Report for: Stienfort Investments Fund

Project No: 15471

Proposed Residential Development at Clonminch, Tullamore, Co Offaly

Daylight, Sunlight and Overshadowing Study

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1 Contents

Executive Summary

This report details the analysis undertaken to quantify the Sunlight / Daylight performance of the proposed residential development at Clonminch, Tullamore, Co Offaly. The report focuses on measuring the daylight impact to the surrounding dwellings when compared to the existing situation. It also considers the impact to daylight and sunlight when considering the proposed design itself. The following can be concluded based on the preliminary studies undertaken:

Shadow Analysis

The Shadow analysis shows different shadows being cast from the existing and proposed schemes at particular periods throughout the year. Overall the impact of overshadowing would be classed as a negligible adverse impact given the following.

- **Clonminch Wood**

Minor additional shading visible from the proposed development on these residential properties during March and June at 8am to a select few properties and with minimal overshadowing during *****December to some of the properties. It should also be noted that there is extensive tree coverage between the proposed site and these existing properties and as such during the winter months the shadows cast will be from said trees and not the proposed development. There is no noted overshadowing evident in at any other period.

- **Limefield**

Minimal overshadowing during *****December to one property (Gayfield House). No additional shading visible from the proposed development on the other existing residential properties (4-7 Limefield) during the months of March, June and December.

- **Oaklee Sheltered Housing**

Minimal additional shading is noted in the early mornings of March and December. No additional shading is visible from the proposed development on the existing properties at any other period.

- **Clonmimch Road**

No additional shading visible from the proposed development on these existing residential properties during the months of March, June and December.

***** Overshadowing can be expected in December when the sun is lower in the sky and shadows cast are much longer. Although this is the case, overshadowing is least noticeable during the winter months as there is a lot less sunlight available at this time of year and so the overall impact is vastly reduced. As noted above, there is extensive tree coverage between the

proposed site and these existing properties and as such during the winter months the shadows cast will be from said trees and not the proposed development.

Overall the potential impact of overshadowing would be classed as a negligible adverse impact given the comments above and is further quantified via the Daylight Analysis of Existing Buildings and Sunlight to Existing Amenity Spaces sections within this report.

Sunlight to Existing Amenity Spaces

As mentioned in Section 3.3.17 of BRE's Site Layout Planning for Daylight and Sunlight, for a space to appear adequately sunlit throughout the year, at least 50% of the garden or amenity area should receive at least 2 hours of sunlight on the 21st of March.

All of the private existing amenity areas tested out with the development site would continue to be quality spaces in terms of sunlight received exceeding BRE recommendations. The proposed development would have a negligible adverse impact to these existing gardens.

Sunlight to Proposed Amenity Spaces

On the 21st of March, the proposed amenity spaces provide across the development site for the apartments would receive at least 2 hours of sunlight across 68% of their area, exceeding BRE recommendations.

Daylight Analysis of Existing Buildings

The Vertical Sky Component for 100% (255 of 257) of the points tested have a value greater than 27% or not less than 0.8 times their former value (that of the Existing Situation), exceeding the BRE recommendations. The points that are below the recommendations are already very low in the existing situation and are as a consequence of the canopy on the existing dwelling and the close proximity to the neighbouring dwelling that is part of the same development.

Given the comments above there would be a minor adverse effect to these proposed neighbouring dwellings with an overall negligible adverse impact from the development as a whole.

Annual Probable Sunlight Hours

As noted in Section 8.2, the majority of the main living room windows of the existing dwellings neighbouring the proposed development needn't be included in the APSH assessment as they fall out with the criterion as set out in the BRE guidelines.

The results of the APSH for the dwellings situated in the neighbouring Part 8 development, in particular numbers 7-12 Oaklee, were carried out due to their initial VSC results. The results of the PASH for these properties all lie within 0.8 times their former value, that of the existing or receive more than 25% annual and 5% winter sunlight, with the exception of two windows (9 &10). Although this is true for these two windows, the results are just outwith the recommendations and the existing situation does not meet the criterion. From observations of the neighbouring development the results can be attributed to the overhang in place on the neighbouring development building and the close proximity to another neighbouring property within the same development.

Average Daylight Factors

Across the proposed development, 93% of the tested rooms are achieving ADF values above the BRE and BS 8206-2:2008 guidelines when Living/Kitchen/Dining spaces are assessed as whole rooms against a 2% ADF target.

Furthermore, 99% of the tested rooms are achieving ADF values above the BRE and BS 8206-2:2008 guidelines when Living/Kitchen/Dining spaces are assessed as whole rooms against a 1.5% ADF target.

It should be noted when the living areas alone are assessed for these spaces that fall below recommended levels (x3) the results are 2.06%,2.03%,2.13% respectively.

Observations

It should be noted that the guidance in the BRE 'Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice' is not mandatory and the guide 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'*.

Whilst the results shown relate to the criteria as laid out in the BRE guidance targets it is important to note that the BRE targets have been drafted primarily for use in low density suburban development and should therefore be used with flexibility and caution when dealing other types of sites. Despite the above, the site performs well in relation to the metrics considered in this report.

In addition, the BS 8206-2:2008 it also notes, "*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.*"

The approach within this report is further supported by the national policy guidance noted in the Sustainable Urban Housing: Design Standards for New Apartments, Section 6.7 which states:

"*Where an applicant cannot fully meet all of the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, which planning authorities should apply their discretion in accepting taking account of its assessment of specific. This may arise due to 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.*"

Taking all of the above information into account, overall the results demonstrate that the proposed development performs well when compared to the BRE recommendations in the BRE 'Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice" by Paul Littlefair, 2011 sometimes referred to as BRE Digest 209 and the "BS 8206-2:2008: Lighting for Buildings - Part 2: Code of Practice for Daylighting".

2 Introduction

2.1 Analysis Undertaken

This report details the analysis undertaken to quantify the Sunlight / Daylight performance of the proposed Clonminch, Tullamore residential development. The report focuses on measuring the daylight impact to the surrounding dwellings when compared to the existing situation. It also considers the impact to daylight and sunlight when considering the proposed design itself. The following can be concluded based on the preliminary studies undertaken:

The focus of the study considers the following items with respect to the proposed new development:

- **Shadow Analysis** - a visual representation analysing any potential changes that may arise from the proposed development to neighbouring existing developments.
- **Sunlight to Existing & Proposed Amenity Spaces** – via an annual sunlight hour's analysis.
- **Daylight Analysis of Existing Buildings** - via consideration of Vertical Sky Component (VSC).
- **Annual Probable Sunlight Hours (APSH)** – assessing sunlight received by neighbouring dwellings.
- **Average Daylight Factors** – via average daylight factor calculations carried for floor plans across the site of the proposed development.

The assessment is based on recommendations outlined in the BRE *'Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice*' guide (BRE Guide) which is also referred to as BRE 209 and the "BS 8206-2:2008: Lighting for Buildings - Part 2: Code of Practice for Daylighting".

2.2 Development Description

3 Analysis Geometry

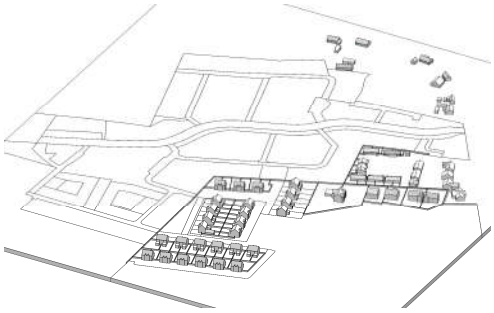
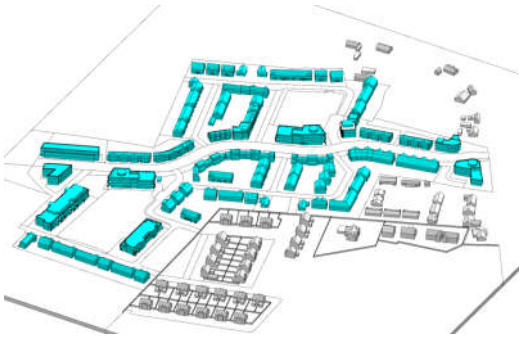
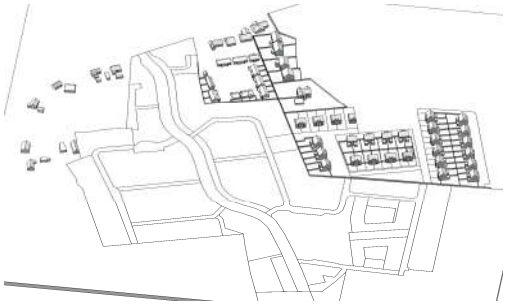
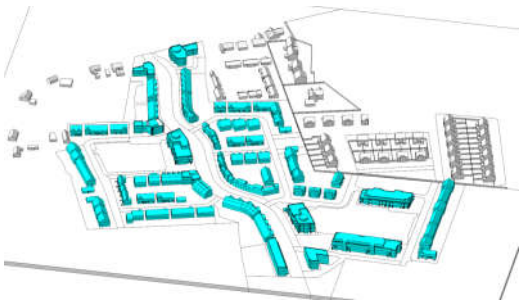
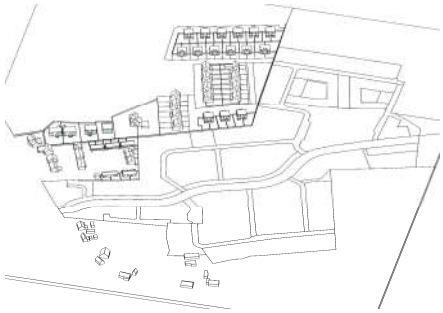
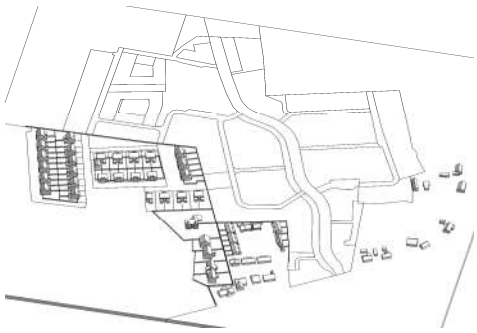
3.1 Orientation

The model orientation is taken from drawings provided by the Architect with the resulting angle shown below.

Orientation

3.2 Model Geometry

The following images show the model created from the architectural information provided and the use of google/bing maps where information was absent.

	Existing Situation	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 BRE – Site Layout Planning for Daylight and Sunlight (2nd edition)

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

The BRE Report, "Site layout planning for daylight and sunlight: a guide to good practice (BR209)", advises on planning developments for good access to daylight and sunlight, and is widely used by local authorities to help determine the impacts of new developments.

4.1 Impact Classification Discussion

BRE guidance in Appendix I – Environmental Impact Assessment suggests impact classifications as minor, moderate and major adverse. It provides further classifications of these impacts with respect to criteria as follows;

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

Negligible adverse impact	• *Loss of light well within guidelines,* ***or*** • *only a small number of windows losing light (within the guidelines)* ***or*** • *limited area of open space losing light (within the guidelines)*

Minor adverse impact (a)	• *Loss of light only just within guidelines* ***and***
	  ○ *a larger number of windows are affected* ***or***
	  ○ *larger area of open space is affected (within the guidelines)*

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

Conventional Windows

The BRE Guide talks about Conventional window design based on the discussions around these it could be determined that this term refers to windows typical with a sill height of 800mm – 1000mm as shown in the images below.

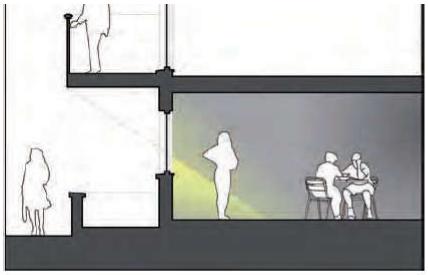


Figure 10: Balconies and projecting access ways can restrict daylight to rooms lit by windows below them

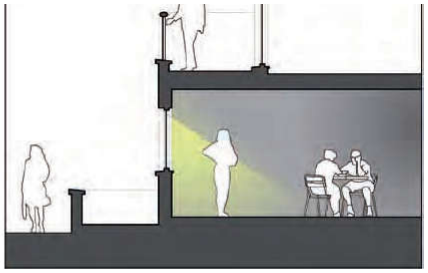
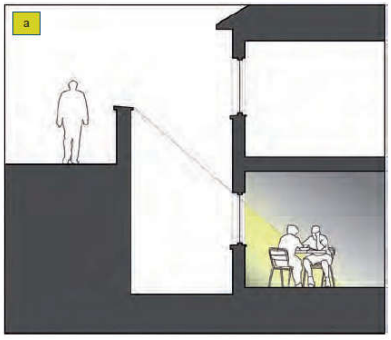
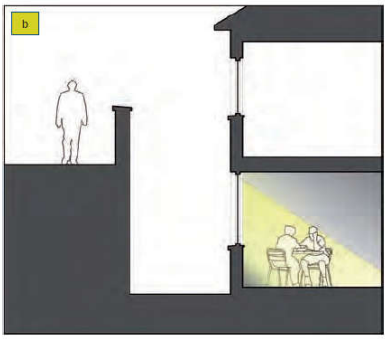


Figure 11: Section showing stepped back rooftop access ways. This gives improved daylight compared to a conventional section (see Figure 10).





4.2 Potential Sensitive Receptors

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

Inset plan	
	
	Site
	24-76 Clonminch Wood
	5-7 Limefield, Gayfield House
	Oaklee Shelterd Housing
	Clonminch Road

5 Shadow Analysis

The statistics of Met Eireann, the Irish Meteorological Service, show the sunniest months in Ireland are May and June.

The following can also be shown:

- During December, Dublin receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.4 hours sunlight each day, i.e. only 22% of potential sunlight hours.
- During June, Dublin receives a mean daily duration of 6.4 hours of sunlight out of a potential 16.7 hours sunlight each day, i.e. only 38% of potential sunlight hours.

Therefore, impact caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. It is noted existing trees along with boundary walls would cast shadows during the winter months without the proposed development in place.

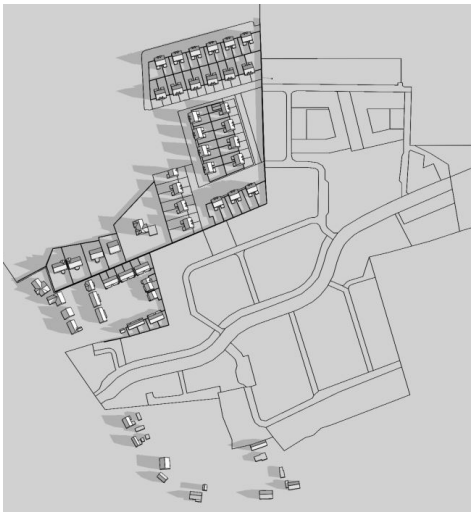
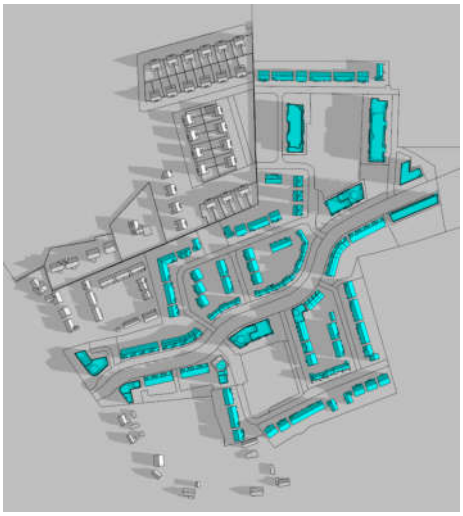
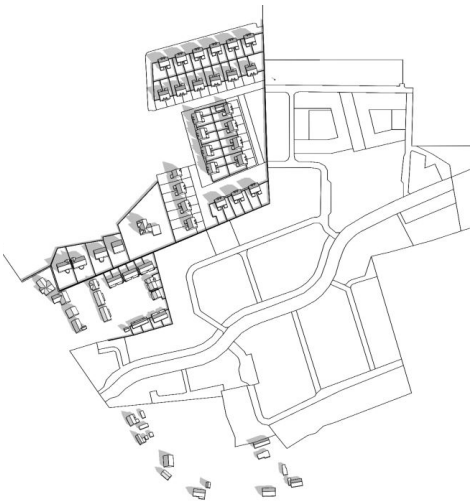
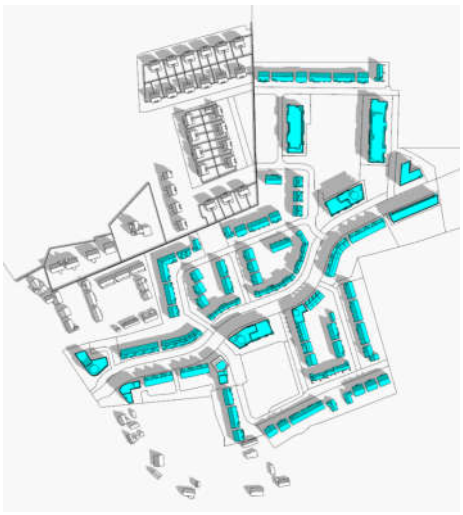
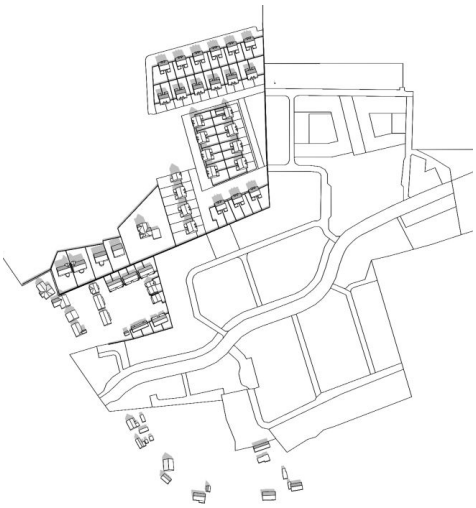
This section will consider the shadows cast for the proposed development for the following dates:

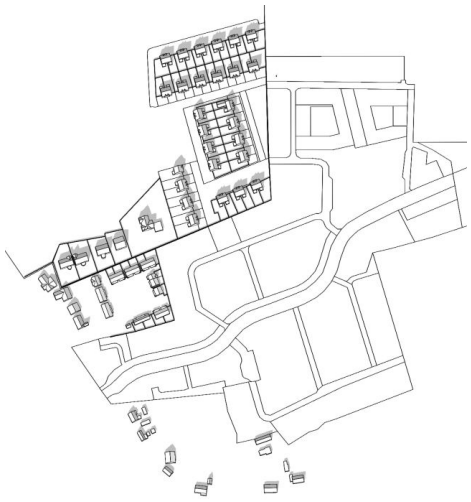
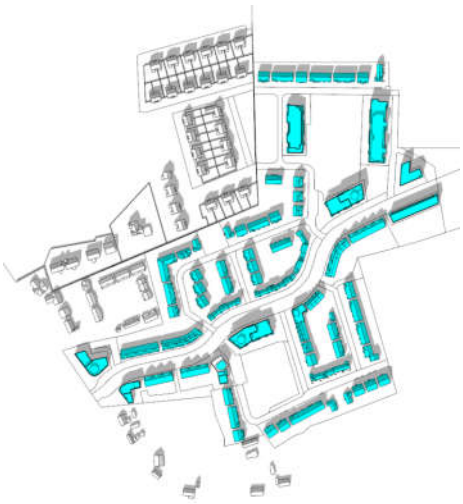
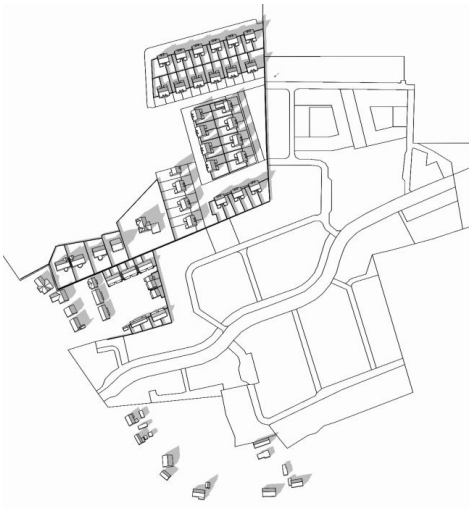
- December 21st (Winter Solstice)
- March 21st / September 21st (Equinox)
- June 21st (Summer Solstice)

These images will show shadows cast for clear conditions with no clouds, assuming the sun is visible for every hour shown. To note, as mentioned previously, trees are not included within this assessment, but would have a significant effect given their maturity. The subsequent images portray the worst case scenario.

