Sunlight and Daylight Access Analysis

of

the Proposed Development

on

Lands adjacent to 'The Grange', Brewery Road/Stillorgan Road, Stillorgan, Blackrock, Co. Dublin

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1.0 Introduction

ARC Architectural Consultants Ltd has been retained by the Applicant, KW PRS ICAV acting for an on behalf of its sub-fund KW PRS Fund 10, to prepare this Sunlight and Daylight Access Analysis of the proposed development on lands adjacent to 'The Grange' Brewery Road/Stillorgan Road, Stillorgan, Blackrock, Co. Dublin.

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.

1.1 Receiving Environment

The application site comprises a large brownfield site at the northern end of Brewery Road, where it approaches the junction with the Stillorgan Road, the N11 National Primary Route. The site adjoins the existing residential development at The Grange, a mixed use commercial and residential development comprised of apartments in 9 no. blocks (ranging in height from four to ten storeys) and 1 no. commercial block fronting on to the Stillorgan Road (five storeys in height). The site currently accommodates 1 no. two storey house at Brewery Road (the Gate Lodge, proposed for demolition), 1 no. single storey marketing suite (proposed for demolition), 1 no. two storey commercial building at Brewery Road (Oaktree Business Centre, proposed for demolition) and most of the single storey terrace at Grange Cottages (i.e. Nos. 2 and 3) at Stillorgan Road (to be retained).

The application site is bounded to the north by the single storey end-of-terrace cottage at No. 1 Grange Cottages and by the N11 National Primary Route. In recent decades, following the opening of the Stillorgan Quality Bus Corridor in 1999, numerous sites fronting on to the N11 National Primary Route near Stillorgan have been developed with high density residential developments, including the seven storey apartment blocks at Beechwood Court at Galloping Green, which oppose the application site.

Brewery Road runs along the western boundary of the site. Lawnswood Park, a residential development of 29 no. detached, two storey dwellings, is located on the opposite (western/northwestern) side of Brewery Road, with the rear gardens of Nos. 14 to 29 Lawnswood Park bounding the western edge of Brewery Road. St Brigid's Church Road is also accessed from the opposite side of Brewery Road to the application site. The two storey houses at Brookvale (a protected structure, RPS No. 1428) and Dunstaffnage are the closest houses to the junction of St Brigid's Church Road, although it is noted that there is significant mature tree planting at the junction of St Brigid's Church Road with Brewery Road and within the gardens of these houses.

To the south, the site is adjoined by a public park. The wider area surrounding the application site is largely residential in character and is typified by vast estates of one and two storey houses of varying styles and types interspersed with higher density residential developments, such as those at Beechwood Court, the Galloping Green apartments and Dunstaffnage Hall.

1.2 Relevant Characteristics of the Proposed Development

In summary, the project provides for the demolition (total c.1,398 sq m GFA) of:

- The Grange Select Marketing Suite' (1 storey)
- 'Oaktree Business Centre' (2 storeys)
- 'The Lodge' (2 storeys)

and the construction of a new 'Build to Rent' residential scheme of 287 residential apartment units; residential tenant amenity space of 961.5 sq m; a crèche facility of 658 sq m; and a substation of 96.5 sq m in the form of 6 new blocks (Blocks H, J, M, N, P and Q) ranging in height from 1 - 11 storeys. The residential element of the scheme provides for the following development mix:

- 19 x Studio Units (6.6%)
- 125 x 1 Bedroom Units (43.6%)
- 143 x 2 Bedroom Units (49.8%)

A total of 100 no. car parking spaces, 596 no. cycle spaces and 5 no. motorcycle spaces are also proposed together with all associated site development works.

Figure 2.1: Indicative diagram showing location of sample rooms, windows and amenity areas at Lawnswood Park, Grange Cottages and The Grange assessed as part of this Sunlight and Daylight Access Analysis

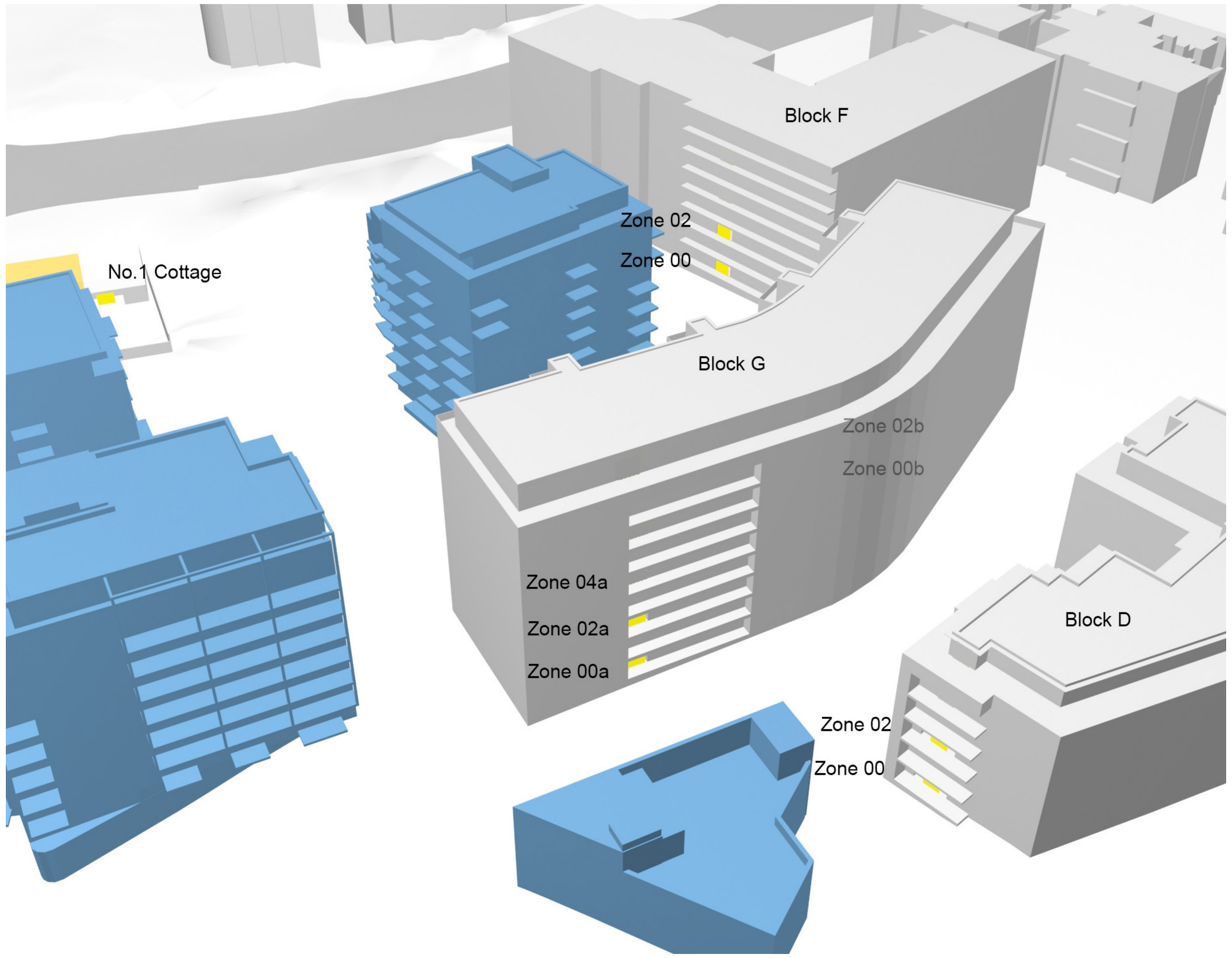

Figure 2.2: Indicative diagram showing location of sample rooms and windows at The Grange assessed as part of this Sunlight and Daylight Access Analysis

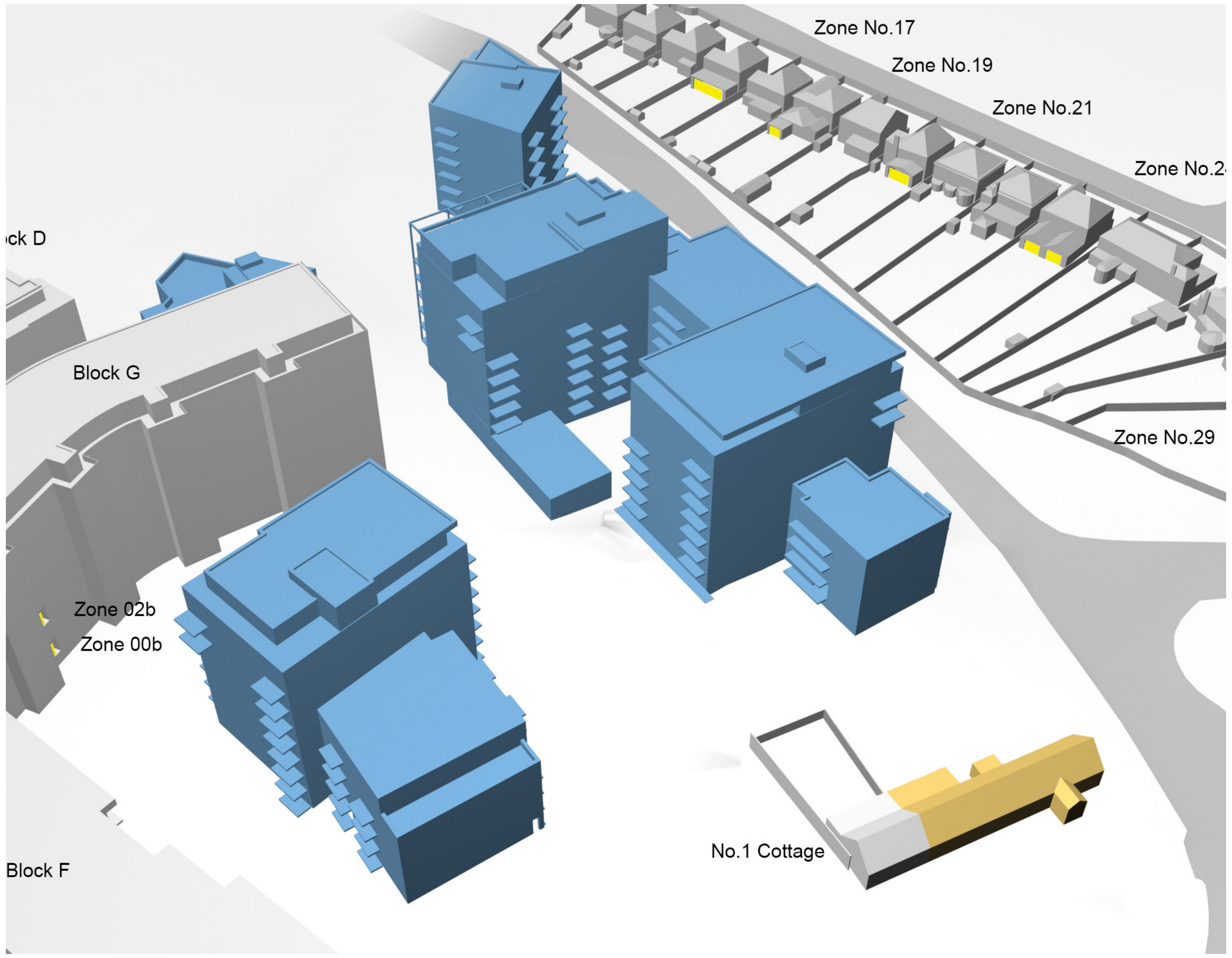

Figure 2.3: Indicative isometric diagram showing location of sample rooms and windows at Lawnswood Park, Grange Cottages and The Grange assessed as part of this Sunlight and Daylight Access Analysis

