

10 CLIMATE (SUNLIGHT)

10.1 Introduction

ARC Architectural Consultants Ltd. has been commissioned by the Applicant to carry out an analysis of the impact of the proposed development on lands at Woodbrook, Shankill, Co. Dublin on sunlight access in the surrounding area.

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 have been prepared or published in Ireland. In the absence of guidance on the matter of sunlight 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 British Standard) and to the Building Research Establishment's *Site layout planning for daylight and sunlight: a guide to good practice* (the BRE Guide). The standards for sunlight access in buildings (and the methodologies for assessment of same) suggested in the British Standard and the BRE Guide have been referenced in this Sunlight Access Analysis.

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).

Given that the British Standard and the BRE Guide were drafted in the UK in the context of UK strategic planning policy, recommendations or advices provided in either document that have the potential to conflict with Irish statutory planning policy have been disregarded for the purposes of this analysis.

This Chapter and assessment have been completed having regard to the guidance outlined in the EPA documents *Guidelines on information to be contained in EIAR* (Draft, August 2017) and *Advice note for Preparing Environmental Impact Statements* (Draft, September 2015) as outlined under Chapter 1 of this EIAR.

10.2 Assessment Methodology

10.2.1 Context under Technical 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."*

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.

10.2.2 Assessment Methodology

A three dimensional digital model of the proposed development, of the emerging design for Phase 2 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 Dun Laoghaire-Rathdown County Council's online planning register, on-site, satellite and aerial photography. 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 Chapter (See Appendix 10.1). Two separate pages have been prepared for each time period on each representative date as follows: -

- *Receiving Environment:* 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 Development:* 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 the proposed development and existing buildings to be retained on the application site are shown in blue. The shadows cast are shown in a dark grey tone.

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.

Note: It is noted that BS 8206-2:2008: Lighting for buildings - Part 2: Code of practice for daylighting was recently replaced with BS EN 17037:2018 Daylight in Buildings. However, given that BS EN 17037:2018 does not provide any recommendations with regard to the assessment of impacts and given that the Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities refer to the BS 8206-2:2008 and not to BS EN 17037:2018, BS 8206:2008 has been referenced in the preparation of this Chapter.

10.2.3 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 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 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 or daylight 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.

10.3 Receiving Environment

The application site is a vacant, green field site located on the eastern side of the R119 Regional Road (the Dublin Road), approximately 1 km south of Shankill village centre. It is bounded to the north by Shanganagh Cemetery and to the east and south by lands associated with Woodbrook Golf Club.

To the south, the site is bounded by lands associated with the two storey house and associated complex of buildings and gardens at Corke Lodge, a protected structure, and the three storey over basement Woodbrook House, a protected structure, and its associated outbuildings, lands and gardens.

Most residential areas in the vicinity of the application site are located at a considerable remove from the application site or separated from the application site by dense bands of mature trees. Saint James's Lodge and The Parsonage, both detached two storey houses, on Dublin Road are located to the northeast of the site. St James Church, a protected structure, is also located to the northeast of the site. The single storey detached house at Beauchamp Lodge is located on the opposite (western) side of the Dublin Road. A school, Woodbrook College, is located approximately 100 m to the southwest of the application site.

10.4 Characteristics of the Proposed Development

The site is generally bounded by the Old Dublin Road (R119) and St. James (Crinken) Church to the west, Shanganagh Public Park and Shanganagh Cemetery to the north, Woodbrook Golf Course to the east and Corke Lodge and woodlands and Woodbrook Golf Clubhouse and car park to the south. The replacement golf hole lands are generally bounded by the existing train line to the west, Shanganagh Public Park to the north and Woodbrook Golf Course to the east and south. The proposed development is within the townlands of Cork Little and Shanganagh, Shankill, Co. Dublin.

In summary, the proposed Strategic Housing Development broadly comprises: -

- 685no. residential units (207no. houses, 48no. duplex and 430no. apartments) in buildings ranging from 2 to 8-storeys.
- 1no. childcare facilities (c. 429 sq. m gross floor area).
- Provision of Woodbrook Distributor Road / Woodbrook Avenue from the Old Dublin Road (R119) to the future Woodbrook DART Station, including the provision of a temporary surface car park (164no. parking spaces including set down areas and ancillary bicycle parking and storage) adjacent the future Woodbrook DART Station in northeast of site.
- Provision of a series of linear parks and green links (Coastal Park and Corridor Park), including 2no. pedestrian / cycle links to Shanganagh Public Park and provision of interim landscaping of future public plaza to serve future Local Centre to allow full north / south connection, supplemented by smaller pocket parks.
- Provision of SuDS infrastructure and connection to existing surface water culvert on Old Dublin Road (R119).
- Provision of waste water infrastructure (pumping station including 24 hour emergency storage and rising foul main through Shanganagh Public Park to tie-in to existing services at St. Anne's Park Residential Estate).
- 2no. replacement golf holes on eastern side of railway line.
- All associated and ancillary site development and infrastructural works, hard and soft landscaping and boundary treatment works.

A full project description is provided in Chapter 3: Description of Proposed Development.

10.5 Potential Impact of the Proposed Development

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 Little fair 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.”

