Report for: Cairn Homes Properties Ltd

Project No: 14353

Parkside 4

Daylight, Sunlight and Overshadowing Study

Confidential

Document created by:

Integrated Environmental Solutions Limited

International Sustainability Consulting Developers of the IES **<Virtual Environment>**

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1	26/09/2019	Issue for Comment	John Gleeson
2	03/10/2019	Issue for Comment – Update to Model Glazing	John Gleeson

1 Contents

Executive Summary

This report details the analysis undertaken to quantify the Sunlight / Daylight impact of the proposed development at Parkside 4, a suburban location on the outskirts of Dublin. The report focuses on measuring the daylight impact to dwellings on Castlemoyne Road and Parkside Boulevard 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. During spring and summer periods there is no overshadowing to the existing dwellings or in fact any additional shading at all to the Parkside Boulevard dwellings given their southerly position in relation to the proposed development.

When considering the dwellings on Castlemoyne Road to the North, there is additional shading observed, but this is limited to the winter months when the impact caused by overshadowing is generally least noticeable. This would be similar to that experienced in any suburban location of this type. It can be concluded that overall the impact of overshadowing would have a negligible adverse impact on the existing dwellings.

Daylight Analysis of Existing Buildings (out with the site boundary)

For the residential dwellings considered on Castlemoyne and Belmoyne, all of the points tested have a vertical sky component (VSC) above 27% or not less than 0.8 times their former value (that of the Existing Scheme). Therefore, these points all exceed BRE recommendations.

Sunlight to Proposed Amenity Spaces

As mentioned above under Section 3.3.17 of BRE's Site Layout Planning for Daylight and Sunlight states that 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 almost 100% of the amenity areas would receive at least 2 hours of sunlight exceeding the BRE recommendations.

Average Daylight Factors

Based on the results of the rooms tested on First and Fourth floors, 92% of the tested spaces in the proposed scheme have an Average Daylight Factors (ADF) above the recommended values in line with the BRE guidelines.

This number across the scheme would be expected to increase further if all of the upper rooms were included in the results.

Discussion

It should be noted that the guidance in 'Site layout planning for daylight and sunlight: a guide to good practice' is not mandatory and the Report 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.

Overall the results demonstrate that the proposed development performance exceeds 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.

2 Introduction

This report details the analysis undertaken to quantify the Sunlight / Daylight impact of the proposed development at Parkside 4, a suburban location on the outskirts of Dublin. The report focuses on measuring the daylight impact to dwellings on Castlemoyne Road and Parkside Boulevard when compared to the existing situation. It also considers the impact to daylight and sunlight when considering the proposed design itself.

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.
- **Daylight Analysis of Existing Buildings** - via consideration of Vertical Sky Component (VSC).
- **Sunlight Proposed Amenity Spaces** – via an annual sunlight hour's analysis.
- **Average Daylight Factors** – via average daylight factor calculations carried for floor plans across the site of the proposed development.

The analysis was completed using IES VE software and the assessment based on recommendations given in BRE – Site Layout Planning for Daylight and Sunlight guide.

3 Methodology

3.1 Orientation

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

Orientation
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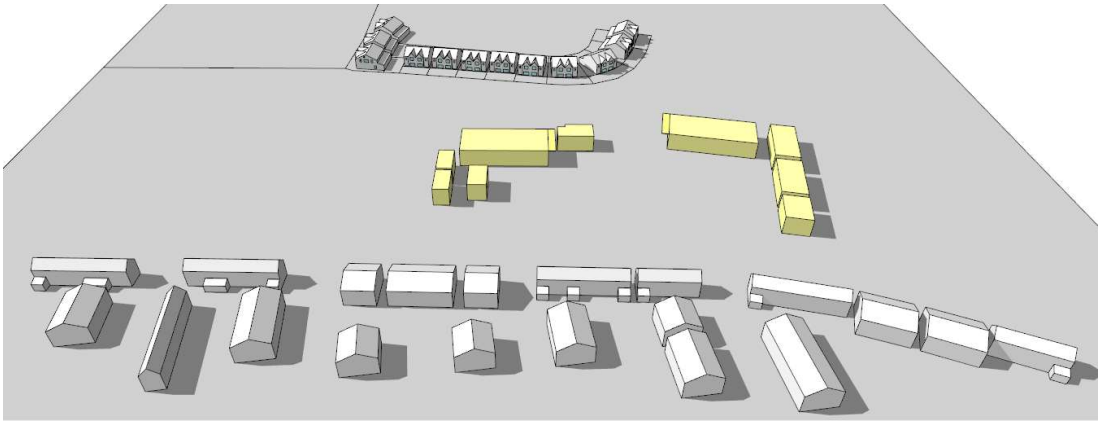
3.2 Model Geometry

3.2.1 Existing Site Model

For last number of years the site has been used as a temporary location for a local school. Although this has been used in the analysis, the results in section 6.2 highlight that these temporary structures have little or no effect to the results of the existing situation.



3.2.2 Proposed Site Model

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

North

East

South

West

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.

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.

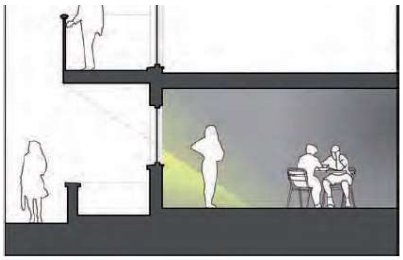


Figure 10: Balconies and projecting access ways can restrict daylight to rooms lit by windows below them

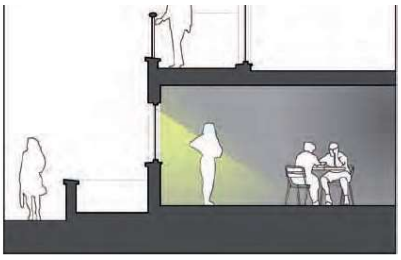
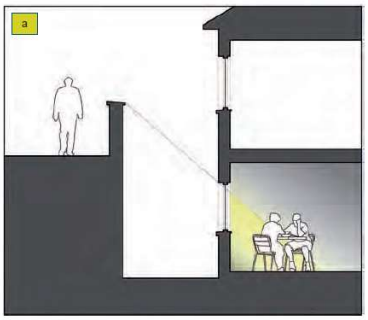
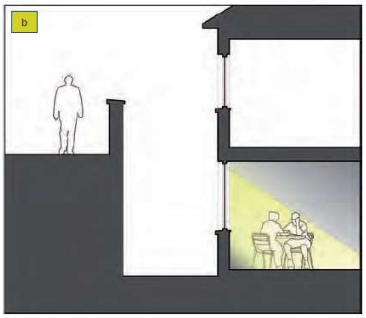


Figure 11: Section showing stepped back rooftop access ways. This gives improved daylight compared to a conventional section (see Figure 10).





4.1 Potential Sensitive Receptors

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

Inset plan	
	
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	Site
	Castlemoyne Road
	Parkside Boulevard

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.

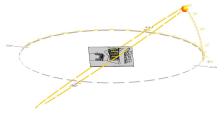
This section will consider the shadows cast for the Proposed development for the following dates:

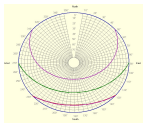
- December 21st (Winter Solstice)
- March 21st / September 21st (Equinox)
- June 21st (Summer Solstice)

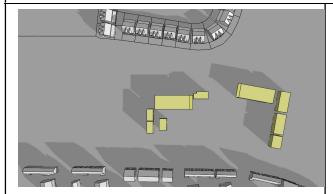
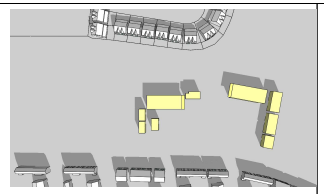
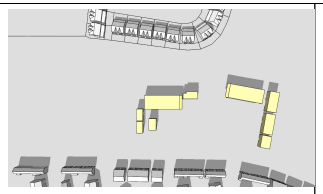
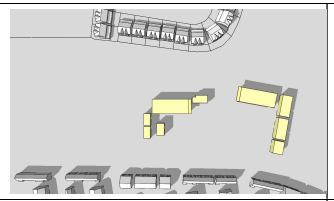
These images will show shadows cast for clear conditions with no clouds, assuming the sun is visible for every hour shown.

5.1 Plan View

5.1.1 March 21st





					Existing
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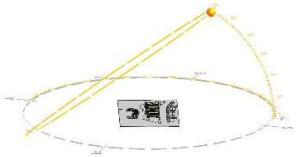
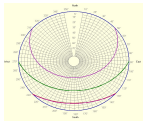
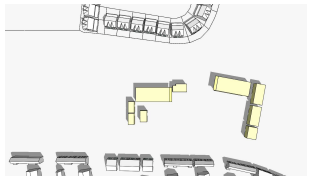
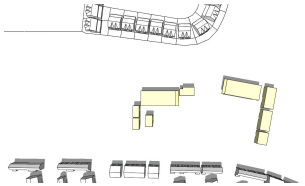
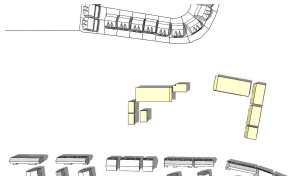
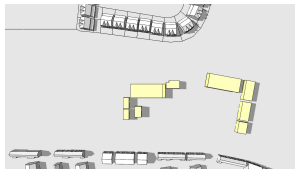
5.1.2 June 21st





					Existing
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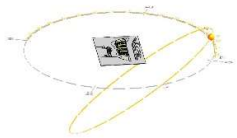
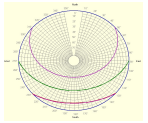
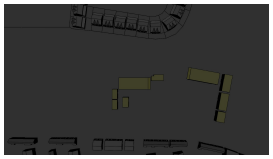
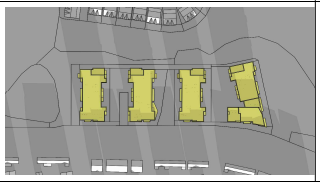
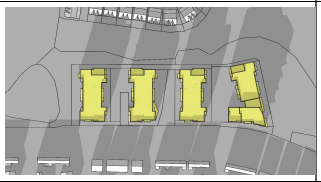
5.1.3 December 21st





					Existing
					Proposed
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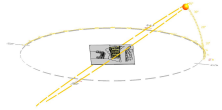
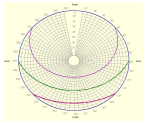
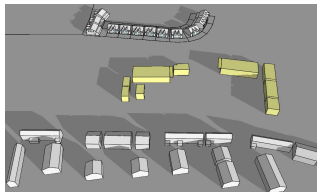
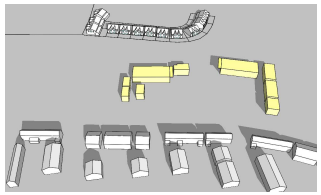
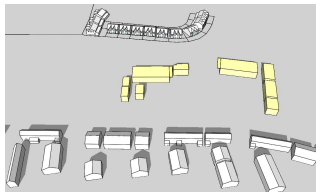
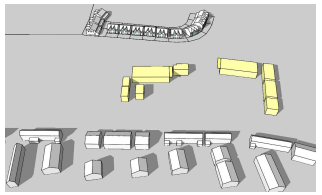
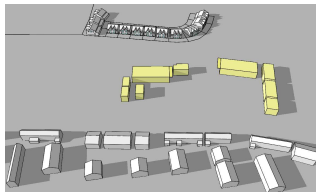
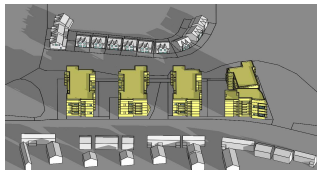
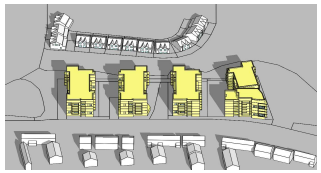
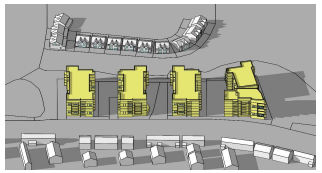
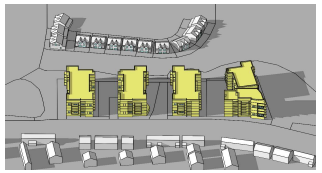
5.2 View 01: Looking toward Castlemoyne