2.0 Assessment of the Impact of the Proposed Development on Sunlight Access

The statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. 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). This can be compared with a mean daily duration of 6.4 hours of sunlight out of a potential 16.7 hours each day received by Dublin during June (i.e., 38% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid winter, the shadow environment in all urban and suburban areas is generally dense throughout winter.

In assessing the impact of a development on sunlight access, the comments of PJ Littlefair in *Site layout planning for daylight and sunlight: a guide to good practice* (the BRE Guide) should be taken into consideration. The BRE Guide states that *"it must be borne in mind that nearly all structures will create areas of new shadow, and some degree of transient overshadowing of a space is to be expected."*

2.1 Overview of the potential impact of shadows cast by the proposed development outside the application site

Having regard to the shape, layout and orientation of the application site and to the location of the proposed development relative to nearby existing development, the potential of the proposed development to result in material overshadowing of lands outside the application site is limited.

To the west and northwest, shadows cast by the proposed development are likely to extend to the rear of a small number of properties at Lawnswood Park for a short time during the morning of the spring, summer and autumn months and during the mornings and early afternoons of the winter months. The impact of shadows cast by the proposed development on lands at Lawnswood Park is predicted to range from none to "imperceptible" to "moderate" depending on the time of year and on the location of the house relative to the proposed development. However, it should be noted that shadows cast by the proposed development are not predicted to interfere with the capacity of rear-facing windows or rear gardens at Lawnswood Park to achieve the recommendations of the Building Research Establishment's *Site layout planning for daylight and sunlight: a guide to good practice* (the BRE Guide) for sunlight access.

The potential for the construction of the proposed development to result in material impacts on sunlight access within the existing development at The Grange is relatively low due to the location of the proposed new blocks relative to existing buildings (i.e. the majority of the units now proposed are located to the north of existing residential buildings at The Grange). During the late evening of the autumn, winter and spring months, shadows cast by the proposed Block P have the potential to extend to part of the lower levels of southern facade of the existing Block G. Similarly, during the late evening of the summer months, when the shadows are long, shadows cast by the proposed Blocks N and P are likely to extend to the lower levels of the existing Block G. Shadows cast by the proposed Block M have the potential to extend to parts of the commercial Block F1 during the late evenings throughout the year. Having regard to the similarity in scale, character and pattern of development of the scheme now proposed to the existing development at The Grange and having regard to statutory planning policy with regard to building height and densification of the urban area, the impact of shadows cast by the proposed development on sunlight access is considered to be consistent with emerging trends for development or "moderate" under a worst case scenario. The construction of the proposed development is unlikely to result in any material change in sunlight access to the existing central garden or any of the other existing principal communal open spaces.

Shadows cast by the proposed development will extend to the rear of Grange Cottages to the north during the evenings throughout the year and have the potential to result in a "slight" to "moderate" impact on sunlight access to the existing houses. However, ARC's analysis indicates that rear-facing windows and the rear garden of No. 1 Grange Cottages will continue to receive a level of sunlight in excess of the level recommended by the Building Research Establishment's *Site layout planning for daylight and sunlight: a guide to good practice* (the BRE Guide) to achieve an appearance of adequate sunlighting over the course of the year after the construction of the proposed development. Given this, the proposed development is not predicted to result in any undue adverse impacts on sunlight access to No. 1 Grange Cottages.

To the north, shadows cast by the proposed development are predicted to result in "imperceptible" to "slight" additional overshadowing of Beechwood Court during the late evenings of the spring and autumn months. During the winter months of November, December and January, shadows cast by the proposal will extend as far as St Brigid's Church Road (i.e. to Brookvale) and to the northern side of the N11 National Primary Route (i.e. to Beechwood Court and to Farmleigh Avenue) during the afternoons. However, the shadow environment at this time of year is so dense that the impact of this additional overshadowing is predicted to be "imperceptible".

The subject development is predicted to have no material impact on sunlight access to the public park to the south.

2.2 Detailed analysis of the potential impact of shadows cast by the proposed development on existing buildings outside the application site

This Sunlight and Daylight Access Analysis assesses the impact of the proposed development to all potential receptors surrounding the application site - these impacts are described in the section entitled "*Overview of the potential impact of shadows cast by the proposed development outside the application site*". However, by way of example in order to illustrate briefly the findings outlined in the overview section, ARC conducted detailed analysis of the potential for the proposed development to result in impacts on sunlight access to a representative sample of sensitive receptors (i.e. windows) in buildings in proximity to the application site (please see Figures 2.1, 2.2 and 2.3).

Section 3.2.1 of the *Site layout planning for daylight and sunlight: a guide to good practice* (the BRE Guide) provides as follows in relation to the assessment of the impact of development on sunlight access to existing buildings:

> *"If a living room of an existing dwelling has a main window facing within 90° of due south, and any part of a new development subtends an angle of more than 25° to the horizontal measured from the centre of the window in a vertical section perpendicular to the window, then the sunlighting of the existing dwelling may be adversely affected. This will be the case if the centre of the window:*
> - *receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between 21 September and 21 March* ***and***
> - *receives less than 0.8 times its former sunlight hours during either period* ***and***
> - *has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours."* [Emphasis added]

In identifying receptors sensitive to changes in the daylight environment, ARC considered two factors:

(i) the use of receptors (i.e. buildings) surrounding the application site: buildings in residential use (and, particularly, habitable rooms within residences) would be considered to be sensitive to changes in the shadow environment;

(ii) the location of receptors relative to the application site: as set out in section 3.2.11 of the BRE Guide *"If a living room of an existing dwelling has a main window facing within 90° of due south, and any part of a new development subtends an angle of more than 25° to the horizontal measured from the centre of the window in a vertical section perpendicular to the window, then the sunlighting of the existing building may be adversely affected."*

Given this, the receptors most sensitive to changes in the sunlight environment as a result of the construction of development on the application site would be windows facing within 90° of due south at low levels of accommodation in buildings in residential use in close proximity to the site (i.e. low level rooms at The Grange, Grange Cottages and Lawnswood Park).

The BRE Guide does not identify a need to undertake detailed quantitative assessment of the impact of new development on existing buildings, which do not face within 90° of due south (i.e. such as the northern side of the existing Block G at The Grange and the northwestern side of the existing Blocks F1 and F2) and does not set out a recommended level of sunlight access for such windows. Given this, the below analysis focuses on windows facing within 90° of due south. A worst case scenario was assumed whereby windows at the lowest level of accommodation were analysed. The results of ARC's analysis are set out in Table 2.1 below.

*Table 2.1: Predicted impact of the proposed development on sunlight access to sample windows** in neighbouring existing buildings*

Zone	Existing Probable Sunlight Hours Received			Proposed Probable Sunlight Hours Received		
	Annual	Summer*	Winter*	Annual	Summer*	Winter*
17 Lawnswood Park Floor 00	66%	46%	20%	60%	43%	17%
	BRE recommendation met: Predicted impact below BRE threshold for adverse impact. ARC's analysis predicts that this window will continue to receive a level of sunlight considerably in excess of the BRE recommendation of 25% Annual Probable Sunlight Hours (including 5% Annual Probable Sunlight Hours during the winter period) after the construction of the proposed development.					
19 Lawnswood Park Floor 00	62%	46%	16%	55%	42%	13%
	BRE recommendation met: Predicted impact below BRE threshold for adverse impact. ARC's analysis predicts that this window will continue to receive a level of sunlight considerably in excess of the BRE recommendation of 25% Annual Probable Sunlight Hours (including 5% Annual Probable Sunlight Hours during the winter period) after the construction of the proposed development.					
21 Lawnswood Park Floor 00	66%	46%	20%	60%	44%	16%
	BRE recommendation met: Predicted impact below BRE threshold for adverse impact. ARC's analysis predicts that this window will continue to receive a level of sunlight considerably in excess of the BRE recommendation of 25% Annual Probable Sunlight Hours (including 5% Annual Probable Sunlight Hours during the winter period) after the construction of the proposed development.					
24 Lawnswood Park Floor 00	65%	46%	19%	63%	46%	17%
	BRE recommendation met: Predicted impact below BRE threshold for adverse impact. ARC's analysis predicts that this window will continue to receive a level of sunlight considerably in excess of the BRE recommendation of 25% Annual Probable Sunlight Hours (including 5% Annual Probable Sunlight Hours during the winter period) after the construction of the proposed development.					
29 Lawnswood Park Floor 00	82%	57%	25%	76%	57%	19%
	BRE recommendation met: Predicted impact below BRE threshold for adverse impact. ARC's analysis predicts that this window will continue to receive a level of sunlight considerably in excess of the BRE recommendation of 25% Annual Probable Sunlight Hours (including 5% Annual Probable Sunlight Hours during the winter period) after the construction of the proposed development.					
1 Grange Cottages Floor 00	56%	41%	15%	40%	31%	9%
	BRE recommendation met: Predicted impact below BRE threshold for adverse impact. ARC's analysis predicts that this window will continue to receive a level of sunlight considerably in excess of the BRE recommendation of 25% Annual Probable Sunlight Hours (including 5% Annual Probable Sunlight Hours during the winter period) after the construction of the proposed development.					

