Assessment of Sunlight & Daylight Access within the Proposed Development

Whitehaven Strategic Housing Development on lands at Northwood Avenue, Santry, Dublin 9

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1.0 Introduction

ARC Architectural Consultants Ltd has been retained by the Applicant to prepare this assessment of sunlight and daylight access within the proposed Whitehaven Strategic Housing Development on lands at Northwood Avenue, Santry, Dublin 9. Please note that the assessment of the impact of the proposed development on sunlight and daylight access to the surrounding area is set out in Chapter 10 of the Environmental Impact Assessment Report submitted with the application.

Note on Reference to Context under Technical and Guidance Documents and on Reference to Methodology

In order to avoid repetition, the sections outlining the relevant recommendations of technical and guidance documents and the methodologies used in undertaking this assessment have been set out in the Technical Appendix at the end of the written section of this report.

1.2 Relevant Characteristics of the Proposed Development

The proposed development will consist of a residential development comprising 5 no. blocks (Blocks 1-5 with Blocks 2 and 3 sharing a ground floor) ranging from 8-9 storeys arranged around a communal courtyard over a shared basement area, providing a total of 255 no. apartment units accommodating 11 no. 1-bedroom units, 229 no. 2-bedroom units and 15 no. 3-bedroom units.

- Block 1 will be an 8-storey block providing a total of 49 no. apartment units comprising 7 no. 1-bedroom units and 42 no. 2-bedroom units.
- Block 2 will be a 9-storey block linked to a single storey plinth providing a total of 60 no. apartment units comprising 1 no. 1-bedroom units, 57 no. 2-bedroom units and 2 no. 3-bedroom units. At ground floor level in the block and adjoining pavilion a concierge, multi-function room and gym for residents will be provided.
- Block 3 will be an 8-storey block providing a total of 47 no. apartment units comprising 1 no. 1-bedroom units, 38 no. 2-bedroom units and 8 no. 3-bedroom units.
- Block 4 will be a 9-storey block stepping down to 8-storeys providing a total of 52 no. apartment units comprising 1 no. 1-bedroom units, 49 no. 2-bedroom units and 2 no. 3-bedroom units.
- Block 5 will be a 9-storey block stepping down to 8-storeys, then 7-storeys and then 5-storeys providing a total of 47 no. apartment units comprising 1 no. 1-bedroom units, 43 no. 2-bedroom units and 3 no. 3-bedroom units.

The proposed development will also provide:

- Shared residential services include a concierge / multifunctional room (c. 246 sq.m.) and gym facility (c.73 sq.m.) located on the ground floor of Block 2 and a single storey plinth.
- A childcare facility (c.398 sq.m.) within the ground floor of Block 1 with associated outdoor play area (c.189 sq.m.) and drop off area.
- Provision of 277 no. associated car parking spaces (including 5 no. disabled parking) at basement level accessed via a ramp access, 13 no. car parking spaces (2 no. of which are for Car Share /Club) at surface level, 8 no. motorbike parking spaces at basement level, 600 no. cycle parking spaces at basement level and 128 no. cycle number spaces at surface level (including 72 no. of sheltered spaces);
- Provision of private open space to apartments in the form of terraces, balconies and gardens; communal open space and play within a shared courtyard and public open spaces to include play areas, pathways and landscaping; and
- Provision of all associated plant, drainage arrangements, utility connections, ESB substation, boundary treatment, landscaping, public lighting, refuse storage, construction compound and site development works.

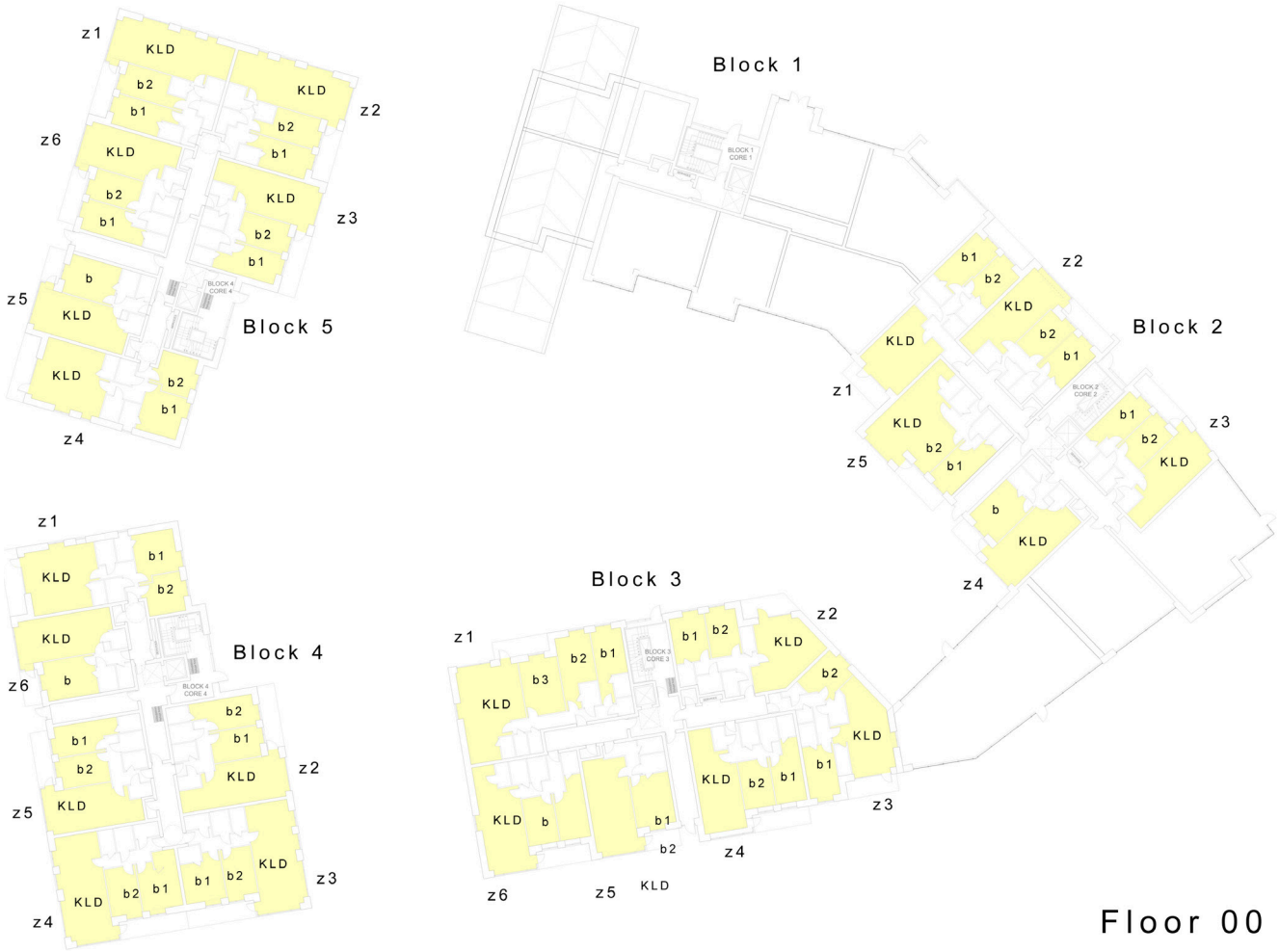


Figure 2.1: Indicative diagram based on floor plan prepared by McCrossan O'Rourke Manning Architects showing location of sample rooms analysed as part of this assessment of daylight access within the proposed development – Floor 00 – annotated in yellow by ARC

