INTEGRATED ENVIRONMENTAL SOLUTIONS

Report for: Ballymore
Project No.: 14221

The Connolly Quarter

Project Ref.	Document Title	Rev	Prepared by:	Issue Date	Approved by:
1831	Daylight, Sunlight and Overshadowing Performance Report	P1	JG	09-10-2019	SOB

Version History

Document created by:
Integrated Environmental Solutions Limited
International Sustainability Consulting Developers of the IES **<Virtual Environment>**

Issued For:	**Prepared by:**	**Checked by:**	
Comment	Douglas Bell Project Manager	John Gleeson BE CEng MIEI	
Version:	**Date:**	**Revision Details:**	**Approved by:**
4	07/10/2019	Final Report	John Gleeson

Contents

Appendix 1: BRE Report

Cover Note

This report is completed to quantify the daylight, sunlight and overshadowing performance of the proposed development – The Connolly Quarter.

The original report was presented to Dublin City Council and An Bord Pleanala at pre-application meetings and consultations.

In response to comments made at these meeting by Dublin City Council and An Bord Pleanala we have taken the following actions which are now incorporated into the updated report as presented in the application.

1. We removed by agreement overhanging balconies that had an adverse effect on daylight levels in living rooms below.

2. We increased the glazing to full width in living rooms on the lower levels of the Development to increase daylight penetration.

3. The Development has been designed to ensure greater distances between buildings and building orientation carefully considered to maximise each room's exposure to the sky and daylight.

4. We increased the quantity of rooms tested to demonstrate compliance over the whole Development.

5. There are no North facing apartments.

6. We engaged BRE (who wrote the Daylight and Overshadowing Guideline recommendations) to carry out a full review on the submission and we have taken on board their suggestions particularly in relation to the target Vertical Sky Component (VSC) suitable for the site.

7. We have included the BRE response to the final IES Report in Appendix 1. BRE have confirmed all their recommendations have been incorporated into the IES Report and results as provided are reasonable.

Executive Summary

Following engagement with Dublin City Council and ABP we commissioned the BRE (Building Research Establishment) to review the IES Report and make recommendations to ensure the report as presented complies with the correct interpretation of the BRE guidelines.

BRE have now confirmed (refer Appendix 1) that the IES Report as now presented takes on board the BRE comments and the results as presented are reasonable.

1.0 Sun Light 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. Of the 15 amenity areas analysed, 12 surpass the BRE recommendation. In this particular development, all amenity areas are available to all occupants via first-floor footbridges. It is therefore reasonable to consider the BRE recommendation across the development in whole. Consequently, given that 68% of the amenity areas in the development as a whole receive more than 2 hours of sunlight on March 21st, the Proposed Development exceeds BRE recommendations.

2.0 Average Daylight Factors:

BRE guidelines recommend a daylight factor of 1.0 in bedrooms and 1.5 in living rooms / kitchens. Kitchens are an integral but small part of the living room so the ADF of 1.5% was considered appropriate in this case.

98% of the tested rooms in the proposed scheme are projected to have an Average Daylight Factors (ADF) above the recommended Average Daylight Factors (ADF) from the BRE guidelines. We note from 2 levels above garden level we have achieved 100% pass rate.
The design team believe we have achieved a balance on window design to achieve optimum daylight factor with no adverse effect on heat loss and energy efficiency.

3.0 Shadow Analysis:

In terms of shading on surrounding properties, the impact of the proposed development is almost identical to that from the previously permitted scheme as shown by the images in Section 3.

4.0 Daylight Analysis of Existing Buildings:

Vertical sky component analysis has been completed to ensure the proposed development meets the recommendations of the BRE guidelines. The analysis was completed for the existing neighbouring properties:

- Oriel Hall
- Oriel Street upper
- St Laurence O'Toole Court House Complex

The results within this report show from all of the points tested. The results are as expected for a high rise development and analysed correctly as per BRE Guidelines and of no greater impact than the previously permitted scheme.

5.0 Results:

The results of the studies carried out with input from BRE indicate that we are in compliance with BRE guidelines and confirms that we have provided a considered design for a medium to high rise Dublin City Centre Residential Development.

1 Introduction

This report was completed to quantify the Sunlight / Daylight performance of the proposed mixed-use development referred to as The Connolly Quarter.

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

- **Sunlight to proposed amenity space and gardens** – via annual sunlight hours comparison.
- **Average Daylight Factors** – via average daylight factor calculations carried for floor plans across Blocks B and C of the proposed development. It was not considered necessary to complete any direct sunlight calculations to living rooms as well as the ADF.
- **Shadow Analysis** - A visual representation analysing any potential changes that may arise from the proposed development on to the neighbouring existing developments.
- **Daylight Analysis of Existing Buildings** - via consideration of Vertical sky component (VSC). It was not possible to provide Daylight Distribution Assessments as existing room layouts are not known.

The analysis was completed using the IES VE software.

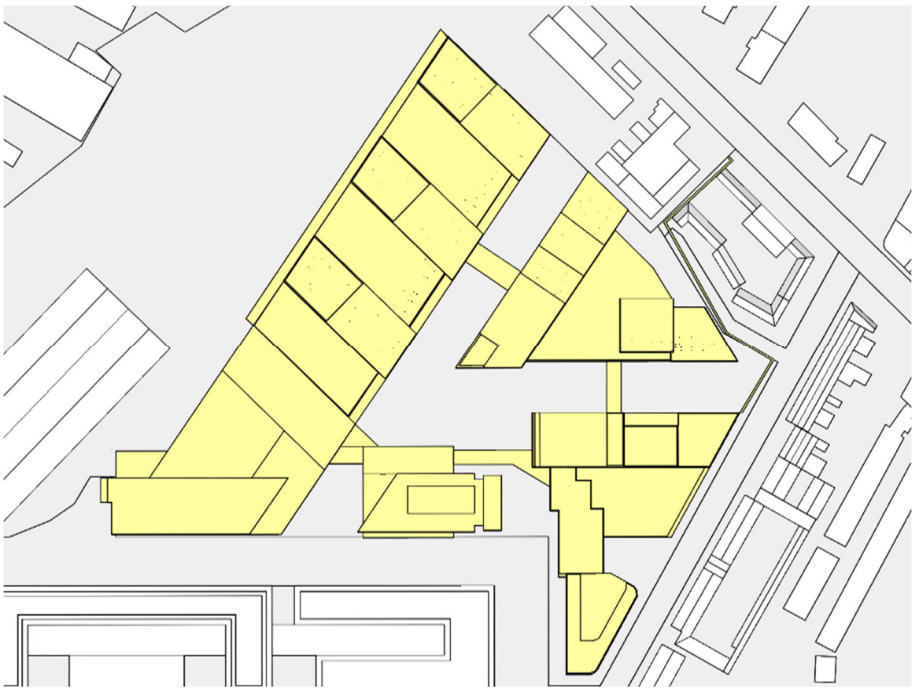
The design team's objective is to exceed the recommendations given in BRE – Site Layout Planning for Daylight and Sunlight guide and as per BRE Report on the Scheme (copy included).

2 Methodology

2.1 Orientation

The model orientation has been taken from drawings provided by RKD architects and the resulting angle shown below is used in the analysis.

Orientation

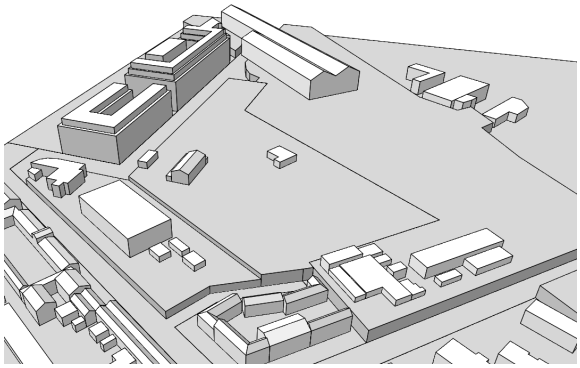
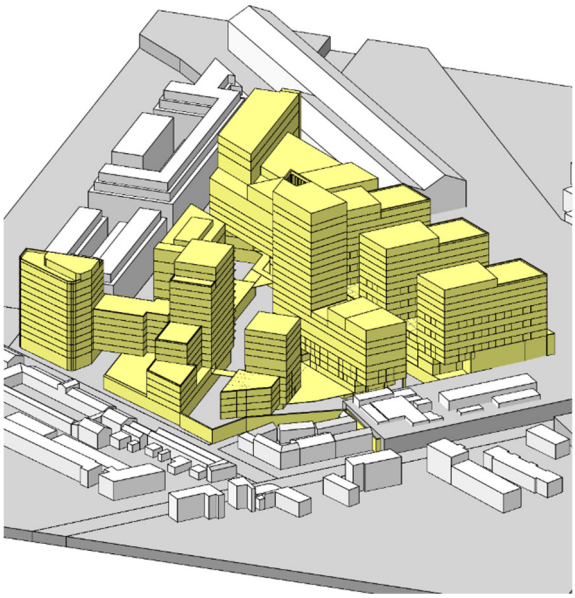
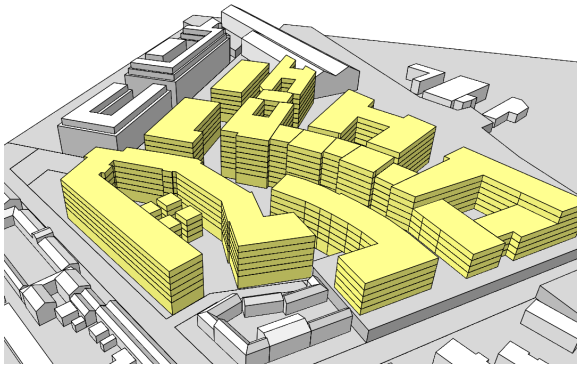


2.2 Proposed models

Given the current vacant character of the site and the relatively large areas of low-density development surrounding the site, the shadow environment of the existing site and its immediate surroundings is inconsistent with what would be typical for an area of the type (urban / industrial docklands)

As such, the analysis will focus on the following two scenarios:

- Previously Permitted Scheme
- Proposed Scheme

<table>
<tr><td>  </td><td rowspan="2">  </td></tr>
<tr><td>Existing Situation</td></tr>
<tr><td>  </td><td rowspan="2"></td></tr>
<tr><td>Previously Permitted Scheme</td></tr>
<tr><td colspan="2">Proposed Scheme</td></tr>
</table>

2.3 Receiving Environment and Potential Sensitive Receptors

The application land is currently a largely vacant site next to Connolly Station in Dublin.

The site is bounded as follows:

- to the East by Oriel Street Upper and Oriel Hall.
- to the South by Sherriff Street Lower
- to the West by the remainder of the largely Connolly Station and railway lines.

The proposed scheme is compared to the Previously Permitted scheme (shown above).

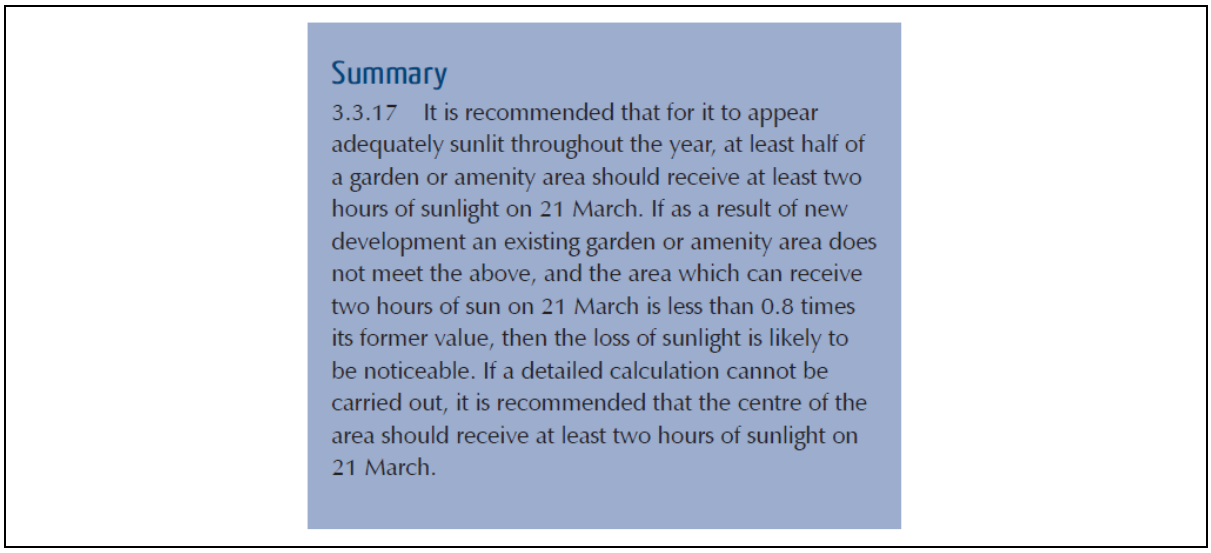
To help understand the potential impact to surrounding buildings potential sensitive receptors were identified as illustrated below.

	Oriel Hall – Residential
	Oriel Street Upper – Residential

3 Sunlight to the Proposed Amenity Spaces

3.1 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.

3.2 Assessment

3.2.1 Methodology

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.

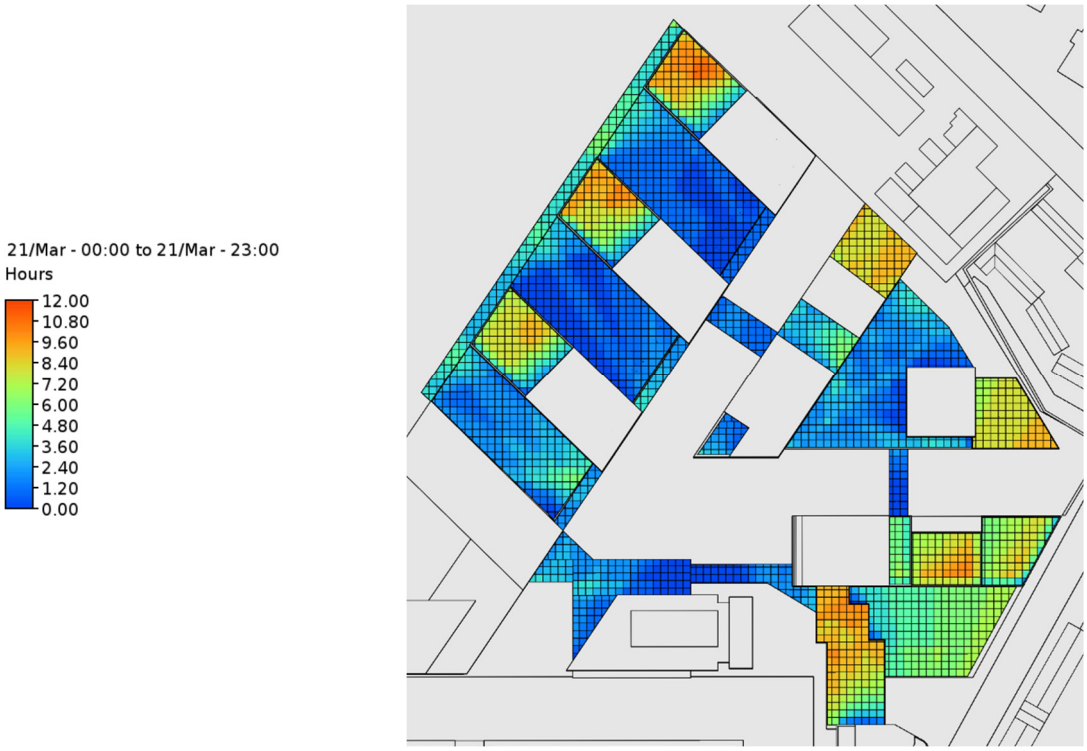
This analysis will be performed on the following proposed amenity spaces as illustrated below:

Proposed Scheme Amenity Areas

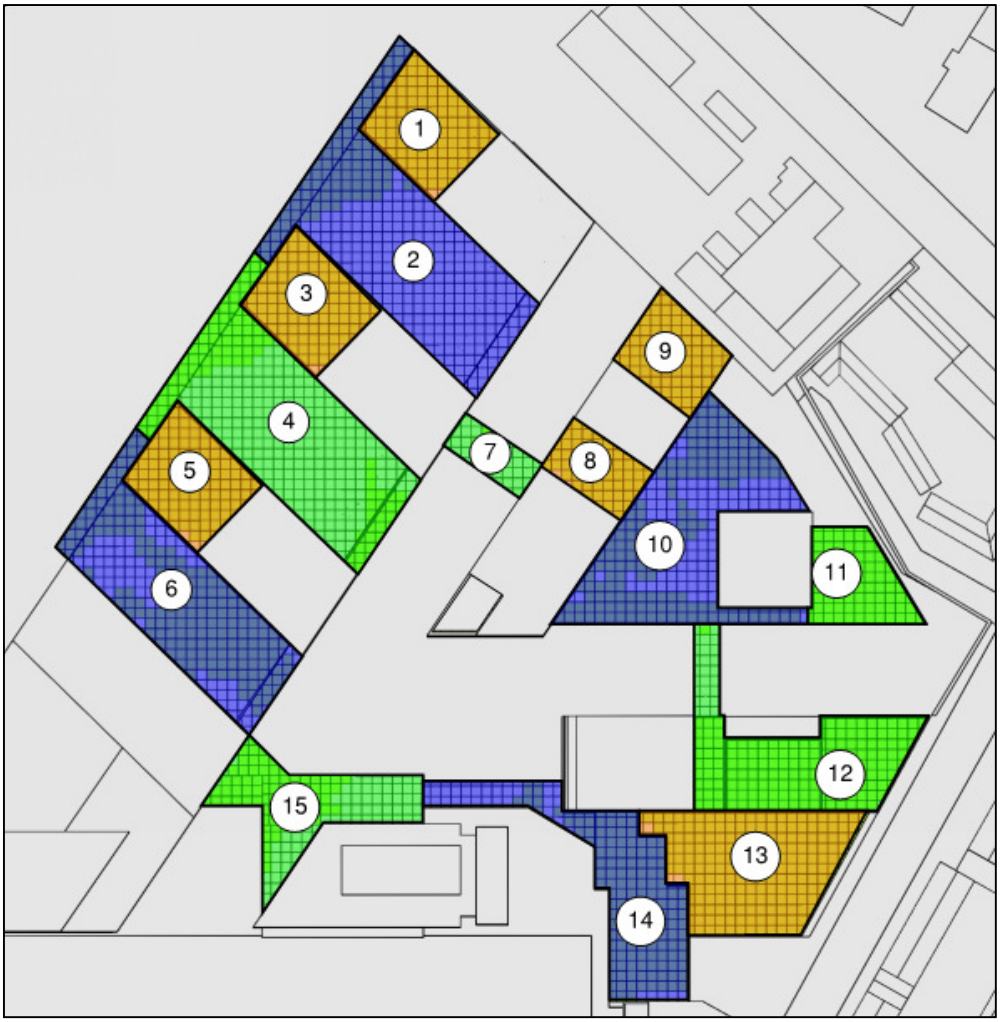
3.2.2 Proposed Amenity Area

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.