5.2.1 March 21st





					Existing
					Proposed
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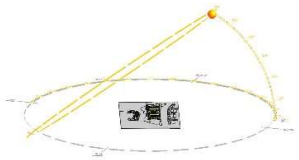
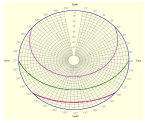
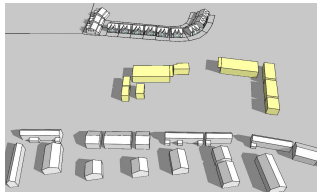
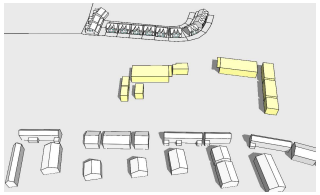
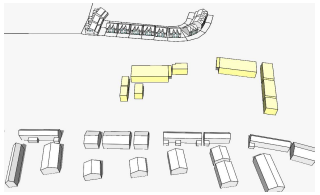
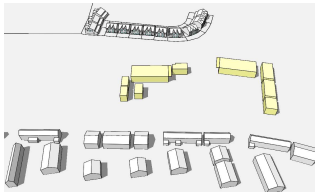
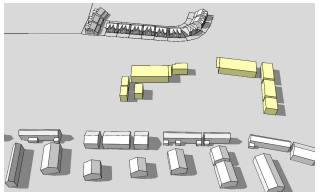
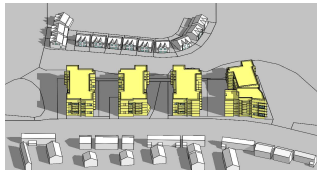
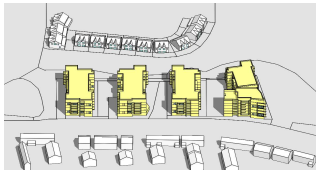
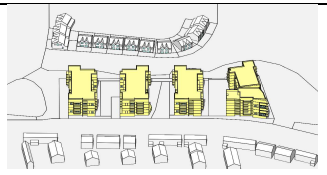
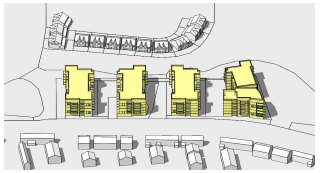
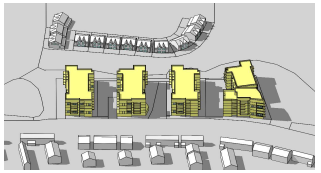
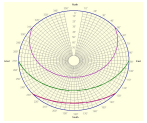
5.2.2 June 21st

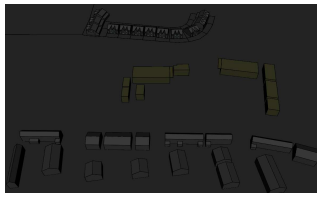
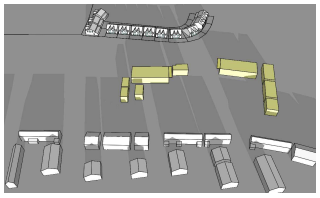
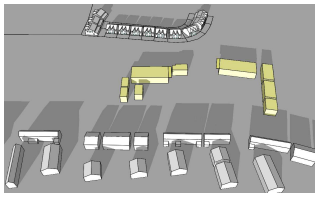
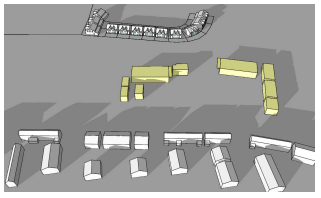
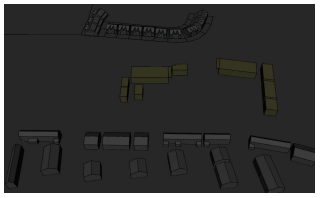
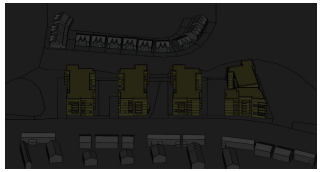
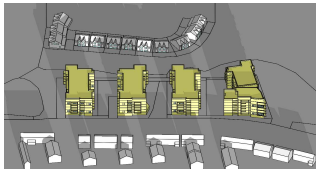
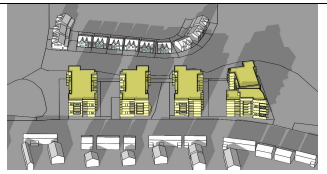
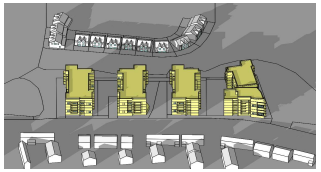




					Existing
					Proposed
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.2.3 December 21st



					Existing
					Proposed
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.3 Discussion

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

- **Morning (until 1200h)**
    - **Castlemoyne Road dwellings** – additional shading visible from the proposed development limited to the winter months. No additional shading in March and June noted.
    - **Parkside Boulevard dwellings** – no additional shading visible from the proposed development on the existing residential dwellings due to their location south of the proposed development site.

- **Afternoon (from 1200h until 1600h)**
    - **Castlemoyne Road dwellings** – additional shading visible from the proposed development limited to the winter months. No additional shading in March and June noted.
    - **Parkside Boulevard dwellings** – no additional shading visible from the proposed development on the existing residential dwellings due to their location south of the proposed development site.

In summary, there is no additional shading noted to the Parkside Boulevard dwellings to south given their position in relation to the proposed development. When considering the dwellings on Castlemoyne Road to the North, there is additional shading observed, but this is limited to the winter months when the impact caused by overshadowing is generally least noticeable. This would be similar to that experienced in any suburban location of this type. It can be concluded that overall the impact of overshadowing would have a negligible adverse impact on the existing dwellings.

6 Daylight Analysis of Existing Buildings (out with the site boundary)

6.1 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 Existing building is itself a good neighbour, standing a reasonable distance from the boundary and taking no more than its fair share of light. Any reduction in the total amount of skylight can be calculated by 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 RadianceIES, a module of IES VE.

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.

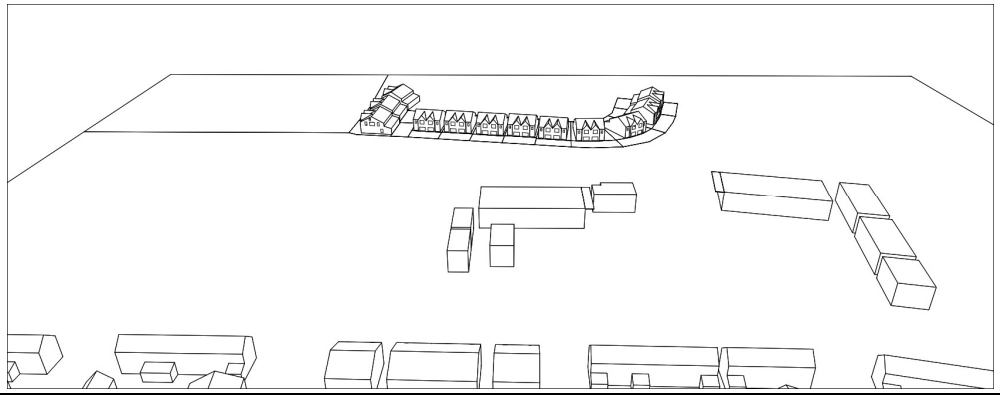
As such this study will compare the Existing and Proposed Schemes and consider whether the Vertical Sky Component (VSC) is greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) in line with BRE guidelines.

6.2 Assessment

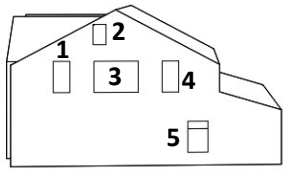
6.2.1 Castlemoyne Road

Based on the above, the following locations have been modelled:

Castlemoyne Road



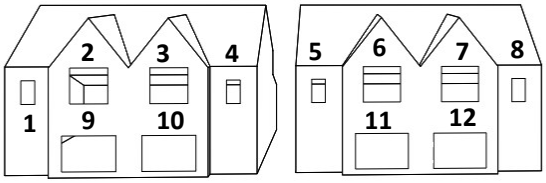
6.2.1.1 House -01



Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed VSC as % of Existing Scheme	Comment
1	38.72	36.78	95%	✓
2	38.96	37.04	95%	✓
3	38.68	36.68	95%	✓
4	38.85	36.34	94%	✓
5	38.39	35.71	93%	✓

✓ All of the tested points have a Proposed VSC greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) and therefore exceed BRE recommendations.

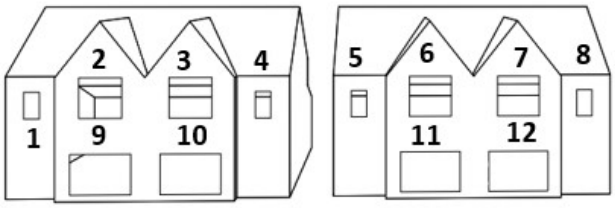
6.2.1.2 House 02 & 03



Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed VSC as % of Existing Scheme	Comment
1	36.46	34.11	94%	✓
2	38.45	35.6	93%	✓
3	38.36	35.64	93%	✓
4	36.54	33.67	92%	✓
5	36.6	33.52	92%	✓
6	38.45	35.04	91%	✓
7	38.42	35.15	91%	✓
8	36.42	33.14	91%	✓
9	37.96	34.68	91%	✓
10	37.77	34.76	92%	✓
11	37.78	34.29	91%	✓
12	37.81	34.01	90%	✓

✓ All of the tested points have a Proposed VSC greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) and therefore exceed BRE recommendations.

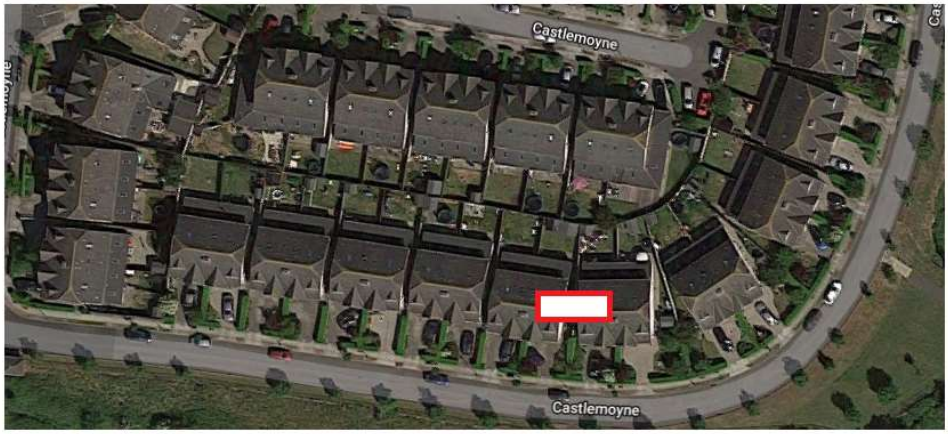
6.2.1.3 House 04 & 05

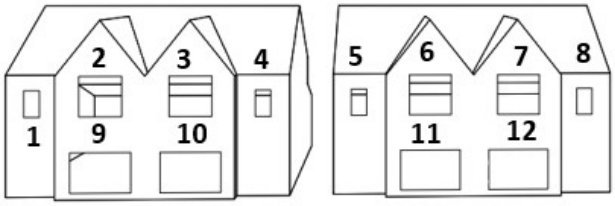


Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed VSC as % of Existing Scheme	Comment
1	36.25	33.7	93%	✓
2	38.49	34.84	91%	✓
3	38.39	34.47	90%	✓
4	36.26	32.44	89%	✓
5	36.2	32.47	90%	✓
6	38.41	34.37	89%	✓
7	38.4	34.3	89%	✓
8	36.03	31.55	88%	✓
9	37.86	33.63	89%	✓
10	37.63	33.24	88%	✓
11	37.78	32.6	86%	✓
12	37.39	32.77	88%	✓

✓ All of the tested points have a Proposed VSC greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) and therefore exceed BRE recommendations.