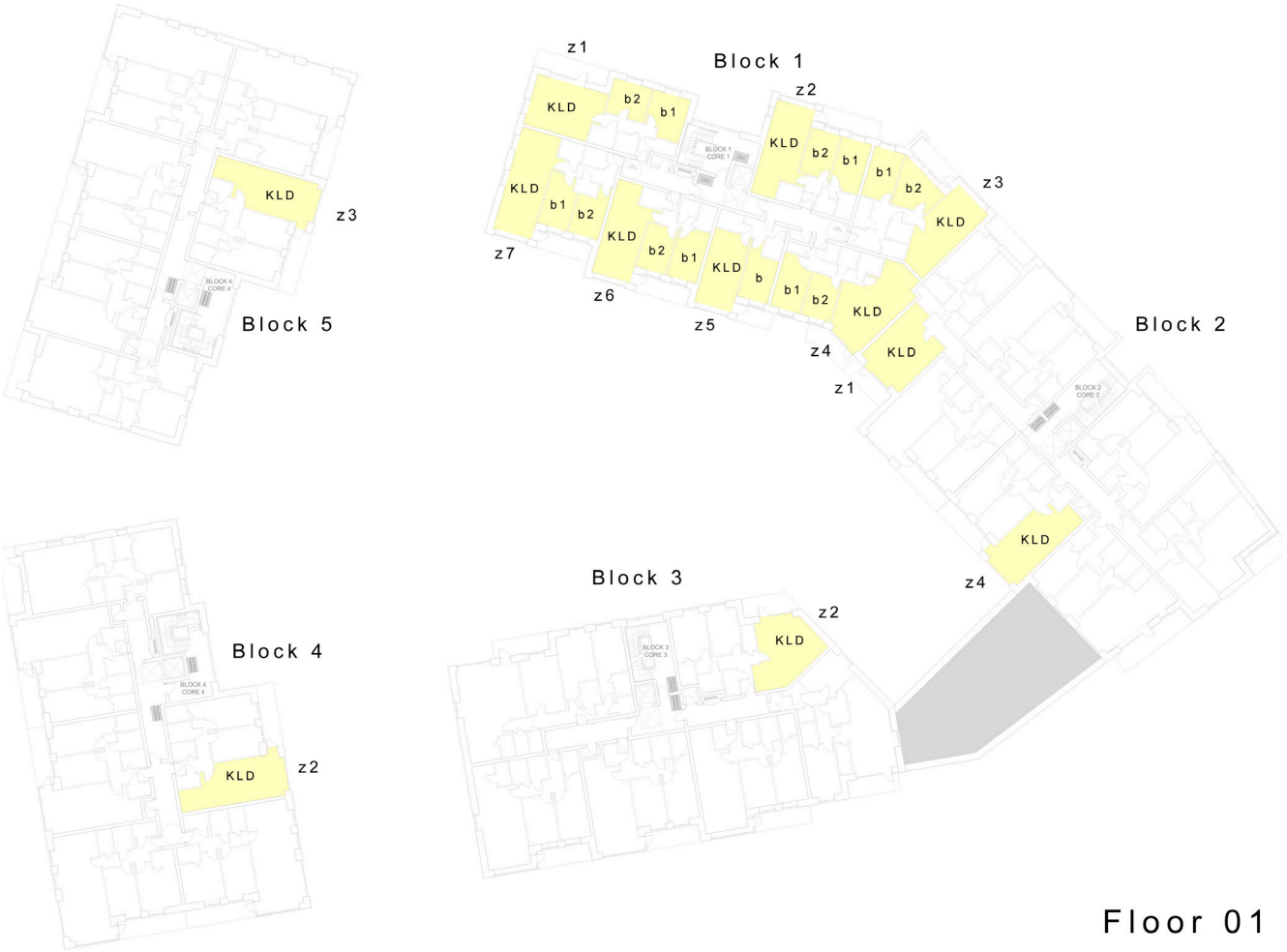


Figure 2.2: Indicative diagram based on floor plan prepared by McCrossan O'Rourke Manning Architects showing location of sample rooms analysed as part of this assessment of daylight access within the proposed development – Floor 01 – annotated in yellow by ARC

2.0 Assessment of Daylight Access within the Proposed Development

2.1 Introduction

The *Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities* provide that *"planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting' when undertaken by development proposers which offer the capability to satisfy minimum standards of daylight provision."*

Section 3.2 of the *Urban Development and Building Height Guidelines* states: *"Appropriate and reasonable regard should be taken of quantitative performance approaches to daylight provision outlined in guides like the Building Research Establishment's 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting'. Where a proposal may not be able to fully meet all the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, in respect of which the planning authority or An Bord Pleanála should apply their discretion, having regard to local factors including specific site constraints and the balancing of that assessment against the desirability of achieving wider planning objectives. Such objectives might include securing comprehensive urban regeneration and or an effective urban design and streetscape solution."*

The standards for daylight and sunlight access in buildings (and the methodologies for assessment of same) suggested in the BRE Guide have been referenced in preparing this report.

The *BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting'* was withdrawn in May 2019, while *BS EN 17037: Daylight in Buildings* was adopted in the United Kingdom in May 2019. In Ireland, *IS EN 17037: Daylight in Buildings* was published by the National Standards Authority of Ireland on 28th January 2019.This report does not refer to *IS EN 17037: Daylight in Buildings* or to the United Kingdom's *BS EN 17037: Daylight in Buildings*. The standards for daylight access (and the methodologies recommended for assessing whether rooms meet those standards) in the BRE Guide are entirely different from those set out in IS EN 17037: 2018 and BS EN 17037: 2018. Given this and given that the *Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities* refers to the BRE Guide and not to IS EN 17037: 2018 or BS EN 17037: 2018, the BRE Guide has been referenced in the preparation of this section of the report. Please note, however, that, in the interests of completeness, assessment of the proposed development under IS EN 17037: 2018 or BS EN 17037: 2018 has been carried out and is included at Appendix A of this report.

The BRE Guide states as follows (at paragraph 2.1.8) in relation to daylight access within new development:

> *"2.1.8 Daylight provision in new rooms may be checked using the average daylight factor (ADF). The ADF is a measure of the overall amount of daylight in a space... BS 8206-2 Code of practice for daylighting, recommends an ADF of 5% for a well daylit space and 2% for a partly daylit space. Below 2% the room will look dull and electric lighting is likely to be turned on. In housing BS 8206-2 also gives minimum value of ADF of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms."*

While not expressly discussed in the BRE Guide, Section 5.6 of the *BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting'* (withdrawn in May 2019) states as follows in relation to multi-function rooms: *"Where one room serves more than one purpose, the minimum average daylight factor should be that for the room type with the highest value. For example, in a space which combines a living room and a kitchen the minimum average daylight factor should be 2%."*

2.2 Detailed Analysis of Daylight Access to Proposed Units – Selection of Representative Sample

As part of this *Assessment of Sunlight & Daylight Access within the Proposed Development,* ARC undertook an assessment of the likely daylight access within the proposed residential units. This assessment assumed that the envisaged development on the site to the northwest has been constructed in the interests of presenting a worst case scenario.