Absolute Scale showing all hours



Custom Scale - showing hours > 2 in green (Any gridded cells area below 2 hours are shown as grey)



	Area <2hrs (m^2)	Area >2hrs (m^2)	Total Area (m^2)	% Area >2hrs
1	5	363	368	99%
2	829	319	1148	28%
3	5	363	368	99%
4	795	320	1115	29%
5	8	360	368	98%
6	242	671	913	73%
7	110	19	129	15%
8	4	195	199	98%
9	0	273	273	100%
10	329	634	963	66%
11	0	288	288	100%
12	78	619	697	89%
13	14	694	708	98%
14	124	513	637	81%
15	214	245	459	53%
Overall	2757	5876	8633	68%

The image below illustrates the quality of the proposed amenity on level 04 located between block B1 and B2. The shadows cast are at 12 o'clock on June 21st. The design team have continued this in conjunction with the wind analysis to provide a quality environment which is comfortable and enjoyable for the occupants of the proposed development.

3.3 Discussion

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 noted the following:

Of the 15 amenity areas analysed, 12 surpass the BRE recommendation. Zone 7 serves as a bridge between amenity areas, therefore it is not expected that occupants would spend a significant amount of time there.

Zones 2 and 4 in Block B do not achieve the minimum sunlight provision. However, Block B as whole exceeds the BRE requirement with 56% of its amenity areas receiving more than 2 hours of sunlight on March 21st. Furthermore, in this particular development, all amenity areas are available to all occupants via first-floor footbridges. It is therefore reasonable to consider the BRE recommendation across the development in whole. Occupants living in Block B have easy access to well-lit amenity areas on the rooftops and across the street.

Consequently, given that 68% of the amenity areas in the development as a whole receive more than 2 hours of sunlight on March 21st, the Proposed Development exceeds BRE recommendations.

4 Average Daylight Factors

The full results for the rooms considered can be seen in the following sections. We have tested Level 04 (i.e. garden level) and Level 06 (i.e 2 floors above garden level) i.e. rooms on the upper floors will generally have unobstructed views and will exceed the BRE recommendations.

We have a tested a total of 182 rooms in this sample of which 178 exceed the BRE guidelines. 98% of the tested rooms in the proposed scheme are projected to have an Average Daylight Factors (ADF) above the recommended Average Daylight Factors (ADF) from the BRE guidelines. This overall rate within the proposed scheme would be greater than 98% if all of the upper floors rooms were included in the results.

We note at Level 06 (i.e. 2 floors above garden level) we achieve 100% pass rate.

The design of each Building has been carefully considered to maximise daylight penetration into each apartment. This has been achieved by optimising width and height of windows and eliminating overhead balconies that are causing shading.

This scheme should be considered as the best example on how to achieve and exceed Daylight Factors with such high density and height in a city centre residential development.

The design enables the minimum acceptable Daylight Factors as stated in BRE Guidelines to be achieved in all rooms at the lowest residential levels in the development which are then exceeded as we rise up each floor.

A Daylight Factor of 1.0 in a bedroom equates to 100 lux which is the same as the artificial light level normally applied to a bedroom.

A Daylight Factor of 1.5 in a living room equates to 150 lux which is greater than the artificial light level required in communal areas.

It is important to note that Daylight Factors are an average over the day and are exceeded for large parts of the day.

The above reference Daylight Factors and lighting examples are based on an overcast day with external illuminance of 10,000 lux. On a bright sunny day with external luminance of 30,000 lux, the minimum Daylight Factor of 1.5 in a Living Room would equate to 450 lux which is greater than the artificial light level applied to an office or classroom.

✓ [1] All these rooms have an average daylight factor of not less than the recommended minimum values (1.5% for living rooms and 1.0% for bedrooms) as stated under BRE's 2011 guidance document Site Layout Planning for Daylight and Sunlight. Therefore, these rooms are all compliant with BRE recommendation.

✓ [2] These rooms have a typically lower average daylight factor than the recommended minimum values.

4.1. Values used in ADF Calculations;

The following Surface Reflectance's are to be used in the ADF calculation.

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

Window Light Transmission Factor: 70%

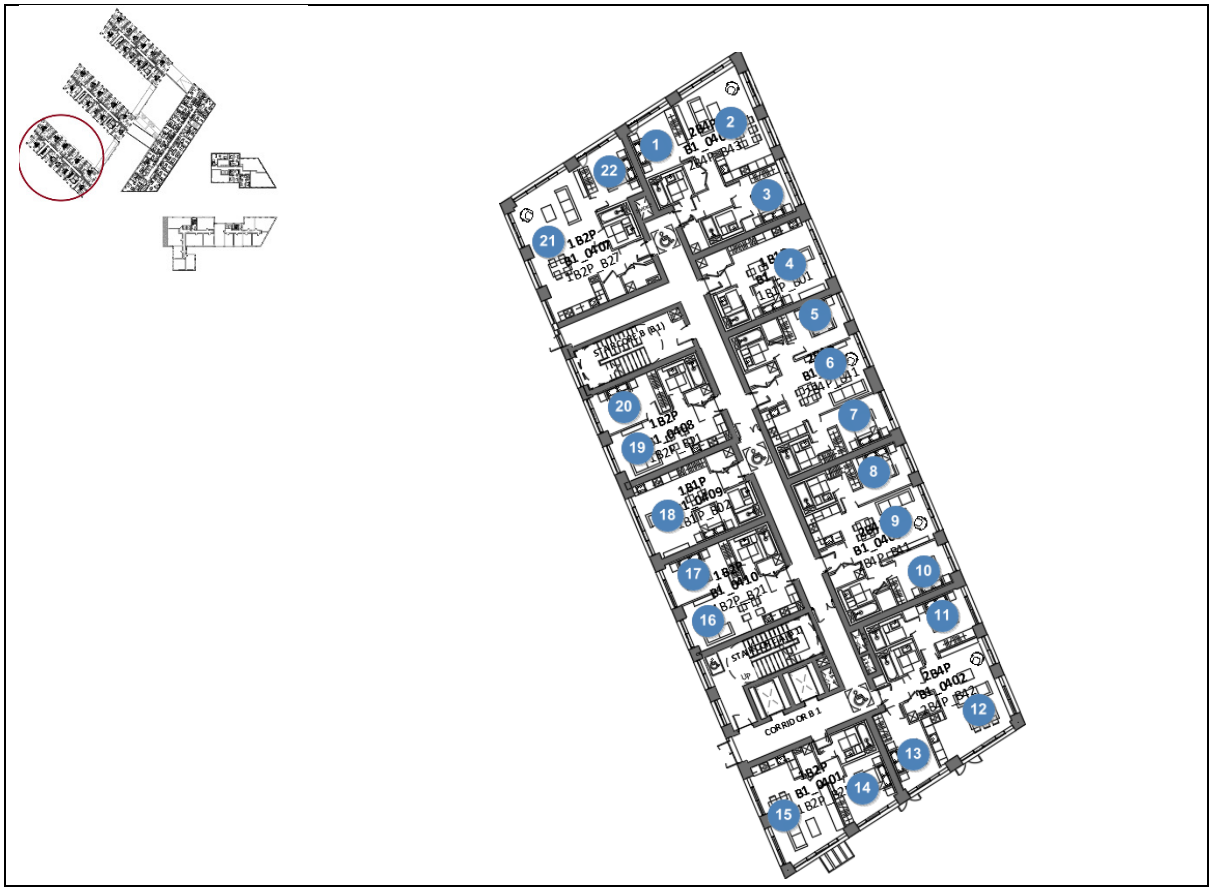
Window Maintenance Factor: 1.0

Window framing has been included as per RKD REVIT file "18134- RKD-00-ZZ-M3-A 0001".

It should be noted that BS 8206 recommends an ADF of 2.0 for Kitchens. However, the Kitchens in these apartments are part of the living room and a much smaller part, therefore the ADF considered appropriate for use in this case is the 1.5% for a living room.

4.1 Block B

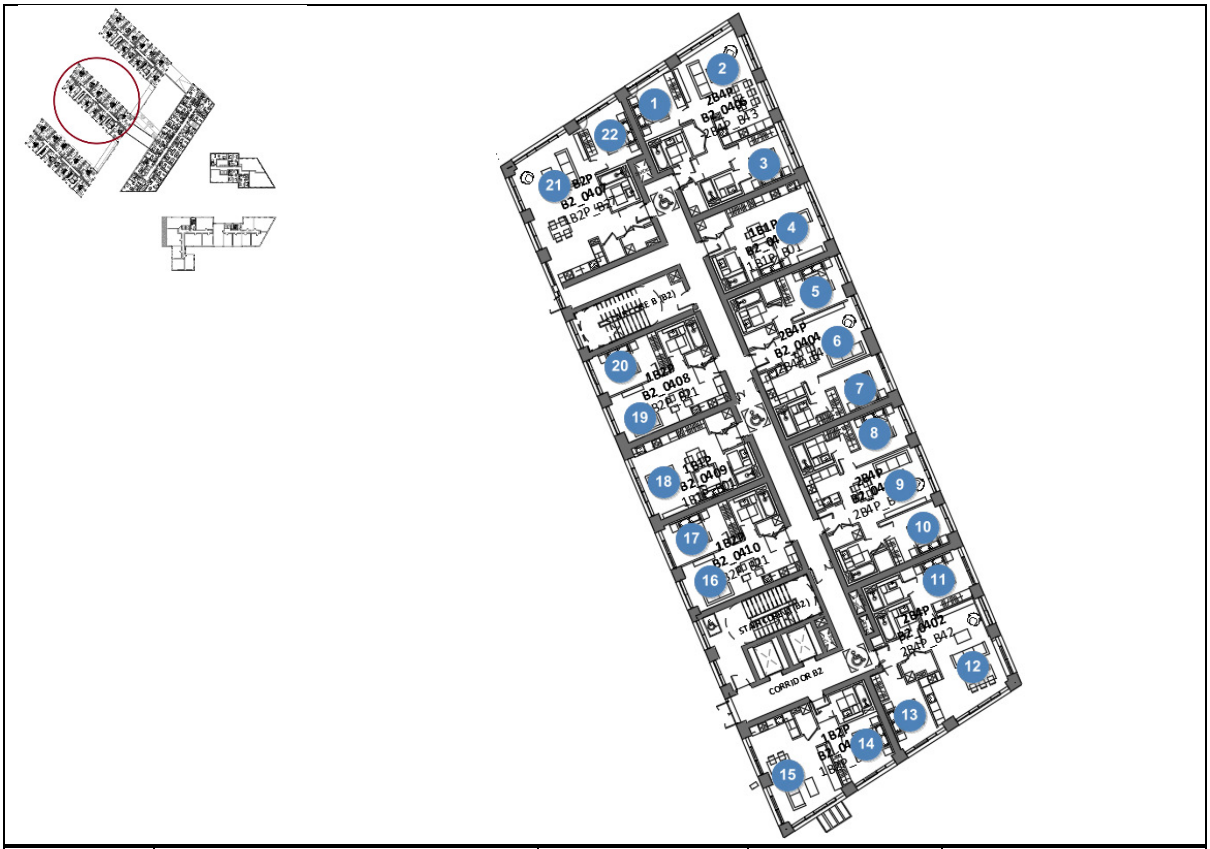
4.1.1 L04: Tower B1



Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L04: B1_04_Bedroom 01	Bedroom	5.63	✓ [1]
2	L04: B1_04_Living Room	Living Room	5.73	✓ [1]
3	L04: B1_04_Bedroom 02	Bedroom	2.72	✓ [1]
4	L04: B1_05_Living Room/ Bedroom	Living Room	1.90	✓ [1]
5	L04: B1_04_Bedroom 01	Bedroom	1.51	✓ [1]
6	L04: B1_04_Living Room	Living Room	1.51	✓ [1]
7	L04: B1_04_Bedroom 02	Bedroom	1.43	✓ [1]
8	L04: B1_03_Bedroom 01	Bedroom	1.37	✓ [1]
9	L04: B1_03_Living Room	Living Room	1.99	✓ [1]
10	L04: B1_03_Bedroom 02	Bedroom	1.49	✓ [1]
11	L04: B1_02_Bedroom 01	Bedroom	1.62	✓ [1]
12	L04: B1_02_Living Room	Living Room	3.01	✓ [1]
13	L04: B1_02_Bedroom 02	Bedroom	3.46	✓ [1]
14	L04: B1_01_Bedroom	Bedroom	2.25	✓ [1]
15	L04: B1_01_Living Room	Living Room	3.70	✓ [1]
16	L04: B1_10_Living Room	Living Room	1.50	✓ [1]
17	L04: B1_10_Bedroom	Bedroom	1.52	✓ [1]
18	L04: B1_09_Living Room/ Bedroom	Living Room	2.23	✓ [1]

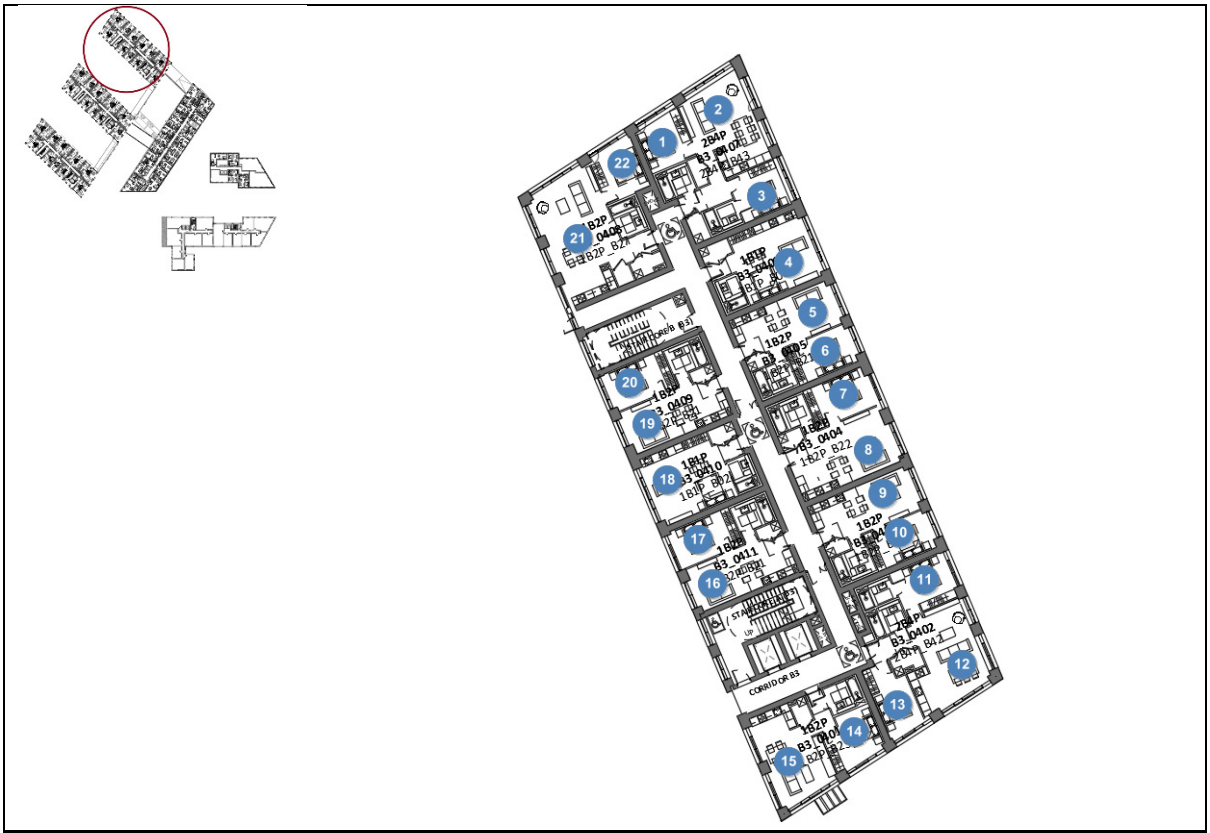
19	L04: B1_08_Living Room	Living Room	1.56	✓ [1]
20	L04: B1_08_Bedroom	Bedroom	2.34	✓ [1]
21	L04: B1_07_Living Room	Living Room	5.24	✓ [1]
22	L04: B1_07_Bedroom	Bedroom	5.80	✓ [1]

4.1.2 L04: Tower B2



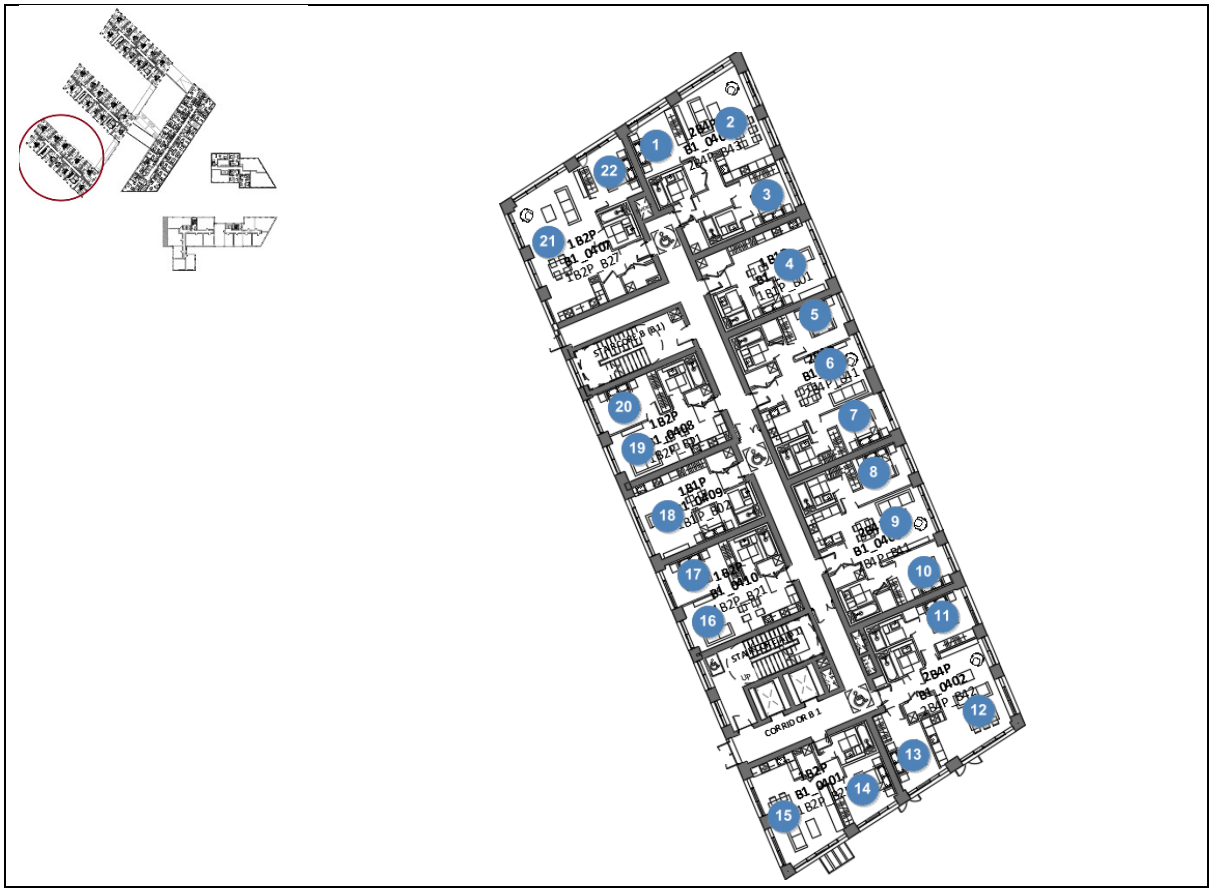
Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L04: B2_04_Bedroom 01	Bedroom	5.12	✓ [1]
2	L04: B2_04_Living Room	Living Room	5.88	✓ [1]
3	L04: B2_04_Bedroom 02	Bedroom	2.89	✓ [1]
4	L04: B2_05_Living Room/ Bedroom	Living Room	2.23	✓ [1]
5	L04: B2_04_Bedroom 01	Bedroom	1.62	✓ [1]
6	L04: B2_04_Living Room	Living Room	1.68	✓ [1]
7	L04: B2_04_Bedroom 02	Bedroom	1.58	✓ [1]
8	L04: B2_03_Bedroom 01	Bedroom	1.63	✓ [1]
9	L04: B2_03_Living Room	Living Room	2.53	✓ [1]
10	L04: B2_03_Bedroom 02	Bedroom	1.92	✓ [1]
11	L04: B2_02_Bedroom 01	Bedroom	2.12	✓ [1]
12	L04: B2_02_Living Room	Living Room	2.79	✓ [1]
13	L04: B2_02_Bedroom 02	Bedroom	1.88	✓ [1]
14	L04: B2_01_Bedroom	Bedroom	1.03	✓ [1]
15	L04: B2_01_Living Room	Living Room	2.26	✓ [1]
16	L04: B2_10_Living Room	Living Room	1.52	✓ [1]
17	L04: B2_10_Bedroom	Bedroom	1.53	✓ [1]
18	L04: B2_09_Living Room/ Bedroom	Living Room	2.20	✓ [1]
19	L04: B2_08_Living Room	Living Room	1.74	✓ [1]
20	L04: B2_08_Bedroom	Bedroom	2.61	✓ [1]
21	L04: B2_07_Living Room	Living Room	5.30	✓ [1]
22	L04: B2_07_Bedroom	Bedroom	5.27	✓ [1]

