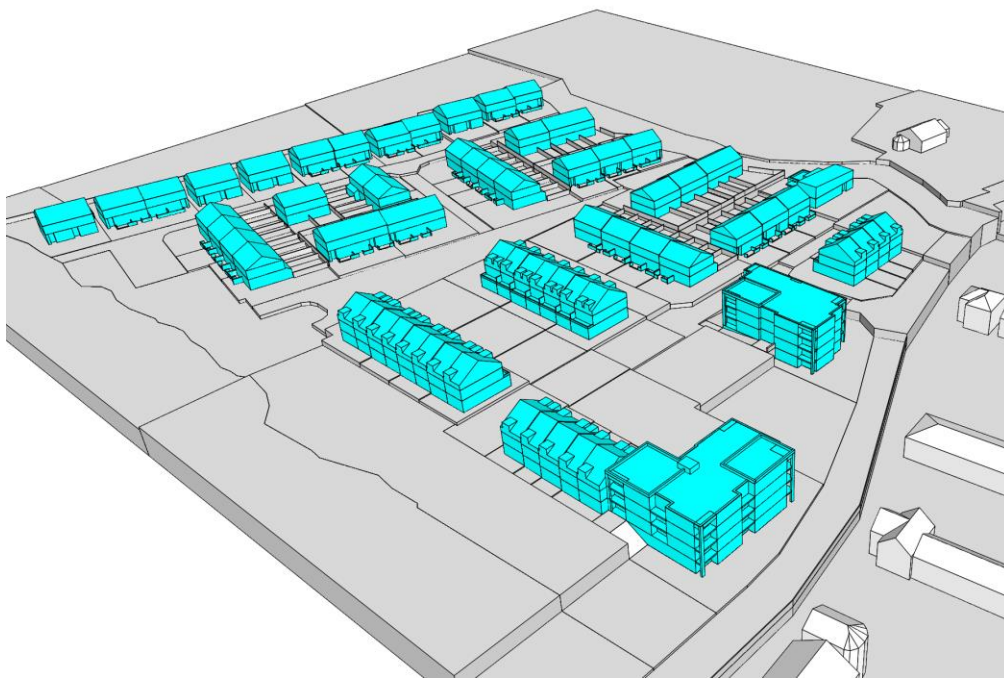




# Bóthar an Chóiste, Galway

*Daylight, Sunlight and Overshadowing Study*



Report For: Lock House Developments Ltd

Project No: 16296

# Version History

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## 1 Executive Summary

This report summarises the analyses undertaken to quantify the Sunlight and Daylight performance of the proposed Bóthar an Chóiste development located in Galway, Ireland. The report focuses on measuring the daylight and sunlight impact to the existing surrounding dwellings as well as the daylight and sunlight performance within the proposed development.

### 1.1 Planning Authority Guidelines

Currently there are a number of different standards and guidelines which, in the writing of this report, appropriate and reasonable regard has been taken to address. It should be noted at this point that the *BS 8206-2: 2008 – ‘Lighting for Buildings – Part 2: Code of Practice for Daylighting’* has been included within this report even though it has now been withdrawn because the BRE guide ‘Site Layout Planning for Daylight and Sunlight’ (2<sup>nd</sup> edition) and the BS 8206-2: 2008 directly refer to each other as noted within the BRE guide (2<sup>nd</sup> edition) itself as below.

“This guide gives advice on site layout planning to achieve good sunlight and daylight both within buildings and in the open spaces between them. It is intended to be used in conjunction with the interior daylight recommendations in the British Standard Code of practice for daylighting, *BS 8206-2: 2008*.”

In addition to this, The Sustainable Urban Housing: Design Standards for New Apartments December 2020 states the following in Section 6.6:

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

However, there is a new standard for the assessment of daylight access within buildings titled *“EN 17037:2018: Daylight in Buildings”* which has been adopted in Ireland as IS EN 17037:2018. This new standard is not directly referred to within the latest Planning Authority Guidelines whereas the BRE Guide (2<sup>nd</sup> Edition) and BS 8206-2:2008 are referred to.

Furthermore, the EN 17037:2018 standard has already been adopted in the UK to inform the BS EN 17037:2018 standard which supersedes BS 8206-2:2008 which is now withdrawn. It is important to note that BS EN 17037:2018 includes a National Annex which specifically addresses daylight provision in residential dwellings in the UK. A similar annex is not included in the IS EN 17037:2018 standard.

Finally, the latest BRE guide ‘Site Layout Planning for Daylight and Sunlight’ (3<sup>rd</sup> edition) has just been published (June 2022). This now directly links to the new daylighting standards EN 17037:2018. Aside from the refinements to the BRE guide, the assessments are the same as what is found within the 2<sup>nd</sup> edition.

With regards to interior daylighting and external sunlight exposure in particular, where different methodologies are found in each of the different standards, all methodologies have been employed for completeness to ensure appropriate and reasonable regard has been taken to address all assessments under all of the different standards. For clarity these are listed below and the following Section 1.2 denotes which standard is applicable for each assessment type:

- BRE Guide – 2<sup>nd</sup> Edition/3<sup>rd</sup> Edition of BR 209 BRE Site Layout Planning for Daylight and Sunlight
- BS 8206-2:2008 – Lighting for Buildings – Part 2: Code of Practice for Daylighting
- IS EN 17037:2018 – Daylight in Buildings
  - This is the Irish implementation of the European EN 17037:2018 standard
- BS EN 17037:2018 – Daylight in Buildings
  - This is the UK implementation of the European EN 17037:2018 standard. It supersedes BS 8206-2:2008 which is withdrawn in the UK. The BS EN standard includes a National Annex which addresses daylight requirements specific to dwellings which is notable as Ireland’s climate matches closely with the UK.

## 1.2 Reference Standards & Summary of Assessments Undertaken

The various daylight and sunlight assessments that were undertaken using the IES VE software are based on a number of different standards which are referenced in the individual sections of this report. For clarity, the assessments that were undertaken are summarised below as well as the reference standards that were used for each (where applicable):

- **Shadow Analysis**
  - Assessed using shadow images cast at key times throughout the year, i.e. March 21<sup>st</sup>, June 21<sup>st</sup> and December 21<sup>st</sup> to determine if any overshadowing impact occurs and to what extent to any existing neighbouring dwellings in accordance with the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions).
- **Sunlight to Amenity Spaces**
  - Assessed using annual Solar Exposure calculations to determine any impact to existing amenities and the sunlight received and also to assess the proposed developments amenity spaces to derive how much sunlight they can expect to receive in accordance with the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions).

- **Sunlight to Existing Buildings**
  - Assessed using the Annual Probable Sunlight Hours (APSH) method in accordance with the BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> & 3<sup>rd</sup> Edition) - to determine any impact to sunlight received to the existing neighbouring building main living areas.
- **Sunlight to Proposed Buildings**
  - Assessed using the Annual Probable Sunlight Hours (APSH) method in accordance with the BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> Edition)
  - Assessed using Solar Exposure calculations in accordance with IS EN 17037:2018 (BRE Guide 3<sup>rd</sup> Edition)
  - In both assessments above the aim is to derive how much sunlight proposed development can expect to receive.
- **Daylight to Existing Buildings**
  - Assessed using the Vertical Sky Component (VSC) method in accordance with the BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> & 3<sup>rd</sup> Edition) - to determine any impact to existing daylight received to the existing building neighbouring the site.
- **Daylight to Proposed Development**
  - Assessed using the Average Daylight Factor (ADF) method in accordance with the BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> Edition)
  - Assessed in accordance with IS EN 17037:2018 Method 2 (BRE Guide 3<sup>rd</sup> Edition)
  - Assessed in accordance with BS EN 17037:2018 National Annex Method 2 (BRE Guide 3<sup>rd</sup> Edition)
  - In all assessments above the aim is to derive how much daylight will be received within each of the apartments within the proposed development.
- **View Out**
  - Assessed in accordance with IS EN 17037:2018 (BRE Guide 3<sup>rd</sup> Edition)
- **Glare**
  - Assessed in accordance with IS EN 17037:2018 (BRE Guide 3<sup>rd</sup> Edition)

The following can be concluded based on the assessments undertaken:

### **1.3 Shadow Analysis**

The shadow analysis illustrates different shadows being cast at key times of the year (March 21<sup>st</sup>, June 21<sup>st</sup> and December 21<sup>st</sup>) for the Existing Situation and the Proposed Scheme. The results from the study are summarised as follows:

#### **Apartment 122, Castlegar South**

No additional shading from the proposed development is observed on this residential property throughout the year.

## **82-90, 112-120 Cluain Riocaird South**

No additional shading from the proposed development is observed on this residential property throughout the year.

### **Residential Dwelling East**

No additional shading from the proposed development is observed on this residential property for the majority of the year. Very minimal overshadowing noted late evenings in March.

The potential shading impact is quantified via the “Sunlight to Amenity Spaces” and “Daylight to Existing Buildings” sections of this report.

## **1.4 Sunlight to Amenity Spaces**

The BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions) states that for a space to appear adequately sunlit throughout the year, at least half of a garden or amenity space should receive at least 2 hours of sunlight on March 21<sup>st</sup>. In the case of existing amenity spaces, if they are already below the 50% threshold then the BRE recommends the results are kept to within 80% of the existing situation with the proposed development in place.

### **Existing Amenity Spaces**

On March 21<sup>st</sup> the existing amenity spaces will receive the same level of sunlight with the proposed development in place. In all cases the results comply with the recommendations in the BRE Guide outlined above.

### **Proposed Amenity Spaces**

On March 21<sup>st</sup>, 100% of the combined proposed public and communal amenity areas situated within the development site will receive at least 2 hours of sunlight over their total combined area. When the communal area is considered individually, it continues to meet the BRE recommendations with 100% of its area receiving at least 2 hours of sunlight. All amenity areas provided will be quality spaces in terms of sunlight.

In addition, all individual areas tested perform as expected. Those facing predominantly north are noted to be below the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions) recommendations as they are shaded by the property on the plot. Those south facing are achieving at least 2 hours of sunlight over 50% of their area on the 21<sup>st</sup> of March.

## **1.5 Sunlight to Existing Buildings**

This study considers the existing scheme and tests if the Annual Probable Sunlight Hours (APSH) results for the living room windows are greater than 25% annual and 5% winter

sunlight or are greater than 0.8 times their former value with the proposed development in place.

Based on the criteria outlined in Section 3.2.7 of the BRE Guide 2<sup>nd</sup> Edition and Section 3.2.9 of the BRE Guide 3<sup>rd</sup> Edition, only one of the existing buildings fit the requirements to be assessed and as such the APSH assessment was only conducted for this property. The BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions) notes that there should be no impact to sunlight for the rest of the properties.

“It is not always necessary to do a full calculation to check sunlight potential. The guideline above is met provided either the following is true:

- If the window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal. Again, obstructions within 90° of due north need not be counted.”

Given the statement above the existing properties adjacent to the proposed development were verified noting that, in a section perpendicular to the window wall, no angle subtended more than 25° and, in some cases, they were also sitting to the south of the proposed development. Therefore, only one existing property was included in the assessment while the rest were excluded on the basis, as noted in section 3.2.7 of the BRE Guide 2<sup>nd</sup> Edition and Section 3.2.9 of the BRE Guide 3<sup>rd</sup> Edition, that these windows need not be analysed as sunlight impact will be unnoticeable to the occupants.

When compared to the Existing Situation, of the 6 no. points tested, 100% (6 no. points) meet both the annual and winter recommendations in the BRE Guide.

## 1.6 Sunlight to Proposed Development

For the sunlight to proposed development assessment, two standards have been analysed: BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> Edition) and IS EN 17037:2018 (BRE Guide 3<sup>rd</sup> Edition). The results under each standard are summarised below.

### **BRE Guide 2<sup>nd</sup> Edition / BS 8206-2:2008**

Within the BS 8206-2:2008 standard (BRE Guide 2<sup>nd</sup> Edition), when discussing annual probable sunlight hours regarding proposed developments, it is noted that:

*“The degree of satisfaction is related to the expectation of sunlight. If a room is necessarily North facing or if the building is in a densely-built urban area, the absence of sunlight is more acceptable than when its exclusion seems arbitrary”.*

This is also reflected in the BRE Guide (2<sup>nd</sup> Edition) which states:



*“The BS 8206-2 criterion applies to rooms of all orientations, although if a room faces significantly north of due east or west it is unlikely to be met.”*

Based on the above criteria for the BRE Guide 2<sup>nd</sup> Edition/BS8206-2:2008, all main living room windows within the proposed development apartments and duplexes have been assessed and a sampling of the house types properties have been assessed with the results included in the following sections.

The sample was aligned with the properties selected for the daylight sampling. As such a sample were chosen from the middle of rows or locations that were in close proximity to neighbouring proposed properties which would be seen as worst-case location as a check on performance with regards to sunlight. Properties in the same orientation will produce very similar if not identical results.

Of the 128 no. points tested, 121 no. points (95%) meet the BRE recommended values over both the annual and winter periods. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, i.e. windows facing *“significantly north of due east or west”* or as a consequence of the impact of balcony projections.

It should be noted that in the development of any apartment type building achieving in the region of 75% to 80% for this assessment would be considered very high and factors such as site constraints and ultimately orientation play a huge part to the outcome of this assessment. In some instances, particularly a scheme like this where you have apartments on either side of a rectangular block, 50% would be the highest percentage achievable. This is because the apartments on one side are not able to meet the requirements based on orientation as noted and the inclusion of balconies within the design scheme (as a requirement).

### **BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018**

As the sunlight exposure assessment in accordance with IS EN 17037:2018 (BRE Guide 3<sup>rd</sup> Edition) considers the orientation of the rooms similar to the BRE Guide 2<sup>nd</sup> Edition/ BS 8206-2:2008 assessment above, it can also be concluded that the criteria for rooms facing significantly north of due east or west is unlikely to be met.

Of the 128 no. points tested, 122 no. points (95%) meet the BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21<sup>st</sup>. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, or as a consequence of the impact of balcony projections.

Overall, the sunlight provision results to the proposed development in accordance with IS EN 17037:23018 are considered excellent in the context of a suburban environment, due to the fact that not all living rooms can face south and the inclusion of balconies.

Note, the sunlight exposure results are visually represented in Appendix B.

### 1.7 Daylight to Existing Buildings

Based on the criteria outlined in Section 2.2.5 of the BRE guidance (2<sup>nd</sup> and 3<sup>rd</sup> Editions), only one of the neighbouring dwellings is required to be included within the VSC assessment as the rest did not meet the criterion as laid out within the BRE guide.

It is not always necessary to do a full calculation to check daylight potential. The guideline above is met provided the following is true:

- no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal.

Given the statement above the existing surrounding dwellings and the proposed development were verified noting that in a section perpendicular to the window wall, no angle subtended more than 25°. Therefore, as noted above, only one of the existing adjacent dwellings has been included within the VSC assessment as the daylight impact will be unnoticeable to the occupants for the remaining existing properties.

When compared to the Existing Situation, of the 6 no. points tested, 100% (6 points) have a Proposed VSC value greater than 27% or not less than 0.8 times their former value compared to the Existing Situation, thus complying with the BRE recommendations.

### 1.8 Daylight to Proposed Development

For the daylight to proposed development assessment, three standards have been analysed: BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> Edition), IS EN 17037:2018 and BS EN 17037:2018 National Annex (BRE Guide 3<sup>rd</sup> Edition). The results under each standard are summarised below.

To note, a sample of the duplexes and houses have been selected as these property types do not experience the same daylight issues that apartments generally do. As such a sample were chosen from the middle of rows or locations that were in close proximity to neighbouring proposed properties which would be considered a worst-case location as a check that there were no performance issues with regards to daylight.

#### **BRE Guide 2<sup>nd</sup> Edition / BS 8206-2:2008**

Across the proposed development, 98% of the tested rooms are achieving Average Daylight Factors (ADF) in accordance with the BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> Edition) when Living/Kitchen/Dining spaces are assessed as whole rooms against a 2% ADF target and Bedrooms against a 1% ADF target. The majority of rooms that are below the recommendations are located on the lower floors. However, overall the quality of daylight provision across the development can be considered high.

### **Compensatory Measures**

With regards to internal daylighting, Section 6.7 of the Sustainable Urban Housing: Design Standards for New Apartments December 2020, states the following:

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

Furthermore, Section 3.2 of the Urban Development and Building Heights: Guidelines for Planning Authorities December 2018, states the following:

*Where a proposal may not be able to fully meet all the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, in respect of which the planning authority or An Bord Pleanála should apply their discretion, having regard to local factors including specific site constraints and the balancing of that assessment against the desirability of achieving wider planning objectives. Such objectives might include securing comprehensive urban regeneration and or an effective urban design and streetscape solution.*

Having regard to the statements above, it should be noted that throughout the design process the design team worked hard to optimise the whole development to maximise the daylight within the proposed scheme. Original daylight results were producing overall figures of 89% for the 2% target. Optimisation solutions were tested which included the following:

- Increase to window areas to allow more daylight into the proposed Living/Kitchen/Dining areas within the apartments, duplexes and terraced housing
- Changes to layouts to improve daylight to the Living/Kitchen/Dining areas within the duplexes including the removal of the lobby to increase the window widths and the reduction of the room depths in certain Living/Kitchen/Dining areas.

The inclusion of the above design solutions produced a high standard of daylight results of 98% for the 2% target.

In addition to this, design features have been incorporated into the development where rooms do not achieve the daylight provision targets in accordance with the standards they

were assessed against. These design features again help to balance off and compensate the lower levels of daylight measured in the applicable spaces and are summarised as follows:

- 68.4% of the apartment units have a floor area 10% greater than the minimum floor area requirements as required by the Design Standards (Dec 2020). Note that larger floor areas make it more difficult to achieve the recommended daylight levels. However, larger windows have been incorporated into the design which also improves the view out for the building occupants.
- 73.6% of the apartment units are dual aspect which is above the 50% minimum requirement as required by the Design Standards (Dec 2020). As a result, more apartment units than the recommended minimum will achieve quality daylight from dual-aspect orientations.
- The proposed scheme provides 5,841sq.m of communal amenity space, thus exceeding the 5,698sq.m required pursuant to the Design Standards (Dec 2020)

### **BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018**

It is important to note that IS EN 17037:2018 (BRE Guide 3<sup>rd</sup> Edition) does not provide different illuminance targets for different space types. Therefore, in the case of residential developments; bedrooms, living rooms, kitchens and combined LKDs all have the same daylight provision targets.

There are two methods to assess daylight provision to the interior which are based on target values in either Table A.1 or Table A.3 of IS EN 17037:2018 which are summarised as follows:

Method 1: This calculation method uses the daylight factor targets on the reference plane as per Table A.3 (refer to Section 10.1.2 of this report). The assessment is carried out on a representative day and time during the year, i.e. 21<sup>st</sup> September @ 12:00 under standard CIE overcast sky conditions.

Method 2: This calculation method uses the illuminance targets on the reference plane as per Table A.1 (refer to Section 10.1.2 of this report). The assessment is carried out for each hour over the course of the year (8,760 hours) using a local weather file which accounts for varying sky conditions and sun positions throughout the year.

As outlined in Section 5.1.4 of the standard, the verification of daylight provision can be determined using either an adequate software or on-site measurements. When using a software, *“a representative model of the space is required together with the key parameters (such as any significant nearby obstructions, the assigned surface reflectance values and glazing transmissivity) that are a reasonable representation of those for the actual, completed building. This can be determined using either Method 1 or Method 2.”*

Based on the above criteria, the daylight provision to the proposed development has been assessed using an adequate software (i.e. IES VE), using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table A.1 of IS EN 17037:2018.

The Method 2 climate-based approach was selected as it is a far more accurate assessment method compared to Method 1. Climate based daylight modelling (CBDM) is more accurate compared to a calculation based on a single day during the year, i.e. Method 1. The amount of daylight varies throughout the year, primarily due to the sun's position, so it is essential the impact of daylight variance is properly considered. CBDM utilises an annual simulation linking location, shading, climate data (including solar intensity and cloud cover) together with the building properties. This provides a complete overview on how the daylight performance varies throughout the year due to changes in these factors.

Across the proposed development, 95% of the tested rooms are achieving the daylight provision targets in accordance with Table A.1 of IS EN 17037:2018 using Method 2.

### **BRE Guide 3<sup>rd</sup> Edition / BS EN 17037:2018 National Annex**

In the UK, EN17037:2018 was adopted to form "BS EN 17037:2018". However, a National Annex was included which states:

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

Whereas IS EN 17037:2018 does not provide different illuminance targets for different space types, the BS EN 17037:2018 National Annex provides target illuminance values for bedrooms, living rooms and kitchens within residential developments as per Table NA.1 (refer to Section 10.1.3 of this report). It is also important to note that as the climate in Ireland is similar to the UK, the targets outlined in the BS EN National Annex could also be applied to dwellings in Ireland.

The BS National Annex also states:

*"Where one room in a UK dwelling serves more than a single purpose, the UK committee recommends 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.”*

Therefore, combined LKDs were assessed using a 200 lux target illuminance ( $E_T$ ).

Across the proposed development, 98% of the tested rooms are achieving the daylight provision targets in accordance with Table NA.1 of BS EN 17037:2018 using Method 2.

## **1.9 View Out**

The View Out assessment is related to buildings such as offices or schools where seating layouts are typically fixed compared to domestic settings where an occupant can move around the space freely. In their own home occupants can choose to sit near to or even at a window which will inevitably provide the varying layers of a ‘View Out’ such as the ground, landscape or sky. This ability to choose their position within a domestic setting means they would always have access to a position in the apartment with the minimum requirements of ‘View Out’. Therefore, all the properties would meet the minimum requirement as outlined in IS EN 17037:2018/ BS EN 17037:2018 National Annex (BRE Guide 3<sup>rd</sup> Edition).

## **1.10 Glare**

As outlined in IS EN 17037:2018/ BS EN 17037:2018 National Annex (BRE Guide 3<sup>rd</sup> Edition), a Glare assessment is suggested in spaces where the *“expected activities are comparable to reading, writing or using display devices and the user is not able to choose freely their position and viewing direction”*. Given that occupants within a domestic setting are free to move around, on this basis a glare assessment for the proposed development has not been carried out.

## **1.11 Observations**

It is important to note that the recommendations within the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions) itself states *“although it gives numerical guidelines these should be interpreted flexibly because natural lighting is only one of many factors in site layout design”*, Although this is true appropriate and reasonable regard has still been taken to the BRE guide.

Whilst the results shown relate to the criteria as laid out in the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions), it is important to note that the BRE targets are guidance only and should therefore be used with flexibility and caution when dealing with different types of sites.

In addition, the foreword of BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> Edition) also states *“The aim of the standard is to give guidance to architects, builders and others who carry out lighting design. It is recognised that lighting is only one of many matters that influence fenestration. These include other aspects of environmental performance (such as noise, thermal equilibrium and the control of energy use), fire hazards, constructional requirements, the external*

*appearance and the surroundings of the site. The best design for a building does not necessarily incorporate the ideal solution for any individual function. For this reason, careful judgement needs to be exercised when using the criteria given in the standard for other purposes, particularly town planning control.”*

Taking all of the above information into account and based on the results from each of the assessments undertaken, the proposed development performs well when compared to the recommendations in the BRE Guide 2<sup>nd</sup> Edition/ BS 8206-2:2008 and the BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018 /BS EN 17037:2018 National Annex. With regards to the existing properties there is a negligible impact when considering sunlight and daylight as a result of the proposed development and the proposed development itself performs well with the same regard.

## 2 Introduction

This report summarises the analyses undertaken to quantify the Sunlight and Daylight performance of the proposed Bóthar an Chóiste development located in Galway, Ireland. The report focuses on measuring the daylight and sunlight impact to the existing surrounding dwellings as well as the daylight and sunlight performance within the proposed development.

### 2.1 Development Description

Planning permission is sought by Lock House Developments Limited (the applicant) for development on a site which extends to 4.626 ha on lands located to the north of Bóthar an Chóiste (also known as Bóthar na Cóiste), in the townland of Castlegar, Galway.

The development will consist of the following:

- 1) Demolition of an existing house (124.6 m<sup>2</sup>), a ruined outbuilding (42.8 m<sup>2</sup>), and a ruined dwelling (41.7 m<sup>2</sup>)
- 2) Construction of 170 no. residential units comprising:
  - i. 84 no. two storey houses (34 no. two-beds, 42 no. three-beds, 8 no. four-beds),
  - ii. 1 no. apartment block comprising 17 no. apartments (10 no. one-beds, 7 no. two-beds),
  - iii. 1 no. apartment block comprising 21 no. apartments (12 no. one-beds, 9 no. two-beds),
  - iv. 48 no. duplex units (11 no. one-beds, 24 no. two-beds, 13 no. three-beds).
- 3) Development of a two-storey creche facility with 46 no. child spaces (c. 300.36 sqm), associated outdoor play areas and parking.
- 4) Provision of all associated surface water and foul drainage services and connections including pumping station with all associated site works and ancillary services.
- 5) The upgrade of the existing Bóthar an Chóiste road from the proposed development to the junction at L5041 consisting of road improvements, road widening and junction re-alignment.
- 6) Pedestrian, cyclist, and vehicular links throughout the development and access with Bóthar an Chóiste, and pedestrian and cyclist link to the adjacent Greenway route.
- 7) Provision of shared communal and private open space, site landscaping and public lighting, resident and visitor parking including electric vehicle charging points, bicycle parking spaces, and all associated site development works.
- 8) The application is accompanied by a Natura Impact Statement (NIS).



### 3 BRE – Site Layout Planning for Daylight and Sunlight (2<sup>nd</sup> and 3<sup>rd</sup> Editions)

Access to daylight and sunlight is a vital part of a healthy environment. Sensitive design should provide sufficient daylight and sunlight to new residential developments while not obstructing light to existing homes nearby.

The 2<sup>nd</sup> and 3<sup>rd</sup> Editions of the BR 209 BRE Site Layout Planning for Daylight and Sunlight, advise on planning developments for good access to daylight and sunlight and is widely used by local authorities to help determine the performance of new developments.

#### 3.1 Impact Classification Discussion

BRE guidance in Appendix I (BRE Guide 2<sup>nd</sup> Edition) and Appendix H (BRE Guide 3<sup>rd</sup> Edition) – Environmental Impact Assessment suggests impact classifications as minor, moderate and major adverse. It provides further classifications of these impacts with respect to criteria summarised in the table below.

Where the loss of skylight or sunlight fully meets the guidelines in the BRE guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions), 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.

Impact	Description
<i>Negligible adverse impact</i>	<ul style="list-style-type: none"> <li>• <i>Loss of light well within guidelines, or</i></li> <li>• <i>only a small number of windows losing light (within the guidelines) or limited area of open space losing light (within the guidelines)</i></li> </ul>
<i>Minor adverse impact (a)</i>	<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 or</i></li> <li>○ <i>larger area of open space is affected (within the guidelines)</i></li> </ul> </li> </ul>
<i>Minor adverse impact (b)</i>	<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>
<i>Major adverse impact</i>	<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>

## 4 Methodology

### 4.1 Planning Authority Guidelines

It should be noted for completeness, that there is a new standard for the assessment of daylight access within buildings entitled “IS EN 17037:2018: Daylight in Buildings”. This new standard is not currently directly referred within the ‘Urban Development and Building Heights’, guidelines for Planning Authorities 2018 or the Sustainable Urban Housing: Design Standards for New Apartments December 2020.

Whereas the BRE 209 or *BS 8206-2:2008* are currently referred within the Urban Development and Building Heights, guidelines for Planning Authorities 2018 and the Sustainable Urban Housing: Design Standards for New Apartments December 2020 which states the following in Section 6.6:

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

In addition, the *BS 8206-2: 2008 – ‘Lighting for Buildings – Part 2: Code of Practice for Daylighting’* which has been included within this report even though it has now been withdrawn because the *BRE guide ‘Site Layout Planning for Daylight and Sunlight’ (2nd edition)* and the *BS 8206-2: 2008* directly refer to each other as noted within the *BRE guide itself as below.*

*“This guide gives advice on site layout planning to achieve good sunlight and daylight both within buildings and in the open spaces between them. It is intended to be used in conjunction with the interior daylight recommendations in the British Standard Code of practice for daylighting, BS 8206-2: 2008.”*

These standards have also been noted to be accepted by An Bord Pleanála.

Therefore, with regards to the different methodologies applied within this report, for clarity these are listed below and the following section 1.2 denotes which standard is applicable for each assessment type:

- BRE Guide – 2<sup>nd</sup> Edition of BR 209 BRE Site Layout Planning for Daylight and Sunlight
  - BS 8206-2:2008 – Lighting for Buildings – Part 2: Code of Practice for Daylighting
- Currently there are a number of different standards and guidelines which in the writing of this report

appropriate and reasonable regard has been taken to address. It should be noted at this point that the *BS 8206-2: 2008 – ‘Lighting for Buildings – Part 2: Code of Practice for Daylighting’* has been included within this report even although it has now been withdrawn because the BRE guide *‘Site Layout Planning for Daylight and Sunlight’ (2nd edition)* and the *BS 8206-2: 2008* directly refer to each other as noted within the BRE guide itself as below.

“This guide gives advice on site layout planning to achieve good sunlight and daylight both within buildings and in the open spaces between them. It is intended to be used in conjunction with the interior daylight recommendations in the British Standard Code of practice for daylighting, *BS 8206-2: 2008*.”

In addition to this, The Sustainable Urban Housing: Design Standards for New Apartments December 2020 states the following in Section 6.6:

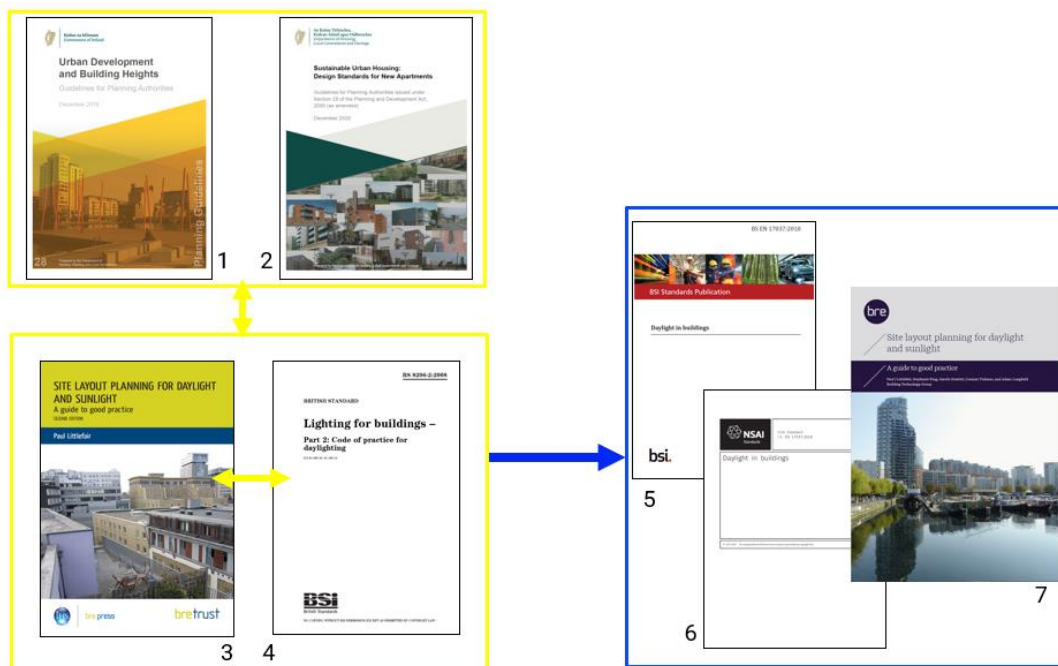
*“Planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide ‘Site Layout Planning for Daylight and Sunlight’ (2nd edition) or BS 8206-2: 2008 – ‘Lighting for Buildings – Part 2: Code of Practice for Daylighting’ when undertaken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

However, there is a new standard for the assessment of daylight access within buildings titled *“EN 17037:2018: Daylight in Buildings”* which has been adopted in Ireland as IS EN 17037:2018. This new standard is not directly referred to within the latest Planning Authority Guidelines whereas the BRE Guide and BS 8206-2:2008 are referred to.

Furthermore, the EN 17037:2018 standard has already been adopted in the UK to inform the BS EN 17037:2018 standard which supersedes BS 8206-2:2008 which is now withdrawn. It is important to note that BS EN 17037:2018 includes a National Annex which specifically addresses daylight provision in residential dwellings in the UK. A similar annex is not included in the IS EN 17037:2018 standard.

Finally, the latest BRE guide *‘Site Layout Planning for Daylight and Sunlight’ (3<sup>rd</sup> edition)* has just been published (June 2022). This now directly links to the new daylighting standards EN 17037:2018. Aside refinements to the BRE guide, the assessments are the same to what is found within the (2<sup>nd</sup> edition).

Therefore, with regards to interior daylighting and external sunlight exposure in particular, where different methodologies are found in each of the different standards, all have been carried out for completeness to ensure appropriate and reasonable regard has been taken to address all assessments under all of the different standards.



The diagram above illustrates the relationship between the standards and guidance documents which are listed out below.

- (1) Urban Development and Building Heights
- (2) The Sustainable Urban Housing: Design Standards for New Apartments
- (3) BRE Guide – 2<sup>nd</sup> Edition of BR 209 BRE Site Layout Planning for Daylight and Sunlight
- (4) BS 8206-2:2008 – Lighting for Buildings – Part 2: Code of Practice for Daylighting
- (5) BS EN 17037:2018 – Daylight in Buildings
  - This is the UK implementation of the European EN 17037:2018 standard. It supersedes BS 8206-2:2008 which is withdrawn in the UK. The BS EN standard includes a National Annex which addresses daylight requirements specific to dwellings which is notable as Ireland’s climate matches closely with the UK.
- (6) IS EN 17037:2018 – Daylight in Buildings
  - This is the Irish implementation of the European EN 17037:2018 standard
- (7) BRE Guide – 3<sup>rd</sup> Edition of BR 209 BRE Site Layout Planning for Daylight and Sunlight

## 4.2 Reference Standards & Summary of Assessments Undertaken

The various daylight and sunlight assessments that were undertaken using the IES VE software are based on a number of different standards which are referenced in the individual sections of this report. For clarity, the assessments that were undertaken are summarised below as well as the reference standards that were used for each (where applicable):

- **Shadow Analysis**
  - Assessed using shadow images cast at key times throughout the year, i.e. March 21<sup>st</sup>, June 21<sup>st</sup> and December 21<sup>st</sup> to determine if any overshadowing impact occurs and to what extent to any existing neighbouring dwellings in accordance with the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions).

- **Sunlight to Amenity Spaces**
  - Assessed using annual Solar Exposure calculations to determine any impact to existing amenities and the sunlight received and also to assess the proposed developments amenity spaces to derive how much sunlight they can expect to receive in accordance with the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions).
  
- **Sunlight to Existing Buildings**
  - Assessed using the Annual Probable Sunlight Hours (APSH) method in accordance with the BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> & 3<sup>rd</sup> Edition) - to determine any impact to sunlight received to the existing neighbouring building main living areas.
- **Sunlight to Proposed Buildings**
  - Assessed using the Annual Probable Sunlight Hours (APSH) method in accordance with the BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> Edition)
  - Assessed using Solar Exposure calculations in accordance with IS EN 17037:2018 (BRE Guide 3<sup>rd</sup> Edition)
  - In both assessments above the aim is to derive how much sunlight proposed development can expect to receive.
- **Daylight to Existing Buildings**
  - Assessed using the Vertical Sky Component (VSC) method in accordance with the BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> & 3<sup>rd</sup> Edition) - to determine any impact to existing daylight received to the existing building neighbouring the site.
- **Daylight to Proposed Development**
  - Assessed using the Average Daylight Factor (ADF) method in accordance with the BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> Edition)
  - Assessed in accordance with IS EN 17037:2018 Method 2 (BRE Guide 3<sup>rd</sup> Edition)
  - Assessed in accordance with BS EN 17037:2018 National Annex Method 2 (BRE Guide 3<sup>rd</sup> Edition)
  - In all assessments above the aim is to derive how much daylight will be received within each of the apartments within the proposed development.
- **View Out**
  - Assessed in accordance with IS EN 17037:2018 (BRE Guide 3<sup>rd</sup> Edition)
- **Glare**
  - Assessed in accordance with IS EN 17037:2018 (BRE Guide 3<sup>rd</sup> Edition)

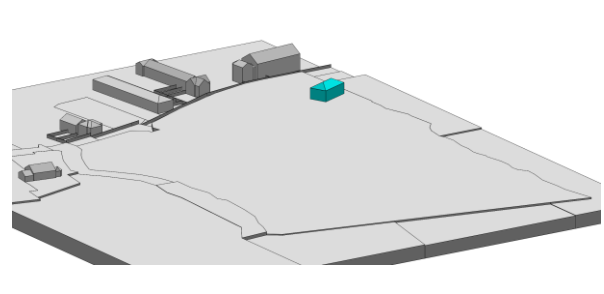
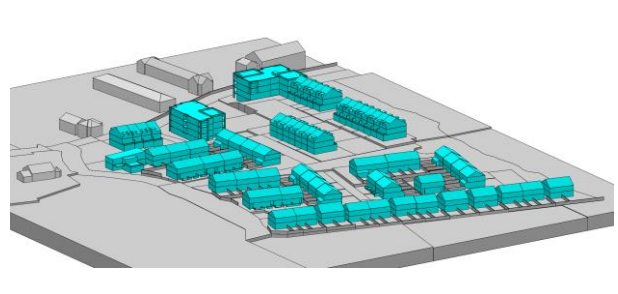
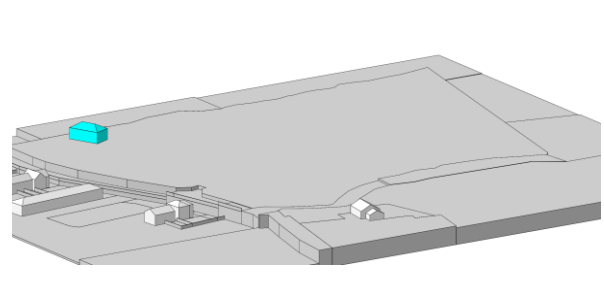
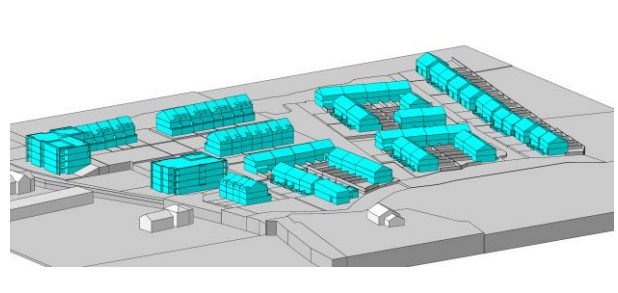
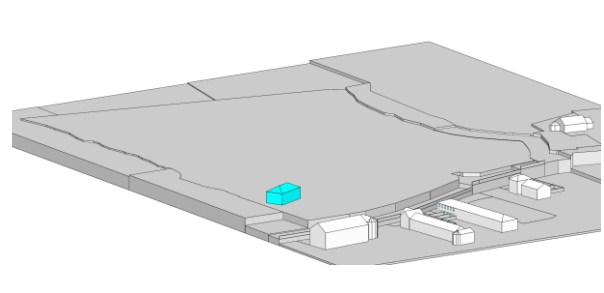
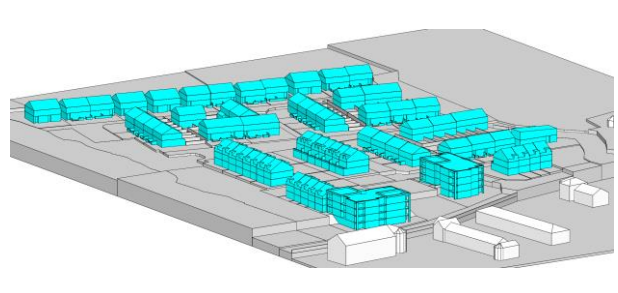
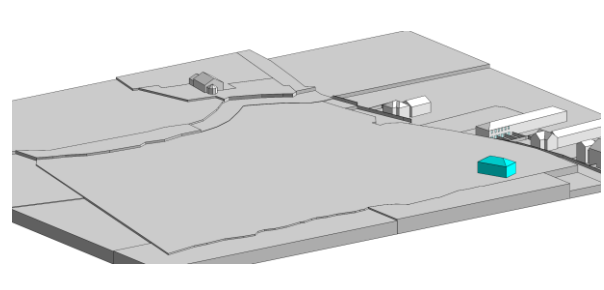
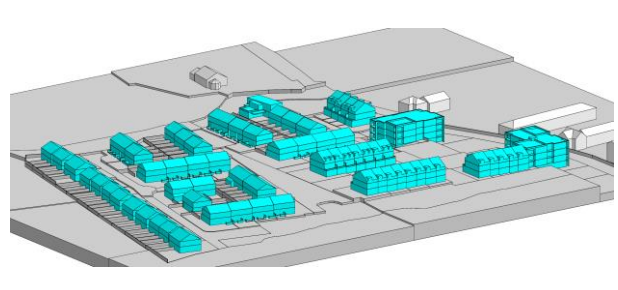
### 4.3 Orientation

The model orientation has been taken from drawings provided by the Architect with the resulting angle shown below used in the analysis.

Orientation	
	
	

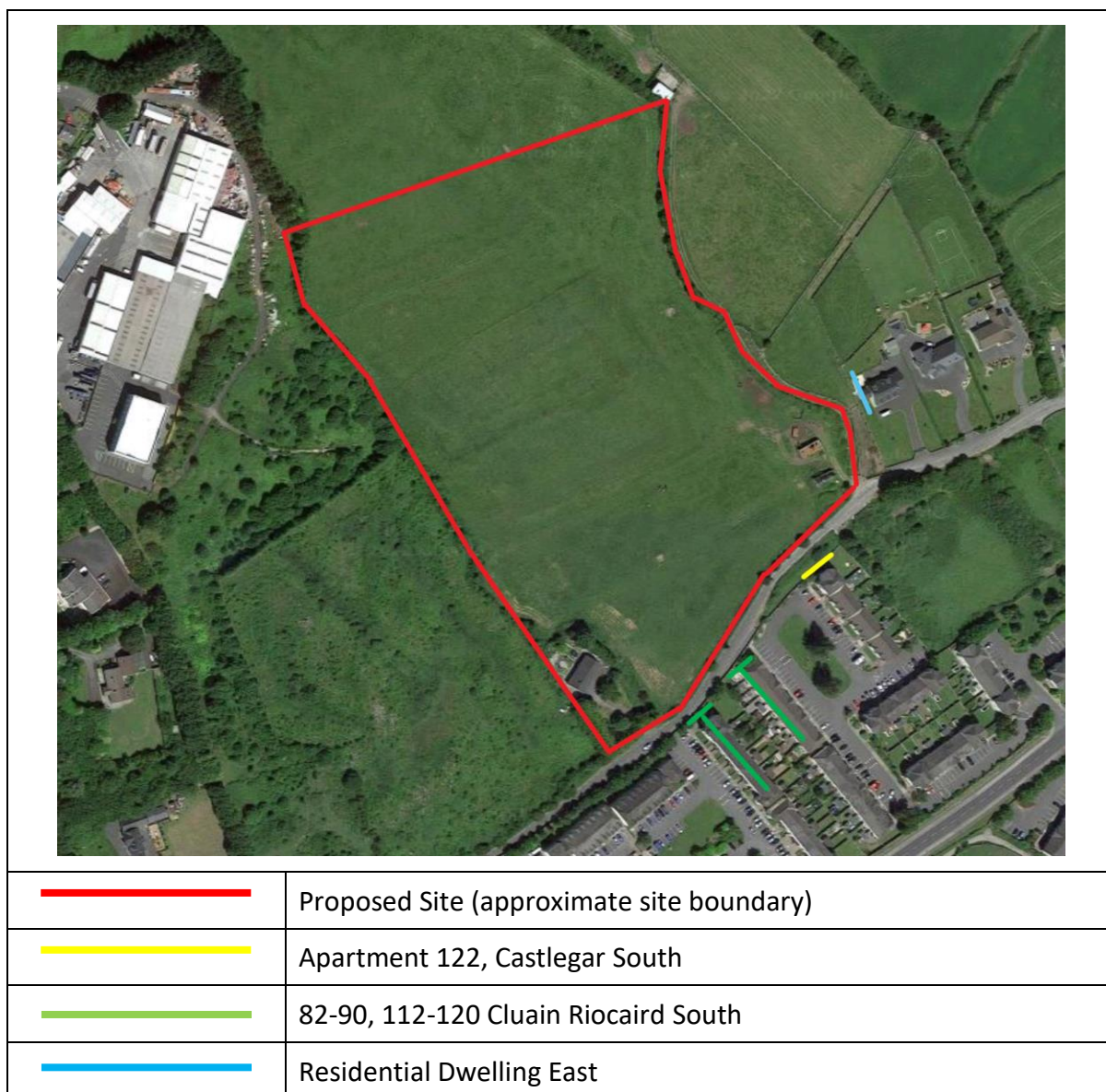
#### 4.4 Proposed Model

The following images illustrate the models created from the architectural information provided and the use of Google/Bing maps where information was absent.