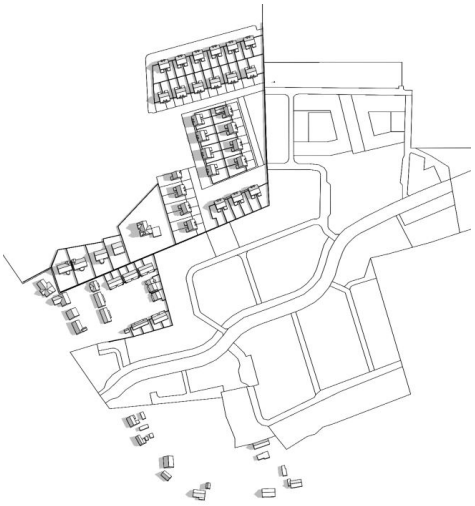
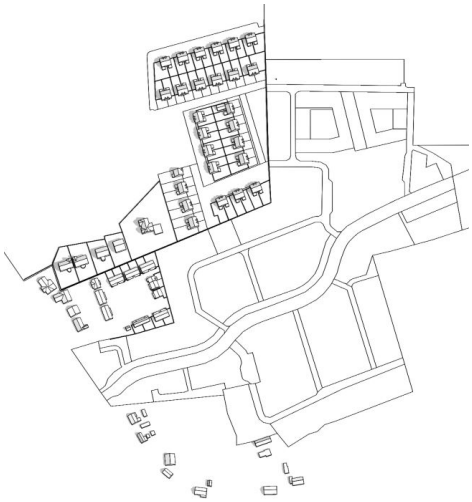
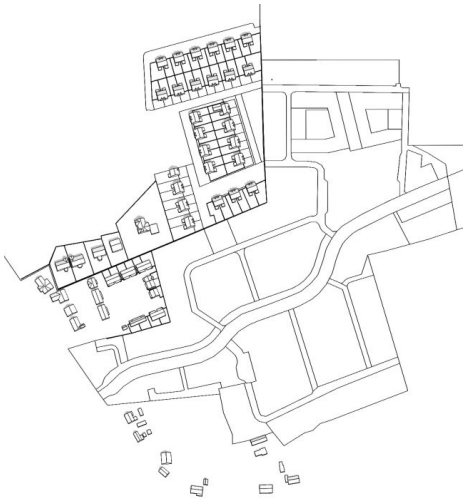
5.1 Plan View

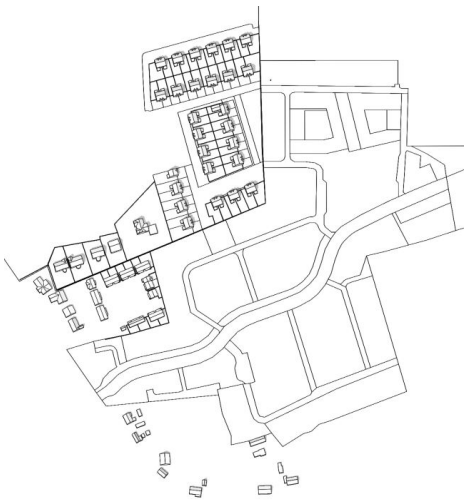
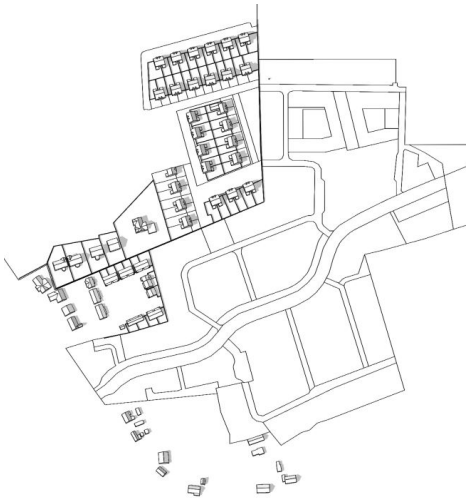
5.1.1 March 21st

	Existing	Proposed
March 21st - 8:00		
March 21st - 10:00		
March 21st - 12:00		

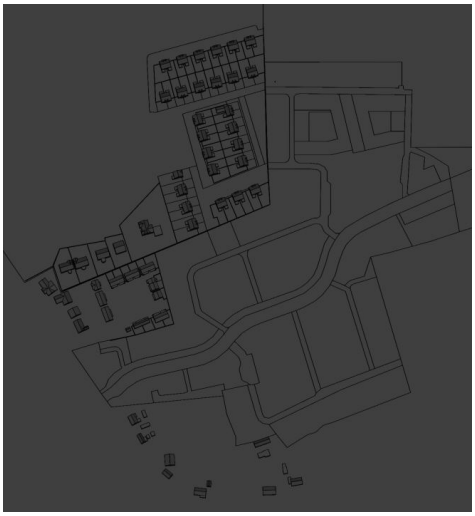
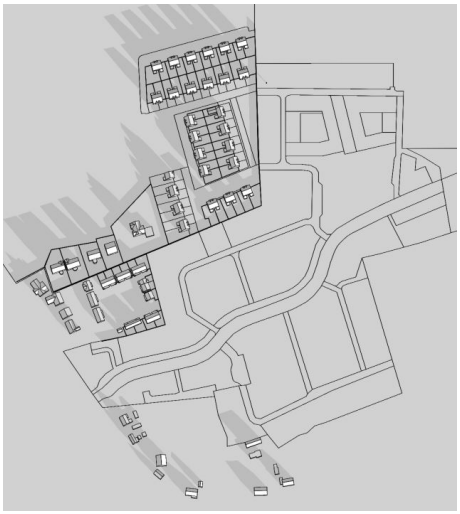
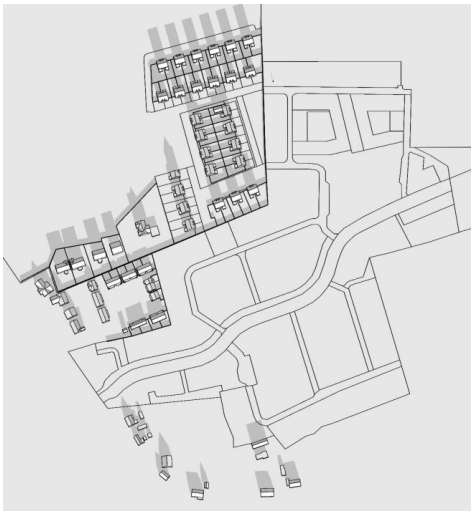
March 21st - 14:00		
March 21st - 16:00		

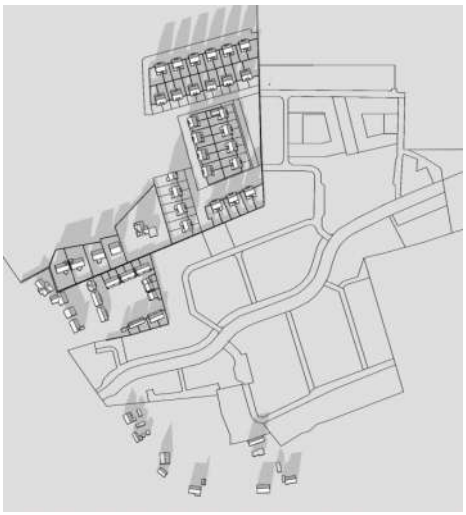
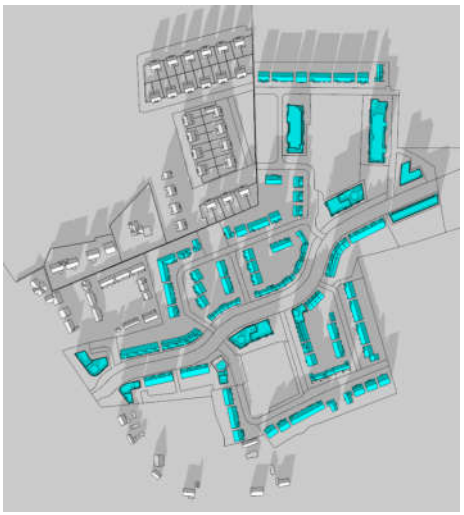
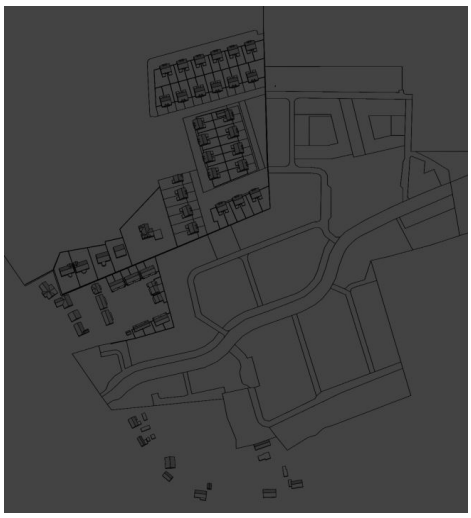
5.1.2 June 21st

	Existing	Proposed
June 21st - 8:00		
June 21st - 10:00		
June 21st - 12:00		

June 21st - 14:00		
June 21st - 16:00		

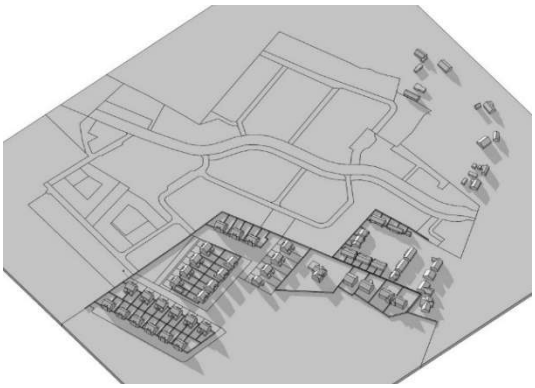
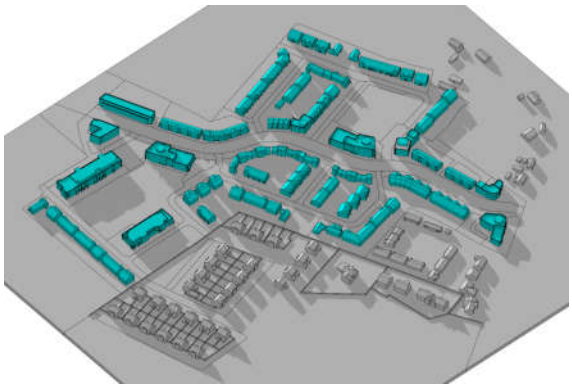
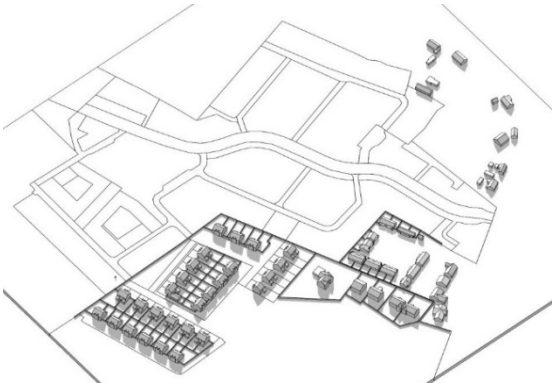
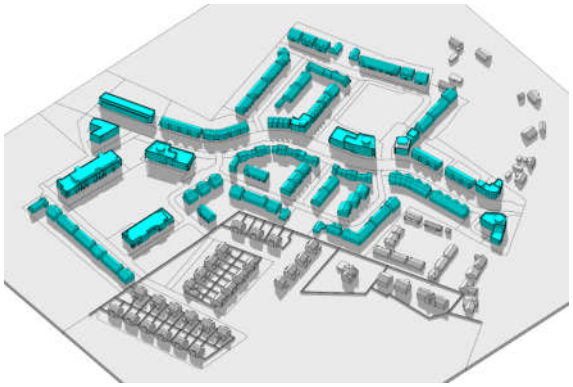
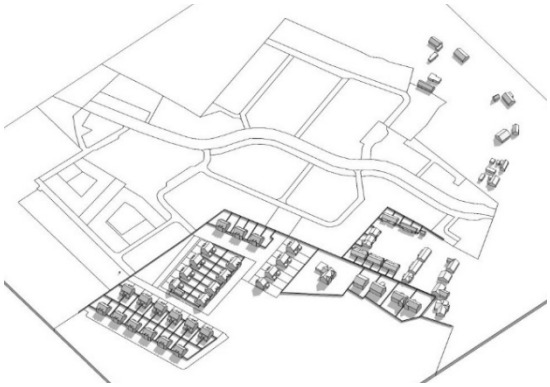
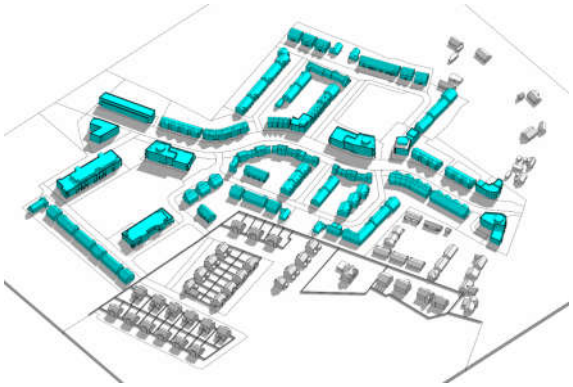
5.1.3 December 21st

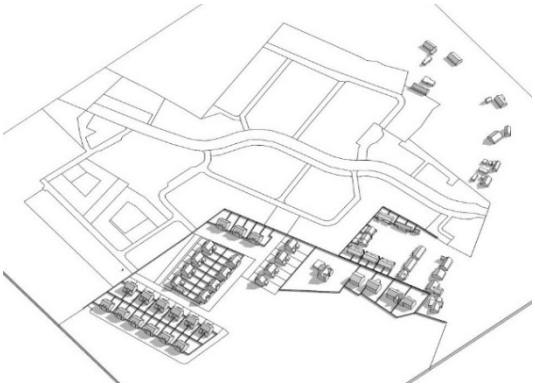
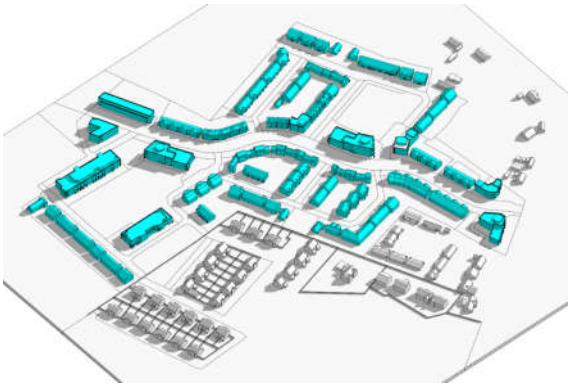
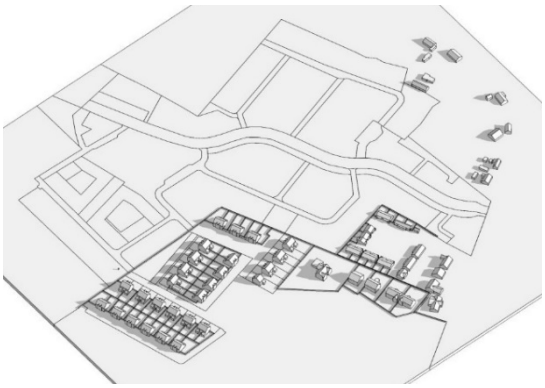
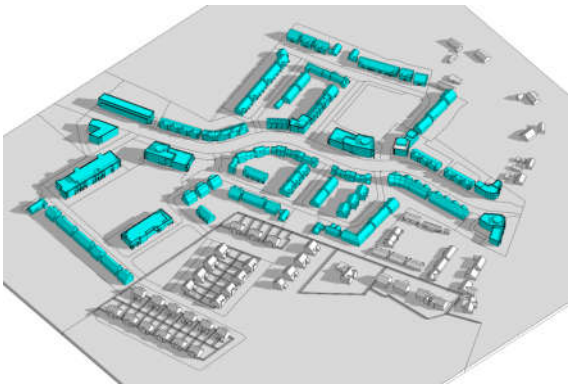
	Existing	Proposed
December 21st - 8:00		
December 21st - 10:00		
December 21st - 12:00		