4.1.3 L04: Tower B3



Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L04: B3_04_Bedroom 01	Bedroom	5.13	✓ [1]
2	L04: B3_04_Living Room	Living Room	8.17	✓ [1]
3	L04: B3_04_Bedroom 02	Bedroom	6.63	✓ [1]
4	L04: B3_05_Living Room/ Bedroom	Living Room	5.57	✓ [1]
5	L04: B3_04_Bedroom 01	Bedroom	4.56	✓ [1]
6	L04: B3_04_Living Room	Living Room	4.69	✓ [1]
7	L04: B3_04_Bedroom 02	Bedroom	4.73	✓ [1]
8	L04: B3_03_Bedroom 01	Bedroom	4.70	✓ [1]
9	L04: B3_03_Living Room	Living Room	6.65	✓ [1]
10	L04: B3_03_Bedroom 02	Bedroom	4.75	✓ [1]
11	L04: B3_02_Bedroom 01	Bedroom	4.70	✓ [1]
12	L04: B3_02_Living Room	Living Room	5.38	✓ [1]
13	L04: B3_02_Bedroom 02	Bedroom	3.33	✓ [1]
14	L04: B3_01_Bedroom	Bedroom	1.63	✓ [1]
15	L04: B3_01_Living Room	Living Room	2.53	✓ [1]
16	L04: B3_10_Living Room	Living Room	1.50	✓ [1]
17	L04: B3_10_Bedroom	Bedroom	1.47	✓ [1]
18	L04: B3_09_Living Room/ Bedroom	Living Room	2.11	✓ [1]
19	L04: B3_08_Living Room	Living Room	1.75	✓ [1]
20	L04: B3_08_Bedroom	Bedroom	2.63	✓ [1]
21	L04: B3_07_Living Room	Living Room	5.35	✓ [1]
22	L04: B3_07_Bedroom	Bedroom	5.25	✓ [1]

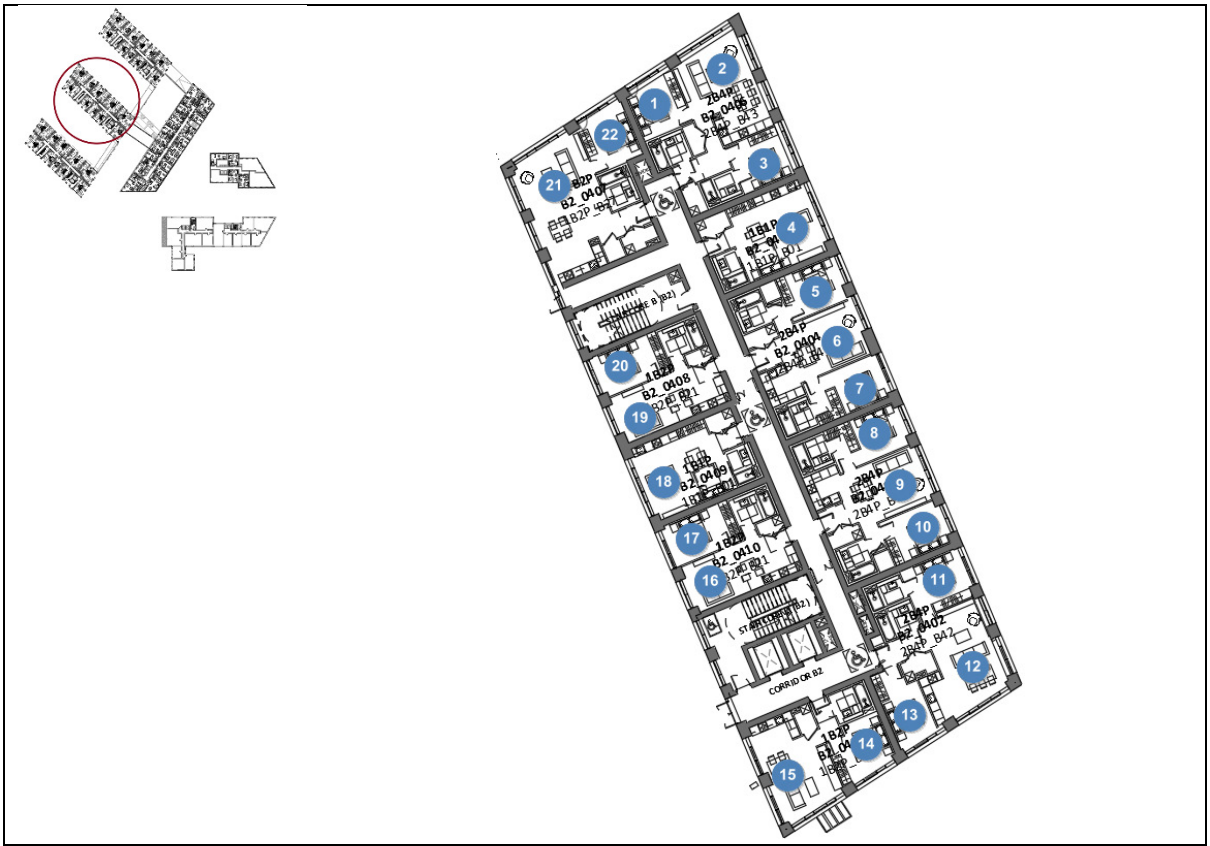
4.1.4 Level 06: Tower B1



Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L06: B1_04_Bedroom 01	Bedroom	5.67	✓ [1]
2	L06: B1_04_Living Room	Living Room	6.14	✓ [1]
3	L06: B1_04_Bedroom 02	Bedroom	3.31	✓ [1]
4	L06: B1_05_Living Room/ Bedroom	Living Room	2.35	✓ [1]
5	L06: B1_04_Bedroom 01	Bedroom	1.93	✓ [1]
6	L06: B1_04_Living Room	Living Room	1.95	✓ [1]
7	L06: B1_04_Bedroom 02	Bedroom	1.86	✓ [1]
8	L06: B1_03_Bedroom 01	Bedroom	1.78	✓ [1]
9	L06: B1_03_Living Room	Living Room	2.54	✓ [1]
10	L06: B1_03_Bedroom 02	Bedroom	1.87	✓ [1]
11	L06: B1_02_Bedroom 01	Bedroom	1.97	✓ [1]
12	L06: B1_02_Living Room	Living Room	3.44	✓ [1]
13	L06: B1_02_Bedroom 02	Bedroom	3.87	✓ [1]
14	L06: B1_01_Bedroom	Bedroom	2.54	✓ [1]
15	L06: B1_01_Living Room	Living Room	4.32	✓ [1]
16	L06: B1_10_Living Room	Living Room	1.88	✓ [1]
17	L06: B1_10_Bedroom	Bedroom	2.07	✓ [1]
18	L06: B1_09_Living Room/ Bedroom	Living Room	2.94	✓ [1]
19	L06: B1_08_Living Room	Living Room	2.05	✓ [1]

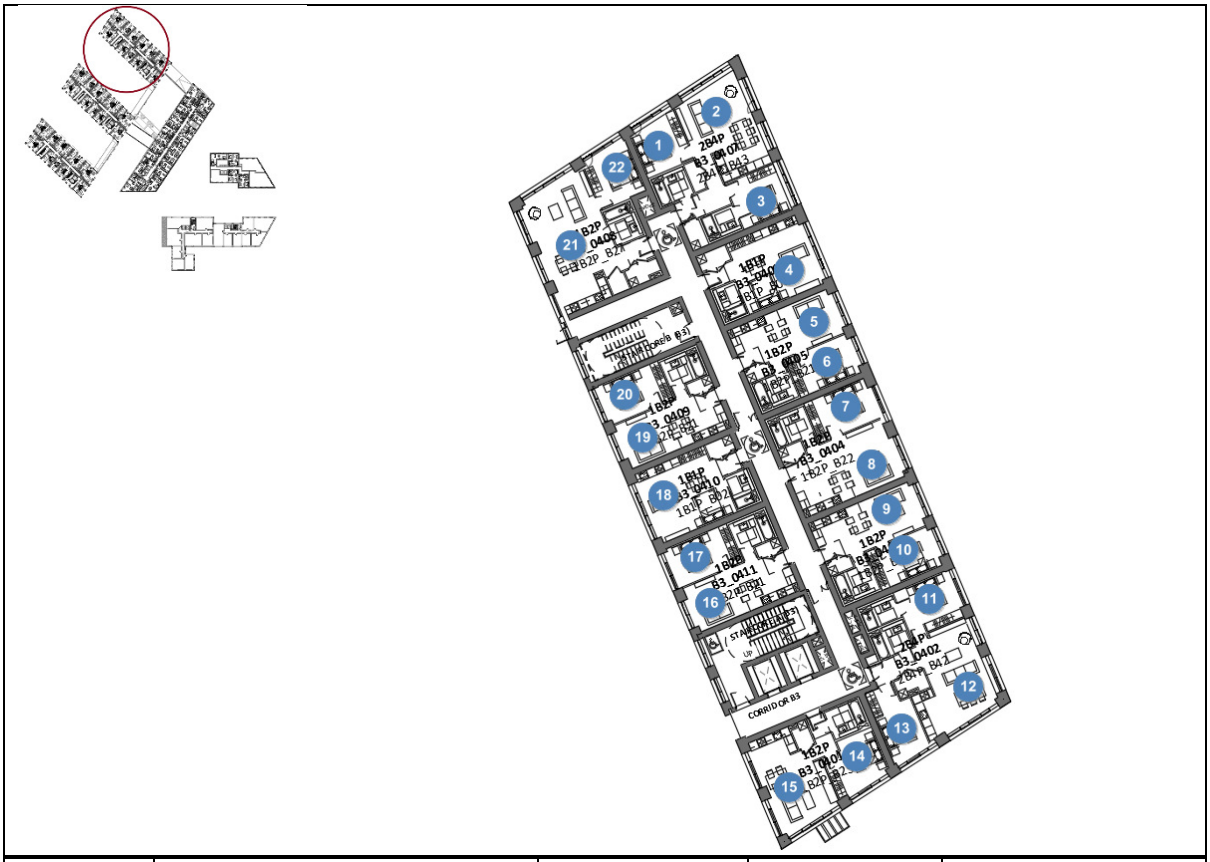
20	L04: B1_08_Bedroom	Bedroom	3.00	✓ [1]
21	L04: B1_07_Living Room	Living Room	5.56	✓ [1]
22	L04: B1_07_Bedroom	Bedroom	5.85	✓ [1]

4.1.5 Level 06: Tower B2



Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L06: B2_04_Bedroom 01	Bedroom	5.15	✓ [1]
2	L06: B2_04_Living Room	Living Room	6.38	✓ [1]
3	L06: B2_04_Bedroom 02	Bedroom	3.59	✓ [1]
4	L06: B2_05_Living Room/ Bedroom	Living Room	2.84	✓ [1]
5	L06: B2_04_Bedroom 01	Bedroom	2.11	✓ [1]
6	L06: B2_04_Living Room	Living Room	2.19	✓ [1]
7	L06: B2_04_Bedroom 02	Bedroom	2.06	✓ [1]
8	L06: B2_03_Bedroom 01	Bedroom	2.11	✓ [1]
9	L06: B2_03_Living Room	Living Room	3.21	✓ [1]
10	L06: B2_03_Bedroom 02	Bedroom	2.39	✓ [1]
11	L06: B2_02_Bedroom 01	Bedroom	2.58	✓ [1]
12	L06: B2_02_Living Room	Living Room	3.49	✓ [1]
13	L06: B2_02_Bedroom 02	Bedroom	2.47	✓ [1]
14	L06: B2_01_Bedroom	Bedroom	1.18	✓ [1]
15	L06: B2_01_Living Room	Living Room	2.69	✓ [1]
16	L06: B2_10_Living Room	Living Room	1.74	✓ [1]
17	L06: B2_10_Bedroom	Bedroom	1.96	✓ [1]
18	L06: B2_09_Living Room/ Bedroom	Living Room	2.75	✓ [1]
19	L06: B2_08_Living Room	Living Room	2.15	✓ [1]
20	L06: B2_08_Bedroom	Bedroom	3.18	✓ [1]
21	L06: B2_07_Living Room	Living Room	5.57	✓ [1]
22	L06: B2_07_Bedroom	Bedroom	5.31	✓ [1]

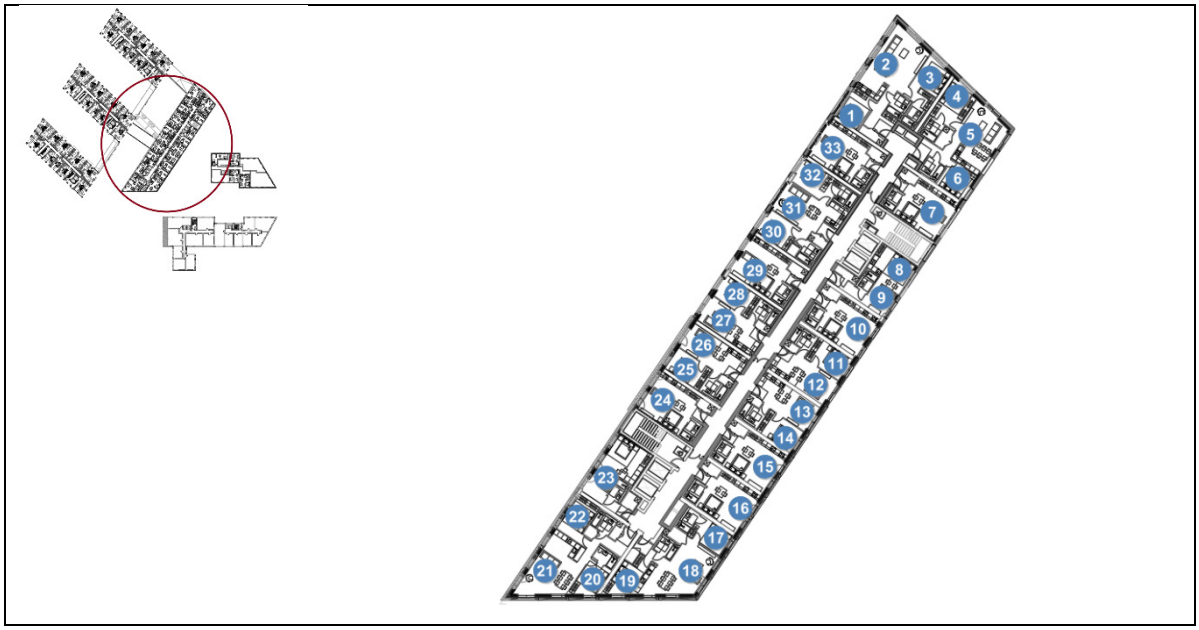
4.1.6 L06: Tower B3



Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L06: B3_04_Bedroom 01	Bedroom	5.15	✓ 1
2	L06: B3_04_Living Room	Living Room	8.21	✓ 1
3	L06: B3_04_Bedroom 02	Bedroom	6.68	✓ 1
4	L06: B3_05_Living Room/ Bedroom	Living Room	5.62	✓ 1
5	L06: B3_04_Bedroom 01	Bedroom	4.61	✓ 1
6	L06: B3_04_Living Room	Living Room	4.74	✓ 1
7	L06: B3_04_Bedroom 02	Bedroom	4.78	✓ 1
8	L06: B3_03_Bedroom 01	Bedroom	4.75	✓ 1
9	L06: B3_03_Living Room	Living Room	6.72	✓ 1
10	L06: B3_03_Bedroom 02	Bedroom	4.80	✓ 1
11	L06: B3_02_Bedroom 01	Bedroom	4.74	✓ 1
12	L06: B3_02_Living Room	Living Room	5.70	✓ 1
13	L06: B3_02_Bedroom 02	Bedroom	4.04	✓ 1
14	L06: B3_01_Bedroom	Bedroom	2.16	✓ 1
15	L06: B3_01_Living Room	Living Room	3.24	✓ 1
16	L06: B3_10_Living Room	Living Room	1.73	✓ 1
17	L06: B3_10_Bedroom	Bedroom	1.91	✓ 1
18	L06: B3_09_Living Room/ Bedroom	Living Room	2.67	✓ 1
19	L06: B3_08_Living Room	Living Room	2.16	✓ 1
20	L06: B3_08_Bedroom	Bedroom	3.19	✓ 1
21	L06: B3_07_Living Room	Living Room	5.62	✓ 1
22	L06: B3_07_Bedroom	Bedroom	5.28	✓ 1