Zone	Existing Probable Sunlight Hours Received			Proposed Probable Sunlight Hours Received		
	Annual	Summer*	Winter*	Annual	Summer*	Winter*
The Grange Block G Zone 00a Floor 00	32%	19%	13%	24%	16%	8%
	Predicted "slight" to "moderate" impact on sunlight access. Given that shadows cast by the proposed development are predicted to reduce sunlight access to this window to 0.75 times its former value (i.e. less than 0.8 times its former value), ARC's analysis predicts that shadows cast by the proposed development are likely to result in a "moderate" change in the sunlight environment within the studied sample room (i.e. one that it is consistent with emerging trends for development). However, given that the window will continue to receive a level of sunlight in excess of the level recommended during the winter period (i.e. more than 5% Annual Probable Sunlight Hours) and given that the level of sunlight access predicted to be received by the window is likely to be so close to the recommended level of 25% Annual Probable Sunlight Hours, some may consider the impact of shadows cast by the proposed development to be "slight" or one which does not affect the sensitivities of the sunlight environment within the room.					
The Grange Block G Zone 02a Floor 02	34%	19%	15%	34%	19%	15%
	BRE recommendation met: Predicted impact below BRE threshold for adverse impact. ARC's analysis predicts that this window will continue to receive a level of sunlight considerably in excess of the BRE recommendation of 25% Annual Probable Sunlight Hours (including 5% Annual Probable Sunlight Hours during the winter period) after the construction of the proposed development.					
The Grange Block G Zone 04a Floor 04	37%	19%	18%	37%	19%	18%
	BRE recommendation met: Predicted impact below BRE threshold for adverse impact. ARC's analysis predicts that this window will continue to receive a level of sunlight considerably in excess of the BRE recommendation of 25% Annual Probable Sunlight Hours (including 5% Annual Probable Sunlight Hours during the winter period) after the construction of the proposed development.					

* For the purposes of this calculation, summer is taken to mean the period between March and September, and winter is considered to be the period between September and March.

** While Section 3.2.1 of the BRE Guide refers to assessing the impact on living room windows, the windows assessed as part of this analysis have been chosen on the basis of potential for impact on sunlight access rather than the use of rooms.

As indicated in Table 2.1 above, ARC's analysis indicates that the proposed development has the potential to result in a "slight" to "moderate" reduction in sunlight access to one of the sample studied windows, the south-facing ground floor window studied in the existing Block G at The Grange. However, as set out in Table 2.1 above, after the construction of the proposed development, this window is likely to continue to have the potential to receive a level of sunlight access in excess of that recommended by the BRE Guide for the period between September and March and a level of sunlight access just under the recommended annual amount.

ARC's analysis further predicts that the potential impact of shadows cast by the proposed development on the other studied windows is likely to range from "imperceptible" to "slight". ARC's analysis predicts that the potential impact of shadows cast by the proposed development on these windows is unlikely to be of a level, which would suggest that sunlight of an existing building "may be adversely affected" (i.e. the three criteria for an adverse impact set out in the BRE Guide were not met in the case of the relevant sample windows studied as part of this analysis). Most sample windows are predicted to remain capable of receiving a level of sunlight access in excess of the annual level recommended by the British Standard and BRE Guide for rooms with a reasonable expectation of sunlight of 25% Annual Probable Sunlight Hours (including 5% Annual Probable Sunlight Hours during the winter period) after the construction of the proposed development.

2.3 Detailed analysis of the potential impact of shadows cast by the proposed development on gardens and amenity areas outside the application site

Insofar as amenity spaces / gardens are concerned, the BRE Guide provides that *"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, <u>and</u> 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."* [Emphasis added.] This suggests that where a garden or amenity area can receive two hours of sun over half its area on 21 March notwithstanding the construction of a proposed development, loss of sunlight as a result of additional overshadowing is not likely to be noticed. Table 2.2 sets out the likely proportion of these gardens in sunlight before and after the construction of the proposed development throughout the day on 21st March.

This analysis assesses the impact of the proposed development to all potential receptors surrounding the application site - these impacts are described above in *"Overview of the potential impact of shadows cast by the proposed development outside the application site"*. However, by way of example in order to illustrate briefly the findings outlined in the overview section, ARC conducted detailed analysis of the potential for the proposed development to result in impacts on sunlight access to a representative sample of sensitive receptors (i.e. gardens) in proximity to the application site (please see Figure 2.1 above). The results of ARC's analysis are set out in Table 2.2 below:

Table 2.2: Predicted impact of the proposed development on sunlight access to sample neighbouring gardens

Zone	21st March Time	Existing Percentage area in sunlight	Proposed Percentage area in sunlight
17 Lawnswood Park Rear Garden	10:00	78%	14%
	11:00	79%	61%
	12:00	79%	80%
	13:00	78%	78%
	14:00	76%	74%
	15:00	74%	73%
	16:00	64%	60%
	17:00	23%	16%
BRE recommendation met: Predicted impact below BRE threshold for adverse impact. At least half of the garden is predicted to receive at least two hours of sunlight on 21 March after the construction of the proposed development.			
19 Lawnswood Park Rear Garden	10:00	87%	83%
	11:00	85%	73%
	12:00	85%	81%
	13:00	85%	85%
	14:00	80%	80%
	15:00	74%	74%
	16:00	62%	61%
	17:00	21%	21%
BRE recommendation met: Predicted impact below BRE threshold for adverse impact. At least half of the garden is predicted to receive at least two hours of sunlight on 21 March after the construction of the proposed development.			

Zone	21st March Time	Existing Percentage area in sunlight	Proposed Percentage area in sunlight
21 Lawnswood Park Rear Garden	10:00	90%	69%
	11:00	82%	82%
	12:00	83%	83%
	13:00	82%	82%
	14:00	76%	76%
	15:00	74%	74%
	16:00	62%	62%
	17:00	34%	34%
BRE recommendation met: Predicted impact below BRE threshold for adverse impact. At least half of the garden is predicted to receive at least two hours of sunlight on 21 March after the construction of the proposed development.			
24 Lawnswood Park Rear Garden	10:00	92%	51%
	11:00	84%	70%
	12:00	84%	84%
	13:00	85%	85%
	14:00	84%	84%
	15:00	79%	79%
	16:00	67%	67%
	17:00	36%	36%
BRE recommendation met: Predicted impact below BRE threshold for adverse impact. At least half of the garden is predicted to receive at least two hours of sunlight on 21 March after the construction of the proposed development.			
29 Lawnswood Park Rear Garden	10:00	92%	91%
	11:00	97%	79%
	12:00	97%	97%
	13:00	99%	99%
	14:00	96%	96%
	15:00	92%	91%
	16:00	82%	79%
	17:00	60%	55%
BRE recommendation met: Predicted impact below BRE threshold for adverse impact. At least half of the garden is predicted to receive at least two hours of sunlight on 21 March after the construction of the proposed development.			

Zone	21st March Time	Existing Percentage area in sunlight	Proposed Percentage area in sunlight
1 Grange Cottages Rear Garden	10:00	57%	41%
	11:00	64%	50%
	12:00	67%	61%
	13:00	66%	55%
	14:00	60%	44%
	15:00	57%	32%
	16:00	44%	2%
	17:00	7%	0%
BRE recommendation met: Predicted impact below BRE threshold for adverse impact. At least half of the garden is predicted to receive at least two hours of sunlight on 21 March after the construction of the proposed development.			

As set out in Table 2.2 above, while shadows cast by the proposed development will result in "imperceptible" to "moderate" additional overshadowing of sample gardens at Lawnswood Park during the mornings of the 21st March and of the rear garden of No. 1 Grange Cottages over the course of the day on 21st March, all sample studied gardens are likely to continue to have the potential to receive at least two hours sunlight over at least half of their respective areas on 21st March.

Given that the neighbouring gardens will remain capable of achieving a level of sunlight very considerably in excess of that recommended by the BRE Guide after the construction of the proposed development, ARC's analysis indicates that the proposed development will not result in any undue adverse impacts on sunlight access to neighbouring gardens throughout the year within the meaning of the BRE Guide.

3.0 Assessment of Sunlight Access within the Proposed Communal Open Space

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 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 at the equinox.

As part of this analysis, ARC assessed the likely proportion of the proposed principal communal open spaces[1] serving the proposed residential development (i.e. the central garden indicated at Figure 2.1) predicted to receive sunlight access on 21st March. The results of ARC's analysis are set out in Table 3.1 below.

Table 3.1: Approximate areas of proposed communal open spaces in sunshine on 21st March

Time	Principal Open Space Percentage area in sunlight - 21st March
09:00	23%
09:30	24%
10:00	32%
10:30	39%
11:00	35%
11:30	32%
12:00	55%
12:30	54%
13:00	52%
13:30	58%
14:00	55%
14:30	60%
15:00	49%
15:30	42%
16:00	33%
16:30	24%
17:00	10%

As suggested by the results set out in Table 3.1 the proposed central garden will receive a level of sunlight in excess of the level recommended by the BRE Guide for amenity spaces. The proposed communal open space will, therefore, appear adequately sunlit throughout the year within the meaning of the BRE Guide. More than this, the proposed communal open space will receive sunlight access throughout the day for most of the year.

1 The subject application proposes a number of communal open spaces. ARC understands that it is intended that these spaces will be interconnected. As such, it is understood that, if constructed, there will be no clear boundary between the proposed open spaces. Given that the proposed central garden will act as the principal open space within the lands contained within the red line boundary, ARC identified this space for analysis of sunlight access under the BRE Guide. Given that the subject application does not propose a boundary to the space, ARC identified a space within the area indicated for the central garden. This space was not chosen with reference to proposed landscaping of the space, but it was considered that analysis of this would give an indication of the likely sunlight environment and amenity value of the principal communal open space.

4.0 Assessment of the Impact of the Proposed Development on Daylight Access

The BRE Guide provides that *"The quantity and quality of daylight inside a room will be impaired if obstructing buildings are large in relation to their distance away"*. Generally speaking, new development is most likely to affect daylight access in existing buildings in close proximity to the application site.