December 21st - 14:00		
December 21st - 16:00		

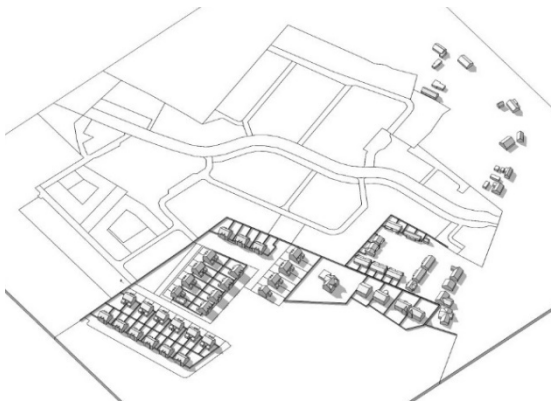
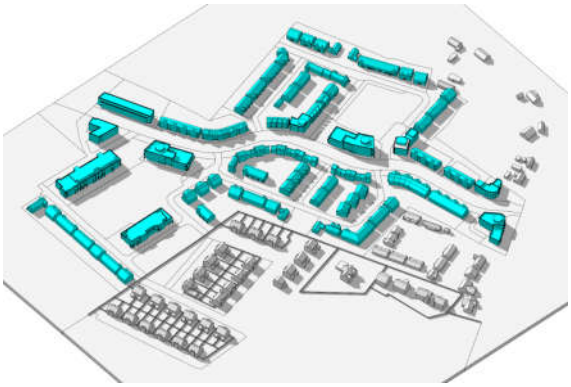
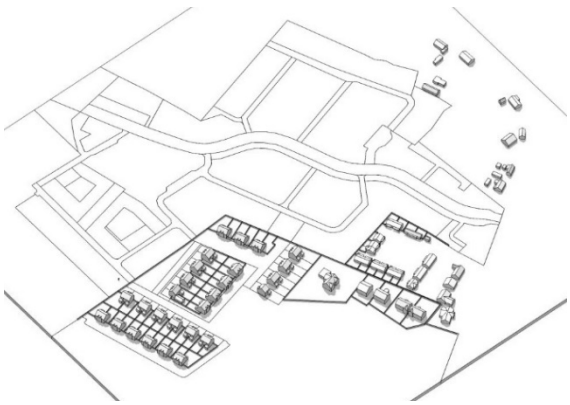
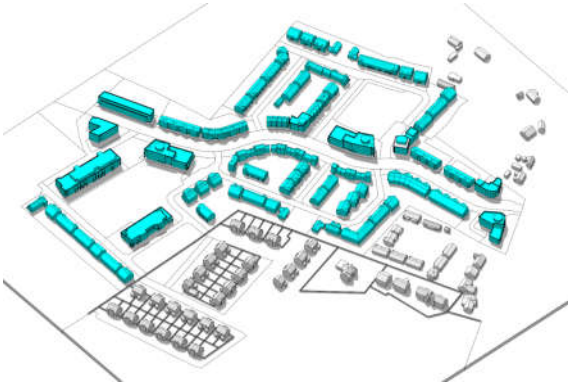
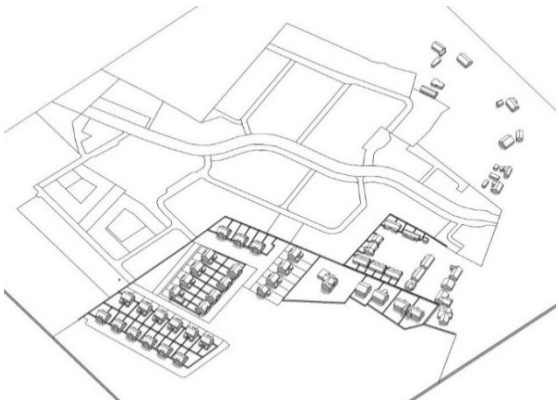
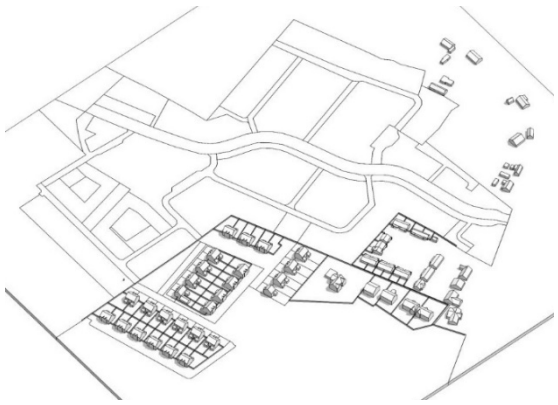
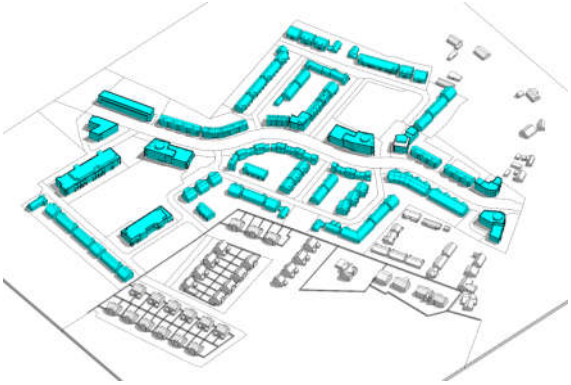
5.2 3D View South West

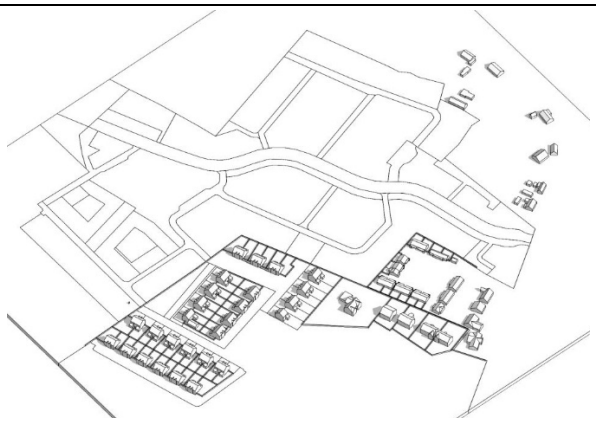
5.2.1 March 21st

	Existing	Proposed
March 21st - 8:00		
March 21st - 10:00		
March 21st - 12:00		

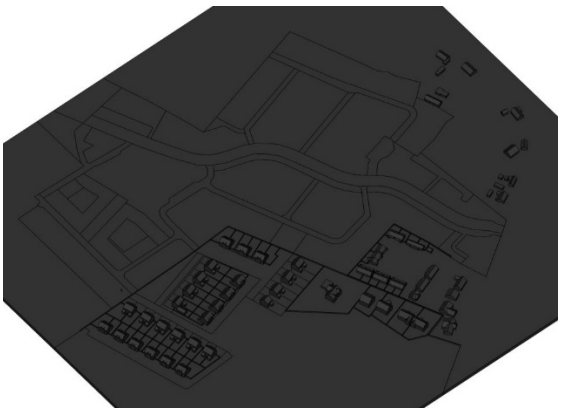
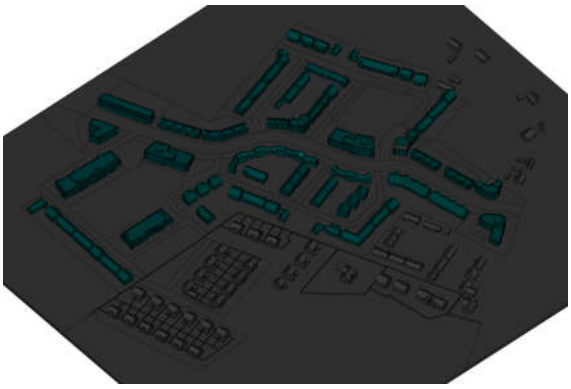
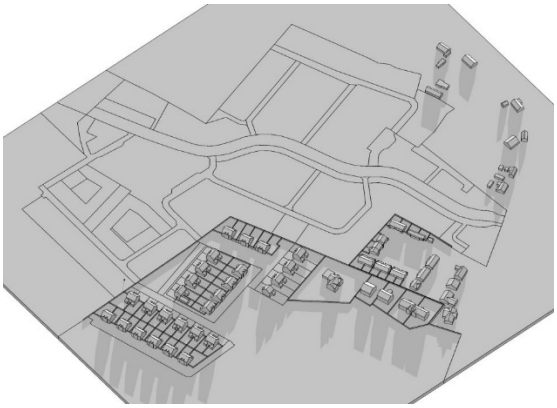
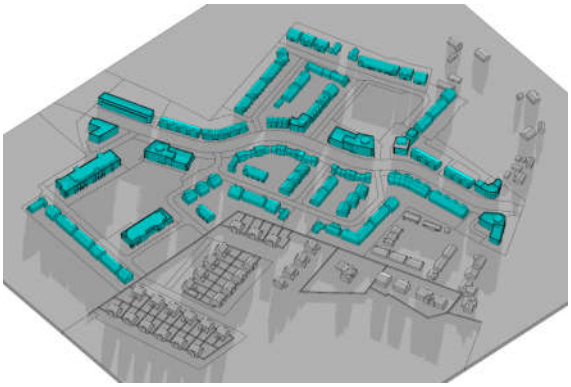
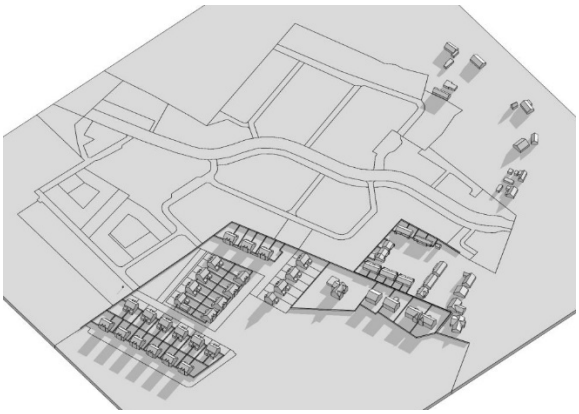
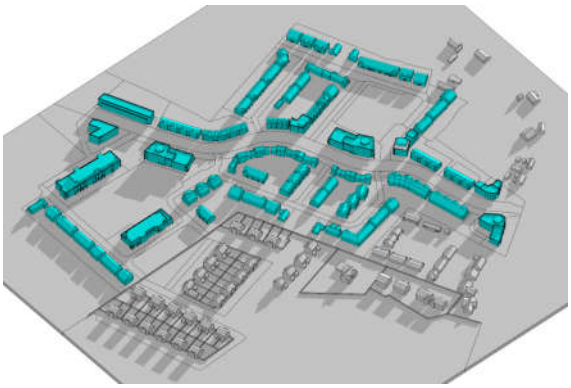
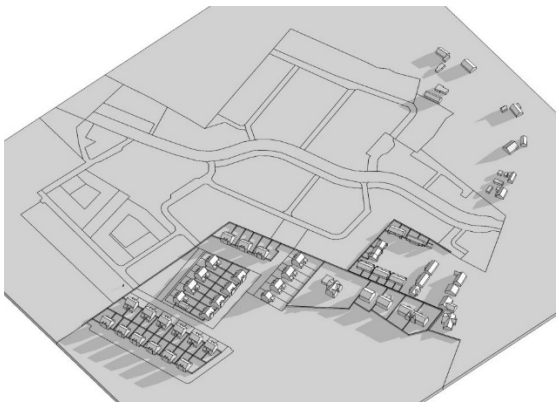
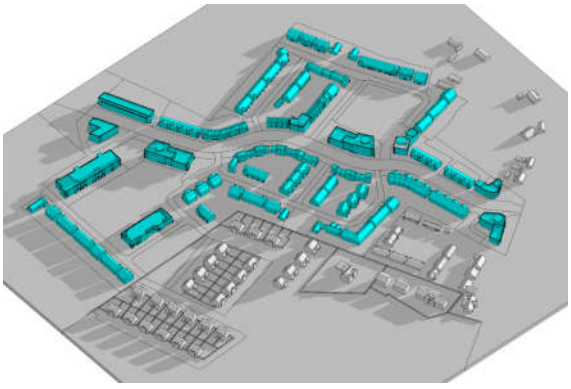
March 21st - 14:00		
March 21st - 16:00		

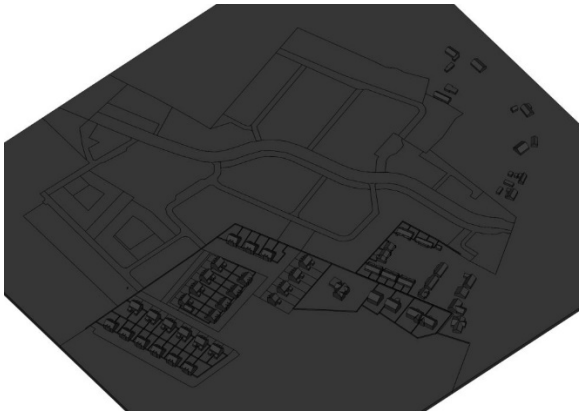
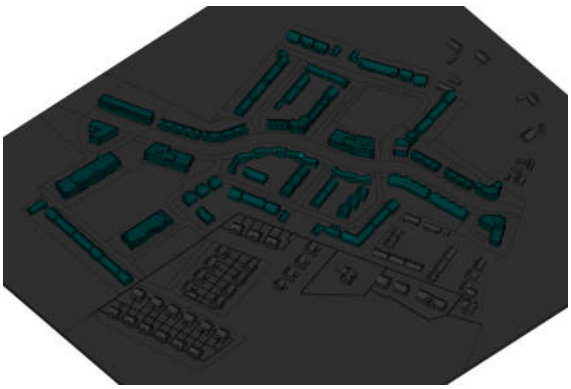
5.2.2 June 21st

	Existing	Proposed
June 21st - 8:00		
June 21st - 10:00		
June 21st - 12:00		
June 21st - 14:00		

June 21st - 16:00		

5.2.3 December 21st

	Existing	Proposed
December 21st - 8:00		
December 21st - 10:00		
December 21st - 12:00		
December 21st - 14:00		

December 21st - 16:00		

5.3 Shadow Analysis Discussion

Shading from the proposed development is summarised as follows based on the analysis of the preceding images:

- **Clonminch Wood**

Minor additional shading visible from the proposed development on these residential properties during March and June at 8am to a select few properties and with minimal overshadowing during *December to some of the properties. It should also be noted that there is extensive tree coverage between the proposed site and these existing properties and as such during the winter months the shadows cast will be from said trees and not the proposed development. There is no noted overshadowing evident in at any other period.

- **Limefield**

Minimal overshadowing during *December to one property (Gayfield House). No additional shading visible from the proposed development on the other existing residential properties (4-7 Limefield) during the months of March, June and December.

- **Oaklee Sheltered Housing**

Minimal additional shading is noted in the early mornings of March and December. No additional shading is visible from the proposed development on the existing properties at any other period.

- **Clonmimch Road**

No additional shading visible from the proposed development on these existing residential properties during the months of March, June and December.

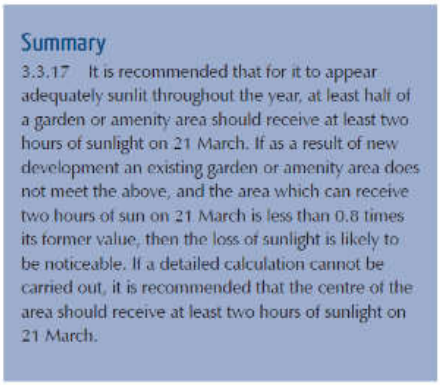
* Overshadowing can be expected in December when the sun is lower in the sky and shadows cast are much longer. Although this is the case, overshadowing is least noticeable during the winter months as there is a lot less sunlight available at this time of year and so the overall impact is vastly reduced. As noted above, there is extensive tree coverage between the proposed site and these existing properties and as such during the winter months the shadows cast will be from said trees and not the proposed development.

Overall the potential impact of overshadowing would be classed as a negligible adverse impact given the comments above and is further quantified via the Daylight Analysis of Existing Buildings and Sunlight To Existing Amenity Spaces sections within this report.

6 Sunlight to Existing & Proposed Amenity Spaces

6.1 Guidance Requirements

The impact of the development proposal on the sunlight availability in the amenity areas will be considered to determine how the amenities perform when assessed against the BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight 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.

BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight states in 3.3.17 that 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 21st March.

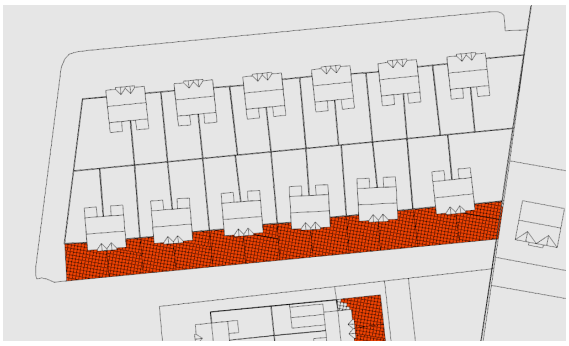
The following images shows the predicted results with respect to this space receiving at least 2 hours of sunlight on 21st March, across the gridded cells. Any gridded cells area below 2 hours are shown as grey.