4.2 Block C

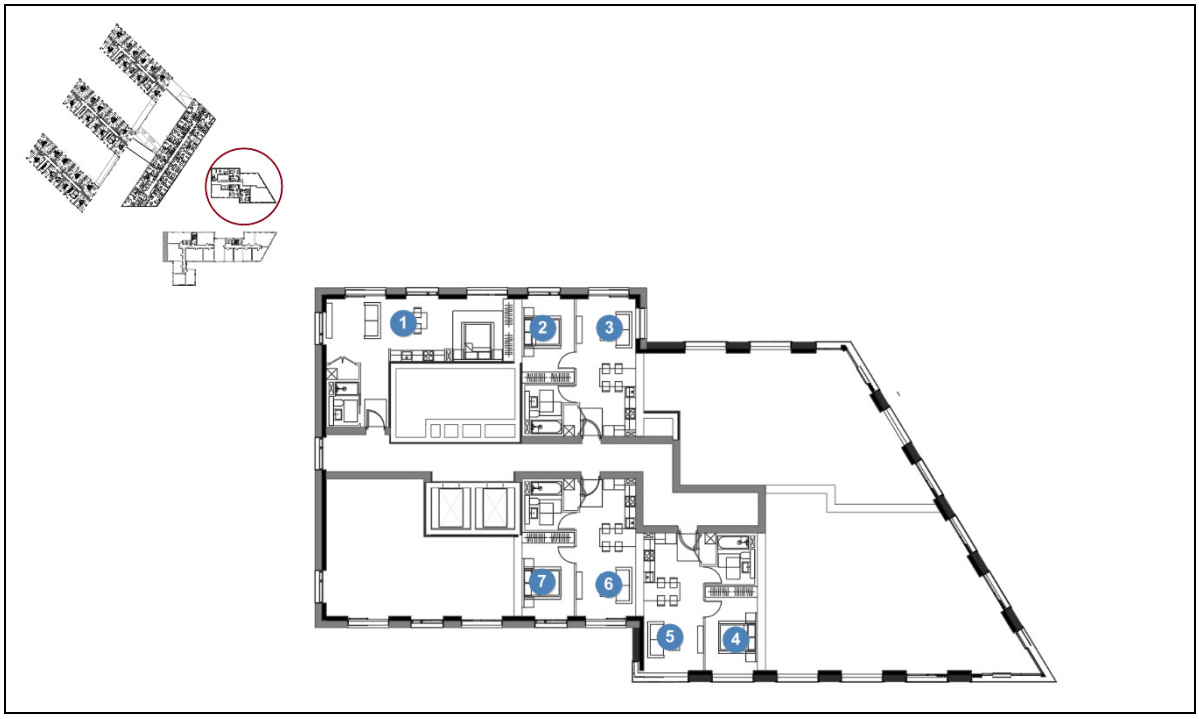
4.2.1 Tower C1 Level 04



Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L04: C1_01_Bedroom 01	Bedroom	2.99	✓ [1]
2	L04: C1_01_Living Room	Living Room	3.93	✓ [1]
3	L04: C1_01_Bedroom 02	Bedroom	2.92	✓ [1]
4	L04: C1_02_Bedroom 02	Bedroom	3.36	✓ [1]
5	L04: C1_02_Living Room	Living Room	4.50	✓ [1]
6	L04: C1_02_Bedroom 01	Bedroom	2.61	✓ [1]
7	L04: C1_03_Living Rm / Bedroom	Living Room	3.93	✓ [1]
8	L04: C1_04_Living Rm / Bedroom	Living Room	4.53	✓ [1]
9	L04: C1_05_Living Rm / Bedroom	Living Room	2.32	✓ [1]
10	L04: C1_06_Living Room	Living Room	1.57	✓ [1]
11	L04: C1_06_Bedroom 01	Bedroom	2.92	✓ [1]
12	L04: C1_07_Living Room	Living Room	2.24	✓ [1]
13	L04: C1_07_Bedroom 01	Bedroom	1.82	✓ [1]
14	L04: C1_08_Living Rm / Bedroom	Living Room	2.07	✓ [1]
15	L04: C1_09_Living Rm / Bedroom	Living Room	2.08	✓ [1]
16	L04: C1_10_Bedroom 01	Bedroom	2.04	✓ [1]
17	L04: C1_10_Living	Living Room	2.49	✓ [1]
18	L04: C1_10_Bedroom 02	Bedroom	1.83	✓ [1]
19	L04: C1_11_Bedroom 02	Bedroom	1.57	✓ [1]
20	L04: C1_11_Living Room	Living Room	2.46	✓ [1]
21	L04: C1_11_Bedroom 01	Bedroom	1.75	✓ [1]
22	L04: C1_12_Living Room	Living Room	1.98	✓ [1]
23	L04: C1_12_Bedroom 01	Bedroom	1.54	✓ [1]
24	L04: C1_13_Living Rm / Bedroom	Living Room	1.52	✓ [1]
25	L04: C1_14_Bedroom 01	Bedroom	1.10	✓ [1]

26	L04: C1_14_Living Room	Living Room	1.56	✓ [1]
27	L04: C1_15_Living Room	Living Room	1.98	✓ [1]
28	L04: C1_15_Bedroom	Bedroom	1.59	✓ [1]
29	L04: C1_16_Living Rm / Bedroom	Living Room	2.05	✓ [1]
30	L04: C1_17_Bedroom 01	Bedroom	2.04	✓ [1]
31	L04: C1_17_Living Room	Living Room	3.18	✓ [1]
32	L04: C1_17_Bedroom 02	Bedroom	1.97	✓ [1]
33	L04: C1_18_Living Rm / Bedroom	Living Room	2.66	✓ [1]

4.2.2 Tower C2 Level 04



Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L04: C2_01_Living Room	Living Room	3.76	✓ [1]
2	L04: C2_02_Living Room	Living Room	3.74	✓ [1]
3	L04: C2_02_Bedroom 02	Bedroom	7.36	✓ [1]
4	L04: C2_04_Living Room	Living Room	3.03	✓ [1]
5	L04: C2_04_Bedroom	Bedroom	4.90	✓ [1]
6	L04: C2_05_Living / Bedroom	Living Room	3.37	✓ [1]
7	L04: C2_05_Living / Bedroom	Living Room	3.01	✓ [1]

Block D

4.2.3 Level 04

Room Reference	Room Name	Room Activity	Average Daylight Factor	BRE Recommendation
1	L04: Block D2_02_Living Room	Living Room	1.13	✓ 2
2	L04: Block D2_01_Bedroom 01	Bedroom	0.80	✓ 2
3	L04: Block D2_01_Bedroom 02	Bedroom	0.83	✓ 2
4	L04: Block D2_01_Living Room	Living Room	1.00	✓ 2
5	L04: Block D1_09_Living Room / Bedroom	Living Room	1.88	✓ 1
6	L04: Block D1_08_Living Room	Living Room	2.22	✓ 1
7	L04: Block D1_08_Bedroom	Bedroom	1.54	✓ 1
8	L04: Block D_02_Living / Bedroom	Living Room	3.87	✓ 1
9	L04: Block D_01_Living / Bedroom	Living Room	3.95	✓ 1
10	L04: Block D_07_Living / Bedroom	Living Room	2.89	✓ 1

5 Shadow Analysis

The statistics of Met Eireann, the Irish Meteorological Service, show that 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. Although this is the case, the actual shadowing effect during the summer period is minimised due to the height of the sun in the sky.

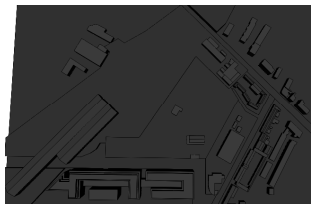
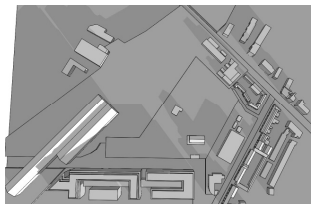
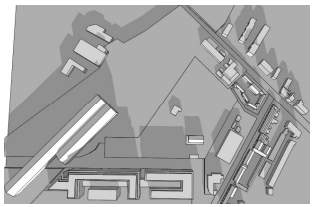
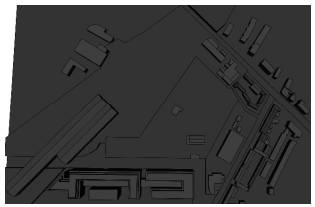
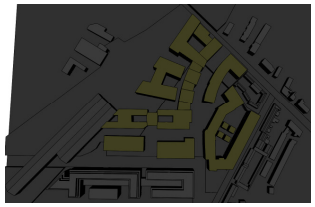
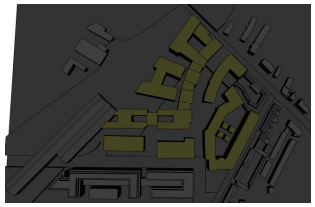
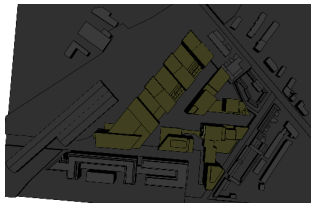
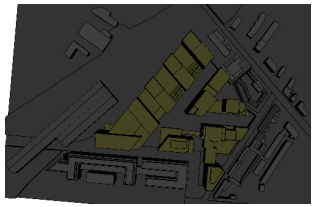
This section will consider the shadows cast for both the Previously Permitted scheme and the proposed development for the following dates;

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

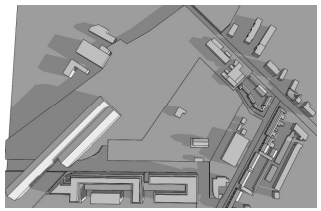
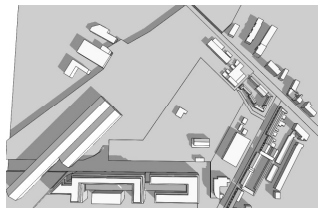
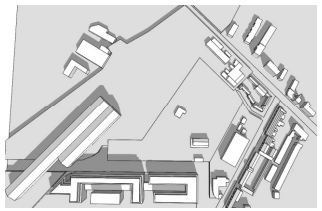
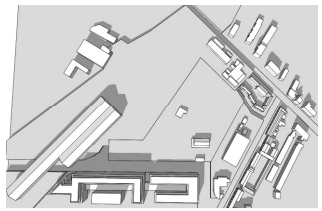
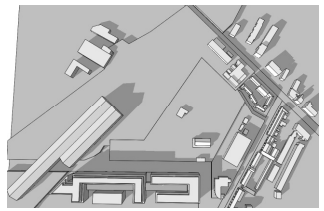
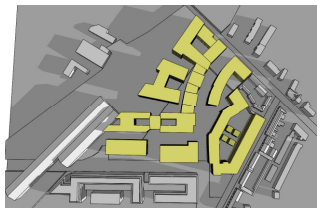
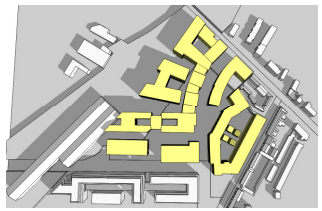
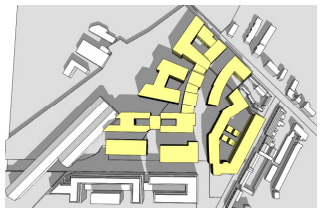
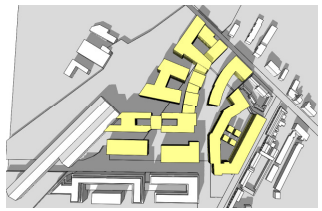
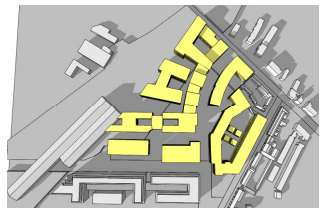
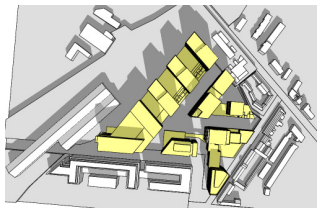
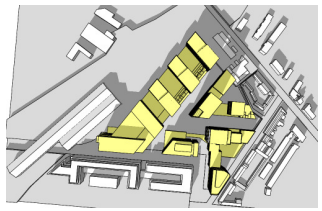
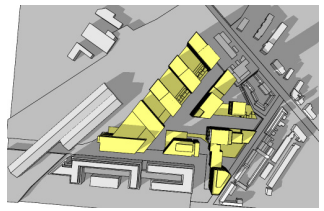
These images will show shadows cast for 'perfect sunny' conditions with no clouds and assumed that the sun is out for every hour shown. Given the discussion above it is important to remember that this is not always going to be the case.

5.1 Plan View

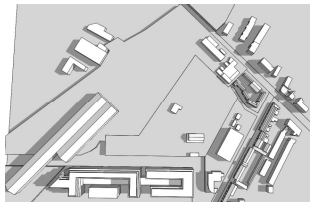
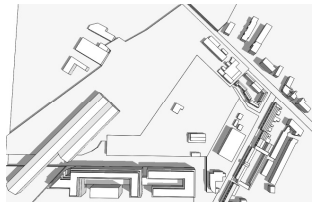
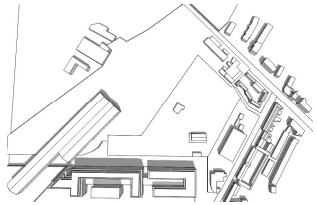
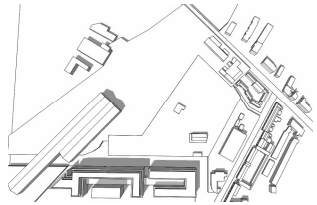
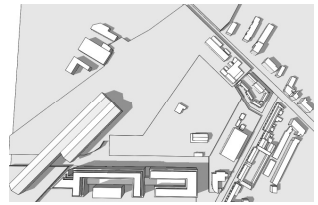
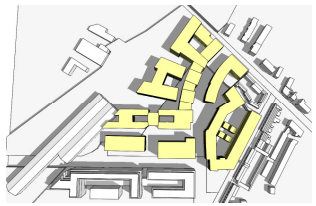
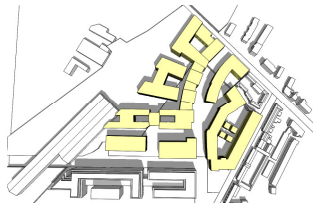
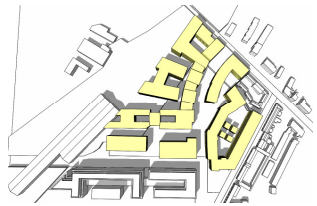
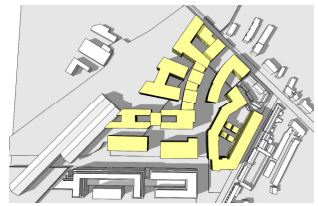
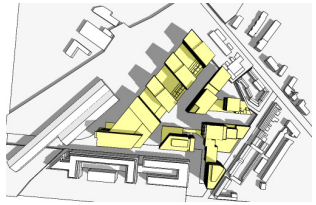
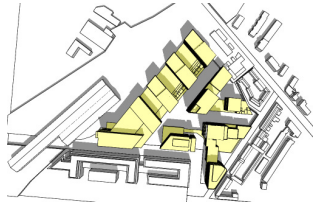
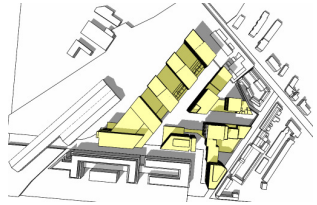
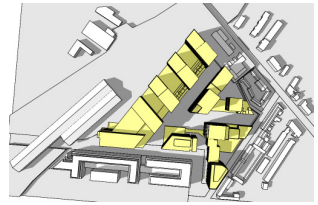
5.1.1 December 21st

					Existing Situation
					Previously Permitted Scheme
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.1.2 March 21st

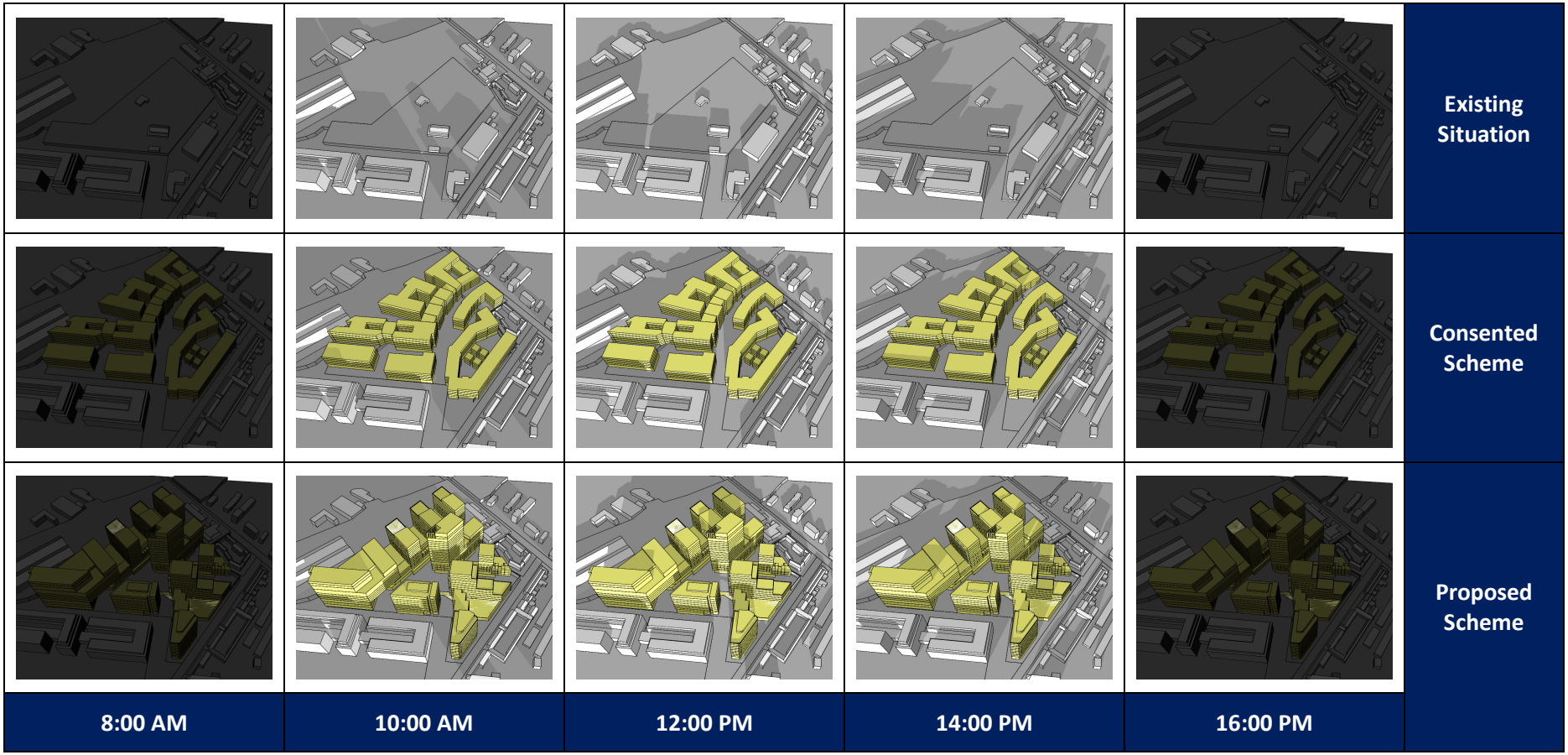
					Existing Situation
					Previously Permitted Scheme
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.1.3 June 21st