The BRE Guide does not dictate how its recommendations in relation to daylight access should be applied to large multi-unit schemes. Specifically, the BRE Guide does not suggest what proportion of rooms within a multi-unit scheme should be analysed to ensure good daylight performance within such a scheme as a whole. Moreover, the BRE Guide does not suggest how to choose the sample of rooms that should be analysed. The following approach was used in choosing the sample for assessment:

- Section 2.1.12 of the BRE Guide states that an initial approach would be to look at daylight access to the *"ground (or lowest storey base)"* of a proposed structure. This is because daylight to the lowest levels of accommodation will be the most obstructed. Given this, ARC assessed all habitable rooms within proposed residences on the ground floor.
- As there is considerable similarity in the plans from floor to floor, it is reasonable to assume that rooms on upper floors will achieve similar or better daylight levels as these rooms will be less obstructed. In the interests of completeness, however, a sample of worst case scenario rooms was also assessed on Floor 01.

The locations of the sample study rooms analysed as part of this analysis of daylight access within residences within the proposed development are illustrated at Figures 2.1 and 2.2 above. For more detail on the methodology used in assessing daylight access, please refer to the Technical Appendix of this Report.

2.3 Engagement with the Design Team during the Design Phase

ARC engaged in a prolonged, iterative process with the Design Team over a period of months to ensure that all habitable rooms within residences within the proposed development would be capable of achieving the recommendations of the BRE Guide with regard to daylight access. This process included:

- Detailed quantitative assessment of emerging designs for proposed unit types where there was a potential for issues with daylight access to arise;
- Detailed quantitative analysis of potential design solutions for the improvement of daylight access was carried out.

2.4 Results of Assessment of Daylight Access within the Proposed Development

ARC's analysis predicts that all sample study rooms (a large proportion of which represent a worst case scenario) within the proposed development will achieve levels of daylight access at or above the minimum Average Daylight Factor recommended by the BRE Guide for living rooms (i.e. 1.5% Average Daylight Factor) and for bedrooms (i.e. 1% Average Daylight Factor). ARC's analysis further indicates that all kitchen / living / dining rooms in unit types throughout the proposal are likely to receive a level of daylight access in excess of the recommended 2% Average Daylight Factor for mixed function rooms[1].

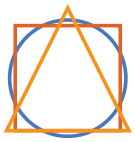
Given that worst case analysis units were included in the assessment sample, ARC's analysis would suggest that all units within the proposed development are likely to achieve Average Daylight Factors in excess of the minimum standards outlined in the BRE Guide.

The results of ARC's analysis of likely daylight access within the proposed development are set out in Table 2.1 below:

1 Although it was withdrawn in May 2019, the British Standard is instructive in relation to multi-function rooms. It states that: *"Where one room serves more than one purpose, the minimum average daylight factor should be that for the room type with the highest value. For example, in a space which combines a living room and a kitchen the minimum average daylight factor should be 2%."*

Table 2.1: BRE Guide (BR209, 2011): Predicted daylight access to sample rooms within the proposed development*

Location	Floor	Room Type	Predicted Average Daylight Factor	Achieves recommended minimum?
Block 1				
B1 01 z1 b1	Floor 01	Bedroom	3.64%	Yes
B1 01 z1 b2	Floor 01	Bedroom	3.79%	Yes
B1 01 z1 kld	Floor 01	Kitchen / Dining / Living Room	6.73%	Yes
B1 01 z2 b1	Floor 01	Bedroom	3.09%	Yes
B1 01 z2 b2	Floor 01	Bedroom	3.02%	Yes
B1 01 z2 kld	Floor 01	Kitchen / Dining / Living Room	6.88%	Yes
B1 01 z3 b1	Floor 01	Bedroom	3.34%	Yes
B1 01 z3 b2	Floor 01	Bedroom	4.59%	Yes
B1 01 z3 kld	Floor 01	Kitchen / Dining / Living Room	4.21%	Yes
B1 01 z4 b1	Floor 01	Bedroom	2.89%	Yes
B1 01 z4 b2	Floor 01	Bedroom	2.96%	Yes
B1 01 z4 kld	Floor 01	Kitchen / Dining / Living Room	2.67%	Yes
B1 01 z5 b	Floor 01	Bedroom	2.88%	Yes
B1 01 z5 kld	Floor 01	Bedroom	5.38%	Yes
B1 01 z6 b1	Floor 01	Kitchen / Dining / Living Room	2.77%	Yes
B1 01 z6 b2	Floor 01	Bedroom	2.97%	Yes
B1 01 z6 kld	Floor 01	Bedroom	5.02%	Yes
B1 01 z7 b1	Floor 01	Kitchen / Dining / Living Room	2.86%	Yes
B1 01 z7 b2	Floor 01	Bedroom	2.94%	Yes
B1 01 z7 kld	Floor 01	Bedroom	6.36%	Yes
Block 2				
B2 00 z1 b1	Floor 00	Bedroom	2.39%	Yes
B2 00 z1 b2	Floor 00	Bedroom	2.64%	Yes
B2 00 z1 kld	Floor 00	Kitchen / Dining / Living Room	3.55%	Yes
B2 00 z2 b1	Floor 00	Bedroom	2.45%	Yes
B2 00 z2 b2	Floor 00	Bedroom	2.41%	Yes
B2 00 z2 kld	Floor 00	Kitchen / Dining / Living Room	5.08%	Yes
B2 00 z3 b1	Floor 00	Bedroom	2.39%	Yes
B2 00 z3 b2	Floor 00	Bedroom	2.48%	Yes
B2 00 z3 kld	Floor 00	Kitchen / Dining / Living Room	3.58%	Yes
B2 00 z4 b	Floor 00	Bedroom	1.70%	Yes
B2 00 z4 kld	Floor 00	Kitchen / Dining / Living Room	3.72%	Yes
B2 00 z5 b1	Floor 00	Bedroom	2.08%	Yes
B2 00 z5 b2	Floor 00	Bedroom	2.12%	Yes
B2 00 z5 kld	Floor 00	Kitchen / Dining / Living Room	3.83%	Yes
B2 01 z1 kld	Floor 01	Kitchen / Dining / Living Room	2.88%	Yes
B2 01 z4 kld	Floor 01	Kitchen / Dining / Living Room	3.61%	Yes
Block 3				
B3 00 z1 b1	Floor 00	Bedroom	3.10%	Yes
B3 00 z1 b2	Floor 00	Bedroom	2.69%	Yes
B3 00 z1 b3	Floor 00	Bedroom	1.99%	Yes
B3 00 z1 kld	Floor 00	Kitchen / Dining / Living Room	5.63%	Yes