6.2.1.4 House 06 & 07

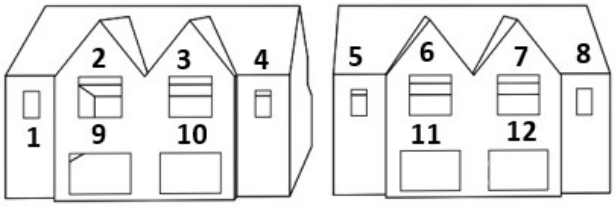




Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed VSC as % of Existing Scheme	Comment
1	36.24	32.14	89%	✓
2	38.34	33.86	88%	✓
3	38.2	33.77	88%	✓
4	36.1	31.49	87%	✓
5	35.97	31.56	88%	✓
6	38.28	33.48	87%	✓
7	38.13	33.67	88%	✓
8	35.93	31.65	88%	✓
9	37.36	32.38	87%	✓
10	37.31	32.3	87%	✓
11	37.25	31.88	86%	✓
12	37.28	31.74	85%	✓

✓ All of the tested points have a Proposed VSC greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) and therefore exceed BRE recommendations.

6.2.1.5 House -08 & 09

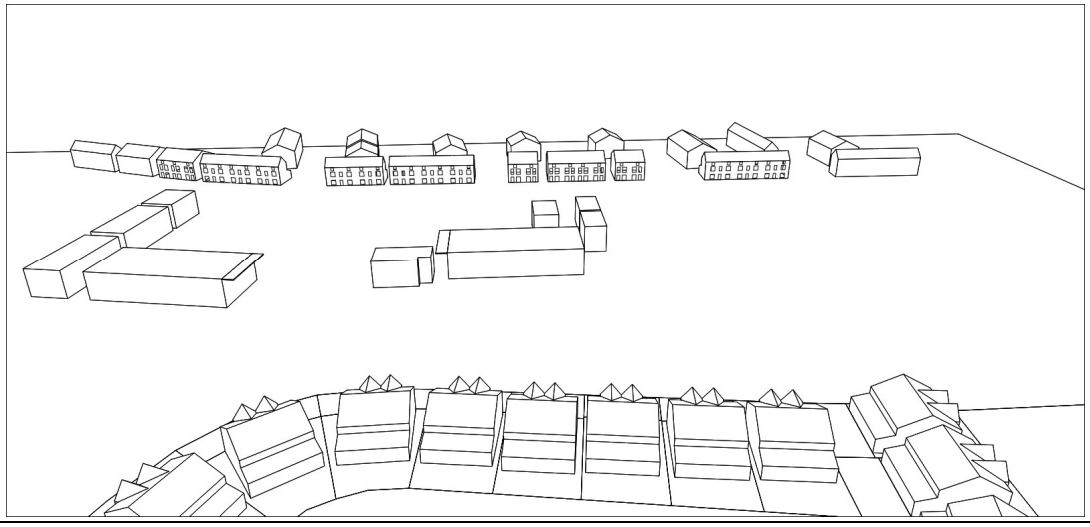


Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed VSC as % of Existing Scheme	Comment
1	36.27	32.51	90%	✓
2	38.62	34.82	90%	✓
3	38.38	35.34	92%	✓
4	36.38	33.81	93%	✓
5	36.9	35.65	97%	✓
6	38.81	37.81	97%	✓
7	38.82	37.96	98%	✓
8	37.1	36.12	97%	✓
9	37.66	33.45	89%	✓
10	38.03	34.33	90%	✓
11	38.67	37.38	97%	✓
12	38.58	37.49	97%	✓

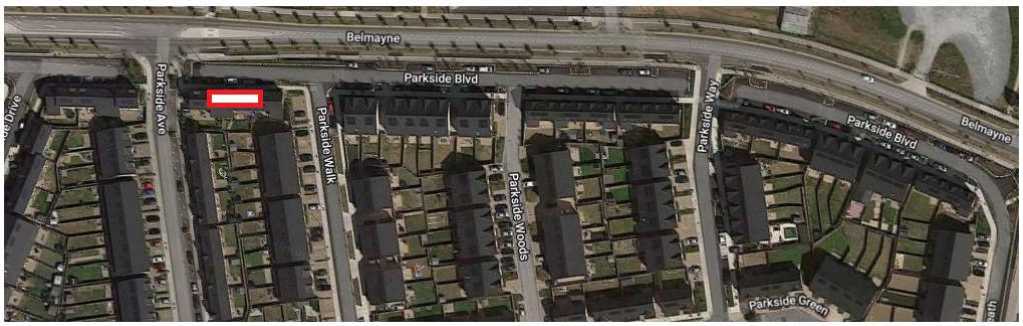
✓ All of the tested points have a Proposed VSC greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) and therefore exceed BRE recommendations.

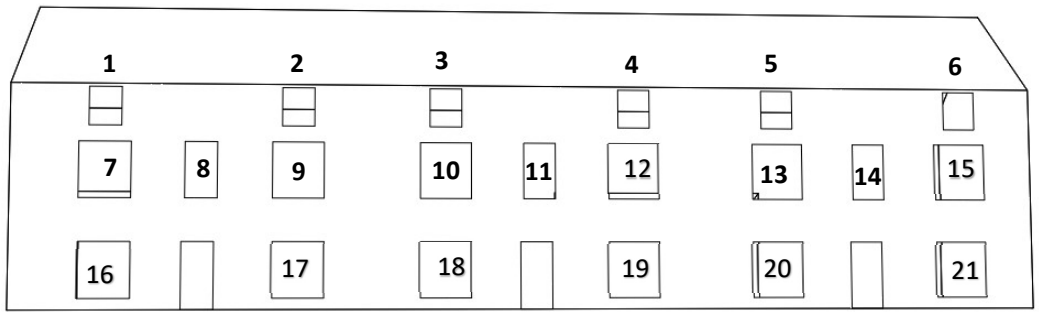
6.2.2 Parkside Boulevard

Based on the above, the following locations have been modelled:



6.2.2.1 House – 01



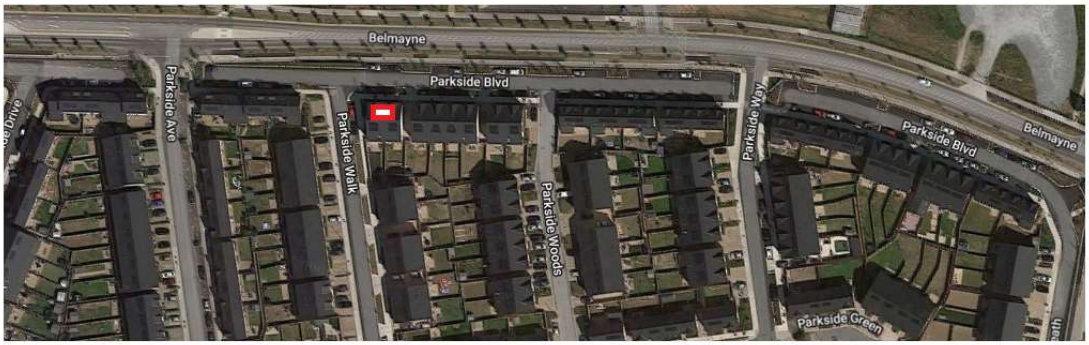


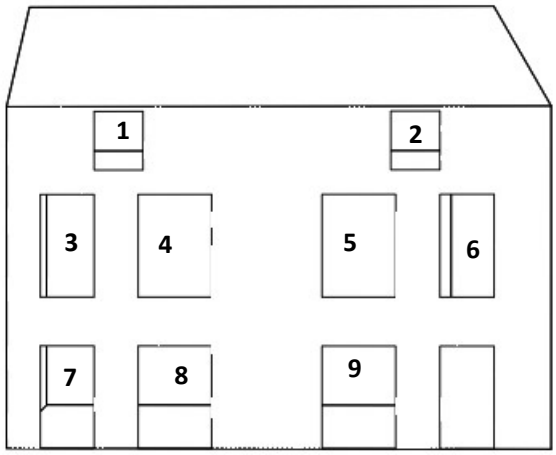
Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed VSC as % of Existing Scheme	Comment
1	38.91	36.11	93%	✓
2	38.97	36.51	94%	✓
3	39.01	36.93	95%	✓
4	39.05	37.07	95%	✓
5	39	37.23	95%	✓
6	39.14	37.59	96%	✓
7	38.8	35.59	92%	✓
8	38.82	35.6	92%	✓
9	38.79	35.87	92%	✓
10	38.9	36.45	94%	✓
11	38.8	36.49	94%	✓
12	38.88	36.85	95%	✓
13	38.82	37.26	96%	✓
14	38.84	37.26	96%	✓
15	38.99	37.27	96%	✓
16	38.34	34.85	91%	✓
17	38.39	35.36	92%	✓

18	38.41	35.67	93%	✓
19	38.52	36.07	94%	✓
20	38.53	36.69	95%	✓
21	38.63	36.92	96%	✓

✓ All of the tested points have a Proposed VSC greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) and therefore exceed BRE recommendations.

6.2.2.2 House – 02

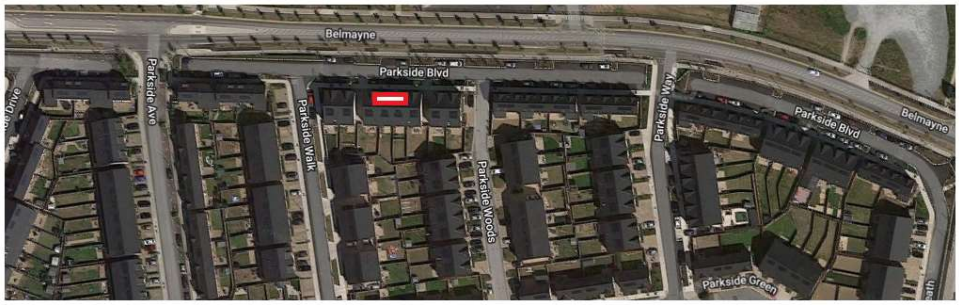


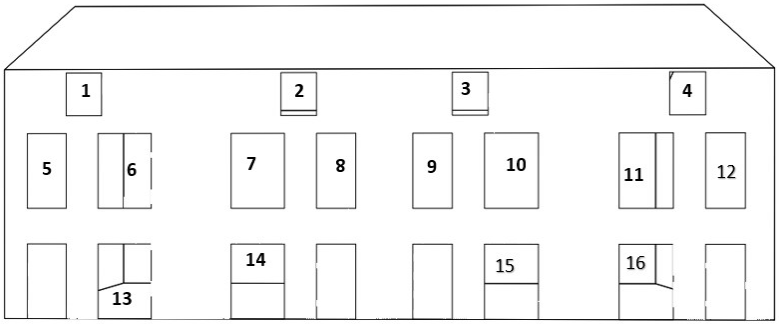


Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed VSC as % of Existing Scheme	Comment
1	39.03	33.86	87%	✓
2	38.8	33.9	87%	✓
3	38.49	32.95	86%	✓
4	38.52	32.88	85%	✓
5	38.61	33.35	86%	✓
6	38.64	32.82	85%	✓
7	37.88	31.68	84%	✓
8	37.82	31.29	83%	✓
9	37.93	31.77	84%	✓

✓ All of the tested points have a Proposed VSC greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) and therefore exceed BRE recommendations.