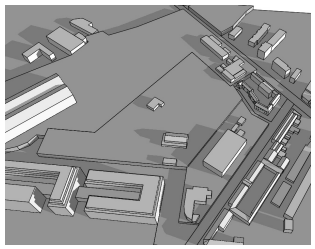
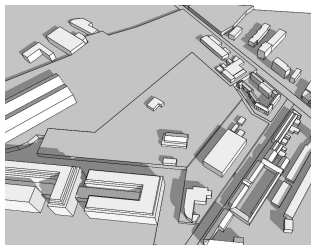
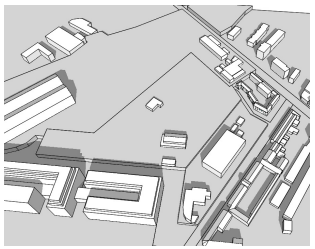
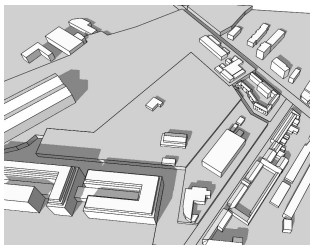
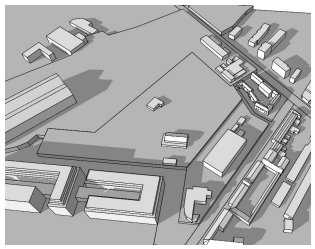
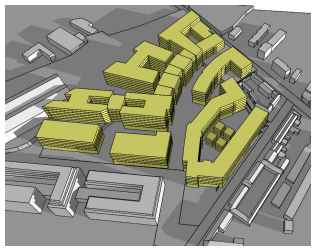
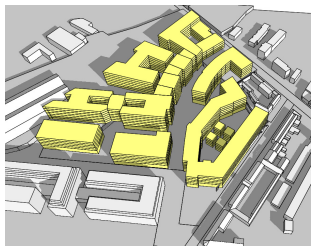
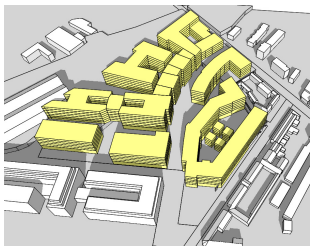
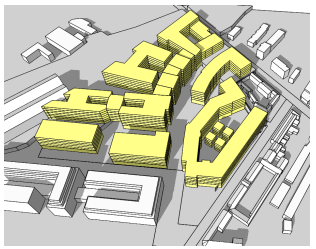
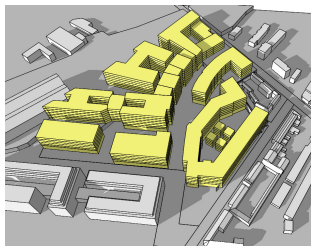
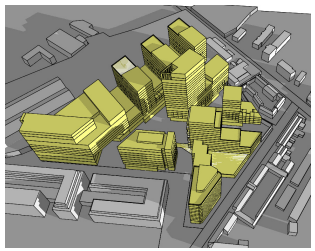
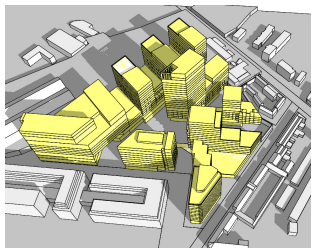
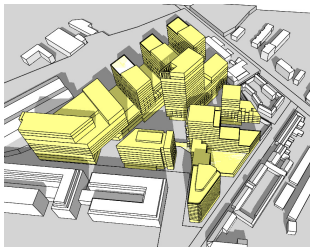
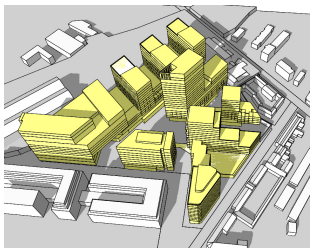
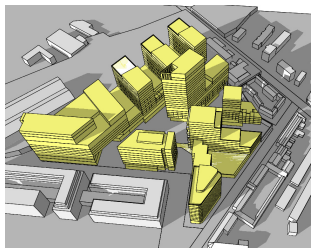
					Existing Situation
					Previously Permitted Scheme
					Proposed Development
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.2 View 01: Looking over from South of Site

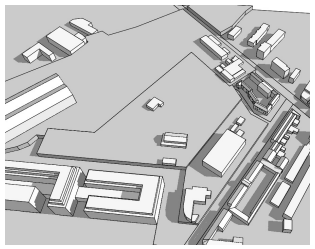
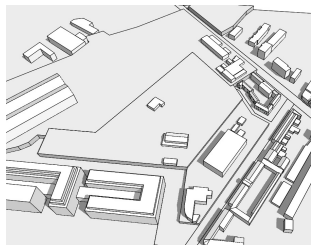
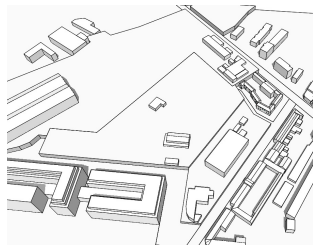
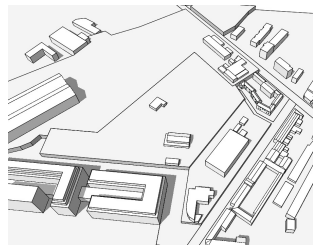
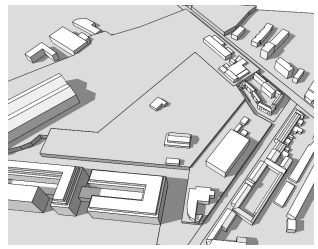
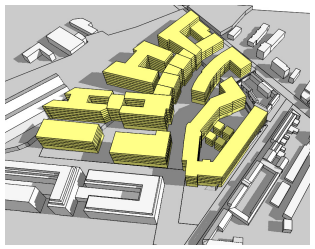
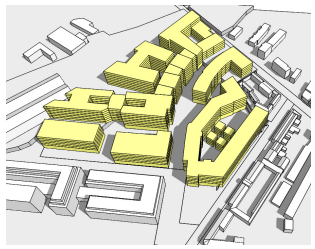
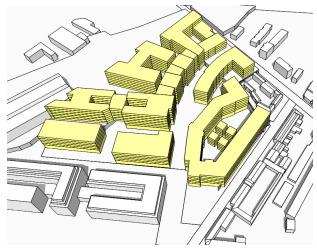
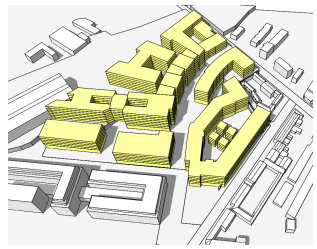
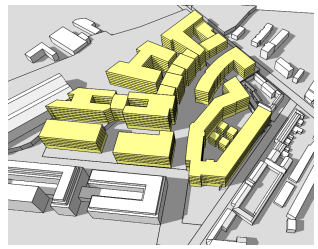
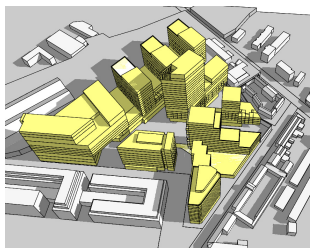
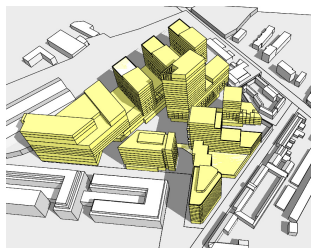
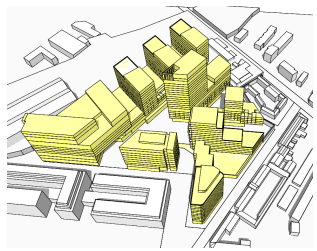
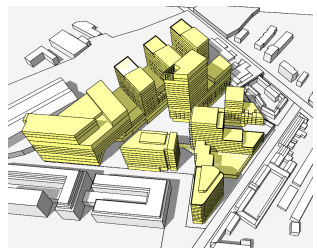
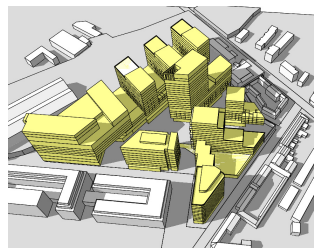
5.2.1 December 21st



5.2.2 March 21st

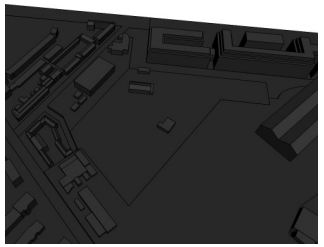
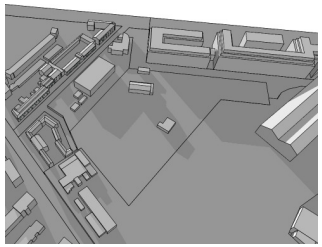
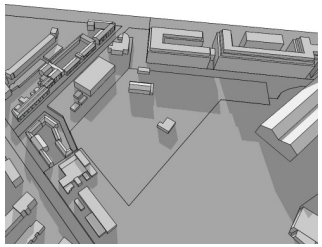
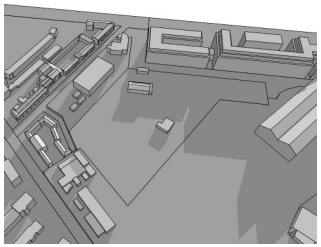
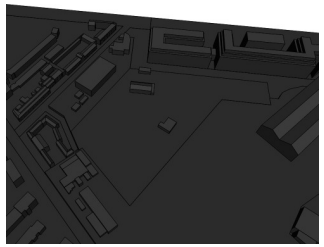
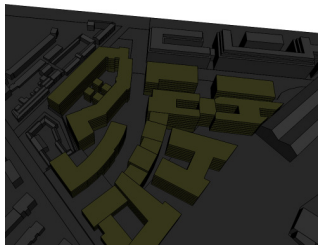
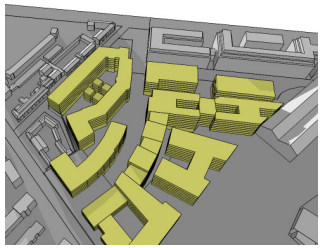
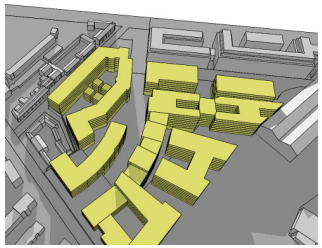
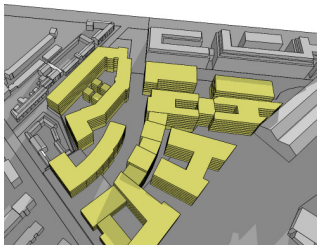
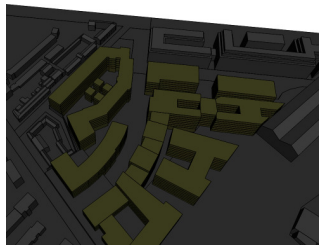
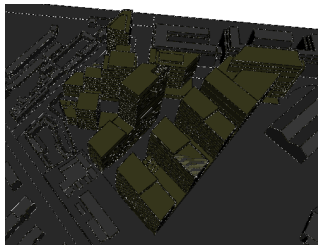
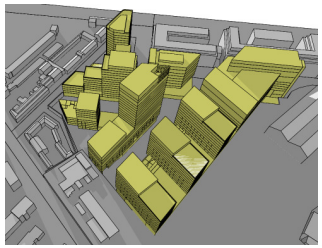
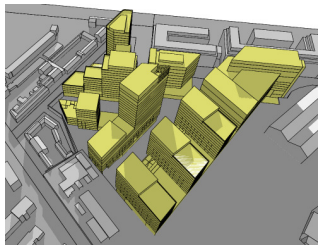
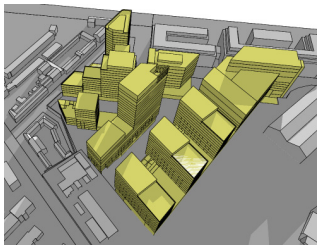
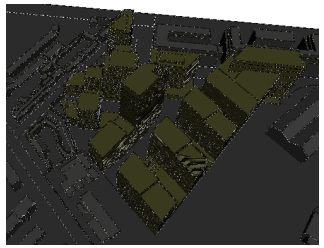
					Existing Situation
					Previously Permitted Scheme
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.2.3 June 21st

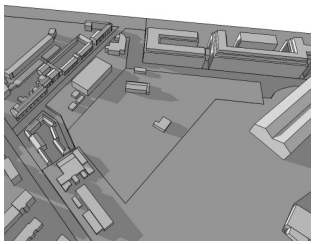
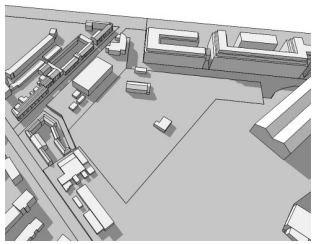
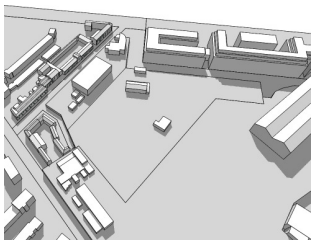
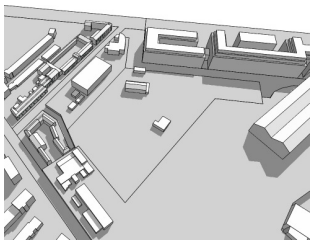
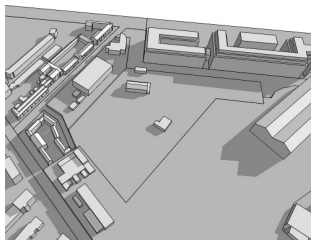
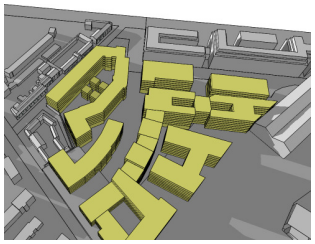
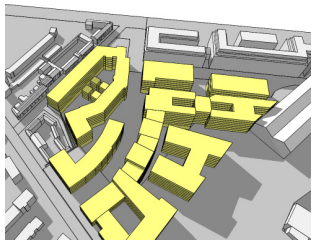
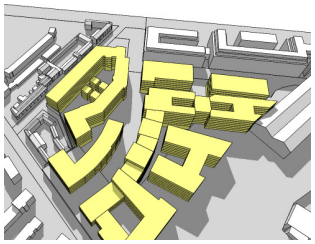
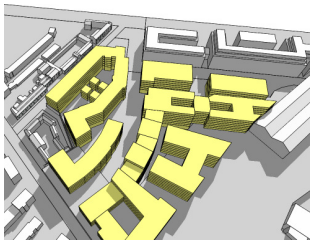
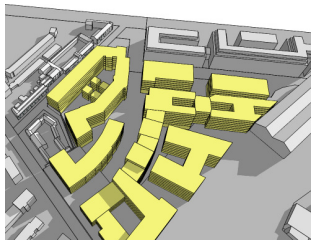
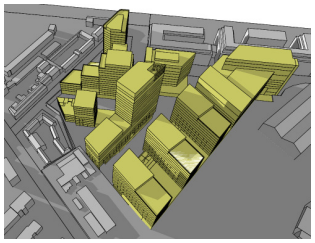
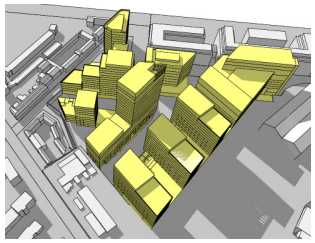
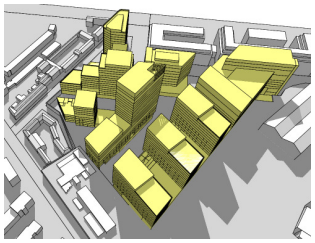
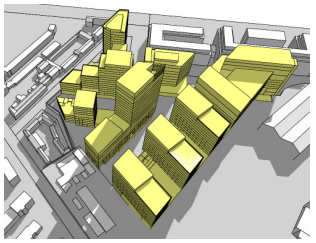
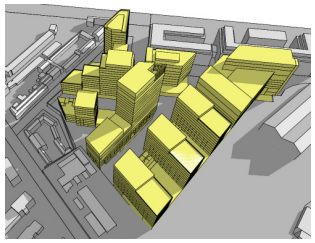
					Existing Situation
					Previously Permitted Scheme
					Proposed Development
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.3 View 02: Looking over from North East of Site

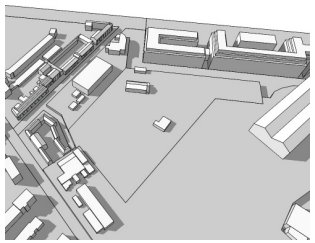
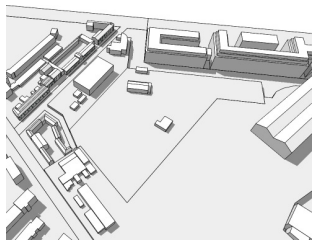
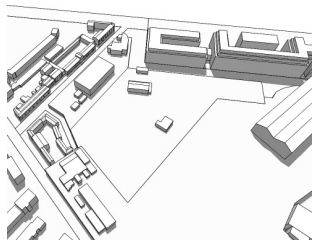
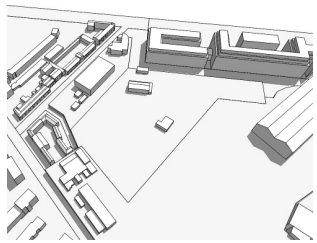
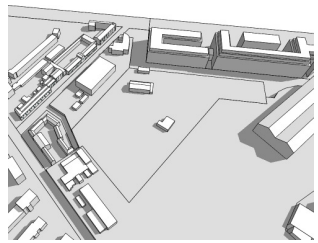
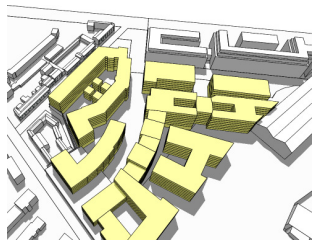
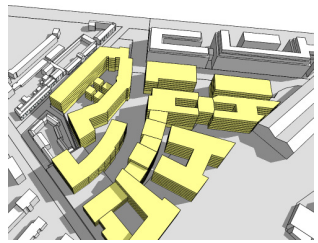
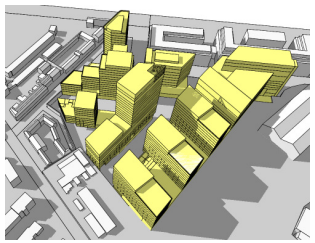
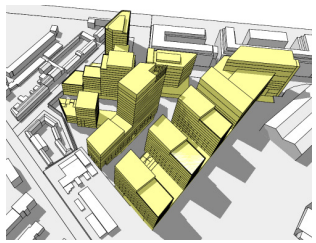
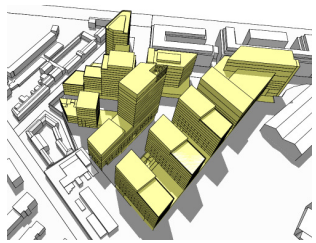
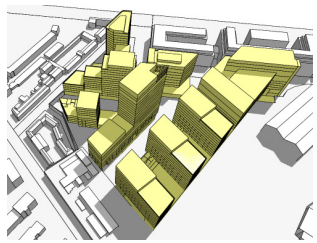
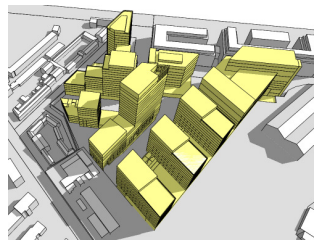
5.3.1 December 21st

					Existing Situation
					Previously Permitted Scheme
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.3.2 March 21st

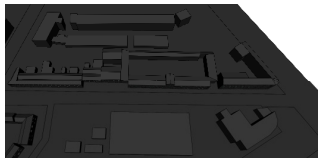
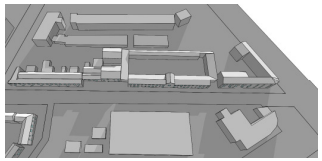
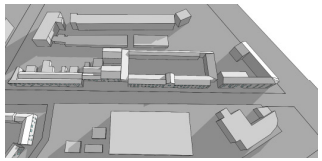
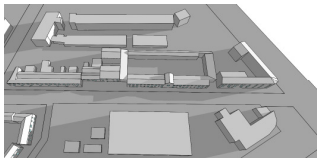
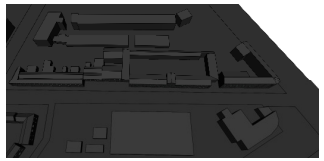
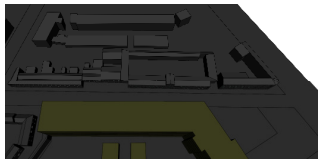
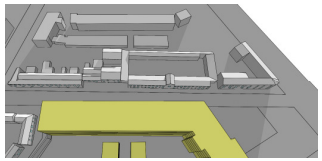
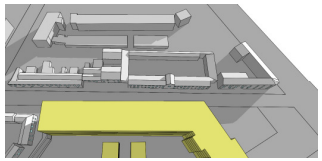
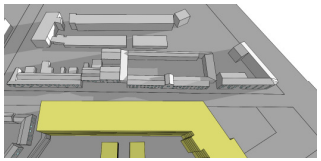
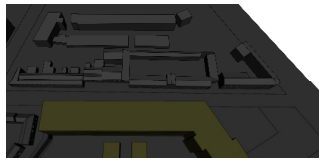
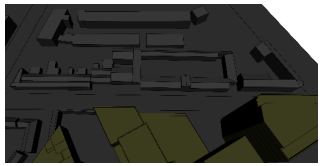
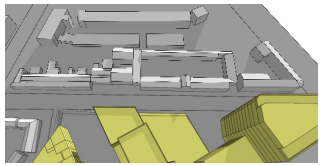
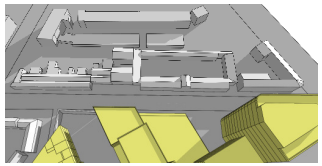
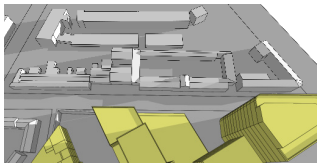
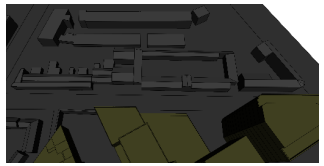
					Existing Situation
					Previously Permitted Scheme
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.3.3 June 21st