Location	Floor	Room Type	Predicted Average Daylight Factor	Achieves recommended minimum?
B3 00 z2 b1	Floor 00	Bedroom	2.67%	Yes
B3 00 z2 b2	Floor 00	Bedroom	2.88%	Yes
B3 00 z2 kld	Floor 00	Kitchen / Dining / Living Room	5.01%	Yes
B3 00 z3 b1	Floor 00	Bedroom	3.21%	Yes
B3 00 z3 b2	Floor 00	Bedroom	2.76%	Yes
B3 00 z3 kld	Floor 00	Kitchen / Dining / Living Room	6.00%	Yes
B3 00 z4 b1	Floor 00	Bedroom	3.25%	Yes
B3 00 z4 b2	Floor 00	Bedroom	3.04%	Yes
B3 00 z4 kld	Floor 00	Kitchen / Dining / Living Room	5.90%	Yes
B3 00 z5 b	Floor 00	Bedroom	2.44%	Yes
B3 00 z5 kld	Floor 00	Kitchen / Dining / Living Room	5.15%	Yes
B3 00 z6 b1	Floor 00	Bedroom	3.21%	Yes
B3 00 z6 b2	Floor 00	Bedroom	3.02%	Yes
B3 00 z6 kld	Floor 00	Kitchen / Dining / Living Room	6.93%	Yes
B3 01 z2 kld	Floor 01	Kitchen / Dining / Living Room	5.03%	Yes
Block 4				
B4 00 z1 b1	Floor 00	Bedroom	2.23%	Yes
B4 00 z1 b2	Floor 00	Bedroom	3.30%	Yes
B4 00 z1 kld	Floor 00	Kitchen / Dining / Living Room	5.36%	Yes
B4 00 z2 b1	Floor 00	Bedroom	2.51%	Yes
B4 00 z2 b2	Floor 00	Bedroom	2.66%	Yes
B4 00 z2 kld	Floor 00	Kitchen / Dining / Living Room	4.11%	Yes
B4 00 z3 b1	Floor 00	Bedroom	2.88%	Yes
B4 00 z3 b2	Floor 00	Bedroom	3.01%	Yes
B4 00 z3 kld	Floor 00	Kitchen / Dining / Living Room	8.10%	Yes
B4 00 z4 b1	Floor 00	Bedroom	2.92%	Yes
B4 00 z4 b2	Floor 00	Bedroom	2.77%	Yes
B4 00 z4 kld	Floor 00	Kitchen / Dining / Living Room	8.30%	Yes
B4 00 z5 b1	Floor 00	Bedroom	2.37%	Yes
B4 00 z5 b2	Floor 00	Bedroom	2.40%	Yes
B4 00 z5 kld	Floor 00	Kitchen / Dining / Living Room	4.54%	Yes
B4 00 z6 b	Floor 00	Bedroom	1.89%	Yes
B4 00 z6 kld	Floor 00	Kitchen / Dining / Living Room	4.53%	Yes
B4 01 z2 kld	Floor 01	Kitchen / Dining / Living Room	4.23%	Yes
Block 5				
B5 00 z1 b1	Floor 00	Bedroom	2.63%	Yes
B5 00 z1 b2	Floor 00	Bedroom	2.78%	Yes
B5 00 z1 kld	Floor 00	Kitchen / Dining / Living Room	7.50%	Yes
B5 00 z2 b1	Floor 00	Bedroom	2.76%	Yes
B5 00 z2 b2	Floor 00	Bedroom	2.53%	Yes
B5 00 z2 kld	Floor 00	Kitchen / Dining / Living Room	6.62%	Yes
B5 00 z3 b1	Floor 00	Bedroom	2.71%	Yes
B5 00 z3 b2	Floor 00	Bedroom	2.56%	Yes
B5 00 z3 kld	Floor 00	Kitchen / Dining / Living Room	3.86%	Yes

Location	Floor	Room Type	Predicted Average Daylight Factor	Achieves recommended minimum?
B5 00 z4 b1	Floor 00	Bedroom	2.16%	Yes
B5 00 z4 b2	Floor 00	Bedroom	3.22%	Yes
B5 00 z4 kld	Floor 00	Kitchen / Dining / Living Room	5.49%	Yes
B5 00 z5 b	Floor 00	Bedroom	1.96%	Yes
B5 00 z5 kld	Floor 00	Kitchen / Dining / Living Room	4.64%	Yes
B5 00 z6 b1	Floor 00	Bedroom	2.58%	Yes
B5 00 z6 b2	Floor 00	Bedroom	2.72%	Yes
B5 00 z6 kld	Floor 00	Kitchen / Dining / Living Room	4.96%	Yes
B5 01 z3 kld	Floor 01	Kitchen / Dining / Living Room	3.95%	Yes

* No galley kitchens are proposed as part of the subject design. Please note that ARC's assessment assumes that all kitchen / living / dining rooms are open plan and that these rooms are not split up by walls or fixed furniture (e.g. a kitchen island).

2.5 *Compensatory Design Solutions*

Section 3.2 of the *Urban Development and Building Height Guidelines* states: *"Appropriate and reasonable regard should be taken of quantitative performance approaches to daylight provision outlined in guides like the Building Research Establishment's 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting'. Where a proposal may not be able to fully meet all the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, in respect of which the planning authority or An Bord Pleanála should apply their discretion, having regard to local factors including specific site constraints and the balancing of that assessment against the desirability of achieving wider planning objectives. Such objectives might include securing comprehensive urban regeneration and or an effective urban design and streetscape solution."*

As mentioned above, ARC engaged in a prolonged, iterative process with the Design Team over a period of months to ensure that all habitable rooms within residences within the proposed development would be capable of achieving the recommendations of the BRE Guide with regard to daylight access. As ARC's analysis suggests that all rooms within the proposal are likely to achieve the recommendations of the BRE Guide for daylight access, no additional compensatory design solutions are proposed.

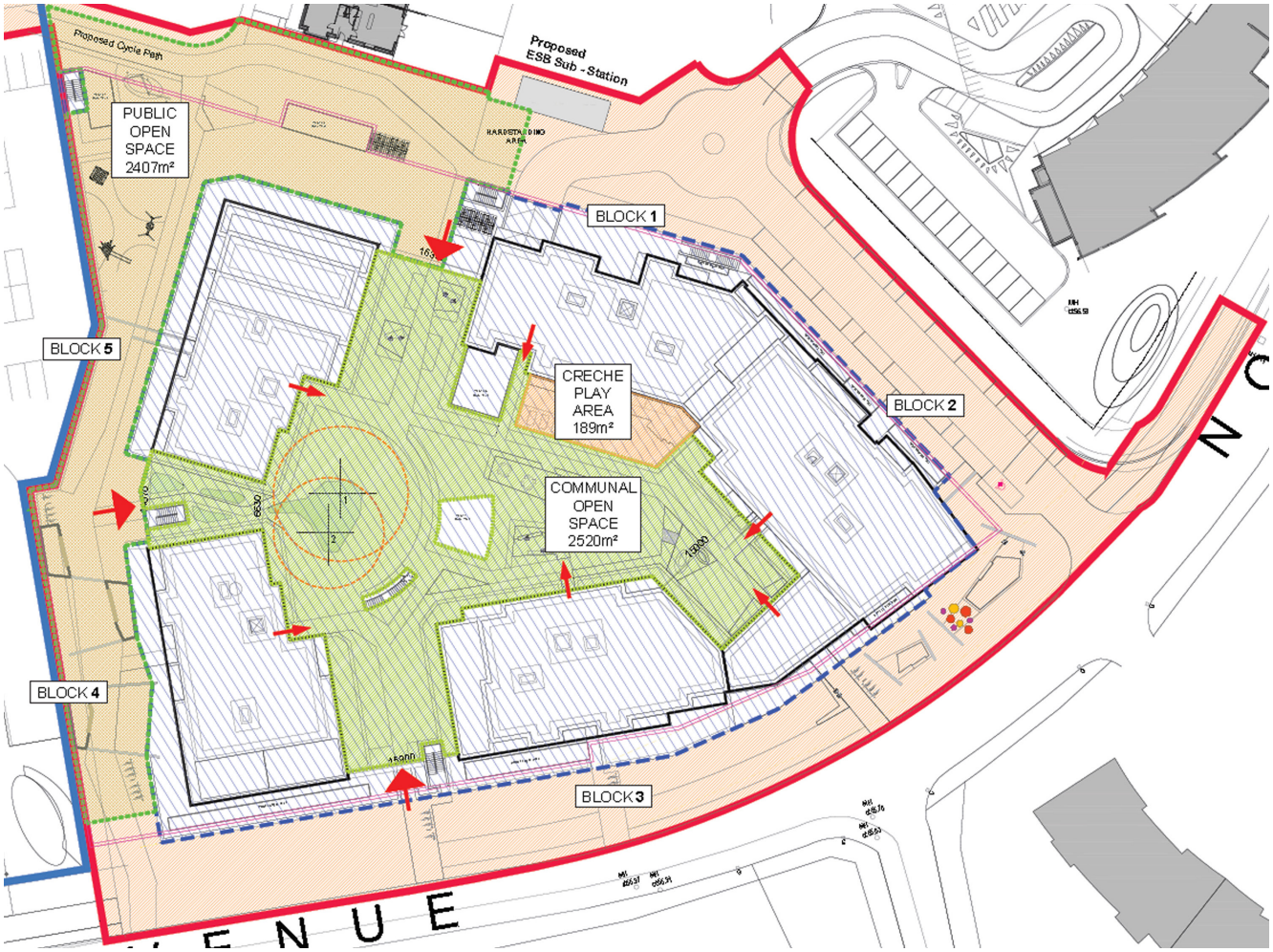


Figure 3.1 Indicative diagram showing location of open spaces within the proposed development assessed as part of this analysis.