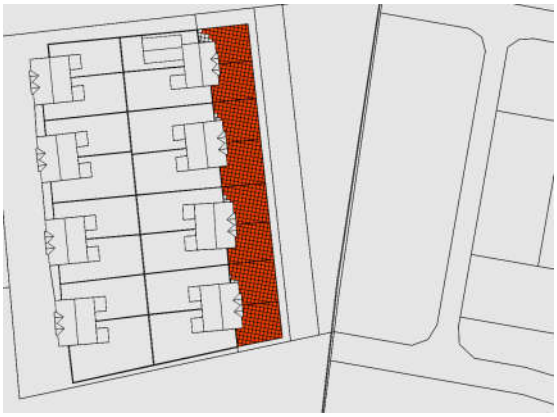
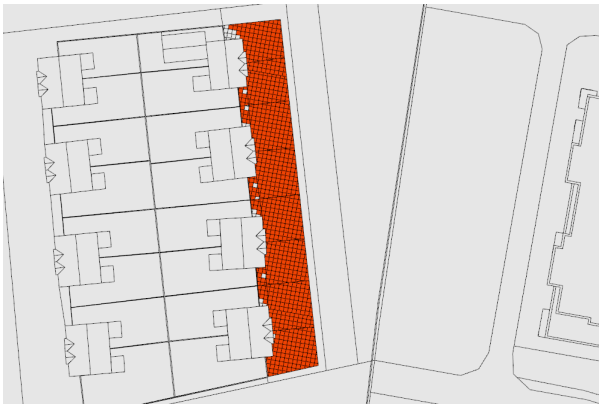
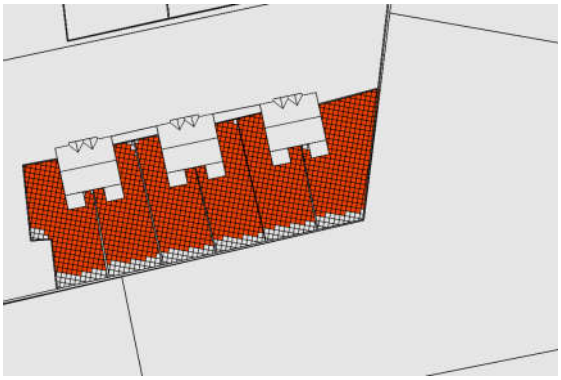
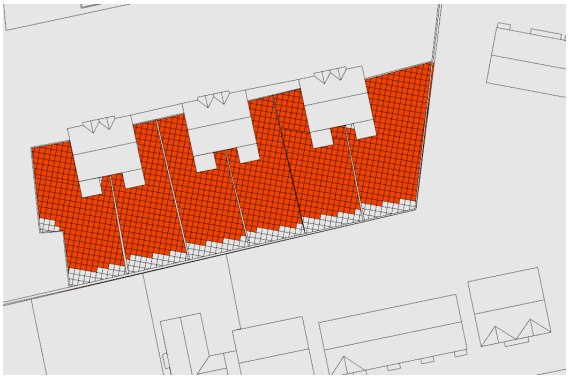
6.2 Existing Amenity Areas

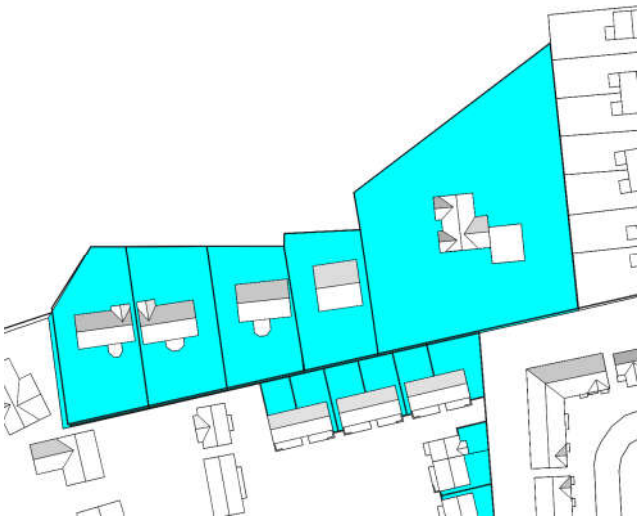
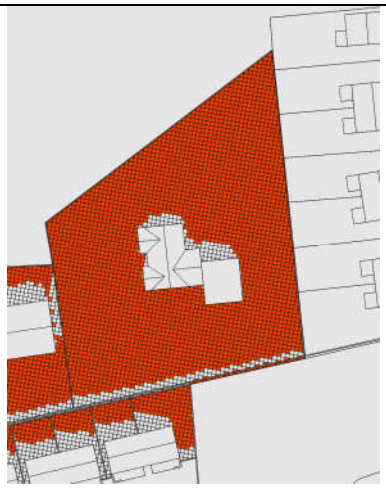
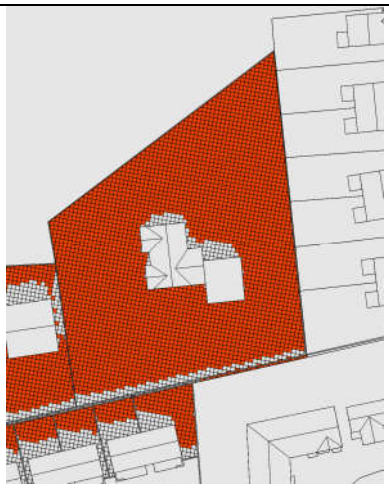
As stated above, for a space to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least 2 hours of sunlight on 21st March.

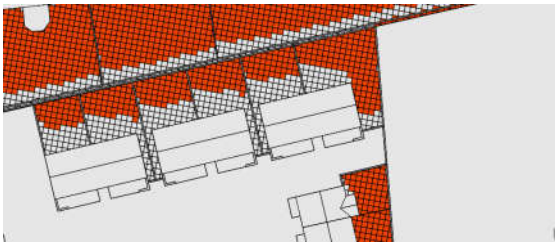
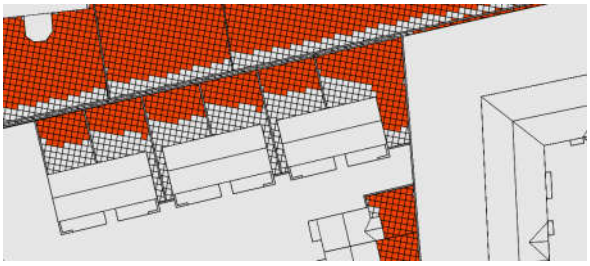
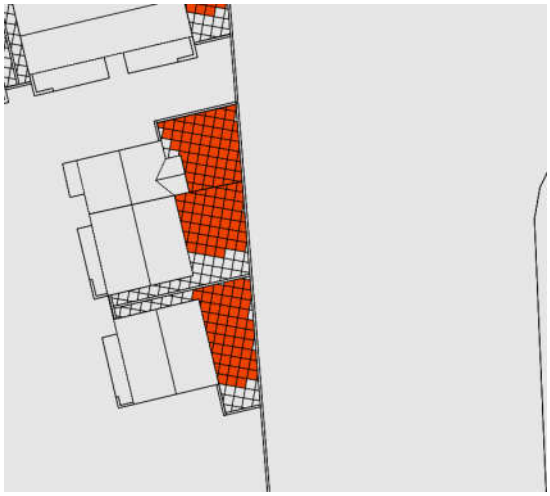
This analysis will be performed on the amenity spaces shown in the images below for the existing and proposed scenarios:

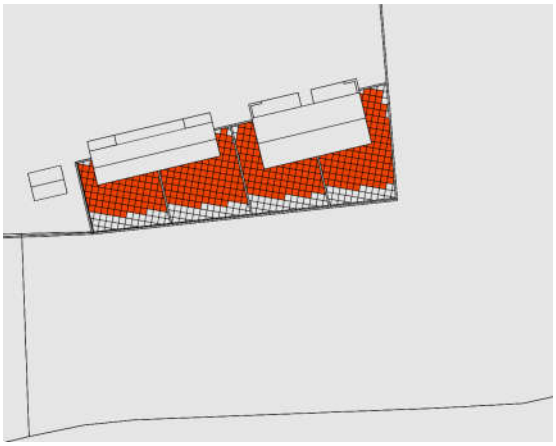
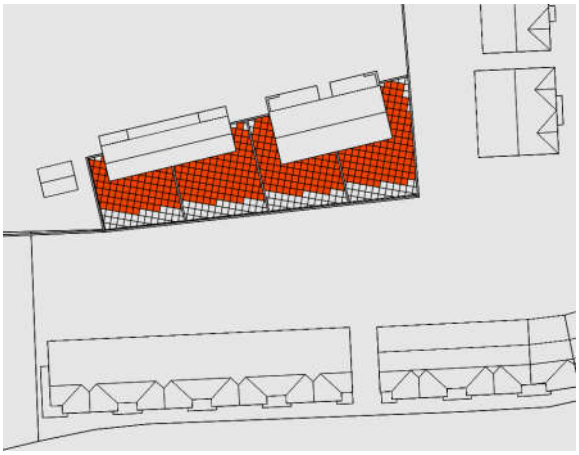
6.2.1 Existing Residential Amenity Areas

	Clonminch Wood - Hours > 2 in red	
		
	Existing	**Proposed**
53-64 Clonminch Wood		

45-52 Clonminch Wood		
31-36 Clonminch Wood		
24-30 Clonminch Wood		

	Limefield - Hours > 2 in red	
		
	Existing	**Proposed**
Gayfield House, Limefield		
4-7 Limefield		

	Oaklee - Hours > 2 in red	
		
	Existing	**Proposed**
7-12 Oaklee		
13-15 Oaklee		

16-19 Oaklee		

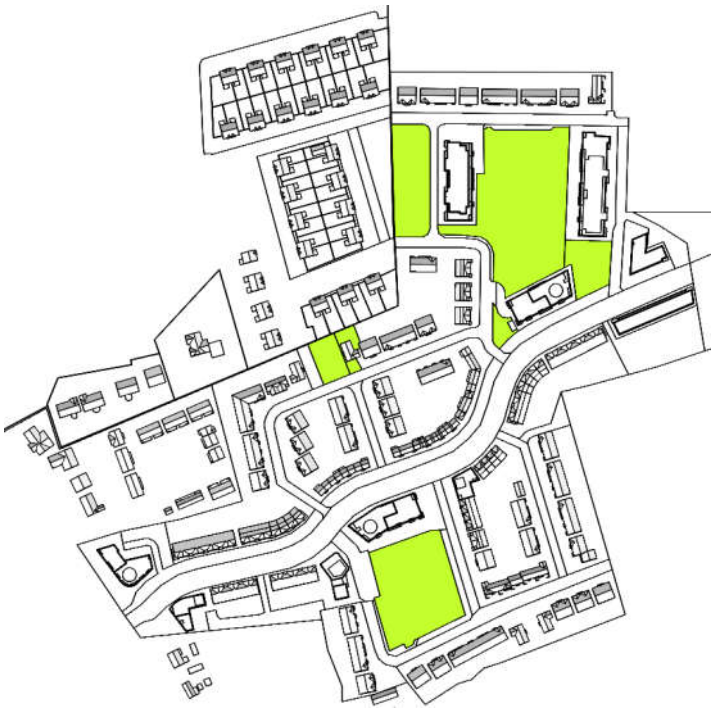
6.2.2 Observations

Inspection of the images above highlights that the proposed development has no observable effect on sunlight received to the rear gardens of the existing properties outwith the development site.

6.3 Proposed Amenity Areas

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 21st March.

This analysis will be performed on the amenity spaces shown in the images below:

Proposed Communal Amenities	

6.4 Proposed Solar Amenity Results

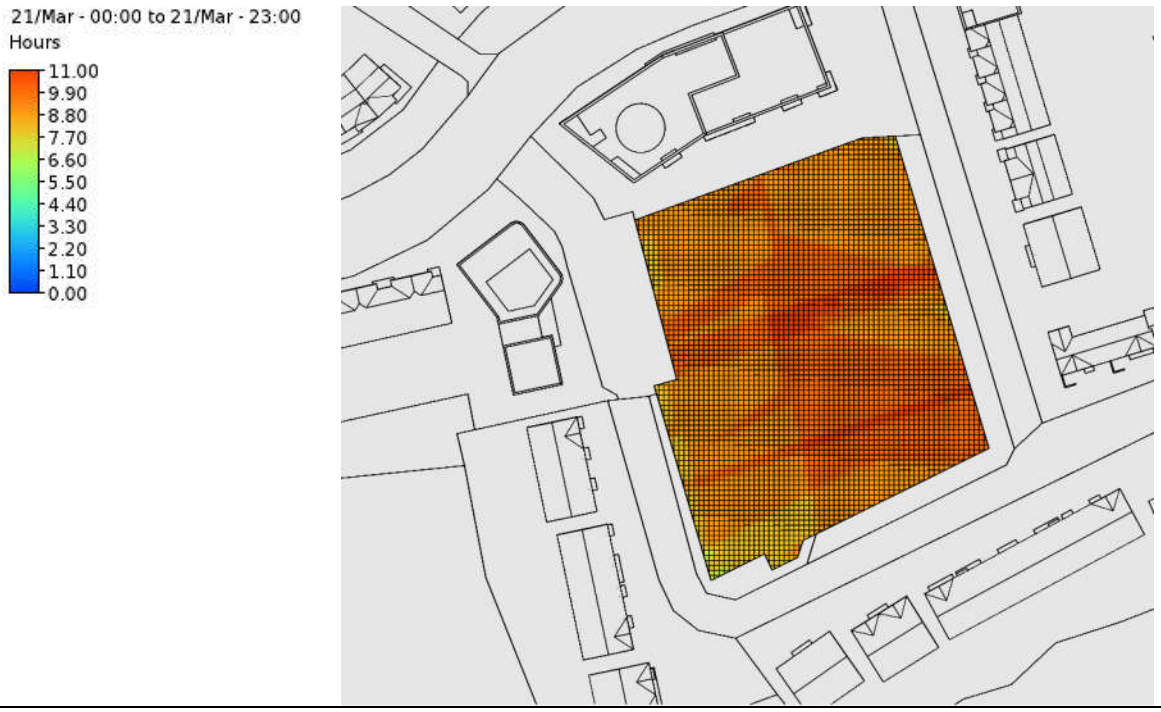
The following images show the predicted results with respect to the proposed building amenity areas that are receiving at least 2 hours of sunlight on 21st March, across the gridded cells.

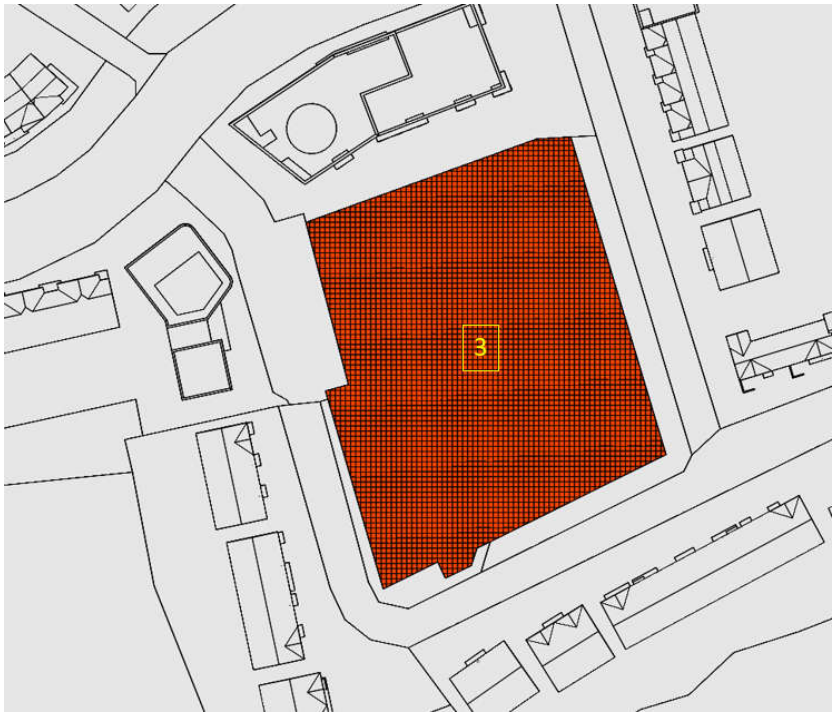
Absolute Scale showing all hours of sunlight received

Receives more than 2 hours of sunlight

Receives less than 2 hours of sunlight

Absolute Scale showing all hours of sunlight received





	Reference	Area (m^2)	Area > 2 Hours (m^2)	Percentage > 2 Hours %
1	Communal Amenity Area	295	273	93%
2	Communal Amenity Area	669	669	100%
3	Communal Amenity Area	4100	4100	100%
4	Communal Amenity Area	302	302	100%
5	Communal Amenity Area	1147	1147	100%
6	Communal Amenity Area	7079	6967	98%
7	Communal Amenity Area	2221	2221	100%
	Total	15813	15679	99%

6.5 Proposed Solar Amenity Discussion

As mentioned in Section 3.3.17 of BRE's Site Layout Planning for Daylight and Sunlight, 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 the 21st of March.

On the 21st of March, the proposed amenity spaces provide across the development site for the apartments would receive at least 2 hours of sunlight across 99% of their area, exceeding BRE recommendations.

7 Daylight Analysis of Existing Buildings (VSC)

7.1 Guidance Requirements

BRE Site layout planning for daylight and sunlight (Section 2.2)

When designing a new development, it is important to safeguard the daylight to nearby buildings. The BRE's 2011 guidance provide 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 Permitted 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 finding the vertical sky component at the centre of key reference points. The vertical sky component definition from the BRE's 2011 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 the Radiance module of the IES VE software.

For typical Schemes the BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight which 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.

As such the primary purpose of this analysis is to check that the existing buildings are above the 27% or not less than 0.8 times their former value (that of the Existing Situation) when modelled.

7.1.1 VSC Values

The BRE Guide also states the following in Section 2.1.6 that the amount of daylight a room needs depends on what it is being used for, but roughly speaking if the VSC is:

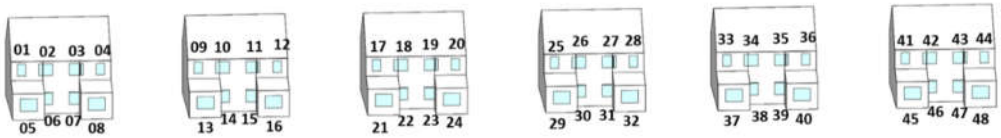
- ≥ 27%, conventional window design will usually give reasonable results
- between 15 % and 27 % special measures (larger windows, changes to room layout) are usually needed to provide adequate daylight

As such these values will be referred to as part of the analysis of the adjacent properties.