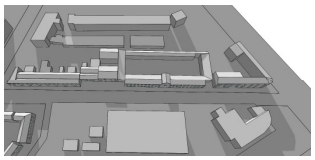
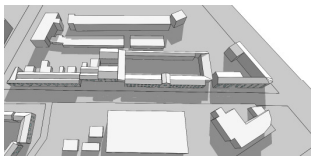
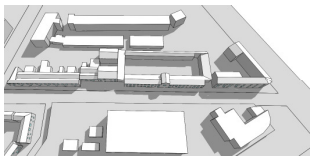
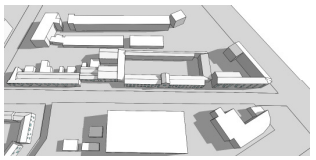
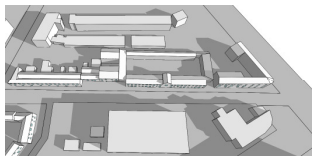
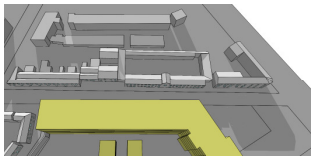
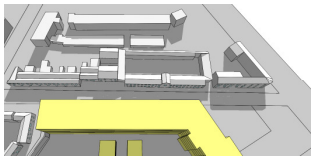
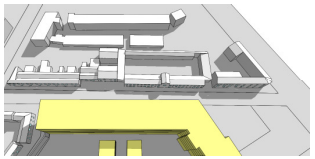
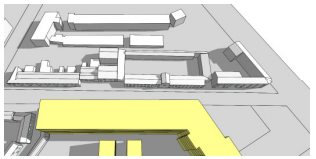
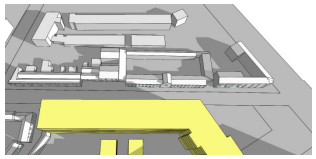
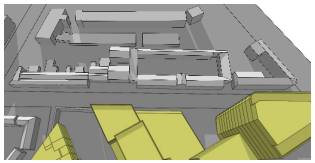
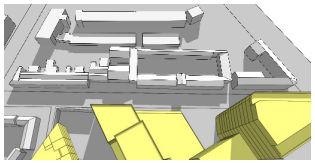
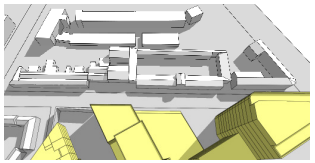
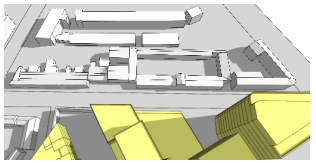
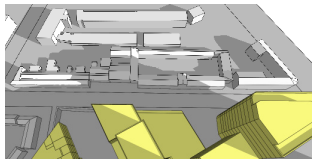
					Existing Situation
					Previously Permitted Scheme
					Proposed Development
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.4 View 03: Looking over from Oriel Street Upper

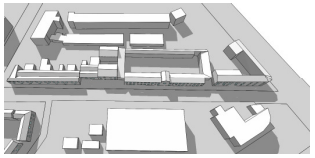
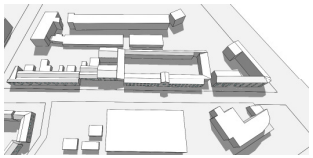
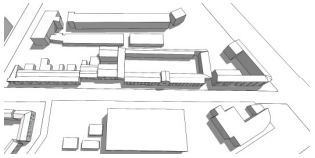
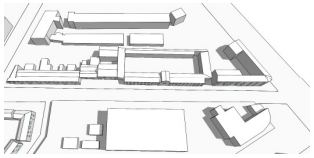
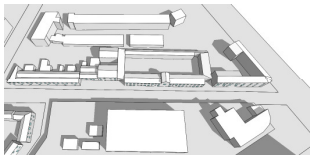
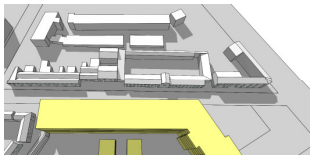
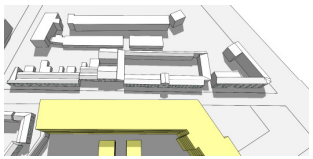
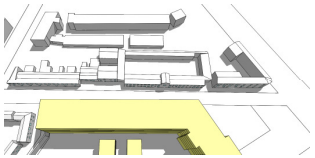
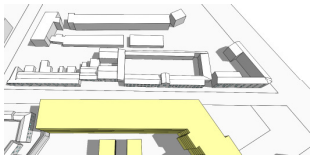
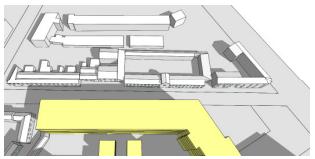
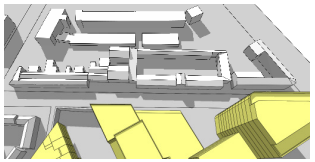
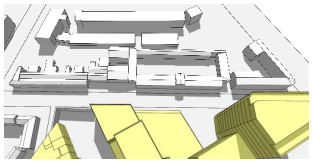
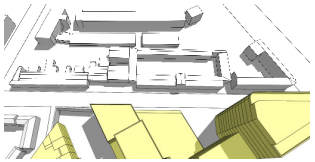
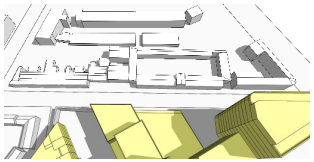
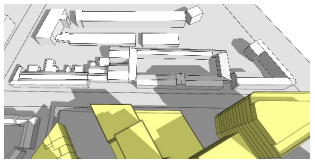
5.4.1 December 21st

					Existing Situation
					Previously Permitted Scheme
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.4.2 March 21st

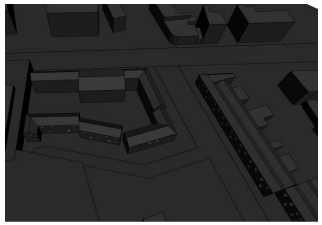
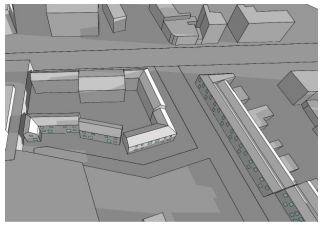
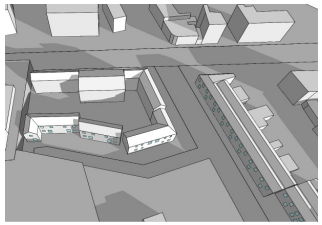
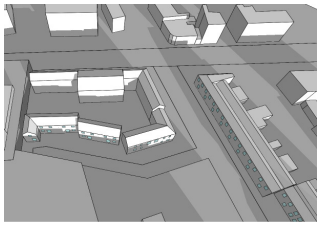
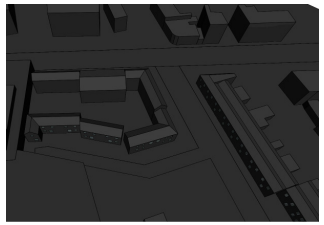
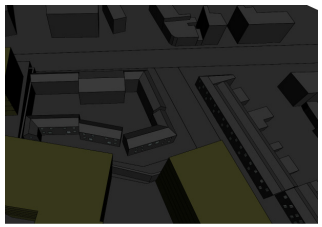
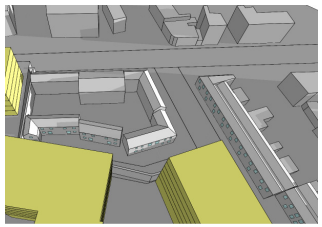
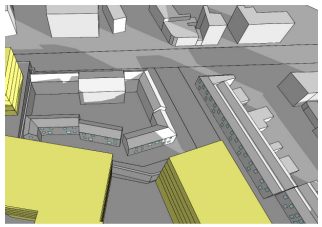
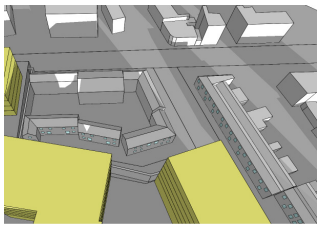
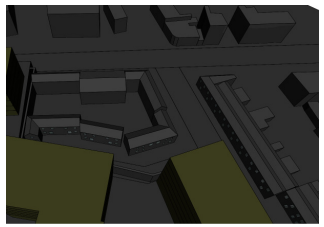
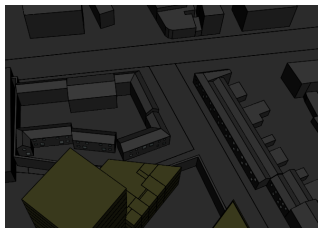
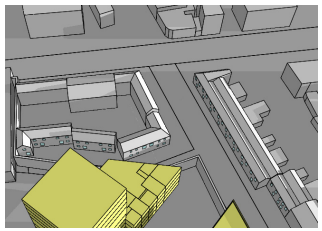
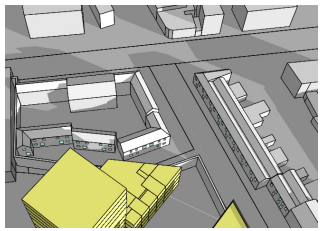
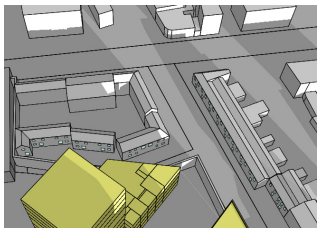
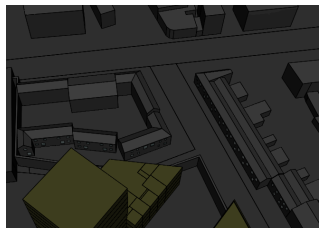
					Existing Situation
					Previously Permitted Scheme
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.4.3 June 21st

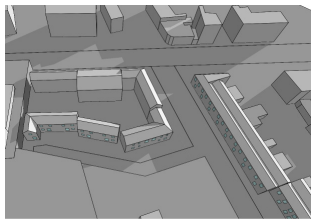
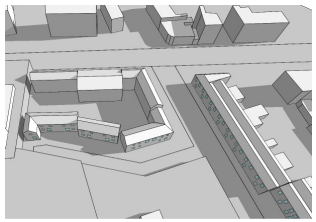
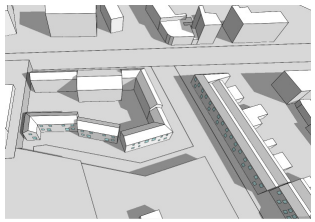
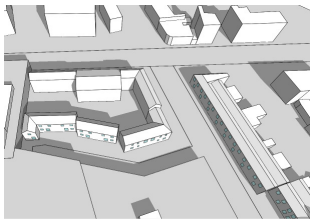
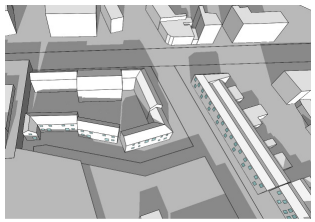
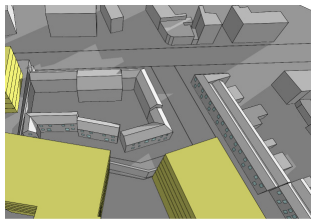
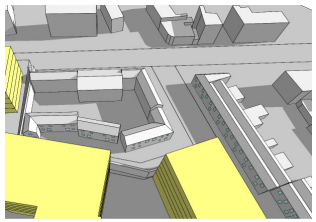
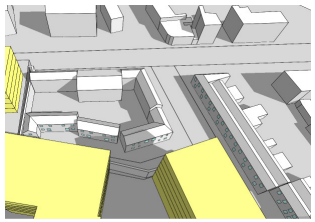
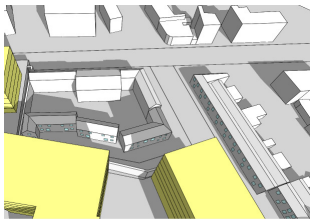
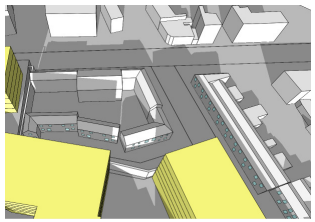
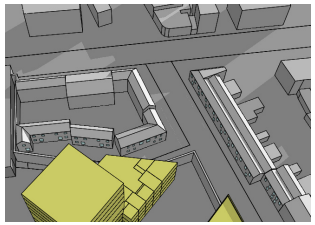
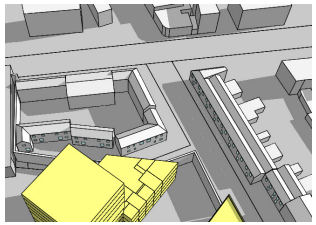
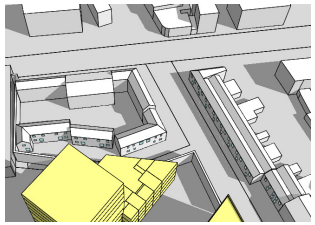
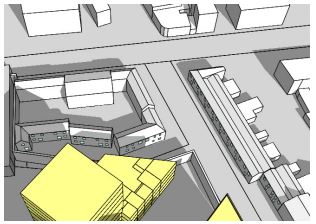
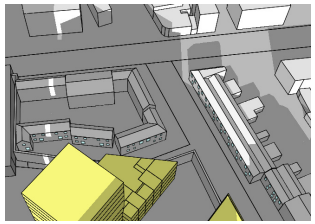
					**Existing Situation**
					**Previously Permitted Scheme**
					**Proposed Development**
8:00 AM	**10:00 AM**	**12:00 PM**	**14:00 PM**	**16:00 PM**	

5.5 View 02: Looking over from Oriel Hall

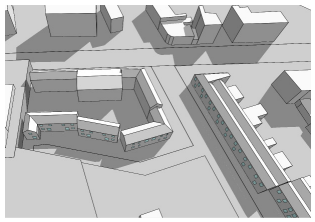
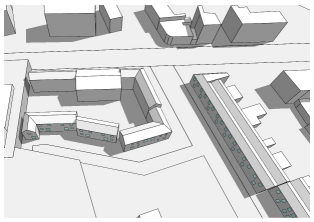
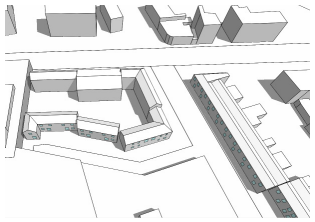
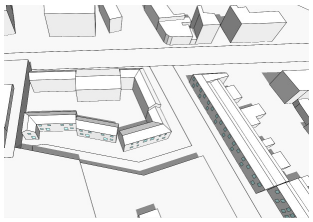
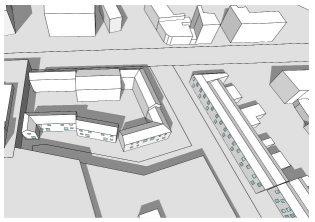
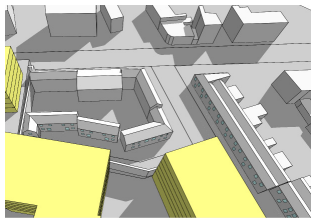
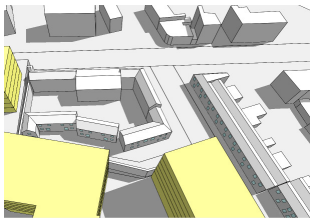
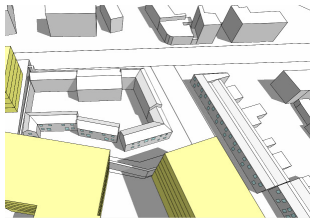
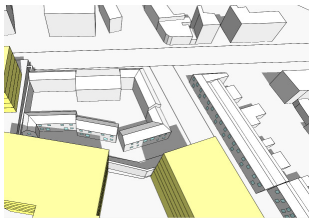
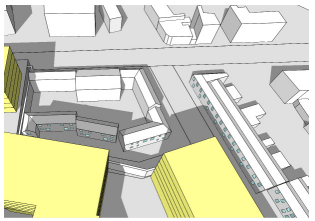
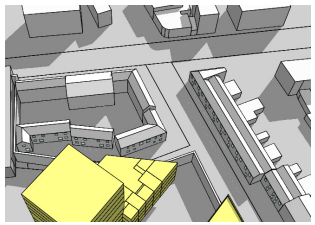
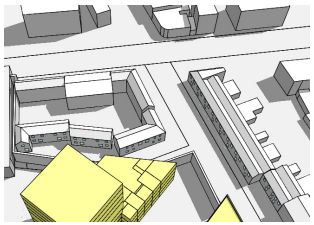
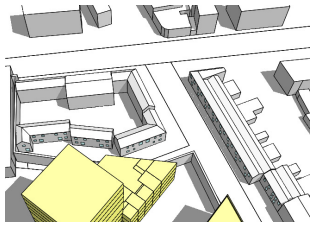
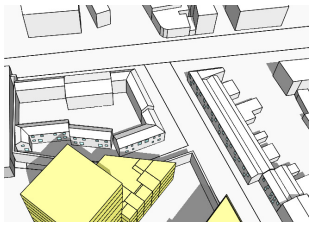
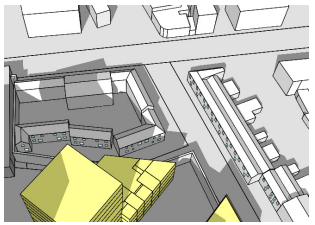
5.5.1 December 21st

					Existing Situation
					Previously Permitted Scheme
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.5.2 March 21st

					Existing Situation
					Previously Permitted Scheme
					Proposed Scheme
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.5.3 June 21st

					Existing Situation
					Previously Permitted Scheme
					Proposed Development
8:00 AM	10:00 AM	12:00 PM	14:00 PM	16:00 PM	

5.6 Discussion

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

- **Morning (until 12h00)**
  - **Oriel Street Upper** – no additional shading visible from the proposed development (compared with the Previously Permitted) on the existing residential dwellings, as they sit to the East of development site.
  - **Oriel Hall** - no additional shading visible from the proposed development (compared with the Previously Permitted) on the existing residential dwellings, as they sit to the East of development site.
- **Midday (from 12h00 until 16h00)**
  - **Oriel Street Upper** – similar shading visible from the proposed development (compared with the Previously Permitted) on the existing residential dwellings, as they sit to the East of development site.
  - **Oriel Hall** - similar shading visible from the proposed development (compared with the Previously Permitted) on the existing residential dwellings, as they sit to the East of development site.
- **Late Afternoon (from 16h00)**
  - **Oriel Street Upper** – similar shading visible from the proposed development (compared with the Previously Permitted) on the existing residential dwellings, as they sit to the East of development site.
  - **Oriel Hall** - similar shading visible from the proposed development (compared with the Previously Permitted) on the existing residential dwellings, as they sit to the East of development site.