3.0 Assessment of Sunlight Access within the Proposed Open Spaces

Appendix 1 of the *Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities* sets out the requirements for quantum of communal amenity space associated with developments of new apartments. The Apartment Guidelines do not prescribe requirements on the issue of sunlight access to proposed open spaces and does not require that planning authorities have regard to quantitative performance approaches to sunlight provision in amenity spaces set out in the Building Research Establishment's *Site layout planning for daylight and sunlight: a guide to good practice* (the BRE Guide).

Section 3 of the Building Research Establishment's *Site layout planning for daylight and sunlight: a guide to good practice* sets out design advice and recommendations for site layout planning to ensure good sunlight access and suggests 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 sunlight on 21st March. ARC had regard to the BRE Guide in undertaking this assessment of sunlight access to open spaces within the proposed development.

Please note that, in determining whether or not to include existing and proposed substantial trees in the three dimensional model for the purposes of this quantitative analysis, ARC made reference to the BRE Guide (as updated in 2011), which states that the *"question of whether trees or fences should be included in the calculation depends upon the type of shade they produce. Normally trees and shrubs need not be included, and partly because the dappled shade of a tree is more pleasant than the deep shadow of a building (this applies especially to deciduous trees)."* Given this, ARC did not show the shadows cast by trees on the shadow study diagrams.

The subject application proposes 3 no. open spaces: a public open space (2520 sq m), a communal open space for residents of the proposal (2407 sq m) and an open space associated with the creche (please see Figure 3.1). ARC's analysis of sunlight access to these spaces is set out in Table 3.1 below:

Table 3.1: Open Space Areas* – Approximate areas in sunshine						
Time	Public Open Space (2384 sq m)		Communal Open Space (2520 sq m)		Creche Open Space (189sq m)	
	March 21st	June 21st	March 21st	June 21st	March 21st	June 21st
09:00	16%	56%	39%	52%	5%	0%
09:30	10%	56%	38%	59%	40%	17%
10:00	8%	51%	38%	69%	83%	44%
10:30	17%	51%	39%	73%	80%	73%
11:00	15%	75%	37%	71%	49%	85%
11:30	40%	86%	40%	70%	20%	93%
12:00	72%	90%	46%	63%	0%	98%
12:30	76%	100%	47%	61%	0%	100%
13:00	84%	99%	38%	55%	0%	100%
13:30	81%	97%	32%	50%	13%	100%
14:00	76%	97%	20%	46%	23%	100%
14:30	65%	97%	14%	41%	52%	100%
15:00	37%	95%	7%	32%	37%	100%
15:30	24%	85%	3%	34%	8%	100%
16:00	14%	87%	4%	30%	4%	100%
16:30	7%	70%	3%	37%	0%	98%
17:00	13%	57%	0%	36%	21%	68%

* This assessment assumed that the envisaged development on the site to the northwest has been constructed in the interests of presenting a worst case scenario.

As suggested by the results set out in Table 3.1, the proposed public open space will receive considerably more sunlight than is recommended by the BRE Guide (e.g. at least two hours of sunlight over at least half the space on 21st March). Moreover, ARC's analysis indicates that the proposed public open space will receive sunlight over most of its area for most of the day during the summer months (May, June, July).

ARC's analysis further indicates that the proposed communal open space and the open space associated with the creche will receive two hours sunlight over more than 39% and 40% of their respective areas for at least two hours on 21st March. As such, these spaces do not achieve the recommendation of Section 3.3.17 of the BRE Guide with regard to sunlight access to amenity spaces. It is noted, however, that the communal open space will receive sunlight over more than half its area until the early afternoon during the summer months, while the creche open space will receive a very high degree of sunshine throughout the day during the summer months.

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March 2022

Appendix A: Daylight Access Analysis under IS EN 17037 / BS EN 17037

1.0 Introduction

As outlined above, the *Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities* provide that *"planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting' when undertaken by development proposers which offer the capability to satisfy minimum standards of daylight provision."*

The *BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting'* was withdrawn in May 2019, while *BS EN 17037: Daylight in Buildings* was adopted in the United Kingdom in May 2019. In Ireland, *IS EN 17037: Daylight in Buildings* was published by the National Standards Authority of Ireland on 28th January 2019. The standards for daylight access (and the methodologies recommended for assessing whether rooms meet those standards) in the BRE Guide are different from those set out in IS EN 17037: 2018 and BS EN 17037: 2018. Given this and given that the *Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities* refers to the BRE Guide and not to IS EN 17037: 2018 or BS EN 17037: 2018, the status of the IS EN 17037: 2018 and BS EN 17037: 2018 under the planning process is unclear. However, in the interests of completeness, in addition to the principal assessment under the BRE Guide (section 2.0 above), this report also assesses daylight access within habitable rooms with reference to IS EN 17037 and to BS EN 17037.

The locations of the sample study rooms analysed as part of this analysis of daylight access within residences within the proposed development are illustrated at Figures 2.1-2.2 above. For more detail on the methodology used in assessing daylight access, please refer to the Technical Appendix of this Report.

2.0 Results of Assessment of Daylight Access within the Proposed Development - Daylight Factor (IS EN 17037 / BS EN 17037)

Under a minimum scenario, *IS EN 17037: Daylight in Buildings* recommends a target illuminance of 300 lux across 50% of a reference plane (a horizontal plane 0.85 m above the ground within a studied room) and a minimum target illuminance of 100 lux across 95% of that reference plane (Table A.1 of IS EN 17037 for vertical windows). Applying Method 1, this corresponds to a recommendation to achieve 2.0% daylight factor across 50% of the reference plane and 0.7% daylight factor across 95% of the reference plane (see Table A.3 of IS EN 17037 for Ireland, Dublin).

The IS EN 17037 does not identify daylighting targets for specific room types. The National Annex attached to the *BS EN 17037: Daylight in Buildings* states as follows:

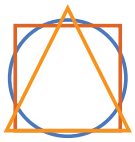
> *"The UK committee supports the recommendations for daylight in buildings given in BS EN 17037: 2018; however, it is the opinion of the UK committee that the recommendations for daylight provision in a space... may not be achievable for some buildings, particularly dwellings."*

The BS EN 17037 goes on to recommend that at least 50% of a horizontal reference plane (at 0.85 m) achieve the following target illuminances for each room type: 100 lux for bedrooms, 150 lux for living rooms and 200 lux for kitchens. This is understood to correspond to a recommendation to achieve 0.7% daylight factor for bedrooms, 1.1% daylight factor for living rooms and 1.4% daylight factor for kitchens over 50% of the horizontal reference plane.