It should be taken into consideration that for the purposes of this report, window positions in some cases have been estimated but are considered representative and sufficient to undertake the assessment.

7.2 Assessment – Clonminch Wood

65-76 Clonminch Wood



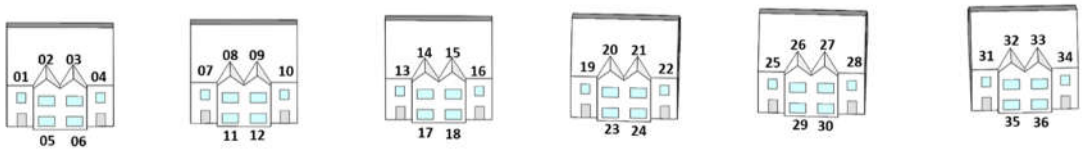
Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	37.27	37.19	100%	✓
2	37.35	37.1	99%	✓
3	37.13	37.12	100%	✓
4	37.16	37.02	100%	✓
5	34.96	34.73	99%	✓
6	21.87	21.5	98%	✓
7	22.25	22.19	100%	✓
8	34.88	34.7	99%	✓
9	36.88	36.81	100%	✓
10	36.84	36.67	100%	✓

11	36.77	36.82	100%	✓
12	36.79	36.81	100%	✓
13	34.11	34.26	100%	✓
14	21.78	21.59	99%	✓
15	21.68	21.84	101%	✓
16	34.14	33.72	99%	✓
17	36.73	36.74	100%	✓
18	36.64	36.86	101%	✓
19	36.79	36.82	100%	✓
20	36.97	36.69	99%	✓
21	34.05	33.99	100%	✓
22	21.56	21.62	100%	✓
23	21.84	21.84	100%	✓
24	33.84	33.85	100%	✓
25	36.85	36.85	100%	✓
26	37.03	36.64	99%	✓
27	36.99	36.7	99%	✓
28	37.01	36.81	99%	✓
29	34.37	34.09	99%	✓
30	21.94	21.74	99%	✓
31	21.53	21.54	100%	✓
32	33.99	33.95	100%	✓
33	37.09	36.92	100%	✓
34	37.44	36.92	99%	✓
35	37.36	36.99	99%	✓
36	37.35	36.87	99%	✓
37	34.86	34.24	98%	✓
38	22.42	22.13	99%	✓
39	22.19	21.85	98%	✓
40	35.1	34.29	98%	✓
41	37.66	37.08	98%	✓
42	37.61	36.89	98%	✓
43	38.02	37.07	98%	✓
44	38.19	37.12	97%	✓
45	35.87	34.6	96%	✓
46	23.38	21.98	94%	✓
47	22.17	21.68	98%	✓
48	36.8	34.78	95%	✓

The following conclusions can be made:

- ✓ These points tested have a vertical sky component greater than 27%. Therefore, these points exceed BRE recommendations.

53-64 Clonminch Wood



Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	37.18	37.04	100%	✓
2	38.09	37.88	99%	✓
3	38.09	38.01	100%	✓
4	37.48	36.84	98%	✓
5	37.36	37.19	100%	✓
6	37.19	37.09	100%	✓
7	37.21	36.54	98%	✓
8	37.62	37.44	100%	✓
9	37.7	37.46	99%	✓
10	36.77	36.59	100%	✓
11	36.51	36.14	99%	✓
12	36.38	36.13	99%	✓
13	36.62	36.54	100%	✓
14	37.55	37.2	99%	✓
15	37.36	37.14	99%	✓
16	36.73	36.12	98%	✓

17	36.13	35.85	99%	✓
18	35.76	35.83	100%	✓
19	36.72	36.41	99%	✓
20	37.51	37.13	99%	✓
21	37.5	37.35	100%	✓
22	36.82	37.18	101%	✓
23	35.76	35.51	99%	✓
24	35.96	35.33	98%	✓
25	37.07	36.81	99%	✓
26	37.93	37.31	98%	✓
27	38	37.63	99%	✓
28	37.19	36.58	98%	✓
29	37	36.21	98%	✓
30	37.07	36.19	98%	✓
31	37.6	36.75	98%	✓
32	38.35	37.36	97%	✓
33	38.38	37.38	97%	✓
34	37.84	36.38	96%	✓
35	37.66	36.35	97%	✓
36	37.54	35.87	96%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

45-52 Clonminch Wood

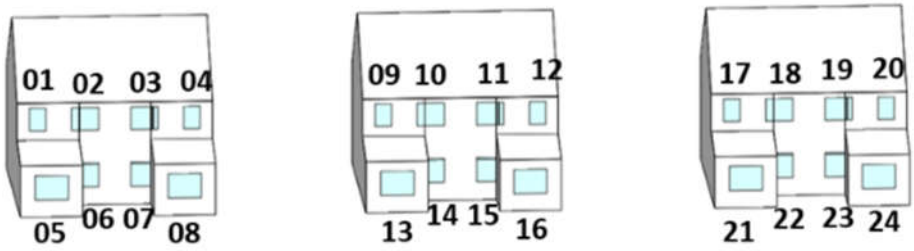
Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	38.29	36.68	96%	✓
2	39.05	37.6	96%	✓
3	39.06	37.57	96%	✓
4	38.57	36.61	95%	✓
5	38.72	36.6	95%	✓
6	37.72	36.42	97%	✓
7	38.21	36.96	97%	✓
8	39.15	37.58	96%	✓
9	39.04	37.53	96%	✓
10	38.24	36.94	97%	✓
11	38.81	36.53	94%	✓
12	38.7	36.7	95%	✓
13	38.25	36.98	97%	✓

14	38.95	37.86	97%	✓
15	38.7	37.78	98%	✓
16	38.21	36.8	96%	✓
17	38.55	36.6	95%	✓
18	38.52	36.67	95%	✓
19	37.62	36.44	97%	✓
20	38.57	37.52	97%	✓
21	38.66	37.55	97%	✓
22	37.88	36.71	97%	✓
23	37.99	36.6	96%	✓
24	37.93	36.43	96%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

31-36 Clonminch Wood



Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	39.02	37.47	96%	✓
2	38.95	37.52	96%	✓
3	39.02	37.67	97%	✓
4	38.93	37.28	96%	✓
5	38.97	36.23	93%	✓
6	23.93	22.39	94%	✓
7	24.38	23.43	96%	✓
8	39.05	35.81	92%	✓
9	39.11	37.3	95%	✓
10	39.01	37	95%	✓
11	39.15	37.04	95%	✓
12	39.1	37.02	95%	✓
13	39	35.02	90%	✓
14	24.25	21.59	89%	✓
15	24.23	22.27	92%	✓

16	38.9	34.82	90%	✓
17	39.15	36.83	94%	✓
18	38.96	36.6	94%	✓
19	39.03	36.74	94%	✓
20	39.05	36.78	94%	✓
21	39.19	34.19	87%	✓
22	24.35	21.18	87%	✓
23	24.18	21.66	90%	✓
24	39.05	34.19	88%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

24-30 Clonminch Wood

Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	37.25	36.25	97%	✓
2	38.2	37.31	98%	✓
3	38.24	37.3	98%	✓
4	37.28	36.82	99%	✓
5	37.13	36.32	98%	✓
6	37.24	36.23	97%	✓
7	37.08	36.47	98%	✓
8	37.67	37.06	98%	✓
9	37.58	37.37	99%	✓
10	37.08	36.44	98%	✓
11	36.5	35.5	97%	✓
12	36.43	35.68	98%	✓
13	36.36	35.91	99%	✓
14	37.29	36.87	99%	✓
15	37.05	36.6	99%	✓

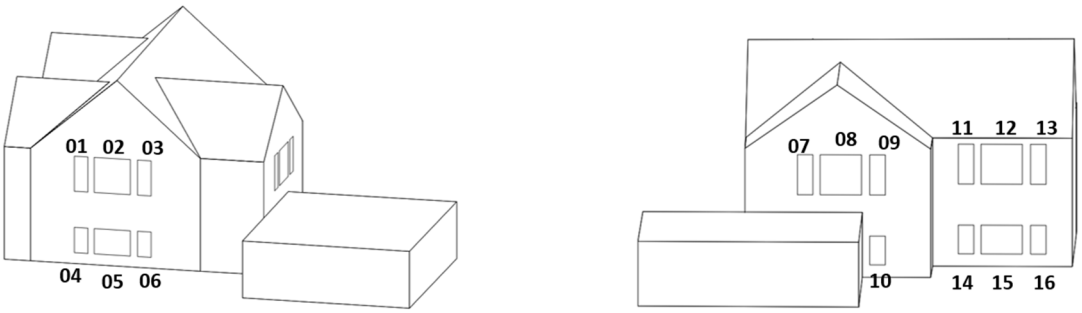
16	36.5	36.16	99%	✓
17	35.8	35.5	99%	✓
18	35.87	35.34	99%	✓
19	36.47	36.29	100%	✓
20	36.62	36.49	100%	✓
21	34.85	34.53	99%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

7.3 Assessment – Limefield

Gayfield House, Limefield.



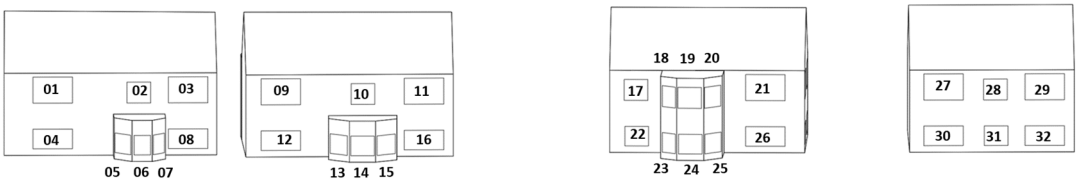
Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	38.84	37.85	97%	✓
2	38.95	37.83	97%	✓
3	38.87	37.8	97%	✓
4	37.27	36.05	97%	✓
5	37.44	35.79	96%	✓
6	37.07	35.76	96%	✓
7	37.82	37.5	99%	✓
8	37.87	37.48	99%	✓
9	37.91	37.46	99%	✓
10	23.78	23.59	99%	✓
11	32.57	32.43	100%	✓
12	35.9	35.43	99%	✓
13	37	36.7	99%	✓

14	26.23	26.03	99%	✓
15	31.3	31.45	100%	✓
16	33.75	33.91	100%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

4-7 Limefield.



Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	38.61	38.35	99%	✓
2	38.38	38.03	99%	✓
3	38.36	37.89	99%	✓
4	35.17	34.98	99%	✓
5	33.84	33.99	100%	✓
6	36.21	36.18	100%	✓
7	33.54	33.43	100%	✓
8	31.51	31.54	100%	✓
9	38.61	38.11	99%	✓
10	38.65	38.19	99%	✓
11	39.02	38.4	98%	✓
12	35.74	35.33	99%	✓
13	34.97	34.78	99%	✓
14	36.5	36.21	99%	✓
15	36.05	35.56	99%	✓
16	33.45	33.11	99%	✓
17	34.33	33.9	99%	✓

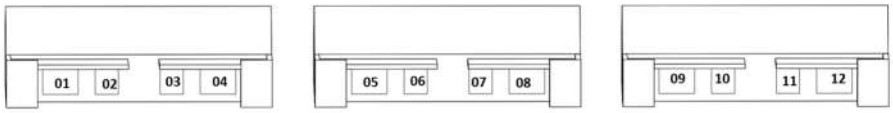
18	38.03	37.76	99%	✓
19	38.55	38.35	99%	✓
20	38.27	37.67	98%	✓
21	37.29	36.78	99%	✓
22	28.04	27.83	99%	✓
23	35.45	35.34	100%	✓
24	35.77	35.84	100%	✓
25	35.33	35.01	99%	✓
26	31.73	31.45	99%	✓
27	38.7	38.19	99%	✓
28	38.59	38.05	99%	✓
29	38.74	38.21	99%	✓
30	36.23	36.05	100%	✓
31	36.07	36	100%	✓
32	35.9	35.79	100%	✓

The following conclusions can be made:

- ✓ These points tested have a vertical sky component greater than 27%. Therefore, these points exceed BRE recommendations.

7.4 Assessment – Oaklee

7-12 Oaklee



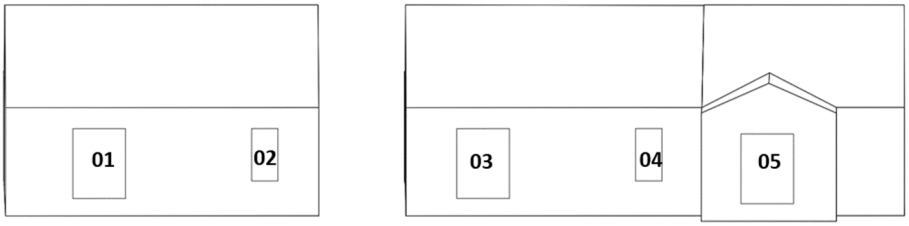
Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	8.55	7.61	89%	✓
2	11.41	10.57	93%	✓
3	13.3	13.17	99%	✓
4	8.28	7.84	95%	✓
5	8.18	7.63	93%	✓
6	11.05	10.53	95%	✓
7	13.35	12.3	92%	✓
8	8.28	7.58	92%	✓
9	5.75	4.37	76%	x
10	8.67	6.76	78%	x
11	11.44	9.29	81%	✓
12	6.46	5.36	83%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

X These points although below the recommendations are already very low in the existing situation and are as a consequence of the canopy on the existing dwelling and the close proximity to the neighbouring dwelling that is part of the same development.

13-15 Oaklee



Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	38.65	29.63	77%	✓
2	38.49	30.59	79%	✓
3	38.32	31.28	82%	✓
4	34.98	28.3	81%	✓
5	38.4	30.99	81%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

16-19 Oaklee

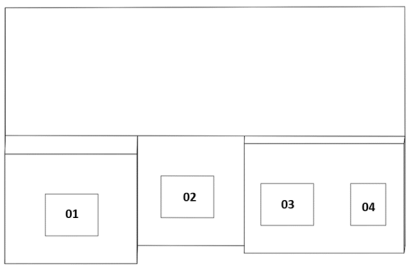
Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	38.86	33.14	85%	✓
2	38.93	33.08	85%	✓
3	38.88	33.57	86%	✓
4	38.62	32.97	85%	✓
5	38.89	33.36	86%	✓
6	39.1	32.91	84%	✓
7	38.81	33.15	85%	✓
8	38.9	33.34	86%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

7.5 Assessment – Clonminch Road

Capice, Clonminch Road

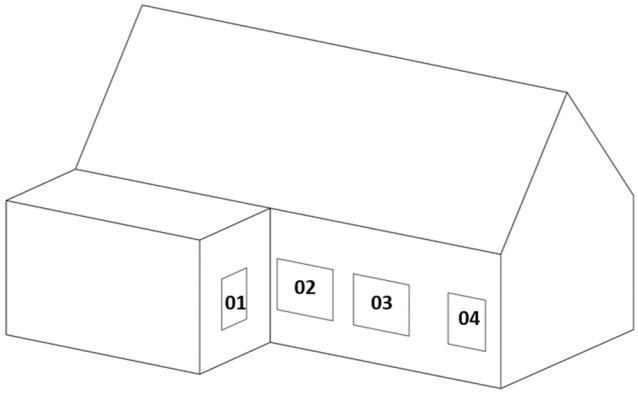


Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	34.17	32.82	96%	✓
2	24.86	24.29	98%	✓
3	35.01	32.53	93%	✓
4	36.34	31.74	87%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

Clonminch Road

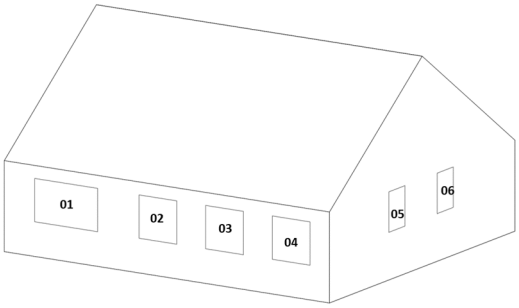


Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	28.13	27.49	98%	✓
2	25.76	25.14	98%	✓
3	32.86	32.49	99%	✓
4	34.35	34.08	99%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

Poplar House, Clonminch Road

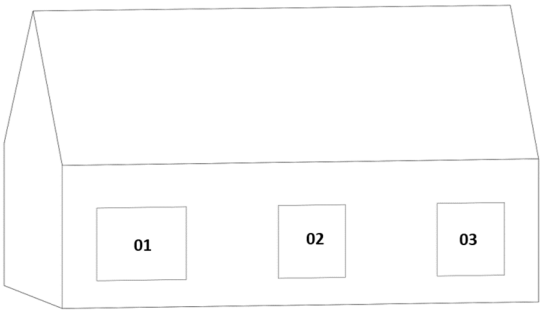


Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	38.62	37.89	98%	✓
2	38.61	38.02	98%	✓
3	38.63	37.94	98%	✓
4	38.89	37.98	98%	✓
5	38.47	37.37	97%	✓
6	38.66	37.37	97%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

Clonminch Road

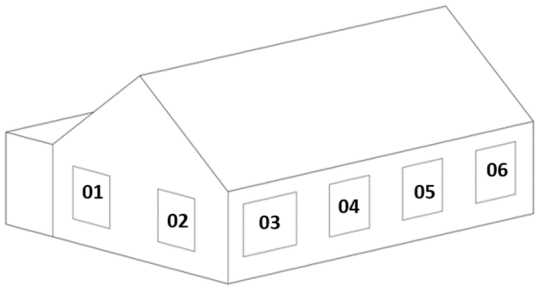


Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	34.62	34.17	99%	✓
2	30.73	29.71	97%	✓
3	25.31	25.05	99%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

Whitehorn, Clonminch Road

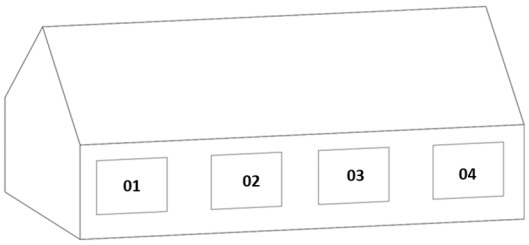


Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	38.5	38.23	99%	✓
2	36.96	36.93	100%	✓
3	32.79	32.07	98%	✓
4	35.7	35.07	98%	✓
5	37.19	36.31	98%	✓
6	37.72	36.75	97%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

Clonminch Road

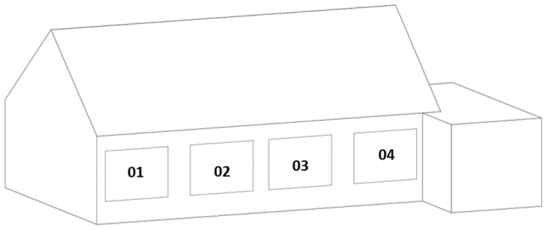


Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	38.02	37.24	98%	✓
2	38.1	37.23	98%	✓
3	38.24	37.3	98%	✓
4	38.28	37.36	98%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

Clonminch Road



Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed Scheme VSC as a % of the Existing	Comment
1	38.41	36.66	95%	✓
2	38.4	36.67	95%	✓
3	37.76	36.2	96%	✓
4	32.67	31.07	95%	✓

The following conclusions can be made:

✓ These points tested have a vertical sky component greater than 27% or not less than 0.8 times their former value. Therefore, these points exceed BRE recommendations.