4.1 Overview of the potential impact of the proposed development on daylight access to existing buildings outside the application site

The BRE Guide provides that *"The quantity and quality of daylight inside a room will be impaired if obstructing buildings are large in relation to their distance away"*. Generally speaking, new development is most likely to affect daylight access in existing buildings in close proximity to the application site. ARC's analysis indicates that any changes in daylight access occurring as a result of the construction of the proposed development have the potential to be most noticeable within those buildings closest to the proposed development (e.g. existing buildings at Grange Cottages and within the existing development at The Grange). However, ARC's analysis further indicated that the potential for noticeable impacts on daylight access at Grange Cottages and within The Grange was restricted to a small proportion of rooms and that affected rooms would retain the potential continue to achieve a level of daylight access (measured in Average Daylight Factor) in excess of the relevant minima recommended by British Standard after the construction of the proposed development. Under a worst case scenario, the potential impact of the proposed development on daylight access within Grange Cottages and The Grange is likely to be consistent with emerging trends for development in the area. Given this, ARC's analysis indicates that the potential impact of the proposed development on daylight access within Grange Cottages and within the existing development was likely to range from none[2] to "imperceptible" to "moderate".

ARC's analysis further indicates that the construction of the proposed development is unlikely to result in a noticeable change in daylight access to neighbouring existing buildings at Lawnswood Park and the potential impact is, therefore, likely to range from none to "imperceptible" to "slight".

Given that the potential for development to result in impacts on daylight access diminishes with distance, it is the finding of ARC's analysis the proposed development does not have the potential to result in any undue adverse impact on daylight access within buildings in the wider area surrounding the application site.

4.2 Detailed analysis of the potential impact of the proposed development on daylight access to existing buildings outside the application site

This Sunlight and Daylight Access Analysis assesses the impact of the proposed development to all potential receptors surrounding the application site - these impacts are described in the section entitled "*Overview of the potential impact of the proposed development on daylight access to existing buildings outside the application site"*. However, by way of example in order to illustrate briefly the findings outlined in the overview section, ARC conducted detailed analysis of the potential for the proposed development to result in impacts on daylight access to a representative sample of sensitive receptors (i.e. rooms) in buildings in proximity to the application site (please see Figure 2.1, 2.2 and 2.3 above). However, by way of example in order to illustrate briefly the findings outlined in the overview section, ARC conducted quantitative analysis of the potential for the proposed development to result in impacts on daylight access to a representative sample of sensitive receptors (i.e. rooms) in buildings in proximity to the application site. In identifying receptors sensitive to changes in the daylight environment, ARC considered two factors:

(i) *the use of receptors (i.e. buildings) surrounding the application site:* buildings in residential use (and, particularly, habitable rooms within residences) would be considered to be sensitive to changes in the daylight environment;

(ii) *the location of receptors relative to the application site:* as set out in section 2.2.21 of the BRE Guide *"If any part of a new building or extension, measured in vertical section perpendicular to a main window wall of an existing building, from the centre of the lowest window, subtends to an angle of more than 25° to the horizontal, then the diffuse daylighting of the existing building may be adversely affected."*

Given this, the receptors most sensitive to changes in the daylight environment as a result of the construction of development on the application site would be windows facing towards the proposal at low levels of accommodation in buildings in residential use in close proximity to the site (i.e. low level rooms at The Grange, Grange Cottages and Lawnswood Park). Therefore, ARC identified

2 Specifically, rooms within existing buildings at Grange Cottages and The Grange in the opposite direction to the proposed development or separated from the site of the proposed development by intervening development are not likely to experience any material impacts on daylight access.

a representative sample of rooms and windows at The Grange, Grange Cottages and Lawnswood Park for detailed quantitative analysis. This sample is considered to constitute a worst-case scenario.

4.2.1 Vertical Sky Component

ARC measured Vertical Sky Component to sample windows in existing buildings (i) before the construction of the proposed development; and (ii) after the construction of the proposed development. The impact of the proposed development on daylight access within existing and permitted buildings was measured using Vertical Sky Component having regard to the BRE Guide, which states as follows: *"In assessing the loss of light to an existing building, the VSC is generally recommended as the appropriate parameter to use."*

The Building Research Establishment's *Site layout planning for daylight and sunlight: a guide to good practice* (the BRE Guide) defines Vertical Sky Component as the *"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"*.

Section 2.2.21 of the BRE Guide suggests that: *"If any part of a new building or extension, measured in a vertical section perpendicular to a main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25° to the horizontal, then the diffuse daylighting of the existing building may be adversely affected. This will be the case if ... the VSC measured at the centre of an existing main window is less than 27%, and less than 0.8 times its former value..."*.

As evidenced by the diagrams included in the BRE Guide, the target value of 27% Vertical Sky Component assumes a typical suburban layout of opposing one to two storey houses. Rigid application of the recommendation that windows achieve a Vertical Sky Component of 27%, particularly in the assessment of the impact of new development on existing buildings, can promote unsustainably low density development. The BRE Guide appears to acknowledge this by facilitating the use of alternative target values. At Appendix F: Setting Alternative Target Values for Skylight and Sunlight Access, it states: *"Sections 2.1, 2.2 and 2.3 give numerical target values in assessing how much light from the sky is blocked by obstructing buildings. These values are purely advisory and different targets may be used based on the special requirements of the proposed development or its location. Such alternative targets may be generated from the layout dimensions of existing development, or they may be derived from considering the internal layout and daylighting needs of the proposed development itself."*

4.2.2 Average Daylight Factor

While BRE Guide discusses the use of Vertical Sky Component in assessing impact on daylight access, it is notable that, while the relevant *British Standard, BS 8206-2:2008: Lighting for buildings - Part 2: Code of practice for daylighting* makes reference to the fact that the BRE Guide recommends the use of Vertical Sky Component in assessment of the impact on existing buildings, the British Standard stops short of making the same recommendation. To the contrary, the British Standard states: *"The vertical sky component is **one of the factors** on which the average daylight factor in an existing interior depends."* (Emphasis added.)

Vertical Sky Component refers to the amount of light from the sky falling directly at a particular point on a vertical surface such as a window or wall. Average Daylight Factor takes into account daylight coming from the sky, externally reflected light and internally reflected light. Given this, it is considered that Average Daylight Factor provides a more comprehensive picture of daylight access within existing buildings and the extent to which new development will change the daylight environment within those existing buildings.

BS 8206-2:2008: Lighting for buildings - Part 2: Code of practice for daylighting states as follows at Section 5.5: Average daylight factor:

> *"The average daylight factor is used as the measure of general illumination from skylight. It is considered good practice to ensure that rooms in dwellings and in most other buildings have a predominantly daylit appearance. In order to achieve this the average daylight factor should be at least 2%."*

In terms of assessing the impact of development on daylight access in an existing room, the British Standard suggests that, where a room has an ADF of 5%, a reduction in daylight access of between 15% and 8% is likely to be noticed - the room *"would be likely to appear more gloomy, and electric lighting would be needed for more of the time"*. In other words, where daylight access is reduced to between 0.85 times and 0.92 times its former value, the occupant of that residence is likely to notice the change. What this is saying is that, in some cases (the details of which are not explained in the British Standard), a reduction in ADF to anything less than 0.92 times the former light levels will be noticeable. In other cases (again not explained), light levels will have to fall to 0.85 times their former value before the change is noticed. Therefore, in all cases where a room has an ADF of 5%, anything greater than a 15% drop in daylight levels (or a drop to 0.85 times its former value) will be noticed. A general rule of thumb is that if daylight access was reduced by one fifth, the occupants will be likely to notice.

In undertaking this analysis, assumptions were made as to the use of the room, the size and layout of the interior of the rooms within neighbouring buildings, the colour schemes used in the decoration of the walls, floor and ceiling of the room and the type of glazing used in the window opes. As such, the rooms in existing buildings adjoining the application site analysed as part of this analysis must be considered to be notional. While it was necessary, in undertaking the analysis, to make assumptions regarding the parameters of chosen sample rooms, comparative analysis of daylight access within assumed rooms is instructive as to the likely extent of change in the daylight environment in existing buildings in proximity to the application site.

As set out at Table 4.1 below, ARC's analysis of sample rooms indicates that any changes in daylight access occurring as a result of the construction of the proposed development have the potential to be most noticeable within the sample rooms closest to the proposed development (e.g. existing buildings at Grange Cottages and within the existing development at The Grange). For example, ARC's analysis indicated a potential for the construction of the proposed development to result in a "moderate" change in daylight access to the rear-facing sample study room at No. 1 Grange Cottages, although the sample study room is predicted remain capable of achieving the higher level of Average Daylight Factor recommended by the British Standard (i.e. 5% ADF is recommended for rooms *"electric lighting is not normally needed during the daytime"*) after the construction of the proposed development. ARC's analysis further indicated that the potential for noticeable impacts on daylight access within a small proportion of rooms at lower levels of accommodation within The Grange (e.g. the west-facing sample study rooms at Block F and north facing sample study rooms at Block G, which directly oppose the proposed site of new structures). Notwithstanding the construction of the proposed development, sample study rooms within The Grange are likely to continue to achieve Average Daylight Factors considerably in excess of the relevant minima recommended by British Standard after the construction of the proposed development. Under a worst case scenario, the potential impact of the proposed development on daylight access within Grange Cottages and The Grange is likely to be consistent with emerging trends for development in the area. Given this, ARC's analysis indicates that the potential impact of the proposed development on daylight access within the sample study rooms at Grange Cottages and within the existing development was likely to range from "imperceptible" to "moderate".

ARC's analysis indicates the construction of the proposed development is predicted to result in an "imperceptible" to "slight" reduction in daylight access to sample rooms studied at Lawnswood Park to the west of the application site.