6.2.2.3 House – 03

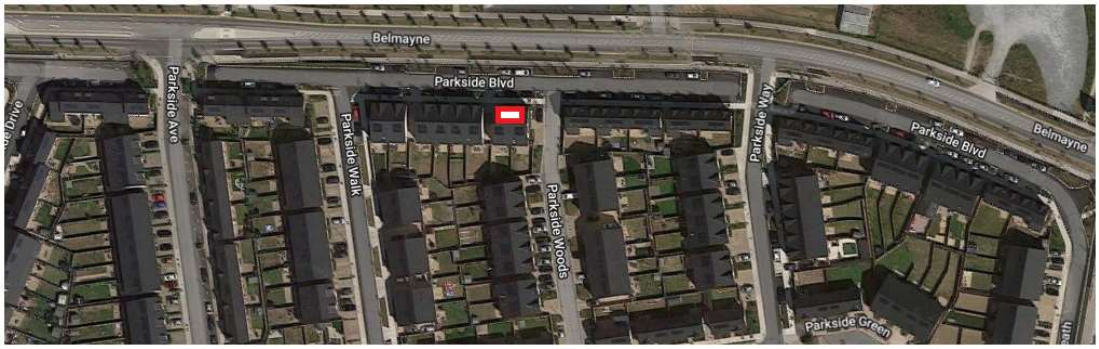


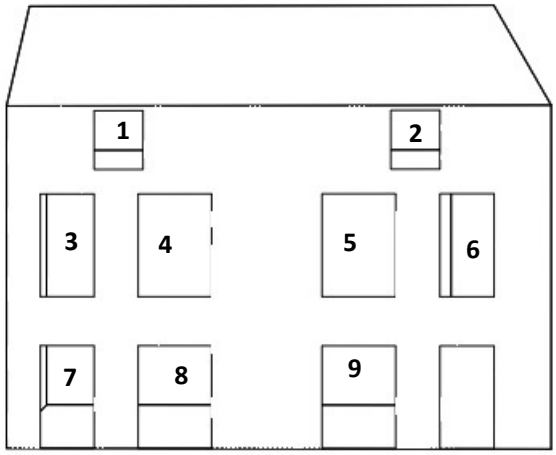


Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed VSC as % of Existing Scheme	Comment
1	38.68	33.32	86%	✓
2	38.81	33.56	86%	✓
3	38.71	33.82	87%	✓
4	38.79	33.63	87%	✓
5	38.18	32.19	84%	✓
6	38.25	32.29	84%	✓
7	38.21	32.54	85%	✓
8	38.26	32.6	85%	✓
9	38.3	32.39	85%	✓
10	38.44	32.44	84%	✓
11	38.31	32.89	86%	✓
12	38.45	32.6	85%	✓
13	37.41	30.84	82%	✓
14	37.32	30.81	83%	✓
15	37.61	30.99	82%	✓
16	37.77	31.41	83%	✓

✓ All of the tested points have a Proposed VSC greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) and therefore exceed BRE recommendations.

6.2.2.4 House – 04

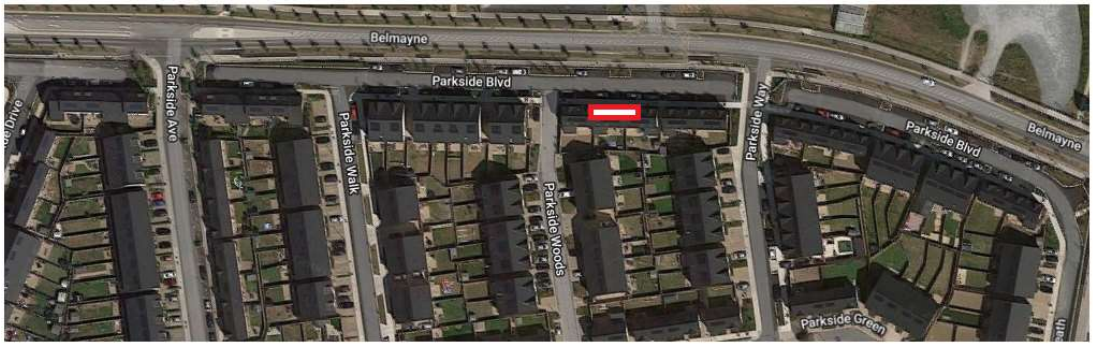


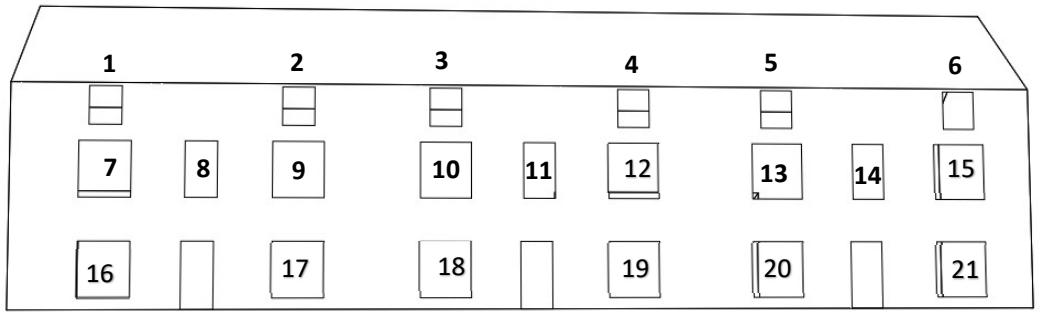


Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed VSC as % of Existing Scheme	Comment
1	38.65	33.04	85%	✓
2	38.82	33.05	85%	✓
3	38.06	32.07	84%	✓
4	38	31.68	83%	✓
5	38.25	31.95	84%	✓
6	38.07	31.99	84%	✓
7	37.24	30.11	81%	✓
8	37.15	30.36	82%	✓
9	37.31	30.23	81%	✓

✓ All of the tested points have a Proposed VSC greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) and therefore exceed BRE recommendations.

6.2.2.5 House – 05



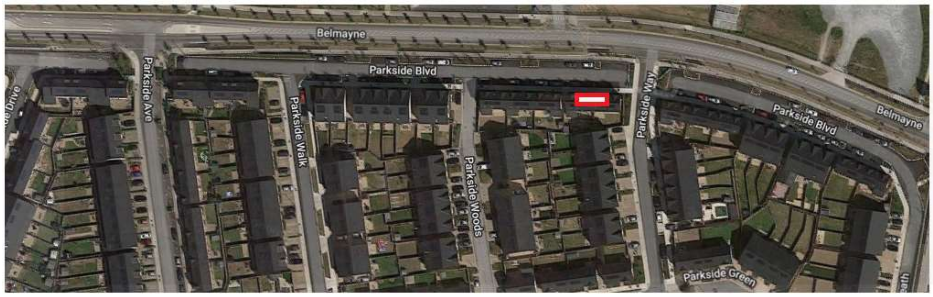


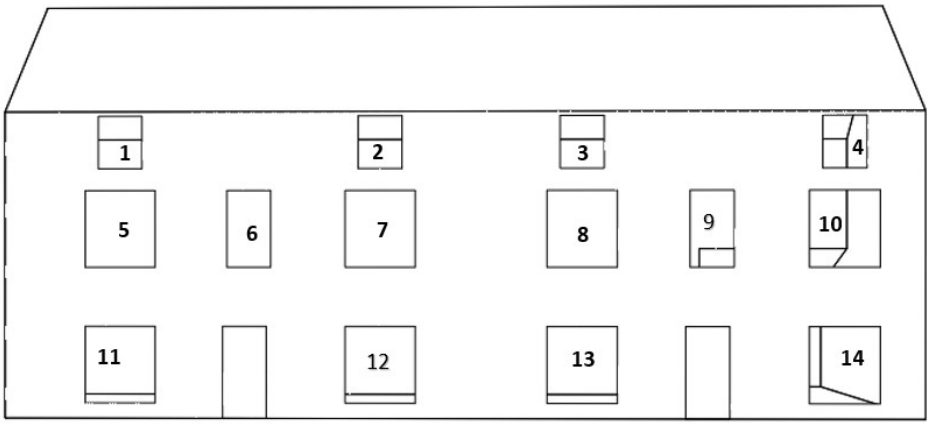
Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed VSC as % of Existing Scheme	Comment
1	38.79	32.99	85%	✓
2	38.82	33.12	85%	✓
3	38.71	33.36	86%	✓
4	38.83	33.54	86%	✓
5	38.85	33.32	86%	✓
6	38.86	33.17	85%	✓
7	38.29	32.26	84%	✓
8	38.3	32	84%	✓
9	38.25	31.97	84%	✓
10	38.33	32.26	84%	✓
11	38.32	32.24	84%	✓
12	38.25	32.04	84%	✓
13	38.23	32.33	85%	✓
14	38.11	32.34	85%	✓
15	38.32	32.33	84%	✓
16	37.48	30.38	81%	✓
17	37.37	30.37	81%	✓

18	37.47	30.42	81%	✓
19	37.4	30.86	83%	✓
20	37.48	30.7	82%	✓
21	37.33	30.48	82%	✓

✓ All of the tested points have a Proposed VSC greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) and therefore exceed BRE recommendations.

6.2.2.6 House – 06

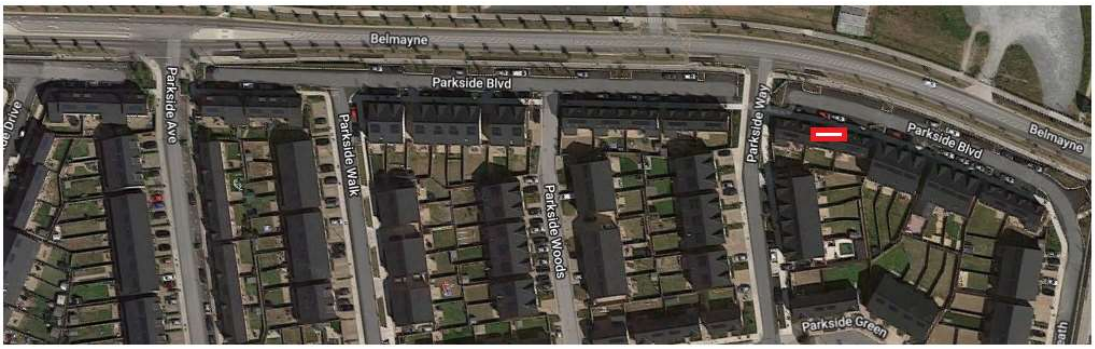


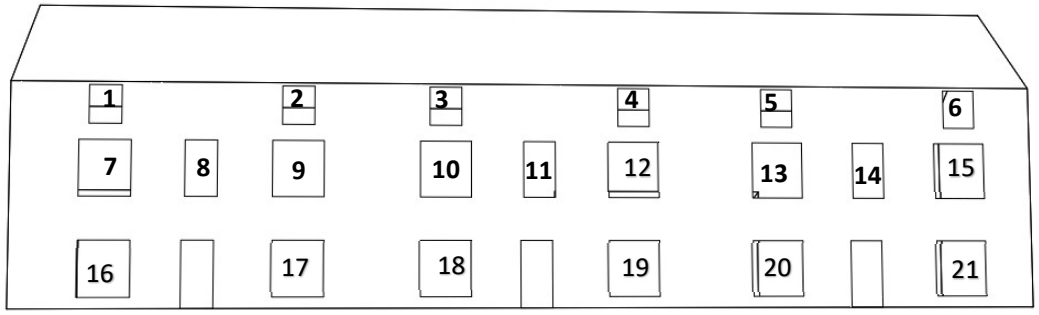


Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed VSC as % of Existing Scheme	Comment
1	38.74	33.05	85%	✓
2	38.62	32.89	85%	✓
3	38.81	33.11	85%	✓
4	38.74	32.81	85%	✓
5	38.12	32.28	85%	✓
6	38.39	31.98	83%	✓
7	38.19	31.57	83%	✓
8	38.15	31.82	83%	✓
9	38.35	31.833	83%	✓
10	38.19	31.45	82%	✓
11	37.34	30.45	82%	✓
12	37.35	30.57	82%	✓
13	37.23	30.09	81%	✓
14	38.38	30.76	80%	✓

✓ All of the tested points have a Proposed VSC greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) and therefore exceed BRE recommendations.