Clonminch Road


The two building indicated above are farm building and as such have not been included in the analysis.

7.6 VSC Analysis Discussion

The Vertical Sky Component for 100% (255 of 257) of the points tested have a value greater than 27% or not less than 0.8 times their former value (that of the Existing Situation), exceeding the BRE recommendations.

Only two windows on the neighbouring Part 8 development have results that lie just outside the recommended levels. Although this is true, the Given the comments above there would be a minor adverse effect to these proposed neighbouring dwellings with an overall negligible adverse impact from the development as a whole.

8 Annual Probable Sunlight Hours (APSH)

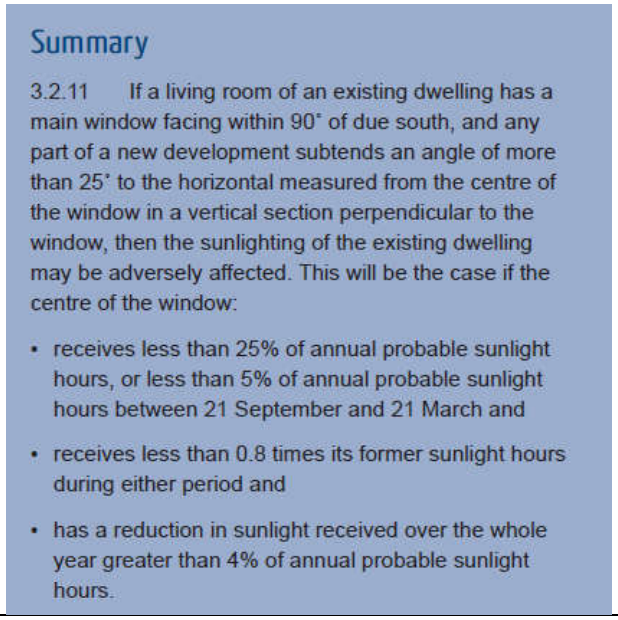
The BRE Site layout planning for daylight and sunlight (Section 3.2) states;

The British Standard BS 8206: Part 2:1992 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 September and 21 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 September and 21 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 September to 21 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.



Summary

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:

- receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between 21 September and 21 March and
- receives less than 0.8 times its former sunlight hours during either period and
- has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.

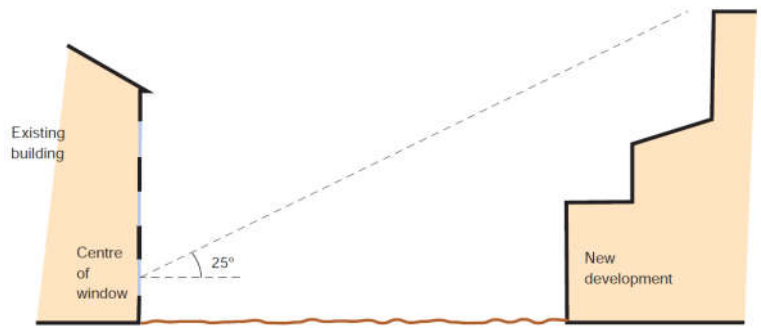
BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight

8.1 APSH Exclusions

The BRE recommendations note that if a new development sits within 90° due south of any main living room window of an existing dwelling, then these should be assessed for APSH. However, there are several exceptional cases in which APSH do not need to be calculated, as shown 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's 2011 guidance document Site Layout Planning for Daylight and Sunlight

Consequently, APSH 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 and has an obstruction, measured in the section perpendicular to the window wall, subtending an angle of more than 25° to the horizontal. (windows due north need not be counted.)
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% and the window wall does not lie within 20° of due south.

8.2 APSH Assessment Exclusions

65-76 Clonminch Wood	
	
1	**65-76 Clonminch Wood**
2	**53-64 Clonminch Wood**
3	**45-52 Clonminch Wood**
4	**31-36 Clonminch Wood**
5	**24-30 Clonminch Wood**
6	**Gayfield House, Limefield.**
7	**4-7 Limefield.**
8	**7-12 Oaklee**
9	**13-15 Oaklee**
10	**16-19 Oaklee**
11	**Clonminch Road**

Reference Points 1/2/4/6/7/10

These windows need not be assessed as all the VSC results are above 27% and the main property windows lie within 20° sue south.

Reference Points 3/5/9

These windows need not be assessed as all the VSC results are above 27% and the main living room windows do not lie within 90° due south. To add to this, no obstruction when from these existing dwellings measured subtends an angle of more than 25° to the horizontal.

Reference Points 11

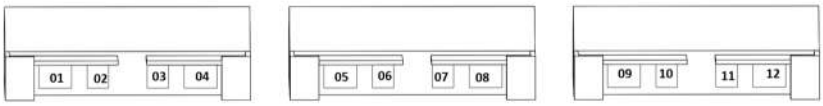
These windows need not be assessed as the main living room windows do not lie within 90° due south or lie to the south of the proposed development.

Reference Points 8

7-12 Oaklee, part of the neighbouring Part 8 development was assessed as the VSC results were below recommended values. It should be noted, although this was the case the results of the existing situation were similarly below recommendation. As noted this was as a result of the canopy on the property in question and a neighbouring building within the same development.

8.3 APSH Results – 7-12 Oaklee

7-12 Oaklee Part 8 Neighbouring Development



Points	Existing Scheme APSH		Proposed Scheme APSH		Proposed Scheme APSH as a % of the Existing Scheme	
	Annual	Winter	Annual	Winter	Annual	Winter
1	14.87	13.07	14.87	13.07	100%	100%
2	22.62	17.08	22.62	17.08	100%	100%
3	28.88	20.61	28.49	20.22	99%	98%
4	15.68	15.10	15.39	14.82	98%	98%
5	14.64	12.85	14.23	12.85	97%	100%
6	23.15	17.54	21.92	16.70	95%	95%
7	26.80	18.71	26.69	18.59	100%	99%
8	15.11	14.54	15.11	14.54	100%	100%
9	11.37	9.58	8.18	6.88	72%	72%
10	21.04	15.54	15.83	10.77	75%	69%
11	27.96	19.61	22.65	14.21	81%	72%
12	14.33	13.75	12.14	11.56	85%	84%

8.4 Annual Probable Sunlight Hours Discussion

As noted in Section 8.2, the majority of the main living room windows of the existing dwellings neighbouring the proposed development needn't be included in the APSH assessment as they fall out with the criterion as set out in the BRE guidelines.

The results of the APSH for the dwellings situated in the neighbouring Part 8 development, in particular numbers 7-12 Oaklee, were carried out due to their initial VSC results. The results of the PASH for these properties all lie within 0.8 times their former value, that of the existing or receive more than 25% annual and 5% winter sunlight, with the exception of two windows (9 &10). Although this is true for these two windows, the results are just outwith the recommendations and the existing situation does not meet the criterion. From observations of the neighbouring development the results can be attributed to the overhang in place on the neighbouring development building and the close proximity to another neighbouring property within the same development.

9 Average Daylight Factors (ADF)

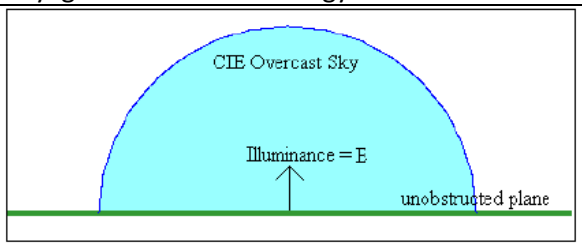
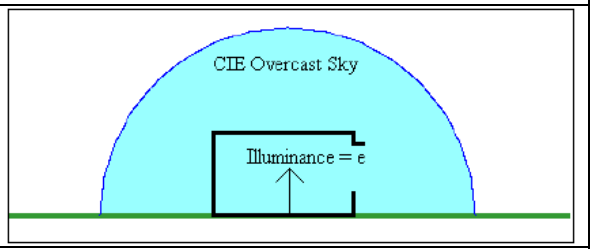
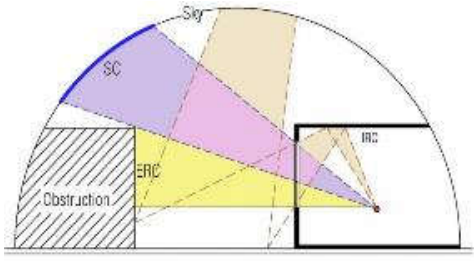
This section addresses daylight to the proposed homes and duplexes.

The purpose of the ADF calculations is to quantify an overall percentage of units which exceeds the BRE recommendations. Our proposed methodology is to complete the ADF calculations for all of the apartments within the development. The objective of the design team was to maximise the number of units which exceed the BRE recommendations.

9.1 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.

<table>
<tr><td colspan="2">Daylight Factor Methodology</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>E = illuminance on unobstructed plane</td><td>e = illuminance at point in interior</td></tr>
<tr><td colspan="2">Daylight Factor = e/E (often expressed as a percentage)</td></tr>
<tr><td colspan="2">SC – Sky Component
ERC – Externally Reflected Component
IRC – Internally Reflected Component
 

Sources of Daylight at a Point Within a Room</td></tr>
</table>

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. Light from the patch of sky visible at the point considered, is expressed as the sky component. Light reflected from opposing exterior

surfaces and then reaches the point, is expressed as the externally reflected component. Light entering through the window but reaching the point only after reflection from internal surfaces, is expressed as the internally reflected component.

9.1.1 Reference and Metrics

BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight 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.

From BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight

As noted above from this the recommended Average Daylight Factors (ADF) are therefore;

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

9.2 Combined Function Spaces – Living / Kitchen / Dining

Note the BRE guide does not provide explicit guidance for an open space that is a combination of Living/Kitchen/Dining (L/K/D) functions.

In addition, a separate document the "*BS 8206-2:2008: Lighting for Buildings - Part 2: Code of Practice for Daylighting*" focuses on internal daylighting performance and 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 this reason, it should be noted where there are open plan spaces within the development the initial target value will be 2%. In addition to this 2% target there will also be the provision of results based on a 1.5% target.

In line with the national policy guidance noted in the Sustainable Urban Housing: Design Standards for New Apartments, Section 6.7 which states:

"*Where an applicant cannot fully meet all of the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, which planning authorities should apply their discretion in accepting taking account of its assessment of specific. This may arise due to 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*."

In this context, the living area has been treated as the main activity, with the design constraint of the kitchen being placed at the back of the space. This design decision is understandable as the kitchen area is classed as a "non-habitable transient space" because their functional significant purpose is only to serve as food preparation and not as a long-term sitting area. Additionally, not every space within a commercially viable apartment development can be in direct connection with an exterior elevation, making the kitchen the obvious choice for this position given that it is a transient space that will require supplementary electric lighting. This is strong evidence that the 1.5% average daylight factor is the appropriate target on this basis.

In addition to complying with further Irish Design Standards for New Apartments, such as the provision of balconies (which reduce daylight within apartments as noted within the BRE guidelines), the 1.5% ADF target is noted as the more appropriate method again in this instance. Although the design target value is lower, this is compensated with a much higher valued outdoor private amenity provision which is noted to be a very desirable commodity for occupants to benefit their connection to the outdoors.

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

Ireland is currently in the midst of a widely recognised housing crisis with a need for quality domestic dwellings. This puts a premium on the number of properties to help overcome the national issue. Modern architectural design maximises the space function by creating open Living/Dining/Kitchen areas. Where previously solid partition walls may have existed to separate these functions, they are now removed to help maximise an open space that creates a more flexible and larger feeling habitable environment.

Therefore, where a kitchen may have been closed off into a cellular space with no access to daylight, the kitchen can now take advantage of daylight distribution from the adjoining living/dining area. Kitchen environments will still typically rely on artificial light, primarily for detail and safety precautions whilst preparing meals, but with this open layout form they will capture daylight that

previously would not be available and which will help reduce artificial lighting needs at suitable times. This in turn helps to reduce electrical energy consumption.

With the kitchens positioned at the back of the space where artificial lighting will typically be required, then aspiring to achieve daylight contribution should be seen as the goal and not measuring it to fixed requirements. As the kitchens will be classed as a "non-habitable transient spaces", the daylight benefit is primary to the habitable spaces of the Living and Dining areas.

9.3 Planning Authority Guidelines

The BRE guide notes 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 (Urban Development and Building Heights, Guidelines for Planning Authorities 2018), where deep plan single aspect combine modern flexible living 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, *"Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design."*

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.

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 have been noted to be accepted by An Bord Pleanala.

9.3.1 Assumptions

The following assumptions are to be used in the study:

- Sky Conditions: Standard CIE overcast sky
- Time (24hr): 12:00
- Date: 21 September
- Working Plane: 0.85m

The following Surface Reflectance's are to be used in the study:

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

Glazing Transmittance:

- Light Transmittance: 70%
- Window Frame thickness: 50 mm

9.4 Block B ADF Results

9.4.1 Block B Level 0

Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L00: BB-01_L/K/D	L/K/D	2.55	✓
2	L00: BB-02_Bedroom 02	Bedroom	1.19	✓
3	L00: BB-02_Bedroom 01	Bedroom	1.53	✓
4	L00: BB-02_L/K/D	L/K/D	3.31	✓
5	L00: BB-03_L/K/D	L/K/D	1.67	x/✓
6	L00: BB-03_Bedroom 01	Bedroom	1.85	✓
7	L00: BB-03_Bedroom 02	Bedroom	1.39	✓
8	L00: BB-04_L/K/D	L/K/D	1.65	x/✓
9	L00: BB-04_Bedroom 01	Bedroom	1.00	✓
10	L00: BB-04_Bedroom 02	Bedroom	1.52	✓
11	L00: BB-05_Bedroom 02	Bedroom	1.39	✓
12	L00: BB-05_Bedroom 01	Bedroom	2.07	✓
13	L00: BB-05_L/K/D	L/K/D	1.62	x/✓
14	L00: BB-06_L/K/D	L/K/D	2.45	✓
15	L00: BB-06_Bedroom 01	Bedroom	1.23	✓
16	L00: BB-06_Bedroom 02	Bedroom	1.03	✓
17	L00: BB-07_L/K/D	L/K/D	4.37	✓
18	L00: BB-07_Bedroom 01	Bedroom	1.62	✓
19	L00: BB-07_Bedroom 02	Bedroom	1.63	✓
20	L00: BB-01_Bedroom 02	Bedroom	1.52	✓
21	L00: BB-01_Bedroom 01	Bedroom	1.36	✓

The following conclusions can be made:

✓ 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 when the 1.5% ADF target is applied.

9.4.2 Block B Level 01

Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L01: BB-01_L/K/D	L/K/D	2.90	✓
2	L01: BB-02_Bedroom 02	Bedroom	1.30	✓
3	L01: BB-02_Bedroom 01	Bedroom	1.65	✓
4	L01: BB-02_L/K/D	L/K/D	3.57	✓
5	L01: BB-03_L/K/D	L/K/D	1.67	x/✓
6	L01: BB-03_Bedroom 01	Bedroom	1.89	✓
7	L01: BB-03_Bedroom 02	Bedroom	1.38	✓
8	L01: BB-04_L/K/D	L/K/D	1.50	x/✓
9	L01: BB-04_Bedroom 01	Bedroom	1.09	✓
10	L01: BB-04_Bedroom 02	Bedroom	3.01	✓
11	L01: BB-05_Bedroom 02	Bedroom	1.40	✓
12	L01: BB-05_Bedroom 01	Bedroom	1.92	✓
13	L01: BB-05_L/K/D	L/K/D	1.50	x/✓
14	L01: BB-06_L/K/D	L/K/D	2.53	✓
15	L01: BB-06_Bedroom 01	Bedroom	1.38	✓
16	L01: BB-06_Bedroom 02	Bedroom	1.13	✓
17	L01: BB-07_L/K/D	L/K/D	2.98	✓
18	L01: BB-07_Bedroom 01	Bedroom	1.35	✓
19	L01: BB-07_Bedroom 02	Bedroom	1.50	✓
20	L01: BB-07_Bedroom 03	Bedroom	2.06	✓
21	L01: BB-01_Bedroom 02	Bedroom	1.60	✓
22	L01: BB-01_Bedroom 01	Bedroom	1.42	✓

The following conclusions can be made:

✓ 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 when the 1.5% ADF target is applied.