In terms of shading on surrounding properties, the impact of the proposed development is almost identical to that from the Previously Permitted scheme.

6 Daylight Analysis of Neighbouring Existing Buildings

We have set out in this section how the proposed Development meets the BRE Recommendations with regards to any reduction of daylight to the existing dwellings.

We set out based on precedents in Dublin City what a comparable VSC Value could be for the Development.

This VSC worked out at a very low base value and following advice from BRE we adopted an alternative approach which is set out in our results.

This alternative approach demonstrated in a reasonable manner how the proposed Development meets BRE Guidelines regarding any reduction of daylight to the existing dwellings.

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 Previously Permitted building is itself a good neighbour, standing a reasonable distance from the boundary and taking no more than its fair share of light.

6.2 Vertical sky component

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.

BRE's 2011 guidance state in its in Introduction that "Although the BRE guide gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design. In special circumstances the developer or planning authority may wish to use different target values. For example, in a historic city existing buildings."

Taking this statement from the BRE guide into consideration, it was important that the proposed site was first analysed to ensure that any special circumstances were taken into account and applicable target values were developed. This is discussed below.

6.3 Daylight / Skylight special circumstances

The particular circumstances in this case are a combination of both, with the proposed development being located close to an historic city centre undergoing significant changes as part of

i) Strategic Development Zones (http://www.dublindocklands.ie/planning/docklands-sdz/sdz-scheme/north-lotts-and-grand-canal-dock-sdz-planning-scheme) or

ii) Recent development plans (http://bolandsquay.com/)

As a result of these there is nearby existing precedent for modern 8-15 storey buildings.

Taking this into account there is an opportunity to develop applicable target values for this situation. Guidance and further explanation as to how this may be done appropriately is given in the BRE 2011 guide and Appendix F in particular. This examines how the criteria for the vertical sky component was determined and the reason therefore for allowing these criteria to vary in city centres.

At a basic level, the target figures in the BRE guide are calculated for what is more typically a suburban (or at least non city centre) environment. To help understand how the 27% VSC value is derived above at the following explanation is offered;

If we consider a theoretical road with two storey terraced houses on either side, twelve metres apart. Assuming the houses have windows at ground and first floor level, and a pitched roof with a central ridge, then a reference point could be taken at the centre of a ground floor window of one of the properties. From this point if a line was drawn to the central ridge of the property on the other side of the road the angle of this line would equate to 25 degrees (this is the 25 degrees referred to in the summaries given with reference to the criteria for skylight in the BRE guide). It we relate this 25-degree line to table F1 (see Appendices) in Appendix F of the BRE's 2011 guidance we can see this equates to an equivalent vertical sky component of 27%, which is the value deemed to give adequate daylighting.

It can be readily appreciated that in a city centre, this kind of urban form is unlikely and is impractical. It would therefore be inappropriate to consider values for two storey terraced housing in a city centre.

To help determine more appropriate target values were used for the study, Appendix F was used to help determine more appropriate target values were used for the study. The approach used to calculate the appropriate target values is described in sections F3 and F4 of Appendix F in the BRE guide.

F3 Whatever the targets chosen for a particular development, it is important that they should be self-consistent. Table F1 can be used to ensure this. First a limiting obstruction angle (for wide obstructions) is chosen from the first column. The second column expresses this as the ratio (spacing of obstruction)/ (height above reference point). The third column gives the equivalent VSC at the reference point; this can be used to assess the skylight impact of taller, narrower obstructions. The remaining three columns give the corresponding quantities which can be used to assess the amount of skylight left to reach adjoining development land (Section 2.3). They are derived from the building-to-building angles in the first column, by using the method illustrated in Figure 12 of Section 2.3, which constructs an imaginary 'mirror image' building the other side of the boundary. Again all angles and heights are expressed relative to a reference point which would normally be at the level of the lowest window.	F4 For example, in a mews in a historic city centre, a typical obstruction angle from ground floor window level might be close to 40° (Figure F1). This would correspond to a VSC of 18%, which could be used as a target value for development in that street if new development is to match the existing layout.
Paragraph F3 from BRE guide	Paragraph F4 from BRE guide

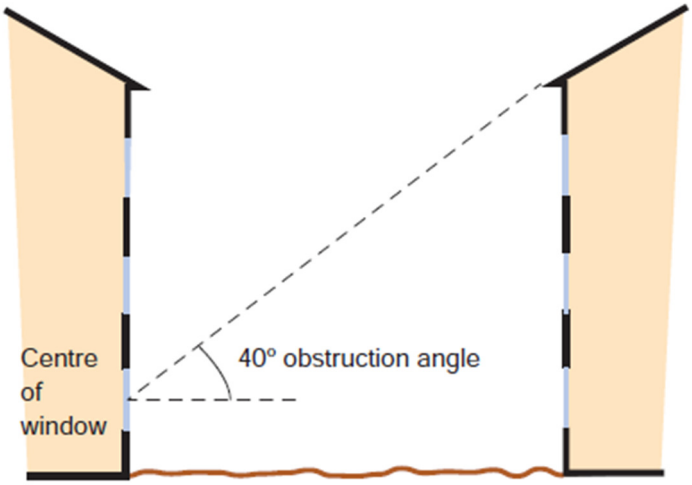


Figure 1: Hypothetical example of a narrow mews with a higher obstruction angle (BRE, 2011)

The BRE states:

"For example, in a mews in a historic city centre, a typical obstruction angle from ground floor window level might be close to 40˚ (see Figure 1). This would correspond to a VSC of 18% (see Figure 2, below), which could be used as a target value for development in that street if new development is to match the existing layout."

Table F1: Equivalent VSCs, spacing-to-height ratios and boundary parameters corresponding to particular obstruction angles between rows of buildings. (Heights and angles are usually relative to a point at the centre of a window, see Figure F2.)

Obstruction angle γ on building, degrees to horizontal	Equivalent spacing-to-height ratio (s_1/h_1)	Equivalent vertical sky component (VSC) (%)	Obstruction angle γ_1 at boundary (degrees to horizontal)	Spacing from boundary, divided by height (s_2/h_2)	Vertical sky component at boundary (%)
16	3.5	32	30	1.7	24
18	3.1	31	33	1.5	23
20	2.7	30	36	1.4	21
22	2.5	29	39	1.2	19
24	2.2	28	42	1.1	17
25	2.1	27	43	1.1	17
26	2.1	27	44	1.0	16
28	1.9	26	47	0.93	14
30	1.7	24	49	0.87	13
32	1.6	23	51	0.81	12
34	1.5	22	53	0.75	11
36	1.4	21	55	0.69	10
38	1.3	20	57	0.64	9
40	1.2	18	59	0.60	8
42	1.1	17	61	0.56	7
44	1.0	16	63	0.52	6
46	1.0	15	64	0.48	6
48	0.90	14	66	0.45	5
50	0.84	13	67	0.42	4

Figure 2: Table F1 from the BRE guide showing equivalent VSCs corresponding to particular obstruction angle

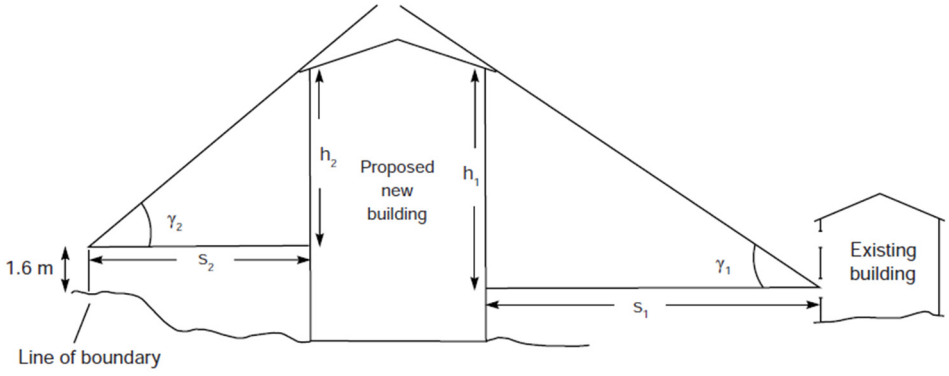


Figure 3: Angles, spacing's and heights used in Table F1 of the BRE guide (BRE, 2011)

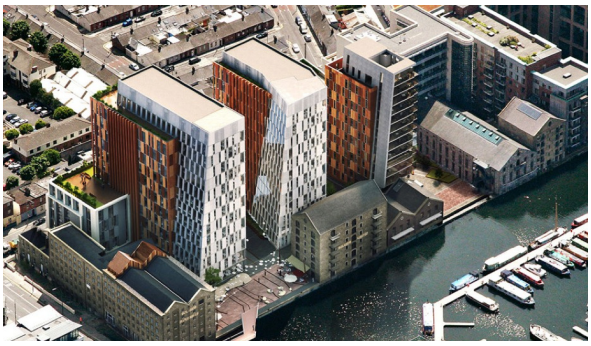
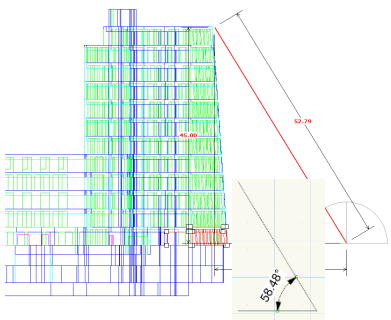
Using the approach above based and using Table F1, above, a corresponding VSC target value can be established from the obstruction angle from the line of boundary.

Figure 3 provides further guidance on the calculation method to be used.

Given that, the site is located in a city centre location of a historic city, an obstruction angle of 40 degrees or greater may be expected.

However, in order to understand the obstruction angles for the surrounding areas a number of calculations were carried out.

These calculations involved measuring the distance from the line of boundary opposite the relevant potential sensitive receptors (s_2 value in Figure 3) and measuring the height from 1.6m to the ridge of the opposite building (h_2 in Figure 3).

Spencer Place– Mayor Street	
	
Boland's Quay Place (up to 8 stories) – Mayor Street Upper	
	
	

The measurements show obstruction angles between 59-66 degrees.

If we take the obstruction angle from building from the first column of BRE Table F1 the maximum angle given is 50 degrees which equates to a target VSC vale of 13% obviously the obstruction angles between 59-66 degrees are in excess of this.

If we assume that the other side of BRE Table F1 can be used an angle of 59 degrees would suggest that the available vertical sky component at the boundary is 8%, this obviously is meant to determine the vertical sky component at the boundary. Using the converse of this it could be suggested that the equivalent vertical sky component at the boundary 8% could be used as an equivalent vertical sky component (VSC) target value. Whereas using an angle of 66 degrees would suggest an equivalent vertical sky component at the boundary 5%

We consider the Target VSC value of 5% to be unreasonably low even though it has been used on other high rise developments in Dublin, and following advice from BRE we have adopted an alternative approach.

It is reasonable to consider the difference in impact of the two schemes – consented and proposed – for example by using consented VSC as target values but not to use them to calculate proportional losses.

Calculations for loss of VSC can be presented which compares the levels of VSC the neighbouring properties currently receive with these they would receive with the development in place. Equivalent losses for the consented scheme could also be presented.

These calculations can be simply obtained using the VSC valves in the IES Report by dividing the VSC with the proposed development in place by the existing scenario. The same can then be done with the consented Development.

Please note that whilst the Block D hotel has been considered for in the shadow analysis completed under section 5 where the impact of the Proposed development is almost identical to the permitted scheme. It is excluded from the Daylight Analysis of Existing Buildings analysis (via consideration of Vertical Sky Component) as it does not form part of this application.

6.4 Assessment

6.4.1 Oriel Hall – Residential

Based on the above the following locations have been modelled:

Orien Hall – Residential Development

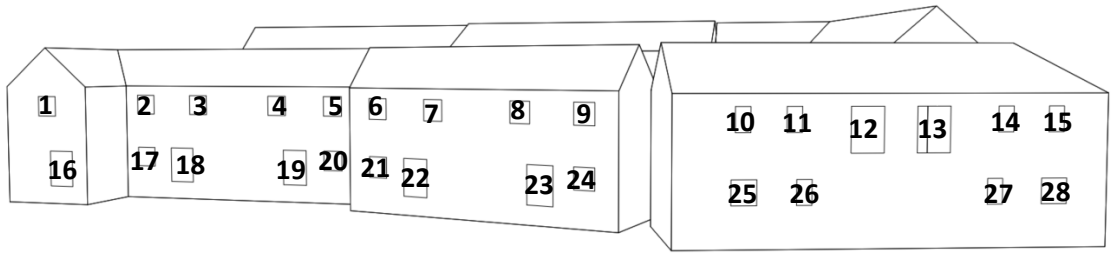


Table 1 Loss of VSC for Oriel Hall

Analysis points	Existing VSC (%)	Proposed VSC (%)	Ratio after/before	Consented VSC (%)	Ratio after/before
1	32.42	10.81	0.33	8.34	0.26
2	32.04	12.10	0.38	11.10	0.35
3	36.09	12.11	0.34	11.02	0.31
4	36.69	12.10	0.33	12.22	0.33
5	33.68	10.23	0.30	11.56	0.34
6	36.87	11.01	0.30	11.08	0.30
7	36.98	10.95	0.30	12.07	0.33
8	37.07	11.25	0.30	14.86	0.40
9	36.68	10.46	0.29	16.95	0.46
10	37.52	13.97	0.37	18.66	0.50
11	37.63	15.11	0.40	18.63	0.50
12	37.31	16.96	0.45	16.74	0.45
13	37.38	19.05	0.51	15.98	0.43
14	37.54	21.67	0.58	15.76	0.42
15	37.53	23.19	0.62	16.70	0.44
16	30.18	7.49	0.25	5.00	0.17
17	26.06	9.43	0.36	6.31	0.24
18	32.23	10.11	0.31	7.77	0.24
19	34.32	9.21	0.27	9.11	0.27
20	30.90	7.68	0.25	7.70	0.25
21	36.21	9.62	0.27	8.81	0.24
22	36.26	9.07	0.25	9.08	0.25
23	35.92	8.60	0.24	11.63	0.32
24	35.01	7.90	0.23	13.32	0.38
25	36.88	11.67	0.32	14.23	0.39
26	36.87	12.82	0.35	14.76	0.40
27	36.53	17.79	0.49	13.48	0.37
28	36.79	19.35	0.53	13.92	0.38

- The windows at Oriel Hall, and at other locations analysed, have very high existing VSCs as they have very few existing obstructions to daylight affecting them. With the proposed development in place, these would fall to well below the standard VSC target of 27%. There would be a major adverse impact on all of the windows.

- However, the consented development would also have had a very large adverse impact. Table 2 examines the differences in retained level of VSC and in after/before ratio. A negative number in red text indicates that the consented development would have more impact than the proposed one.

Table 2 Differences in VSC and in after/before ratio for Oriel Hall

Analysis points	Difference in VSC Proposed - consented	Difference in ratio Proposed - consented
1	2.47	0.08
2	1.00	0.03
3	1.09	0.03
4	-0.12	0.00
5	-1.33	-0.04
6	-0.07	0.00
7	-1.12	-0.03
8	-3.61	-0.10
9	-6.49	-0.18
10	-4.69	-0.13
11	-3.52	-0.09
12	0.22	0.01
13	3.07	0.08
14	5.91	0.16
15	6.49	0.17
16	2.49	0.08
17	3.12	0.12
18	2.34	0.07
19	0.10	0.00
20	-0.02	0.00
21	0.81	0.02
22	-0.01	0.00
23	-3.03	-0.08
24	-5.42	-0.15
25	-2.56	-0.07
26	-1.94	-0.05
27	4.31	0.12
28	5.43	0.15

- 14 windows would receive more daylight than they would have in the consented scenario. These values might be considered a pass of an alternative target.

- 14 windows would receive less daylight than they would have in the consented scenario. For four of these the difference would be negligible, with very small differences in VSC which would result in the same after/before ratio as the consented development when considered to two significant figures.

- The remaining 10 windows are windows 5, 7 to 11 and 23 to 26. Their retained VSC values would be between 7.9% and 15.11%. Some of them are substantially lower than they would have been with the consented scenario, for example window 24 would retain 7.9% of VSC instead of 13.32%.

6.4.2 Oriel Street Upper – Residential

6.4.2.1 1-7 Oriel Street Upper

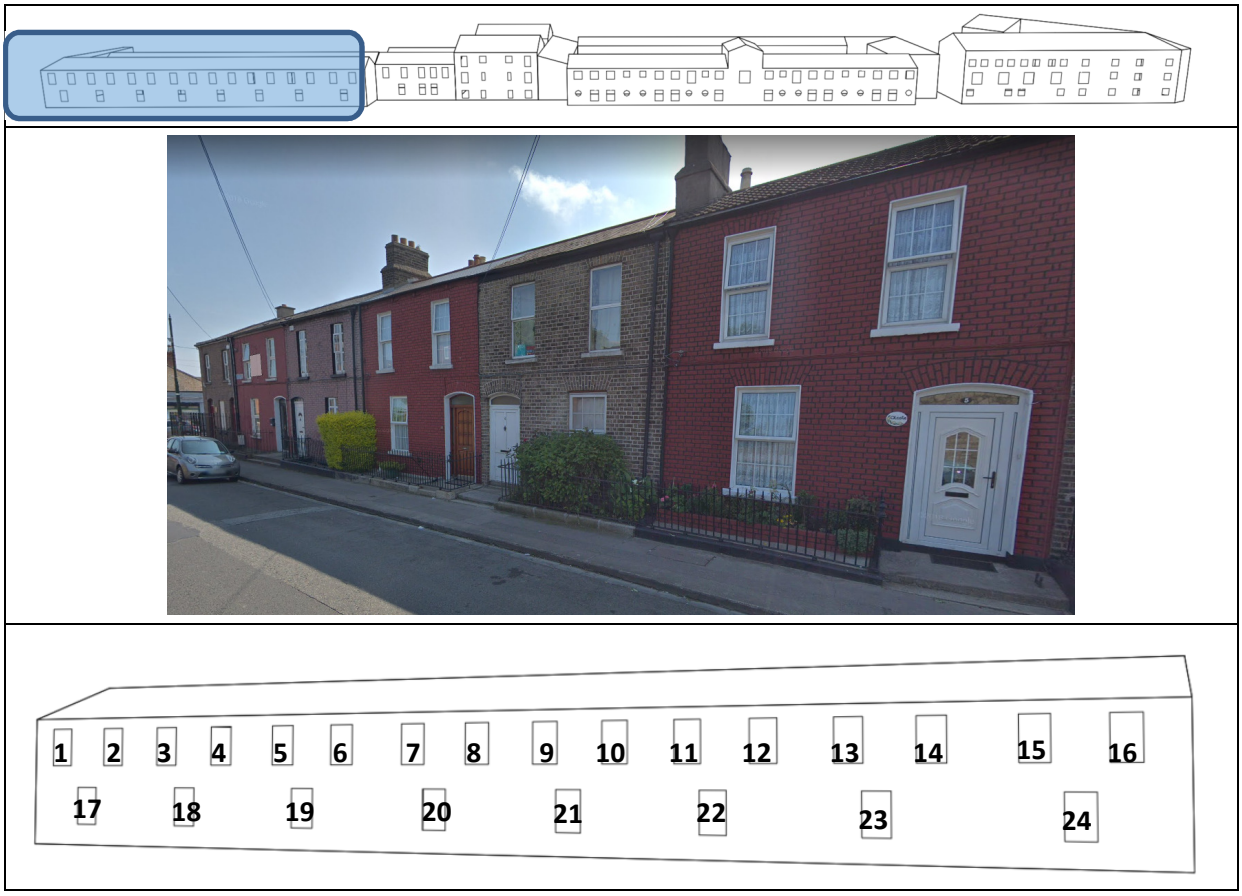


Table 3 Loss of VSC for 1-7 Oriel Street Upper

Analysis points	Existing VSC (%)	Proposed VSC (%)	Ratio after/before	Consented VSC (%)	Ratio after/before
1	36.40	29.04	0.80	31.47	0.86
2	34.21	28.78	0.84	30.70	0.90
3	34.17	28.27	0.83	30.14	0.88
4	34.45	27.81	0.81	29.54	0.86
5	34.79	27.52	0.79	28.69	0.82
6	35.27	27.09	0.77	28.32	0.80
7	35.89	27.21	0.76	26.99	0.75
8	36.16	27.49	0.76	26.60	0.74
9	36.59	27.00	0.74	25.39	0.69
10	36.85	27.26	0.74	24.07	0.65
11	36.80	26.73	0.73	23.21	0.63
12	36.97	26.36	0.71	21.32	0.58
13	37.25	25.85	0.69	19.20	0.52
14	37.23	24.52	0.66	17.91	0.48
15	37.36	24.31	0.65	16.32	0.44
16	37.47	22.80	0.61	15.33	0.41
17	31.48	27.21	0.86	28.69	0.91
18	31.77	26.25	0.83	27.38	0.86
19	32.68	25.25	0.77	26.26	0.80
20	34.08	25.37	0.74	24.88	0.73
21	35.04	24.95	0.71	22.77	0.65
22	35.75	24.84	0.69	20.59	0.58
23	36.27	23.34	0.64	16.57	0.46
24	36.40	21.43	0.59	13.53	0.37

- The windows would retain a lot more daylight than those at Oriel Hall. Loss of daylight to twelve windows would be within the standard BRE guidelines, with windows either retaining at least 27% of VSC or retaining at least 0.8 times what they currently receive.