	Existing Scheme	Proposed Scheme
View looking from North of Site		
View looking from East of Site		
View looking from South of Site		
View looking from West of Site		

#### 4.5 Potential Sensitive Receptors

To help understand the potential impact to surrounding buildings, potential sensitive receptors were identified as illustrated below.





## 5 Shadow Analysis

The statistics of Met Eireann, the Irish Meteorological Service, show that the sunniest months in Ireland are May and June, based on 1981-2010 averages or latest:

<https://www.met.ie/climate/30-year-averages>.

The following can also be shown:

- During December a mean daily duration of 1.7 hours of sunlight out of a potential 7.3 hours sunlight each day is received (i.e. only 23% of potential sunlight hours).
- During June a mean daily duration of 5.8 hours of sunlight out of a potential 15.9 hours sunlight each day is received (i.e. only 36% of potential sunlight hours).

Therefore, the impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months.

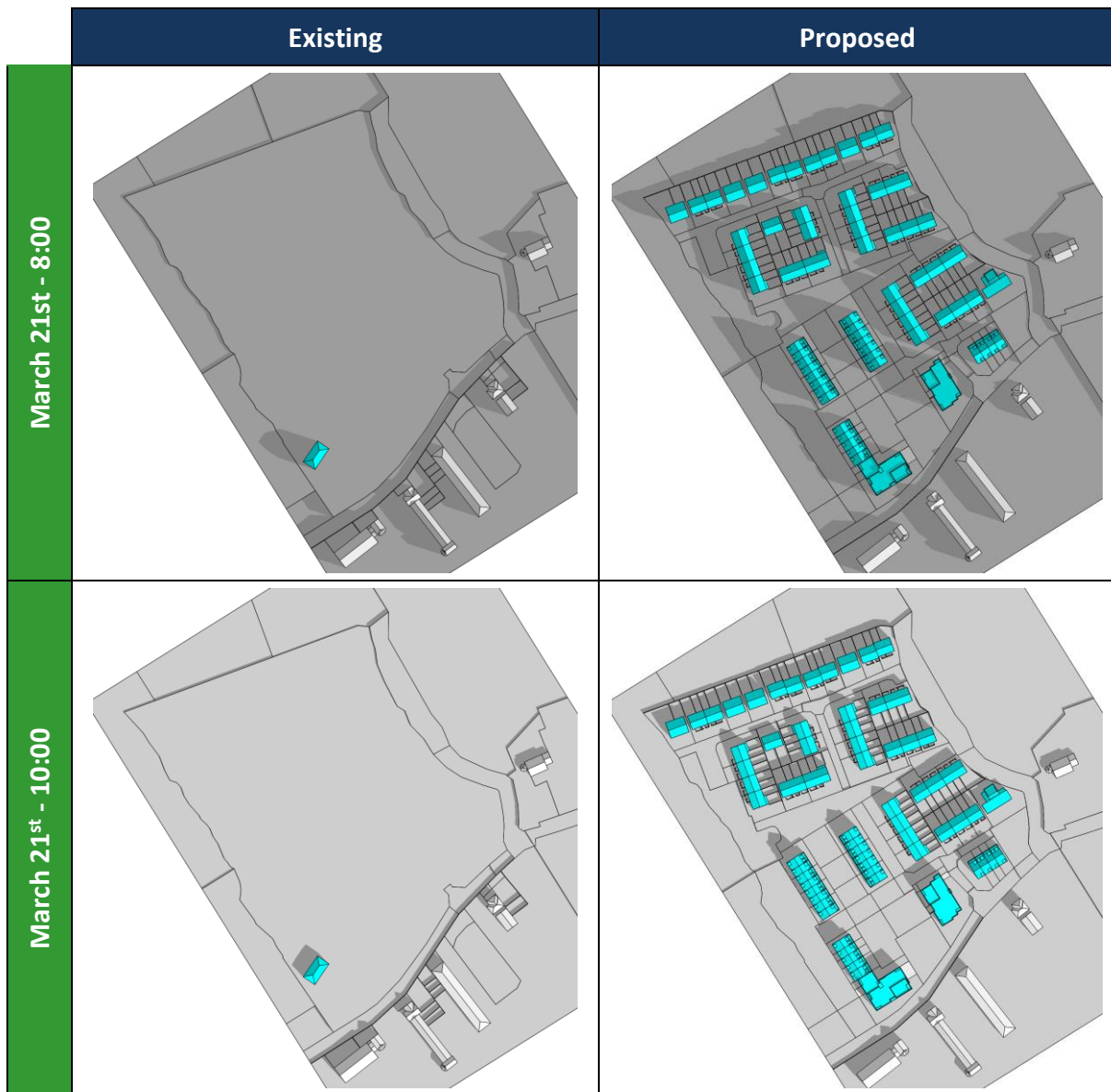
This section will consider the shadows cast by the proposed development on the following dates:

- March 21<sup>st</sup> / September 21<sup>st</sup> (Equinox)
- June 21<sup>st</sup> (Summer Solstice)
- December 21<sup>st</sup> (Winter Solstice)

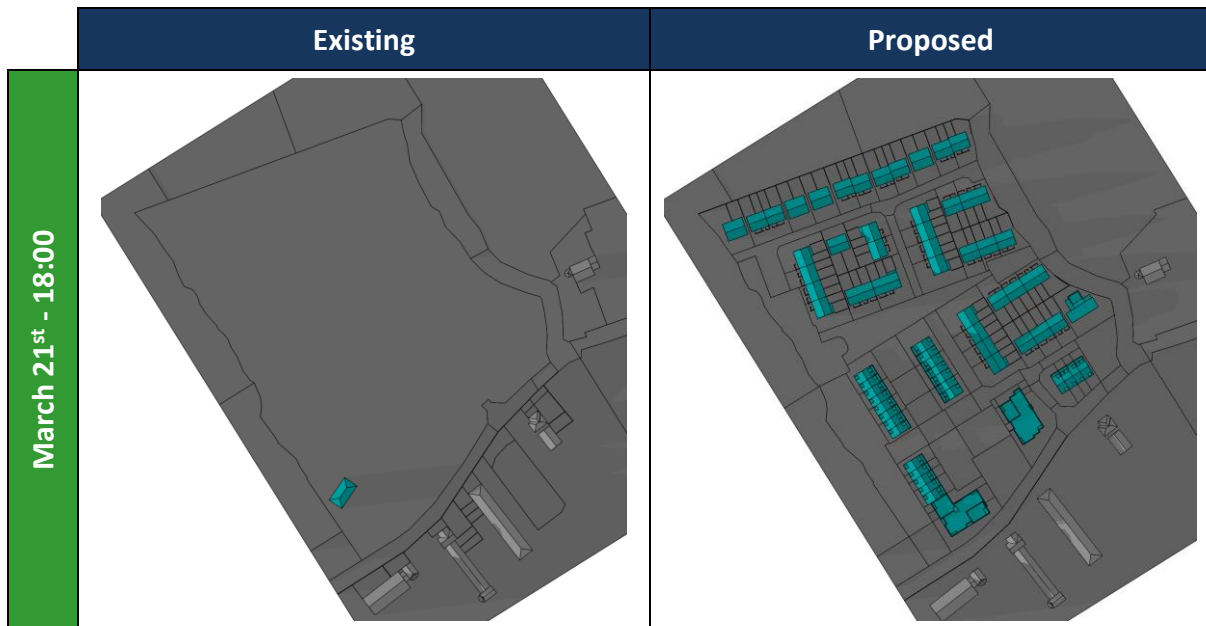
These images illustrate shadows cast for 'perfect sunny' conditions with no clouds and assumed that the sun is shining for every hour shown. Given the discussion above it is important to remember that this is not always going to be the case.

## 5.1 Plan View

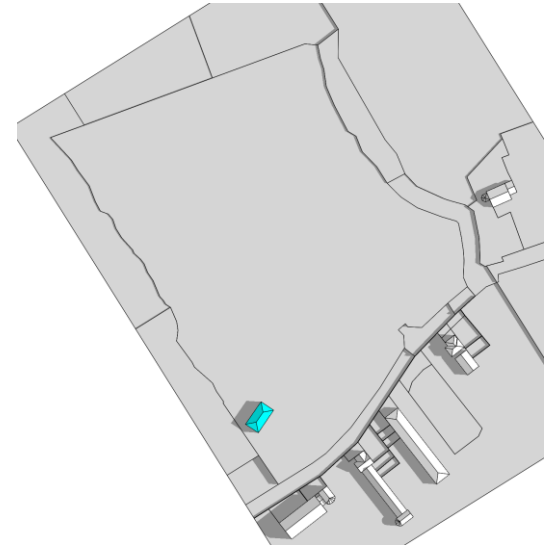





### 5.1.1 March 21<sup>st</sup>



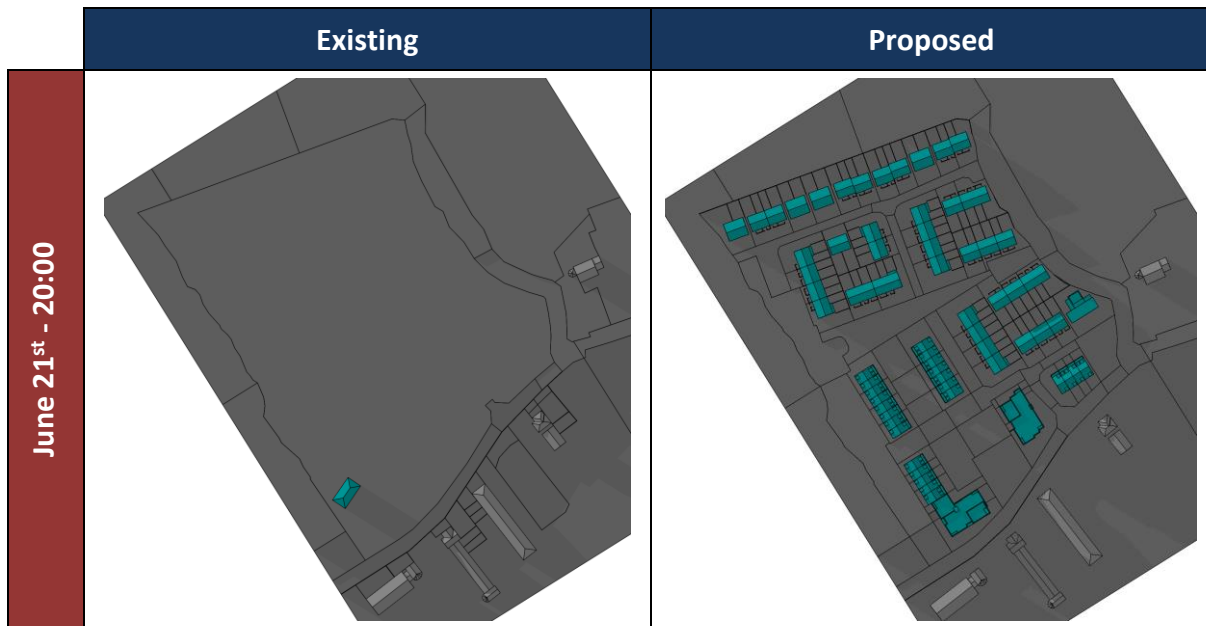
	Existing	Proposed
March 21 <sup>st</sup> - 12:00		
March 21 <sup>st</sup> - 14:00		
March 21 <sup>st</sup> - 16:00		



### 5.1.2 June 21<sup>st</sup>

	Existing	Proposed
June 21 <sup>st</sup> - 8:00		
June 21 <sup>st</sup> - 10:00		
June 21 <sup>st</sup> - 12:00		

	Existing	Proposed
June 21 <sup>st</sup> - 14:00		
June 21 <sup>st</sup> - 16:00		
June 21 <sup>st</sup> - 18:00		



### 5.1.3 December 21<sup>st</sup>

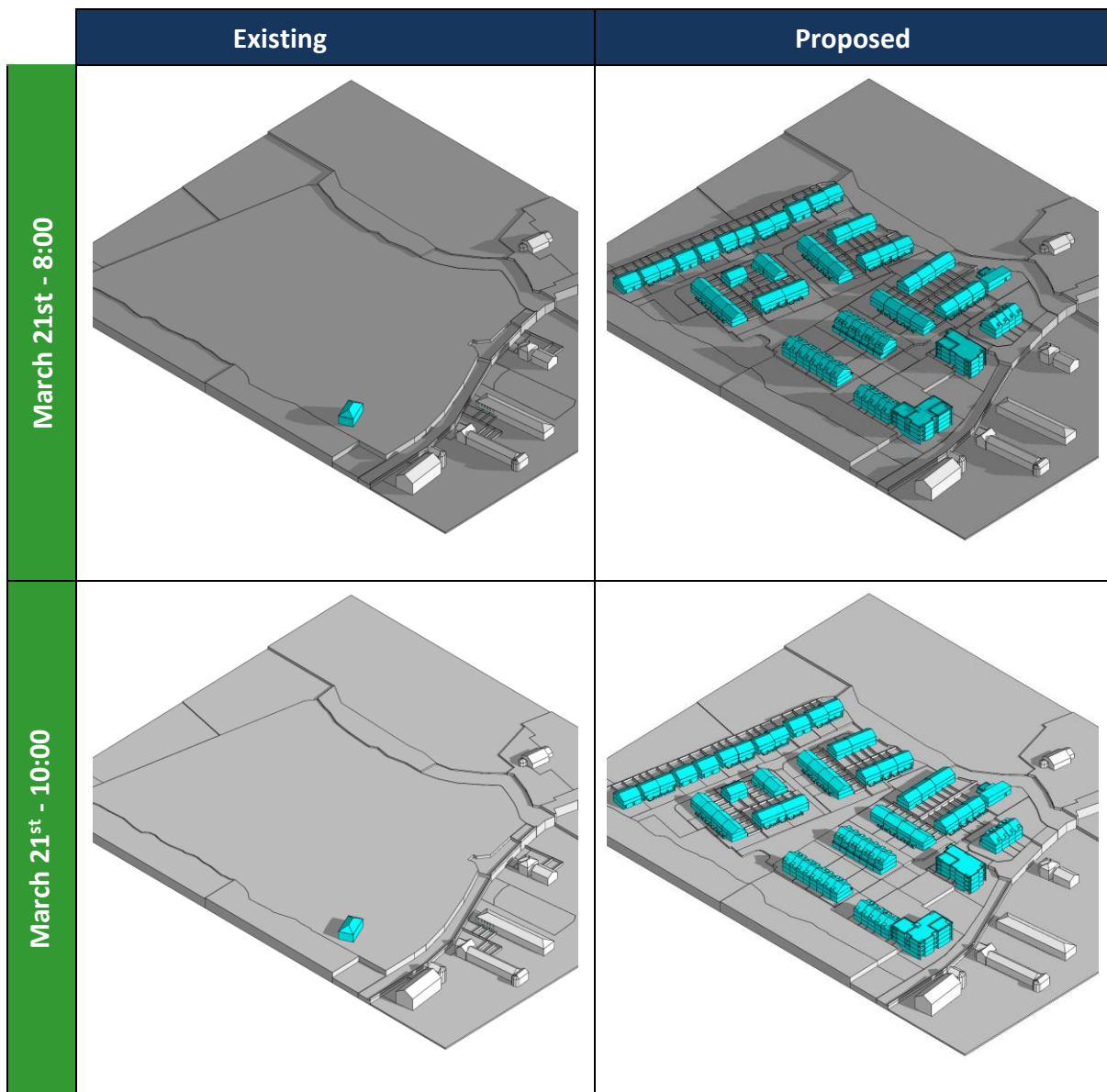
	Existing	Proposed
December 21 <sup>st</sup> - 8:00		
December 21 <sup>st</sup> - 10:00		
December 21 <sup>st</sup> - 12:00		



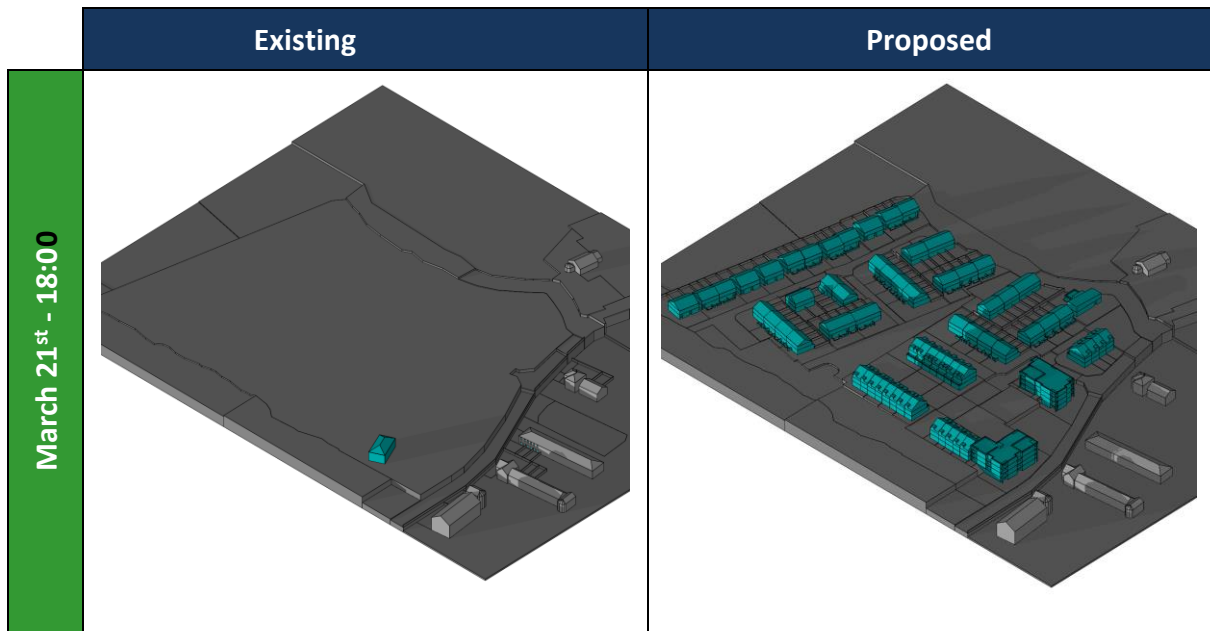
	Existing	Proposed
December 21 <sup>st</sup> - 14:00		
December 21 <sup>st</sup> - 16:00		

## 5.2 3D View

### 5.2.1 March 21<sup>st</sup>



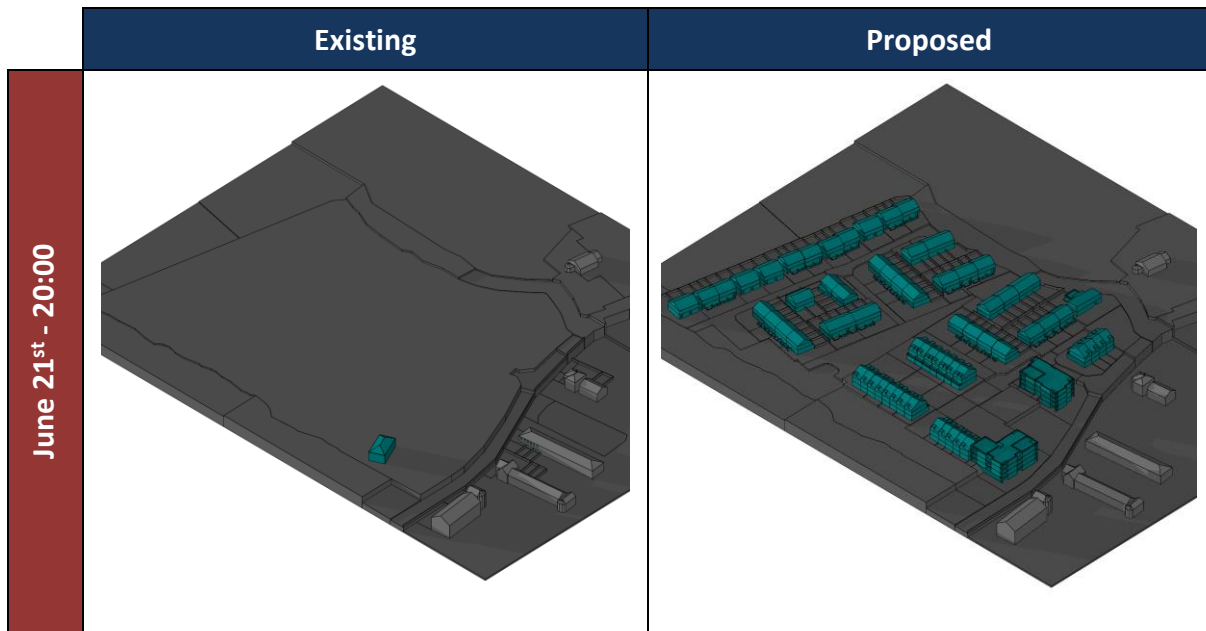
	Existing	Proposed
March 21 <sup>st</sup> - 12:00		
March 21 <sup>st</sup> - 14:00		
March 21 <sup>st</sup> - 16:00		



5.2.2 June 21<sup>st</sup>

	Existing	Proposed
June 21 <sup>st</sup> - 8:00		
June 21 <sup>st</sup> - 10:00		
June 21 <sup>st</sup> - 12:00		

	Existing	Proposed
June 21 <sup>st</sup> - 14:00		
June 21 <sup>st</sup> - 16:00		
June 21 <sup>st</sup> - 18:00		



5.2.3 December 21<sup>st</sup>

	Existing	Proposed
December 21 <sup>st</sup> - 8:00		
December 21 <sup>st</sup> - 10:00		
December 21 <sup>st</sup> - 12:00		



	Existing	Proposed
December 21 <sup>st</sup> - 14:00		
December 21 <sup>st</sup> - 16:00		

### **5.3 Discussion**

The shadow analysis illustrates different shadows being cast at key times of the year (March 21<sup>st</sup>, June 21<sup>st</sup> and December 21<sup>st</sup>) for the Existing Situation and the Proposed Scheme. The results from the study are summarised as follows:

#### **Apartment 122, Castlegar South**

No additional shading from the proposed development is observed on this residential property throughout the year.

#### **82-90, 112-120 Cluain Riocaird South**

No additional shading from the proposed development is observed on this residential property throughout the year.

#### **Residential Dwelling East**

No additional shading from the proposed development is observed on this residential property for the majority of the year. Very minimal overshadowing noted late evenings in March.

The potential shading impact is quantified via the “Sunlight to Amenity Spaces” and “Daylight to Existing Buildings” sections of this report.

## 6 Sunlight to Amenity Spaces

### 6.1 Guidance Requirements

The impact of the proposed development on the sunlight availability to the amenity spaces will be considered to determine how the amenity spaces perform when assessed against the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions) which states the following in Section 3.3.17:

#### Summary

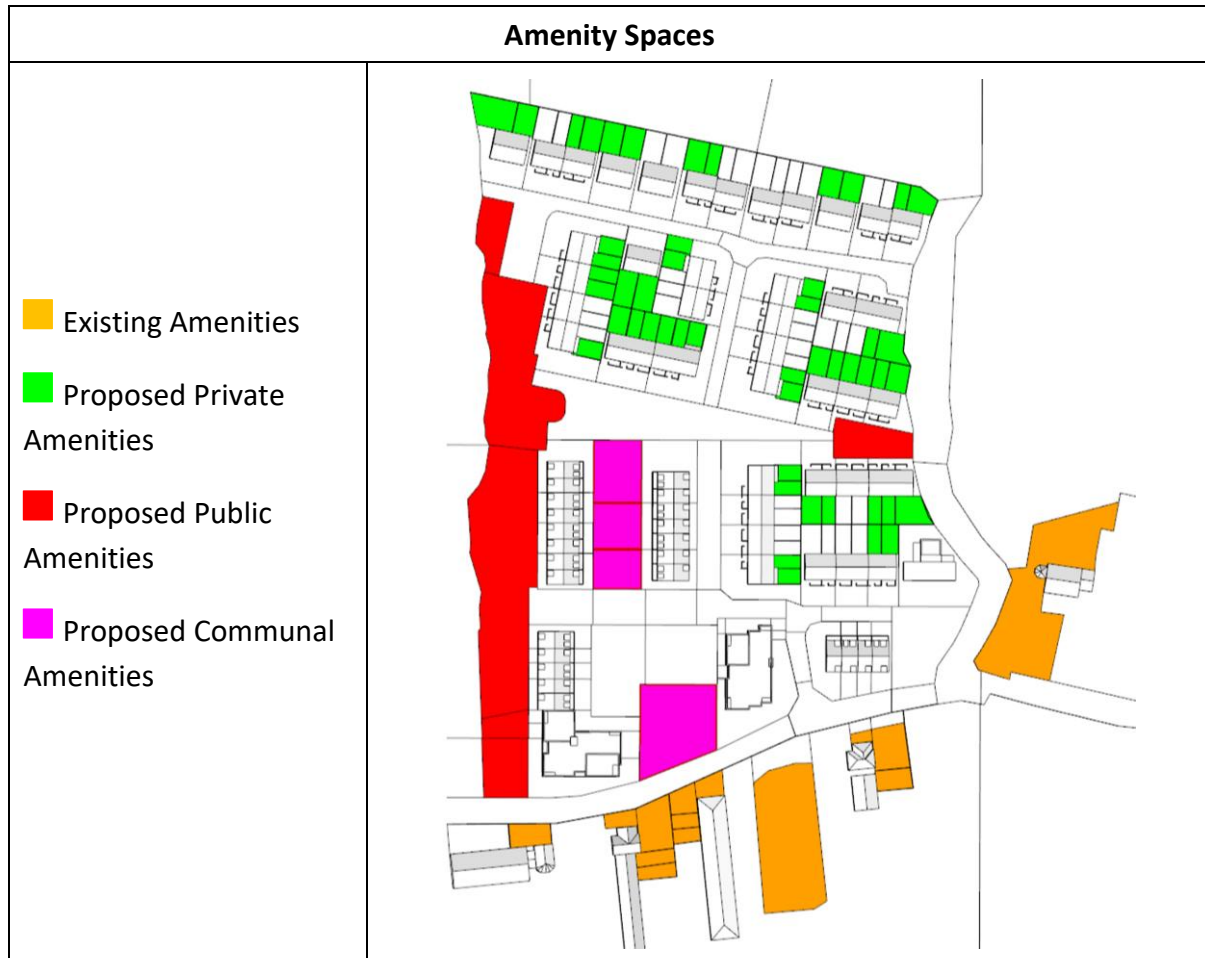
3.3.17 It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can 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.

The BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions) states that for a space to appear adequately sunlit throughout the year, at least half of a garden or amenity space should receive at least 2 hours of sunlight on March 21<sup>st</sup>.

### 6.1.1 Existing and Proposed Amenity Spaces

As outlined in Section 3.3.17 of the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions), for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity space should receive at least 2 hours of sunlight on March 21<sup>st</sup>. In the case of existing amenity spaces, if they are already below the 50% threshold then the BRE recommends the results kept to within 80% of the existing situation with the proposed development in place.

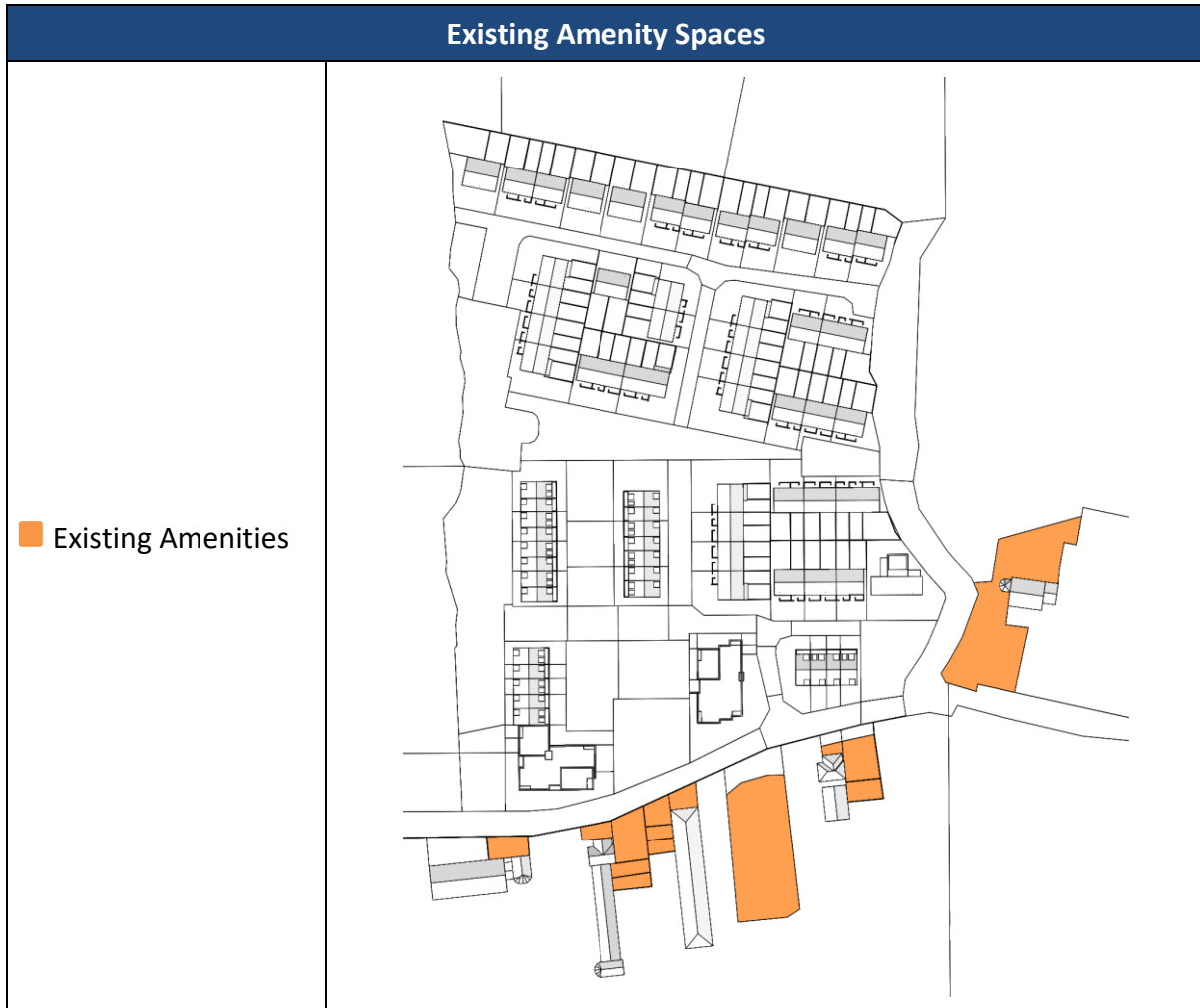
This analysis will be performed on the amenity spaces illustrated in the image below.



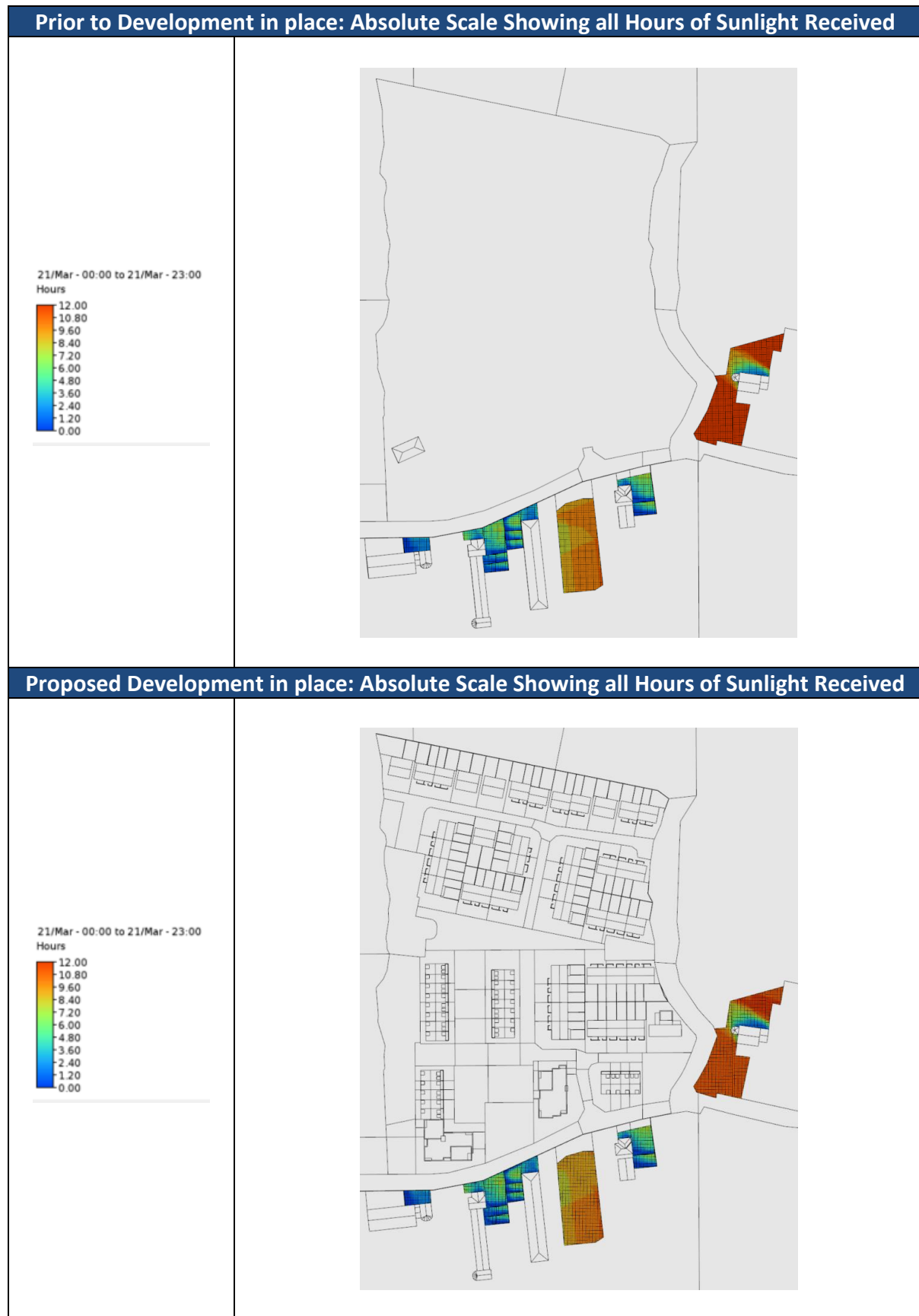
The following images illustrate the predicted results with respect to this space receiving at least 2 hours of sunlight on March 21<sup>st</sup>. Any areas that receive less than 2 hours of sunlight are colour-coded in grey.

### 6.1.2 Existing Amenity Spaces

As stated above for a space to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least 2 hours of sunlight on March 21<sup>st</sup>. This analysis performed on the following amenity spaces highlighted below:



### 6.1.2.1 Existing Amenity Spaces Results



**Prior to Development in place: Hours of Sunlight > 2 Illustrated in Red**

- Receives more than 2 hours of sunlight
- Receives less than 2 hours of sunlight

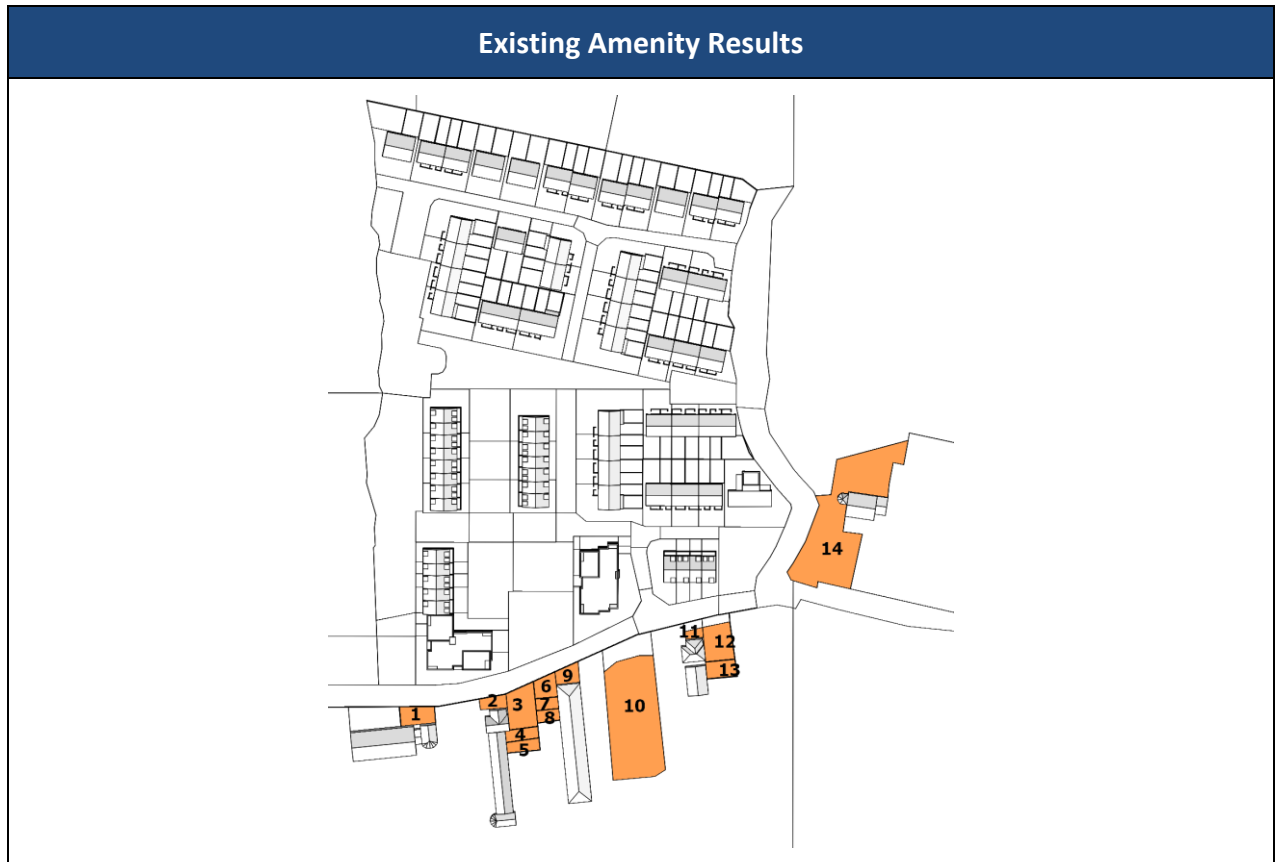


**Proposed Development in place: Hours of Sunlight > 2 Illustrated in Red**

- Receives more than 2 hours of sunlight
- Receives less than 2 hours of sunlight



### 6.1.2.2 Existing Amenity Results



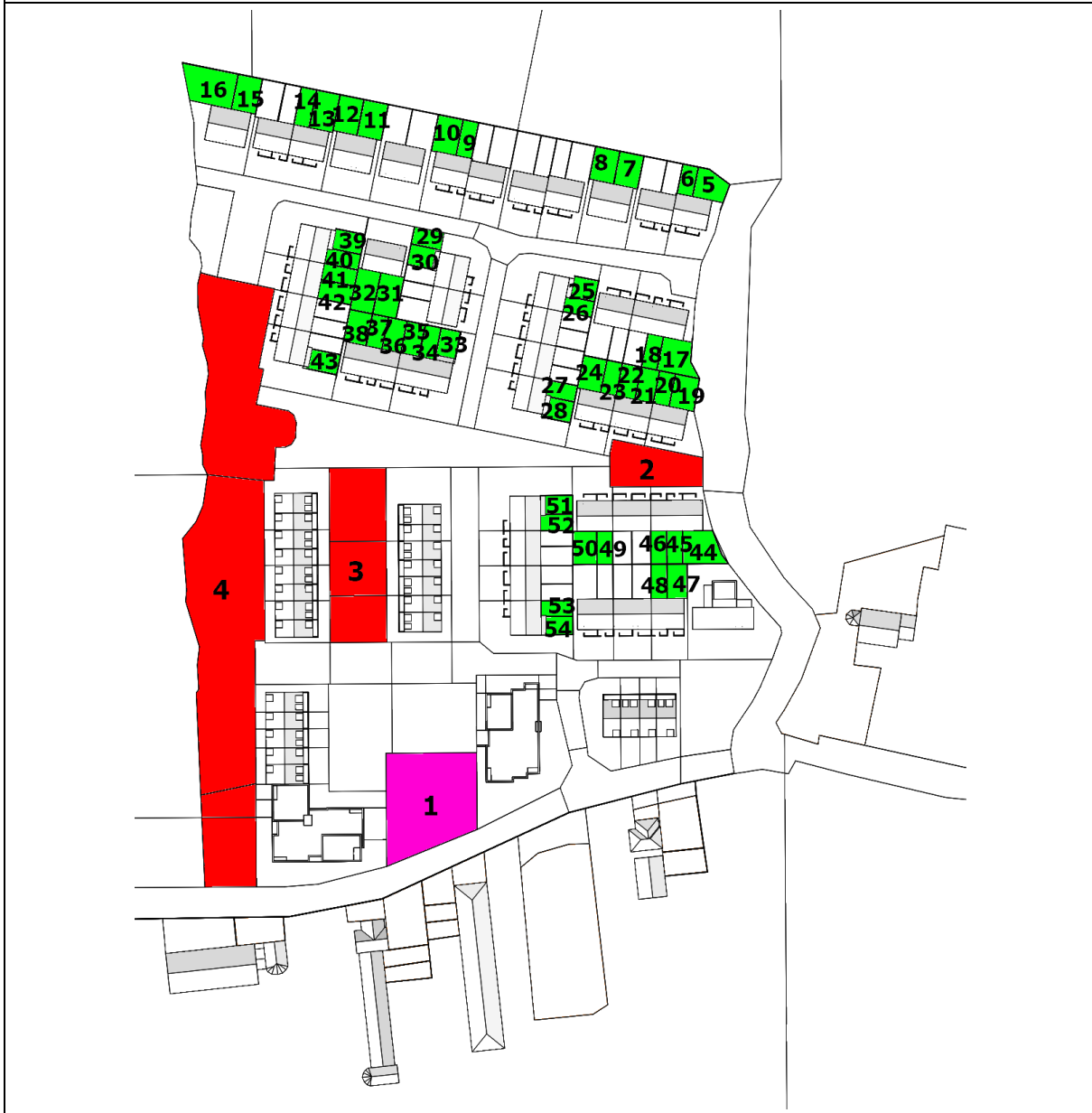
Ref	Area (m <sup>2</sup> )	Existing Area >2 hrs		Existing Area with Proposed Development in Place >2 hrs		Proposed vs Existing (%)	Comment
		(m <sup>2</sup> )	(%)	(m <sup>2</sup> )	(%)		
1	130	61	47%	61	47%	100%	✓
2	71	65	92%	65	92%	100%	✓
3	76	31	41%	31	41%	100%	✓
4	80	34	43%	34	43%	100%	✓
5	237	203	86%	203	86%	100%	✓
6	54	31	57%	31	57%	100%	✓
7	54	33	61%	33	61%	100%	✓
8	93	63	68%	63	68%	100%	✓
9	84	70	83%	70	83%	100%	✓
10	1,233	1,233	100%	1,233	100%	100%	✓
11	32	26	81%	26	81%	100%	✓
12	102	54	53%	54	53%	100%	✓
13	209	163	78%	163	78%	100%	✓
14	1,387	1,358	98%	1,358	98%	100%	✓



### 6.1.3 Proposed Amenity Spaces



- Proposed Private Amenities
- Proposed Public Amenities
- Proposed Communal Amenities



**Communal Amenity:**

Ref.	Total Area (m2)	Area Receiving >2h (m2)	Percent Receiving >2h	Comment
1 (Communal Area)	884	884	100%	✓
<b>Total</b>	<b>884</b>	<b>884</b>	<b>100%</b>	<b>✓</b>

**Public Amenity:**

Ref.	Total Area (m2)	Area Receiving >2h (m2)	Percent Receiving >2h	Comment
2(Public Open Space)	367	367	100%	✓
3(Public Open Space)	1,996	1,996	100%	
4 (Public Open Space)	4,300	4,300	100%	✓
<b>Total</b>	<b>6,663</b>	<b>6,663</b>	<b>100%</b>	<b>✓</b>

**Private Amenity:**

Ref.	Total Area (m)	Area Receiving >2h (m)	Percent Receiving >2h	Comment
5	92	60	65%	✓
6	49	9	18%	x
7	84	27	32%	x
8	85	58	68%	✓
9	60	16	27%	x
10	97	41	42%	x
11	96	35	36%	x
12	90	33	37%	x
13	97	36	37%	x
14	61	18	30%	x
15	91	32	35%	x
16	184	182	99%	✓
17	118	87	74%	✓
18	55	24	44%	x
19	85	33	39%	x
20	57	12	21%	x
21	64	14	22%	x
22	66	15	23%	x
23	53	11	21%	x
24	82	41	50%	✓
25	53	33	62%	✓
26	48	21	44%	x
27	48	23	48%	x
28	64	38	59%	✓
29	54	27	50%	✓
30	64	32	50%	✓
31	105	67	64%	✓
32	100	64	64%	✓
33	68	16	24%	x
34	56	9	16%	x

Ref.	Total Area (m)	Area Receiving >2h (m)	Percent Receiving >2h	Comment
35	62	12	19%	x
36	64	14	22%	x
37	56	10	18%	x
38	77	39	51%	✓
39	62	34	55%	✓
40	55	22	40%	x
41	57	24	42%	x
42	65	31	48%	x
43	73	40	55%	✓
44	131	110	84%	✓
45	54	42	78%	✓
46	54	42	78%	✓
47	72	24	33%	x
48	55	18	33%	x
49	56	41	73%	✓
50	82	57	70%	✓
51	62	27	44%	x
52	54	24	44%	x
53	53	19	36%	x
54	61	28	46%	x

On March 21<sup>st</sup>, 100% of the combined proposed public and communal amenity areas situated within the development site will receive at least 2 hours of sunlight over their total combined area. When the communal area is considered individually, it continues to meet the BRE recommendations with 100% of its area receiving at least 2 hours of sunlight. All amenity areas provided will be quality spaces in terms of sunlight.