ARC analysed each habitable room within the proposed development with reference to these criteria and the results are set out in Table A below. Where rooms achieve the relevant criteria, it is highlighted in green. Please note that, in relation to the assessment under BS EN 17037, the results of analysis are provided only in relation to the relevant room type (e.g. for a bedroom, the proportion of the room achieving 0.7% daylight factor across the working plane is provided and the table cell related to the proportion of the room achieving 1.4% daylight factor (i.e. the standard for kitchens) is marked as "Not Applicable" as this is not applicable to the assessment).

Table A: EN 17037: Predicted daylight access to sample rooms within the proposed development

Location	Floor	Room Type	Minimum Target Daylight Factor (D_{TM}) Proportion (%) of room achieving 0.7% daylight factor (Target = 95%)	Target Daylight Factor (D_T) Proportion (%) of room achieving 2.0% daylight factor (Target = 50%)	Proportion (%) of room achieving 0.7% daylight factor Target for bedrooms = 50%	Proportion (%) of room achieving 1.4% daylight factor Target for kitchens / KLDs = 50%
Block 1						
B1 01 z1 b1	Floor 01	Bedroom	91.40%	91.40%	91.40%	Not Applicable
B1 01 z1 b2	Floor 01	Bedroom	91.00%	91.00%	91.00%	Not Applicable
B1 01 z1 kld	Floor 01	KLD	96.10%	96.10%	Not Applicable	96.10%
B1 01 z2 b1	Floor 01	Bedroom	89.20%	89.20%	89.20%	Not Applicable
B1 01 z2 b2	Floor 01	Bedroom	86.60%	86.60%	86.60%	Not Applicable
B1 01 z2 kld	Floor 01	KLD	99.10%	99.10%	Not Applicable	99.10%
B1 01 z3 b1	Floor 01	Bedroom	90.50%	90.40%	90.50%	Not Applicable
B1 01 z3 b2	Floor 01	Bedroom	93.80%	93.80%	93.80%	Not Applicable
B1 01 z3 kld	Floor 01	KLD	98.20%	96.20%	Not Applicable	97.70%
B1 01 z4 b1	Floor 01	Bedroom	91.20%	91.20%	91.20%	Not Applicable
B1 01 z4 b2	Floor 01	Bedroom	92.00%	92.00%	92.00%	Not Applicable
B1 01 z4 kld	Floor 01	KLD	94.30%	61.50%	Not Applicable	79.00%
B1 01 z5 b	Floor 01	Bedroom	90.40%	90.40%	90.40%	Not Applicable
B1 01 z5 kld	Floor 01	Bedroom	99.20%	99.20%	99.20%	Not Applicable
B1 01 z6 b1	Floor 01	KLD	87.50%	87.50%	Not Applicable	87.50%
B1 01 z6 b2	Floor 01	Bedroom	92.30%	92.30%	92.30%	Not Applicable
B1 01 z6 kld	Floor 01	Bedroom	98.00%	98.00%	98.00%	Not Applicable
B1 01 z7 b1	Floor 01	KLD	92.30%	92.30%	Not Applicable	92.30%
B1 01 z7 b2	Floor 01	Bedroom	85.60%	85.60%	85.60%	Not Applicable
B1 01 z7 kld	Floor 01	Bedroom	99.90%	99.80%	99.90%	Not Applicable
Block 2						
B2 00 z1 b1	Floor 00	Bedroom	79.30%	53.60%	79.30%	Not Applicable
B2 00 z1 b2	Floor 00	Bedroom	83.30%	60.90%	83.30%	Not Applicable
B2 00 z1 kld	Floor 00	KLD	97.00%	95.60%	Not Applicable	97.00%
B2 00 z2 b1	Floor 00	Bedroom	83.20%	55.30%	83.20%	Not Applicable
B2 00 z2 b2	Floor 00	Bedroom	85.20%	52.30%	85.20%	Not Applicable
B2 00 z2 kld	Floor 00	KLD	95.50%	95.10%	Not Applicable	95.20%
B2 00 z3 b1	Floor 00	Bedroom	76.40%	55.80%	76.40%	Not Applicable
B2 00 z3 b2	Floor 00	Bedroom	83.80%	52.60%	83.80%	Not Applicable
B2 00 z3 kld	Floor 00	KLD	88.10%	85.20%	Not Applicable	87.60%
B2 00 z4 b	Floor 00	Bedroom	79.00%	24.00%	79.00%	Not Applicable
B2 00 z4 kld	Floor 00	KLD	92.60%	92.60%	Not Applicable	92.60%
B2 00 z5 b1	Floor 00	Bedroom	77.20%	51.90%	77.20%	Not Applicable
B2 00 z5 b2	Floor 00	Bedroom	82.00%	49.20%	82.00%	Not Applicable
B2 00 z5 kld	Floor 00	KLD	92.60%	92.60%	Not Applicable	92.60%
B2 01 z1 kld	Floor 01	KLD	97.00%	71.20%	Not Applicable	96.70%
B2 01 z4 kld	Floor 01	KLD	92.60%	91.20%	Not Applicable	92.60%



Location	Floor	Room Type	Minimum Target Daylight Factor (D_{TM}) Proportion (%) of room achieving 0.7% daylight factor (Target = 95%)	Target Daylight Factor (D_T) Proportion (%) of room achieving 2.0% daylight factor (Target = 50%)	Proportion (%) of room achieving 0.7% daylight factor Target for bedrooms = 50%	Proportion (%) of room achieving 1.4% daylight factor Target for kitchens / KLDs = 50%
Block 3						
B3 00 z1 b1	Floor 00	Bedroom	93.50%	92.00%	93.50%	Not Applicable
B3 00 z1 b2	Floor 00	Bedroom	92.40%	75.60%	92.40%	Not Applicable
B3 00 z1 b3	Floor 00	Bedroom	87.20%	35.00%	87.20%	Not Applicable
B3 00 z1 kld	Floor 00	KLD	99.50%	98.40%	Not Applicable	99.50%
B3 00 z2 b1	Floor 00	Bedroom	92.10%	82.10%	92.10%	Not Applicable
B3 00 z2 b2	Floor 00	Bedroom	93.50%	92.00%	93.50%	Not Applicable
B3 00 z2 kld	Floor 00	KLD	96.70%	96.70%	Not Applicable	96.70%
B3 00 z3 b1	Floor 00	Bedroom	93.00%	87.80%	93.00%	Not Applicable
B3 00 z3 b2	Floor 00	Bedroom	86.30%	86.20%	86.30%	Not Applicable
B3 00 z3 kld	Floor 00	KLD	99.60%	99.60%	Not Applicable	99.60%
B3 00 z4 b1	Floor 00	Bedroom	94.00%	92.00%	94.00%	Not Applicable
B3 00 z4 b2	Floor 00	Bedroom	89.20%	87.30%	89.20%	Not Applicable
B3 00 z4 kld	Floor 00	KLD	99.10%	99.10%	Not Applicable	99.10%
B3 00 z5 b	Floor 00	Bedroom	86.60%	61.40%	86.60%	Not Applicable
B3 00 z5 kld	Floor 00	KLD	99.90%	99.90%	Not Applicable	99.90%
B3 00 z6 b1	Floor 00	Bedroom	94.00%	91.70%	94.00%	Not Applicable
B3 00 z6 b2	Floor 00	Bedroom	89.20%	85.70%	89.20%	Not Applicable
B3 00 z6 kld	Floor 00	KLD	99.20%	99.20%	Not Applicable	99.20%
B3 01 z2 kld	Floor 01	KLD	96.70%	96.60%	Not Applicable	96.70%
Block 4						
B4 00 z1 b1	Floor 00	Bedroom	76.90%	55.10%	76.90%	Not Applicable
B4 00 z1 b2	Floor 00	Bedroom	88.20%	88.00%	88.20%	Not Applicable
B4 00 z1 kld	Floor 00	KLD	98.40%	97.30%	Not Applicable	98.40%
B4 00 z2 b1	Floor 00	Bedroom	100.00%	100.00%	100.00%	Not Applicable
B4 00 z2 b2	Floor 00	Bedroom	93.30%	82.60%	93.30%	Not Applicable
B4 00 z2 kld	Floor 00	KLD	98.60%	98.60%	Not Applicable	98.60%
B4 00 z3 b1	Floor 00	Bedroom	84.60%	79.20%	84.60%	Not Applicable
B4 00 z3 b2	Floor 00	Bedroom	90.80%	86.40%	90.80%	Not Applicable
B4 00 z3 kld	Floor 00	KLD	100.00%	100.00%	Not Applicable	100.00%
B4 00 z4 b1	Floor 00	Bedroom	85.60%	81.50%	85.60%	Not Applicable
B4 00 z4 b2	Floor 00	Bedroom	84.10%	75.20%	84.10%	Not Applicable
B4 00 z4 kld	Floor 00	KLD	100.00%	100.00%	Not Applicable	100.00%
B4 00 z5 b1	Floor 00	Bedroom	89.90%	68.70%	89.90%	Not Applicable
B4 00 z5 b2	Floor 00	Bedroom	93.40%	71.70%	93.40%	Not Applicable
B4 00 z5 kld	Floor 00	KLD	99.70%	99.70%	Not Applicable	99.70%
B4 00 z6 b	Floor 00	Bedroom	86.10%	27.10%	86.10%	Not Applicable
B4 00 z6 kld	Floor 00	KLD	99.90%	99.80%	Not Applicable	99.90%
B4 01 z2 kld	Floor 01	KLD	98.60%	98.10%	Not Applicable	98.60%