Table 4.1: Predicted impact of the proposed development on daylight access to sample rooms in buildings in proximity to the application site

Sample Room	Floor	Vertical Sky Component			Average Daylight Factor			Predicted Impact
		Existing	Proposed	Change	Existing	Proposed	Change	
17 Lawnswood Park	Floor 00	34.40%	28.80%	Vertical Sky Component is predicted to remain above 27% after the construction of the proposed development.	11.53%	11.11%	Average Daylight Factor is predicted to decrease to 0.96 times its former value after the construction of the proposed development.	ARC's analysis predicts an "imperceptible" impact on daylight access.
19 Lawnswood Park	Floor 00	28.80%	23.70%	Vertical Sky Component is predicted to decrease to 0.83 times its former value after the construction of the proposed development.	8.33%	7.96%	Average Daylight Factor is predicted to decrease to 0.96 times its former value after the construction of the proposed development.	ARC's analysis predicts an "imperceptible" impact on daylight access.
21 Lawnswood Park	Floor 00	34.80%	30.30%	Vertical Sky Component is predicted to remain above 27% after the construction of the proposed development.	9.85%	9.46%	Average Daylight Factor is predicted to decrease to 0.96 times its former value after the construction of the proposed development.	ARC's analysis predicts an "imperceptible" impact on daylight access.
24 Lawnswood Park	Floor 00	31.80%	28.20%	Vertical Sky Component is predicted to remain above 27% after the construction of the proposed development.	5.22%	5.00%	Average Daylight Factor is predicted to decrease to 0.96 times its former value after the construction of the proposed development.	ARC's analysis predicts an "imperceptible" impact on daylight access.
29 Lawnswood Park	Floor 00	34.00%	30.60%	Vertical Sky Component is predicted to remain above 27% after the construction of the proposed development.	7.01%	6.58%	Average Daylight Factor is predicted to decrease to 0.93 times its former value after the construction of the proposed development.	ARC's analysis predicts an "imperceptible" impact on daylight access.
1 Grange Cottages	Floor 00	31.90%	23.40%	Vertical Sky Component is predicted to decrease to 0.73 times its former value after the construction of the proposed development.	7.55%	5.94%	Average Daylight Factor is predicted to decrease to 0.79 times its former value after the construction of the proposed development.	ARC's analysis predicts a "moderate" impact on daylight access
Block D Zone 00 The Grange	Floor 00	18.90%	12.90%	Vertical Sky Component is predicted to decrease to 0.68 times its former value after the construction of the proposed development.	4.69%	4.56%	Average Daylight Factor is predicted to decrease to 0.91 times its former value after the construction of the proposed development.	ARC's analysis predicts an "imperceptible" to "slight" impact on daylight access
Block D Zone 02 The Grange	Floor 02	19.00%	16.90%	Vertical Sky Component is predicted to decrease to 0.89 times its former value after the construction of the proposed development.	4.70%	4.74%	Average Daylight Factor is predicted to increase to 1.01 times its former value after the construction of the proposed development.	ARC's analysis predicts an "imperceptible" impact on daylight access.
Block F Zone 00 The Grange	Floor 00	19.70%	7.80%	Vertical Sky Component is predicted to decrease to 0.40 times its former value after the construction of the proposed development.	5.49%	5.15%	Average Daylight Factor is predicted to decrease to 0.86 times its former value after the construction of the proposed development.	ARC's analysis predicts an "imperceptible" to "slight" impact on daylight access
Block F Zone 02 The Grange	Floor 02	20.70%	11.40%	Vertical Sky Component is predicted to decrease to 0.55 times its former value after the construction of the proposed development.	6.01%	5.28%	Average Daylight Factor is predicted to decrease to 0.83 times its former value after the construction of the proposed development.	ARC's analysis predicts a "slight" to "moderate" impact on daylight access
Block G Zone 00a The Grange	Floor 00	13.70%	8.30%	Vertical Sky Component is predicted to decrease to 0.61 times its former value after the construction of the proposed development.	5.55%	5.41%	Average Daylight Factor is predicted to decrease to 0.97 times its former value after the construction of the proposed development.	ARC's analysis predicts an "imperceptible" impact on daylight access.
Block G Zone 02a The Grange	Floor 02	29.10%	18.80%	Vertical Sky Component is predicted to decrease to 0.65 times its former value after the construction of the proposed development.	6.02%	6.01%	Average Daylight Factor is predicted to decrease to 0.998 times its former value after the construction of the proposed development.	ARC's analysis predicts an "imperceptible" impact on daylight access.
Block G Zone 00b The Grange	Floor 00	14.80%	13.20%	Vertical Sky Component is predicted to decrease to 0.89 times its former value after the construction of the proposed development.	7.71%	6.84%	Average Daylight Factor is predicted to decrease to 0.89 times its former value after the construction of the proposed development.	ARC's analysis predicts an "imperceptible" to "slight" impact on daylight access.
Block G Zone 02b The Grange	Floor 02	29.60%	21.80%	Vertical Sky Component is predicted to decrease to 0.74 times its former value after the construction of the proposed development.	7.72%	7.13%	Average Daylight Factor is predicted to decrease to 0.92 times its former value after the construction of the proposed development.	ARC's analysis predicts an "imperceptible" to "not significant" impact on daylight access.

5.0 Assessment of Daylight Access within the Proposed Development

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."* Given this, as part of this *Sunlight and Daylight Access Analysis,* ARC undertook an assessment of the likely daylight access within the proposed residential units with reference to the quantitative performance approaches to daylight provision outlined in the British Standard.

A sample of rooms within the proposed development was studied, although an emphasis was placed on analysis rooms likely to receive lower levels of daylight (e.g. rooms at the lowest levels of accommodation; rooms with the potential to receive lower levels of daylight access due to their location within the proposed development and/or due to their layout and fenestration). This analysis focuses on new residential accommodation. 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 Figure 2.1 above. For more detail on the methodology used in assessing daylight access, please refer to the Technical Appendix of this Report. The results of ARC's analysis of likely daylight access within the proposed development are set out in Table 5.1 below:

Table 5.1: Predicted daylight access to sample rooms within the proposed development

Location	Floor	Room Type	Predicted Average Daylight Factor
Zone H 00 01	Floor 00	Kitchen / living / dining room	5.32%
Zone H 00 02	Floor 00	Kitchen / living / dining room	4.12%
Zone H 00 03	Floor 00	Kitchen / living / dining room	3.97%
Zone H 01 01	Floor 01	Kitchen / living / dining room	3.27%
Zone H 01 04	Floor 01	Kitchen / living / dining room	3.46%
Zone H 01 06	Floor 01	Kitchen / living / dining room	3.41%
Zone J 00 01	Floor 01	Kitchen / living / dining room	5.14%
Zone J 01 04	Floor 01	Kitchen / living / dining room	2.61%
Zone J 01 05	Floor 01	Kitchen / living / dining room	2.54%
Zone J 01 06	Floor 02	Kitchen / living / dining room	4.61%
Zone J 01 09	Floor 02	Kitchen / living / dining room	3.69%
Zone M 01 02	Floor 01	Kitchen / living / dining room	4.02%
Zone M 01 05	Floor 01	Kitchen / living / dining room	4.34%
Zone M 01 07	Floor 02	Kitchen / living / dining room	5.14%
Zone M 01 09	Floor 01	Kitchen / living / dining room	3.74%
Zone N 01 01	Floor 01	Kitchen / living / dining room	4.59%
Zone N 01 05	Floor 01	Kitchen / living / dining room	5.84%

ARC's analysis indicated that all sample study rooms within the proposed development are likely to achieve levels of daylight access in excess of the minimum levels recommended by the British Standard for achieving a predominantly daylit appearance (i.e. 2% Average Daylight Factor) and for living rooms (i.e. 1.5% Average Daylight Factor) or kitchens (i.e. 2% Average Daylight Factor).

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September 2019

Technical Appendix

Explanatory Note

To date, it is understood that no standards or guidance documents (statutory or otherwise) on the subject of sunlight access to buildings or open spaces or daylight access to buildings have been prepared or published in Ireland. In the absence of guidance on the matter of sunlight and daylight access tailored to Irish climatic conditions, Irish practitioners tend to refer to the relevant *British Standard, BS 8206-2:2008: Lighting for buildings - Part 2: Code of practice for daylighting*. The standards for daylight and sunlight access in buildings (and the methodologies for assessment of same) suggested in the British Standard have been referenced in this Sunlight and Daylight Access Analysis.

The contents of 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 have also been considered in the preparation of the report in the interests of completeness.

Neither the British Standard nor the BRE Guide set out rigid standards or limits. The BRE Guide 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.]

That the recommendations of the BRE Guide are not suitable for rigid application to all developments in all contexts is of particular importance in the context of national and local policies for the consolidation and densification of urban areas or when assessing applications for highly constrained sites (e.g. lands in close proximity or immediately to the south of residential lands).

The purpose of this report is to provide a general indication of daylight performance and sunlight access before and after the construction of 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. 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.

Sunlight Access to Buildings and Open Spaces

Context under Technical and Guidance Documents

The relevant *British Standard, BS 8206-2:2008: Lighting for buildings - Part 2: Code of practice for daylighting*, recommends, at Section 5.3: Sunlight Duration, the following test for the assessment of sunlight access to residential accommodation: *"Interiors in which the occupants have a reasonable expectation of direct sunlight should receive at least 25% of probable sunlight hours... At least 5% of probable sunlight hours should be received during the winter months, between 21 September and 21 March. Sunlight is taken to enter an interior when it reaches one or more window reference points." "Probable sunlight hours"* is described by the British Standard as meaning the *"long-term average of the total number of hours during the year in which direct sunlight reaches the unobstructed ground."* Using data available from Met Eireann, the Irish Meteorological Service, ARC has determined that where a window is capable of receiving three hours of sunlight at the equinox, the tests set out in the British Standard will usually be met.

The BRE Guide states that *"Any reduction in sunlight access below this level should be kept to a minimum. If the available sunlight hours are both less than the amount above and less than 0.8 times their former value, either over the whole year or just in the winter months (21 September to 21 March), then the occupants of the existing building will notice the loss of sunlight … The room may appear colder and less cheerful and less pleasant"*.

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 at the equinox. The BRE Guide recommends that, as a rule of thumb, the centre of the space should receive at least two hours of sunlight on the 21st March in order to appear adequately sunlit throughout the year.

Assessment Methodology for Sunlight Access

A three dimensional digital model of the proposed development 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. 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.

In determining whether or not to include existing and proposed substantial trees in the three dimensional model, 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 results are presented in shadow study diagrams associated with this report. Two separate pages have been prepared for each time period on each representative date as follows:

- ***Existing shadow baseline:*** this page 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 shadow environment:*** this page 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 existing buildings to be retained on the application site are shown in orange. Buildings to be retained, but moved to a different location on the site, are shown in purple. The proposed development on the application site is shown in blue. The shadows cast are shown in a dark grey tone.

Please note that, for the purposes of preparing shadow diagrams, communal open spaces were modelled as a flat plane (i.e. were not modelled to reflect the proposed changes in ground levels). Proposed changes in ground level will result in some small areas of additional shadowing at ground level.