9.4.3 Block B Level 02

Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L02: BB-01_L/K/D	L/K/D	3.16	✓
2	L02: BB-02_Bedroom 02	Bedroom	1.30	✓
3	L02: BB-02_Bedroom 01	Bedroom	1.65	✓
4	L02: BB-02_L/K/D	L/K/D	2.14	✓
5	L02: BB-03_L/K/D	L/K/D	2.19	✓
6	L02: BB-03_Bedroom 01	Bedroom	1.89	✓
7	L02: BB-03_Bedroom 02	Bedroom	1.38	✓
8	L02: BB-04_L/K/D	L/K/D	2.17	✓
9	L02: BB-04_Bedroom 01	Bedroom	1.09	✓
10	L02: BB-04_Bedroom 02	Bedroom	1.99	✓
11	L02: BB-05_Bedroom 02	Bedroom	1.40	✓
12	L02: BB-05_Bedroom 01	Bedroom	1.92	✓
13	L02: BB-05_L/K/D	L/K/D	1.52	x/✓
14	L02: BB-06_L/K/D	L/K/D	2.50	✓
15	L02: BB-06_Bedroom 01	Bedroom	1.38	✓
16	L02: BB-06_Bedroom 02	Bedroom	1.15	✓
17	L02: BB-07_L/K/D	L/K/D	2.98	✓
18	L02: BB-07_Bedroom 01	Bedroom	1.35	✓
19	L02: BB-07_Bedroom 02	Bedroom	1.50	✓
20	L02: BB-07_Bedroom 03	Bedroom	2.06	✓
21	L02: BB-01_Bedroom 02	Bedroom	1.60	✓
22	L02: BB-01_Bedroom 01	Bedroom	1.42	✓

The following conclusions can be made:

✓ 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 when the 1.5% ADF target is applied.

9.4.4 Block B Level 03

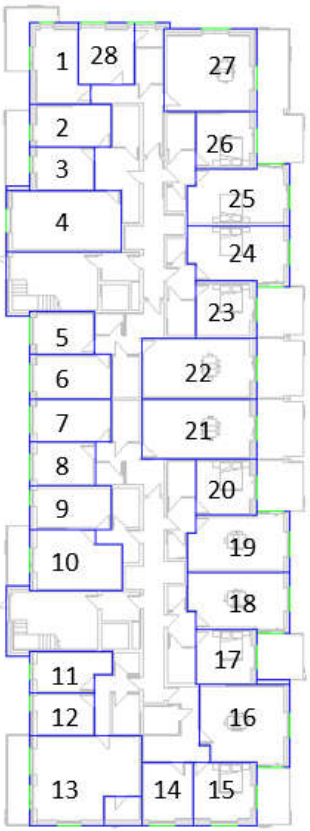
Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L03: BB-01_Bedroom 02	Bedroom	1.37	✓
2	L03: BB-01_Bedroom 01	Bedroom	2.66	✓
3	L03: BB-01_L/K/D	L/K/D	2.03	✓
4	L03: BB-02_L/K/D	L/K/D	2.61	✓
5	L03: BB-02_Bedroom 01	Bedroom	1.96	✓
6	L03: BB-02_Bedroom 02	Bedroom	1.09	✓
7	L03: BB-07_L/K/D	L/K/D	4.08	✓
8	L03: BB-07_Bedroom 01	Bedroom	2.14	✓
9	L03: BB-07_Bedroom 02	Bedroom	2.15	✓
10	L03: BB-07_Bedroom 03	Bedroom	2.79	✓

The following conclusions can be made:

✓ 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.

9.5 Block D ADF Results

9.5.1 Block D Level 0



Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L00: BD-01_Bedroom_01	Bedroom	1.57	✓
2	L00: BD-11_Bedroom_02	Bedroom	1.54	✓
3	L00: BD-11_Bedroom_01	Bedroom	1.04	✓
4	L00: BD-11_L/K/D	L/K/D	2.38	✓
5	L00: BD-04_Bedroom_01	Bedroom	2.11	✓
6	L00: BD-04_Bedroom_02	Bedroom	1.94	✓
7	L00: BD-05_Bedroom_02	Bedroom	1.97	✓
8	L00: BD-05_Bedroom_01	Bedroom	2.35	✓
9	L00: BD-10_Bedroom	Bedroom	1	✓
10	L00: BD-10_L/K/D	L/K/D	1.68	x/✓
11	L00: BD-09_Bedroom_02	Bedroom	1.36	✓
12	L00: BD-09_Bedroom_01	Bedroom	1.3	✓
13	L00: BD-09_L/K/D	L/K/D	2.73	✓
14	L00: BD-08_Bedroom_02	Bedroom	2.1	✓
15	L00: BD-08_Bedroom_01	Bedroom	2.59	✓
16	L00: BD-08_L/K/D	L/K/D	2.26	✓

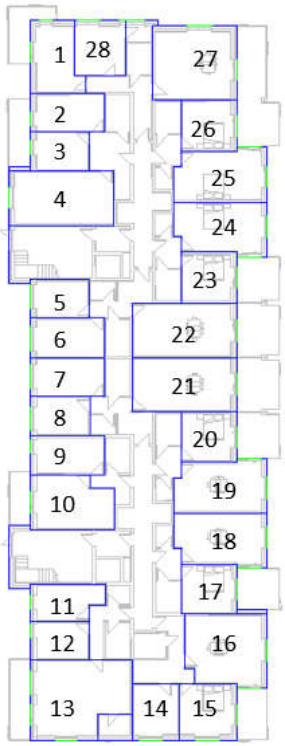
17	L00: BD-07_Bedroom	Bedroom	1.01	✓
18	L00: BD-07_L/K/D	L/K/D	2.36	✓
19	L00: BD-06_L/K/D	L/K/D	2.55	✓
20	L00: BD-06_Bedroom	Bedroom	3.51	✓
21	L00: BD-05_L/K/D	L/K/D	2.46	✓
22	L00: BD-04_L/K/D	L/K/D	2.47	✓
23	L00: BD-03_Bedroom	Bedroom	1.63	✓
24	L00: BD-03_L/K/D	L/K/D	2.23	✓
25	L00: BD-02_L/K/D	L/K/D	2.45	✓
26	L00: BD-02_Bedroom	Bedroom	1.2	✓
27	L00: BD-01_L/K/D	L/K/D	3.13	✓
28	L00: BD-01_Bedroom_02	Bedroom	1.81	✓

The following conclusions can be made:

✓ 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 when the 1.5% ADF target is applied.

9.5.2 Block D Level 1



Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L01: BD-01_Bedroom_01	Bedroom	1.78	✓
2	L01: BD-11_Bedroom_02	Bedroom	1.94	✓
3	L01: BD-11_Bedroom_01	Bedroom	1.05	✓
4	L01: BD-11_L/K/D	L/K/D	2.51	✓
5	L01: BD-04_Bedroom_01	Bedroom	2.22	✓
6	L01: BD-04_Bedroom_02	Bedroom	2.02	✓
7	L01: BD-05_Bedroom_02	Bedroom	2.05	✓
8	L01: BD-05_Bedroom_01	Bedroom	2.27	✓
9	L01: BD-10_Bedroom	Bedroom	1.17	✓
10	L01: BD-10_L/K/D	L/K/D	2.30	✓
11	L01: BD-09_Bedroom_02	Bedroom	1.43	✓
12	L01: BD-09_Bedroom_01	Bedroom	1.39	✓
13	L01: BD-09_L/K/D	L/K/D	2.84	✓
14	L01: BD-08_Bedroom_02	Bedroom	2.45	✓
15	L01: BD-08_Bedroom_01	Bedroom	3.09	✓
16	L01: BD-08_L/K/D	L/K/D	2.38	✓
17	L01: BD-07_Bedroom	Bedroom	1.98	✓
18	L01: BD-07_L/K/D	L/K/D	2.55	✓
19	L01: BD-06_L/K/D	L/K/D	2.78	✓

20	L01: BD-06_Bedroom	Bedroom	3.03	✓
21	L01: BD-05_L/K/D	L/K/D	2.43	✓
22	L01: BD-04_L/K/D	L/K/D	2.44	✓
23	L01: BD-03_Bedroom	Bedroom	2.93	✓
24	L01: BD-03_L/K/D	L/K/D	2.15	✓
25	L01: BD-02_L/K/D	L/K/D	2.38	✓
26	L01: BD-02_Bedroom	Bedroom	1.95	✓
27	L01: BD-01_L/K/D	L/K/D	3.36	✓
28	L01: BD-01_Bedroom_02	Bedroom	1.93	✓

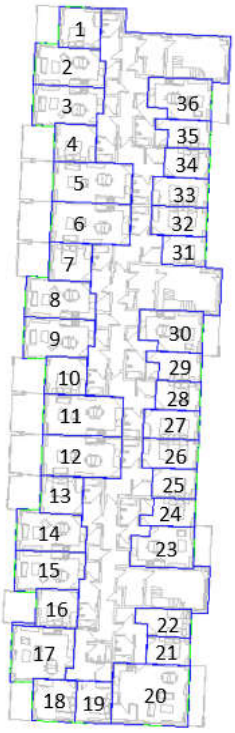
The following conclusions can be made:

✓ 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 when the 1.5% ADF target is applied.

9.6 Block E ADF Results

9.6.1 Block E Level 0



Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L00: BE-15_Bedroom	Bedroom	3.97	✓
2	L00: BE-15_L/K/D	L/K/D	2.39	✓
3	L00: BE-14_L/K/D	L/K/D	2.34	✓
4	L00: BE-14_Bedroom	Bedroom	1.01	✓
5	L00: BE-13_L/K/D	L/K/D	2.44	✓
6	L00: BE-12_L/K/D	L/K/D	2.43	✓
7	L00: BE-11_Bedroom	Bedroom	1.68	✓
8	L00: BE-11_L/K/D	L/K/D	2.29	✓
9	L00: BE-10_L/K/D	L/K/D	2.33	✓
10	L00: BE-10_Bedroom	Bedroom	1.70	✓
11	L00: BE-09_L/K/D	L/K/D	2.47	✓
12	L00: BE-08_L/K/D	L/K/D	2.46	✓
13	L00: BE-07_Bedroom	Bedroom	1.70	✓
14	L00: BE-07_L/K/D	L/K/D	2.30	✓
15	L00: BE-06_L/K/D	L/K/D	2.29	✓
16	L00: BE-06_Bedroom	Bedroom	1.62	✓
17	L00: BE-05_L/K/D	L/K/D	2.98	✓
18	L00: BE-05_Bedroom 02	Bedroom	4.07	✓

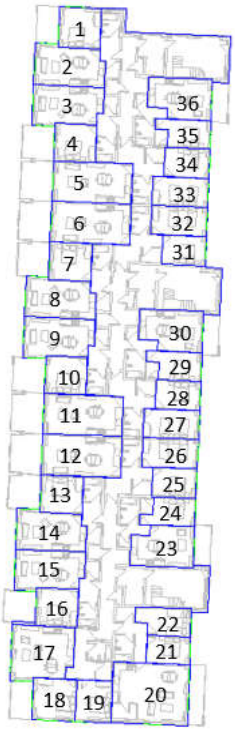
19	L00: BE-05_Bedroom 01	Bedroom	2.92	✓
20	L00: BE-04_L/K/D	L/K/D	2.85	✓
21	L00: BE-04_Bedroom 02	Bedroom	2.80	✓
22	L00: BE-04_Bedroom 01	Bedroom	2.26	✓
23	L00: BE-03_L/K/D	L/K/D	2.69	✓
24	L00: BE-03_Bedroom	Bedroom	3.39	✓
25	L00: BE-08_Bedroom 02	Bedroom	3.63	✓
26	L00: BE-08_Bedroom 01	Bedroom	2.91	✓
27	L00: BE-09_Bedroom 02	Bedroom	2.58	✓
28	L00: BE-09_Bedroom 01	Bedroom	3.49	✓
29	L00: BE-02_Bedroom	Bedroom	3.56	✓
30	L00: BE-02_L/K/D	L/K/D	2.74	✓
31	L00: BE-12_Bedroom 02	Bedroom	3.50	✓
32	L00: BE-12_Bedroom 01	Bedroom	2.97	✓
33	L00: BE-13_Bedroom 02	Bedroom	2.97	✓
34	L00: BE-13_Bedroom 01	Bedroom	3.52	✓
35	L00: BE-01_Bedroom	Bedroom	3.14	✓
36	L00: BE-01_L/K/D	L/K/D	2.80	✓

The following conclusions can be made:

✓ 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 when the 1.5% ADF target is applied.

9.6.2 Block E Level 1



Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L01: BE-15_Bedroom	Bedroom	4.30	✓
2	L01: BE-15_L/K/D	L/K/D	2.55	✓
3	L01: BE-14_L/K/D	L/K/D	2.49	✓
4	L01: BE-14_Bedroom	Bedroom	2.11	✓
5	L01: BE-13_L/K/D	L/K/D	1.76	x/✓
6	L01: BE-12_L/K/D	L/K/D	1.75	x/✓
7	L01: BE-11_Bedroom	Bedroom	2.07	✓
8	L01: BE-11_L/K/D	L/K/D	2.45	✓
9	L01: BE-10_L/K/D	L/K/D	2.48	✓
10	L01: BE-10_Bedroom	Bedroom	2.11	✓
11	L01: BE-09_L/K/D	L/K/D	1.77	x/✓
12	L01: BE-08_L/K/D	L/K/D	1.76	x/✓
13	L01: BE-07_Bedroom	Bedroom	2.11	✓
14	L01: BE-07_L/K/D	L/K/D	2.45	✓
15	L01: BE-06_L/K/D	L/K/D	2.41	✓
16	L01: BE-06_Bedroom	Bedroom	1.71	✓
17	L01: BE-05_L/K/D	L/K/D	3.14	✓
18	L01: BE-05_Bedroom 02	Bedroom	4.36	✓
19	L01: BE-05_Bedroom 01	Bedroom	3.09	✓
20	L01: BE-04_L/K/D	L/K/D	3.14	✓

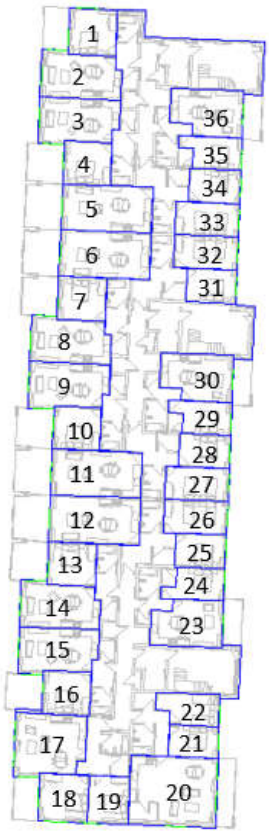
21	L01: BE-04_Bedroom 02	Bedroom	3.04	✓
22	L01: BE-04_Bedroom 01	Bedroom	2.45	✓
23	L01: BE-03_L/K/D	L/K/D	2.83	✓
24	L01: BE-03_Bedroom	Bedroom	3.52	✓
25	L01: BE-08_Bedroom 02	Bedroom	3.77	✓
26	L01: BE-08_Bedroom 01	Bedroom	3.03	✓
27	L01: BE-09_Bedroom 02	Bedroom	2.67	✓
28	L01: BE-09_Bedroom 01	Bedroom	3.62	✓
29	L01: BE-02_Bedroom	Bedroom	3.68	✓
30	L01: BE-02_L/K/D	L/K/D	2.86	✓
31	L01: BE-12_Bedroom 02	Bedroom	3.64	✓
32	L01: BE-12_Bedroom 01	Bedroom	3.07	✓
33	L01: BE-13_Bedroom 02	Bedroom	3.08	✓
34	L01: BE-13_Bedroom 01	Bedroom	3.64	✓
35	L01: BE-01_Bedroom	Bedroom	3.28	✓
36	L01: BE-01_L/K/D	L/K/D	2.86	✓

The following conclusions can be made:

✓ 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 when the 1.5% ADF target is applied.

9.6.3 Block E Level 2



Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L02: BE-15_Bedroom	Bedroom	4.43	✓
2	L02: BE-15_L/K/D	L/K/D	2.62	✓
3	L02: BE-14_L/K/D	L/K/D	2.55	✓
4	L02: BE-14_Bedroom	Bedroom	2.16	✓
5	L02: BE-13_L/K/D	L/K/D	2.04	✓
6	L02: BE-12_L/K/D	L/K/D	1.99	x/✓
7	L02: BE-11_Bedroom	Bedroom	2.13	✓
8	L02: BE-11_L/K/D	L/K/D	2.51	✓
9	L02: BE-10_L/K/D	L/K/D	2.54	✓
10	L02: BE-10_Bedroom	Bedroom	2.16	✓
11	L02: BE-09_L/K/D	L/K/D	2.01	✓
12	L02: BE-08_L/K/D	L/K/D	2.01	✓
13	L02: BE-07_Bedroom	Bedroom	2.16	✓
14	L02: BE-07_L/K/D	L/K/D	2.51	✓
15	L02: BE-06_L/K/D	L/K/D	2.47	✓
16	L02: BE-06_Bedroom	Bedroom	1.76	✓
17	L02: BE-05_L/K/D	L/K/D	3.12	✓

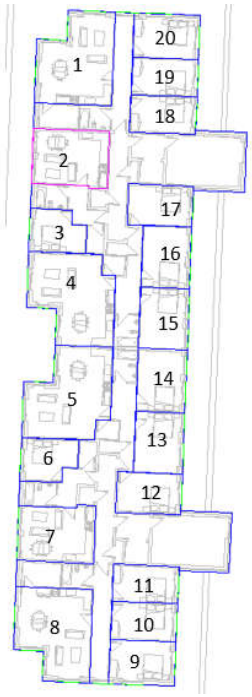
18	L02: BE-05_Bedroom 02	Bedroom	4.48	✓
19	L02: BE-05_Bedroom 01	Bedroom	3.19	✓
20	L02: BE-04_L/K/D	L/K/D	4.00	✓
21	L02: BE-04_Bedroom 02	Bedroom	3.23	✓
22	L02: BE-04_Bedroom 01	Bedroom	2.61	✓
23	L02: BE-03_L/K/D	L/K/D	4.35	✓
24	L02: BE-03_Bedroom	Bedroom	3.64	✓
25	L02: BE-08_Bedroom 02	Bedroom	3.83	✓
26	L02: BE-08_Bedroom 01	Bedroom	3.07	✓
27	L02: BE-09_Bedroom 02	Bedroom	2.72	✓
28	L02: BE-09_Bedroom 01	Bedroom	3.67	✓
29	L02: BE-02_Bedroom	Bedroom	3.80	✓
30	L02: BE-02_L/K/D	L/K/D	4.35	✓
31	L02: BE-12_Bedroom 02	Bedroom	3.69	✓
32	L02: BE-12_Bedroom 01	Bedroom	3.12	✓
33	L02: BE-13_Bedroom 02	Bedroom	3.12	✓
34	L02: BE-13_Bedroom 01	Bedroom	3.69	✓
35	L02: BE-01_Bedroom	Bedroom	3.35	✓
36	L02: BE-01_L/K/D	L/K/D	4.36	✓

The following conclusions can be made:

✓ 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 when the 1.5% ADF target is applied.