6.2.2.7 House – 07



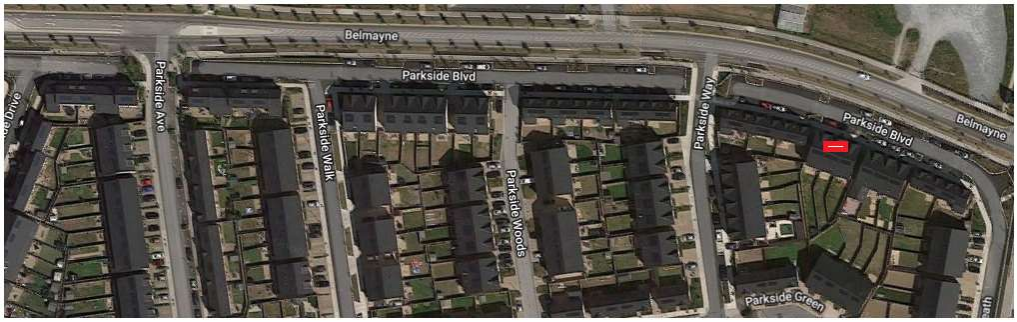


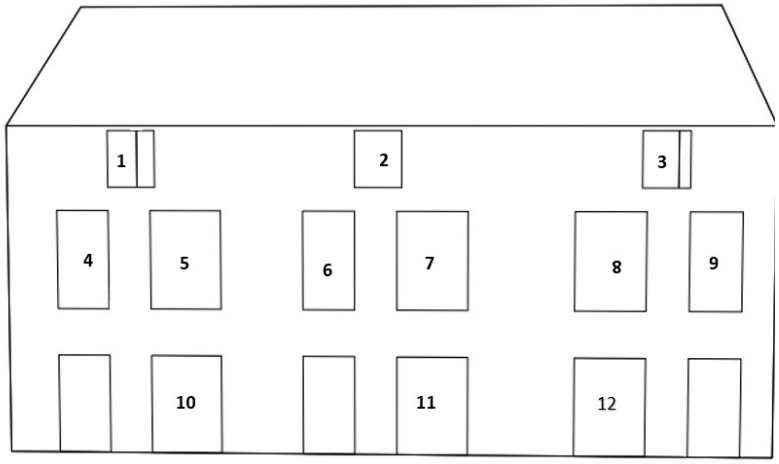
Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed VSC as % of Existing Scheme	Comment
1	38.75	34.82	90%	✓
2	38.79	33.85	87%	✓
3	38.76	33.91	87%	✓
4	38.68	33.58	87%	✓
5	39.67	33.29	84%	✓
6	38.66	33.32	86%	✓
7	38.57	34.17	89%	✓
8	38.42	33.48	87%	✓
9	38.23	33.41	87%	✓
10	38.19	32.8	86%	✓
11	38.2	32.83	86%	✓
12	38.33	32.7	85%	✓
13	38.17	32.13	84%	✓
14	38.03	32.52	86%	✓
15	38.07	32.59	86%	✓
16	37.72	33.05	88%	✓

17	37.63	32.1	85%	✓
18	37.6	31.68	84%	✓
19	37.19	31.27	84%	✓
20	37.12	31.05	84%	✓
21	37.14	30.95	83%	✓

✓ All of the tested points have a Proposed VSC greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) and therefore exceed BRE recommendations.

6.2.2.8 House – 08





Points	Existing Scheme VSC	Proposed Scheme VSC	Proposed VSC as % of Existing Scheme	Comment
1	38.91	37.1	95%	✓
2	38.89	36.58	94%	✓
3	38.95	36.09	93%	✓
4	38.76	36.86	95%	✓
5	38.73	36.57	94%	✓
6	38.5	36.34	94%	✓
7	38.55	36.13	94%	✓
8	38.56	35.61	92%	✓
9	38.6	35.38	92%	✓
10	38.4	36.01	94%	✓
11	38.08	35.37	93%	✓
12	38.2	34.79	91%	✓

✓ All of the tested points have a Proposed VSC greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) and therefore exceed BRE recommendations.

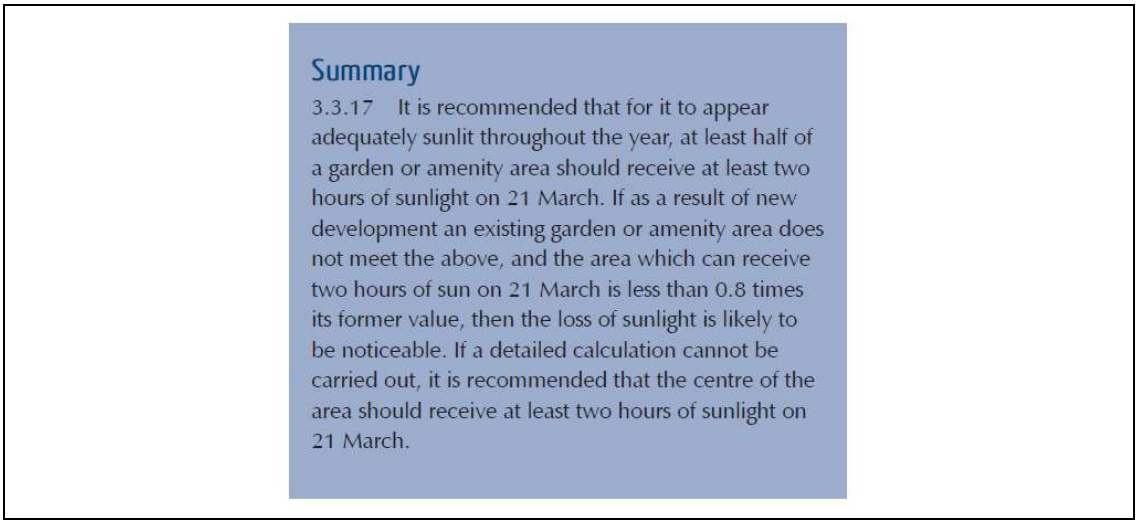
6.3 Observation

For the residential dwellings considered on Castlemoyne Road and Parkside Boulevard, all of the test points have a Proposed VSC greater than 27% or not less than 0.8 times their former value (that of the Existing Situation) and therefore exceed BRE recommendations.

7 Sunlight to Existing and Proposed Amenity Spaces

7.1 Requirements

The impact of the development proposal on the sunlight availability in the amenity areas will be considered to determine how they 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.

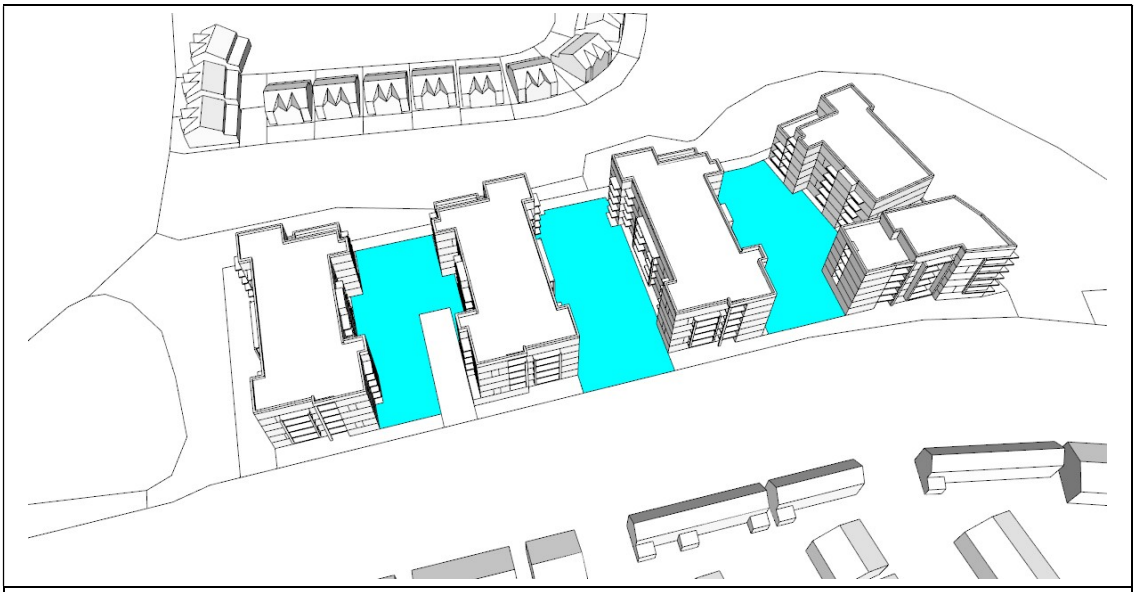
BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight states in 3.3.17 that for a space to, appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least 2 hours of sunlight on 21st March.

7.2 Proposed Amenity Areas

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 as noted in the BRE guidelines.

This analysis will be performed for the proposed amenity spaces as shown in the images below:

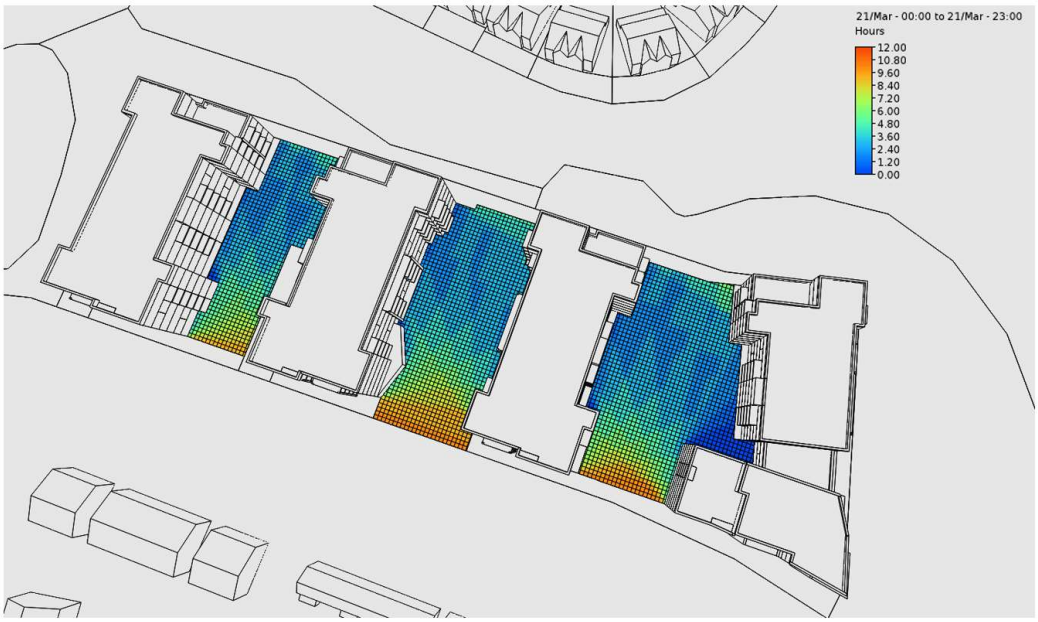
7.2.1 Proposed Scheme



Proposed Scheme Amenity Areas

The following images shows the predicted results with respect to this space receiving the absolute hours of sunlight and at least 2 hours of sunlight on 21st March, across the gridded cells.

