below criteria
H08.1	Yes	7.3	High
H10.1	Yes	5.8	High
H11.1	Yes	5.9	High
H24.1	Yes	5.5	High
H25.1	Yes	7.2	High
H30.1	No	0.8	Below criteria
H31.1	No	1.1	Below criteria
H34.1	Yes	6.3	High
H35.1	Yes	5.8	High
H45.1	No	0.0	Below criteria
H46.1	No	1.8	Minimum
H49.1	Yes	7.3	High
H50.1	Yes	6.4	High

Table 24: Sunlight hours to living spaces in duplex

Appendix D - Sun on the Ground for Amenity of Houses and Duplex units

Sunlight on the Ground - Private Amenity			
Plot No.	Location in duplex units	% Area receiving 2 hours sunlight on 21st March	Meets Criteria
No.1	Rear	66.6%	Y
No.3	Rear	50.0%	Y
No.5	Rear	50.7%	Y
No.7	Rear	64.1%	Y
No.9		62.6%	Y
No.10	Front	85.4%	Y
No.12		55.2%	Y
No.13		57.4%	Y
No.14		57.4%	Y
No.15		57.4%	Y
No.16		57.4%	Y
No.17		67.8%	Y
No.18		66.6%	Y
No.19		58.3%	Y
No.20		58.3%	Y
No.21		58.3%	Y
No.22		52.0%	Y
No.23		55.4%	Y
No.24	Front	91.6%	Y
No.26		50.2%	Y
No.27		86.2%	Y
No.28		84.2%	Y
No.29		89.7%	Y
No.30	Rear	58.1%	Y
No.32		80.6%	Y
No.33		58.7%	Y
No.34	Front	83.3%	Y
No.36		62.9%	Y
No.37		55.6%	Y
No.38		83.5%	Y
No.39		82.5%	Y
No.40		82.7%	Y
No.41		81.4%	Y
No.42		85.8%	Y
No.43		84.5%	Y
No.44		89.6%	Y
No.45	Rear	59.0%	Y
No.47		81.5%	Y
No.48		58.6%	Y
No.49	Front	83.3%	Y
No.51		62.9%	Y
No.52		55.6%	Y
No.53		81.3%	Y
No.54		88.8%	Y
No.55		85.7%	Y
No.56		88.9%	Y
No.57		84.4%	Y
No.58		85.5%	Y
No.59		87.6%	Y
No.60		98.7%	Y

Table 25: Sun on the ground to private amenity spaces at ground level