In addition, all individual areas tested perform as expected. Those facing predominantly north are noted to be below the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions) recommendations as they are shaded by the property on the plot. Those south facing are achieving at least 2 hours of sunlight over 50% of their area on the 21<sup>st</sup> of March.

## 6.2 Discussion

As outlined in Section 3.3.17 of the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions), for a space to appear adequately sunlit throughout the year, at least half of the garden or amenity area should receive at least 2 hours of sunlight on March 21<sup>st</sup>. In the case of existing amenity spaces, if they are already below the 50% threshold then the BRE recommends the results kept to within 80% of the existing situation with the proposed development in place.

### Existing Amenity Spaces

On March 21<sup>st</sup> the existing amenity spaces will receive the same level of sunlight with the proposed development in place. In all cases the results comply with the recommendations in the BRE Guide outlined above.

### Proposed Amenity Spaces

On March 21<sup>st</sup>, 100% of the combined proposed public and communal amenity areas situated within the development site will receive at least 2 hours of sunlight over their total combined area. When the communal area is considered individually, it continues to meet the BRE recommendations with 100% of its area receiving at least 2 hours of sunlight. All amenity areas provided will be quality spaces in terms of sunlight.

In addition, all individual areas tested perform as expected. Those facing predominantly north are noted to be below the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions) recommendations as they are shaded by the property on the plot. Those south facing are achieving at least 2 hours of sunlight over 50% of their area on the 21<sup>st</sup> of March.

## 7 Sunlight to Existing Buildings

### 7.1 Guidance – BRE Guide (2<sup>nd</sup> Edition) / BS 8206-2:2008

The British Standard BS 8206-2:2008 recommends that interiors where the occupants expect sunlight should receive at least one quarter (25%) of annual probable sunlight hours, including at least 5% of annual probable sunlight hours during the winter months, between 21<sup>st</sup> September and 21<sup>st</sup> March.

Here 'probable sunlight hours' means the total number of hours in the year that the sun is expected to shine on unobstructed ground, allowing for average levels of cloudiness for the location in question.

If a window reference point can receive more than 25% of annual probable sunlight hours, including at least 5% of annual probable sunlight hours during the winter months between 21<sup>st</sup> September and 21<sup>st</sup> March, then the room should still receive enough sunlight. Any reduction in sunlight access below this level should be kept to a minimum.

If the available sunlight hours are both less than the amount given and less than 0.8 times their former value, either over the whole year or just during the winter months (21<sup>st</sup> September to 21<sup>st</sup> March) and reduction in sunlight across the year has a greater reduction than 4%, then the occupants of the existing building will notice the loss of sunlight.

<p><b>Summary</b></p> <p>3.2.11 If a living room of an existing dwelling has a main window facing within 90° of due south, and any part of a new development subtends an angle of more than 25° to the horizontal measured from the centre of the window in a vertical section perpendicular to the window, then the sunlighting of the existing dwelling may be adversely affected. This will be the case if the centre of the window:</p> <ul style="list-style-type: none"> <li>• receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between 21 September and 21 March and</li> <li>• receives less than 0.8 times its former sunlight hours during either period and</li> <li>• has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.</li> </ul>
<p>BRE 2<sup>nd</sup> and 3<sup>rd</sup> Editions guidance document Site Layout Planning for Daylight and Sunlight</p>

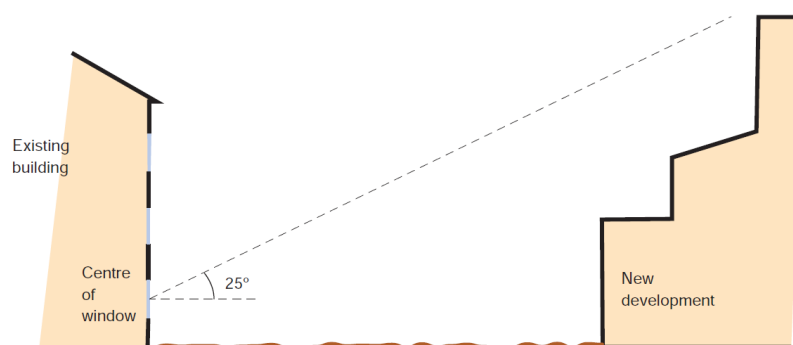
As such this study will compare the Existing Scheme and Proposed Schemes and consider if the values on the existing buildings meet the requirements outlined above when compared to their former value (that of the Existing scheme).

## 7.2 AP SH Exclusions

The BRE recommendations note that if a new development sits within 90° of due south of any main living room window of an existing dwelling, then these should be assessed for AP SH. However, there are several exceptional cases in which AP SH is not required to be calculated, as indicated below:

3.2.7 It is not always necessary to do a full calculation to check sunlight potential. The guideline above is met provided either of the following is true:

- 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 (NB obstructions within 90° of due north of the existing window need not count here).
- The window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal (Figure 14 in Section 2.2). Again, obstructions within 90° of due north of the existing window need not be counted.
- The window wall faces within 20° of due south and the reference point has a VSC (section 2.1) of 27% or more.



BRE 2<sup>nd</sup> and 3<sup>rd</sup> Editions guidance document Site Layout Planning for Daylight and Sunlight

Consequently, AP SH will only be calculated for adjacent windows which meet the following conditions:

1. The existing building has living room with a main window which faces within 90 degrees of due south.
2. Existing building is located to the North, East, or West of the Proposed Development.
3. The VSC of the existing window is less than 27%.

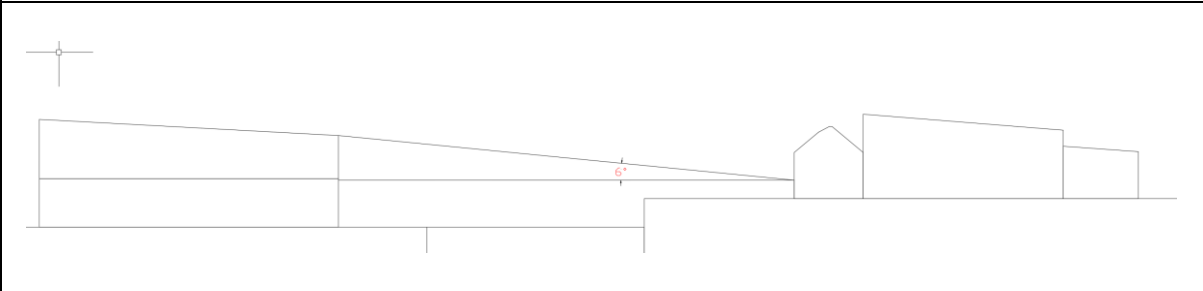
Based on the criteria outlined in Section 3.2.7 of the BRE Guide 2<sup>nd</sup> Edition and Section 3.2.9 of the BRE Guide 3<sup>rd</sup> Edition, only one of the existing buildings fit the requirements to be assessed and as such the APSP assessment was only conducted for this property. The BRE guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions) notes that there should be no impact to sunlight for the rest of the properties “It is not always necessary to do a full calculation to check sunlight potential. The guideline above is met provided either the following is true:

- If the window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal. Again, obstructions within 90° of due north need not be counted.”

Given the statement above the surrounding dwellings adjacent to the proposed development were verified noting that, in a section perpendicular to the window wall, no angle subtended more than 25° and, in some cases, they were also sitting to the south of the proposed development. Therefore, only one of the existing adjacent properties was included in the assessment, the rest of the surrounding properties were excluded on the basis, as noted in section 3.2.7 of the BRE Guide 2<sup>nd</sup> Edition and Section 3.2.9 of the BRE Guide 3<sup>rd</sup> Edition, that these windows need not be analysed as sunlight impact will be unnoticeable to the existing occupants. To note, as an added check the 25-degree rule was carried out for good measure on all neighbouring buildings regardless of orientation in relation to the proposed development as can be seen from the following images.

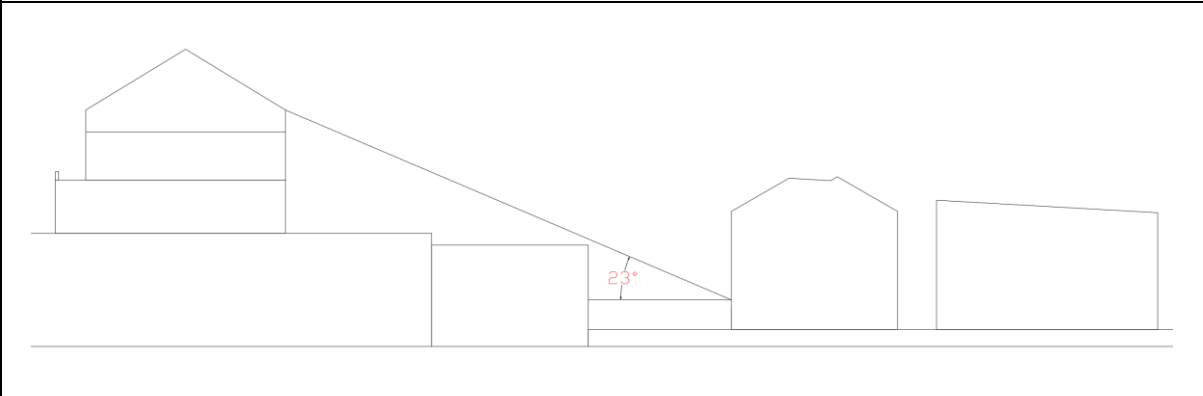


**View 1: Residential Dwelling East**



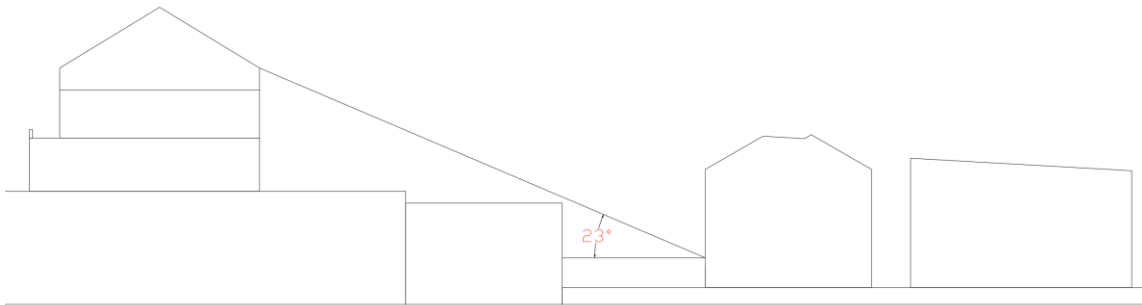
Site Section – Qualification of 25° Rule (6° Angle Observed)

**View 2: Apartment 122, Castlegar**



Site Section – Qualification of 25° Rule (23° Angle Observed)

**View 3: Apartment 122, Castlegar**



Site Section – Qualification of 25° Rule (23° Angle Observed)

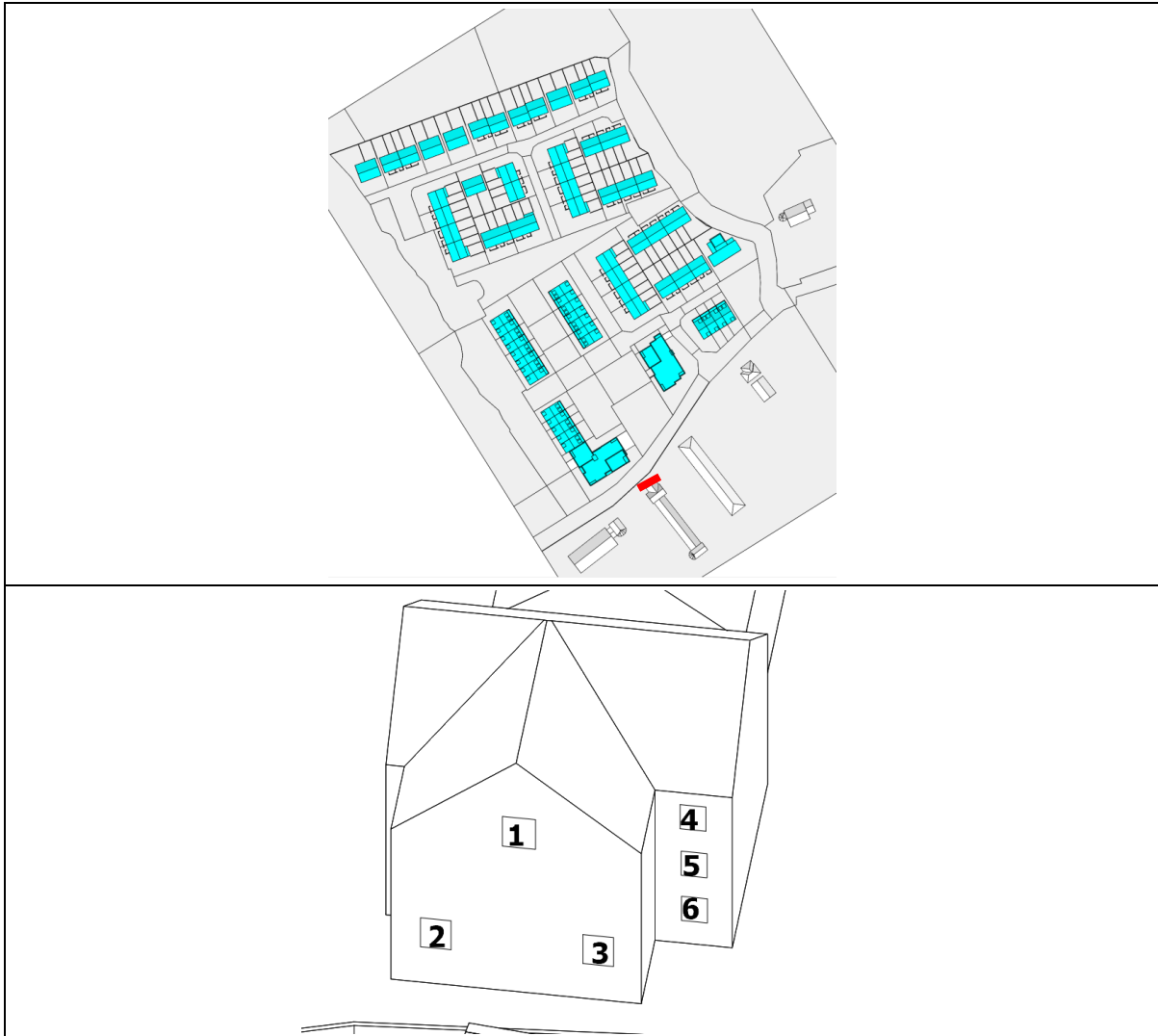
### 7.3 AP SH Assessment

Based on the above criteria, the locations in the following sections have been modelled and analysed with the results also included.

Please note, the “Comment” symbol in each of the tables represents the following:

- ✓/✓ For these locations, both the Proposed Scheme annual and winter AP SH results are greater than 25% and 5% respectively, or are greater than 0.8 times their former value with the proposed development in place.
- ✓/ x For these locations, the annual AP SH results are greater than 25% or are greater than 0.8 times their former value with the proposed development in place, however, the winter results are below the guidelines.
- x /✓ For these locations, the annual AP SH results are less than the recommended values, however, the winter AP SH results are greater than 5% or greater than 0.8 times their former value with the proposed development in place.
- x / x For these locations, both the annual and winter AP SH results are less than 25% and 5% respectively, and less than 0.8 times their former value with the proposed development in place.

### 7.3.1 View 1: Main St, Kilmacullagh



Points	Existing Situation APSH		Proposed Scheme APSH		Proposed APSH as a % of Existing Situation		Comment
	Annual	Winter	Annual	Winter	Annual	Winter	
1	22.85	4.89	18.79	4.89	82%	100%	✓/✓
2	15.95	2.8	13.29	2.8	83%	100%	✓/✓
3	15.73	2.8	13.67	2.8	87%	100%	✓/✓
4	21.77	4.9	19.58	4.9	90%	100%	✓/✓
5	19.28	3.9	18.14	3.9	94%	100%	✓/✓
6	16.89	3.5	15.26	3.5	90%	100%	✓/✓

## 7.4 Discussion

This study considers the proposed scheme and tests if the Annual Probable Sunlight Hours (APSH) results for the living room windows are greater than 25% annual and 5% winter sunlight or are greater than 0.8 times their former value with the proposed development in place.

Based on the criteria outlined in Section 3.2.7 of the BRE Guide 2<sup>nd</sup> Edition and Section 3.2.9 of the BRE Guide 3<sup>rd</sup> Edition, only one of the existing buildings fit the requirements to be assessed and as such the APSH assessment was only conducted for this property. The BRE guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions) notes that there should be no impact to sunlight for the rest of the properties.

“It is not always necessary to do a full calculation to check sunlight potential. The guideline above is met provided either the following is true:

- If the window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal. Again, obstructions within 90° of due north need not be counted.”

Given the statement above the existing properties adjacent to the proposed development were verified noting that, in a section perpendicular to the window wall, no angle subtended more than 25° and, in some cases, they were also sitting to the south of the proposed development. Therefore, only one existing property was included in the assessment while the rest were excluded on the basis, as noted in section 3.2.7 of the BRE Guide 2<sup>nd</sup> Edition and Section 3.2.9 of the BRE Guide 3<sup>rd</sup> Edition, that these windows need not be analysed as sunlight impact will be unnoticeable to the occupants.

When compared to the Existing Situation, of the 6 no. points tested, 100% (6 no. points) meet both the annual and winter recommendations in the BRE Guide.

## 8 Sunlight to Proposed Development

### 8.1 Guidance – BRE Guide (2<sup>nd</sup> Edition) / BS8206-2:2008

The British Standard BS 8206-2:2008 recommends that interiors where the occupants expect sunlight should receive at least one quarter (25%) of annual probable sunlight hours, including at least 5% of annual probable sunlight hours during the winter months, between 21<sup>st</sup> September and 21<sup>st</sup> March. Here 'probable sunlight hours' means the total number of hours in the year that the sun is expected to shine on unobstructed ground, allowing for average levels of cloudiness for the location in question.

If a window reference point can receive more than one quarter of annual probable sunlight hours, including at least 5% of annual probable sunlight hours during the winter months between 21<sup>st</sup> September and 21<sup>st</sup> March, then the room should still receive enough sunlight. Any reduction in sunlight access below this level should be kept to a minimum.

As stated in Section 3.1.12 of the BRE Guide (2<sup>nd</sup> Edition), “If window positions are already known, the centre of each main living room window can be used for the calculation”.

3.1.12 If window positions are already known, the centre of each main living room window can be used for the calculation. In the case of a floor-to-ceiling window such as a patio door, a point 1.6 m above ground on the centre line of the window may be used. In accordance with the recommendation in BS 8206-2, a point on the inside face of the window wall should be taken. Sunlight blocked by the window reveals should not be included, but the effect of the window frames in blocking sunlight need not be taken into account. If a room has multiple windows on the same wall or on adjacent walls, the highest value of APSH should be taken. If a room has two windows on opposite walls, the APSH due to each can be added together.

#### Summary (new buildings)

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

- at least one main window wall faces within 90° of due south and
- the centre of at least one window to a main living room can receive 25% of annual probable sunlight hours, including at least 5% of annual probable sunlight hours in the winter months between 21 September and 21 March.

3.1.16 Where groups of dwellings are planned, site layout design should aim to maximise the number of dwellings with a main living room that meets the above recommendations.

Extract from the BRE Guide (2<sup>nd</sup> Edition)

## 8.2 Guidance – BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018

Section 5.3.1 of IS EN 17037:2018 states that “*exposure to sunlight is an important quality criterion of an interior space and can contribute to human well-being.*” Table A.6 from IS EN 17037:2018 summarises the recommendation for daily sunlight exposure.

**Table A.6 — Recommendation for daily sunlight exposure**

Level of recommendation for exposure to sunlight	Sunlight exposure
Minimum	1,5 h
Medium	3,0 h
High	4,0 h

Within the context of a domestic property, BRE Guide 3<sup>rd</sup> Edition/IS EN 17037:2018 states that at least one habitable space within a dwelling should receive the recommended minimum value of 1.5 hours of sunlight on the 21<sup>st</sup> of March. The test is carried out on a clear, cloud free day.

## 8.3 AP SH & Sunlight Exposure Assessment

Based on the above criteria for both the BRE Guide 2<sup>nd</sup> Edition/BS8206-2:2008 and BRE Guide 3<sup>rd</sup> Edition/IS EN 17037:2018, all main living room windows within the proposed development have been assessed with the results included in the following sections.

Please note, the “Comment” symbol in each of the tables represents the following:

### BRE Guide 3<sup>rd</sup> Edition / BS 8206-2:2008

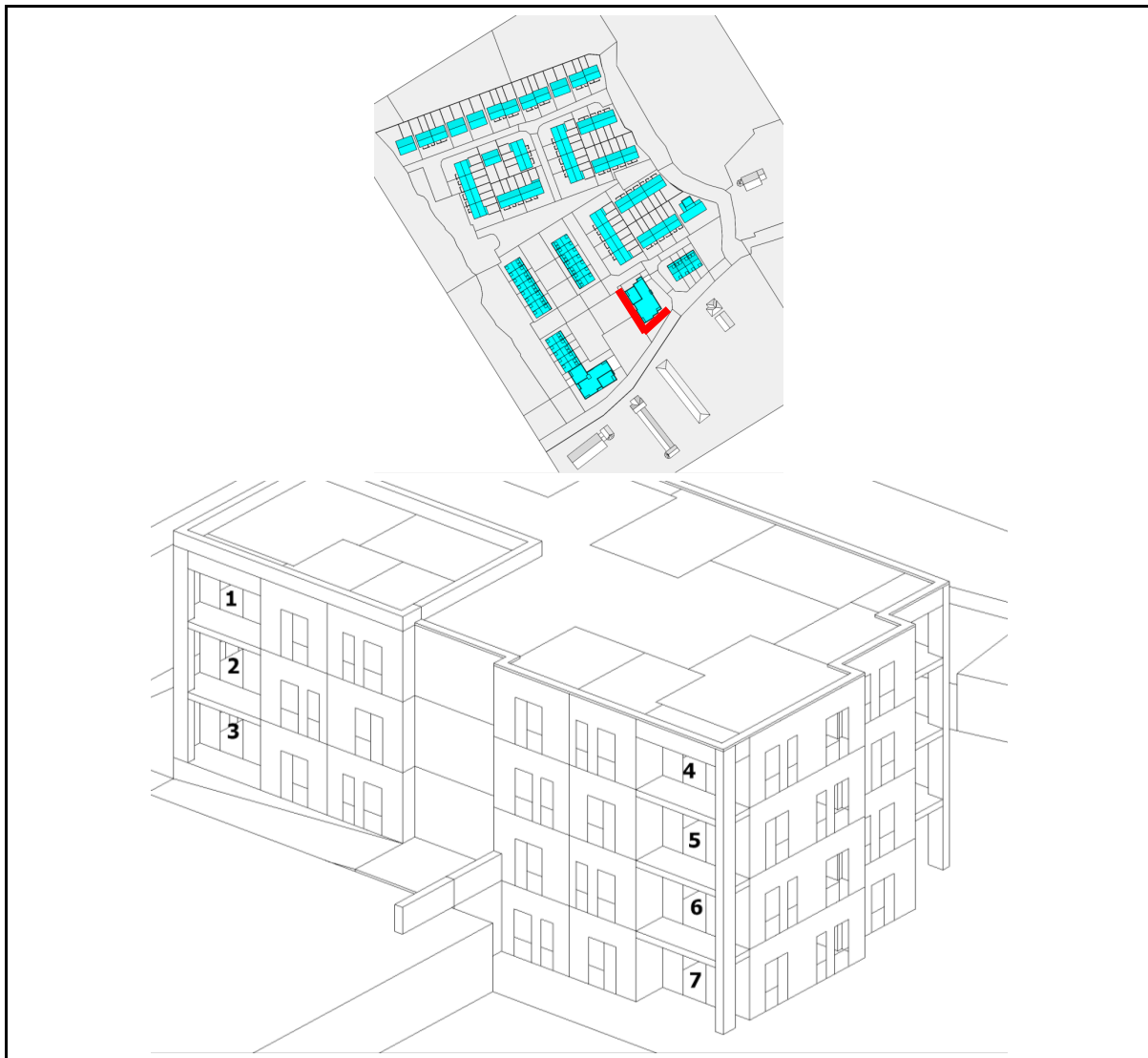
- ✓/✓ For these locations, both the annual and winter AP SH results are greater than 25% and 5% respectively.
- x/✓ For these locations, the annual AP SH results are less than the recommended values, however, the winter AP SH results are greater than 5%.
- ✓ / x For these locations, the winter AP SH results are less than the recommended values, however, the annual AP SH results are greater than 25%.
- x / x For these locations, both the annual and winter AP SH results are less than the recommended values.

### BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018

- ✓ These rooms achieve the minimum 1.5 hours of recommended sunlight exposure on March 21<sup>st</sup>.
- x These rooms do not achieve the minimum 1.5 hours of recommended sunlight exposure on March 21<sup>st</sup>.

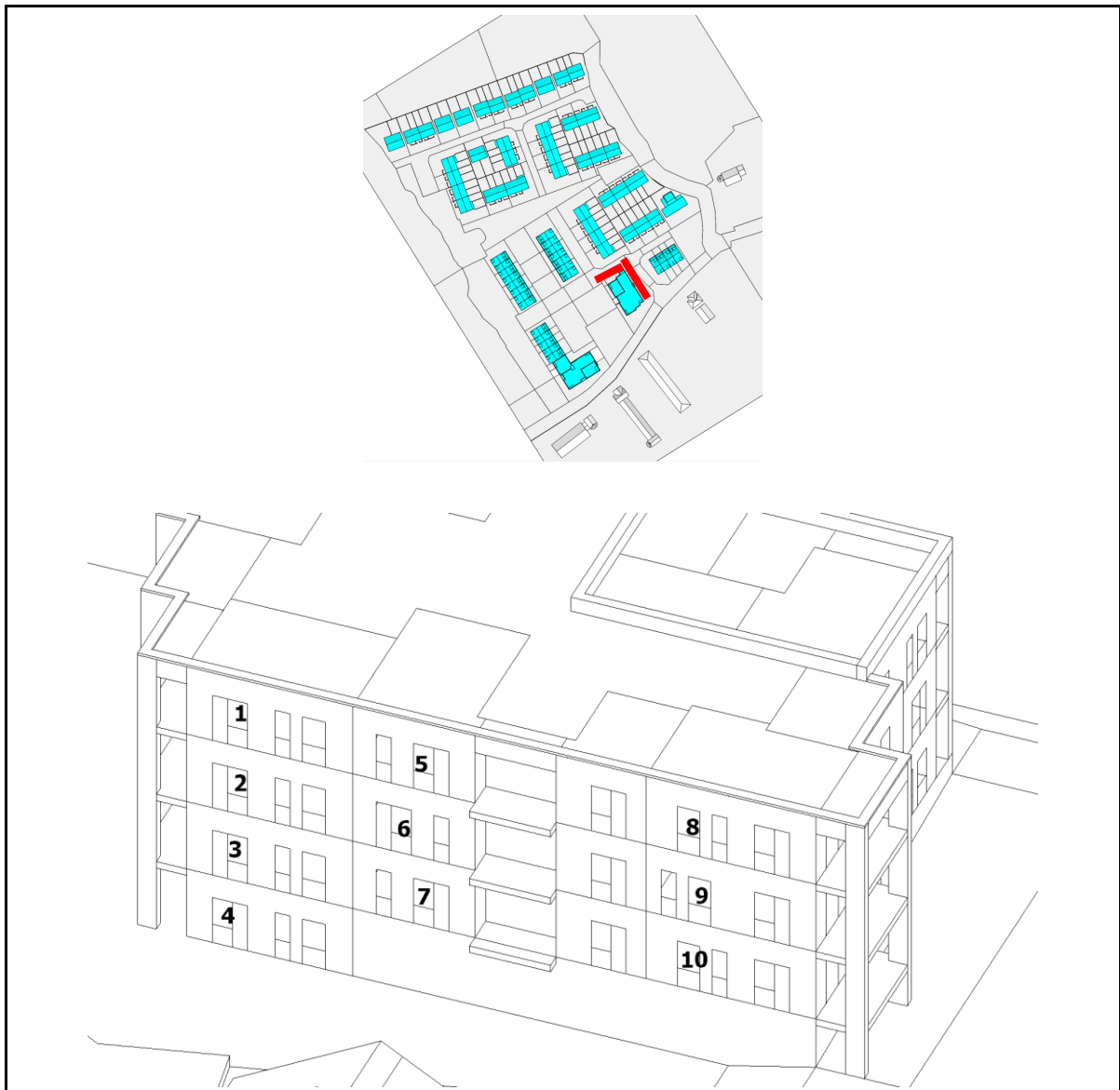


### 8.3.1 View 01 – Apartment Block A1



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	25.12	12.32	✓/✓	✓
2	27.02	15.40	✓/✓	✓
3	25.83	14.68	✓/✓	✓
4	29.53	17.71	✓/✓	✓
5	33.58	17.21	✓/✓	✓
6	31.76	15.55	✓/✓	✓
7	30.37	15.21	✓/✓	✓

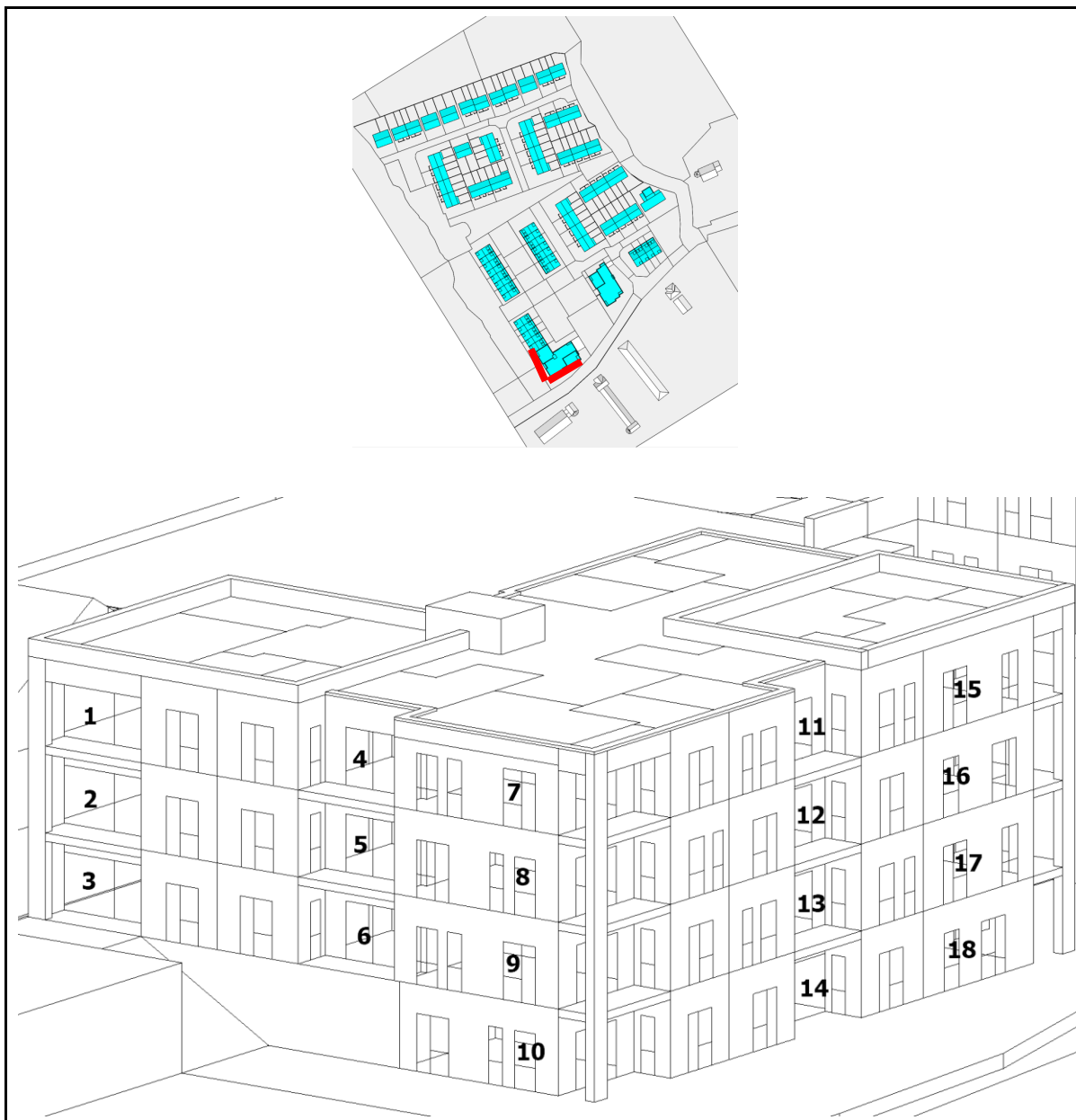
### 8.3.2 View 02 – Apartment Block A1



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	35.92	9.86	✓/✓	✓
2	25.92	9.86	✓/✓	✓
3	25.91	9.86	✓/✓	✓
4	31.78	9.42	✓/✓	✓
5	35.92	9.86	✓/✓	✓
6	35.92	9.86	✓/✓	✓
7	35.91	9.86	✓/✓	✓

Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
8	34.44	9.86	✓/✓	✓
9	29.57	8.98	✓/✓	✓
10	28.80	8.93	✓/✓	✓

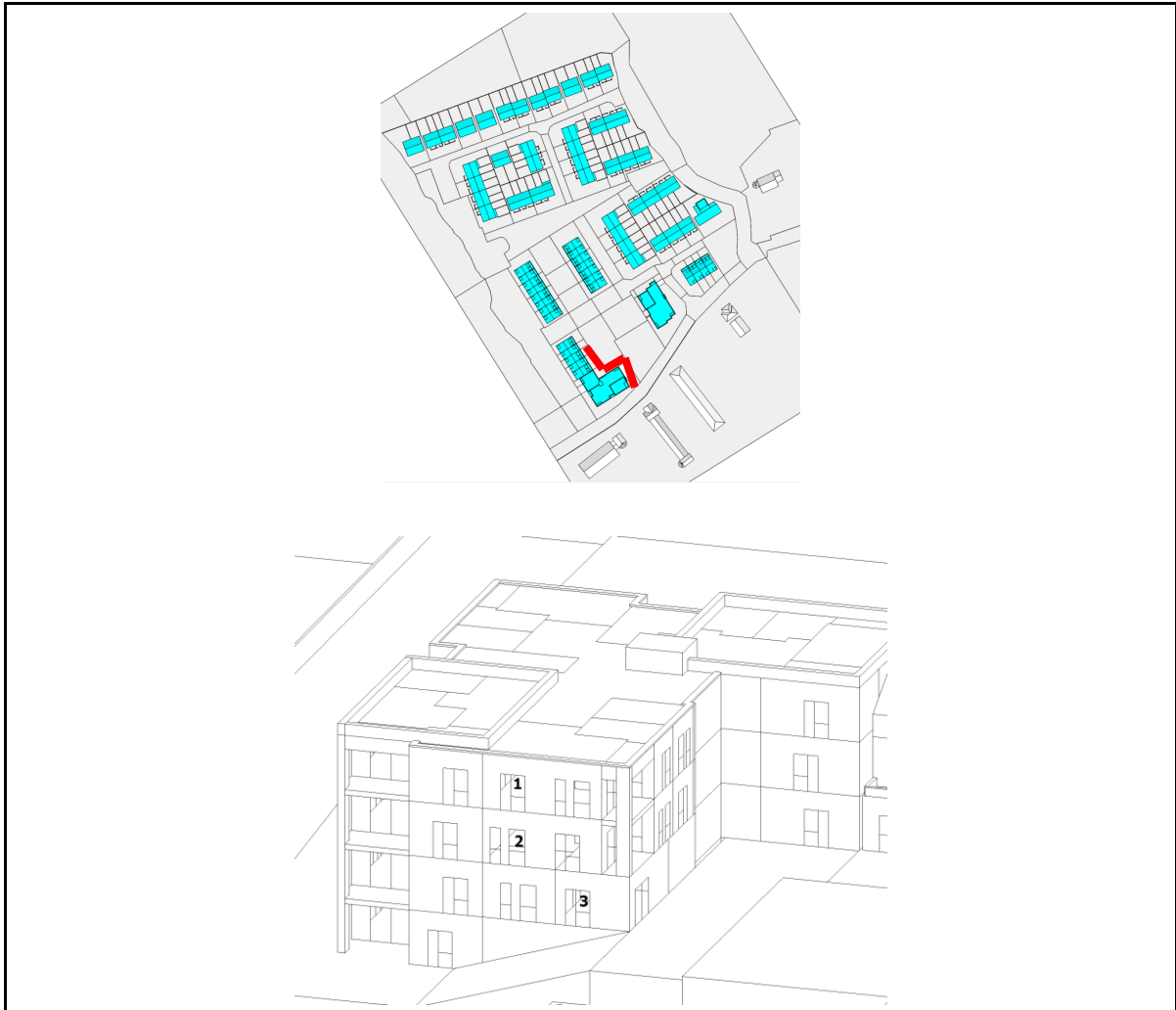
### 8.3.3 View 03 – Apartment Block A2



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	25.24	15,86	✓/✓	✓
2	28.31	12.13	✓/✓	✓
3	27.70	11.46	✓/✓	✓
4	49.93	20.21	✓/✓	✓
5	34.99	18.62	✓/✓	✓

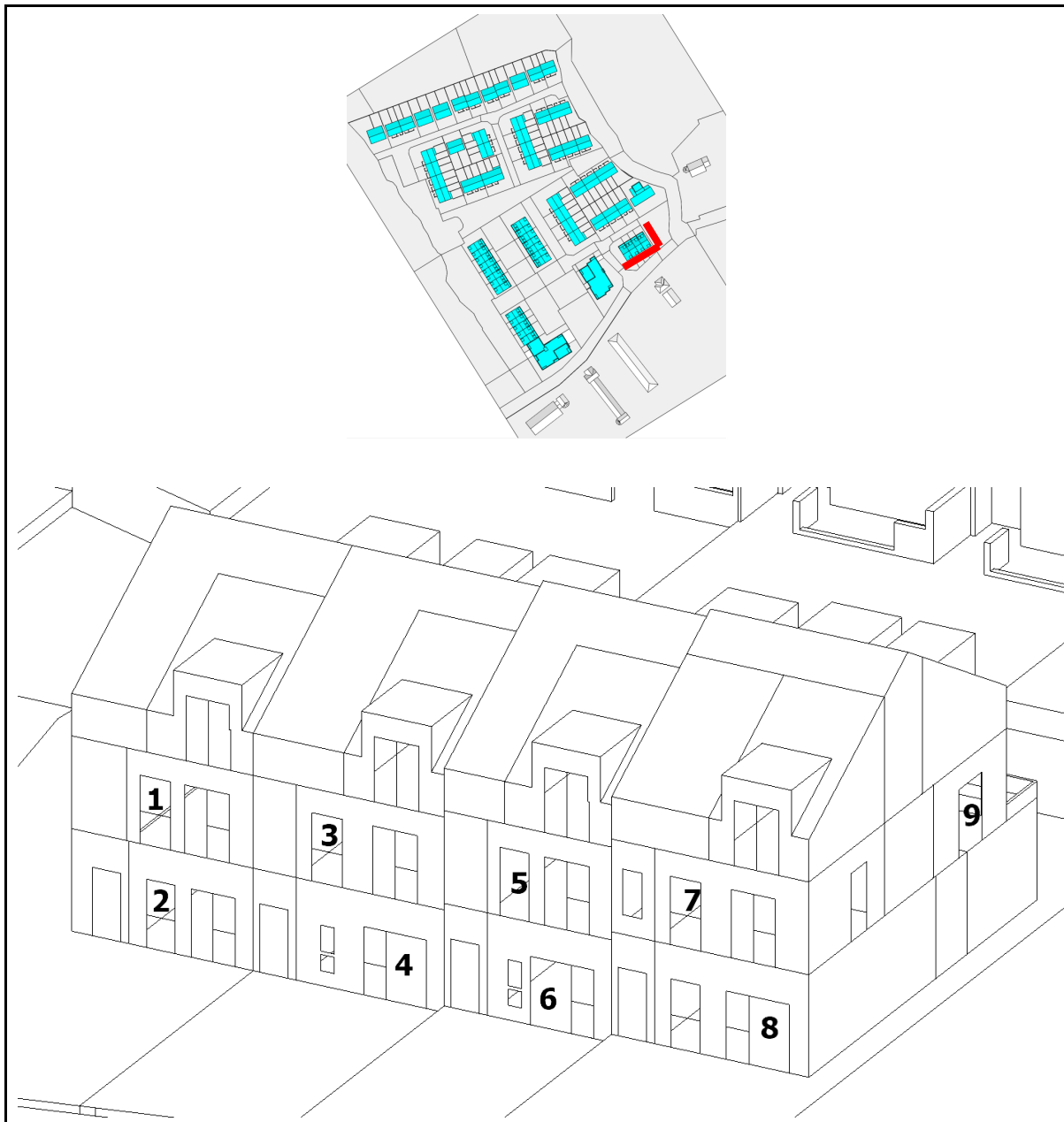
Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
6	34.87	18.55	✓/✓	✓
7	64.08	28.17	✓/✓	✓
8	64.08	28.17	✓/✓	✓
9	64.08	28.17	✓/✓	✓
10	59.24	27.09	✓/✓	✓
11	51.68	25.47	✓/✓	✓
12	33.55	24.26	✓/✓	✓
13	33.09	24.03	✓/✓	✓
14	28.44	21.10	✓/✓	✓
15	77.46	35.21	✓/✓	✓
16	77.46	35.21	✓/✓	✓
17	76.06	33.80	✓/✓	✓
18	72.69	31.69	✓/✓	✓

### 8.3.4 View 04 – Apartment Block A2



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	35.92	9.86	✓/✓	✓
2	35.92	9.86	✓/✓	✓
3	35.92	9.86	✓/✓	✓