In order to calculate sunlight access to rooms, ARC referenced the methodology outlined in *Appendix A: Indicators to calculate access to skylight, sunlight and solar radiation* of the BRE Guide. Using proprietary sunlight and daylight access analysis software, ARC analysed a sunpath diagram overlaid with a shading mask corresponding to the existing or proposed shadow environment (as appropriate) and the sunlight probability diagram for a latitude of 53° N (i.e. Dublin) for a reference point (i.e. the centre point) of each sample study window. The sunlight availability indicator has 100 spots on it. Each of these represents 1% of annual probable sunlight hours (APSH). The percentage of APSH at the reference point is found by counting up all the unobstructed spots.

Definition of Effects on Sunlight Access

The assessment of the impact of the proposed development on sunlight access had regard to the *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* prepared by the Environmental Protection Agency (Draft of 2017), and to Directive 2011/92/EU (as amended by Directive 2014/52/EU) on the assessment of the likely effects of certain public and private projects on the environment.

The list of definitions given below is taken from *Table 3.3: Descriptions of Effects* contained in the *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* prepared by the Environmental Protection Agency. Some comment is also given below on what these definitions might imply in the case of sunlight access. The definitions from the EPA document are in italics.

- ***Imperceptible:*** *An effect capable of measurement but without significant consequences.* The definition implies that the development would cause a change in the sunlight received at a location, capable of measurement, but not noticeable to the casual observer. If the development caused no change in sunlight access, there could be no effect.

- ***Not Significant:*** *An effect which causes noticeable[2] changes in the character of the environment but without significant consequences* (the footnote "2" to the word *"noticeable"* is: *"for the purposes of planning consent procedures"*). The definition implies that the development would cause a change in the sunlight received at a location, which is capable of measurement and capable of being noticed by an observer who is taking an active interest in the extent to which the proposal might affect sunlight access.

- ***Slight:*** *An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.* For this definition to apply, the amount of sunlight received at a location would be changed by shadows cast by the development to an extent that is both capable of measurement and is noticeable to a minor degree. However, the shadow environment of the surrounding environment should remain largely unchanged.

- ***Moderate:*** *An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.* In this case, a development must bring about a change in the shadow environment of the area; and this change must be consistent with a pattern of change that is already occurring, is likely to occur, or is envisaged by policy. A moderate effect would occur where other developments were bringing about changes in sunlight access of similar extent in the area.

- ***Significant:*** *An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.* The definition implies that the existence of the development would change the extent of sunlight access in a manner that is not *"consistent with existing and emerging baseline trends"*. For example, a development resulting in a *"significant"* diminution of sunlight access would overshadow a location to the extent that there is a significant change in the amount of direct sunlight received at that location.

- Very Significant: *An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.* For example, a *"very significant"* reduction in sunlight access would occur where the development overshadows a location for most of the time that the location would have been in sunlight prior to the construction of the development and where overshadowing of that magnitude is not *"consistent with existing and emerging baseline trends"*.

- ***Profound:*** *An effect which obliterates sensitive characteristics.* Examples of development resulting in a *"profound"* effect on sunlight access would include facilitating sunlight access at a location where that location has previously had none (e.g. facilitating sunlight access as a result of the demolition of a building) or by removal of all access to sunlight at a location.

In relation to sunlight access, it is conceivable that there could be positive impacts, but this implies that a development would involve a reduction of the size or scale of built form (e.g. such as the demolition of a building, which might result in an increase in sunlight access). Though that is possible, it is usually unlikely as most development involves the construction of new obstructions to sunlight access.

The range of possible impacts listed above deal largely with the extent of impact; and the extent of the impact of a development is usually proportional to the extent to which that development is large in scale and/or height and its proximity to the location. This proportionality may be modified by the extent to which the development is seen as culturally or socially acceptable, and on the interaction between the proposed development, the character of the existing shadow environment and the land use pattern of the receiving environment.

Daylight Access to Buildings

Context under Technical and Guidance Documents
Section 2.2.21 of the BRE Guide suggests that:

> *"If any part of a new building or extension, measured in a vertical section perpendicular to a main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25° to the horizontal, then the diffuse daylighting of the existing building may be adversely affected. This will be the case if ...*
>
> - *the VSC measured at the centre of an existing main window is less than 27%, and less than 0.8 times its former value..."*

BS 8206-2:2008: Lighting for buildings - Part 2: Code of practice for daylighting states as follows at Section 5.5: Average daylight factor:

> *"The average daylight factor is used as the measure of general illumination from skylight. It is considered good practice to ensure that rooms in dwellings and in most other buildings have a predominantly daylit appearance. In order to achieve this the average daylight factor should be at least 2%.*
>
> *If the average daylight factor in a space is at least 5% then electric lighting is not normally needed during the daytime, provided the uniformity is satisfactory … If the average daylight factor in a space is between 2% and 5% supplementary electric lighting is usually required."*

The British Standard goes on to recommend a minimum of 1% Average Daylight Factor for bedrooms; 1.5% Average Daylight Factor for living rooms and 2% Average Daylight Factor for kitchens.

Assessment Methodology for Daylight Access
A three dimensional digital model of the proposed development 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. Existing and proposed landscaping was not included in this model. In assessing daylight access within rooms within the proposed development, assumptions were made as to the colour schemes (e.g. materials, reflectances, etc) used in the decoration of the walls, floor and ceiling of the room and the type of glazing used in the window opes. In all cases, rooms are assessed as excluding furniture and window treatments (e.g. curtains, blinds). Assumptions are also made as to the materials and reflectances of external surfaces.

In assessing the impact of the proposed development on existing buildings, ARC assessed the Vertical Sky Component of each window at a point at the centre of each window. In assessing daylight access within the proposed development, Average Daylight Factor was assessed on the working plane (i.e., at work top level). 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 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 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. Unless specifically referenced, analysis of uniformity of daylight access within a room has not been carried out as part of this assessment.

Definition of Effects on Daylight Access
The assessment of the impact of the proposed development on daylight access had regard to the *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* prepared by the Environmental Protection Agency (Draft of 2017), and to Directive 2011/92/EU (as amended by Directive 2014/52/EU) on the assessment of the likely effects of certain public and private projects on the environment.

The list of definitions given below is taken from *Table 3.3: Descriptions of Effects* contained in the *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* prepared by the Environmental Protection Agency. Some comment is also given below on what these definitions might imply in the case of daylight access. The definitions from the EPA document are in italics.

- ***Imperceptible:*** *An effect capable of measurement but without significant consequences.* The definition implies that the development would cause a change in the daylight received at a location, capable of measurement, but not noticeable to the casual observer. If the development caused no change in daylight access, there could be no effect.

- ***Not Significant:*** *An effect which causes noticeable2 changes in the character of the environment but without significant consequences* (the footnote "2" to the word *"noticeable"* is: *"for the purposes of planning consent procedures"*). The definition implies that the development would cause a change in the daylight received at a location, which is capable of measurement and capable of being noticed by an observer who is taking an active interest in the extent to which the proposal might affect daylight access.

- ***Slight:*** *An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.* For this definition to apply, the amount of daylight received at a location would be changed by the construction of the development to an extent that is both capable of measurement and is noticeable to a minor degree. However, the daylight environment within an existing building should remain largely unchanged.

- ***Moderate:*** *An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.* In this case, a development must bring about a change in the daylight environment within an existing building; and this change must be consistent with a pattern of change that is already occurring, is likely to occur, or is envisaged by policy. A moderate effect would occur where other developments were bringing about changes in daylight access of similar extent in the area.

- ***Significant:*** *An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.* The definition implies that the existence of the development would change the extent of daylight access in a manner that is not *"consistent with existing and emerging baseline trends"*. For example, a development resulting in a *"significant"* diminution of daylight access would reduce daylight to the extent that minimum standards for daylighting are not met and artificial lighting is required for part of the day.

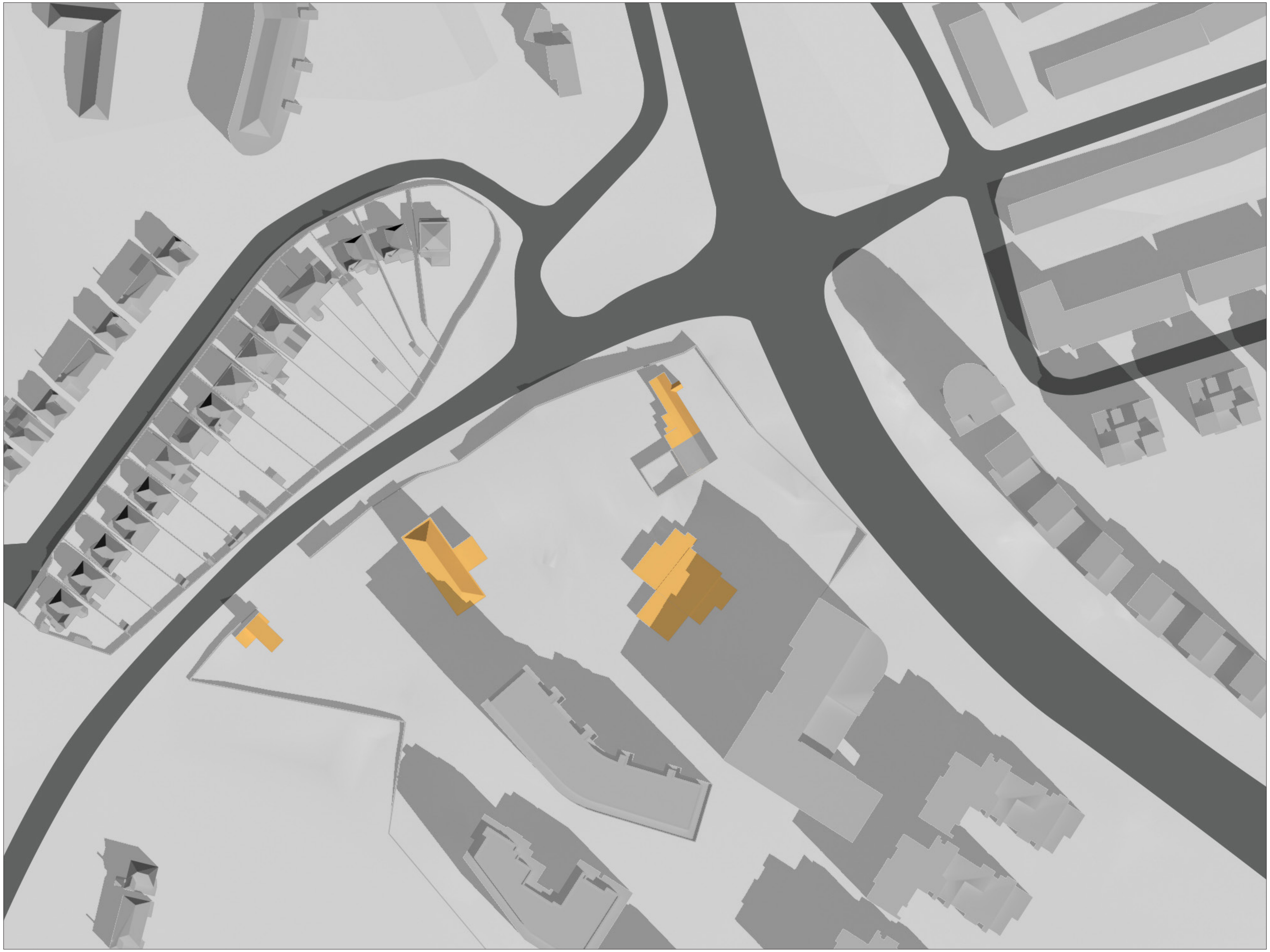
- ***Very Significant:*** *An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.* The definition implies that the existence of the development would change the extent of daylight access to a considerable degree and in a manner that is not *"consistent with existing and emerging baseline trends"*. For example, a *"very significant"* effect would occur where a development would result in daylight received in a room falling well below the minimum standards for daylighting and where artificial lighting would be required in that room as the principal source of lighting all the time.