- Of the remaining 12 windows, 11 would retain more VSC than they would have with the consented scenario in place. These could be considered to meet an alternative target.

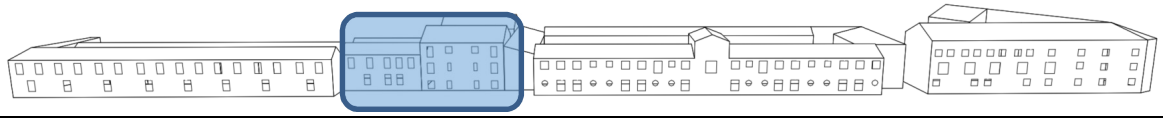
- Loss of daylight to the last window would be only marginally outside the guidelines, retaining just below the standard recommended VSC of 27% and 0.77 times what it currently receives. This would be a minor adverse impact. This could be compared to a reasonable alternative target as discussed above.

Table 4 Differences in VSC and in after/before ratio for 1-7 Oriel Street Upper

Analysis points	Difference in VSC Proposed - consented	Difference in ratio Proposed - consented
1	-2.43	-0.07
2	-1.92	-0.06
3	-1.87	-0.05
4	-1.73	-0.05
5	-1.17	-0.03
6	-1.23	-0.03
7	0.22	0.01
8	0.89	0.02
9	1.61	0.04
10	3.19	0.09
11	3.52	0.10
12	5.04	0.14
13	6.65	0.18
14	6.61	0.18
15	7.99	0.21
16	7.47	0.20
17	-1.48	-0.05
18	-1.13	-0.04
19	-1.01	-0.03
20	0.49	0.01
21	2.18	0.06
22	4.25	0.12
23	6.77	0.19
24	7.9	0.22

- Taken as a whole the proposed development would have less impact than the consented one on this terrace of houses.

6.4.2.2 8-10 Oriel Street Upper



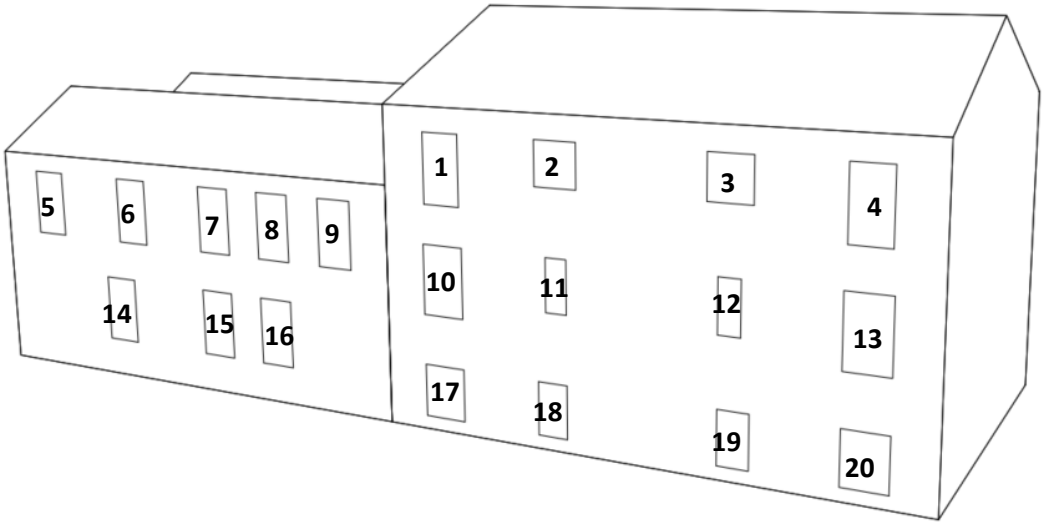


Table 5 Loss of VSC for 8-10 Oriel Street Upper

Analysis points	Existing VSC (%)	Proposed VSC (%)	Ratio after/before	Consented VSC (%)	Ratio after/before
1	37.84	23.13	0.61	19.08	0.50
2	37.93	22.90	0.60	19.15	0.50
3	37.98	22.43	0.59	19.06	0.50
4	37.89	21.68	0.57	18.28	0.48
5	30.07	16.29	0.54	14.03	0.47
6	35.99	21.68	0.60	16.68	0.46
7	37.07	22.61	0.61	17.27	0.47
8	37.25	22.22	0.60	17.17	0.46
9	37.43	22.02	0.59	17.33	0.46
10	37.34	21.07	0.56	16.29	0.44
11	37.25	21.64	0.58	16.31	0.44
12	37.22	20.56	0.55	15.84	0.43
13	36.91	19.95	0.54	15.77	0.43
14	33.19	17.70	0.53	12.36	0.37
15	35.83	19.77	0.55	14.57	0.41
16	36.32	20.07	0.55	14.71	0.41
17	36.74	19.10	0.52	13.89	0.38
18	36.60	19.43	0.53	13.82	0.38
19	36.13	18.31	0.51	13.50	0.37
20	35.52	17.89	0.50	13.24	0.37

- Although the proposed development would have a major adverse impact on the windows, the proposed development would have less impact than the consented development in all cases, and therefore could be considered to have achieved an alternative target based on the original development.

Table 6 Differences in VSC and in after/before ratio for 8-10 Oriel Street Upper

Analysis points	Difference in VSC Proposed - consented	Difference in ratio Proposed - consented
1	4.05	0.11
2	3.75	0.10
3	3.37	0.09
4	3.40	0.09
5	2.26	0.08
6	5.00	0.14
7	5.34	0.14
8	5.05	0.14
9	4.69	0.13
10	4.78	0.13
11	5.33	0.14
12	4.72	0.13
13	4.18	0.11
14	5.34	0.16
15	5.20	0.15
16	5.36	0.15
17	5.21	0.14
18	5.61	0.15
19	4.81	0.13
20	4.65	0.13

6.4.2.3 St. Laurence O'Toole Court House Complex

Table 7 Loss of VSC for St Laurence O'Toole Court House Complex

Analysis points	Existing VSC (%)	Proposed VSC (%)	Ratio after/before	Consented VSC (%)	Ratio after/before
1	36.67	17.96	0.49	13.28	0.36
2	37.44	18.24	0.49	13.18	0.35
3	37.44	18.02	0.48	13.11	0.35
4	37.46	17.98	0.48	13.21	0.35
5	37.25	17.77	0.48	13.40	0.36
6	37.34	17.95	0.48	13.17	0.35
7	37.30	17.63	0.47	13.26	0.36
8	37.26	17.37	0.47	13.13	0.35
9	37.28	17.95	0.48	13.88	0.37
10	37.22	17.57	0.47	13.99	0.38
11	37.15	16.38	0.44	14.54	0.39
12	37.23	16.38	0.44	15.69	0.42
13	36.99	16.59	0.45	15.98	0.43
14	37.11	16.00	0.43	16.87	0.45
15	36.93	15.55	0.42	17.95	0.49
16	36.72	15.47	0.42	18.48	0.50
17	36.97	14.65	0.40	19.84	0.54
18	36.71	14.68	0.40	20.90	0.57
19	36.63	13.51	0.37	21.83	0.60
20	36.59	13.03	0.36	22.55	0.62
21	36.68	12.33	0.34	24.31	0.66
22	36.93	15.65	0.42	11.03	0.30
23	36.85	15.67	0.43	10.81	0.29
24	36.69	15.96	0.43	11.42	0.31
25	36.66	15.69	0.43	11.446	0.31
26	36.52	15.83	0.43	11.72	0.32
27	36.54	15.21	0.42	13.41	0.37
28	36.38	14.19	0.39	15.68	0.43
29	36.24	13.54	0.37	16.73	0.46
30	35.85	12.69	0.35	20.00	0.56
31	35.93	11.78	0.33	20.93	0.58

- The proposed development would have a major adverse impact on all of the windows in this building. The impact of the consented development would also have been major adverse for the most part, but the losses are a lot smaller in some cases.

- The differences between the two schemes are shown in Table 8 below.

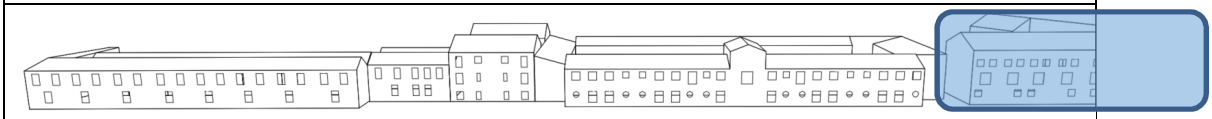
Table 8 Differences in VSC and in after/before ratio for St Laurence O'Toole Court House Complex

Analysis points	Difference in VSC Proposed - consented	Difference in ratio Proposed - consented
1	4.68	0.13
2	5.06	0.14
3	4.91	0.13
4	4.77	0.13
5	4.37	0.12
6	4.78	0.13
7	4.37	0.12
8	4.24	0.11
9	4.07	0.11
10	3.58	0.10
11	1.84	0.05
12	0.69	0.02
13	0.61	0.02
14	-0.87	-0.02
15	-2.4	-0.06
16	-3.01	-0.08
17	-5.19	-0.14
18	-6.22	-0.17
19	-8.32	-0.23
20	-9.52	-0.26
21	-11.98	-0.33
22	4.62	0.13
23	4.86	0.13
24	4.54	0.12
25	4.244	0.12
26	4.11	0.11
27	1.8	0.05
28	-1.49	-0.04
29	-3.19	-0.09
30	-7.31	-0.20
31	-9.15	-0.25

- 19 windows would be less affected with the proposed development compared to the consented development. These could be considered to meet an alternative target based on the original development.

- 12 windows would be more affected by the proposed development, substantially so in some cases. These could be considered with a properly calculated alternative target based on typical VSCs in the vicinity of high rise developments.

6.4.2.4 21-25 Oriel Street Upper

21-25 Oriel Street Upper



NOTE:

This does not form part of this Planning Application.

Table 9 Summary of impacts to neighbouring properties

Location	Impact of proposed development	Impact of consented development	Change
Oriel Hall	Major adverse	Major	14 better, 4 negligible change, 10 worse
1-7 Oriel Street Upper	Minor to moderate adverse	Minor to major adverse	Better overall. 12 within guidelines, 11 better, 1 worse but only marginally outside standard guidelines
8-10 Oriel Street Upper	Moderate to major adverse	Major adverse	Better in all cases.
St Laurence O'Toole Court House Complex	Major adverse	Major adverse	19 better, 12 worse, some substantially worse

The neighbouring properties at Oriel Hall and on Oriel Street Upper are currently almost completely unobstructed and have high existing VSCs. The development would have a moderate to major adverse impact on most of them. However, the consented development would also have a moderate to major adverse impact. When comparing the impacts of the proposed and consented developments, some windows would be less affected and some would be more affected, such that there is no clear improvement or dis-improvement when all the neighbouring properties are considered together.

7 Conclusion

Following engagement with Dublin City Council and ABP we commissioned the BRE (Building Research Establishment) to review the IES Report and make recommendations to ensure the report as presented complies with the correct interpretation of the BRE guidelines.

BRE have now confirmed (refer Appendix 1) that the IES Report as now presented takes on board the BRE comments and the results as presented are reasonable.

1.0 Sun Light 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.

Of the 15 amenity areas analysed, 12 surpass the BRE recommendation. In this particular development, all amenity areas are available to all occupants via first-floor footbridges. It is therefore reasonable to consider the BRE recommendation across the development in whole. Consequently, given that 68% of the amenity areas in the development as a whole receive more than 2 hours of sunlight on March 21st, the Proposed Development exceeds BRE recommendations.

2.0 Average Daylight Factors:

BRE guidelines recommend a daylight factor of 1.0 in bedrooms and 1.5 in living rooms / kitchens. Kitchens are an integral but small part of the living room so the ADF of 1.5% was considered appropriate in this case.

98% of the tested rooms in the proposed scheme are projected to have an Average Daylight Factors (ADF) above the recommended Average Daylight Factors (ADF) from the BRE guidelines. We note from 2 levels above garden level we have achieved 100% pass rate.

The design team believe we have achieved a balance on window design to achieve optimum daylight factor with no adverse effect on heat loss and energy efficiency.

3.0 Shadow Analysis:

In terms of shading on surrounding properties, the impact of the proposed development is almost identical to that from the previously permitted scheme as shown by the images in Section 3.

4.0 Daylight Analysis of Existing Buildings:

Vertical sky component analysis has been completed to ensure the proposed development meets the recommendations of the BRE guidelines. The analysis was completed for the existing neighbouring properties:

- Oriel Hall
- Oriel Street upper
- St Laurence O'Toole Court House Complex

The results within this report show from all of the points tested. The results are as expected for a high rise development and analysed correctly as per BRE Guidelines and of no greater impact than the previously permitted scheme.

5.0 Results:

The results of the studies carried out with input from BRE indicate that we are in compliance with BRE guidelines and confirms that we have provided a considered design for a medium to high rise Dublin City Centre Residential Development.

Appendix 1: BRE Report

BRE
Bucknalls Lane
Watford, Herts
WD25 9XX

T: +44 (0)333 321 8811
E: Enquiries@bregroup.com
W: www.bregroup.com

Simon O'Brien
Homan O'Brien
89 Booterstown Avenue
Blackrock
Co. Dublin
A94 P2C2
Ireland

Date: 7 October 2019
Our Ref.: P115690-1001
Your Ref.: 14221

Dear Simon,

Addendum to daylight and sunlight report for Project Connolly

Thank you for sending the updated IES Report for Project Connolly. We have commented on the changes it makes below.

Sunlight to the proposed amenity areas

All of the amenity areas have now been analysed for sunlight provision using the methodology contained in the BRE Report 'Site layout planning for daylight and sunlight: a guide to good practice'. Three of the fifteen areas would not receive the recommended amount of sunlight due to their positions between blocks. As all of the residents would have access to all of the amenity areas and none would be confined to the shaded areas, it may be reasonable to consider them together as a whole. 68% of the total amenity area would receive enough sunlight on 21 March, and therefore sunlight provision to the development as a whole would be within the guidelines.

Daylight provision to the proposed flats

The standard for kitchens has now been referenced in the IES report. BS 8206 Part 2 states that where a room has more than one use, the higher value of average daylight factor (ADF) should be used. However, as discussed in our main report, P115690-1000, local authorities often accept the lower value as a small kitchen would not be considered a habitable room.

The factors used in the ADF calculations have now been provided:

Reflectance factors: Individual reflectance factors have been used for the room interiors. These assume that light colours will be provided and maintained in the rooms. They are generally reasonable, and conservative in places. If a light coloured wood floor finish were used, for example, this would have a higher reflectance factor of 0.4 compared to the 0.2 which has been used and would lead to slightly higher ADFs than those reported.

Window transmission factor: A factor of 70% has been used. This is generally reasonable.

Maintenance factor: A factor of 1.0 has been used. This assumes that the windows will be in pristine condition and does not allow for normal build-up of dirt. We would normally expect dirt build up to be allowed flor. However, this could be balanced against the conservative values used for indoor reflectance.

Framing factor: The report confirms that frames were allowed for in the calculations.

Overall, allowing for some trade-off between reflectance factor and maintenance factor, the values suggest that the reported ADF values are reasonable. Using these factors, four rooms in block D2 would have lower values of ADF than the recommended minimum for living rooms or bedrooms. As noted in our main report, this is a very limited number of failures for the size of the development.

Loss of daylight to neighbouring buildings

Although the IES report still discusses the derivation of alternative targets using obstruction angle, it goes on to assess the impact of the development using the vertical sky components (VSCs) arising from the consented development. We generally recommend use of VSCs as they allow for daylight reaching around the sides of buildings as well as over the top of them. Comparison with the VSCs arising from the consented development is an approach which we recommended and used in our previous review, and IES have adopted those table data and sections of review text.

As concluded in our previous report which used this approach, when comparing the impacts of the proposed and consented developments, some windows would be less affected and some would be more affected.

Yours sincerely

Stephanie King
Senior Lighting Consultant
For and on behalf of BRE
Tel 01923 664474
stephanie.king@bregroup.com

PJ Littlefair

Dr Paul Littlefair
Principal Lighting Consultant
For and on behalf of BRE
Tel 01923 664874
paul.littlefair@bregroup.com

EUROPE

Glasgow Head Office
Helix Building, Kelvin Campus
West of Scotland Science Park
Glasgow G20 0SP UK
T +44 (0)141 945 8500
E sales@iesve.com

Dublin
4th Floor, Castleforbes House
Castleforbes Road
Dublin 1, Ireland
T +353 (0) 1875 0104
E sales@iesve.com

NORTH AMERICA

Atlanta
834 Inman Village Parkway NE
Suite 230, Atlanta GA 30307
T +1 (404) 806 2018
E consulting@iesve.com

ASIA

Pune
Dhananjay Plaza, II Floor,
Plot No. 21, Pune- Mumbai Highway
Near Lalani Quantum / Home Decor,
Bavdhan, Pune 411 021, India
T +91 (020) 6560 2848
E india@iesve.com

AUSTRALIA

Melbourne
Level 1, 123 Camberwell Road
Hawthorn East, Melbourne
Vic 3123, Australia
T +61 (0) 3 9808 8431
E support@iesve.com