Proposed Scheme: Absolute Scale showing all hours of sunlight received



Proposed Scheme: showing hours > 2 in red

7.2.2 Observations

As noted under Section 3.3.17 of BRE's Site Layout Planning for Daylight and Sunlight states 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.

The images above highlight almost 100% of the amenity areas would receive at least 2 hours of sunlight exceeding the BRE recommendations.

8 Average Daylight Factors

This section addresses daylight to the proposed apartments.

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.

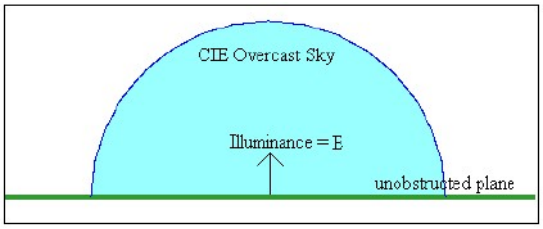
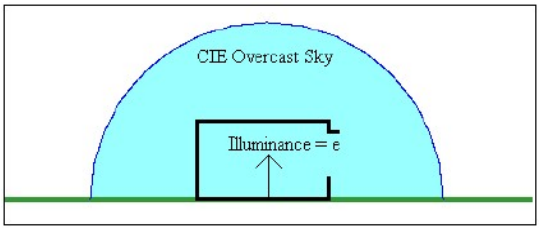
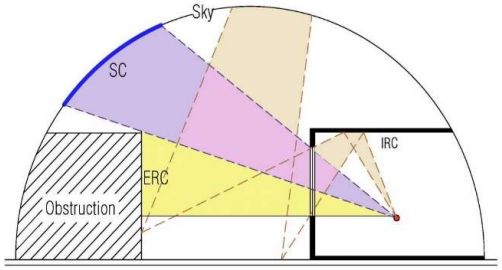
From BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight

From this the recommended Average Daylight Factors (ADF) are therefore:

- Bedrooms 1.0%
- Living Rooms 1.5%

This study will consider the predicted ADF to the proposed apartments. Analysis was performed using RadianceIES, a module of IES VE to quantify the following metrics.

ADF 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 a CIE overcast sky. This represents a diffuse sky and no direct sunlight is accounted.

For ADF there are three possible paths along which diffuse light can enter the room through glazed windows:

a) Light from the sky patch visible at the point considered, expressed as the sky component.
b) Light reflected from opposing exterior surfaces and then reaches the point, expressed as the externally reflected component.
c) Light entering through the window but reaching the point only after reflection from internal surfaces, expressed as the internally reflected component.

8.1 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
- Ground Floor - Floor to Ceiling Height — 2.70 m
- First Floor - Floor to Ceiling Height — 2.45 m

The following surface reflectance's were used:

Material Surface	Reflectance
External Wall	0.50
Internal Partition	0.50
Roof	0.20
Ground	0.20
Floor/Ceiling (Floor)	0.20
Floor/Ceiling (Ceiling)	0.70

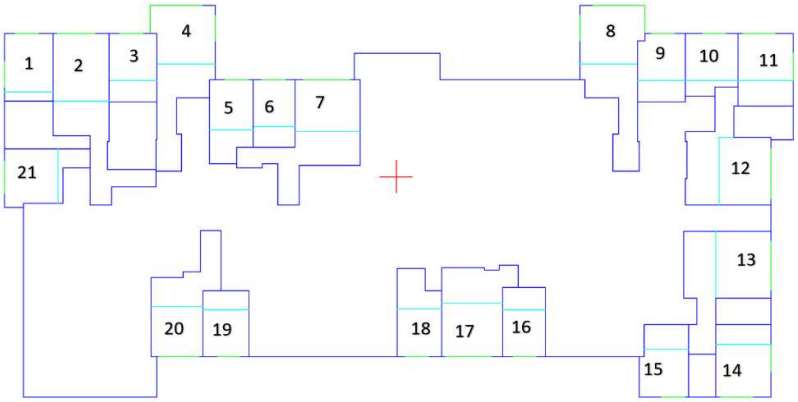
Glazing Transmittance:

- Light Transmittance — 70%
- Assumed Window Frame thickness — 50 mm

8.2 Rooms Considered for Analysis

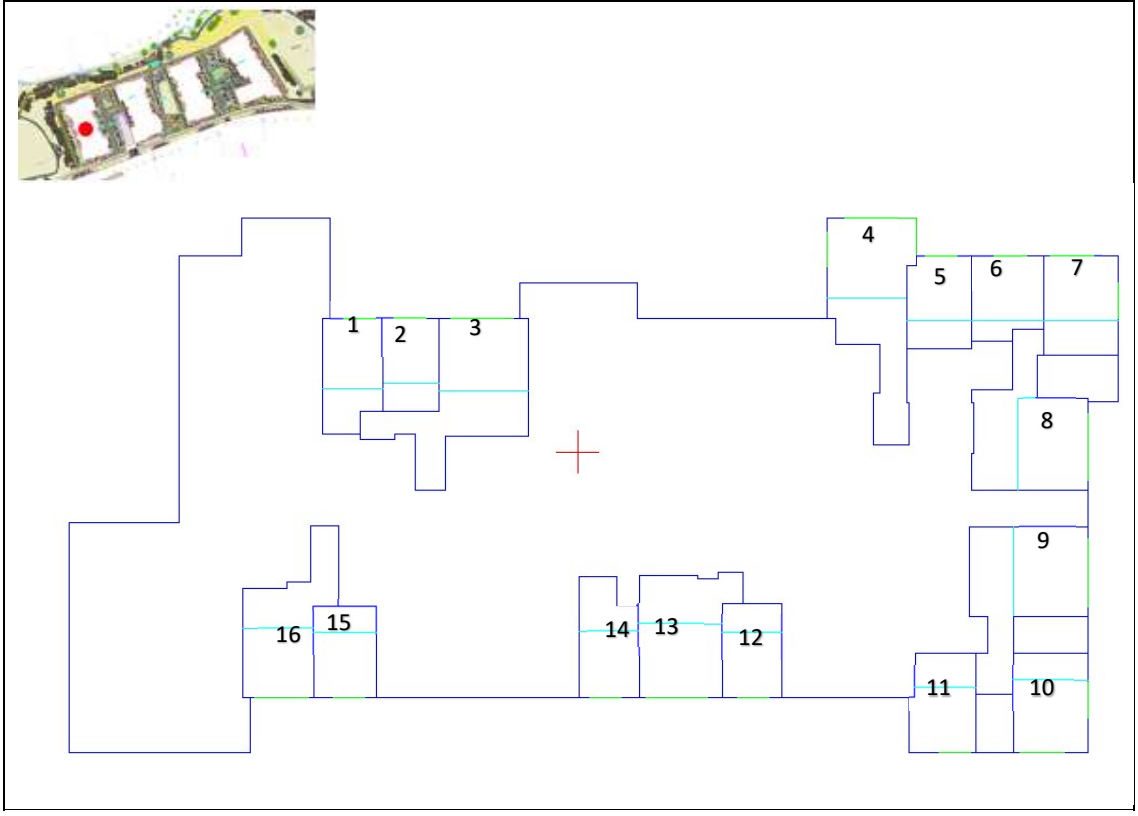
8.2.1 Block A

Level 01



Room Reference	Room Name	Room Activity	External Window Area	Average Daylight Factor	BRE Recommendation
1	L01: A1_Bedroom 02	Bedroom	7.65	3.66	✓
2	L01: A1_Living	Living	6.075	1.52	✓
3	L01: A2_Bedroom 01	Bedroom	3.6	0.89	x
4	L01: A2_Living	Living	16.65	6.33	✓
5	L01: A3_Bedroom 01	Bedroom	3.6	1.47	✓
6	L01: A3_Bedroom 02	Bedroom	3.6	1.61	✓
7	L01: A3_Living	Living	7.2	1.32	x
8	L01: A4_Living	Living	16.537	5.92	✓
9	L01: A4_Bedroom 01	Bedroom	3.6	0.77	x
10	L01: A5_Bedroom 02	Bedroom	3.6	1.66	✓
11	L01: A5_Bedroom 01	Bedroom	9.112	4.96	✓
12	L01: A5_Living	Living	7.65	1.97	✓
13	L01: A6_Living	Living	7.65	2.19	✓
14	L01: A6_Bedroom 01	Bedroom	9.112	5.55	✓
15	L01: A6_Bedroom 02	Bedroom	3.6	2.36	✓
16	L01: A7_Bedroom 02	Bedroom	3.6	2.34	✓
17	L01: A7_Living	Living	7.088	1.88	✓
18	L01: A7_Bedroom 01	Bedroom	3.6	2.19	✓
19	L01: A8_Bedroom 01	Bedroom	3.6	2.28	✓
20	L01: A8_Living	Living	6.188	1.81	✓
21	L01: A1_Bedroom 01	Bedroom	5.063	3.04	✓