- ***Profound:*** *An effect which obliterates sensitive characteristics.* Examples of development resulting in a ***"profound"*** effect on daylight access would include facilitating daylight access to a room in an existing building where the existing room has none (e.g. as a result of the demolition of a building) or by removal of all access to daylight within an existing building.

In relation to daylight access, it is conceivable that a development could result in positive effects, but this implies that a development would involve a reduction of the size or scale of built form (e.g. such as the demolition of a building, which might result in an increase in daylight access). Though that is possible, it is usually unlikely as most development involves the construction of new obstructions to daylight access.

RECEIVING ENVIRONMENT

OSI LICENCE NO. AR 0087019



N

SHADOW STUDY

LANDS ADJACENT TO 'THE GRANGE', BREWERY ROAD/ STILLORGAN ROAD

STILLORGAN, BLACKROCK, CO. DUBLIN

SEPTEMBER 2019

DATE : MARCH 21ST - EQUINOX

SUNRISE : 6.26 AM

SUNSET : 6.39 PM

TIME :

10.00 AM

PROPOSED DEVELOPMENT

OSI LICENCE NO. AR 0087019

N

SHADOW STUDY

LANDS ADJACENT TO 'THE GRANGE', BREWERY ROAD/ STILLORGAN ROAD

STILLORGAN, BLACKROCK, CO. DUBLIN

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STILLORGAN, BLACKROCK, CO. DUBLIN

SEPTEMBER 2019

DATE : MARCH 21ST - EQUINOX

SUNRISE : 6.26 AM

SUNSET : 6.39 PM

TIME :

12.00 PM

PROPOSED
DEVELOPMENT

OSI LICENCE NO. AR 0087019

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SHADOW STUDY
LANDS ADJACENT TO 'THE GRANGE', BREWERY ROAD/ STILLORGAN ROAD
STILLORGAN, BLACKROCK, CO. DUBLIN
SEPTEMBER 2019

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TIME :
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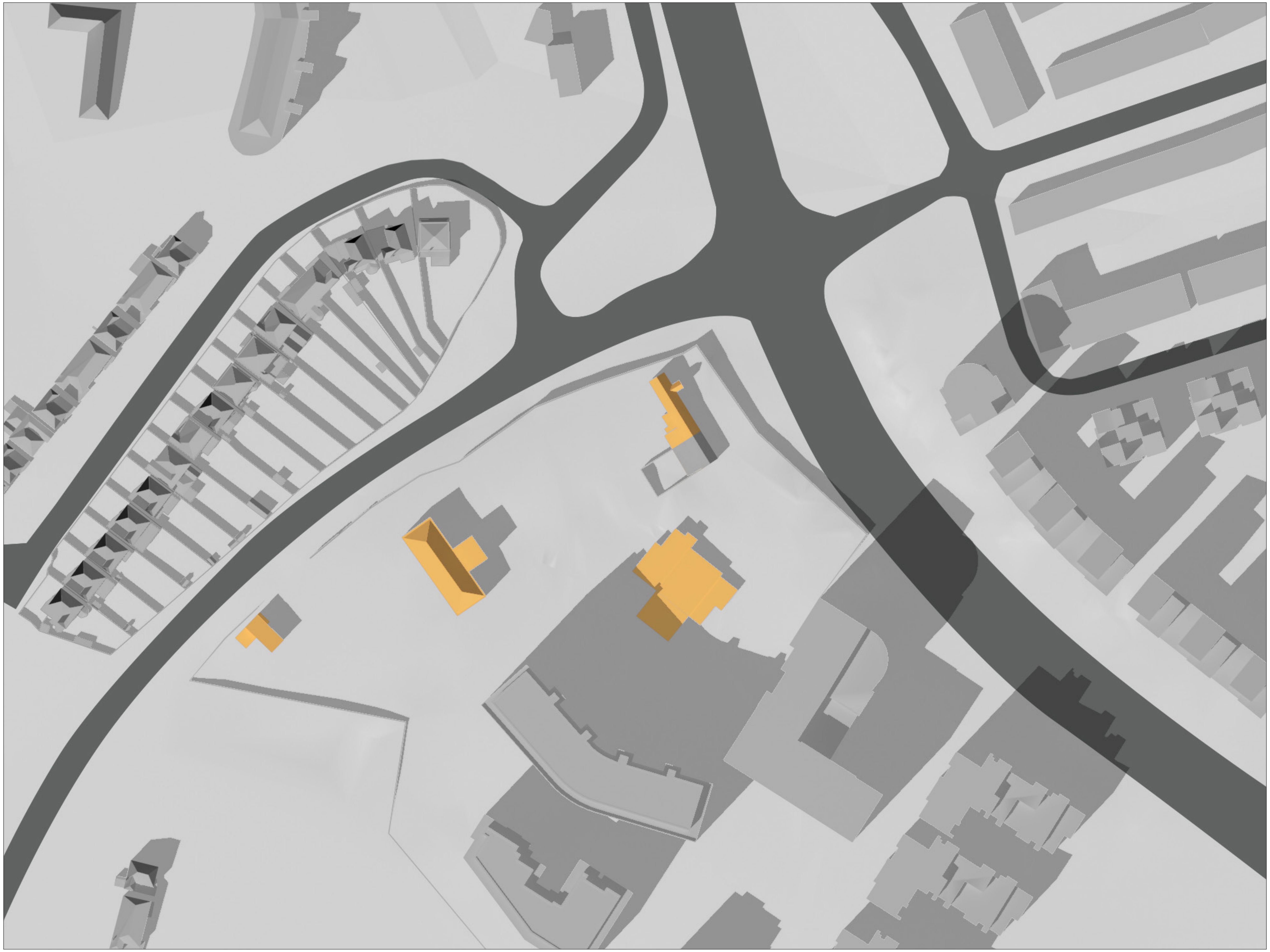


SHADOW STUDY

LANDS ADJACENT TO 'THE GRANGE', BREWERY ROAD/ STILLORGAN ROAD

STILLORGAN, BLACKROCK, CO. DUBLIN

SEPTEMBER 2019

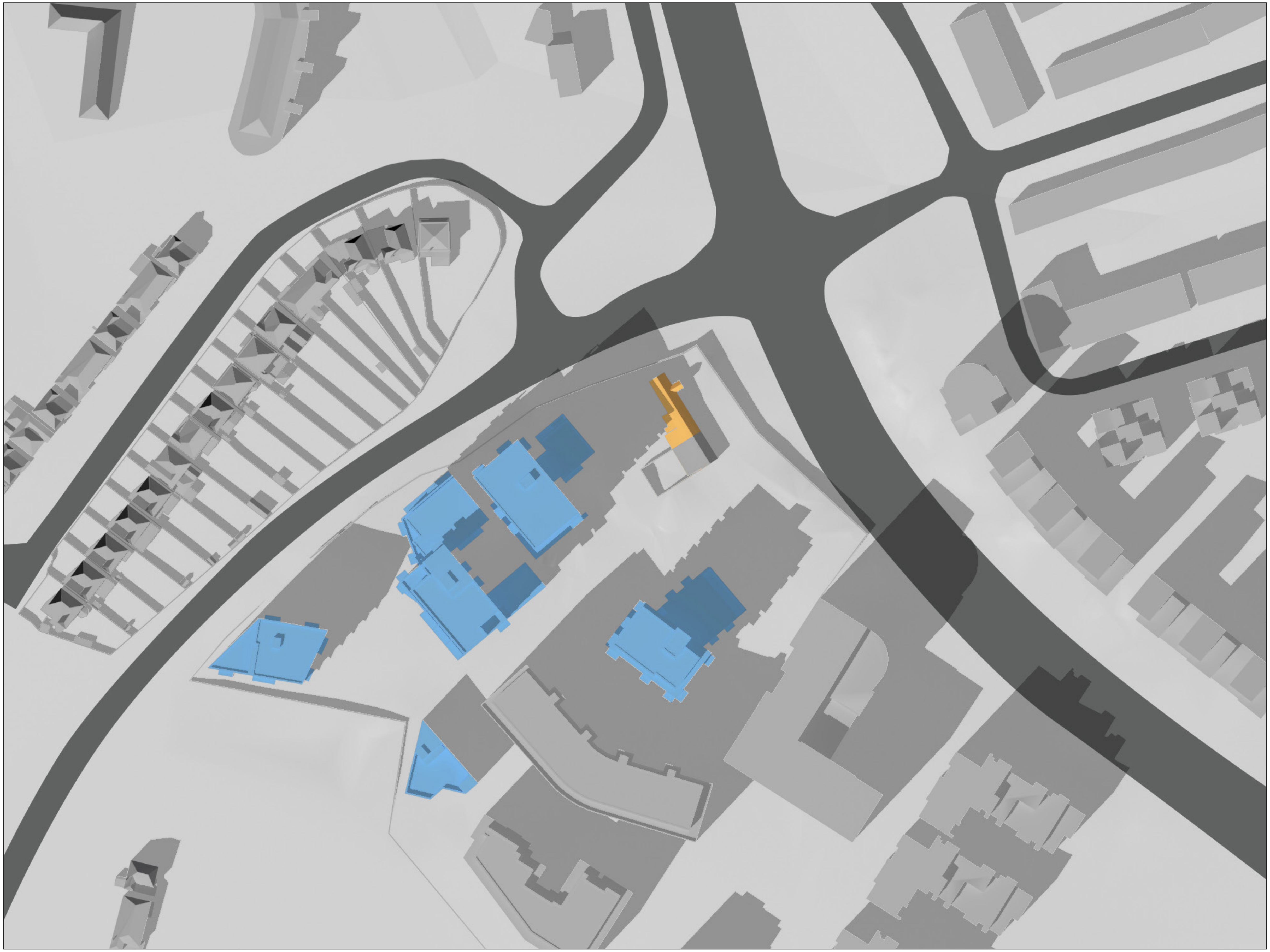
DATE : MARCH 21ST - EQUINOX

SUNRISE : 6.26 AM

SUNSET : 6.39 PM

TIME :