Location	Floor	Room Type	Minimum Target Daylight Factor (D_{TM}) Proportion (%) of room achieving 0.7% daylight factor (Target = 95%)	Target Daylight Factor (D_T) Proportion (%) of room achieving 2.0% daylight factor (Target = 50%)	Proportion (%) of room achieving 0.7% daylight factor Target for bedrooms = 50%	Proportion (%) of room achieving 1.4% daylight factor Target for kitchens / KLDs = 50%
Block 5						
B5 00 z1 b1	Floor 00	Bedroom	86.90%	73.30%	86.90%	Not Applicable
B5 00 z1 b2	Floor 00	Bedroom	92.70%	85.30%	92.70%	Not Applicable
B5 00 z1 kld	Floor 00	KLD	99.70%	99.70%	Not Applicable	99.70%
B5 00 z2 b1	Floor 00	Bedroom	93.10%	81.70%	93.10%	Not Applicable
B5 00 z2 b2	Floor 00	Bedroom	86.70%	80.80%	86.70%	Not Applicable
B5 00 z2 kld	Floor 00	KLD	98.30%	97.80%	Not Applicable	97.90%
B5 00 z3 b1	Floor 00	Bedroom	93.10%	81.80%	93.10%	Not Applicable
B5 00 z3 b2	Floor 00	Bedroom	86.30%	73.40%	86.30%	Not Applicable
B5 00 z3 kld	Floor 00	KLD	96.90%	96.70%	Not Applicable	96.90%
B5 00 z4 b1	Floor 00	Bedroom	76.00%	55.30%	76.00%	Not Applicable
B5 00 z4 b2	Floor 00	Bedroom	89.50%	88.90%	89.50%	Not Applicable
B5 00 z4 kld	Floor 00	KLD	97.60%	96.90%	Not Applicable	97.60%
B5 00 z5 b	Floor 00	Bedroom	85.60%	33.30%	85.60%	Not Applicable
B5 00 z5 kld	Floor 00	KLD	99.10%	98.50%	Not Applicable	99.00%
B5 00 z6 b1	Floor 00	Bedroom	86.90%	71.50%	86.90%	Not Applicable
B5 00 z6 b2	Floor 00	Bedroom	91.40%	77.40%	91.40%	Not Applicable
B5 00 z6 kld	Floor 00	KLD	99.90%	99.80%	Not Applicable	99.90%
B5 01 z3 kld	Floor 01	KLD	96.90%	96.90%	Not Applicable	96.90%

3.0 *Results of Assessment of Daylight Access within the Proposed Development - Daylight Factor (IS EN 17037 / BS EN 17037)*

ARC's analysis of daylight access within the proposed development using Method 1 outlined in *IS EN 17037: Daylight in Buildings* and *BS EN 17037: Daylight in Buildings* (National Annex) indicates as follows:

- 86 of 91 (94.5%) of sample rooms subject to detailed daylight access analysis are likely to achieve the recommendations set out in IS EN 17037: 2018 for Method 1 / Daylight Factor analysis.

- 91 of 91 (100%) of sample rooms subject to detailed daylight access analysis are likely to achieve the recommendations for residential development set out in the National Annex to BS EN 17037: 2018.

Technical Appendix

Explanatory Note

In assessing sunlight and daylight access, Irish practitioners tend to refer to the relevant PJ Littlefair's 2011 revision of the 1991 publication *Site layout planning for daylight and sunlight: a guide to good practice* for the Building Research Establishment (the BRE Guide).

Section 1.7 of the BRE Guide provides: *"The guidance here is intended for use in the UK and Republic of Ireland"*. Its use in assessing impacts on sunlight and daylight access as part of the planning process is supported by national government planning policy including:

- The *Guidelines for Planning Authorities on Sustainable Residential Development in Urban Areas*, which, at Section 7.2 states: *"Planning authorities should require that daylight and shadow projection diagrams be submitted in all such proposals. The recommendations of "Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice" (B.R.E. 1991)*[1] *or B.S. 8206 "Lighting for Buildings, Part 2 1992: Code of Practice for Daylighting" should be followed in this regard."*

- The *Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities*, which, at Section 6.6, states: *"Planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting' when undertaken by development proposers which offer the capability to satisfy minimum standards of daylight provision."*

- The *Urban Development and Building Height Guidelines*, which, at Section 3.2, states: *""Appropriate and reasonable regard should be taken of quantitative performance approaches to daylight provision outlined in guides like the Building Research Establishment's 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting'. Where a proposal may not be able to fully meet all the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, in respect of which the planning authority or An Bord Pleanála should apply their discretion, having regard to local factors including specific site constraints and the balancing of that assessment against the desirability of achieving wider planning objectives. Such objectives might include securing comprehensive urban regeneration and or an effective urban design and streetscape solution."*

The standards for daylight and sunlight access in buildings (and the methodologies for assessment of same) suggested in the BRE Guide have been referenced in this report.

The BRE Guide does not set out rigid standards or limits, but is preceded by the following very clear warning as to how the design advice contained therein should be used:

> *"The advice given here is not mandatory and* ***the guide should not be seen as an instrument of planning policy****; its aim is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design."* [Emphasis added.]

This report is prepared by ARC Architectural Consultants Ltd for the benefit of the Applicant and in accordance with our instructions. ARC Architectural Consultants Ltd disclaims any liability, legal or otherwise, from any party, other than the Applicant, seeking to rely upon the content of this report. The purpose of this report is to provide a general indication of daylight performance and sunlight access within the proposed development on the basis of numerous assumptions outlined below and with reference to design tools set out in the guidance documents referenced above as part of the planning process. ARC takes no responsibility for any errors introduced by the third party proprietary sunlight and daylight analysis software used to perform the quantitative assessment. This report does not offer a guarantee of daylight performance or sunlight access to existing or future occupants or owners of the application site or neighbouring lands or any other party.