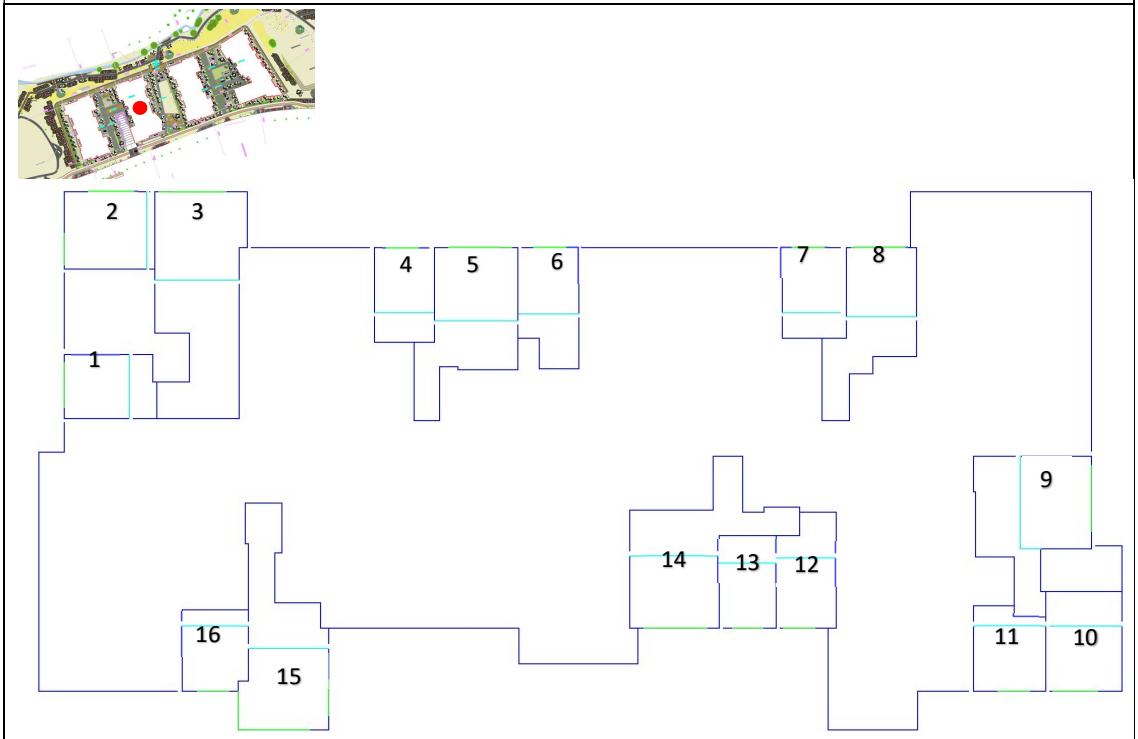
Level 04



Room Reference	Room Name	Room Activity	External Window Area	Average Daylight Factor	BRE Recommendation
1	L04: A1_Bedroom 01	Bedroom	3.6	1.99	✓
2	L04: A1_Bedroom 02	Bedroom	3.6	2.2	✓
3	L04: A1_Living	Living	7.2	1.75	✓
4	L04: A2_Living	Living	16.538	7.52	✓
5	L04: A2_Bedroom 01	Bedroom	3.6	1.01	✓
6	L04: A3_Bedroom 02	Bedroom	3.6	2.14	✓
7	L04: A3_Bedroom 01	Bedroom	9.112	5.63	✓
8	L04: A3_Living	Living	7.65	2.11	✓
9	L04: A4_Living	Living	7.65	2.33	✓
10	L04: A4_Bedroom 01	Bedroom	9.112	5.65	✓
11	L04: A4_Bedroom 02	Bedroom	3.6	2.39	✓
12	L04: A5_Bedroom 02	Bedroom	3.6	2.42	✓
13	L04: A5_Living	Living	7.088	1.94	✓
14	L04: A5_Bedroom 01	Bedroom	3.6	1.37	✓
15	L04: A6_Bedroom 01	Bedroom	3.6	2.35	✓
16	L04: A6_Living	Living	6.188	1.92	✓

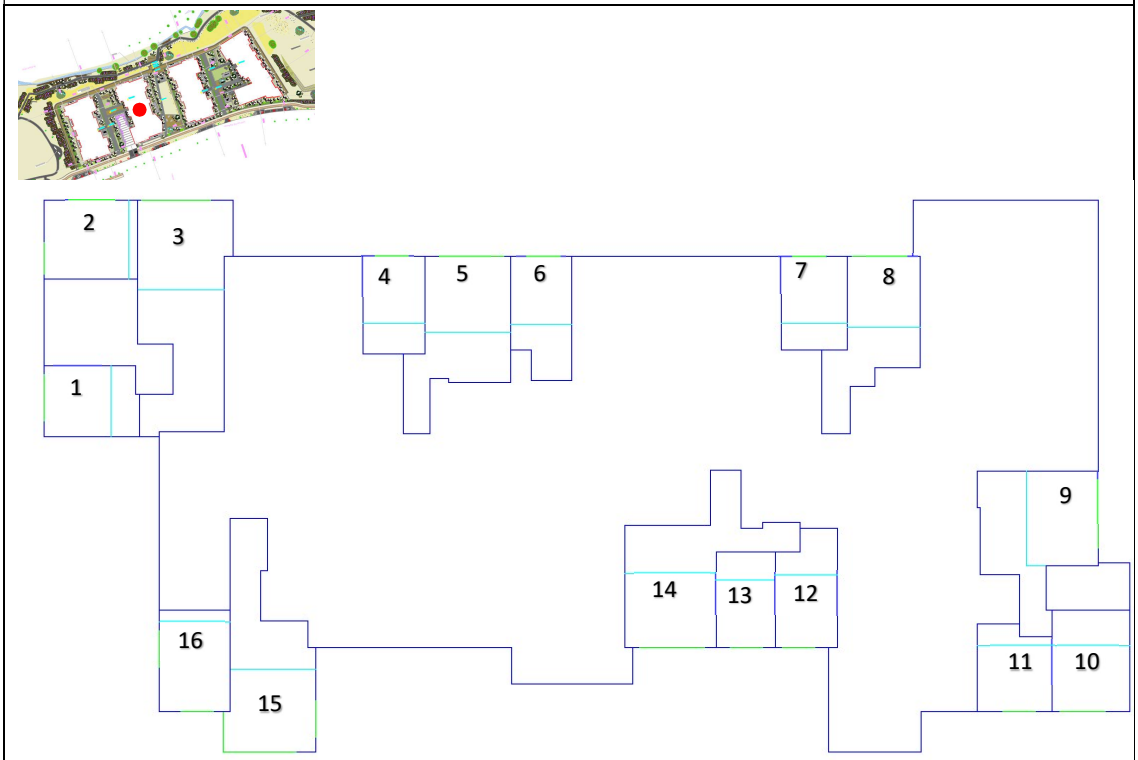
8.2.2 Block B

Level 01



Room Reference	Room Name	Room Activity	External Window Area	Average Daylight Factor	BRE Recommendation
1	L01: B1_Bedroom 02	Bedroom	5.063	3.31	✓
2	L01: B1_Bedroom 01	Bedroom	8.663	4.33	✓
3	L01: B1_Living	Living	7.65	1.82	✓
4	L01: B2_Bedroom 02	Bedroom	3.6	1.59	✓
5	L01: B2_Living	Living	7.087	1.37	x
6	L01: B2_Bedroom 01	Bedroom	3.6	1.47	✓
7	L01: B3_Bedroom 01	Bedroom	3.6	1.52	✓
8	L01: B3_Living	Living	6.187	1.25	x
9	L01: B4_Living	Living	7.537	1.95	✓
10	L01: B4_Bedroom 01	Bedroom	5.063	2.36	✓
11	L01: B4_Bedroom 02	Bedroom	3.6	1.53	✓
12	L01: B5_Bedroom 01	Bedroom	3.6	1.46	✓
13	L01: B5_Bedroom 02	Bedroom	3.6	1.57	✓
14	L01: B5_Living	Living	7.2	1.27	x
15	L01: B6_Living	Living	16.537	6.11	✓
16	L01: B6_Bedroom 01	Bedroom	3.6	0.86	x

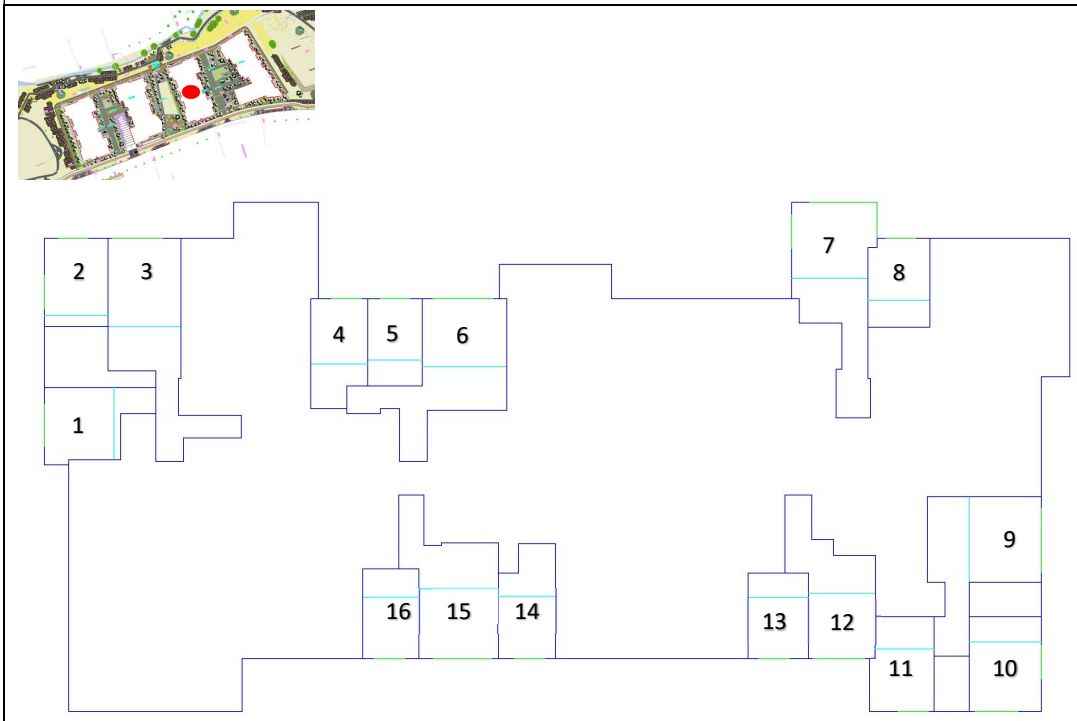
Level 04



Room Reference	Room Name	Room Activity	External Window Area	Average Daylight Factor	BRE Recommendation
1	L04: B1_Bedroom 02	Bedroom	5.063	3.51	✓
2	L04: B1_Bedroom 01	Bedroom	8.663	4.99	✓
3	L04: B1_Living	Living	7.65	2.25	✓
4	L04: B2_Bedroom 02	Bedroom	3.6	2.21	✓
5	L04: B2_Living	Living	7.087	1.75	✓
6	L04: B2_Bedroom 01	Bedroom	3.6	1.21	✓
7	L04: B3_Bedroom 01	Bedroom	3.6	2.13	✓
8	L04: B3_Living	Living	6.187	1.68	✓
9	L04: B4_Living	Living	7.537	2.09	✓
10	L04: B4_Bedroom 01	Bedroom	5.062	3.04	✓
11	L04: B4_Bedroom 02	Bedroom	3.6	2.04	✓
12	L04: B5_Bedroom 01	Bedroom	3.6	1.97	✓
13	L04: B5_Bedroom 02	Bedroom	3.6	2.25	✓
14	L04: B5_Living	Living	7.2	1.73	✓
15	L04: B6_Living	Living	16.537	7.92	✓
16	L04: B6_Bedroom 01	Bedroom	7.65	3.31	✓

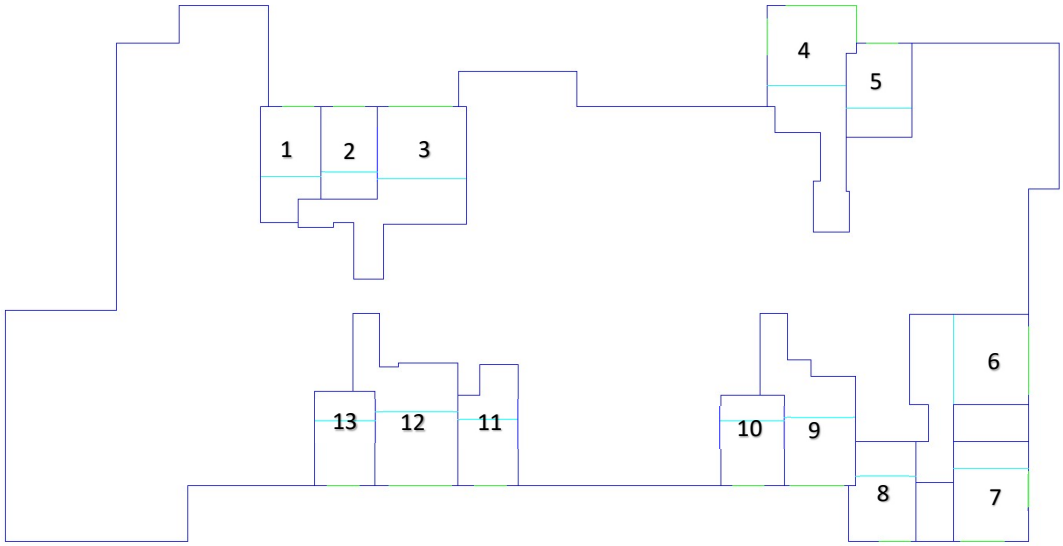
8.2.3 Block C

Level 01



Room Reference	Room Name	Room Activity	External Window Area	Average Daylight Factor	BRE Recommendation
1	L01: C1_Bedroom 01	Bedroom	5.062	3.04	✓
2	L01: C1_Bedroom 02	Bedroom	7.65	3.64	✓
3	L01: C1_Living	Living	6.075	1.53	✓
4	L01: C2_Bedroom 01	Bedroom	3.6	1.59	✓
5	L01: C2_Bedroom 02	Bedroom	3.6	1.73	✓
6	L01: C2_Living	Living	7.2	1.53	✓
7	L01: C3_Living	Living	16.538	6.41	✓
8	L01: C3_Bedroom 01	Bedroom	3.6	0.75	x
9	L01: C4_Living	Living	7.65	2.17	✓
10	L01: C4_Bedroom 01	Bedroom	9.113	4.78	✓
11	L01: C4_Bedroom 02	Bedroom	3.6	1.74	✓
12	L01: C5_Living	Living	6.188	1.28	x
13	L01: C5_Bedroom 01	Bedroom	3.6	1.56	✓
14	L01: C6_Bedroom 01	Bedroom	3.6	1.47	✓
15	L01: C6_Living	Living	7.087	1.37	x
16	L01: C6_Bedroom 02	Bedroom	3.6	1.59	✓