### 8.3.5 View 05 – Duplex D1

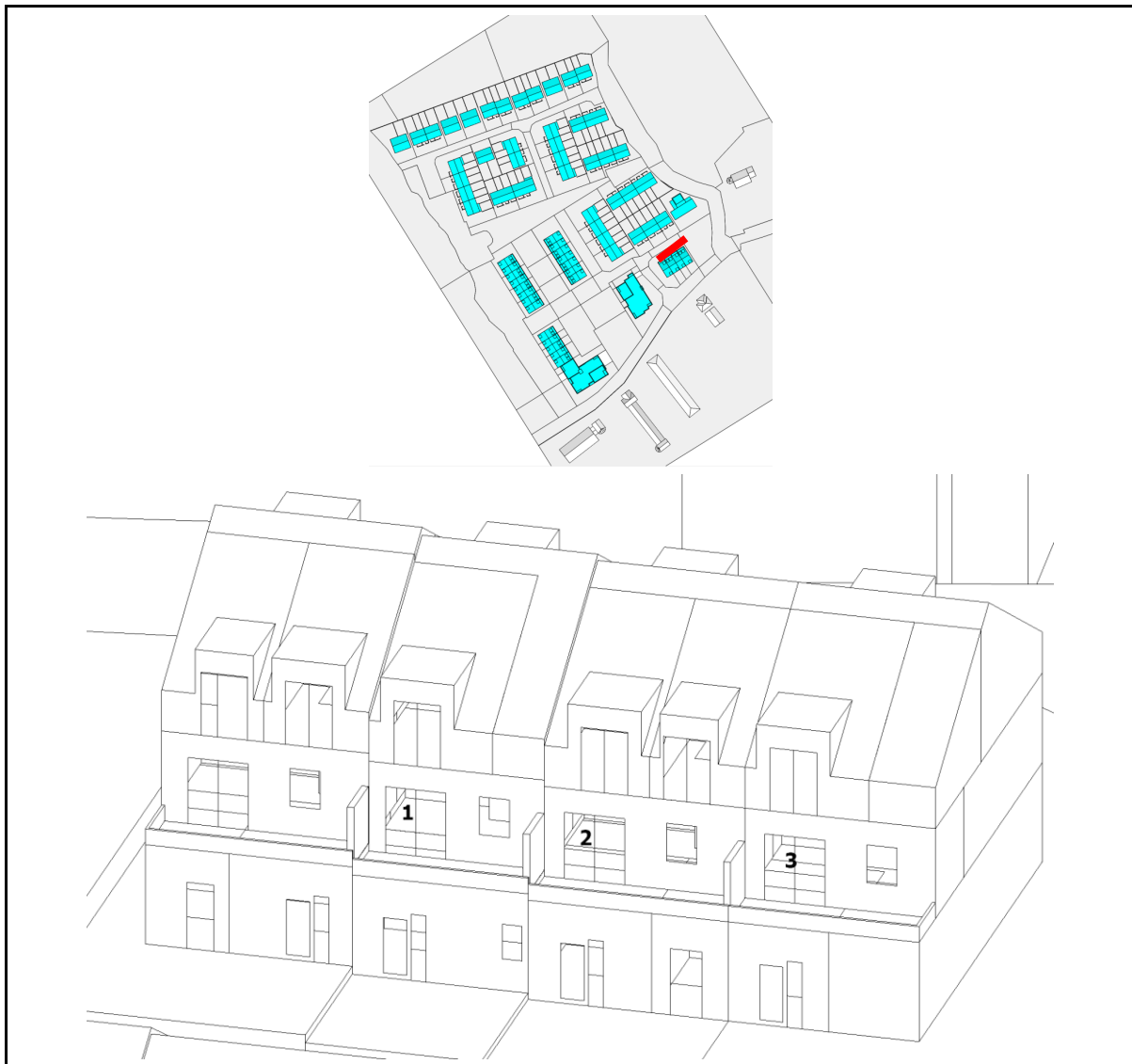


Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	72.26	30.01	✓/✓	✓
2	68.89	27.25	✓/✓	✓
3	74.96	32.89	✓/✓	✓
4	70.89	30.59	✓/✓	✓

Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
5	75.35	33.10	✓/✓	✓
6	72.88	31.73	✓/✓	✓
7	75.35	33.10	✓/✓	✓
8	72.66	32.28	✓/✓	✓
9	35.92	9.86	✓/✓	✓

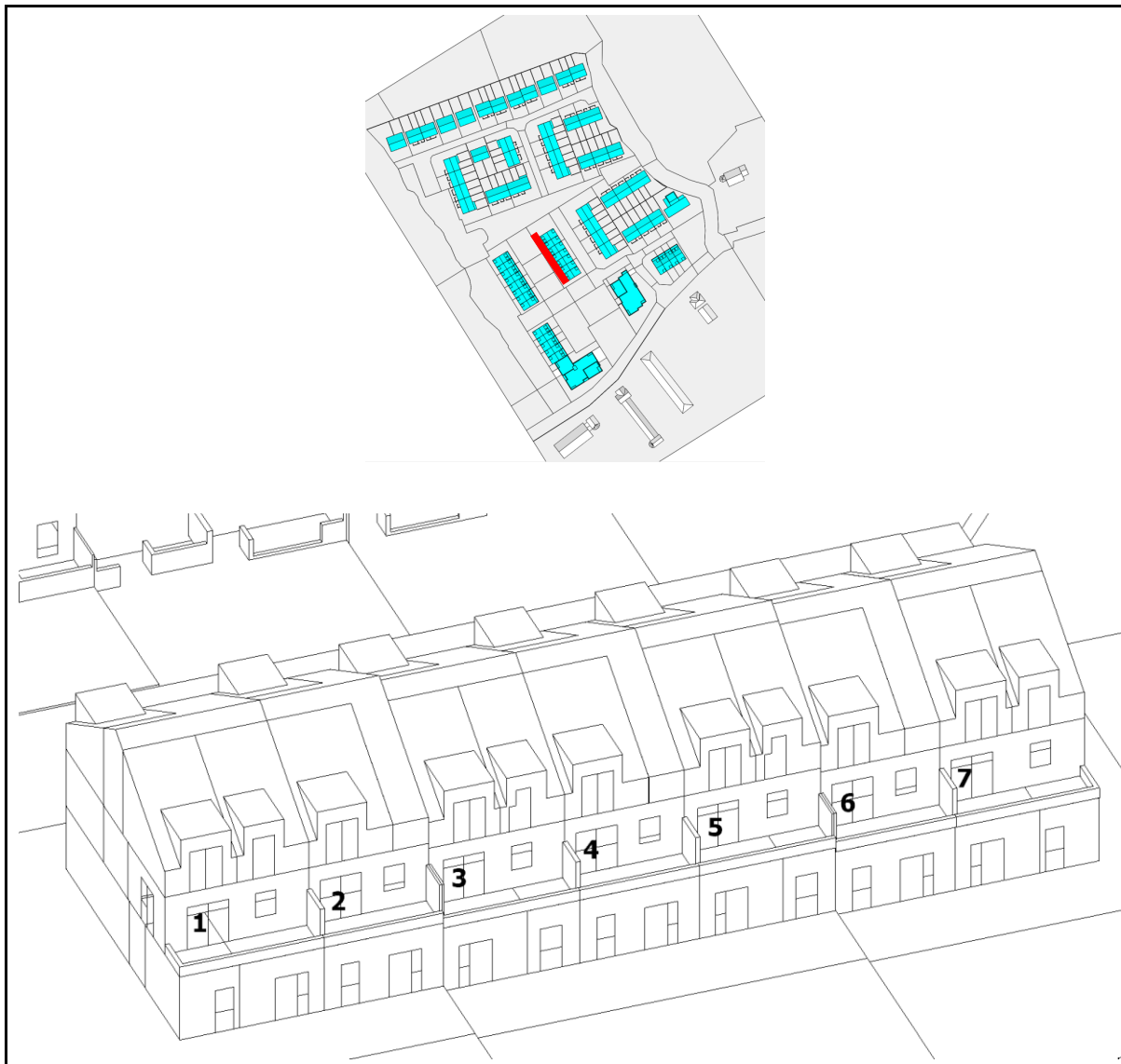


### 8.3.6 View 06 – Duplex D1



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	17.31	0.99	x / x	x
2	16.19	0.70	x / x	x
3	15.87	0.70	x / x	x

### 8.3.7 View 07 – Duplex D2



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	56.41	21.90	✓/✓	✓
2	49.95	21.29	✓/✓	✓
3	48.97	20.87	✓/✓	✓
4	49.14	20.89	✓/✓	✓
5	50.24	21.48	✓/✓	✓
6	50.19	22.11	✓/✓	✓
7	51.45	23.68	✓/✓	✓

### 8.3.8 View 08 – Duplex D2



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	31.59	8.38	✓/✓	✓
2	26.90	5.63	✓/✓	✓
3	30.06	7.52	✓/✓	✓
4	25.61	5.63	✓/✓	✓
5	30.99	8.45	✓/✓	✓
6	25.29	5.95	✓/✓	✓
7	30.69	8.45	✓/✓	✓
8	25.68	6.35	✓/✓	✓
9	30.99	8.45	✓/✓	✓
10	25.42	6.29	✓/✓	✓
11	30.71	8.45	✓/✓	✓
12	26.43	7.04	✓/✓	✓

Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
13	30.99	8.45	✓/✓	✓
14	26.25	7.08	✓/✓	✓

### 8.3.9 Views 09 – Duplex D3



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	64.08	28.17	✓/✓	✓
2	64.08	28.17	✓/✓	✓
3	64.08	28.17	✓/✓	✓
4	64.08	28.17	✓/✓	✓
5	64.08	28.17	✓/✓	✓
6	63.71	28.14	✓/✓	✓
7	64.08	28.17	✓/✓	✓
8	64.08	28.17	✓/✓	✓
9	64.08	28.17	✓/✓	✓
10	63.87	28.15	✓/✓	✓
11	64.08	28.17	✓/✓	✓
12	64.08	28.17	✓/✓	✓

Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
13	64.08	28.17	✓/✓	✓
14	63.81	28.15	✓/✓	✓
15	64.05	28.13	✓/✓	✓
16	63.24	27.33	✓/✓	✓

### 8.3.10 View 10 – Duplex D3



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	31.64	8.82	✓/✓	✓
2	29.34	6.36	✓/✓	✓
3	31.69	9.48	✓/✓	✓
4	28.58	6.36	✓/✓	✓
5	31.53	9.41	✓/✓	✓
6	27.58	5.71	✓/✓	✓
7	31.29	9.34	✓/✓	✓
8	29.32	6.29	✓/✓	✓

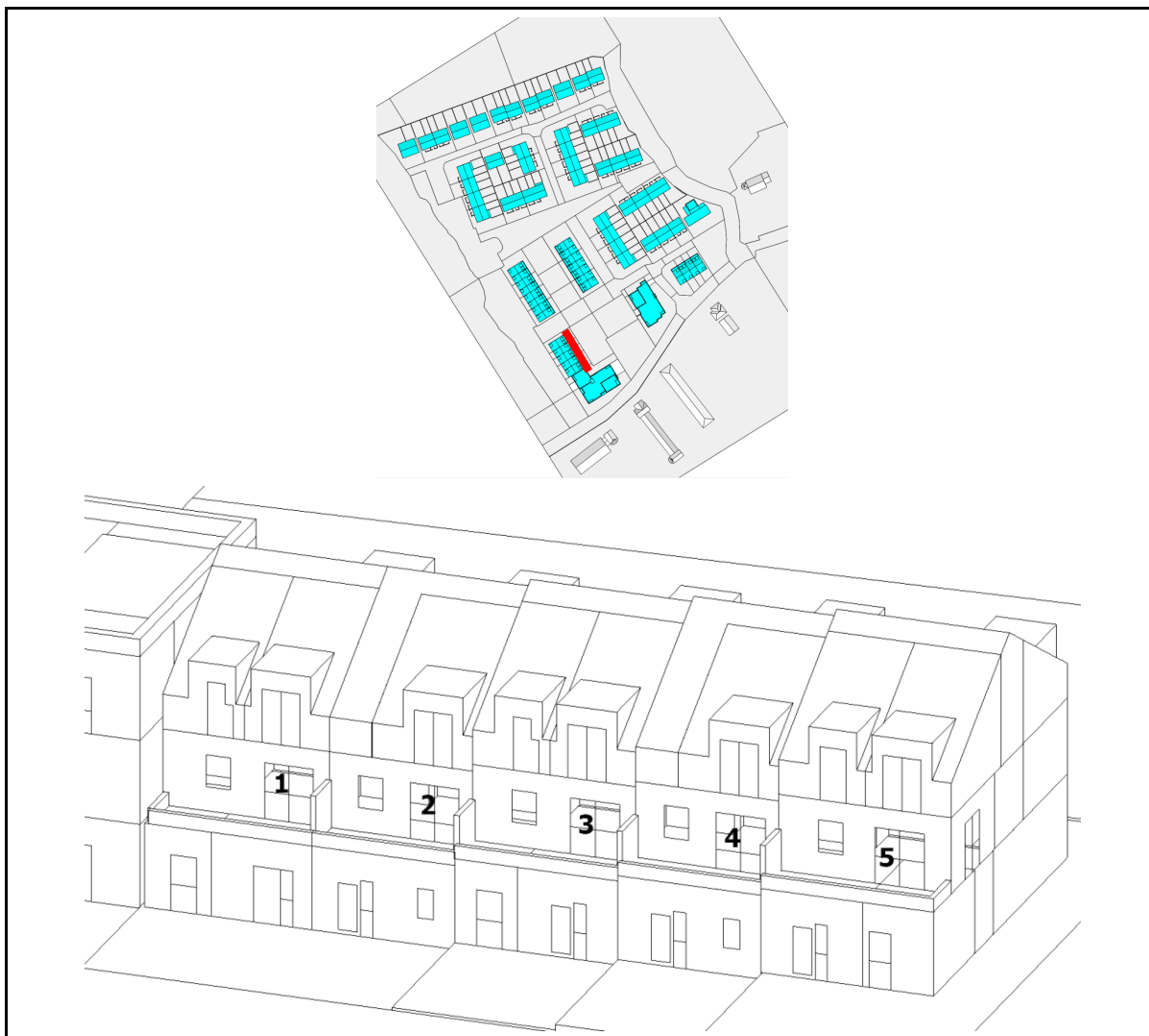
### 8.3.11 View 11 – Duplex D4



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	64.08	28.17	✓/✓	✓
2	64.08	28.17	✓/✓	✓
3	64.08	28.17	✓/✓	✓
4	63.78	27.95	✓/✓	✓
5	64.08	28.17	✓/✓	✓
6	63.12	27.52	✓/✓	✓
7	64.08	28.17	✓/✓	✓
8	62.13	26.78	✓/✓	✓
9	64.08	28.17	✓/✓	✓
10	62.13	26.78	✓/✓	✓



### 8.3.12 View 12 – Duplex D4



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	20.62	0.15	x / x	x
2	25.88	2.01	✓ / x	✓
3	27.85	4.08	✓ / x	✓
4	27.71	4.43	✓ / x	✓
5	29.78	6.36	✓ / ✓	✓

### 8.3.13 View 13 – Terrace 01



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	48.08	15.71	✓ / ✓	✓
2	51.46	21.59	✓ / ✓	✓

### 8.3.14 View 14 – Terrace 01



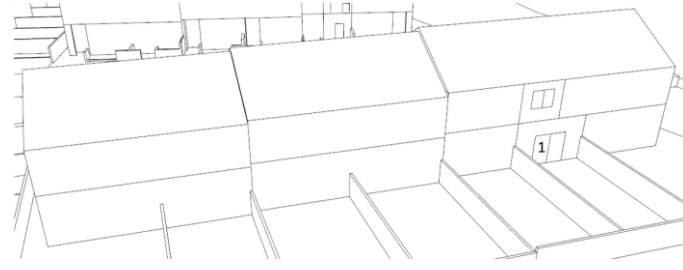

Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	66.46	25.01	✓/✓	✓

### 8.3.15 View 15 – Terrace 02

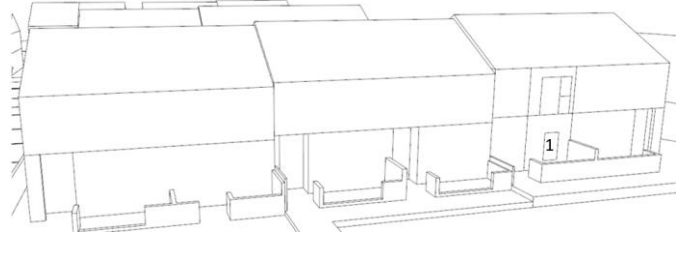



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	12.55	0.42	x / x	x
2	64.14	22.92	✓ / ✓	✓

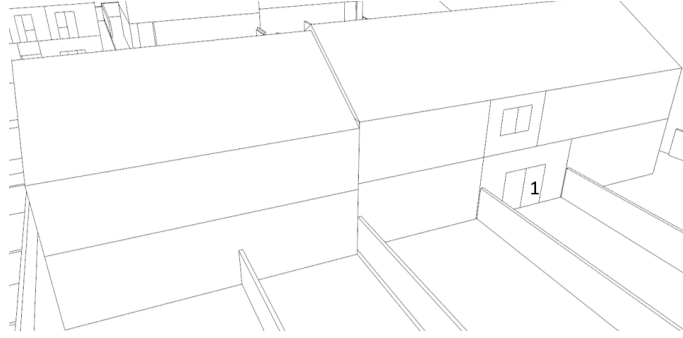

### 8.3.16 View 16 – Terrace 03

				
Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	59.37	21.36	✓/✓	✓

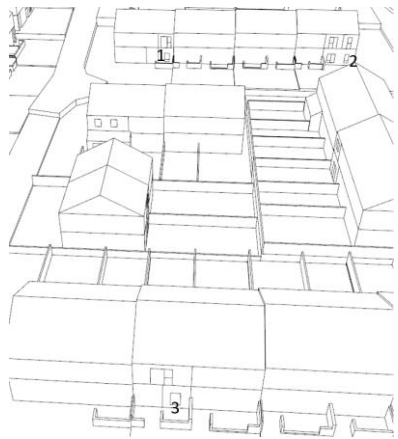

### 8.3.17 View 17 – Terrace 04

				
Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	55.33	24.44	✓/✓	✓



### 8.3.18 View 18 – Terrace 05

				
Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	58.59	20.64	✓/✓	✓

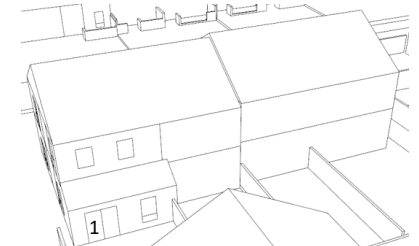


### 8.3.19 View 19 – Terrace 06

				
Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	42.96	11.81	✓/✓	✓
2	51.75	21.67	✓/✓	✓
3	49.50	17.20	✓/✓	✓

### 8.3.20 View 20 – Terrace 06

				
Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	70.01	30.56	✓ / ✓	✓

### 8.3.21 View 21 – Terrace 08

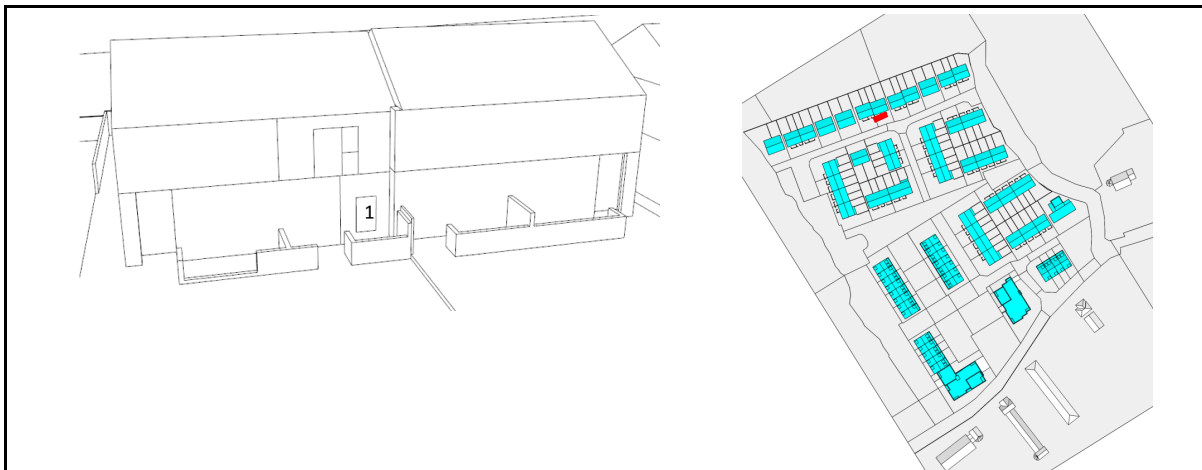
				
				
Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	38.64	11.08	✓ / ✓	✓
2	24.45	4.07	x / x	✓

### 8.3.22 View 22 – Terrace 09



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	73.41	32.70	✓ / ✓	✓
2	10.69	0.00	x / x	x

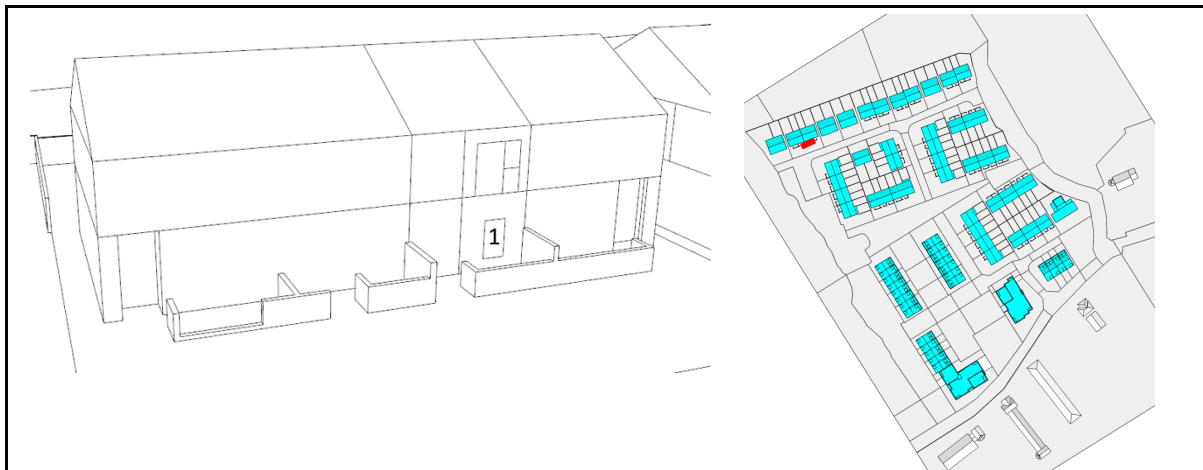
### 8.3.23 View 23 – Terrace 10



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	54.73	23.87	✓ / ✓	✓



### 8.3.24 View 24 – Terrace 11



Ref.	BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 APSH Assessment			BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Sunlight Exposure > 1.5 hrs
	APSH Annual (%)	APSH Winter (%)	Comment	Comment
1	64.40	27.55	✓ / ✓	✓

## 8.4 Discussion

### **BRE Guide 2<sup>nd</sup> Edition / BS 8206-2:2008**

Within the BS 8206-2:2008 standard, when discussing annual probable sunlight hours regarding proposed developments, it is noted that:

*“The degree of satisfaction is related to the expectation of sunlight. If a room is necessarily North facing or if the building is in a densely-built urban area, the absence of sunlight is more acceptable than when its exclusion seems arbitrary”.*

This is also reflected in the BRE Guide 2<sup>nd</sup> Edition which states:

*“The BS 8206-2 criterion applies to rooms of all orientations, although if a room faces significantly north of due east or west it is unlikely to be met.”*

Of the 128 no. points tested, 121 no. points (95%) meet the BRE recommended values over both the annual and winter periods. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, i.e. windows facing “*significantly north of due east or west*” or as a consequence of the impact of balcony projections.

It should be noted that in the development of any apartment type building achieving in the region of 75% to 80% for this assessment would be considered very high and factors such site constraints and ultimately orientation play a huge part to the outcome of this assessment. In

some instance and particularly a scheme like this where you have apartments on either side of a rectangular block, 50% would be as highest percentage achievable with the apartments on one side not able meet requirements purely on orientation as noted and the inclusion of balconies within the design scheme (as a requirement).

**BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018**

As the sunlight exposure assessment in accordance with BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018 considers the orientation of the rooms similar to the BRE Guide 2<sup>nd</sup> Edition / BS 8206-2:2008 assessment above, it can also be concluded that the criteria for rooms facing significantly north of due east or west is unlikely to be met.

Of the 128 no. points tested, 122 no. points (95%) meet the BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21<sup>st</sup>. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, or as a consequence of the impact of balcony projections.

Overall, the sunlight provision results to the proposed development in accordance with IS EN 17037:23018 are considered excellent in the context of a suburban environment, due to the fact that not all living rooms can face south and the inclusion of balconies.

## 9 Daylight to Existing Buildings

### 9.1 Guidance – BRE Guide (2<sup>nd</sup> Edition) / BS 8206-2:2008 & BRE Guide (3<sup>rd</sup> Edition) / IS EN 17037:2018

When designing a new development, it is important to safeguard the daylight to nearby buildings. The BRE Guide provides numerical values that are purely advisory. Different criteria may be used based on the requirements for daylighting in an area viewed against other site layout constraints. Another issue is whether the existing building is itself a good neighbour, standing a reasonable distance from the boundary and taking no more than its fair share of light. Any reduction in the total amount of skylight can be calculated by determining the vertical sky component at the centre of key reference points. The vertical sky component definition from the BRE Guide (2<sup>nd</sup> Edition & 3<sup>rd</sup> Edition) is described below:

#### Vertical sky component (VSC)

Ratio of that part of illuminance, at a point on a given vertical plane, that is received directly from a 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.

The maximum possible VSC value for an opening in a vertical wall, assuming no obstructions, is 40%. This VSC at any given point can be tested in RadianceIES, a module of IES VE.

For typical residential schemes the BRE Guide (2<sup>nd</sup> Edition) states the following in Section 2.2.7:

2.2.7 If this VSC is greater than 27% then enough skylight should still be reaching the window of the existing building. Any reduction below this level should be kept to a minimum. If the VSC, with the new development in place, is both less than 27% and less than 0.8 times its former value, occupants of the existing building will notice the reduction in the amount of skylight. The area lit by the window is likely to appear more gloomy, and electric lighting will be needed more of the time.

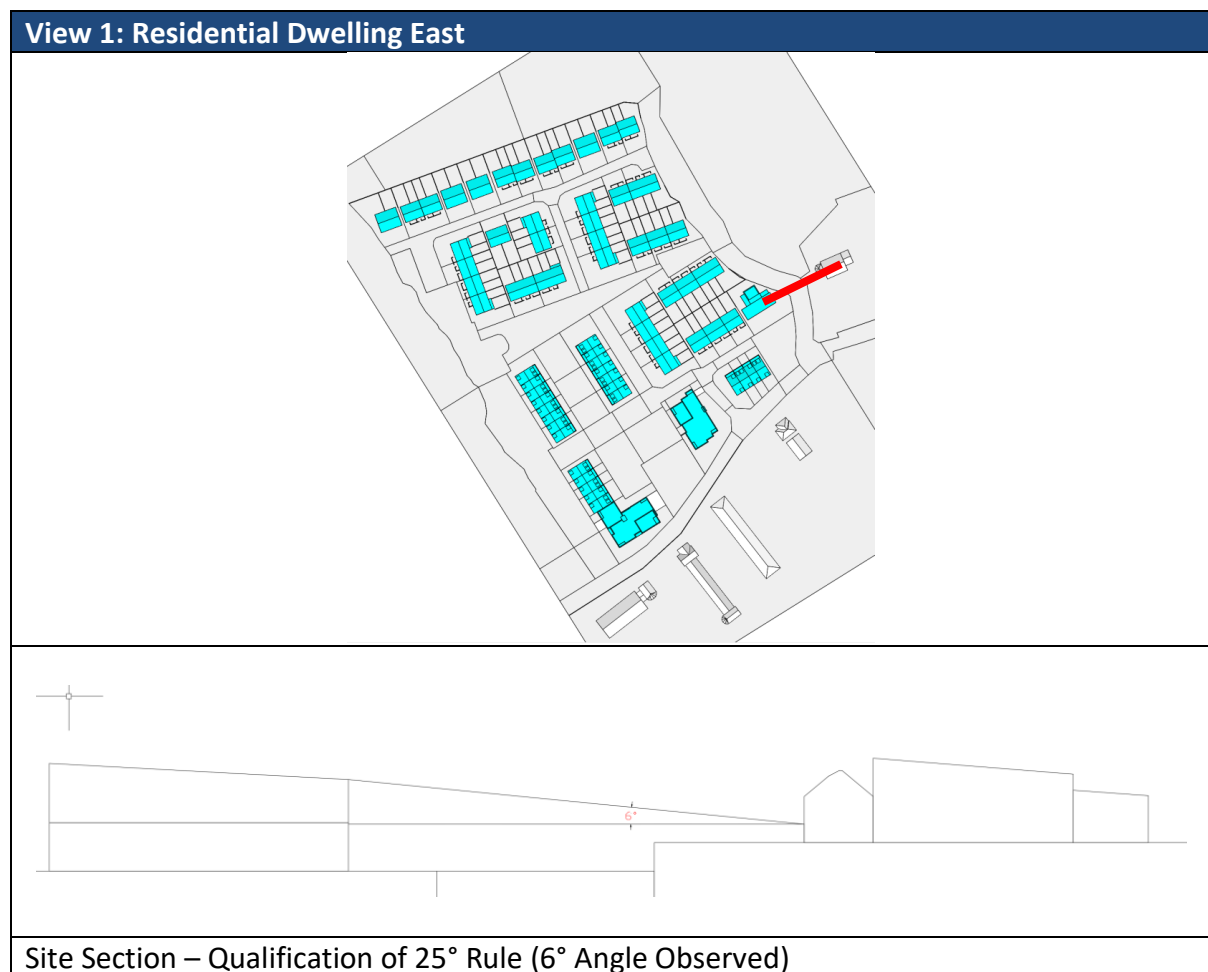
Based on the criteria outlined in Section 2.2.5 of the BRE Guide (2<sup>nd</sup> Edition), only one of the existing dwellings need to be included within the VSC assessment as the rest did not meet the criterion as laid out within the BRE guide.

It is not always necessary to do a full calculation to check daylight potential. The guideline above is met provided the following is true:

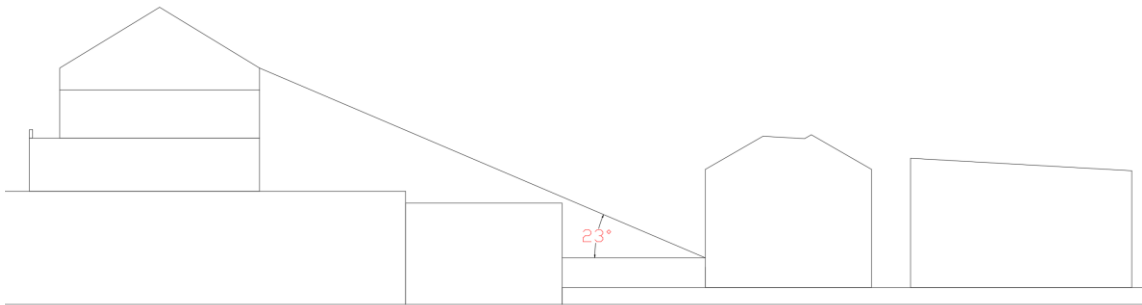
- no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal.

Given the statement above the surrounding dwellings and the proposed development were verified noting that in a section perpendicular to the window wall, no angle subtended more than 25°. Therefore, as noted above, only one of the existing dwellings has been included within the VSC assessment as the daylight impact to the rest will be unnoticeable to the occupants.

The results from the 25° degree check carried out can be seen from the images below.



**View 2: Apartment 122, Castlegar**



Site Section – Qualification of 25° Rule (23° Angle Observed)

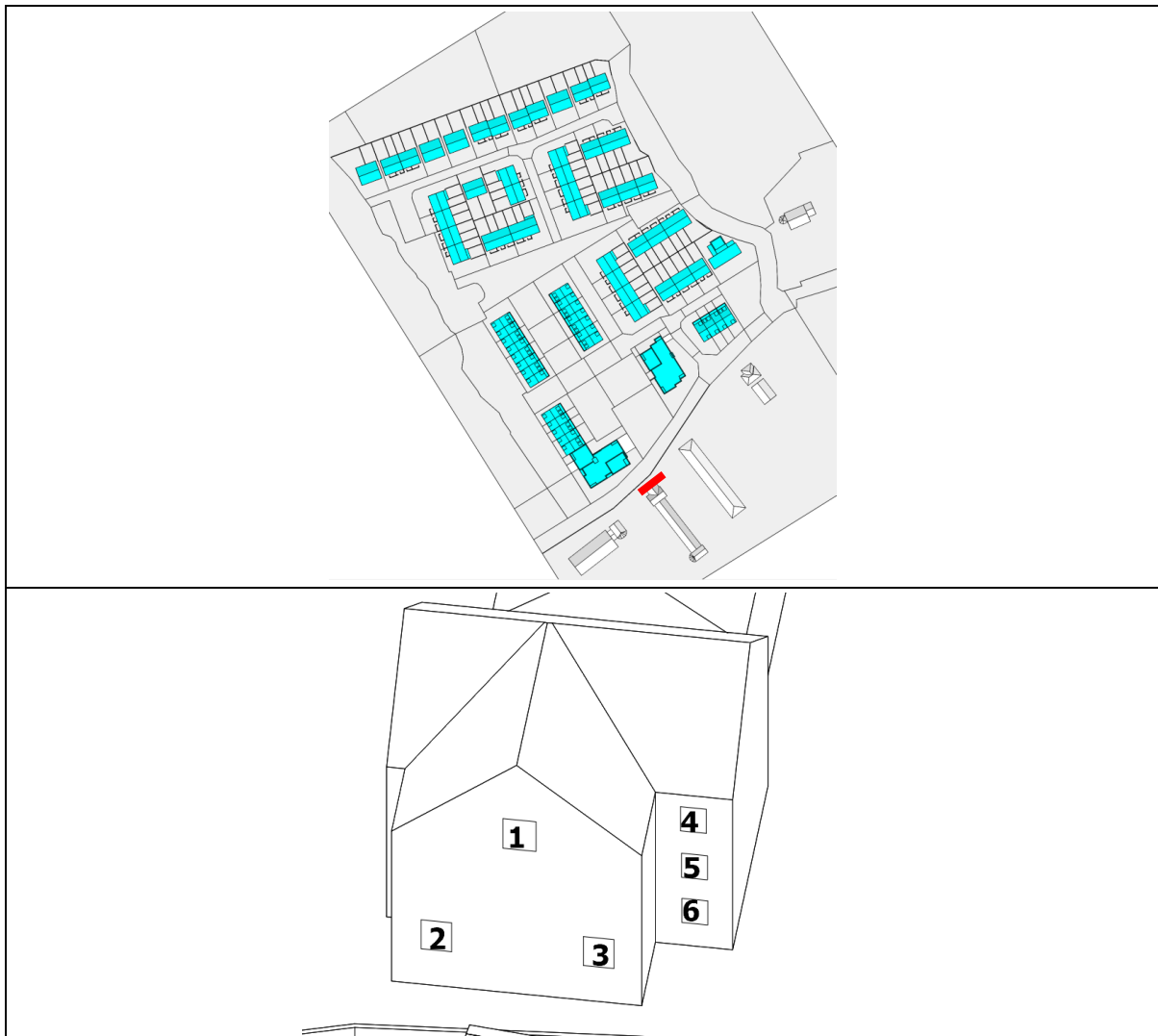
## 9.2 Assessment

Based on the above criteria, the locations in the following sections have been modelled and analysed with the results also included.

Please note, the “Comment” symbol in each of the tables represents the following:

- ✓ For these locations, the Proposed Scheme VSC value is greater than 27% or 0.8 times their former value (that of the Existing Situation/Permitted Scheme).
- ✓<sup>1</sup> For these locations, the Proposed Scheme VSC value is less than 0.8 times its former value (that of the Existing). However, the Proposed Scheme VSC values are between 15% and 27% and hence adequate daylight should still be expected (as per Section 2.1.6 of the BRE Guide) given the presence of larger than conventional windows.
- x For these locations, the Proposed Scheme VSC value is less than 15% and less than 0.8 times its former value (that of the Existing Situation), therefore, it does not achieve the BRE recommendations.

### 9.2.1 View 1: Apartment 82 Cluain Riocaird South



Points	Existing Situation VSC (%)	Proposed Scheme VSC (%)	Proposed VSC % of Existing Situation	Comment
1	38.02	32.15	85%	✓
2	31.58	27.26	86%	✓
3	31.42	25.89	82%	✓
4	31.42	26.65	85%	✓
5	24.98	20.32	81%	✓
6	21.66	17.48	81%	✓

### 9.3 Discussion

Based on the criteria outlined in Section 2.2.5 of the BRE guidance (2<sup>nd</sup> and 3<sup>rd</sup> Editions), one of the neighbouring dwellings need to be included within the VSC assessment as the rest did not meet the criterion as laid out within the BRE guide.

It is not always necessary to do a full calculation to check daylight potential. The guideline above is met provided the following is true:

- no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal.

Given the statement above the existing surrounding dwellings and the proposed development were verified noting that in a section perpendicular to the window wall, no angle subtended more than 25°. Therefore, as noted above, only one of the existing adjacent dwellings has been included within the VSC assessment as the daylight impact will be unnoticeable to the occupants for the remaining existing properties.

When compared to the Existing Situation, of the 6 no. points tested, 100% (6 points) have a Proposed VSC value greater than 27% or not less than 0.8 times their former value compared to the Existing Situation, thus complying with the BRE recommendations.



## 10 Daylight to Proposed Development

This section addresses daylight provision to the proposed housing and duplex apartments. The purpose of the calculations is to quantify an overall percentage of units which exceeds the daylight provision recommendations. Our proposed methodology is to complete the calculations for all of the duplex apartments and a sample of the housing within the development. The objective of the design team is to maximise the number of units which exceed the minimum recommendations.

### 10.1 Reference Standards

The daylight provision to the proposed development was assessed against the following standards for completeness:

- BRE Guide (2<sup>nd</sup> Edition) / BS 8206-2:2008
- BRE Guide (3<sup>rd</sup> Edition) / IS EN 17037:2018
- BRE Guide (3<sup>rd</sup> Edition) / BS EN 17037:2018

The following sections summarise the various requirements of each standard.

#### 10.1.1 BRE Guide (2<sup>nd</sup> Edition) / BS 8206-2:2008

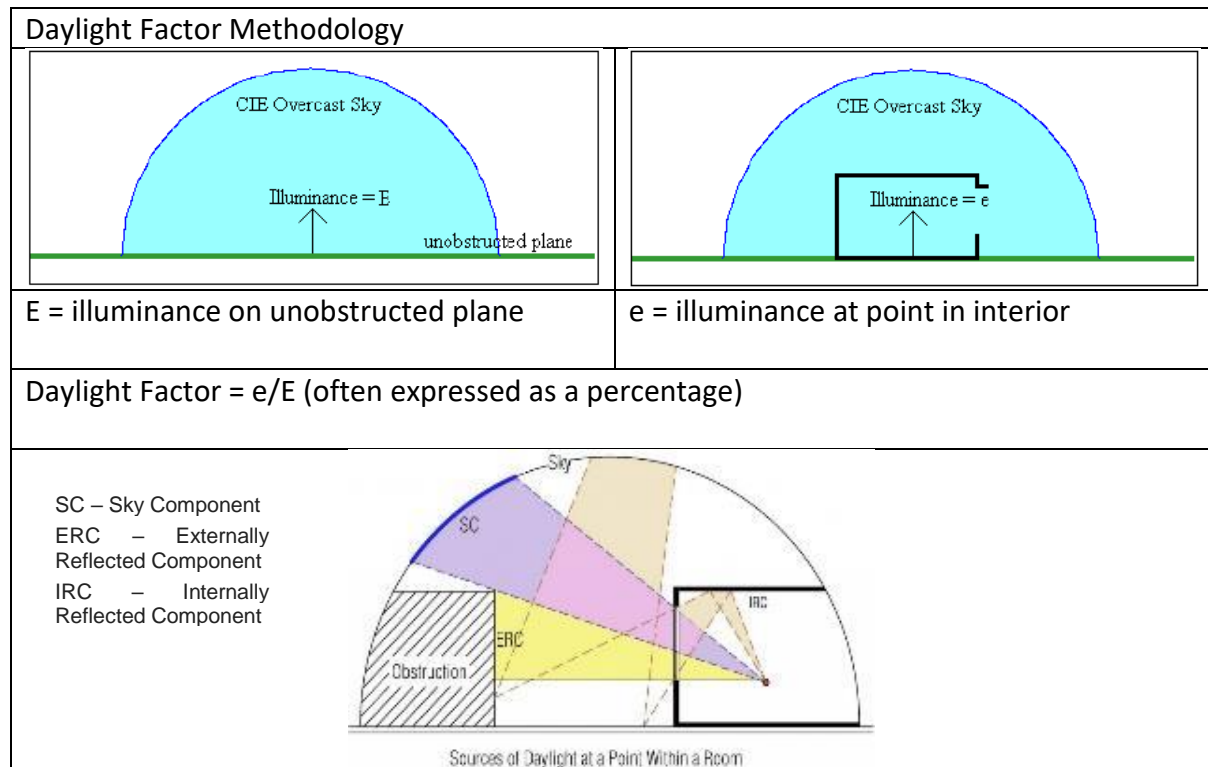
The BRE Guide (2<sup>nd</sup> Edition) states that the “*advice is not mandatory and that the guide should not be seen as an instrument of planning policy*”. It should be noted when trying to achieve height and density within a development where deep plan, single aspect, combined living, kitchen and dining spaces exist (in some situations with a balcony in place as well), it is very difficult to achieve good levels of daylight across the whole space. Therefore, when considering the modelling approach noted above, results should be interpreted with flexibility as noted in the BRE guide (2<sup>nd</sup> Edition):

*“Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design.”*

### 10.1.1.1 Introduction to ADF

Daylight is constantly changing, so its level at a point in a building is usually defined as an average daylight factor (ADF).

This is the ratio of the indoor illuminance at the point in question to the outdoor unobstructed horizontal illuminance.



Both illuminances are measured under the same standard sky, a CIE overcast sky. Since the sun is in a particular position for only a short period each day, direct sunlight is excluded. Instead diffuse sunlight is used for average daylight calculations. Diffuse sunlight describes the sunlight that has been scattered by molecules and particles in the atmosphere but has still made it down to surface of the earth.

For average daylight factor there are three possible paths along which diffuse light can get into a room through glazed windows.

1. Light from the patch of sky visible at the point considered, is expressed as the sky component.
2. Light reflected from opposing exterior surfaces and then reaches the point, is expressed as the externally reflected component.
3. Light entering through the window but reaching the point only after reflection from internal surfaces, is expressed as the internally reflected component.

Average Daylight Factor is an average of all measured points within the space.

#### 10.1.1.2 ADF Requirements

The BRE Guide (2<sup>nd</sup> Edition) states the following in Appendix C with respect to Average Daylight Factors (ADF):

**C4** If a predominantly daylit appearance is required, then the ADF should be 5% or more if there is no supplementary electric lighting, or 2% or more if supplementary electric lighting is provided. There are additional recommendations for dwellings of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms. These additional recommendations are minimum values of ADF which should be attained even if a predominantly daylit appearance is not achievable.

Therefore, the recommended Average Daylight Factors (ADF) are summarized as follows:

- Bedrooms – 1.0%
- Living Rooms – 1.5%
- Kitchens – 2.0%

The BRE Guide (2<sup>nd</sup> Edition) does not provide explicit guidance for an open space that is a combination of Living/Kitchen/Dining (LKD) functions. However, the BS 8206-2:2008 standard states:

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

Although the above target is referenced within BS 8206-2:2008, it also states, *“The aim of the standard is to give guidance to architects, builders and others who carry out lighting design. It is recognised that lighting is only one of many matters that influence fenestration. These include other aspects of environmental performance (such as noise, thermal equilibrium and the control of energy use), fire hazards, constructional requirements, the external appearance and the surroundings of the site. The best design for a building does not necessarily incorporate the ideal solution for any individual function. For this reason, careful judgement should be exercised when using the criteria given in the standard for other purposes, particularly town planning.”*

For the purposes of clarity, we have assessed all LKDs against the 2% ADF target.

### 10.1.2 BRE Guide (3<sup>rd</sup> Edition) / IS EN 17037:2018

As outlined in Section 5.1.2 of the IS EN 17037:2018 standard:

*“A space is considered to provide adequate daylight if a target illuminance level is achieved across a fraction of the reference plane within a space for at least half of the daylight hours. In addition, for spaces with vertical or inclined daylight openings, a minimum target illuminance level is also to be achieved across the reference plane”.*

Annex A of IS EN 17037:2018 gives three levels of recommendation for the assessment of daylight provision in interior spaces which are summarised as follows:

*“The three levels are: minimum, medium and high, and the minimum recommendation should be provided.”*

It is important to note that IS EN 17037:2018 does not provide different illuminance targets for different space types. Therefore, in the case of residential developments; bedrooms, living rooms, kitchens and combined LKDs all have the same daylight provision targets.

Table A.1 of IS EN 17037:2018 (included below) provides recommendations for daylight provision by daylight openings in vertical and inclined surfaces. Note, Table A.2 provides similar recommendations for daylight openings in horizontal surfaces, e.g. rooflights. As there are no rooflights in the proposed development, the recommendations in Table A.2 are not followed.

To achieve the minimum level of daylight provision for vertical and inclined openings as per Table A.1, the following must be achieved:

- A target illuminance ( $E_T$ ) of 300 lux must be achieved on over 50% of the floor area for over 50% of the available daylight hours, and
- A minimum target illuminance ( $E_{TM}$ ) of 100 lux must be achieved on over 95% of the floor area for over 50% of the available daylight hours.
- Both targets above must be satisfied for a space to be deemed compliant with the requirements.

**Table A.1 — Recommendations of daylight provision by daylight openings in vertical and inclined surface**

Level of recommendation for vertical and inclined daylight opening	Target illuminance $E_T$ lx	Fraction of space for target level $F_{plane, \%}$	Minimum target illuminance $E_{TM}$ lx	Fraction of space for minimum target level $F_{plane, \%}$	Fraction of daylight hours $F_{time, \%}$
Minimum	300	50 %	100	95 %	50 %
Medium	500	50 %	300	95 %	50 %
High	750	50 %	500	95 %	50 %

NOTE Table A.3 gives target daylight factor ( $D_T$ ) and minimum target daylight factor ( $D_{TM}$ ) corresponding to target illuminance level and minimum target illuminance, respectively, for the CEN capital cities.