3.00 PM



PROPOSED
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STILLORGAN, BLACKROCK, CO. DUBLIN
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TIME :
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SEPTEMBER 2019

DATE : MARCH 21ST - EQUINOX
SUNRISE : 6.26 AM
SUNSET : 6.39 PM

TIME :
5.00 PM

PROPOSED
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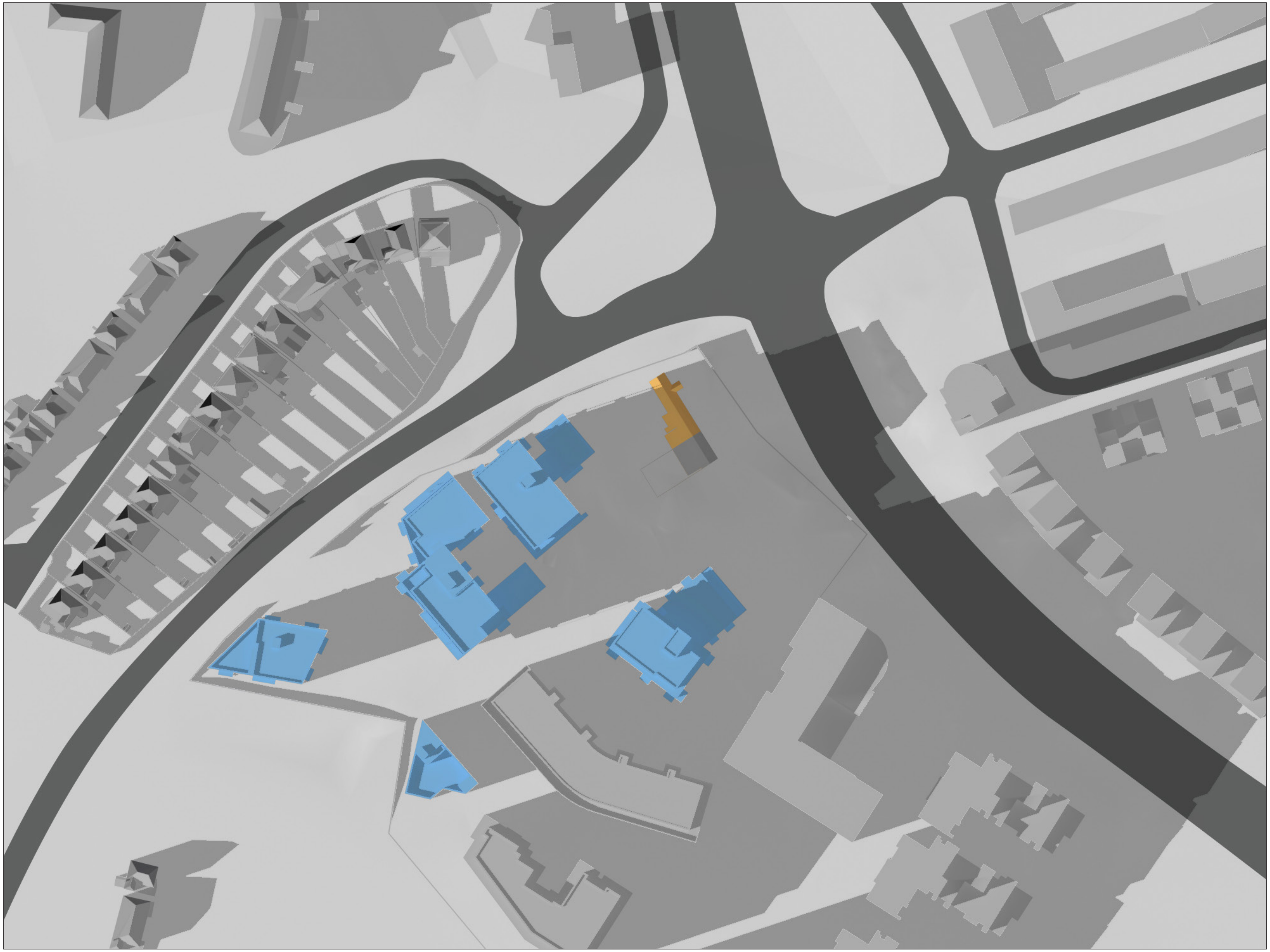

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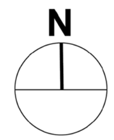

SHADOW STUDY

LANDS ADJACENT TO 'THE GRANGE', BREWERY ROAD/ STILLORGAN ROAD

STILLORGAN, BLACKROCK, CO. DUBLIN

SEPTEMBER 2019

DATE : JUNE 21ST - SUMMER SOLSTICE

SUNRISE : 4.56 AM

SUNSET : 9.56 PM

TIME :

9.00 AM

PROPOSED
DEVELOPMENT

OSI Licence No. AR 0087019

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SHADOW STUDY
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TIME :
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SEPTEMBER 2019

DATE : DECEMBER 21ST - WINTER SOLSTICE
SUNRISE : 8.37 AM
SUNSET : 4.07 PM

TIME :
10.30 AM

PROPOSED
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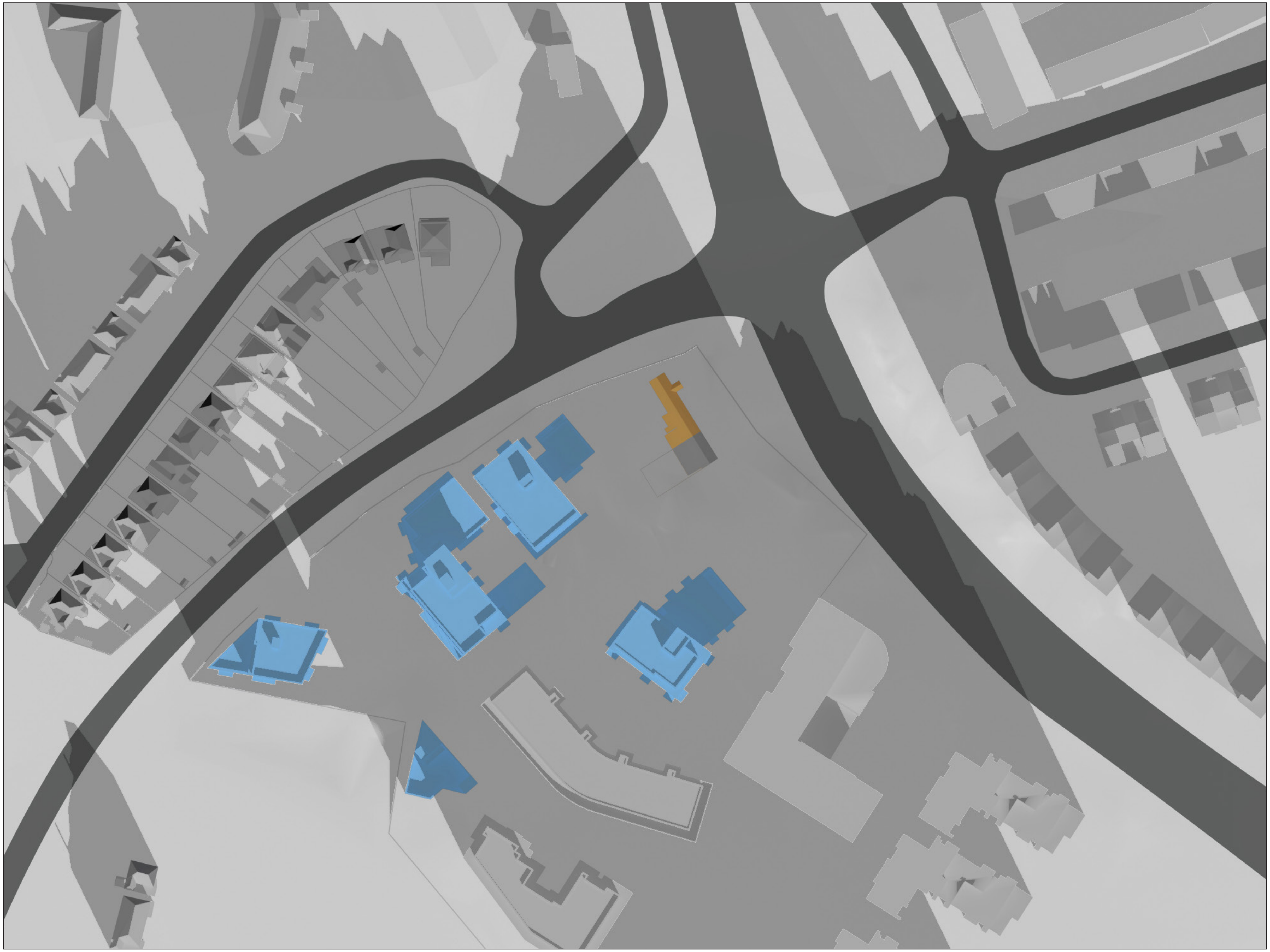

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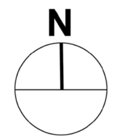

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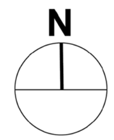

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