9.6.4 Block E Level 3



Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L03: BE-01_L/K/D	L/K/D	3.37	✓
2	L03: BE-02_L/K/D	L/K/D	2.47	✓
3	L03: BE-02_Bedroom	Bedroom	2.72	✓
4	L03: BE-03_L/K/D	L/K/D	1.92	x/✓
5	L03: BE-04_L/K/D	L/K/D	1.91	x/✓
6	L03: BE-05_Bedroom	Bedroom	2.73	✓
7	L03: BE-05_L/K/D	L/K/D	2.47	✓
8	L03: BE-06_L/K/D	L/K/D	3.23	✓
9	L03: BE-06_Bedroom 03	Bedroom	4.63	✓
10	L03: BE-06_Bedroom 02	Bedroom	2.30	✓
11	L03: BE-06_Bedroom 01	Bedroom	1.98	✓
12	L03: BE-04_Bedroom 03	Bedroom	1.91	✓
13	L03: BE-04_Bedroom 02	Bedroom	3.23	✓
14	L03: BE-04_Bedroom 01	Bedroom	3.58	✓
15	L03: BE-03_Bedroom 03	Bedroom	3.37	✓
16	L03: BE-03_Bedroom 02	Bedroom	3.35	✓
17	L03: BE-03_Bedroom 01	Bedroom	1.99	✓
18	L03: BE-01_Bedroom 03	Bedroom	1.99	✓
19	L03: BE-01_Bedroom 02	Bedroom	2.31	✓
20	L03: BE-01_Bedroom 01	Bedroom	5.33	✓

The following conclusions can be made:

✓ 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 when the 1.5% ADF target is applied.

9.7 Block G ADF Results

9.7.1 Block G Level 0

Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L00: BG-01_L/K/D	L/K/D	4.36	✓
2	L00: BG-02_Bedroom 02	Bedroom	1.03	✓
3	L00: BG-02_Bedroom 01	Bedroom	2.20	✓
4	L00: BG-02_L/K/D	L/K/D	2.17	✓
5	L00: BG-03_L/K/D	L/K/D	1.33	x
6	L00: BG-03_Bedroom 01	Bedroom	2.45	✓
7	L00: BG-03_Bedroom 02	Bedroom	1.92	✓
8	L00: BG-04_Bedroom 02	Bedroom	2.45	✓
9	L00: BG-04_Bedroom 01	Bedroom	1.80	✓
10	L00: BG-04_L/K/D	L/K/D	1.38	x
11	L00: BG-05_Bedroom 02	Bedroom	1.94	✓
12	L00: BG-05_Bedroom 01	Bedroom	2.52	✓
13	L00: BG-05_L/K/D	L/K/D	1.45	x
14	L00: BG-06_L/K/D	L/K/D	3.21	✓
15	L00: BG-06_Bedroom 01	Bedroom	2.47	✓
16	L00: BG-06_Bedroom 02	Bedroom	2.00	✓
17	L00: BG-07_L/K/D	L/K/D	2.65	✓
18	L00: BG-07_Bedroom 01	Bedroom	2.19	✓
19	L00: BG-07_Bedroom 02	Bedroom	2.44	✓
20	L00: BG-01_Bedroom 02	Bedroom	1.68	✓
21	L00: BG-01_Bedroom 01	Bedroom	1.95	✓

The following conclusions can be made:

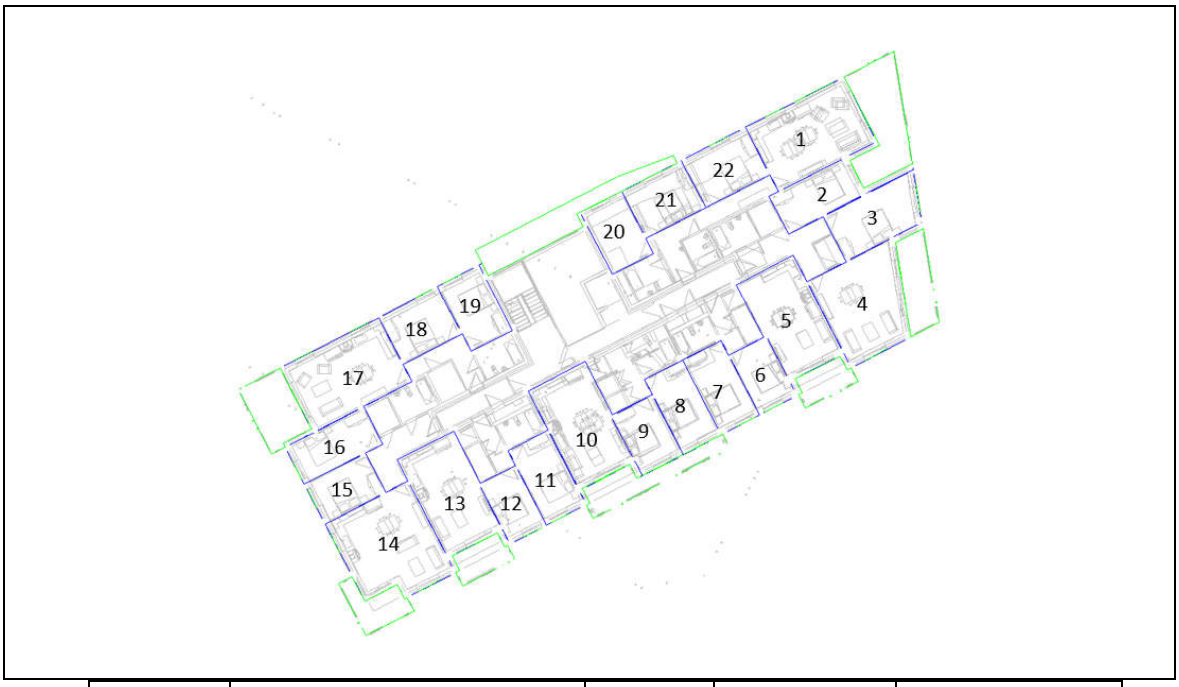
✓ These rooms have an ADF greater than the recommended minimum values (2.0% for combined L/K/Ds and 1.0% for bedrooms) as stated within the BRE Guide.

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 when the 1.5% ADF target is applied.

x The ADF in these rooms falls below the BRE recommendation for a L/K/D when the whole space is assessed against both the 2% & the 1.5% ADF targets.

It can be noted that when the living area alone is assessed for these spaces that fall below recommended levels the results are 2.06%,2.03%,2.13% respectively.

9.7.2 Block G Level 1



Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L01: BG-01_L/K/D	L/K/D	4.82	✓
2	L01: BG-02_Bedroom 02	Bedroom	1.13	✓
3	L01: BG-02_Bedroom 01	Bedroom	2.34	✓
4	L01: BG-02_L/K/D	L/K/D	2.37	✓
5	L01: BG-03_L/K/D	L/K/D	1.54	x/✓
6	L01: BG-03_Bedroom 01	Bedroom	2.69	✓
7	L01: BG-03_Bedroom 02	Bedroom	2.11	✓
8	L01: BG-04_Bedroom 02	Bedroom	1.51	✓
9	L01: BG-04_Bedroom 01	Bedroom	2.01	✓
10	L01: BG-04_L/K/D	L/K/D	1.59	x/✓
11	L01: BG-05_Bedroom 02	Bedroom	2.07	✓
12	L01: BG-05_Bedroom 01	Bedroom	2.75	✓
13	L01: BG-05_L/K/D	L/K/D	1.71	x/✓
14	L01: BG-06_L/K/D	L/K/D	3.47	✓
15	L01: BG-06_Bedroom 01	Bedroom	2.64	✓
16	L01: BG-06_Bedroom 02	Bedroom	2.14	✓
17	L01: BG-07_L/K/D	L/K/D	2.85	✓
18	L01: BG-07_Bedroom 01	Bedroom	2.29	✓
19	L01: BG-07_Bedroom 02	Bedroom	2.56	✓
20	L01: BG-01_Bedroom 03	Bedroom	2.72	✓
21	L01: BG-01_Bedroom 02	Bedroom	2.62	✓
22	L01: BG-01_Bedroom 01	Bedroom	2.06	✓

The following conclusions can be made:

✓ 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 when the 1.5% ADF target is applied.

9.7.3 Block G Level 2

Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L02: BG-01_L/K/D	L/K/D	4.95	✓
2	L02: BG-02_Bedroom 02	Bedroom	1.17	✓
3	L02: BG-02_Bedroom 01	Bedroom	2.41	✓
4	L02: BG-02_L/K/D	L/K/D	2.47	✓
5	L02: BG-03_L/K/D	L/K/D	1.66	x/✓
6	L02: BG-03_Bedroom 01	Bedroom	2.81	✓
7	L02: BG-03_Bedroom 02	Bedroom	2.23	✓
8	L02: BG-04_Bedroom 02	Bedroom	2.01	✓
9	L02: BG-04_Bedroom 01	Bedroom	2.72	✓
10	L02: BG-04_L/K/D	L/K/D	2.15	✓
11	L02: BG-05_Bedroom 02	Bedroom	2.18	✓
12	L02: BG-05_Bedroom 01	Bedroom	2.88	✓
13	L02: BG-05_L/K/D	L/K/D	2.25	✓
14	L02: BG-06_L/K/D	L/K/D	4.04	✓
15	L02: BG-06_Bedroom 01	Bedroom	2.73	✓
16	L02: BG-06_Bedroom 02	Bedroom	2.21	✓
17	L02: BG-07_L/K/D	L/K/D	3.22	✓
18	L02: BG-07_Bedroom 01	Bedroom	2.34	✓
19	L02: BG-07_Bedroom 02	Bedroom	2.61	✓
20	L02: BG-01_Bedroom 03	Bedroom	2.79	✓
21	L02: BG-01_Bedroom 02	Bedroom	2.70	✓
22	L02: BG-01_Bedroom 01	Bedroom	2.08	✓

The following conclusions can be made:

✓ 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 when the 1.5% ADF target is applied.

9.7.4 Block G Level 3

Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L03: BG-01_L/K/D	L/K/D	5.59	✓
2	L03: BG-02_Bedroom 02	Bedroom	1.10	✓
3	L03: BG-02_Bedroom 01	Bedroom	2.74	✓
4	L03: BG-02_L/K/D	L/K/D	2.60	✓
5	L03: BG-03_L/K/D	L/K/D	1.90	x/✓
6	L03: BG-03_Bedroom 01	Bedroom	3.51	✓
7	L03: BG-03_Bedroom 02	Bedroom	2.19	✓
8	L03: BG-01_Bedroom 03	Bedroom	3.93	✓
9	L03: BG-01_Bedroom 02	Bedroom	2.58	✓
10	L03: BG-01_Bedroom 01	Bedroom	2.62	✓

The following conclusions can be made:

✓ 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 when the 1.5% ADF target is applied.

9.7.5 Discussion

The purpose of the ADF calculations is to quantify an overall percentage of units which exceeds the BRE and the BS 8206-2:2008 recommendations. Our proposed methodology is to complete the ADF calculations for all the apartment units within the development. The objective of the design team is to maximise the number of units which exceed the BRE and the BS 8206-2:2008 recommendations.

As noted previously in Section 9.3, where there are combined living/kitchen/dining areas within the development, these have been assessed as whole spaces against a 2% ADF target as well as a 1.5% ADF target value.

The results are summarised in the following table:

Rooms Tested	No. Rooms
Total Bedrooms Tested	213
Total Living/Kitchen/Dining Areas Tested	121
Total Spaces Tested	334

Whole Space For L/K/D against 2% ADF Target		%
Bedrooms Pass	213	100%
L/K/D Areas Pass	98	83%
Total Overall	311	93%

Whole Space For L/K/D against 1.5% ADF Target		%
Bedrooms Pass	213	100%
L/K/D Areas Pass	118	98%
Total Overall	331	99%

Across the proposed development, 93% of the tested rooms are achieving ADF values above the BRE and BS 8206-2:2008 guidelines when Living/Kitchen/Dining spaces are assessed as whole rooms against a 2% ADF target.

Furthermore, 99% of the tested rooms are achieving ADF values above the BRE and BS 8206-2:2008 guidelines when Living/Kitchen/Dining spaces are assessed as whole rooms against a 1.5% ADF target.

As noted previously when the living areas alone is assessed for these spaces that fall below recommended levels (x3) the results are 2.06%,2.03%,2.13% respectively.

10 Conclusion

The following can be concluded based on the studies undertaken.

The Shadow analysis shows different shadows being cast from the existing and proposed schemes at particular periods throughout the year. Overall the impact of overshadowing would be classed as a negligible adverse impact given the following.

10.1 Shadow Analysis

- **Clonminch Wood**

Minor additional shading visible from the proposed development on these residential properties during March and June at 8am to a select few properties and with minimal overshadowing during *December to some of the properties. It should also be noted that there is extensive tree coverage between the proposed site and these existing properties and as such during the winter months the shadows cast will be from said trees and not the proposed development. There is no noted overshadowing evident in at any other period.

- **Limefield**

Minimal overshadowing during *December to one property (Gayfield House). No additional shading visible from the proposed development on the other existing residential properties (4-7 Limefield) during the months of March, June and December.

- **Oaklee Sheltered Housing**

Minimal additional shading is noted in the early mornings of March and December. No additional shading is visible from the proposed development on the existing properties at any other period.

- **Clonmimch Road**

No additional shading visible from the proposed development on these existing residential properties during the months of March, June and December.

* Overshadowing can be expected in December when the sun is lower in the sky and shadows cast are much longer. Although this is the case, overshadowing is least noticeable during the winter months as there is a lot less sunlight available at this time of year and so the overall impact is vastly reduced. As noted above, there is extensive tree coverage between the proposed site and these existing properties and as such during the winter months the shadows cast will be from said trees and not the proposed development.

Overall the potential impact of overshadowing would be classed as a negligible adverse impact given the comments above and is further quantified via the Daylight Analysis of Existing Buildings and Sunlight to Existing Amenity Spaces sections within this report.

10.2 Sunlight to Existing Amenity Spaces

As mentioned in Section 3.3.17 of BRE's Site Layout Planning for Daylight and Sunlight, for a space to appear adequately sunlit throughout the year, at least 50% of the garden or amenity area should receive at least 2 hours of sunlight on the 21st of March.

All of the private existing amenity areas tested out with the development site would continue to be quality spaces in terms of sunlight received exceeding BRE recommendations. The proposed development would have a negligible adverse impact to these existing gardens.

10.3 Sunlight to Proposed Amenity Spaces

As mentioned in Section 3.3.17 of BRE's Site Layout Planning for Daylight and Sunlight, 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 the 21st of March.

On the 21st of March, the proposed amenity spaces provide across the development site for the apartments would receive at least 2 hours of sunlight across 68% of their area, exceeding BRE recommendations.

10.4 Daylight Analysis of Existing Buildings

The Vertical Sky Component for 100% (255 of 257) of the points tested have a value greater than 27% or not less than 0.8 times their former value (that of the Existing Situation), exceeding the BRE recommendations. The points that are below the recommendations are already very low in the existing situation and are as a consequence of the canopy on the existing dwelling and the close proximity to the neighbouring dwelling that is part of the same development.

Given the comments above there would be a minor adverse effect to these proposed neighbouring dwellings with an overall negligible adverse impact from the development as a whole.

10.5 Annual Probable Sunlight Hours

As noted in Section 8.2, the majority of the main living room windows of the existing dwellings neighbouring the proposed development needn't be included in the APSH assessment as they fall out with the criterion as set out in the BRE guidelines.

The results of the APSH for the dwellings situated in the neighbouring Part 8 development, in particular numbers 7-12 Oaklee, were carried out due to their initial VSC results. The results of the PASH for these properties all lie within 0.8 times their former value, that of the existing or receive more than 25% annual and 5% winter sunlight, with the exception of two windows (9 &10). Although this is true for these two windows, the results are just outwith the recommendations and the existing situation does not meet the criterion. From observations of the neighbouring development the results can be attributed to the overhang in place on the neighbouring development building and the close proximity to another neighbouring property within the same development.

10.6 Average Daylight Factors

Across the proposed development, 93% of the tested rooms are achieving ADF values above the BRE and BS 8206-2:2008 guidelines when Living/Kitchen/Dining spaces are assessed as whole rooms against a 2% ADF target.

Furthermore, 99% of the tested rooms are achieving ADF values above the BRE and BS 8206-2:2008 guidelines when Living/Kitchen/Dining spaces are assessed as whole rooms against a 1.5% ADF target.

It should be noted when the living areas alone are assessed for these spaces that fall below recommended levels (x3) the results are 2.06%,2.03%,2.13% respectively.

10.7 Observations

It should be noted that the guidance in the BRE 'Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice' is not mandatory and the guide 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'*.

Whilst the results shown relate to the criteria as laid out in the BRE guidance targets it is important to note that the BRE targets have been drafted primarily for use in low density suburban development and should therefore be used with flexibility and caution when dealing other types of sites. Despite the above, the site performs well in relation to the metrics considered in this report.

In addition, the BS 8206-2:2008 it also notes, "*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.*"

The approach within this report is further supported by the national policy guidance noted in the Sustainable Urban Housing: Design Standards for New Apartments, Section 6.7 which states:

"*Where an applicant cannot fully meet all of the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, which planning authorities should apply their discretion in accepting taking account of its assessment of specific. This may arise due to 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*."

Taking all of the above information into account, overall the results demonstrate that the proposed development performs well when compared to the BRE recommendations in the BRE 'Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice" by Paul Littlefair, 2011 sometimes referred to as BRE Digest 209 and the "BS 8206-2:2008: Lighting for Buildings - Part 2: Code of Practice for Daylighting".

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