The recommendations in Table A.1 can also be expressed in terms of a daylight factor “D”. Table A.3 provides the corresponding daylight factor (D) relative to a recommended target illuminance  $E_T$  (lx) and target minimum illuminance  $E_{TM}$  (lx) depending on the location for daylight openings in vertical and inclined surfaces. Note, Table A.4 provides similar target values for openings in horizontal surfaces, e.g. rooflights. As there are no rooflights in the proposed development, the recommendations in Table A.4 are not followed.

The extract from Table A.3 below is for Dublin with the daylight factor targets highlighted, i.e. to achieve the target illuminance ( $E_T$ ) of 300 lux outlined in Table A.1, an equivalent target daylight factor is 2.0%. Furthermore, to achieve the minimum target illuminance ( $E_{TM}$ ) of 100 lux outlined in Table A.1, an equivalent target daylight factor is 0.7%.

**Table A.3 — Values of  $D$  for daylight openings to exceed an illuminance level of 100, 300, 500 or 750 lx for a fraction of daylight hours  $F_{time, \%} = 50\%$  for 33 capitals of CEN national members**

Nation	Capital <sup>a</sup>	Geographical latitude $\varphi$ [°]	Median External Diffuse Illuminance $E_{V,d,med}$	$D$ to exceed 100 lx	$D$ to exceed 300 lx	$D$ to exceed 500 lx	$D$ to exceed 750 lx
Ireland	Dublin	53,43	14 900	0,7 %	2,0 %	3,4 %	5,0 %

Therefore, to achieve the minimum level of daylight provision for vertical and inclined openings as per Table A.3, the following must be achieved:

- A target daylight factor ( $D_T$ ) of 2.0% must be achieved on over 50% of the floor area for over 50% of the available daylight hours, and
- A minimum target daylight factor ( $D_{TM}$ ) of 0.7% must be achieved on over 95% of the floor area for over 50% of the available daylight hours.
- Both targets above must be satisfied for a space to be deemed compliant with the requirements.

There are two methods to assess daylight provision to the interior which are based on target values in either Table A.1 or Table A.3 which are summarised as follows:

**Method 1:** This calculation method uses the daylight factor targets on the reference plane as per Table A.3. The assessment is carried out on a representative day and time during the year, i.e. 21<sup>st</sup> September @ 12:00 under standard CIE overcast sky conditions.

**Method 2:** This calculation method uses the illuminance targets on the reference plane as per Table A.1. The assessment is carried out for each hour over the course of the year (8,760 hours) using a local weather file which accounts for varying sky conditions and sun positions throughout the year.

As outlined in Section 5.1.4, the verification of daylight provision can be determined using either an adequate software or on-site measurements. When using a software, *“a representative model of the space is required together with the key parameters (such as any significant nearby obstructions, the assigned surface reflectance values and glazing transmissivity) that are a reasonable representation of those for the actual, completed building. This can be determined using either Method 1 or Method 2.”*

Based on the above criteria, the daylight provision to the proposed development has been assessed using an adequate software (i.e. IES VE), using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table A.1 of IS EN 17037:2018.

The Method 2 climate-based approach was selected as it is a far more accurate assessment method compared to Method 1. Climate based daylight modelling (CBDM) is more accurate compared to a calculation based on a single day during the year, i.e. Method 1. The amount of daylight varies throughout the year, primarily due to the sun’s position, so it is essential the impact of daylight variance is properly considered. CBDM utilises an annual simulation linking location, shading, climate data (including solar intensity and cloud cover) together with the building properties. This provides a complete overview on how the daylight performance varies throughout the year due to changes in these factors.

### **10.1.3 BRE Guide 3<sup>rd</sup> Edition / BS EN 17037:2018 National Annex**

In the UK, EN17037:2018 was adopted to form “BS EN 17037:2018”. However, a “National Annex NA” was included which states:

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

Whereas IS EN 17037:2018 does not provide different illuminance targets for different space types, the BS EN 17037:2018 National Annex provides target illuminance values for bedrooms, living rooms and kitchens within residential developments as per Table NA.1 below. It is also important to note that as the climate in Ireland is similar to the UK, the targets outlined in the BS EN National Annex could also be applied to dwellings in Ireland.

**Table NA.1 — Values of target illuminance for room types in UK dwellings**

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

The BS National Annex also states:

*“Where one room in a UK dwelling serves more than a single purpose, the UK committee recommends 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.”*

Therefore, combined LKDs are to be assessed using a 200 lux target illuminance ( $E_T$ ).

Finally, the BS National Annex also states that:

*“It is the opinion of the UK committee that the recommendation in Clause A.2 – that a target illuminance level should be achieved across the entire (i.e. 95 %) fraction of the reference plane within a space – need not be applied to rooms in dwellings.”*

Therefore, when assessing the daylight provisions in residential dwellings in accordance with BS EN 17037:2018, only the target illuminance ( $E_T$ ) or target daylight factor ( $D_T$ ) will be assessed for Bedrooms, Living Rooms, Kitchens (or combined LKDs) on over 50% of the floor area over 50% of the available daylight hours. The minimum target illuminance ( $E_{TM}$ ) or minimum target daylight factor ( $D_{TM}$ ) will not be assessed.

Based on the above criteria, the daylight provision to the proposed development has been assessed using an adequate software (i.e. IES VE), using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table NA.1 of BS EN 17037:2018.

## 10.2 Daylight Model Inputs

The following inputs were used in the study:

### BRE Guide (2<sup>nd</sup> Edition) / BS 8206-2:2008

- Sky Conditions: Standard CIE overcast sky
- Time (24hr): 12:00
- Date: 21 September

### BRE Guide (3<sup>rd</sup> Edition) / IS EN / BS EN 17037:2018

- Weather File: Galway.epw (15 year average)

### Common Inputs to all Standards

- Working Plane Height: 0.85m
- Glazing Light Transmittance: 70%
- Window Frame thickness: 50 mm

The following surface reflectance values are used in the study:

Material Surface	Reflectance
External Wall	0.20/0.60
Internal Partition	0.80
Roof	0.20
Ground	0.20
Floor/Ceiling (Floor)	0.40
Floor/Ceiling (Ceiling)	0.80



### 10.3 Daylight Results

The following tables summarise the daylight provision results for each property type assessed within the development. Individual room results can be viewed in Appendix A.

The purpose of the calculations is to quantify an overall percentage of rooms which exceed the recommendations. The objective of the design team is to maximise the number of units which exceed the recommendations.

As outlined previously in Section 10.1.1.2, where there are combined Living/Kitchen/Dining areas (LKDs) within the development, these have been assessed as whole spaces against an initial 2% ADF target.

The results are summarised in the following tables:

#### Apartment Blocks

The daylight provision results for the Apartment Blocks A1 and B1 under the various standards are summarised below. A 100% compliance rate is achieved in accordance with the BRE Guide 2<sup>nd</sup> Edition / BS 8206:2008 when LKDs are assessed against a 2% ADF target. Under BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018 Method 2 & BS EN 17037:2018 Method 2 National Annex, a compliance rate of 100% is achieved. Overall, the quality of daylight provision to the Apartment Blocks is very high.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	54
Total No. LKDs Tested	38
Total No. Spaces Tested	92

BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 LKDs Assessed Against 2% ADF Target				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	54	100%	0	0%
No. LKDs	38	100%	0	0%
Total No.	92	100%	0	0%

BRE Guide 3 <sup>rd</sup> Edition / IS EN 17037:2018 Method 2 Assessment				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	54	100%	0	0%
No. LKDs	38	100%	0	0%
Total No.	92	100%	0	0%

BRE Guide 3 <sup>rd</sup> Edition / BS EN 17037:2018 Method 2 Assessment - National Annex				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	54	100%	0	0%
No. LKDs	38	100%	0	0%
<b>Total No.</b>	<b>92</b>	<b>100%</b>	<b>0</b>	<b>0%</b>

## Houses & Duplexes

The daylight provision results for the selected Houses and Duplexes under the various standards are summarised below. A 97% compliance rate is achieved in accordance with the BRE Guide 2<sup>nd</sup> Edition / BS 8206:2008 when LKDs are assessed against a 2% ADF target. Under BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018 Method 2, a compliance rate of 94% is achieved which increases to 97% under BRE Guide 3<sup>rd</sup> Edition / BS EN 17037:2018 Method 2 National Annex. Overall, the quality of daylight provision to the selected Houses and Duplexes is high with the majority of rooms that are failing located on the lower floors.

Rooms Tested	Total No. Rooms
Total No. Bedrooms Tested	139
Total No. LKDs Tested	32
Total No. KDs Tested	32
Total No. Living Rooms Tested	32
<b>Total No. Spaces Tested</b>	<b>235</b>

BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 LKDs Assessed Against 2% ADF Target				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	139	100%	0	0%
No. LKDs	25	78%	7	22%
No. KDs	32	100%	0	0%
No. Living Rooms	32	100%	0	0%
<b>Total No.</b>	<b>228</b>	<b>97%</b>	<b>7</b>	<b>3%</b>

BRE Guide 3 <sup>rd</sup> Edition / IS EN 17037:2018 Method 2 Assessment				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	136	98%	3	2%
No. LKDs	24	75%	8	25%
No. KDs	28	88%	4	13%
No. Living Rooms	32	100%	0	0%
<b>Total No.</b>	<b>220</b>	<b>94%</b>	<b>15</b>	<b>6%</b>

BRE Guide 3 <sup>rd</sup> Edition / BS EN 17037:2018 Method 2 Assessment - National Annex				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	139	100%	0	0%
No. LKDs	25	78%	7	22%
No. KDs	32	100%	0	0%
No. Living Rooms	32	100%	0	0%
<b>Total No.</b>	<b>228</b>	<b>97%</b>	<b>7</b>	<b>3%</b>

## Total for The Development

The overall daylight provision results for the tested spaces in the development under the various standards are summarised below. An 98% compliance rate is achieved in accordance with the BRE Guide 2<sup>nd</sup> Edition / BS 8206:2008 when LKDs are assessed against a 2% ADF target. Under BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018 Method 2, a compliance rate of 95% is achieved which increases to 98% under BRE Guide 3<sup>rd</sup> Edition / BS EN 17037:2018 Method 2 National Annex. Overall the quality of daylight provision across the development is high, with the majority of rooms that are failing located on the lower floors.

Rooms Tested	No. Rooms
Total No. Bedrooms Tested	193
Total No. LKDs Tested	70
No. KDs Tested	32
No. Living Rooms Tested	32
<b>Total No. Spaces Tested</b>	<b>327</b>

BRE Guide 2 <sup>nd</sup> Edition / BS 8206:2008 LKDs Assessed Against 2% ADF Target				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	193	100%	0	0%
No. LKDs	63	90%	7	10%
No. KDs	32	100%	0	0%
No. Living Rooms	32	100%	0	0%
<b>Total No.</b>	<b>320</b>	<b>98%</b>	<b>7</b>	<b>2%</b>

BRE Guide 3 <sup>rd</sup> Edition / IS EN 17037:2018 Method 2 Assessment				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	190	98%	3	2%
No. LKDs	62	89%	8	11%
No. KDs	28	88%	4	13%
No. Living Rooms	32	100%	0	0%
<b>Total No.</b>	<b>312</b>	<b>95%</b>	<b>15</b>	<b>2%</b>

BRE Guide 3 <sup>rd</sup> Edition / BS EN 17037:2018 Method 2 Assessment - National Annex				
Room Type	Pass (No.)	Pass (%)	Fail (No.)	Fail (%)
No. Bedrooms	193	100%	0	0%
No. LKDs	63	90%	7	10%
No. KDs	32	100%	0	0%
No. Living Rooms	32	100%	0	0%
<b>Total No.</b>	<b>320</b>	<b>98%</b>	<b>7</b>	<b>2%</b>

## 10.4 Compensatory Measures

### 10.4.1.1 Irish Standards and Design Development

With regards to internal daylighting, Section 6.7 of the Sustainable Urban Housing: Design Standards for New Apartments December 2020, states the following:

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

Furthermore, Section 3.2 of the Urban Development and Building Heights: Guidelines for Planning Authorities December 2018, states the following:

*Where a proposal may not be able to fully meet all the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, in respect of which the planning authority or An Bord Pleanála should apply their discretion, having regard to local factors including specific site constraints and the balancing of that assessment against the desirability of achieving wider planning objectives. Such objectives might include securing comprehensive urban regeneration and or an effective urban design and streetscape solution.*

Having regard to the statements above, it should be noted that throughout the design process the design team worked hard to optimise the whole development to maximise the daylight within the proposed scheme. Original daylight results were producing overall figures of 89% for the 2% target. Optimisation solutions were tested which included the following:

- Increase to window areas to allow more daylight into the proposed Living/Kitchen/Dining areas within the apartments, duplexes and terraced housing
- Changes to layouts to improve daylight to the Living/Kitchen/Dining areas within the duplexes including the removal of the lobby to increase the window widths and the reduction of the room depths in certain Living/Kitchen/Dining areas.

The inclusion of the above design solutions produced a high standard of daylight results of 98% for the 2% target.

In addition to this, design features have been incorporated into the development where rooms do not achieve the daylight provision targets in accordance with the standards they were assessed against. These design features again help to balance off and compensate the lower levels of daylight measured in the applicable spaces and are summarised as follows:

- 68.4% of the apartment units have a floor area 10% greater than the minimum floor area requirements as required by the Design Standards (Dec 2020). Note that larger floor areas make it more difficult to achieve the recommended daylight levels. However, larger windows have been incorporated into the design which also improves the view out for the building occupants.
- 73.6% of the apartment units are dual aspect which is above the 50% minimum requirement as required by the Design Standards (Dec 2020). As a result, more apartment units than the recommended minimum will achieve quality daylight from dual-aspect orientations.
- The proposed scheme provides 5,841sq.m of communal amenity space, thus exceeding the 5,698sq.m required pursuant to the Design Standards (Dec 2020)

## 11 Conclusion

The following can be concluded based on the assessments undertaken:

### 11.1 Shadow Analysis

The shadow analysis illustrates different shadows being cast at key times of the year (March 21<sup>st</sup>, June 21<sup>st</sup> and December 21<sup>st</sup>) for the Existing Situation and the Proposed Scheme. The results from the study are summarised as follows:

#### **Apartment 122, Castlegar South**

No additional shading from the proposed development is observed on this residential property throughout the year.

#### **82-90, 112-120 Cluain Riocaird South**

No additional shading from the proposed development is observed on this residential property throughout the year.

#### **Residential Dwelling East**

No additional shading from the proposed development is observed on this residential property for the majority of the year. Very minimal overshadowing noted late evenings in March.

The potential shading impact is quantified via the “Sunlight to Amenity Spaces” and “Daylight to Existing Buildings” sections of this report.

### 11.2 Sunlight to Amenity Spaces

The BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions) states that for a space to appear adequately sunlit throughout the year, at least half of a garden or amenity space should receive at least 2 hours of sunlight on March 21<sup>st</sup>. In the case of existing amenity spaces, if they are already below the 50% threshold then the BRE recommends the results are kept to within 80% of the existing situation with the proposed development in place.

#### **Existing Amenity Spaces**

On March 21<sup>st</sup> the existing amenity spaces will receive the same level of sunlight with the proposed development in place. In all cases the results comply with the recommendations in the BRE Guide outlined above.

### **Proposed Amenity Spaces**

On March 21<sup>st</sup>, 100% of the combined proposed public and communal amenity areas situated within the development site will receive at least 2 hours of sunlight over their total combined area. When the communal area is considered individually, it continues to meet the BRE recommendations with 100% of its area receiving at least 2 hours of sunlight. All amenity areas provided will be quality spaces in terms of sunlight.

In addition, all individual areas tested perform as expected. Those facing predominantly north are noted to be below the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions) recommendations as they are shaded by the property on the plot. Those south facing are achieving at least 2 hours of sunlight over 50% of their area on the 21<sup>st</sup> of March.

### **11.3 Sunlight to Existing Buildings**

This study considers the existing scheme and tests if the Annual Probable Sunlight Hours (APSH) results for the living room windows are greater than 25% annual and 5% winter sunlight or are greater than 0.8 times their former value with the proposed development in place.

Based on the criteria outlined in Section 3.2.7 of the BRE Guide 2<sup>nd</sup> Edition and Section 3.2.9 of the BRE Guide 3<sup>rd</sup> Edition, only one of the existing buildings fit the requirements to be assessed and as such the APSH assessment was only conducted for this property. The BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions) notes that there should be no impact to sunlight for the rest of the properties.

“It is not always necessary to do a full calculation to check sunlight potential. The guideline above is met provided either the following is true:

- If the window wall faces within 90° of due south and no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal. Again, obstructions within 90° of due north need not be counted.”

Given the statement above the existing properties adjacent to the proposed development were verified noting that, in a section perpendicular to the window wall, no angle subtended more than 25° and, in some cases, they were also sitting to the south of the proposed development. Therefore, only one existing property was included in the assessment while the rest were excluded on the basis, as noted in section 3.2.7 of the BRE Guide 2<sup>nd</sup> Edition and Section 3.2.9 of the BRE Guide 3<sup>rd</sup> Edition, that these windows need not be analysed as sunlight impact will be unnoticeable to the occupants.

When compared to the Existing Situation, of the 6 no. points tested, 100% (6 no. points) meet both the annual and winter recommendations in the BRE Guide.

## 11.4 Sunlight to Proposed Development

For the sunlight to proposed development assessment, two standards have been analysed: BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> Edition) and IS EN 17037:2018 (BRE Guide 3<sup>rd</sup> Edition). The results under each standard are summarised below.

### **BRE Guide 2<sup>nd</sup> Edition / BS 8206-2:2008**

Within the BS 8206-2:2008 standard (BRE Guide 2<sup>nd</sup> Edition), when discussing annual probable sunlight hours regarding proposed developments, it is noted that:

*“The degree of satisfaction is related to the expectation of sunlight. If a room is necessarily North facing or if the building is in a densely-built urban area, the absence of sunlight is more acceptable than when its exclusion seems arbitrary”.*

This is also reflected in the BRE Guide (2<sup>nd</sup> Edition) which states:

*“The BS 8206-2 criterion applies to rooms of all orientations, although if a room faces significantly north of due east or west it is unlikely to be met.”*

Based on the above criteria for the BRE Guide 2<sup>nd</sup> Edition/BS8206-2:2008, all main living room windows within the proposed development apartments and duplexes have been assessed and a sampling of the house types properties have been assessed with the results included in the following sections.

The sample was aligned with the properties selected for the daylight sampling. As such a sample were chosen from the middle of rows or locations that were in close proximity to neighbouring proposed properties which would be seen as worst-case location as a check on performance with regards to sunlight. Properties in the same orientation will produce very similar if not identical results.

Of the 128 no. points tested, 121 no. points (95%) meet the BRE recommended values over both the annual and winter periods. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, i.e. windows facing *“significantly north of due east or west”* or as a consequence of the impact of balcony projections.

It should be noted that in the development of any apartment type building achieving in the region of 75% to 80% for this assessment would be considered very high and factors such as site constraints and ultimately orientation play a huge part to the outcome of this assessment. In some instances, particularly a scheme like this where you have apartments on either side of a rectangular block, 50% would be the highest percentage achievable. This is because the apartments on one side are not able to meet the requirements based on orientation as noted and the inclusion of balconies within the design scheme (as a requirement).



### **BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018**

As the sunlight exposure assessment in accordance with IS EN 17037:2018 (BRE Guide 3<sup>rd</sup> Edition) considers the orientation of the rooms similar to the BRE Guide 2<sup>nd</sup> Edition/ BS 8206-2:2008 assessment above, it can also be concluded that the criteria for rooms facing significantly north of due east or west is unlikely to be met.

Of the 128 no. points tested, 122 no. points (95%) meet the BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018 sunlight exposure recommendations of greater than 1.5 hours on March 21<sup>st</sup>. Where windows do not meet this recommendation, this is predominantly as a result of their orientation, or as a consequence of the impact of balcony projections.

Overall, the sunlight provision results to the proposed development in accordance with IS EN 17037:23018 are considered excellent in the context of a suburban environment, due to the fact that not all living rooms can face south and the inclusion of balconies.

Note, the sunlight exposure results are visually represented in Appendix B.

### **11.5 Daylight to Existing Buildings**

Based on the criteria outlined in Section 2.2.5 of the BRE guidance (2<sup>nd</sup> and 3<sup>rd</sup> Editions), only one of the neighbouring dwellings is required to be included within the VSC assessment as the rest did not meet the criterion as laid out within the BRE guide.

It is not always necessary to do a full calculation to check daylight potential. The guideline above is met provided the following is true:

- no obstruction, measured in the section perpendicular to the window wall, subtends an angle of more than 25° to the horizontal.

Given the statement above the existing surrounding dwellings and the proposed development were verified noting that in a section perpendicular to the window wall, no angle subtended more than 25°. Therefore, as noted above, only one of the existing adjacent dwellings has been included within the VSC assessment as the daylight impact will be unnoticeable to the occupants for the remaining existing properties.

When compared to the Existing Situation, of the 6 no. points tested, 100% (6 points) have a Proposed VSC value greater than 27% or not less than 0.8 times their former value compared to the Existing Situation, thus complying with the BRE recommendations.

## 11.6 Daylight to Proposed Development

For the daylight to proposed development assessment, three standards have been analysed: BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> Edition), IS EN 17037:2018 and BS EN 17037:2018 National Annex (BRE Guide 3<sup>rd</sup> Edition). The results under each standard are summarised below.

To note, a sample of the duplexes and houses have been selected as these property types do not experience the same daylight issues that apartments generally do. As such a sample were chosen from the middle of rows or locations that were in close proximity to neighbouring proposed properties which would be considered a worst-case location as a check that there were no performance issues with regards to daylight.

### **BRE Guide 2<sup>nd</sup> Edition / BS 8206-2:2008**

Across the proposed development, 98% of the tested rooms are achieving Average Daylight Factors (ADF) in accordance with the BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> Edition) when Living/Kitchen/Dining spaces are assessed as whole rooms against a 2% ADF target and Bedrooms against a 1% ADF target. The majority of rooms that are below the recommendations are located on the lower floors. However, overall the quality of daylight provision across the development can be considered high.

### **Compensatory Measures**

With regards to internal daylighting, Section 6.7 of the Sustainable Urban Housing: Design Standards for New Apartments December 2020, states the following:

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

Furthermore, Section 3.2 of the Urban Development and Building Heights: Guidelines for Planning Authorities December 2018, states the following:

*Where a proposal may not be able to fully meet all the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, in respect of which the planning authority or An Bord Pleanála should apply their discretion, having regard to local factors including specific site constraints and the balancing of that assessment against the desirability of achieving wider planning*

*objectives. Such objectives might include securing comprehensive urban regeneration and or an effective urban design and streetscape solution.*

Having regard to the statements above, it should be noted that throughout the design process the design team worked hard to optimise the whole development to maximise the daylight within the proposed scheme. Original daylight results were producing overall figures of 89% for the 2% target. Optimisation solutions were tested which included the following:

- Increase to window areas to allow more daylight into the proposed Living/Kitchen/Dining areas within the apartments, duplexes and terraced housing
- Changes to layouts to improve daylight to the Living/Kitchen/Dining areas within the duplexes including the removal of the lobby to increase the window widths and the reduction of the room depths in certain Living/Kitchen/Dining areas.

The inclusion of the above design solutions produced a high standard of daylight results of 98% for the 2% target.

In addition to this, design features have been incorporated into the development where rooms do not achieve the daylight provision targets in accordance with the standards they were assessed against. These design features again help to balance off and compensate the lower levels of daylight measured in the applicable spaces and are summarised as follows:

- 68.4% of the apartment units have a floor area 10% greater than the minimum floor area requirements as required by the Design Standards (Dec 2020). Note that larger floor areas make it more difficult to achieve the recommended daylight levels. However, larger windows have been incorporated into the design which also improves the view out for the building occupants.
- 73.6% of the apartment units are dual aspect which is above the 50% minimum requirement as required by the Design Standards (Dec 2020). As a result, more apartment units than the recommended minimum will achieve quality daylight from dual-aspect orientations.
- The proposed scheme provides 5,841sq.m of communal amenity space, thus exceeding the 5,698sq.m required pursuant to the Design Standards (Dec 2020)

### **BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018**

It is important to note that IS EN 17037:2018 (BRE Guide 3<sup>rd</sup> Edition) does not provide different illuminance targets for different space types. Therefore, in the case of residential developments; bedrooms, living rooms, kitchens and combined LKDs all have the same daylight provision targets.

There are two methods to assess daylight provision to the interior which are based on target values in either Table A.1 or Table A.3 of IS EN 17037:2018 which are summarised as follows:

Method 1: This calculation method uses the daylight factor targets on the reference plane as per Table A.3 (refer to Section 10.1.2 of this report). The assessment is carried out on a representative day and time during the year, i.e. 21<sup>st</sup> September @ 12:00 under standard CIE overcast sky conditions.

Method 2: This calculation method uses the illuminance targets on the reference plane as per Table A.1 (refer to Section 10.1.2 of this report). The assessment is carried out for each hour over the course of the year (8,760 hours) using a local weather file which accounts for varying sky conditions and sun positions throughout the year.

As outlined in Section 5.1.4 of the standard, the verification of daylight provision can be determined using either an adequate software or on-site measurements. When using a software, *“a representative model of the space is required together with the key parameters (such as any significant nearby obstructions, the assigned surface reflectance values and glazing transmissivity) that are a reasonable representation of those for the actual, completed building. This can be determined using either Method 1 or Method 2.”*

Based on the above criteria, the daylight provision to the proposed development has been assessed using an adequate software (i.e. IES VE), using the Method 2 climate-based approach and targeting the minimum recommended values outlined in Table A.1 of IS EN 17037:2018.

The Method 2 climate-based approach was selected as it is a far more accurate assessment method compared to Method 1. Climate based daylight modelling (CBDM) is more accurate compared to a calculation based on a single day during the year, i.e. Method 1. The amount of daylight varies throughout the year, primarily due to the sun’s position, so it is essential the impact of daylight variance is properly considered. CBDM utilises an annual simulation linking location, shading, climate data (including solar intensity and cloud cover) together with the building properties. This provides a complete overview on how the daylight performance varies throughout the year due to changes in these factors.

Across the proposed development, 95% of the tested rooms are achieving the daylight provision targets in accordance with Table A.1 of IS EN 17037:2018 using Method 2.

### **BRE Guide 3<sup>rd</sup> Edition / BS EN 17037:2018 National Annex**

In the UK, EN17037:2018 was adopted to form “BS EN 17037:2018”. However, a National Annex was included which states:

*“The UK committee supports the recommendations for daylight in buildings given in BS EN 17037:2018; however, it is the opinion of the UK committee that the recommendations for*

*daylight provision in a space (see Clause A.2) may not be achievable for some buildings, particularly dwellings. The UK committee believes this could be the case for dwellings with basement rooms or those with significant external obstructions (for example, dwellings situated in a dense urban area or with tall trees outside), or for existing buildings being refurbished or converted into dwellings. This National Annex therefore provides the UK committee's guidance on minimum daylight provision in all UK dwellings."*

Whereas IS EN 17037:2018 does not provide different illuminance targets for different space types, the BS EN 17037:2018 National Annex provides target illuminance values for bedrooms, living rooms and kitchens within residential developments as per Table NA.1 (refer to Section 10.1.3 of this report). It is also important to note that as the climate in Ireland is similar to the UK, the targets outlined in the BS EN National Annex could also be applied to dwellings in Ireland.

The BS National Annex also states:

*"Where one room in a UK dwelling serves more than a single purpose, the UK committee recommends 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."*

Therefore, combined LKDs were assessed using a 200 lux target illuminance ( $E_T$ ).

Across the proposed development, 98% of the tested rooms are achieving the daylight provision targets in accordance with Table NA.1 of BS EN 17037:2018 using Method 2.

## **11.7 View Out**

The View Out assessment is related to buildings such as offices or schools where seating layouts are typically fixed compared to domestic settings where an occupant can move around the space freely. In their own home occupants can choose to sit near to or even at a window which will inevitably provide the varying layers of a 'View Out' such as the ground, landscape or sky. This ability to choose their position within a domestic setting means they would always have access to a position in the apartment with the minimum requirements of 'View Out'. Therefore, all the properties would meet the minimum requirement as outlined in IS EN 17037:2018/ BS EN 17037:2018 National Annex (BRE Guide 3<sup>rd</sup> Edition).

## **11.8 Glare**

As outlined in IS EN 17037:2018/ BS EN 17037:2018 National Annex (BRE Guide 3<sup>rd</sup> Edition), a Glare assessment is suggested in spaces where the *"expected activities are comparable to reading, writing or using display devices and the user is not able to choose freely their position*

*and viewing direction*". Given that occupants within a domestic setting are free to move around, on this basis a glare assessment for the proposed development has not been carried out.

### **11.9 Observations**

It is important to note that the recommendations within the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions) itself states *"although it gives numerical guidelines these should be interpreted flexibly because natural lighting is only one of many factors in site layout design"*, Although this is true appropriate and reasonable regard has still been taken to the BRE guide.

Whilst the results shown relate to the criteria as laid out in the BRE Guide (2<sup>nd</sup> and 3<sup>rd</sup> Editions), it is important to note that the BRE targets are guidance only and should therefore be used with flexibility and caution when dealing with different types of sites.

In addition, the foreword of BS 8206-2:2008 (BRE Guide 2<sup>nd</sup> Edition) also states *"The aim of the standard is to give guidance to architects, builders and others who carry out lighting design. It is recognised that lighting is only one of many matters that influence fenestration. These include other aspects of environmental performance (such as noise, thermal equilibrium and the control of energy use), fire hazards, constructional requirements, the external appearance and the surroundings of the site. The best design for a building does not necessarily incorporate the ideal solution for any individual function. For this reason, careful judgement needs to be exercised when using the criteria given in the standard for other purposes, particularly town planning control."*

Taking all of the above information into account and based on the results from each of the assessments undertaken, the proposed development performs well when compared to the recommendations in the BRE Guide 2<sup>nd</sup> Edition/ BS 8206-2:2008 and the BRE Guide 3<sup>rd</sup> Edition / IS EN 17037:2018 /BS EN 17037:2018 National Annex. With regards to the existing properties there is a negligible impact when considering sunlight and daylight as a result of the proposed development and the proposed development itself performs well with the same regard.

## 12 Appendix A – Daylight Provision Results

The tables in the following sections summarise the daylight provision results for the rooms that were assessed in the proposed development. Note, within the tables the code “LKD” equates to combined Living, Kitchen, Dining area.

The results for the following daylight standards are included in each table:

- BRE Guide (2<sup>nd</sup> Edition) / BS 8206-2:2008
- BRE Guide (3<sup>rd</sup> Edition) / IS EN 17037:2018
- BRE Guide (3<sup>rd</sup> Edition) / BS EN 17037:2018 National Annex

Please note, the “Comment” symbol in each of the tables represents the following:

### BRE Guide (2<sup>nd</sup> Edition) / BS 8206-2:2008

- ✓ These rooms have an ADF greater than the recommended minimum values (2.0% for combined L/K/Ds and 1.0% for bedrooms) as stated within the BRE Guide.
- x/✓ The ADF in these rooms falls below the BRE recommendation for a L/K/D when the whole space is assessed against the 2% ADF target. However, the whole space complies with an alternative 1.5% ADF target.
- x The ADF in these rooms falls below the BRE recommendation for a L/K/D when the whole space is assessed against the 2% ADF design value or in the case of Bedrooms, is less than the 1% ADF target.

### BRE Guide (3<sup>rd</sup> Edition) / IS EN 17037:2018

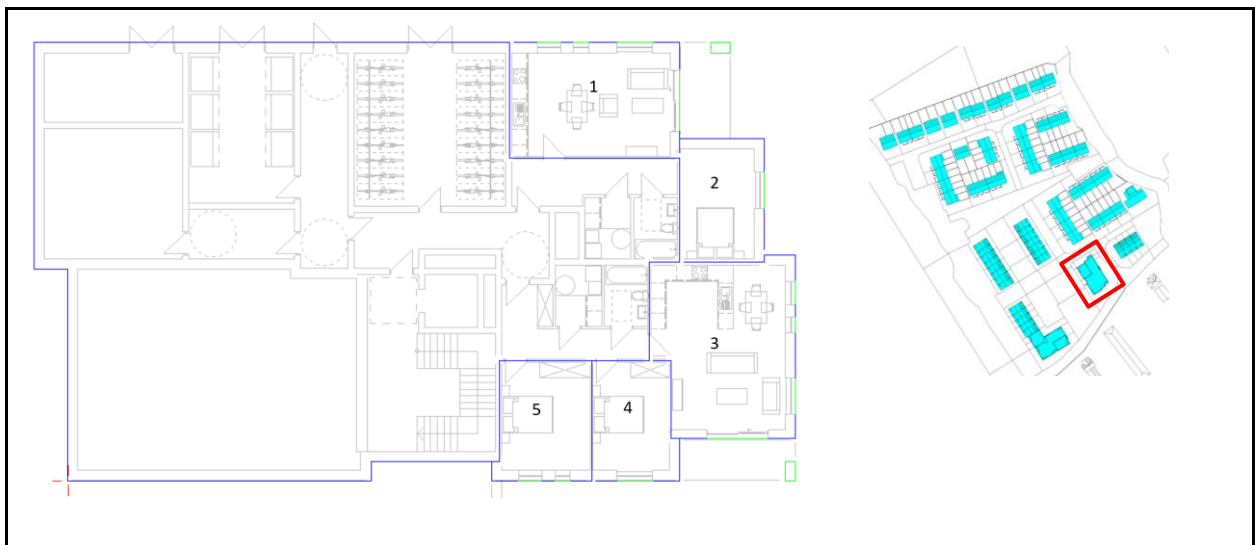
- ✓ These rooms achieve both the target illuminance ( $E_T$ ) and minimum target illuminance ( $E_{TM}$ ) over the minimum floor area requirements, i.e. 300 lux for over 50% of their floor area ( $E_T$ ) and 100 lux for over 95% of their floor area ( $E_{TM}$ ).
- x These rooms do not achieve both the target illuminance ( $E_T$ ) and minimum target illuminance ( $E_{TM}$ ) over the minimum floor area requirements.

### BRE Guide (3<sup>rd</sup> Edition) / BS EN 17037:2018 National Annex

- ✓ These rooms achieve the target illuminance ( $E_T$ ) over the minimum floor area requirements, i.e. 100 lux for over 50% of bedroom floor areas, and 200 lux for over 50% of LKD floor areas.
- x These rooms do not achieve the target illuminance ( $E_T$ ) over the minimum floor area requirements.

## 12.1 Daylight Provision Results

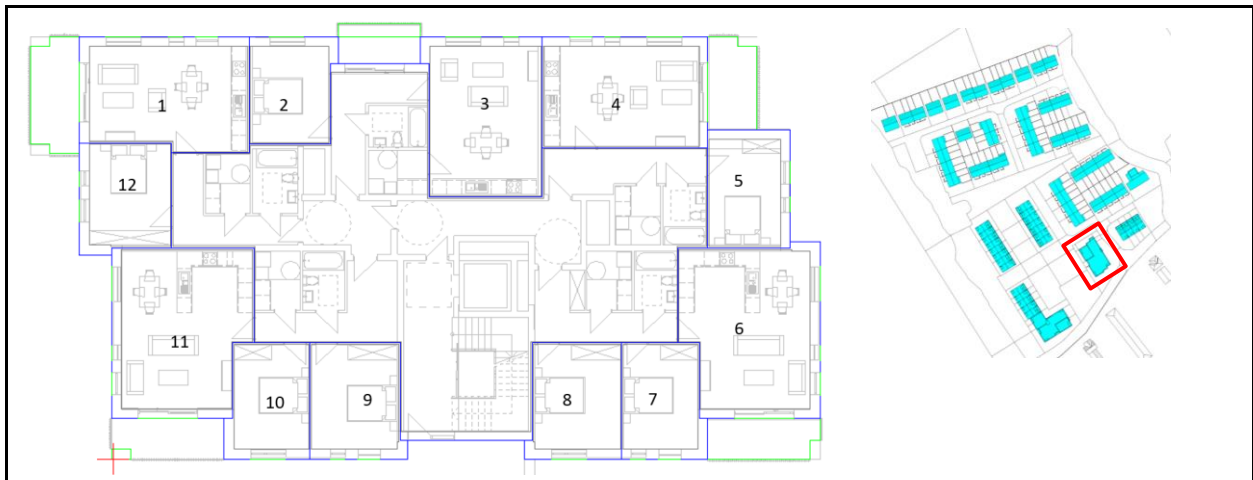
### 12.1.1 Apartment Block A1 - LGF



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	LKD	3.53	✓	100	100	✓	100	✓
2	Bedroom	2.90	✓	100	100	✓	100	✓
3	LKD	3.20	✓	100	100	✓	100	✓
4	Bedroom	2.42	✓	100	100	✓	100	✓
5	Bedroom	1.68	✓	83	100	✓	100	✓

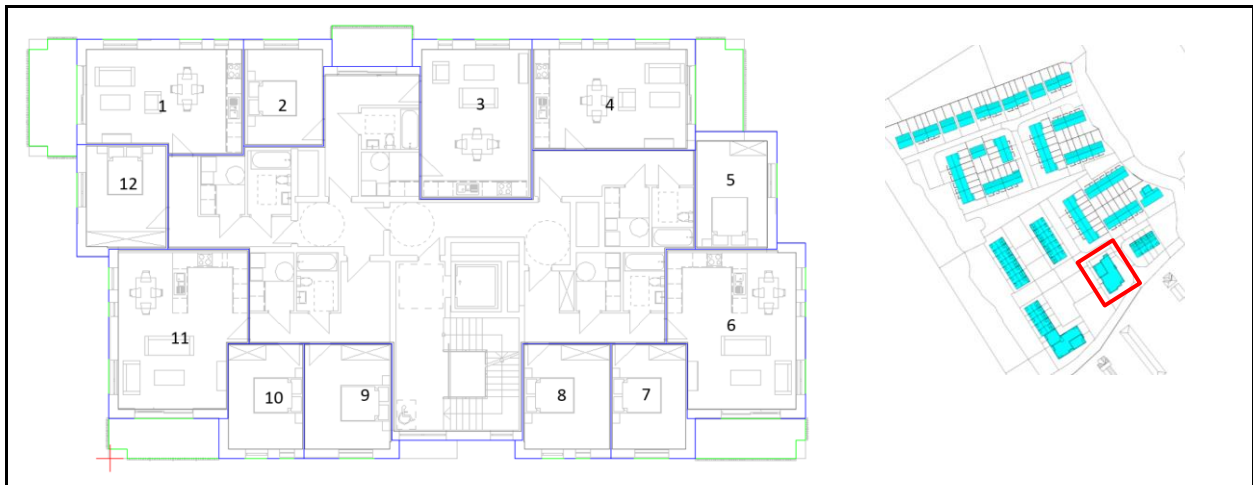


### 12.1.2 Apartment Block A1 – UPG



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	LKD	4.11	✓	100	100	✓	100	✓
2	Bedroom	2.72	✓	100	100	✓	100	✓
3	LKD	2.00	✓	100	100	✓	100	✓
4	LKD	4.36	✓	100	100	✓	100	✓
5	Bedroom	3.16	✓	100	100	✓	100	✓
6	LKD	3.91	✓	100	100	✓	100	✓
7	Bedroom	2.65	✓	100	100	✓	100	✓
8	Bedroom	2.58	✓	100	100	✓	100	✓
9	Bedroom	2.42	✓	100	100	✓	100	✓
10	Bedroom	2.91	✓	100	100	✓	100	✓
11	LKD	3.65	✓	100	100	✓	100	✓
12	Bedroom	2.32	✓	100	100	✓	100	✓

### 12.1.3 Apartment Block A1 – L01



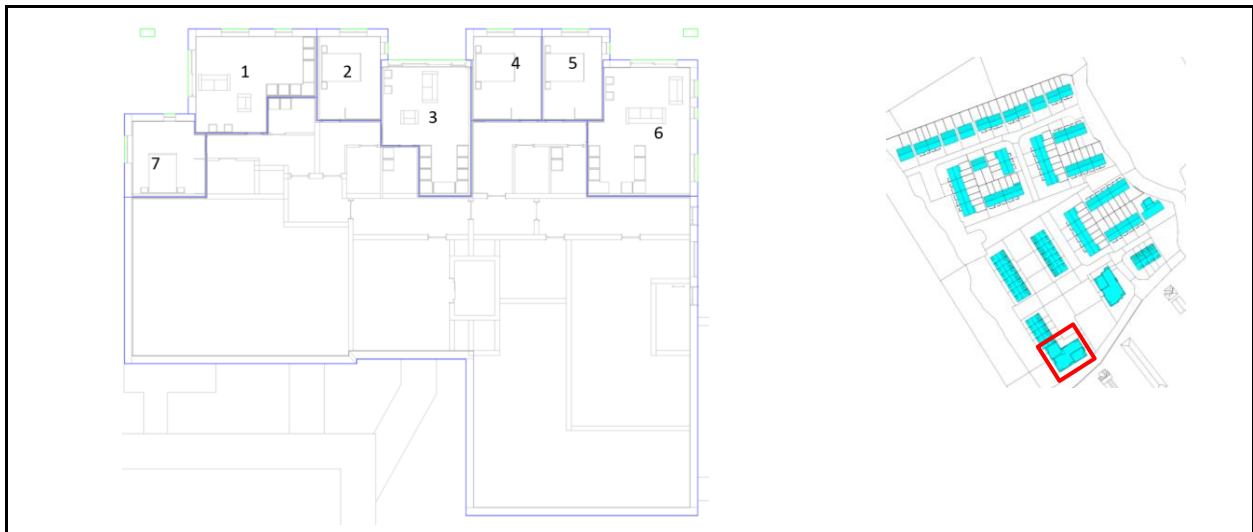
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	LKD	4.41	✓	100	100	✓	100	✓
2	Bedroom	2.94	✓	100	100	✓	100	✓
3	LKD	2.01	✓	100	100	✓	100	✓
4	LKD	4.51	✓	100	100	✓	100	✓
5	Bedroom	3.37	✓	100	100	✓	100	✓
6	LKD	4.00	✓	100	100	✓	100	✓
7	Bedroom	3.07	✓	100	100	✓	100	✓
8	Bedroom	2.56	✓	100	100	✓	100	✓
9	Bedroom	2.73	✓	100	100	✓	100	✓
10	Bedroom	2.79	✓	100	100	✓	100	✓
11	LKD	3.90	✓	100	100	✓	100	✓
12	Bedroom	2.63	✓	100	100	✓	100	✓

### 12.1.4 Apartment Block A1 – L02



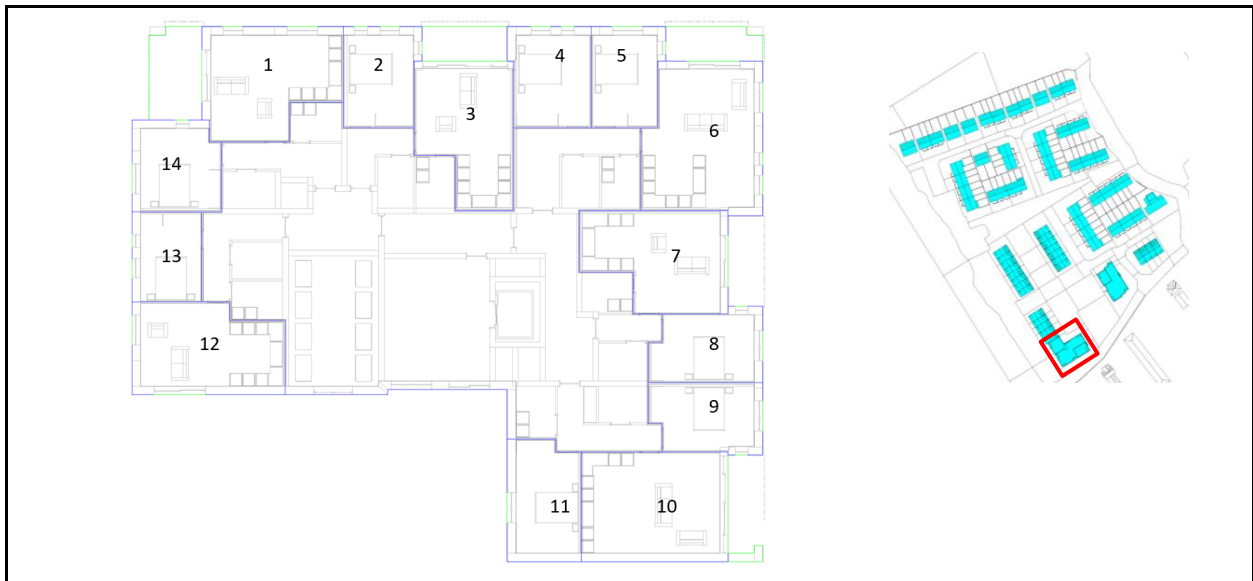
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	LKD	4.55	✓	100	100	✓	100	✓
2	Bedroom	3.24	✓	100	100	✓	100	✓
3	LKD	2.23	✓	100	100	✓	100	✓
4	LKD	4.53	✓	100	100	✓	100	✓
5	Bedroom	3.43	✓	100	100	✓	100	✓
6	LKD	4.00	✓	100	100	✓	100	✓
7	Bedroom	3.00	✓	100	100	✓	100	✓
8	Bedroom	2.94	✓	100	100	✓	100	✓
9	Bedroom	2.77	✓	100	100	✓	100	✓
10	Bedroom	3.27	✓	100	100	✓	100	✓
11	LKD	3.91	✓	100	100	✓	100	✓
12	Bedroom	2.84	✓	100	100	✓	100	✓