1 The *Guidelines for Planning Authorities on Sustainable Residential Development in Urban Areas* refer to the first edition of the BRE Guide as published in 1991. A second edition of the Guide was published in 2011.

Daylight Access to Buildings

Context under Technical and Guidance Documents

The standards for daylight and sunlight access in buildings (and the methodologies for assessment of same) suggested in the BRE Guide have been referenced in preparing this report. The *BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting'* was withdrawn in May 2019, while *BS EN 17037: Daylight in Buildings* was adopted in the United Kingdom in May 2019. In Ireland, *IS EN 17037: Daylight in Buildings* was published by the National Standards Authority of Ireland on 28th January 2019. This report does not refer to *IS EN 17037: Daylight in Buildings* or to the United Kingdom's *BS EN 17037: Daylight in Buildings*. The standards for daylight access (and the methodologies recommended for assessing whether rooms meet those standards) in the BRE Guide are entirely different from those set out in IS EN 17037: 2018 and BS EN 17037: 2018. Given this and given that the *Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities* refers to the BRE Guide and not to IS EN 17037: 2018 or BS EN 17037: 2018, the BRE Guide has been referenced in the preparation of this report.

The BRE Guide states as follows (at paragraph 2.1.8) in relation to daylight access within new development:

> *"2.1.8 Daylight provision in new rooms may be checked using the average daylight factor (ADF). The ADF is a measure of the overall amount of daylight in a space... BS 8206-2 Code of practice for daylighting, recommends an ADF of 5% for a well daylit space and 2% for a partly daylit space. Below 2% the room will look dull and electric lighting is likely to be turned on. In housing BS 8206-2 also gives minimum value of ADF of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms."*

While not expressly discussed in the BRE Guide, Section 5.6 of the *BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting'* (withdrawn in May 2019) states as follows in relation to multi-function rooms: *"Where one room serves more than one purpose, the minimum average daylight factor should be that for the room type with the highest value. For example, in a space which combines a living room and a kitchen the minimum average daylight factor should be 2%."*

Assessment Methodology for Daylight Access

A three dimensional digital model of the proposed development, of development envisaged on the adjoining site to the northwest and of existing buildings in the area was constructed by ARC Consultants based on drawings and three dimensional models supplied by the Design Team; and with reference to the online planning register, on-site, satellite and aerial photography. At paragraph H1.2, the BRE Guide states: *"It is generally more difficult to calculate the effects of trees on daylight because of their irregular shaps and because some light will generally penetrate through the tree crown. Where the effect of a new building on existing buildings nearby is being analysed, it is usual to ignore the effect of existing trees."* Given this, existing and proposed landscaping was not included in this model.

In assessing daylight access within rooms within the proposed development, the following assumptions were made:

- Internal floor reflectance: 40%
- Internal wall reflectance: 80%
- Internal ceiling reflectance: 80%
- External material reflectance: 20%
- Glazing transmission: 70%
- Glazing maintenance factor: 90%
- Working plane height: 0.85 m

Please note that the reflectance of internal materials is based on specifications for materials provided to ARC by the design team. For example, walls are specfied as being painted with Fleetwood Gardenia 10B15 (light reflectance value of 82%) or Fleetwood Oxford White (one colour throughout), standard white ceilings and skirtings and Kronopol Sigma Corinne oak flooring. Taking a conservative approach, internal wall reflectance was assessed as 80%, internal ceiling reflectance as 80% and internal floor reflectance as 40%.

Daylight levels (Average Daylight Factor under Section 2.0 and Daylight Factor under Appendix A) were assessed on the working plane (i.e., at work top level, 850 mm). All assessments of daylight within the proposal assumed that development envisaged on the adjoining site to the northwest had been constructed to present a worst case scenario. Having regard to

the extreme variability in sky luminance over the course of any given day depending on weather conditions and the changing seasons, in order for daylight factor to be a meaningful and comparable measure of daylight access, it is necessary to assume a particular luminance distribution for the sky when calculating Daylight Factor and Average Daylight Factor. This daylight access analysis uses the Commission Internationale de l'Eclairage (CIE) Standard Overcast Sky Distribution model in its calculations, which is the standard sky most commonly used in daylight access analysis. This model assumes that sky luminance varies from horizon to zenith and is considered to correspond to an overcast day. As such, calculation of Daylight Factor and Average Daylight Factor in a room in circumstances where the sky luminance corresponds to the CIE Standard Overcast Sky Distribution could be considered to represent a worst case scenario. In relation to Average Daylight Factor, unless specifically referenced, analysis of uniformity of daylight access within a room has not been carried out as part of this assessment.

Sunlight Access to Buildings and Open Spaces

Context under Technical and Guidance Documents

Section 3.3 of the Building Research Establishment's *Site layout planning for daylight and sunlight: a guide to good practice* sets out design advice and recommendations for site layout planning to ensure good sunlight access to amenity spaces and to minimise the impact of new development on existing amenity spaces. The Guide suggests 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 sunlight on 21st March.

Assessment Methodology for Sunlight Access

A three dimensional digital model of the proposed development, of development envisaged on the adjoining site to the northwest and of existing buildings in the area was constructed by ARC Consultants based on drawings and three dimensional models supplied by the Design Team. Where survey data of surrounding context was not available, assumptions were made, with reference to on-site, satellite and aerial photography and to the online planning register, where relevant, in the creation of the three dimensional model. Section 3.3.9 of the BRE Guide provides that the *"question of whether trees or fences should be included in the calculation depends upon the type of shade they produce. Normally trees and shrubs need not be included, and partly because the dappled shade of a tree is more pleasant than the deep shadow of a building (this applies especially to deciduous trees)."* Given this, existing and proposed landscaping was not included in the assessment model.

Using the digital model, shadows were cast by ARC at several times of the day at the summer and winter solstices, and at the equinox. An equinox occurs twice a year: the March or vernal equinox (typically in or around the 20th to 21st March) and the September or autumnal equinox (typically in or around the 21st to 23rd September). For the purposes of this analysis and with reference to the BRE Guide, shadows were cast at several times of the day on 21st March.

The results are presented in shadow study diagrams associated with this report. Two images have been prepared for each time period on each representative date as follows:

- ***Receiving Environment:*** this image shows the shadows cast by the existing buildings only. Existing buildings surrounding the application site are shown in light grey, while existing buildings on the application site are shown in orange. The shadows cast are shown in a dark grey tone.
- ***Proposed Development:*** this image shows the shadows cast by the existing buildings together with the shadows cast by the proposed development. The existing buildings surrounding the site are shown in light grey, while the proposed development on the application site is shown in blue. The shadows cast are shown in a dark grey tone.
- ***Cumulative:*** this image shows the shadows cast by the existing buildings together with the shadows cast by the proposed development and the envisaged development on the adjoining site to the northwest (to be the subject of a separate planning application). The existing buildings surrounding the site are shown in light grey, while the proposed development on the application site is shown in blue. The envisaged development on the adjoining site to the northwest is shown in dark blue. The shadows cast are shown in a dark grey tone.

In order to calculate sunlight access to open spaces, ARC used proprietary sunlight analysis software to calculate the proportion of proposed open spaces in sunlight at regular intervals on 21st March. Assessment of sunlight access to proposed open spaces assumed that development envisaged on the adjoining site to the northwest had been constructed to present a worst case scenario.