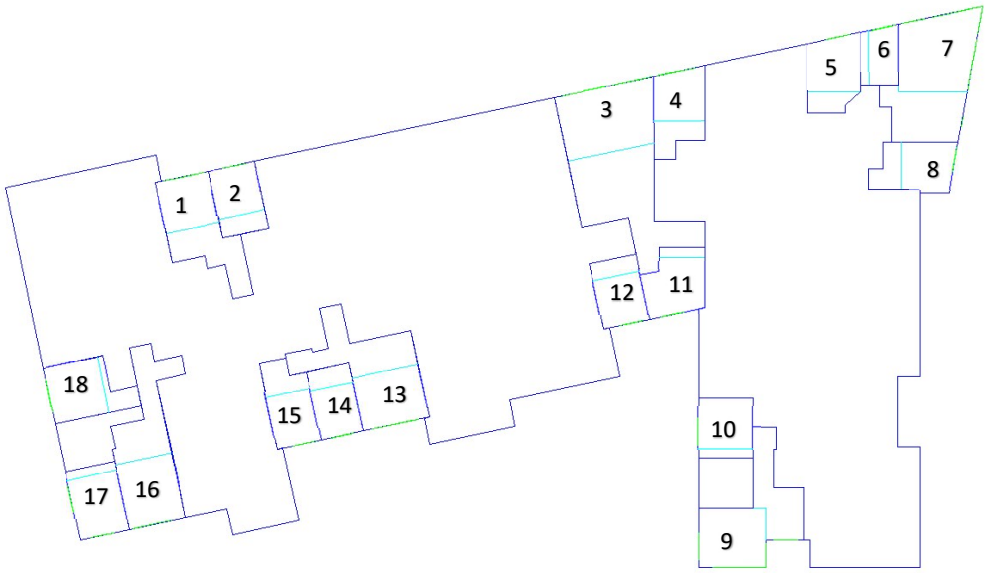
Level 04



Room Reference	Room Name	Room Activity	External Window Area	Average Daylight Factor	BRE Recommendation
1	L04: C1_Bedroom 01	Bedroom	3.6	2.01	✓
2	L04: C1_Bedroom 02	Bedroom	3.6	4.52	✓
3	L04: C1_Living	Living	7.2	1.76	✓
4	L04: C2_Living	Living	16.537	7.87	✓
5	L04: C2_Bedroom 01	Bedroom	3.6	1.01	✓
6	L04: C3_Living	Living	7.65	2.32	✓
7	L04: C3_Bedroom 01	Bedroom	9.112	5.47	✓
8	L04: C3_Bedroom 02	Bedroom	3.6	2.23	✓
9	L04: C4_Living	Living	6.187	1.68	✓
10	L04: C4_Bedroom 01	Bedroom	3.6	2.13	✓
11	L04: C5_Bedroom 01	Bedroom	3.6	1.21	✓
12	L04: C5_Living	Living	7.087	1.75	✓
13	L04: C5_Bedroom 02	Bedroom	3.6	2.21	✓

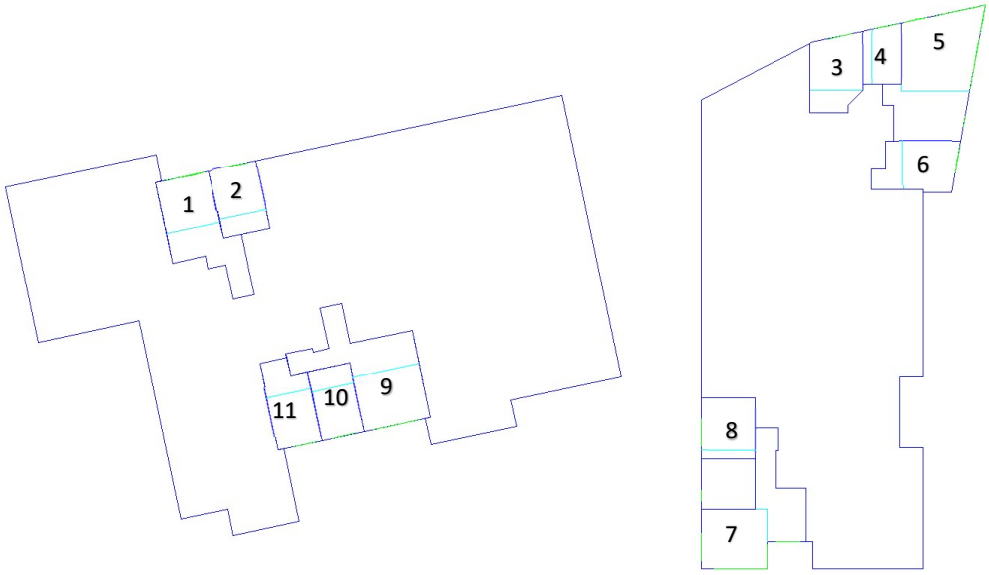
8.2.4 Block D

Level 01



Room Reference	Room Name	Room Activity	External Window Area	Average Daylight Factor	BRE Recommendation
1	L01: D2_Living	Living	6.188	1.87	✓
2	L01: D2_Bedroom 01	Bedroom	3.6	2.3	✓
3	L01: D3_Living	Living	13.163	2.28	✓
4	L01: D3_Bedroom 01	Bedroom	6.075	2.06	✓
5	L01: D4_Bedroom 01	Bedroom	3.6	2.2	✓
6	L01: D4_Bedroom 03	Bedroom	3.6	1.48	✓
7	L01: D4_Living	Living	23.401	4.86	✓
8	L01: D4_Bedroom 02	Bedroom	3.6	2.34	✓
9	L01: D5_Living	Living	15.863	5.89	✓
10	L01: D5_Bedroom 01	Bedroom	4.05	1.29	✓
11	L01: D3_Bedroom 03	Bedroom	7.2	1.03	✓
12	L01: D3_Bedroom 02	Bedroom	3.6	1.59	✓
13	L01: D6_Living	Living	7.2	1.50	✓
14	L01: D6_Bedroom 02	Bedroom	3.6	1.76	✓
15	L01: D6_Bedroom 01	Bedroom	3.6	1.59	✓
16	L01: D1_Living	Living	6.075	1.50	✓
17	L01: D1_Bedroom 02	Bedroom	7.65	3.68	✓
18	L01: D1_Bedroom 01	Bedroom	5.063	3.12	✓

Level 04



Room Reference	Room Name	Room Activity	External Window Area	Average Daylight Factor	BRE Recommendation
1	L04: D1_Living	Living	6.188	1.97	✓
2	L04: D1_Bedroom 01	Bedroom	3.6	2.35	✓
3	L04: D2_Bedroom 01	Bedroom	3.6	2.24	✓
4	L04: D2_Bedroom 03	Bedroom	3.6	1.54	✓
5	L04: D2_Living	Living	23.401	5.05	✓
6	L04: D2_Bedroom 02	Bedroom	3.6	2.4	✓
7	L04: D3_Living	Living	15.863	5.87	✓
8	L04: D3_Bedroom 01	Bedroom	4.05	1.97	✓
9	L04: D4_Living	Living	7.2	1.78	✓
10	L04: D4_Bedroom 02	Bedroom	3.6	2.24	✓
11	L04: D4_Bedroom 01	Bedroom	3.6	1.99	✓

8.2.5 Observations

92% of the tested rooms in the proposed scheme are projected to have an Average Daylight Factors (ADF) above the recommended minimum Average Daylight Factors (ADF) in line with the BRE guidelines.

The 'worst' case locations have been tested on the first and fourth floors i.e. rooms on the upper floors will generally have unobstructed views and should meet the BRE recommendations. As such, the percentage above the recommendations across the scheme would be expected to increase further if all of the upper rooms were included in the analysis.

These are summarised as follows:

Block A

Tested	37	
Bedroom Passes	21	
Living Room Passes	13	
Below BRE recommendations	3	(x2 Bedrooms/1 Living Room)
	92%	

Block B

Tested	32	
Bedroom Passes	19	
Living Room Passes	9	
Below BRE recommendations	4	(1 Bedrooms/x3 Living Rooms)
	88%	

Block C

Tested	29	
Bedroom Passes	17	
Living Room Passes	9	
Below BRE recommendations	3	(1 Bedrooms/x2 Living Rooms)
	90%	

Block D

Tested	29
Bedroom Passes	20
Living Room Passes	9
Below BRE recommendations	0
	100%

Overall Summary Table:

Tested	127
Bedroom Passes	77
Living Room Passes	40
Below BRE recommendations	10
	92%

9 Conclusion

The following can be concluded based on the studies undertaken.

9.1 Shadow Analysis

The Shadow analysis shows different shadows being cast from the existing and proposed schemes at particular periods throughout the year. During spring and summer periods there is no overshadowing to the existing dwellings or in fact any additional shading at all to the Parkside Boulevard dwellings given their southerly position in relation to the proposed development.

When considering the dwellings on Castlemoyne Road to the North, there is additional shading observed, but this is limited to the winter months when the impact caused by overshadowing is generally least noticeable. This would be similar to that experienced in any suburban location of this type. It can be concluded that overall the impact of overshadowing would have a negligible adverse impact on the existing dwellings.

9.2 Daylight Analysis of Existing Buildings (out with the site boundary)

For the residential dwellings considered on Castlemoyne and Belmoyne, all of the points tested have a vertical sky component (VSC) above 27% or not less than 0.8 times their former value (that of the Existing Scheme). Therefore, these points all exceed BRE recommendations.

9.3 Sunlight to Proposed Amenity Spaces

As mentioned above under Section 3.3.17 of BRE's Site Layout Planning for Daylight and Sunlight states that 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, almost 100% of the amenity areas would receive at least 2 hours of sunlight exceeding the BRE recommendations.

9.4 Average Daylight Factors

Based on the results of the rooms tested on First and Fourth floors, 92% of the tested points in the proposed scheme have an Average Daylight Factors (ADF) above the recommended values in line with the BRE guidelines.

This number across the scheme would be expected to increase further if all of the upper rooms were included in the results.

9.5 Observations

It should be noted the guidance in 'Site layout planning for daylight and sunlight: a guide to good practice' is not mandatory and the Report 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.

Overall the results demonstrate that the proposed development performance exceeds 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.

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