### 12.1.5 Apartment Block A2 – LGF



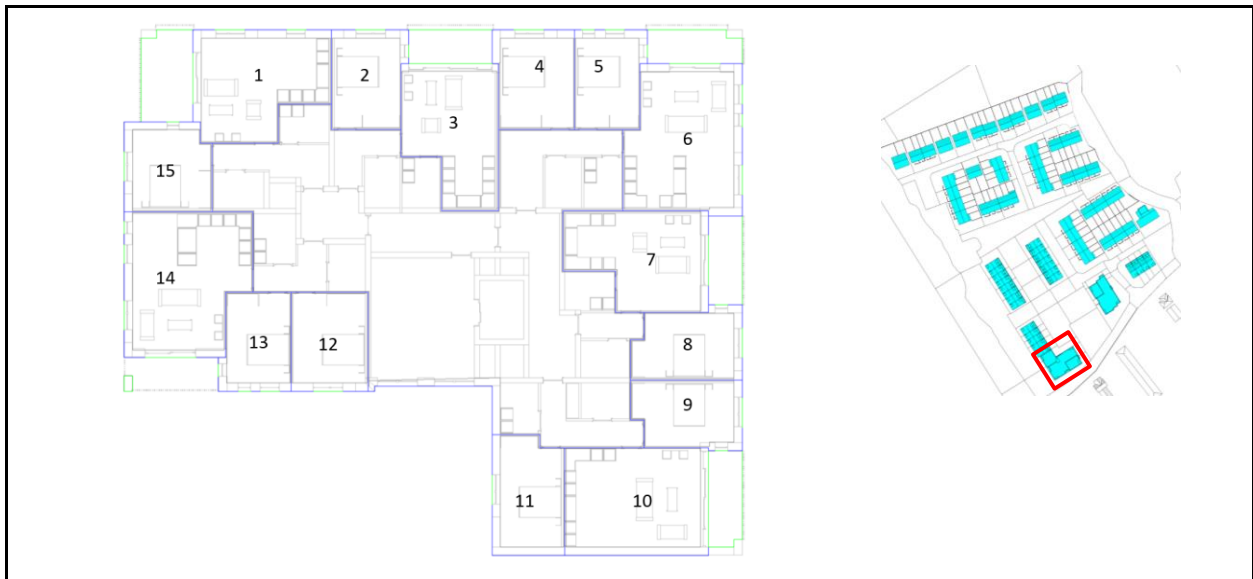
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	LKD	3.35	✓	100	100	✓	100	✓
2	Bedroom	2.58	✓	100	100	✓	100	✓
3	LKD	2.36	✓	100	100	✓	100	✓
4	Bedroom	2.25	✓	100	100	✓	100	✓
5	Bedroom	2.77	✓	100	100	✓	100	✓
6	LKD	3.37	✓	100	100	✓	100	✓
7	Bedroom	2.64	✓	100	100	✓	100	✓

### 12.1.6 Apartment Block A2 – UPG



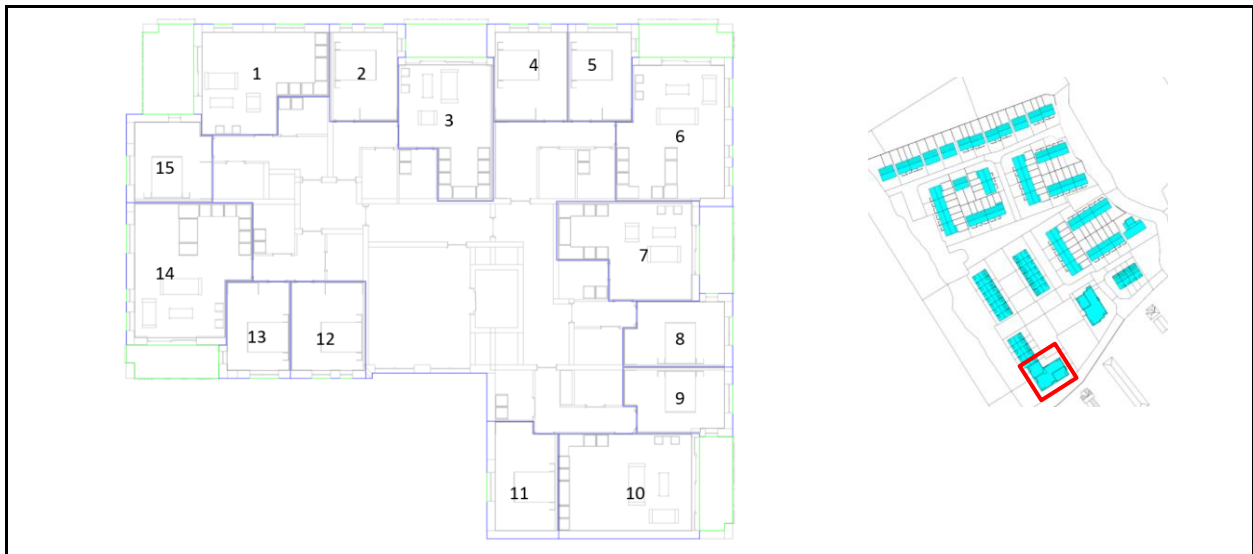
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	LKD	3.83	✓	100	100	✓	100	✓
2	Bedroom	2.78	✓	100	100	✓	100	✓
3	LKD	2.90	✓	100	100	✓	100	✓
4	Bedroom	2.45	✓	100	100	✓	100	✓
5	Bedroom	3.19	✓	100	100	✓	100	✓
6	LKD	3.99	✓	100	100	✓	100	✓
7	LKD	2.01	✓	100	100	✓	100	✓
8	Bedroom	2.87	✓	100	100	✓	100	✓
9	Bedroom	2.75	✓	100	100	✓	100	✓
10	LKD	2.42	✓	100	100	✓	100	✓
11	Bedroom	2.12	✓	100	100	✓	100	✓
12	LKD	4.47	✓	100	100	✓	100	✓
13	Bedroom	3.12	✓	100	100	✓	100	✓
14	Bedroom	3.12	✓	100	100	✓	100	✓

### 12.1.7 Apartment Block A2 – L01



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	LKD	3.83	✓	100	100	✓	100	✓
2	Bedroom	3.02	✓	100	100	✓	100	✓
3	LKD	3.98	✓	99.59	100	✓	100	✓
4	Bedroom	2.60	✓	100	100	✓	100	✓
5	Bedroom	2.96	✓	100	100	✓	100	✓
6	LKD	4.01	✓	100	100	✓	100	✓
7	LKD	2.06	✓	100	100	✓	100	✓
8	Bedroom	2.90	✓	100	100	✓	100	✓
9	Bedroom	2.81	✓	100	100	✓	100	✓
10	LKD	2.51	✓	100	100	✓	100	✓
11	Bedroom	2.37	✓	100	100	✓	100	✓
12	Bedroom	2.51	✓	100	100	✓	100	✓
13	Bedroom	2.92	✓	100	100	✓	100	✓
14	LKD	3.88	✓	100	100	✓	100	✓
15	Bedroom	3.21	✓	100	100	✓	100	✓

### 12.1.8 Apartment Block A2 – L02



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	LKD	3.84	✓	100	100	✓	100	✓
2	Bedroom	3.30	✓	100	100	✓	100	✓
3	LKD	4.20	✓	99.66	100	✓	99.93	✓
4	Bedroom	2.69	✓	100	100	✓	100	✓
5	Bedroom	3.40	✓	100	100	✓	100	✓
6	LKD	4.31	✓	100	100	✓	100	✓
7	LKD	3.03	✓	100	100	✓	100	✓
8	Bedroom	3.41	✓	100	100	✓	100	✓
9	Bedroom	3.01	✓	100	100	✓	100	✓
10	LKD	2.45	✓	100	100	✓	100	✓
11	Bedroom	2.98	✓	100	100	✓	100	✓
12	Bedroom	2.58	✓	100	100	✓	100	✓
13	Bedroom	3.29	✓	100	100	✓	100	✓
14	LKD	3.84	✓	100	100	✓	100	✓
15	Bedroom	3.34	✓	100	100	✓	100	✓

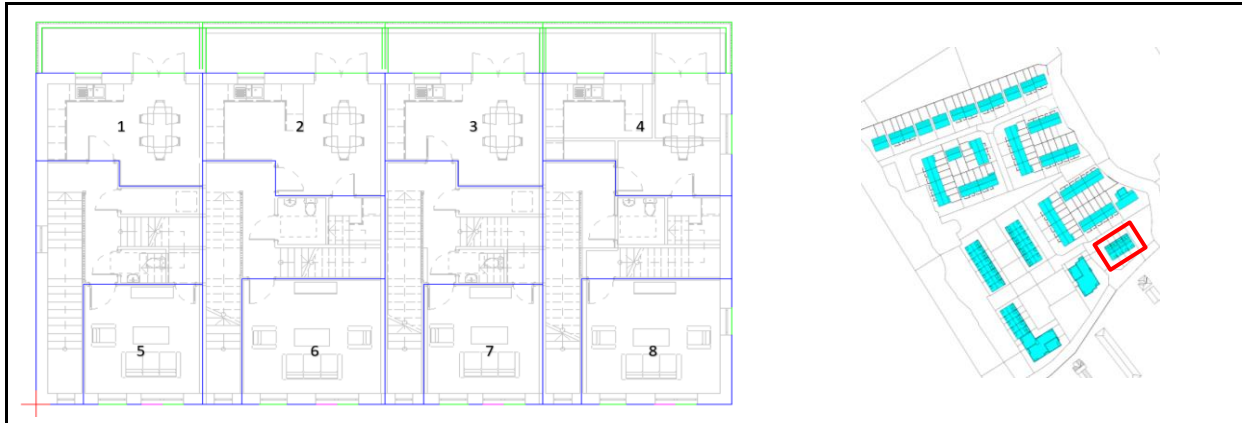
### 12.1.9 Duplex 01 – L00



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	Bedroom	1.44	✓	88.14	100	✓	100	✓
2	Bedroom	2.17	✓	100	100	✓	100	✓
3	Bedroom	1.45	✓	36.68	100	x	100	✓
4	Bedroom	1.66	✓	100	100	✓	100	✓
5	Bedroom	1.42	✓	29.53	100	x	65.4	✓
6	Bedroom	1.83	✓	63.31	100	✓	100	✓
7	LKD	2.00	✓	100	100	✓	100	✓
8	LKD	2.14	✓	100	100	✓	100	✓
9	LKD	2.01	✓	100	100	✓	100	✓
10	LKD	2.75	✓	100	100	✓	100	✓

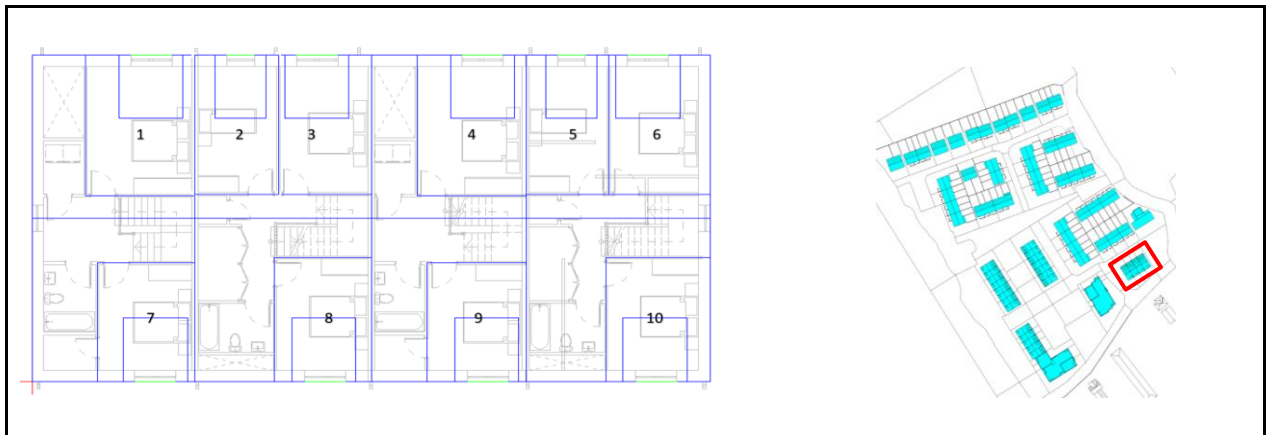


### 12.1.10 Duplex 01 – L01



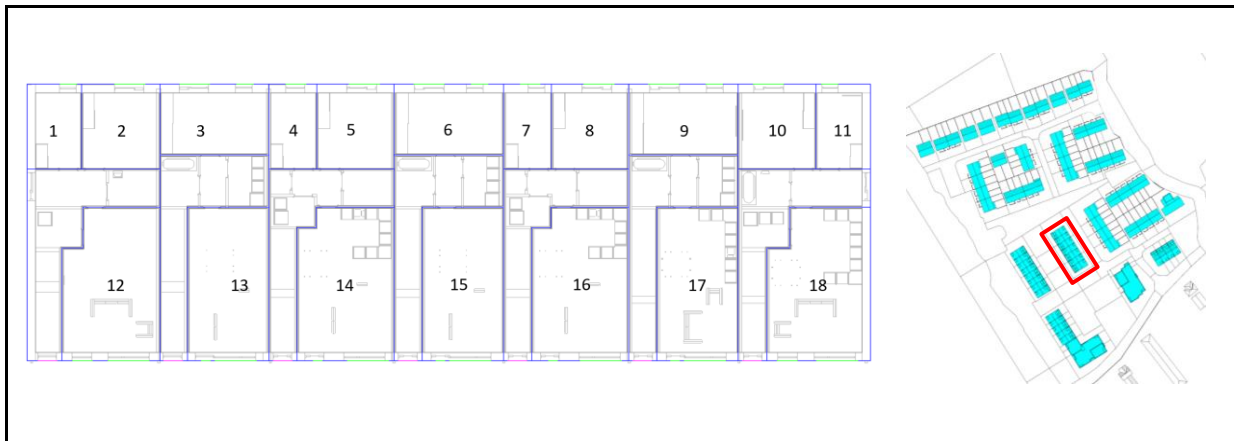
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	KD	3.53	✓	100	100	✓	100	✓
2	KD	2.83	✓	100	100	✓	100	✓
3	KD	3.49	✓	100	100	✓	100	✓
4	KD	4.67	✓	100	100	✓	100	✓
5	Living	2.74	✓	100	100	✓	100	✓
6	Living	2.10	✓	100	100	✓	100	✓
7	Living	2.74	✓	100	100	✓	100	✓
8	Living	3.50	✓	100	100	✓	100	✓

### 12.1.11 Duplex 01 – Level 02



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	Bedroom	1.97	✓	100	100	✓	100	✓
2	Bedroom	1.70	✓	66.67	100	✓	100	✓
3	Bedroom	2.26	✓	100	100	✓	100	✓
4	Bedroom	1.98	✓	100	100	✓	100	✓
5	Bedroom	1.75	✓	100	100	✓	100	✓
6	Bedroom	2.31	✓	100	100	✓	100	✓
7	Bedroom	2.63	✓	100	100	✓	100	✓
8	Bedroom	2.65	✓	100	100	✓	100	✓
9	Bedroom	2.70	✓	100	100	✓	100	✓
10	Bedroom	2.72	✓	100	100	✓	100	✓

### 12.1.12 Duplex 02 – Level 00



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	Bedroom	1.65	✓	100	100	✓	100	✓
2	Bedroom	2.23	✓	100	100	✓	100	✓
3	Bedroom	2.90	✓	100	100	✓	100	✓
4	Bedroom	2.06	✓	100	100	✓	100	✓
5	Bedroom	2.20	✓	100	100	✓	100	✓
6	Bedroom	2.86	✓	100	100	✓	100	✓
7	Bedroom	2.04	✓	100	100	✓	100	✓
8	Bedroom	2.20	✓	100	100	✓	100	✓
9	Bedroom	3.46	✓	100	100	✓	100	✓
10	Bedroom	2.68	✓	100	100	✓	100	✓
11	Bedroom	1.73	✓	100	100	✓	100	✓
12	LKD	2.05	✓	100	100	✓	100	✓
13	LKD	1.79	x	100	100	✓	100	✓
14	LKD	1.47	x	100	100	✓	100	✓
15	LKD	1.79	x	100	100	✓	100	✓
16	LKD	1.50	x	100	100	✓	100	✓
17	LKD	2.20	✓	100	100	✓	100	✓
18	LKD	2.24	✓	100	100	✓	100	✓

### 12.1.13 Duplex 02 – Level 01



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	KD	2.92	✓	100	100	✓	100	✓
2	KD	3.38	✓	100	100	✓	100	✓
3	KD	2.83	✓	100	100	✓	100	✓
4	KD	3.41	✓	100	100	✓	100	✓
5	KD	2.92	✓	100	100	✓	100	✓
6	KD	3.42	✓	100	100	✓	100	✓
7	KD	3.77	✓	100	100	✓	100	✓
8	Living	2.06	✓	100	100	✓	100	✓
9	Living	2.44	✓	100	100	✓	100	✓
10	Living	2.05	✓	100	100	✓	100	✓
11	Living	2.55	✓	100	100	✓	100	✓
12	Living	2.05	✓	100	100	✓	100	✓
13	Living	2.49	✓	100	100	✓	100	✓
14	Living	3.36	✓	100	100	✓	100	✓

### 12.1.14 Duplex 02 – Level 02



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	Bedroom	1.67	✓	100	100	✓	100	✓
2	Bedroom	2.24	✓	100	100	✓	100	✓
3	Bedroom	1.95	✓	100	100	✓	100	✓
4	Bedroom	1.71	✓	100	100	✓	100	✓
5	Bedroom	2.21	✓	100	100	✓	100	✓
6	Bedroom	1.90	✓	100	100	✓	100	✓
7	Bedroom	1.60	✓	100	100	✓	100	✓
8	Bedroom	2.16	✓	100	100	✓	100	✓
9	Bedroom	1.80	✓	100	100	✓	100	✓
10	Bedroom	1.56	✓	100	100	✓	100	✓
11	Bedroom	2.21	✓	100	100	✓	100	✓
12	Bedroom	2.44	✓	100	100	✓	100	✓
13	Bedroom	2.47	✓	100	100	✓	100	✓
14	Bedroom	2.44	✓	100	100	✓	100	✓
15	Bedroom	2.59	✓	100	100	✓	100	✓
16	Bedroom	2.51	✓	100	100	✓	100	✓
17	Bedroom	2.48	✓	100	100	✓	100	✓
18	Bedroom	2.52	✓	100	100	✓	100	✓

### 12.1.15 Duplex 03 – Level 00



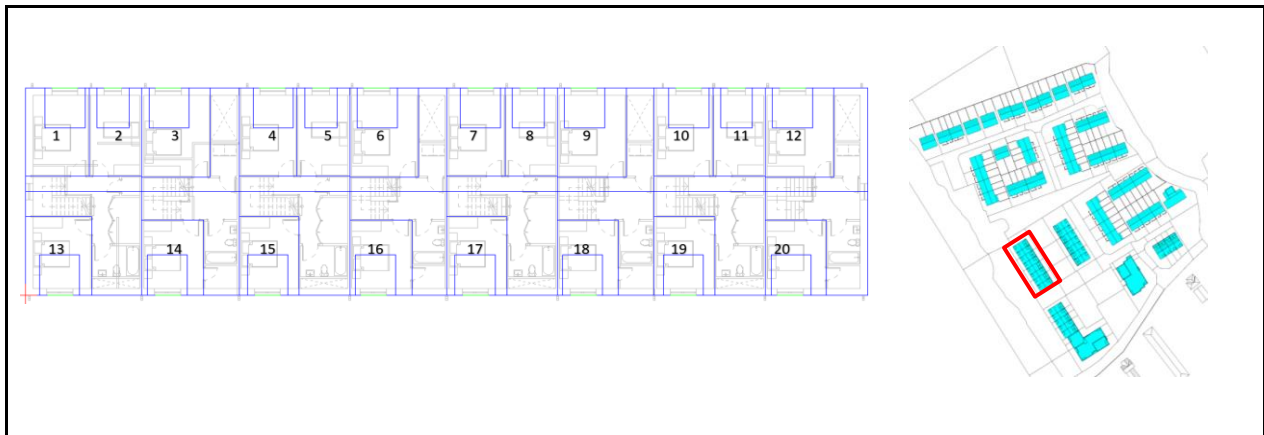
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	Bedroom	1.82	✓	57.14	100	✓	100	✓
2	Bedroom	1.63	✓	98.28	100	✓	100	✓
3	Bedroom	2.01	✓	100	100	✓	100	✓
4	Bedroom	1.59	✓	100	100	✓	100	✓
5	Bedroom	2.33	✓	100	100	✓	100	✓
6	Bedroom	1.93	✓	100	100	✓	100	✓
7	Bedroom	2.44	✓	100	100	✓	100	✓
8	Bedroom	2.18	✓	100	100	✓	100	✓
9	Bedroom	1.85	✓	100	100	✓	100	✓
10	Bedroom	1.53	✓	100	100	✓	100	✓
11	Bedroom	1.95	✓	100	100	✓	100	✓
12	Bedroom	1.59	✓	100	100	✓	100	✓
13	LKD	2.31	✓	100	100	✓	100	✓
14	LKD	2.04	✓	100	100	✓	100	✓
15	LKD	2.05	✓	100	100	✓	100	✓
16	LKD	2.04	✓	100	100	✓	100	✓
17	LKD	1.68	x	100	100	✓	100	✓
18	LKD	2.04	✓	100	100	✓	100	✓
19	LKD	1.68	x	100	100	✓	100	✓
20	LKD	2.12	✓	100	100	✓	100	✓

### 12.1.16 Duplex 03 – Level 01



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	KD	7.71	4.76	✓	100	100	✓	100
2	KD	4.77	3.58	✓	100	100	✓	100
3	KD	4.77	3.04	✓	100	100	✓	100
4	KD	4.77	3.55	✓	100	100	✓	100
5	KD	4.77	2.87	✓	100	100	✓	100
6	KD	4.77	3.56	✓	100	100	✓	100
7	KD	4.77	3.03	✓	100	100	✓	100
8	KD	4.77	3.70	✓	100	100	✓	100
9	Living	5.36	3.55	✓	100	100	✓	100
10	Living	3.36	2.68	✓	100	100	✓	100
11	Living	3.36	2.23	✓	100	100	✓	100
12	Living	3.47	2.77	✓	100	100	✓	100
13	Living	3.36	2.24	✓	100	100	✓	100
14	Living	3.36	2.66	✓	100	100	✓	100
15	Living	3.36	2.22	✓	100	100	✓	100
16	Living	3.47	2.77	✓	100	100	✓	100

### 12.1.17 Duplex 03 – Level 02



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	Bedroom	2.37	✓	100	100	✓	100	✓
2	Bedroom	1.76	✓	100	100	✓	100	✓
3	Bedroom	1.98	✓	100	100	✓	100	✓
4	Bedroom	2.27	✓	99.87	100	✓	100	✓
5	Bedroom	1.73	✓	100	100	✓	100	✓
6	Bedroom	1.95	✓	100	100	✓	100	✓
7	Bedroom	2.30	✓	100	100	✓	100	✓
8	Bedroom	1.73	✓	100	100	✓	100	✓
9	Bedroom	1.94	✓	100	100	✓	100	✓
10	Bedroom	2.27	✓	100	100	✓	100	✓
11	Bedroom	1.74	✓	100	100	✓	100	✓
12	Bedroom	2.02	✓	100	100	✓	100	✓
13	Bedroom	2.77	✓	100	100	✓	100	✓
14	Bedroom	2.78	✓	100	100	✓	100	✓
15	Bedroom	2.83	✓	100	100	✓	100	✓
16	Bedroom	2.69	✓	100	100	✓	100	✓
17	Bedroom	2.75	✓	100	100	✓	100	✓
18	Bedroom	2.59	✓	100	100	✓	100	✓
19	Bedroom	2.77	✓	100	100	✓	100	✓
20	Bedroom	2.79	✓	100	100	✓	100	✓

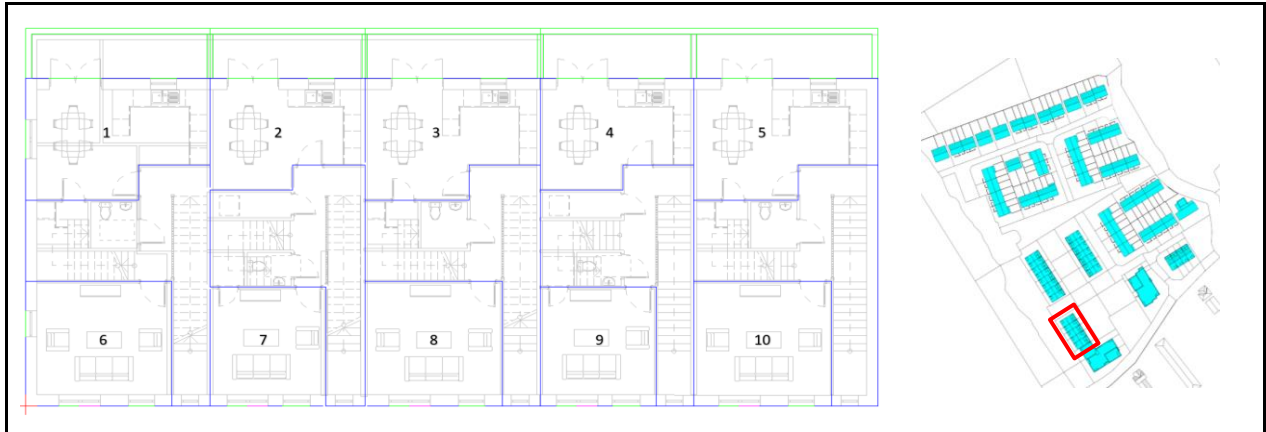


### 12.1.18 Duplex 04 – Level 00



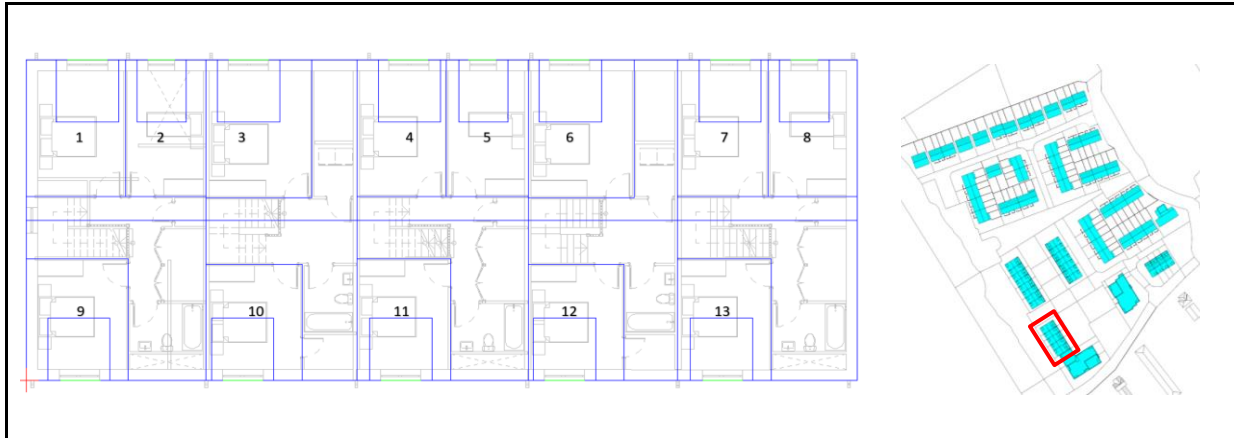
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	Bedroom	1.89	✓	100	100	✓	100	✓
2	Bedroom	1.71	✓	100	100	✓	100	✓
3	Bedroom	2.10	✓	100	100	✓	100	✓
4	Bedroom	1.70	✓	100	100	✓	100	✓
5	Bedroom	2.49	✓	100	100	✓	100	✓
6	Bedroom	2.02	✓	100	100	✓	100	✓
7	Bedroom	2.52	✓	100	100	✓	100	✓
8	Bedroom	2.45	✓	100	100	✓	100	✓
9	LKD	2.28	✓	100	100	✓	100	✓
10	LKD	2.00	✓	100	100	✓	100	✓
11	LKD	2.00	✓	52.61	100	✓	89.32	✓
12	LKD	2.28	✓	53.68	100	✓	83.71	✓
13	LKD	2.20	✓	49.1	100	x	76.47	✓

### 12.1.19 Duplex 04 – Level 01



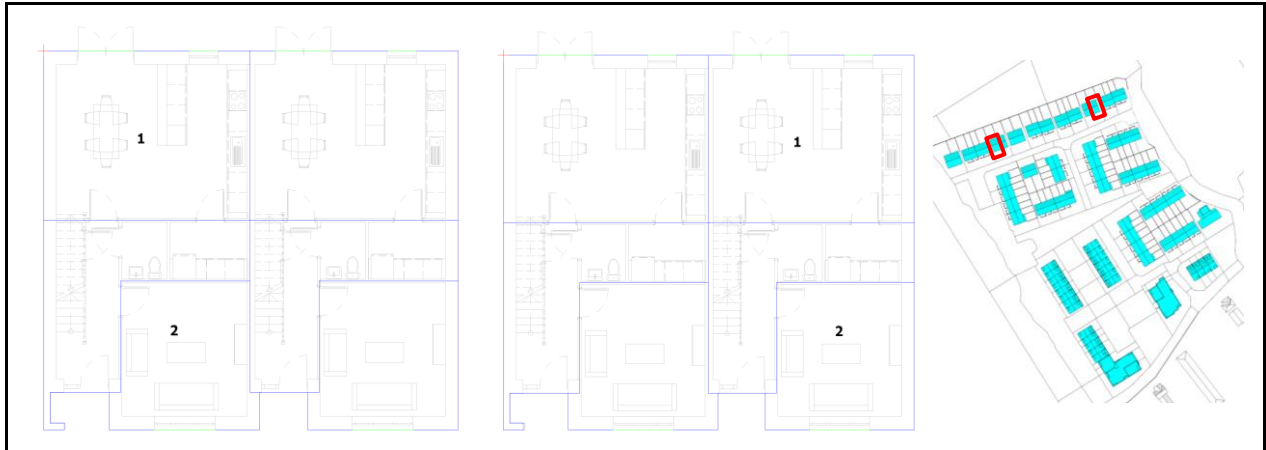
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	KD	4.58	✓	100	100	✓	100	✓
2	KD	3.63	✓	100	100	✓	100	✓
3	KD	3.14	✓	100	100	✓	100	✓
4	KD	3.58	✓	100	100	✓	100	✓
5	KD	2.91	✓	100	100	✓	100	✓
6	Living	3.42	✓	100	100	✓	100	✓
7	Living	2.76	✓	100	100	✓	100	✓
8	Living	2.20	✓	100	100	✓	100	✓
9	Living	2.71	✓	100	100	✓	100	✓
10	Living	2.19	✓	100	100	✓	100	✓

### 12.1.20 Duplex 04 – Level 02



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	Bedroom	2.38	✓	100	100	✓	100	✓
2	Bedroom	1.82	✓	100	100	✓	100	✓
3	Bedroom	2.05	✓	100	100	✓	100	✓
4	Bedroom	2.31	✓	100	100	✓	100	✓
5	Bedroom	1.70	✓	100	100	✓	100	✓
6	Bedroom	1.97	✓	100	100	✓	100	✓
7	Bedroom	2.29	✓	100	100	✓	100	✓
8	Bedroom	1.54	✓	100	100	✓	100	✓
9	Bedroom	2.77	✓	100	100	✓	100	✓
10	Bedroom	2.80	✓	100	100	✓	100	✓
11	Bedroom	2.80	✓	100	100	✓	100	✓
12	Bedroom	2.79	✓	100	100	✓	100	✓
13	Bedroom	2.72	✓	100	100	✓	100	✓

12.1.22 Houses A-A1 – Level 00



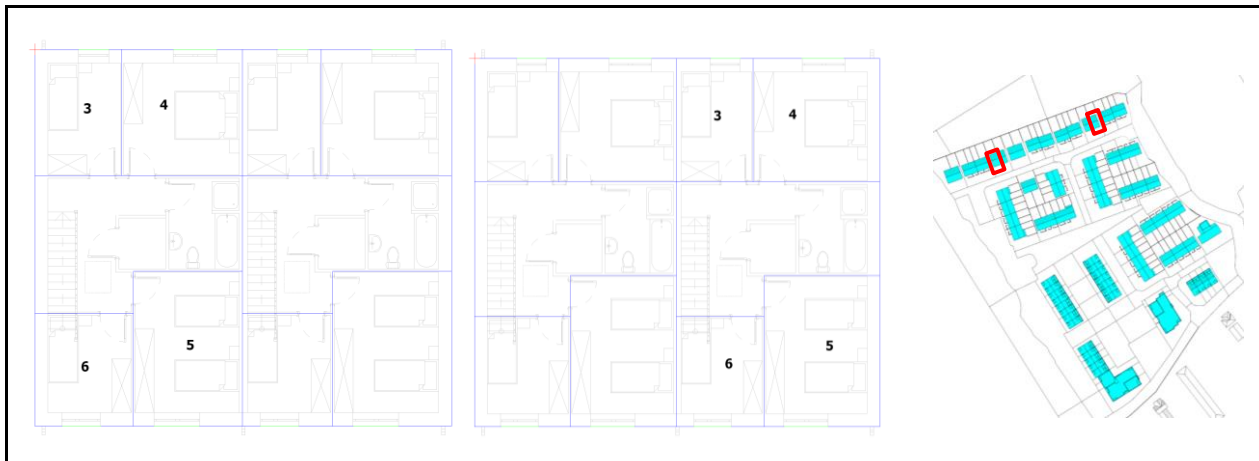
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Cmt
1	KD	2.42	✓	95.77	100	✓	100	✓
2	Living	3.04	✓	100	100	✓	100	✓



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Cmt
1	KD	2.35	✓	49.32	100	x	100	✓
2	Living	3.09	✓	100	100	✓	100	✓



12.1.24 Houses A-A1 – Level 01



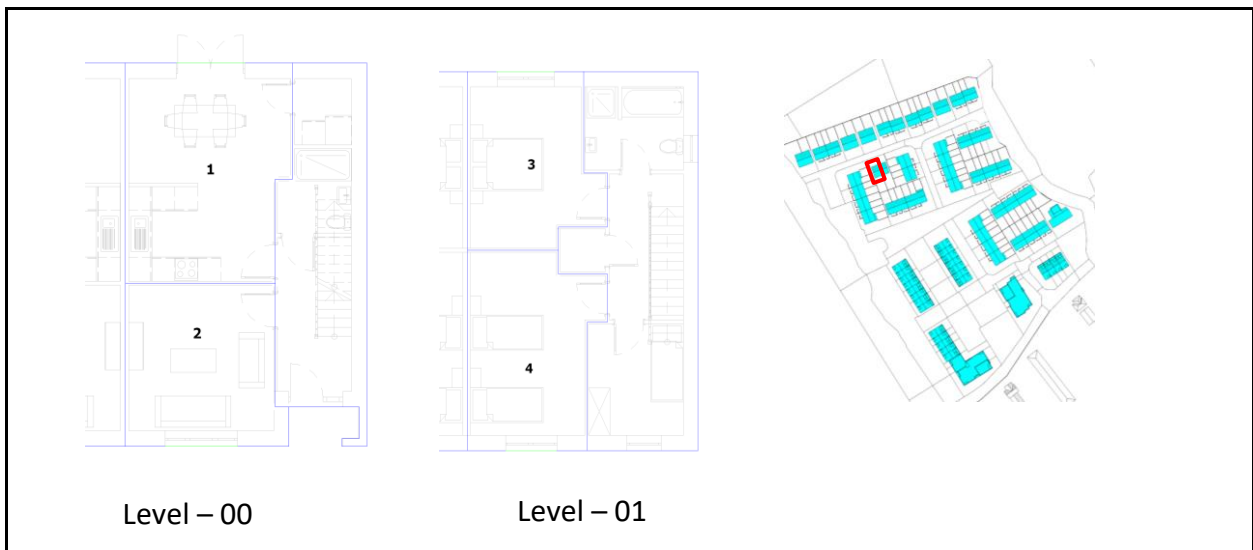
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Cmt
3	Bedroom	2.75	✓	100	100	✓	100	✓
4	Bedroom	3.00	✓	100	100	✓	100	✓
5	Bedroom	3.14	✓	100	100	✓	100	✓
6	Bedroom	4.28	✓	100	100	✓	100	✓

Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Cmt
3	Bedroom	2.85	✓	100	100	✓	100	✓
4	Bedroom	2.97	✓	91.7	100	✓	100	✓
5	Bedroom	3.10	✓	100	100	✓	100	✓
6	Bedroom	4.57	✓	100	100	✓	100	✓

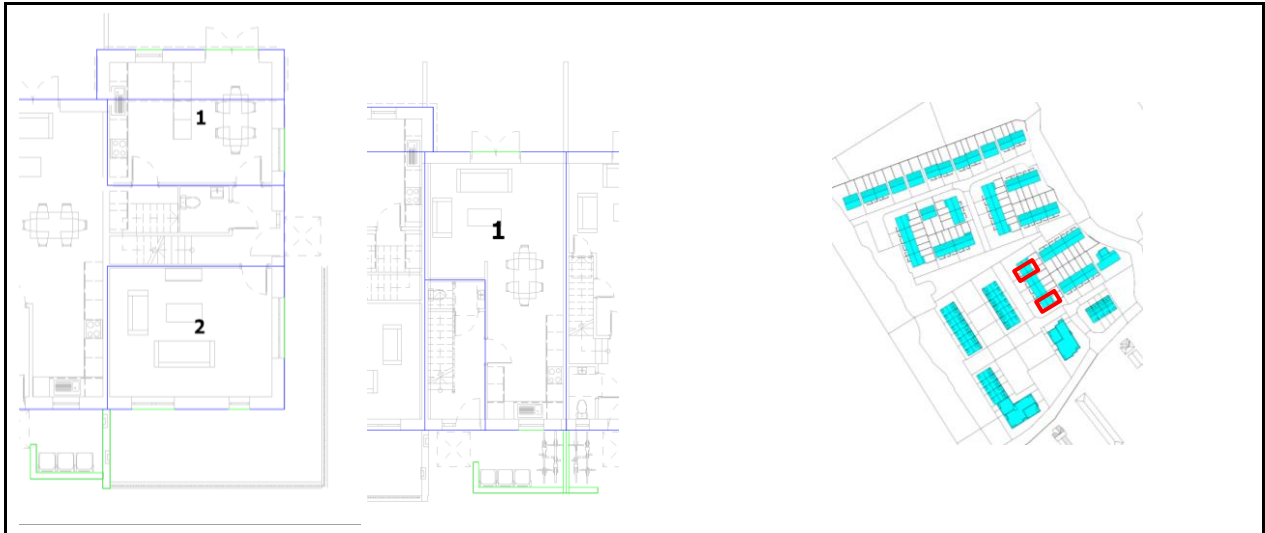


### 12.1.26 Houses B-B1



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	KD	2.28	✓	48	100	x	68	✓
2	Living	3.42	✓	100	100	✓	100	✓
3	Bedroom	2.81	✓	100	100	✓	100	✓
4	Bedroom	2.94	✓	100	100	✓	100	✓

12.1.27 Terrace 01– Level 00



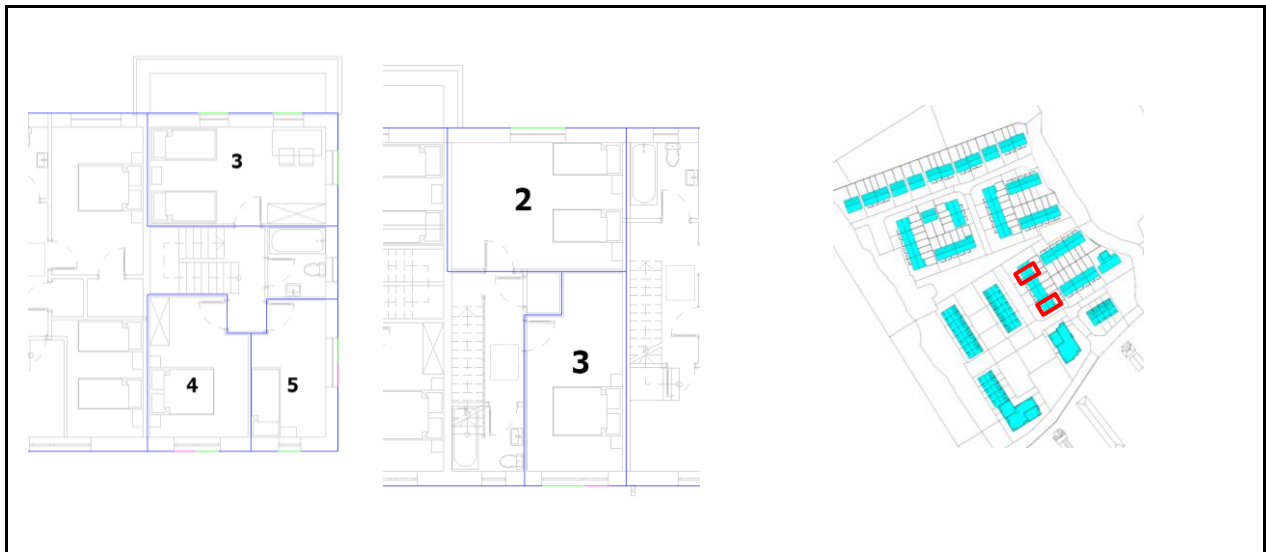
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Cmt
1	KD	3.78	✓	100	100	✓	100	✓
2	Living	4.26	✓	100	100	✓	100	✓

Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Cmt
1	LKD	2.00	✓	100	100	✓	100	✓



12.1.28 Terrace 01– Level 01



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Cmt
3	Bedroom	4.28	✓	100	100	✓	100	✓
4	Bedroom	4.32	✓	100	100	✓	100	✓
5	Bedroom	1.82	✓	100	100	✓	100	✓
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Cmt
2	Bedroom	2.27	✓	92.5	100	✓	100	✓
3	Bedroom	2.49	✓	100	100	✓	100	✓



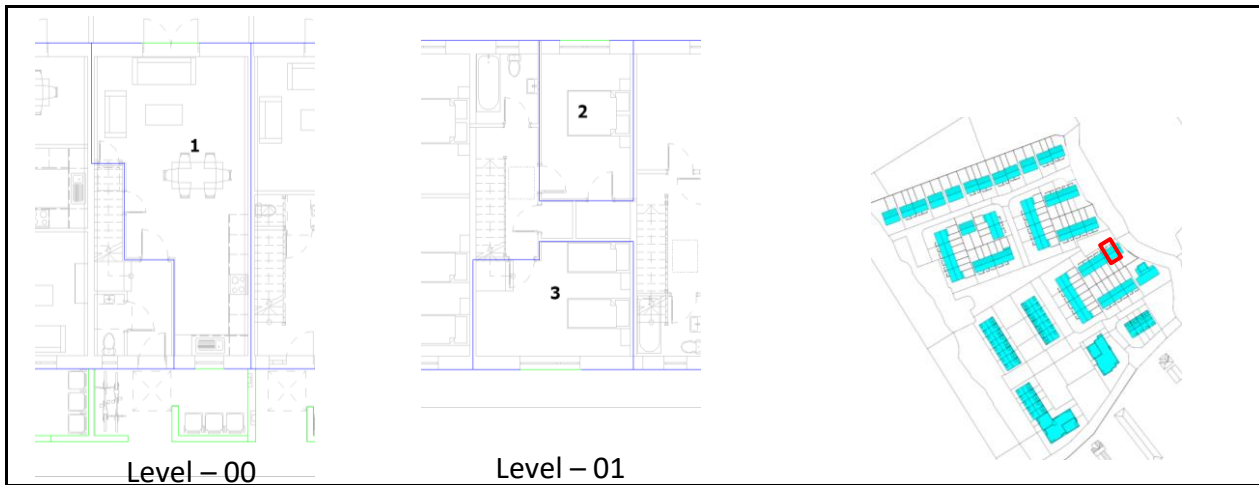


12.1.29 Terrace 02



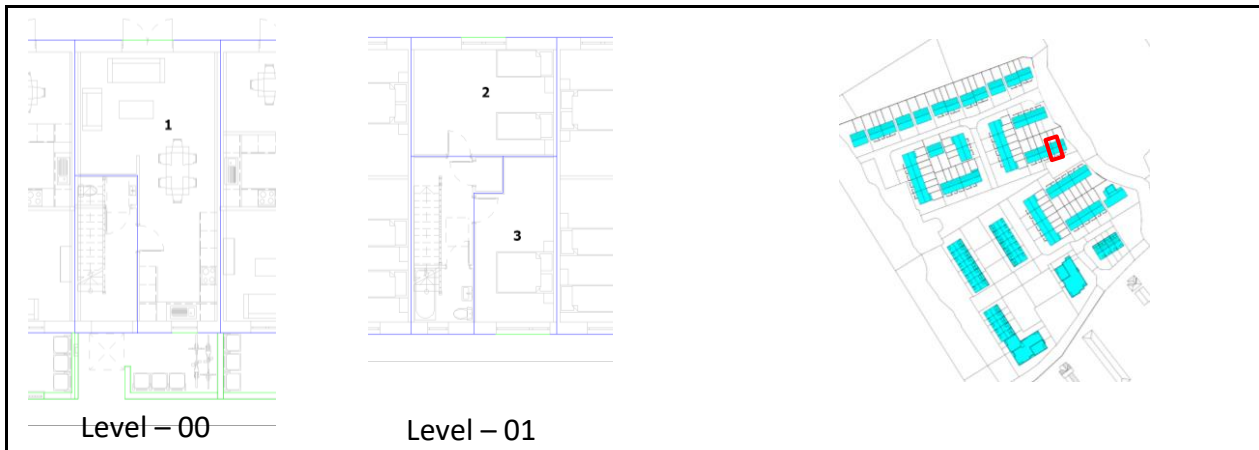
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	KD	2.13	✓	40.68	100	x	62.03	✓
2	Living	3.00	✓	100	100	✓	100	✓
3	Bedroom	2.82	✓	46.15	100	✓	100	✓
4	Bedroom	3.57	✓	100	100	✓	100	✓
5	Bedroom	2.68	✓	100	100	✓	100	✓

12.1.30 Terrace 03



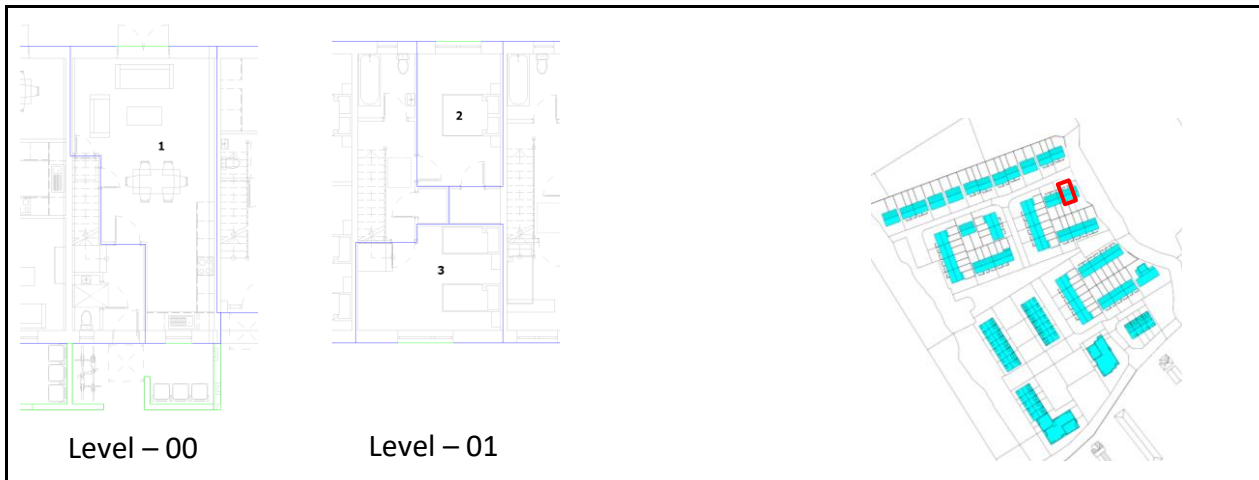
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	LKD	2.40	✓	100	100	✓	100	✓
2	Bedroom	3.04	✓	100	100	✓	100	✓
3	Bedroom	4.14	✓	100	100	✓	100	✓

**12.1.31 Terrace 04**



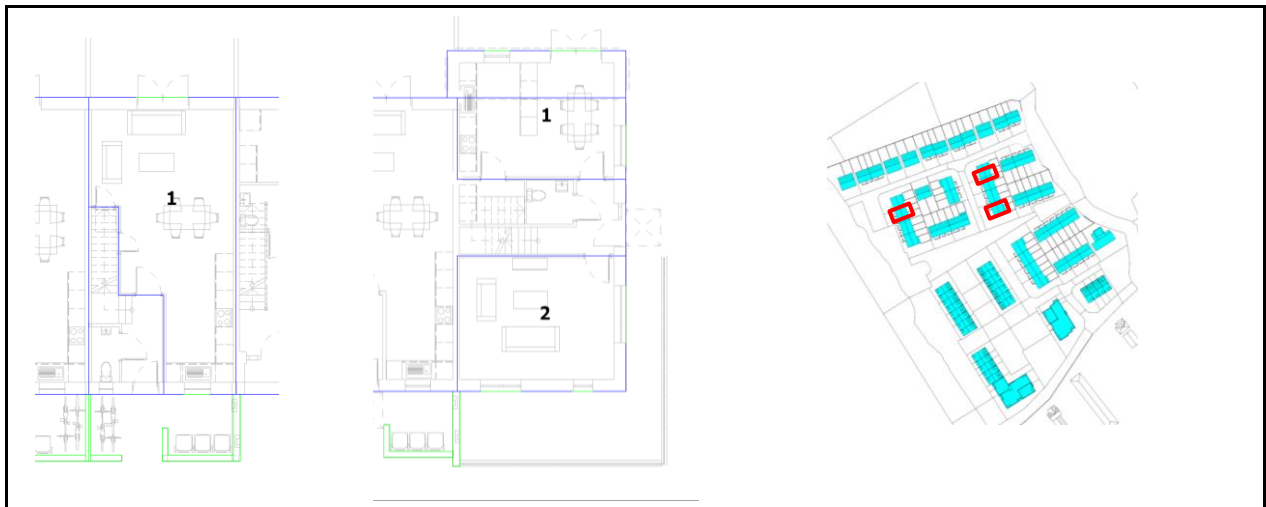
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	LKD	2.22	✓	98.2	100	✓	100	✓
2	Bedroom	2.46	✓	82.05	100	✓	100	✓
3	Bedroom	3.85	✓	100	100	✓	100	✓

12.1.32 Terrace 05



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	LKD	2.18	✓	100	100	✓	100	✓
2	Bedroom	3.01	✓	72	100	✓	100	✓
3	Bedroom	4.05	✓	100	100	✓	100	✓

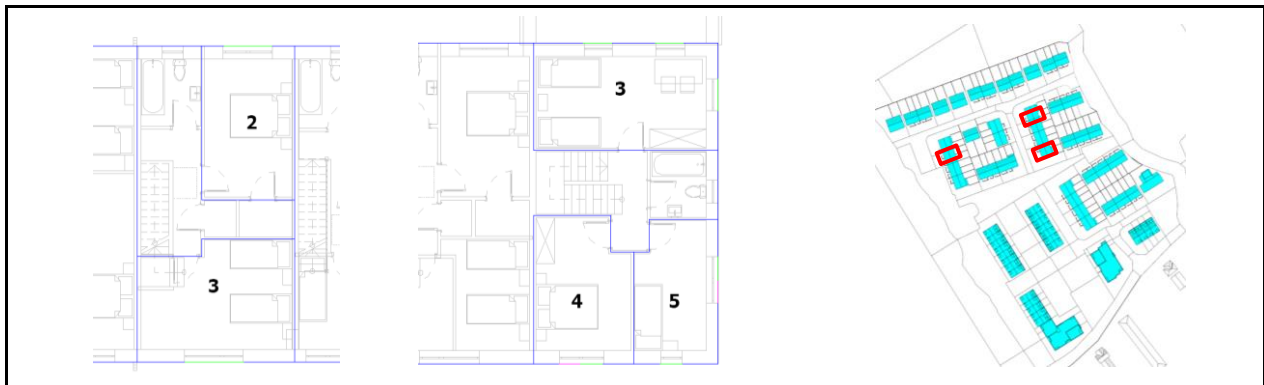
12.1.33 Terrace 06– Level 00



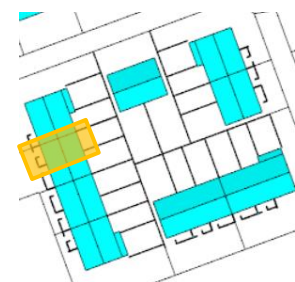
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Cmt
1	KD	3.92	✓	100	100	✓	100	✓
2	Living	4.28	✓	100	100	✓	100	✓
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Cmt
1	LKD	1.55	x	52.38	100	✓	98.81	✓
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Cmt
1	2.09	✓	100	100	✓	100	✓	2.09



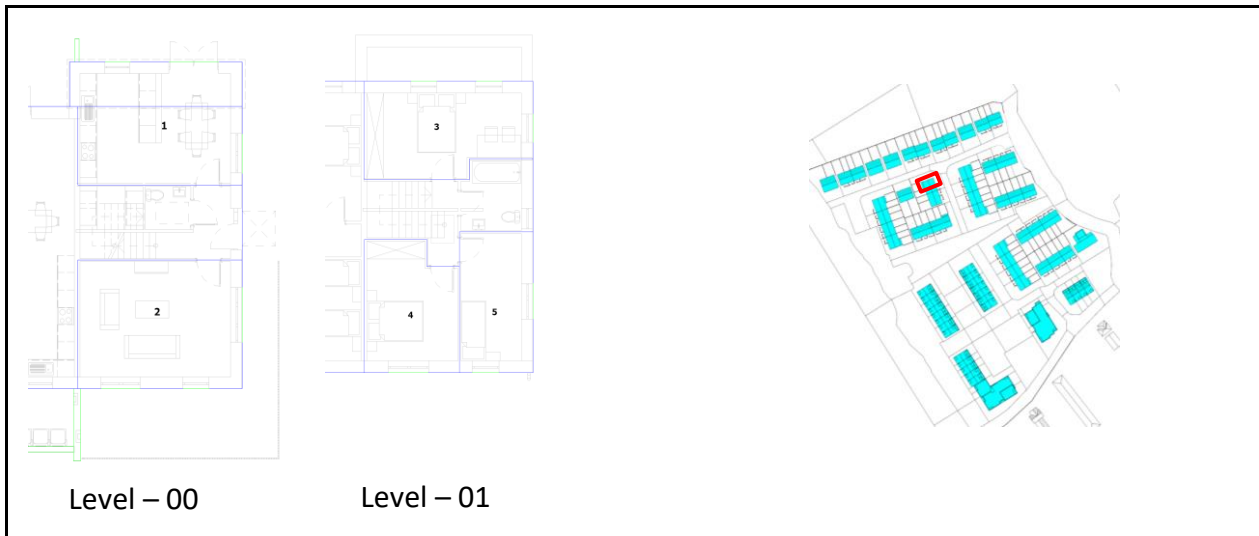
12.1.34 Terrace 06– Level 01



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Cmt
3	Bedroom	4.14	✓	100	100	✓	100	✓
4	Bedroom	4.51	✓	100	100	✓	100	✓
5	Bedroom	1.86	✓	100	100	✓	100	✓
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Cmt
2	Bedroom	2.01	✓	43.59	100	x	100	✓
3	Bedroom	2.56	✓	100	100	✓	100	✓
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Cmt	Floor Area > E <sub>T</sub> (%)	Cmt
2	LKD	2.09	✓	100	100	✓	100	✓
3	Bedroom	2.93	✓	100	100	✓	100	✓



### 12.1.35 Terrace 08



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	KD	3.89	✓	100	100	✓	100	✓
2	Living	4.20	✓	100	100	✓	100	✓
3	Bedroom	4.24	✓	100	100	✓	100	✓
4	Bedroom	6.17	✓	100	100	✓	100	✓
5	Bedroom	3.56	✓	100	100	✓	100	✓

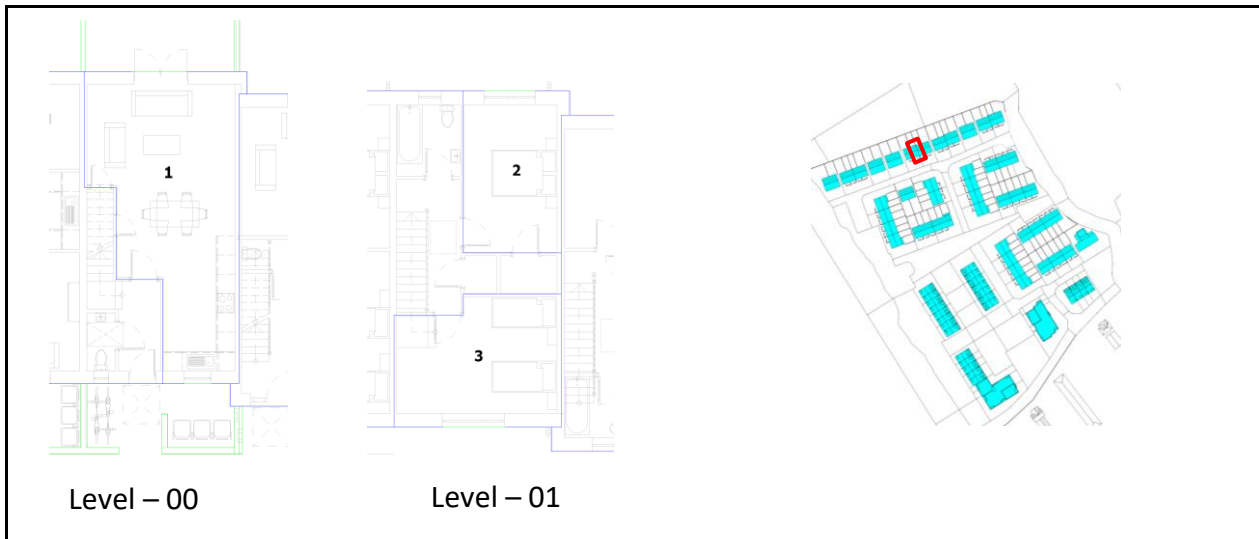
12.1.36 Terrace 09



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	KD	2.51	✓	46	100	x	72	✓
2	Living	3.72	✓	100	100	✓	100	✓
3	Bedroom	3.00	✓	100	100	✓	100	✓
4	Bedroom	3.00	✓	100	100	✓	100	✓
5	Bedroom	3.75	✓	100	100	✓	100	✓

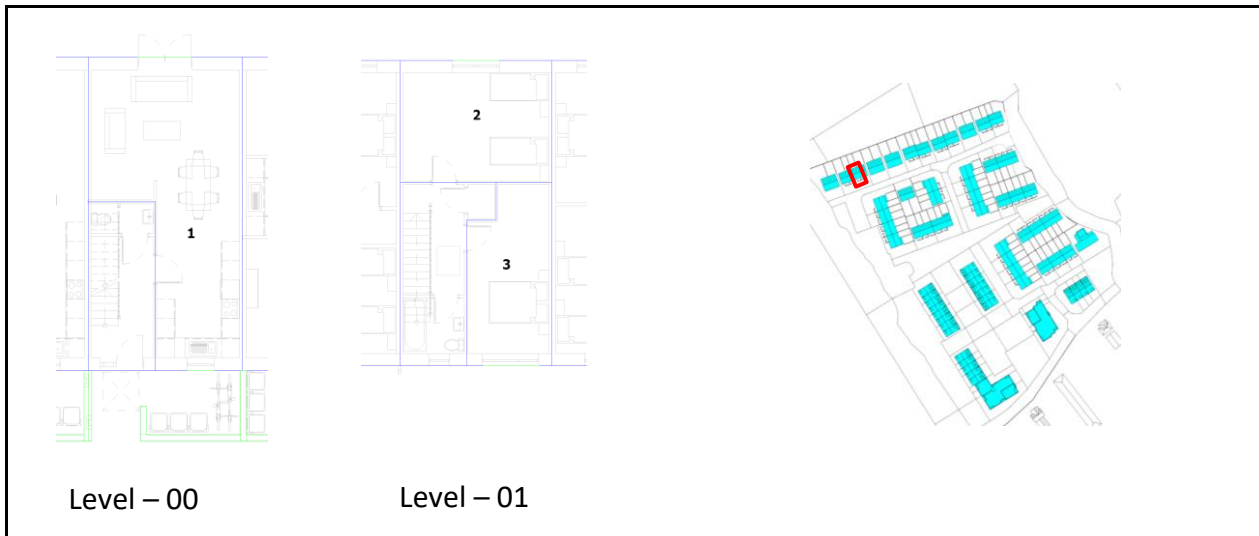


12.1.37 Terrace 10



Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	LKD	2.15	✓	90.36	100	✓	100	✓
2	Bedroom	3.16	✓	100	100	✓	100	✓
3	Bedroom	3.97	✓	100	100	✓	100	✓

12.1.38 Terrace 11



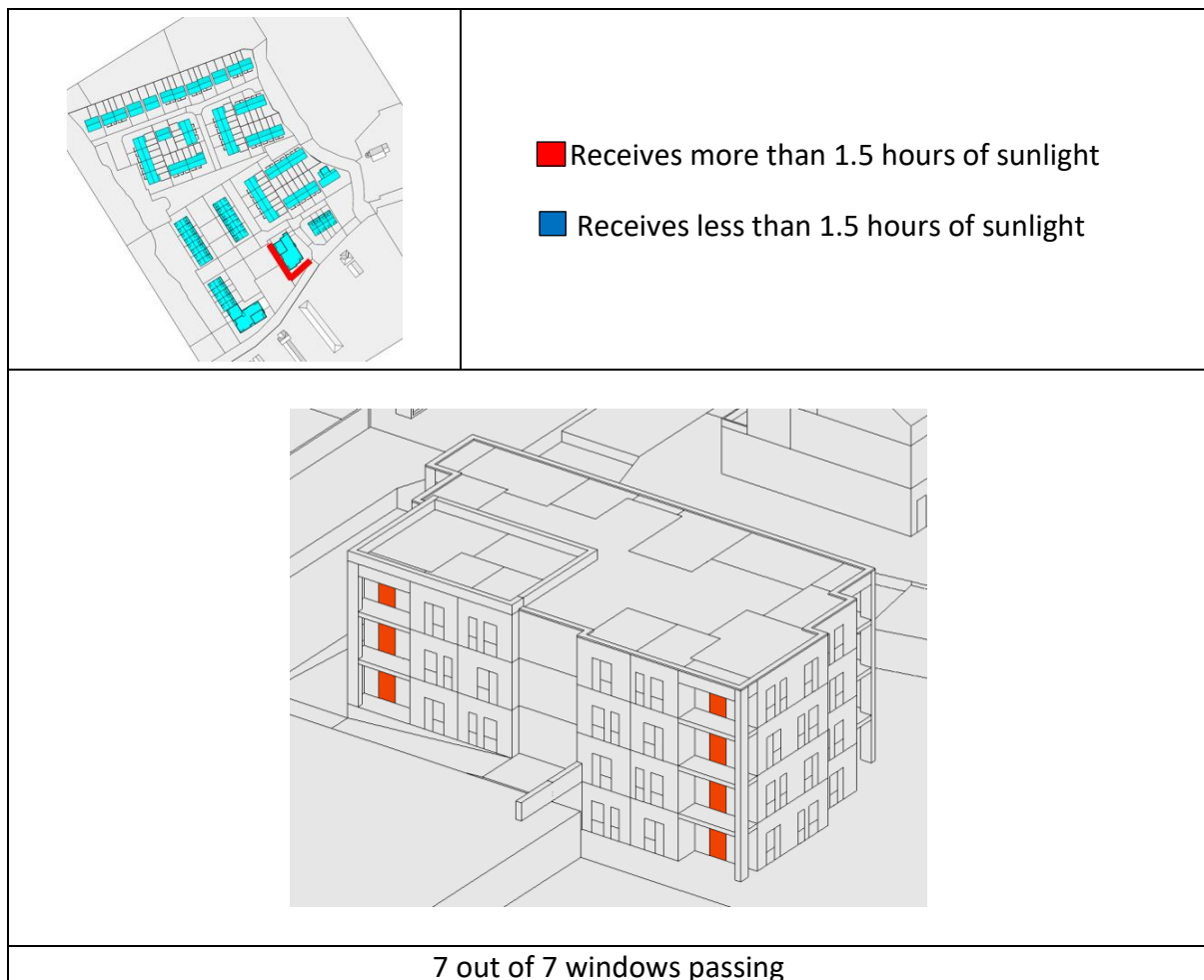
Ref.	Room Activity	BRE Guide 2 <sup>nd</sup> Edition BS 8206:2008		BRE Guide 3 <sup>rd</sup> Edition IS EN 17037:2018 Method 2			BRE Guide 3 <sup>rd</sup> Edition BS EN 17037:2018 Method 2 National Annex	
		ADF (%)	Comment	Floor Area > E <sub>T</sub> (%)	Floor Area > E <sub>TM</sub> (%)	Comment	Floor Area > E <sub>T</sub> (%)	Comment
1	LKD	LKD	2.01	✓	90.48	100	✓	100
2	Bedroom	Bedroom	2.58	✓	100	100	✓	100
3	Bedroom	Bedroom	4.12	✓	100	100	✓	100

## 13 Appendix B – Sunlight Exposure Results

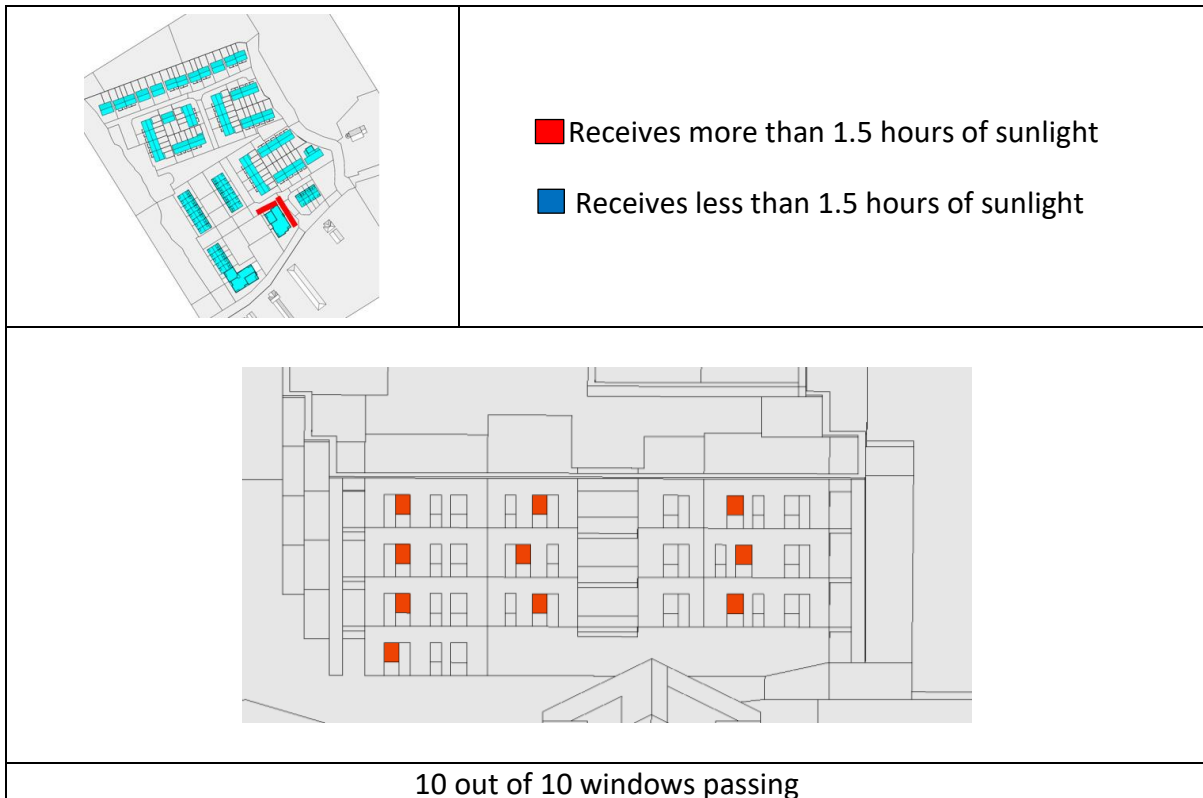
### 13.1 Sunlight Exposure Results

The IS EN 17037:2018 (BRE Guide 3<sup>rd</sup> Edition) sunlight exposure results tabulated in Section 8.2 for the proposed development are visually represented in the following images. The windows highlighted in “red” achieve the minimum 1.5 hours of recommended sunlight on March 21<sup>st</sup>, while the windows highlighted in “blue” do not achieve the recommended value.

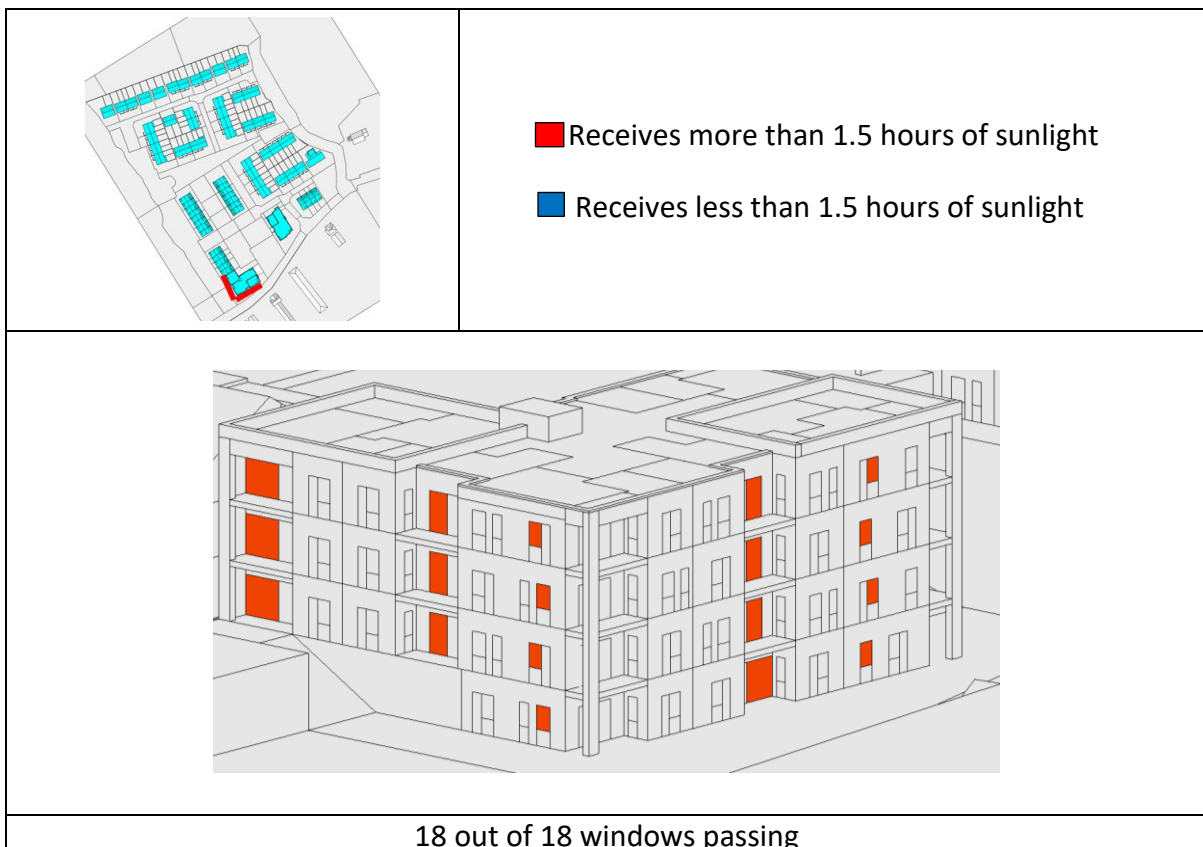
#### 13.1.1 View 01 – Apartment Block A1



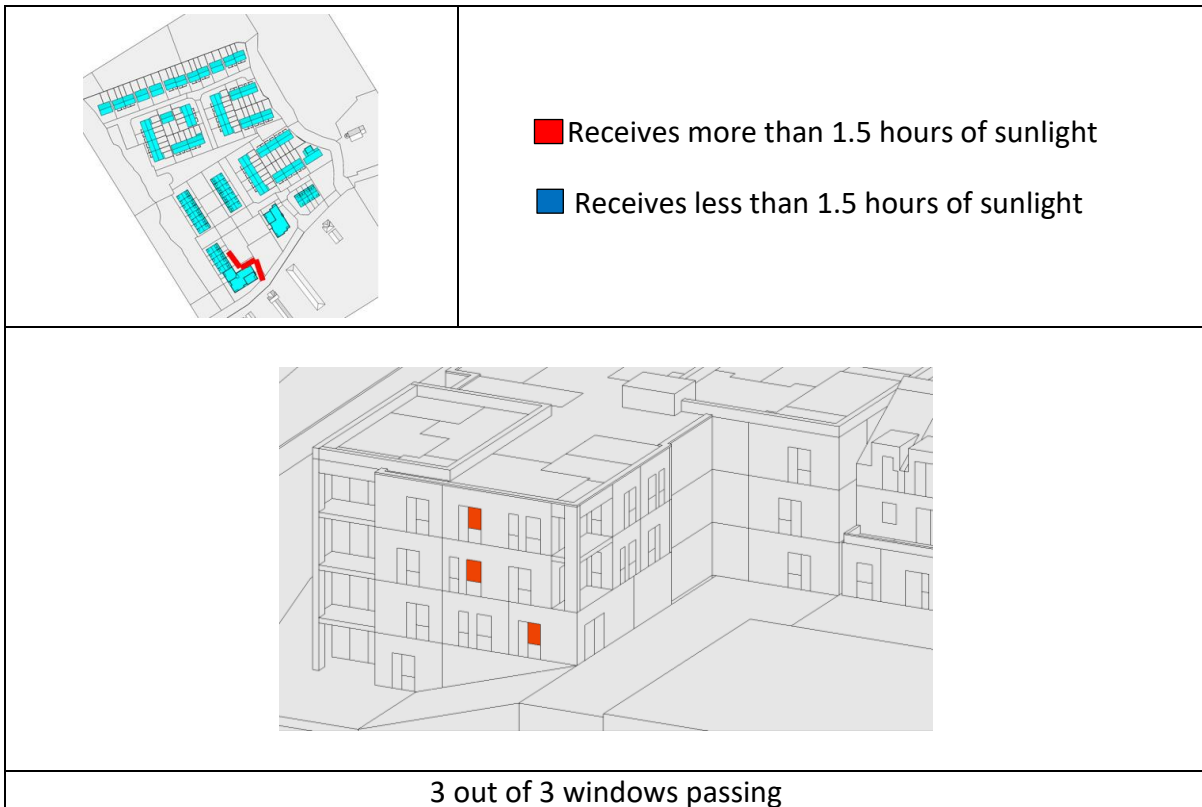
### 13.1.2 View 02 – Apartment Block A1



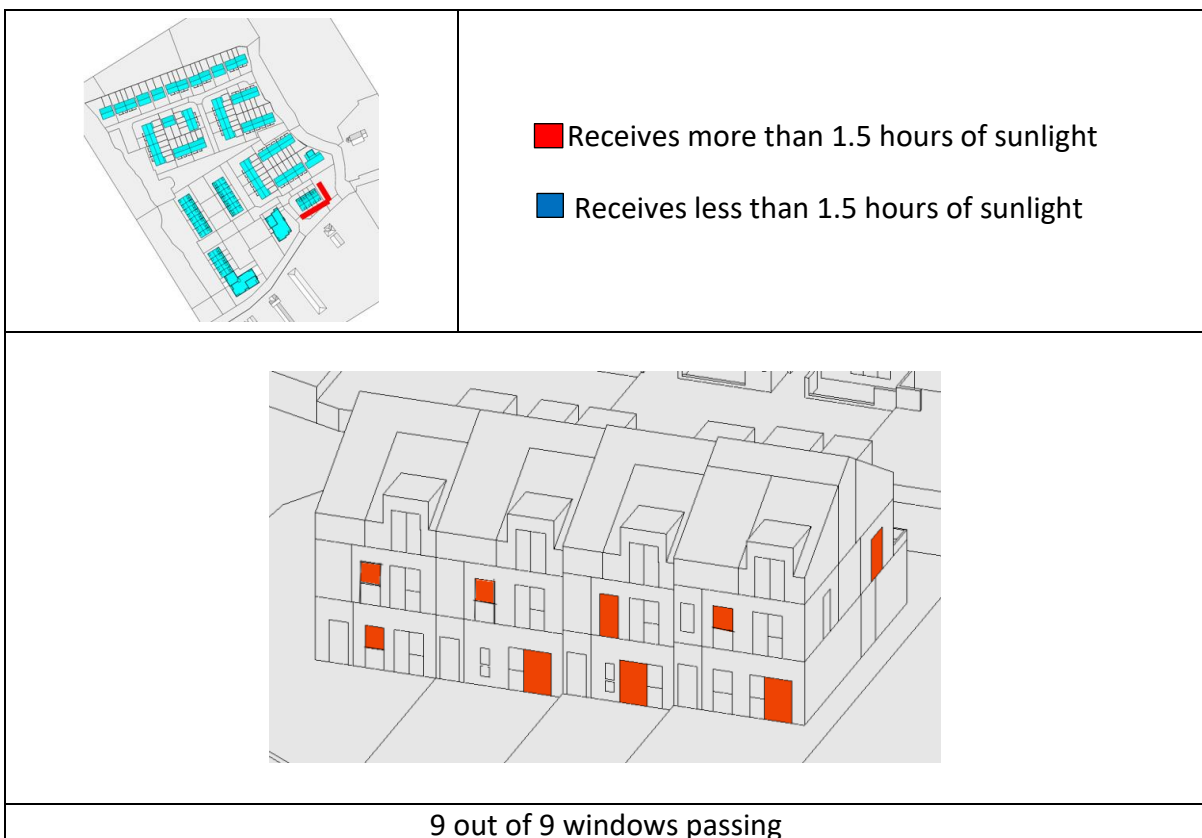
### 13.1.3 View 03 – Apartment Block A2



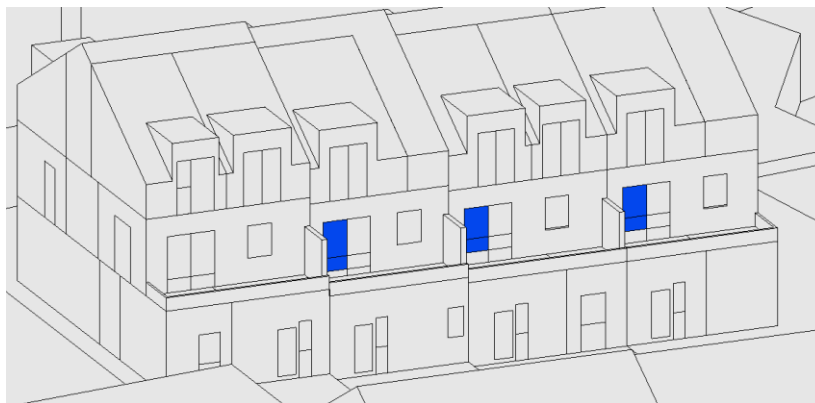
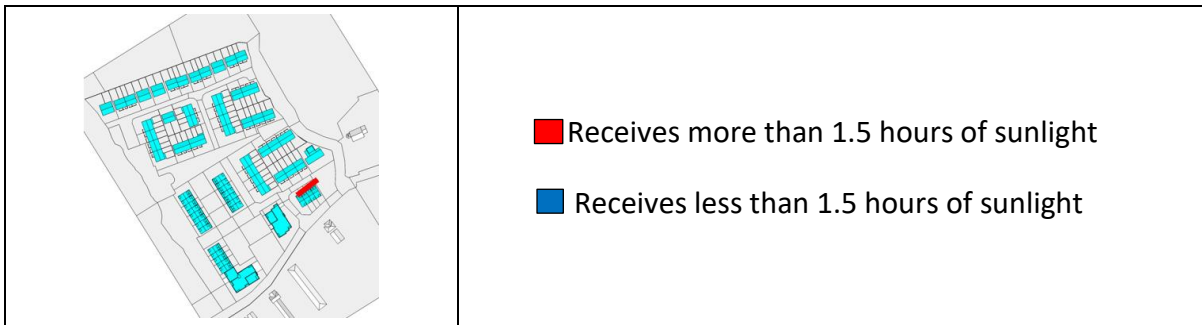
### 13.1.4 View 04 – Apartment Block A2



### 13.1.5 View 05 – Duplex D1

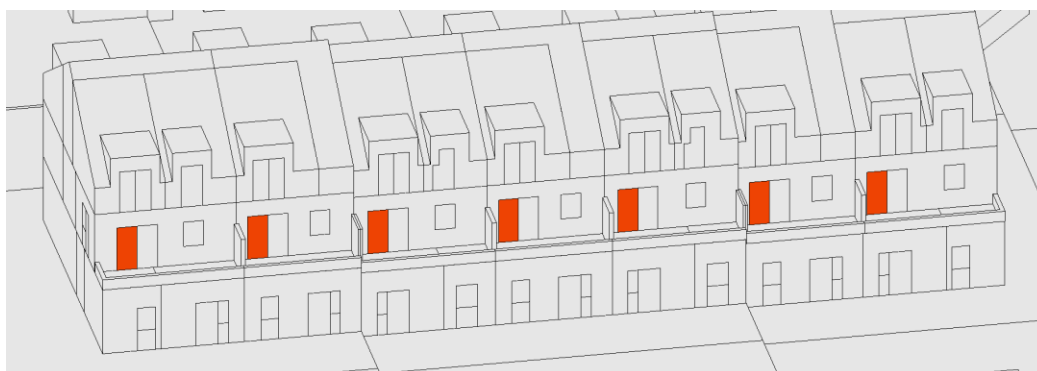
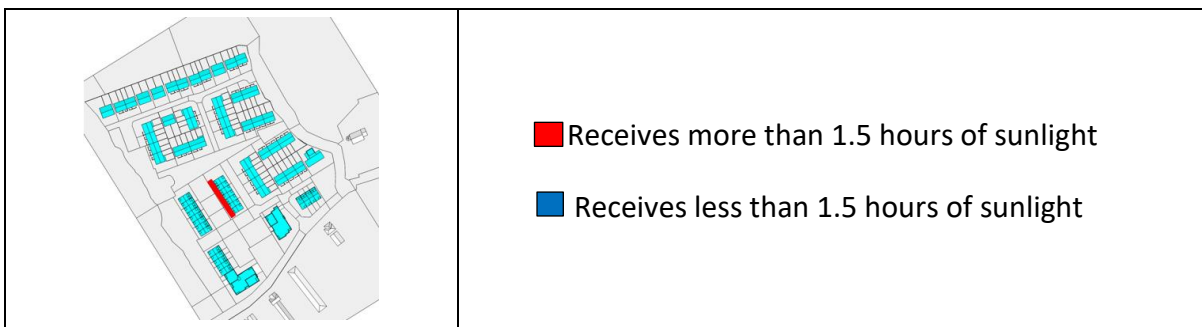


### 13.1.6 View 06 – Duplex D1



0 out of 3 windows passing

### 13.1.7 Views 07 – Duplex D2

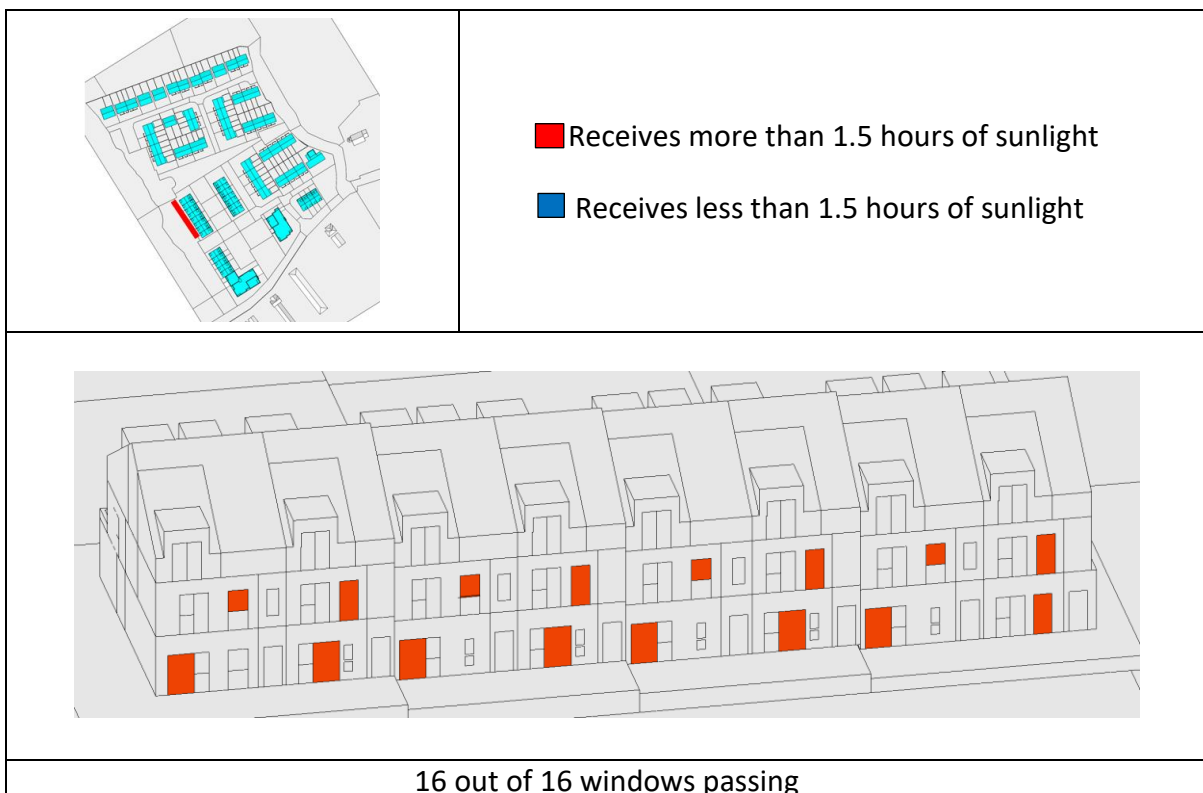


7 out of 7 windows passing

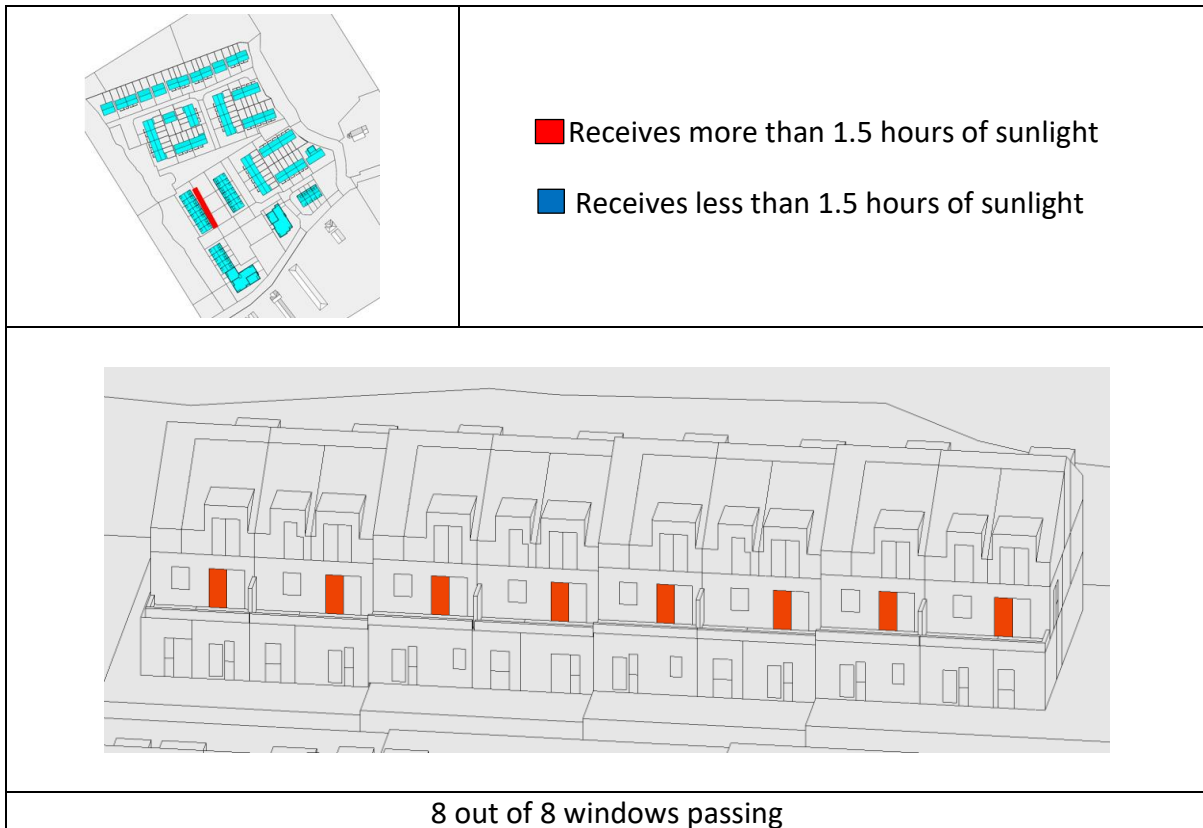
### 13.1.8 View 08 – Duplex D2



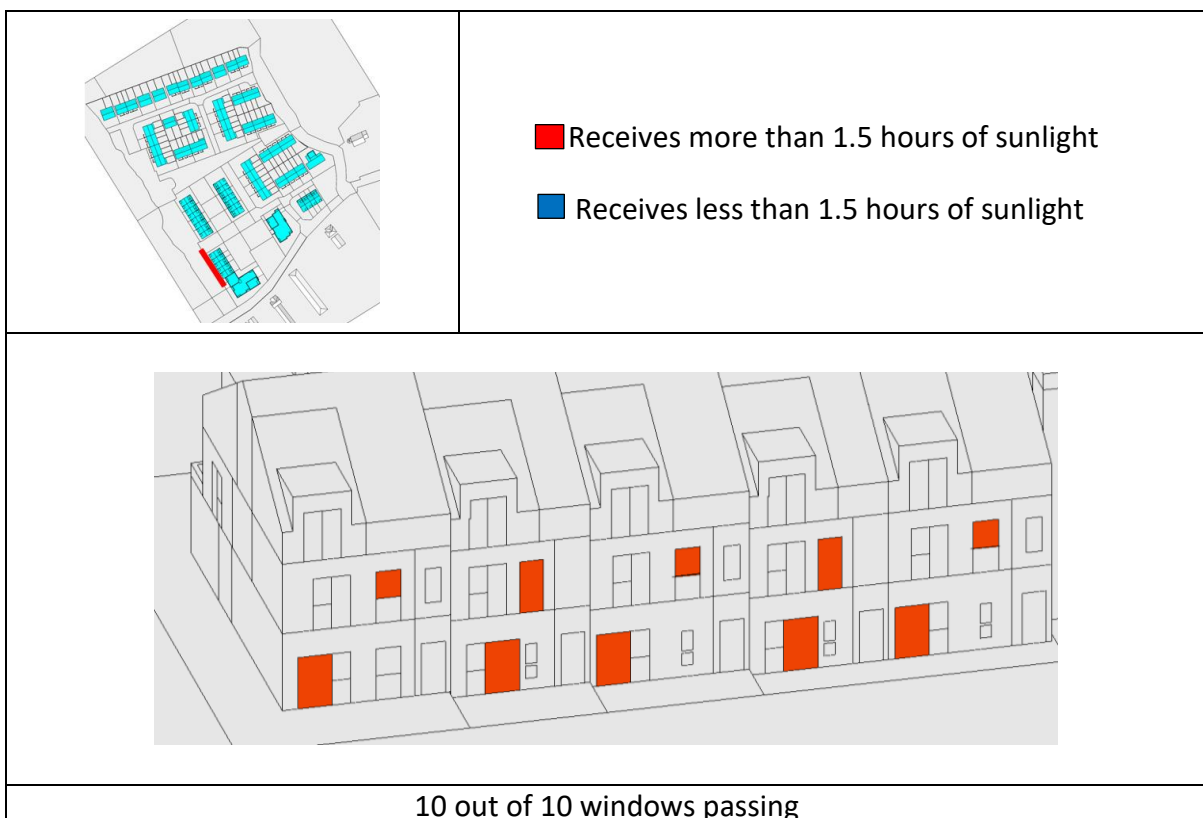
### 13.1.9 View 09 – Duplex D3



### 13.1.1 View 10 – Duplex D3

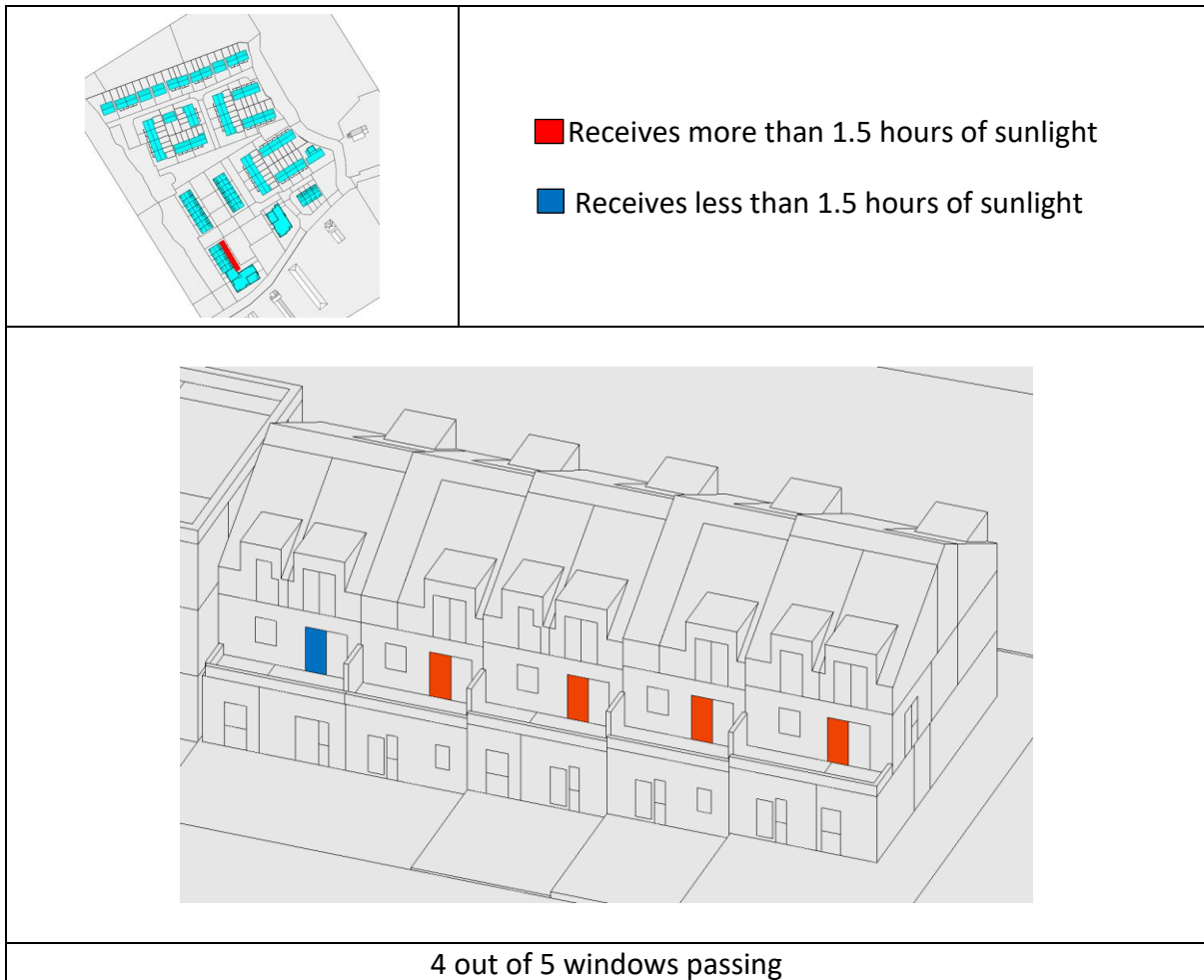


### 13.1.2 View 11 – Duplex D4





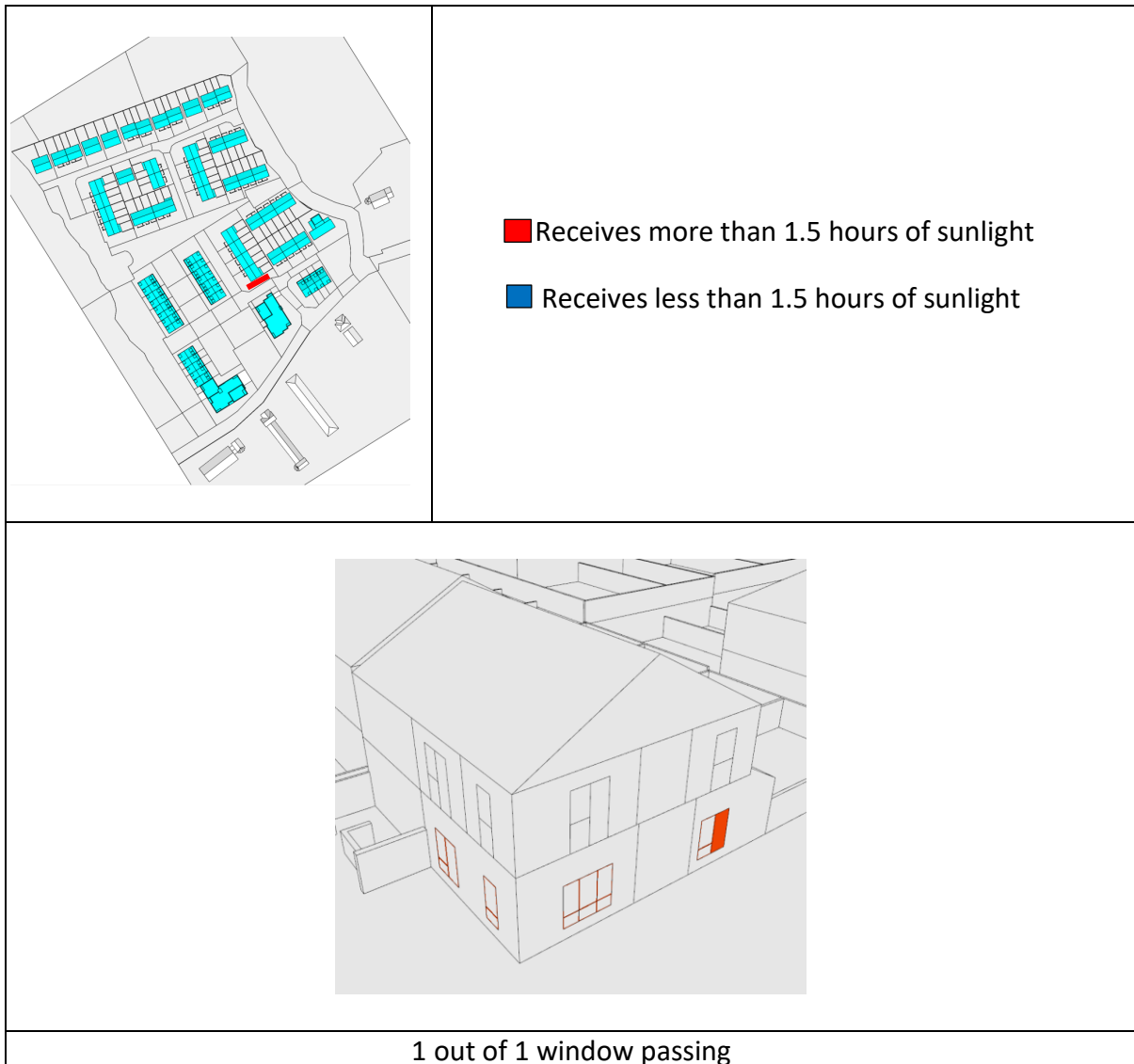
### 13.1.3 View 12 – Duplex D4



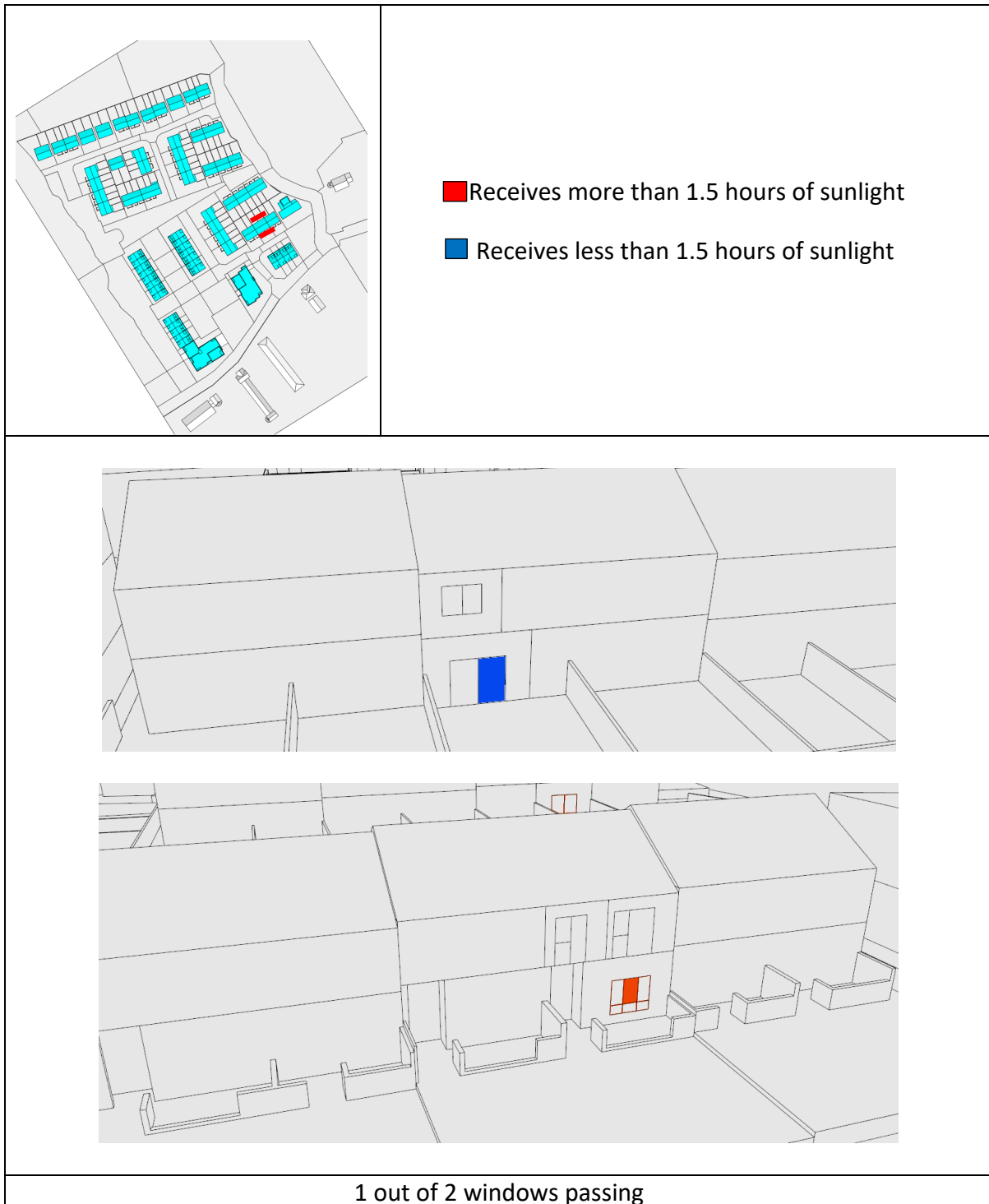
### 13.1.4 View 13 – Terrace 01



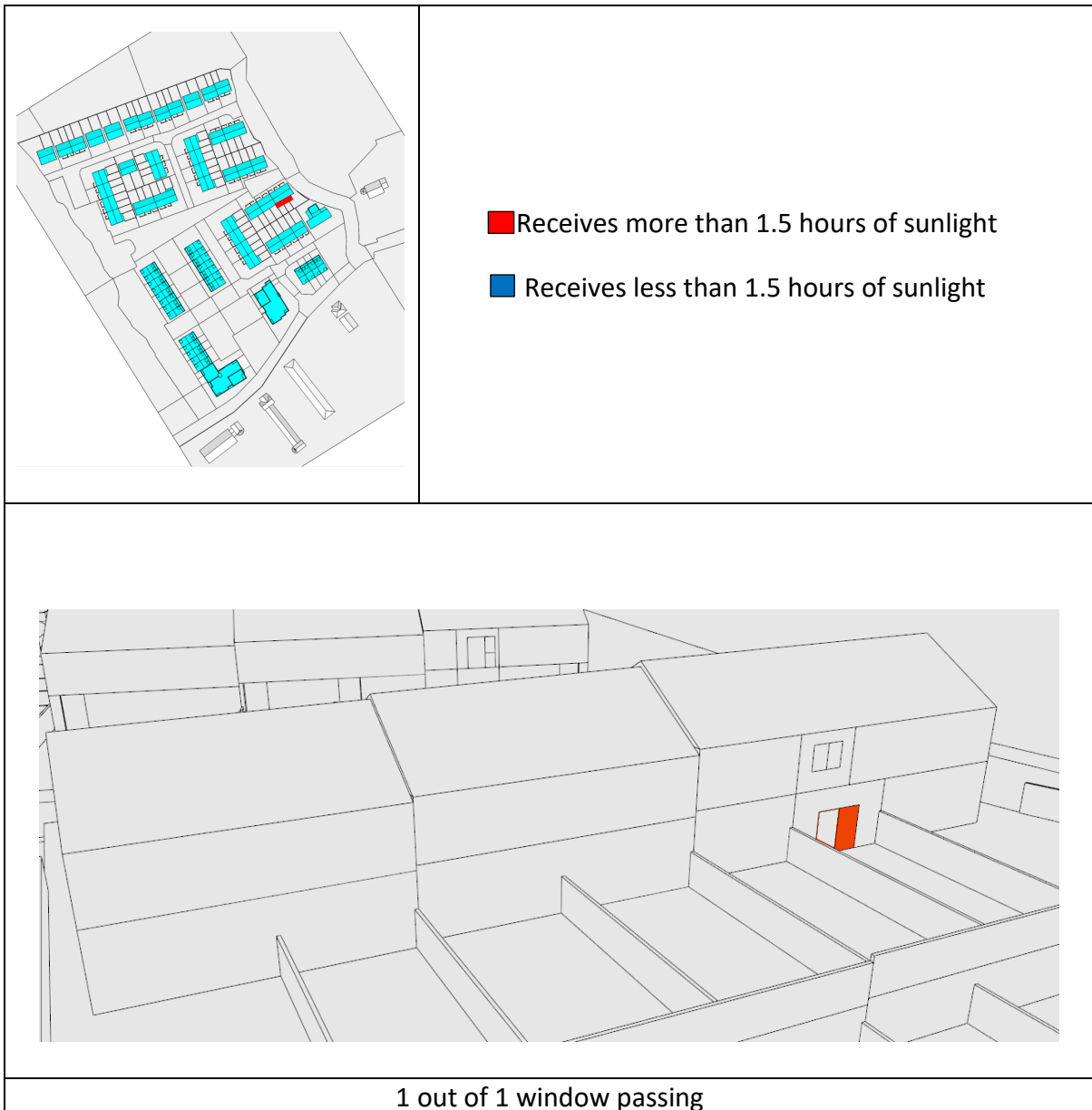
### 13.1.5 View 14 – Terrace 01



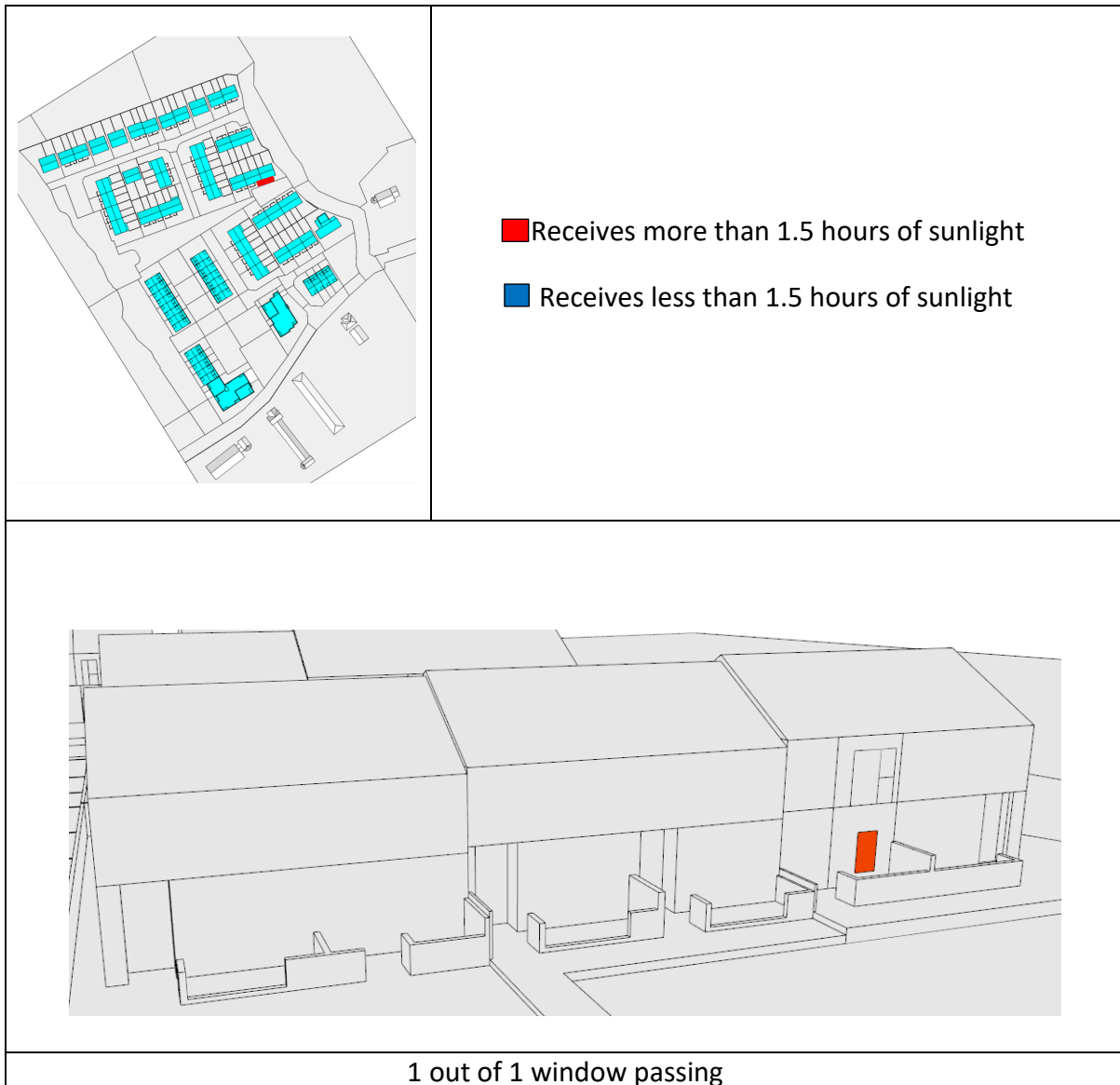
### 13.1.6 View 15 – Terrace 02



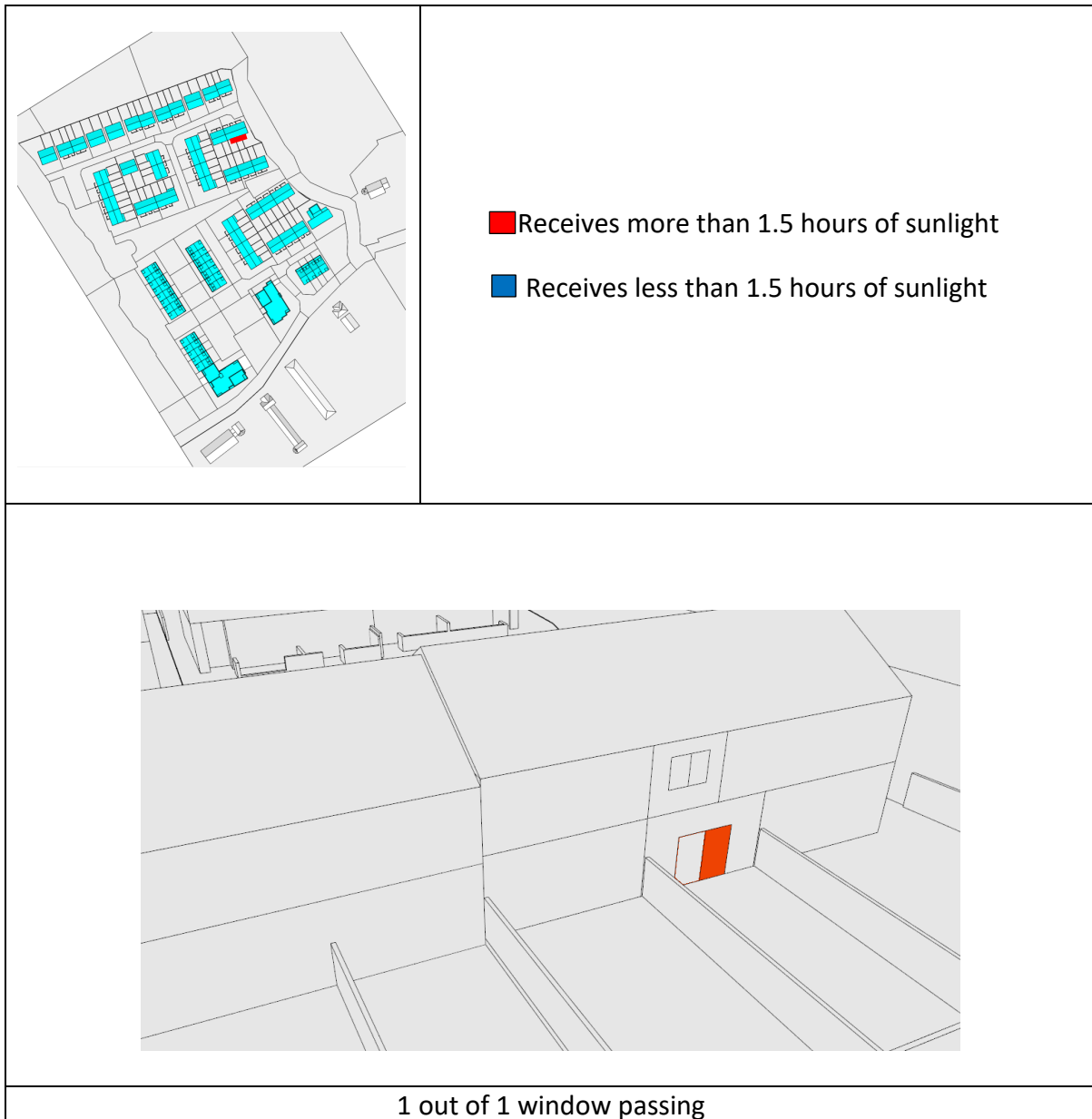
### 13.1.7 View 16 – Terrace 03



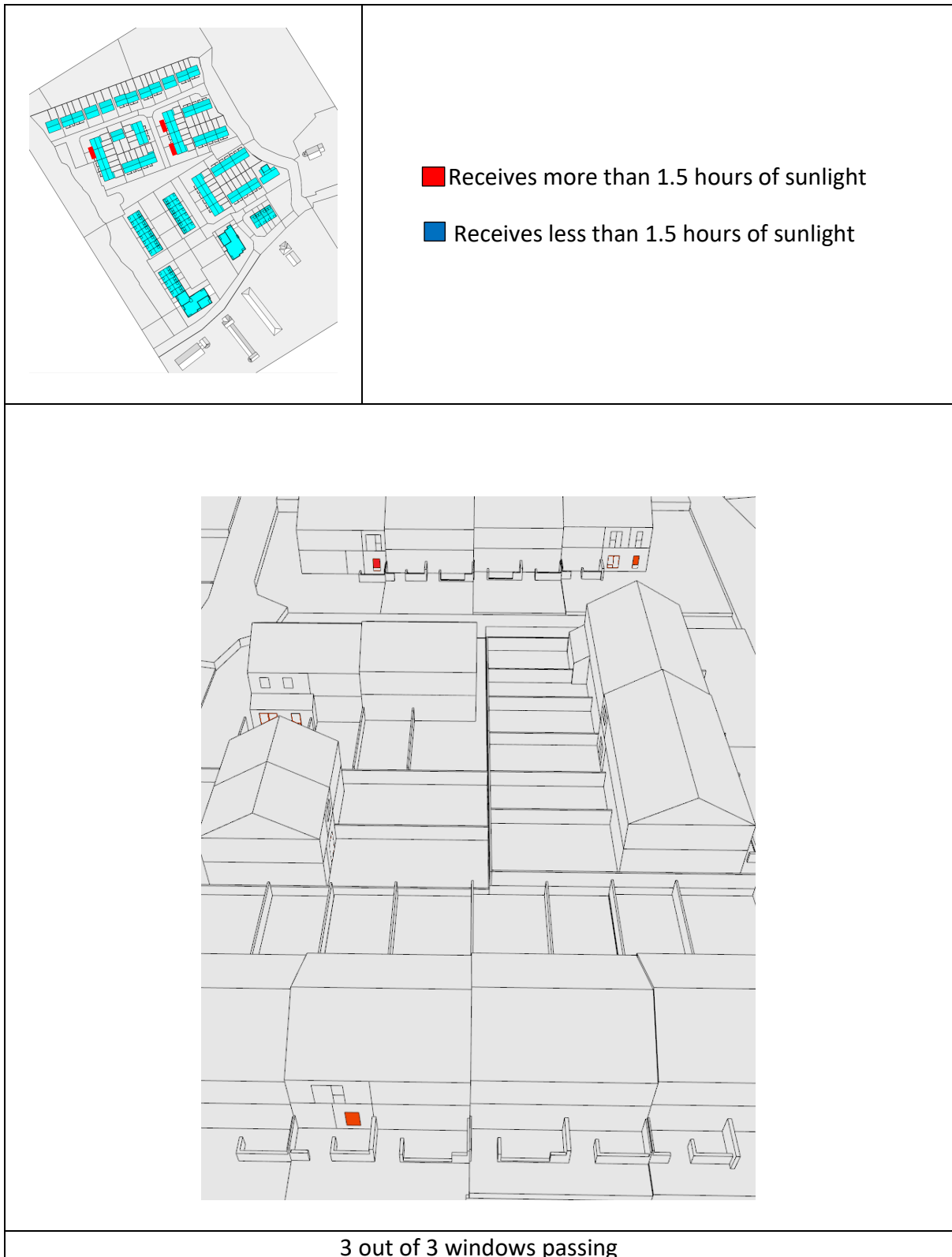
### 13.1.8 View 17 – Terrace 04



### 13.1.9 View 18 – Terrace 05

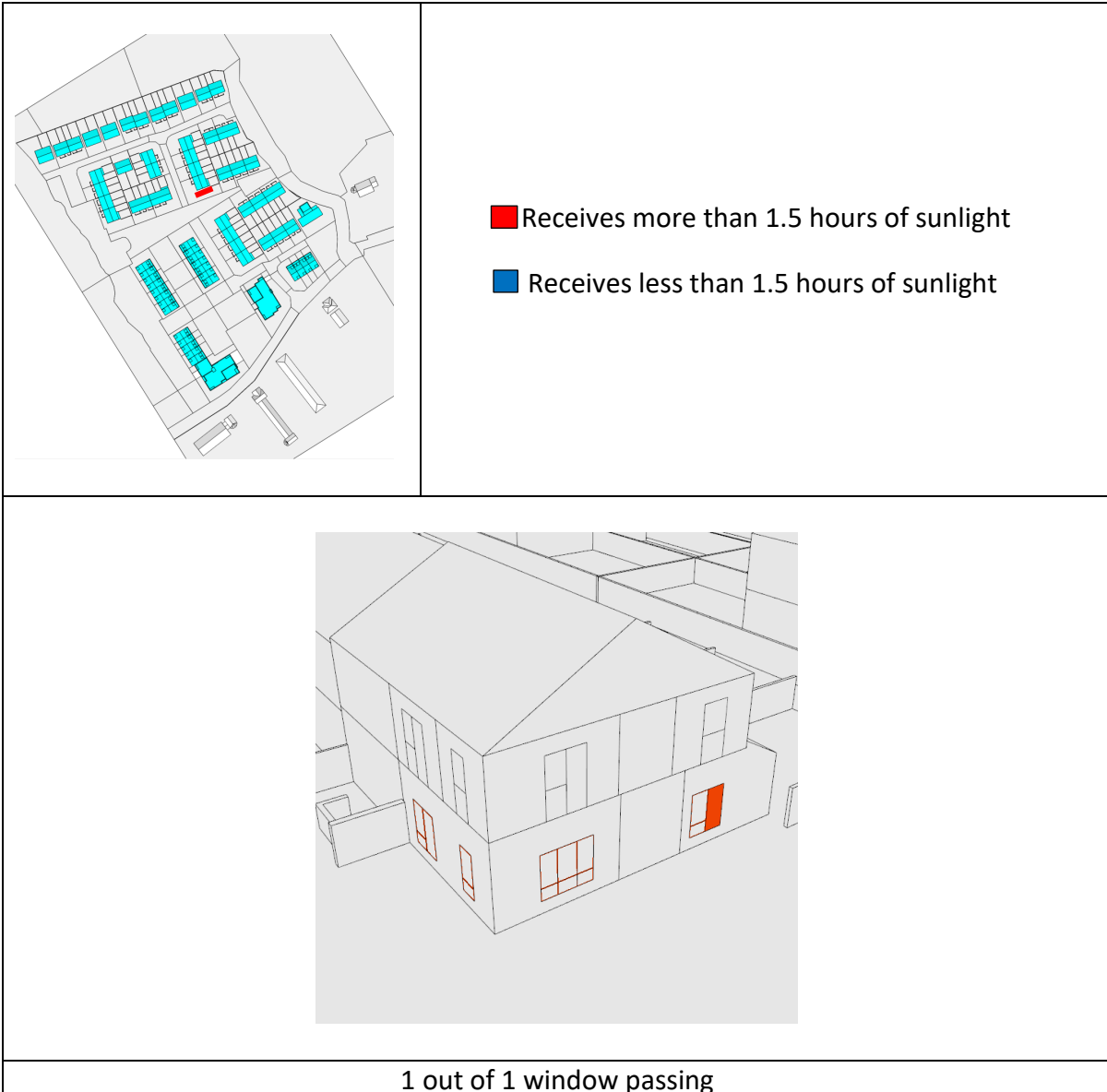


13.1.10 View 19 – Terrace 06

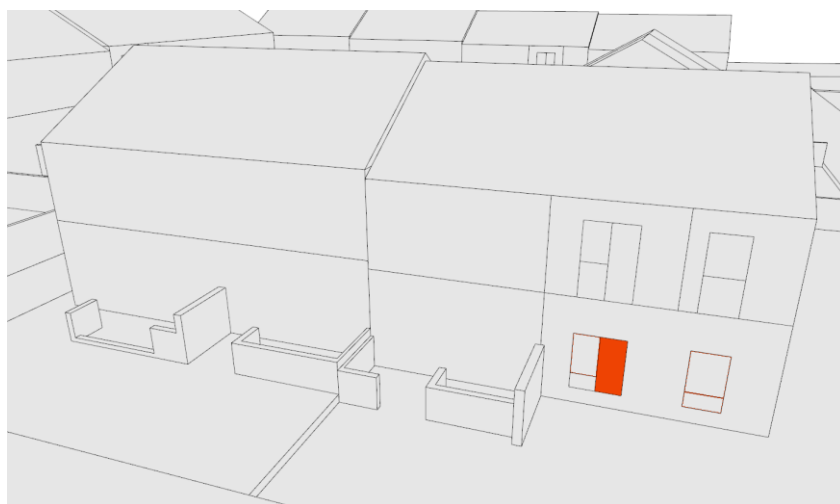
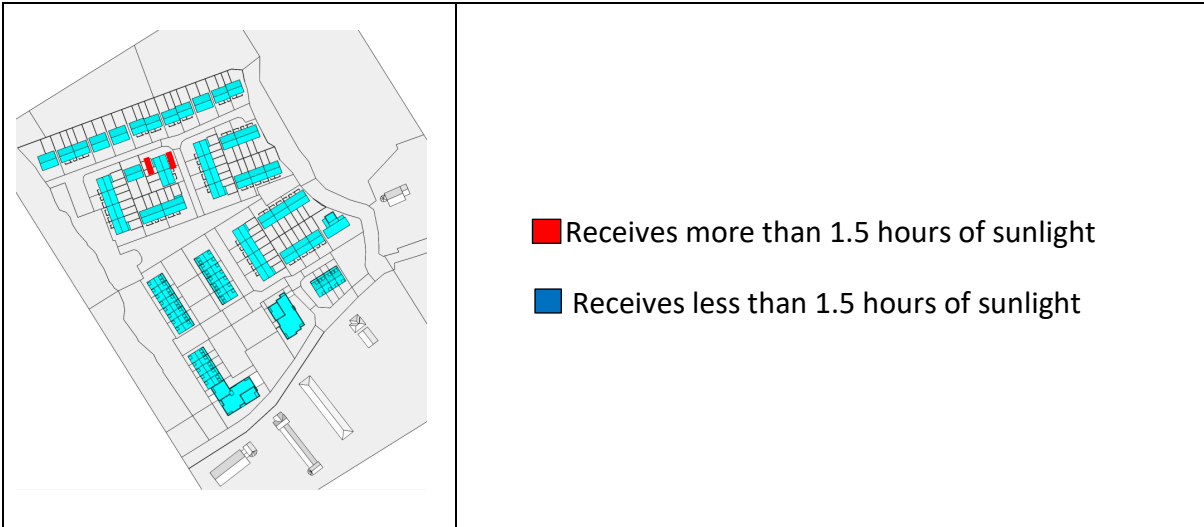




13.1.11 View 20 – Terrace 06

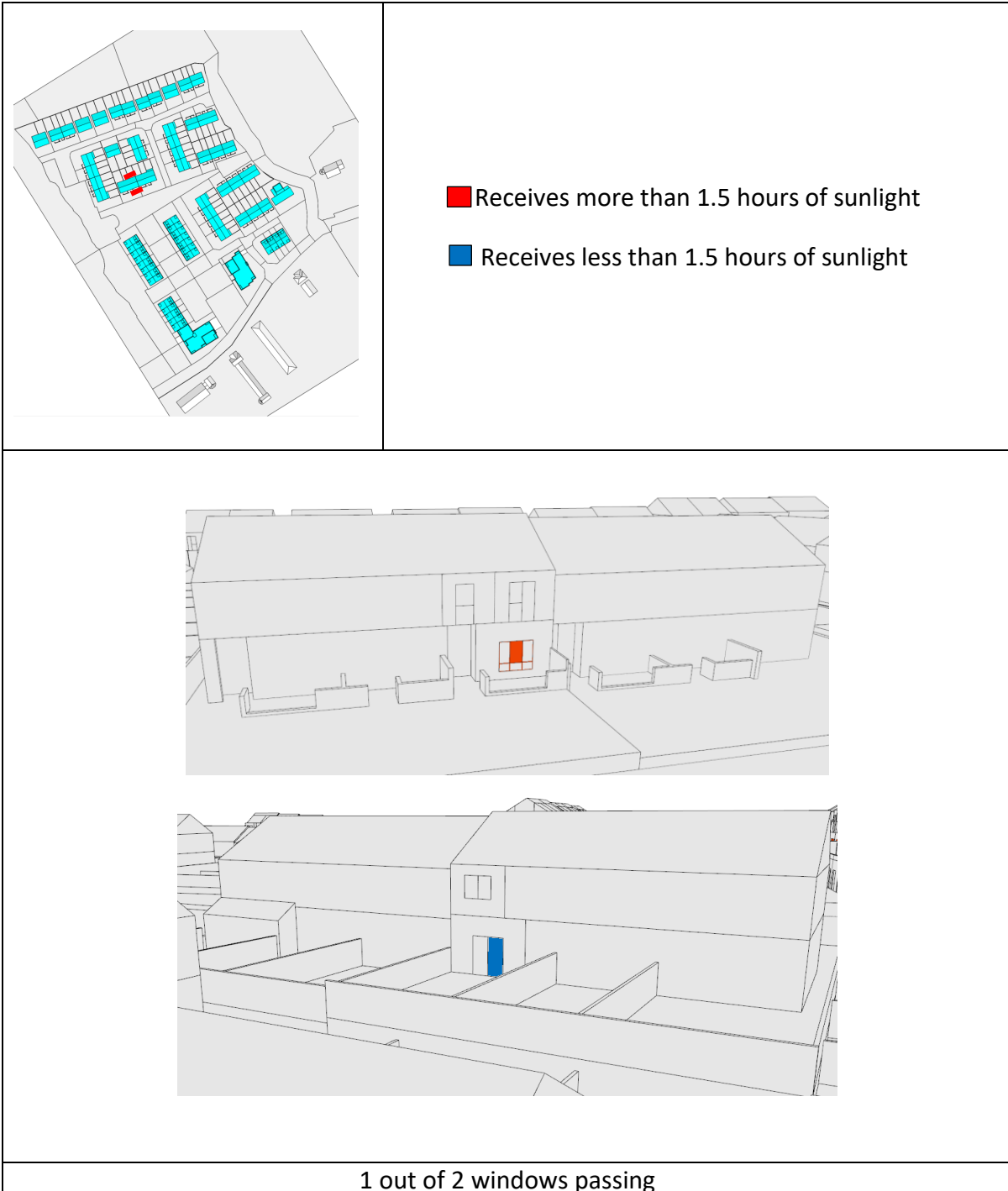


13.1.12 View 21 - Terrace 08

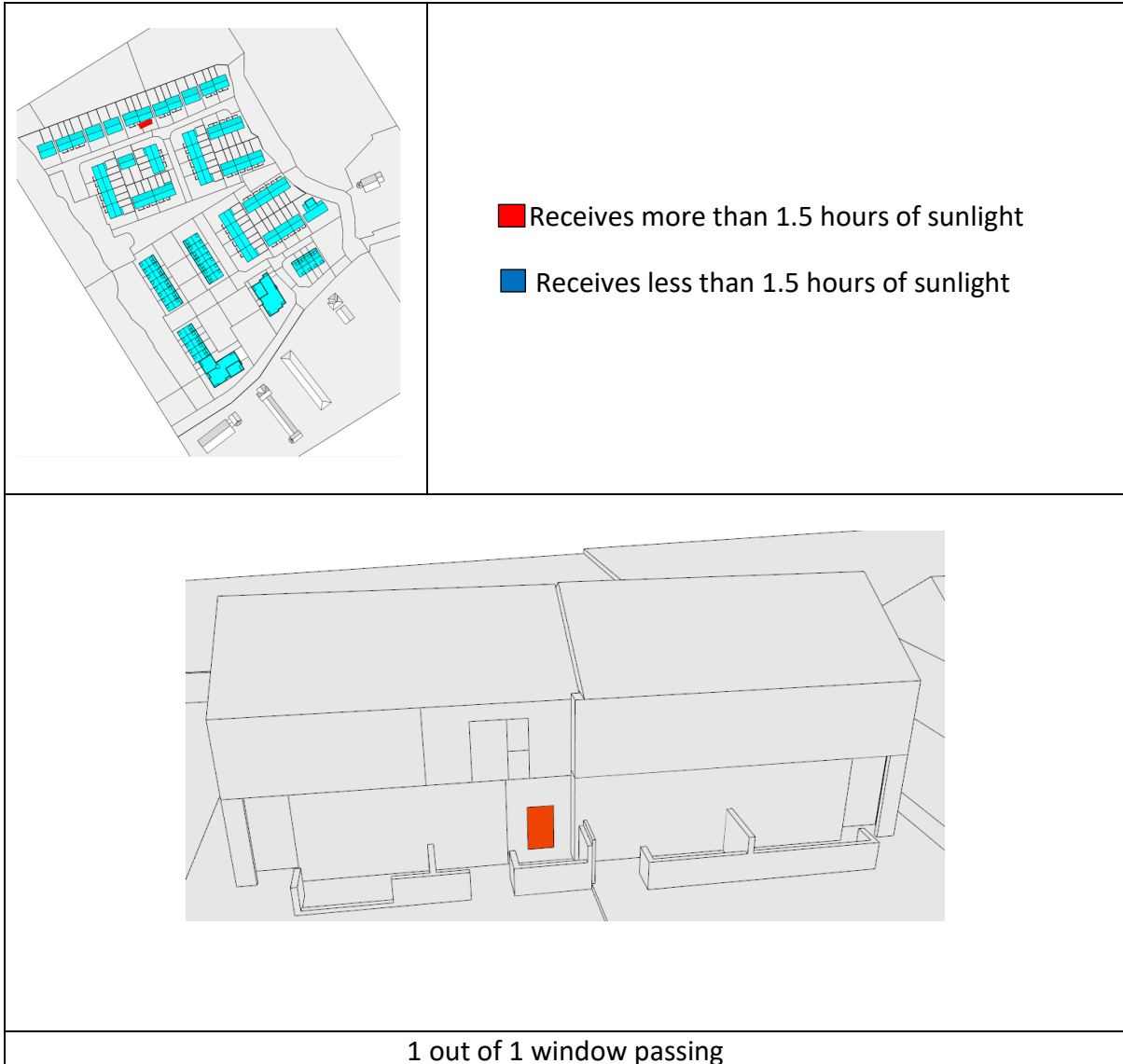


2 out of 2 windows passing

13.1.13 View 22 – Terrace 09



13.1.14 View 23 – Terrace 10



13.1.15 View 24 – Terrace 11