10.5.1 Proposed Development

10.5.1.1 Construction Stage

The potential impact of the construction phase of the proposed development on sunlight access is likely to be, initially, lesser than the potential impact of the completed development. As the proposed development nears completion, the potential impact of the emerging development is likely to be similar in all material respects to that of the completed development. It is noted that temporary structures and machinery (e.g. hoarding, scaffolding, cranes, etc.) also have the potential to cast shadows, although any additional impacts arising from temporary structures or machinery are likely to be temporary and minor.

10.5.1.2 Operational Stage

All impacts described in this section will be permanent. Impacts described as “imperceptible” or “not significant” are considered to be neutral in character. Any reduction in sunlight access resulting in a “slight”, “moderate”, “significant”, “very significant” or “profound” impact would usually be considered to be negative in character, unless otherwise indicated. Any increase in sunlight access resulting in a “slight”, “moderate”, “significant”, “very significant” or “profound” impact would usually be considered to be positive in character, unless otherwise indicated.

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

Shadows cast by the proposed development have the potential to extend to a minor extent into lands associated with St James Church and the Parsonage to the northwest of the application site during the mornings and early afternoons throughout the year. There is also a potential that shadows cast by the proposed development will extend across the Dublin Road (e.g. to Beauchamp Lodge) for a short time during the very early mornings of the spring, summer and autumn months. The extent of additional overshadowing arising as a result of the construction of the proposed development is likely to be minor and has the potential to result in an “imperceptible” to “slight” impact on sunlight access on lands to the west and northwest of the application site. ARC’s analysis indicates that the construction of the proposed development is not likely to interfere with the potential of relevant windows within the existing buildings on the Dublin Road and their associated rear gardens 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.

To the north and east, the potential impact of the proposed development on lands at Shanganagh Cemetery and Woodbrook Golf Course is likely to be minimal. While shadows from the proposed development have the potential to extend into Woodbrook Golf Course during the late afternoons and evenings throughout the year, the golf course will likely continue to receive a level of sunlight very considerably in excess of the level recommended by the BRE Guide after the construction of the proposed development.

Similarly, notwithstanding additional overshadowing during the winter months (e.g. November, December and January), ARC's analysis indicates that the construction of the proposed development is not likely to interfere with the potential of Shanganagh Cemetery to receive a level of sunlight in excess of the level recommended by the BRE Guide to achieve an appearance of adequate sunlighting over the course of the year. Given this, ARC's analysis indicates that the proposed development has the potential to have an "imperceptible" to "slight" impact on lands to the north and east of the site.

ARC's analysis indicates that shadows cast by the proposed development do not have the potential to result in material impacts on sunlight access on lands to the south (e.g. lands associated with Woodbrook House and Corke Lodge, protected structures, and Woodbrook College).

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

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. windows) in buildings in proximity to the application site (please see Figure 10.1 below). Within that representative sample of buildings, a worst case scenario was studied whereby windows at the lowest levels of accommodation were analysed.



Figure 10.1: Indicative diagram showing the location of sample rooms, windows and gardens assessed as part of this analysis.

The British Standard and the BRE Guide recommend that, where a window with a reasonable expectation of sunlight is capable of receiving 25% of annual probable sunlight hours (including 5% of annual probable sunlight hours during the winter months), that window will be adequately sunlit throughout the year. The BRE Guide indicates that “*sunlighting of the existing dwelling may be adversely affected*” if, after the construction of a proposed development a window with a reasonable expectation of sunlight (i.e. facing within 90 degrees of due south) the following three criteria are met: (i) the centre of the window receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between 21st September and 21st March; and (ii) receives less than 0.8 times its former sunlight hours during either period; and (iii) has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.

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. as is the case for all sample windows except the window at Zone 08) and does not set out a recommended level of sunlight access for such windows. However, this detailed quantitative analysis includes analysis of these windows in the interests of completeness. For the purposes of this analysis, all studied sample windows have been assessed as if these windows have a reasonable expectation of sunlight and the recommendations of the BRE Guide at Section 3.2.1 have been applied. 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 10.1 below.

Zone	Existing			Proposed		
	Probable Sunlight Hours Received			Probable Sunlight Hours Received		
	Annual	Summer*	Winter*	Annual	Summer*	Winter*
Zone 01 – Floor 00	17%	17%	0%	17%	17%	0%
Zone 02 – Floor 00	5%	5%	0%	5%	5%	0%
Zone 03 – Floor 00	14%	14%	0%	14%	14%	0%
Zone 04 – Floor 00	14%	14%	0%	14%	14%	0%
Zone 05 – Floor 00	13%	13%	0%	13%	13%	0%
Zone 06 – Floor 00	42%	31%	11%	42%	31%	11%
Zone 07 – Floor 00	36%	29%	7%	30%	24%	6%
Zone 08 – Floor 00	47%	34%	13%	40%	33%	7%
Zone 09 – Floor 00	41%	31%	10%	36%	30%	6%
Zone 10 – Floor 00	39%	29%	10%	38%	29%	8%
Zone 11 – Floor 00	42%	31%	11%	42%	31%	11%
Zone 12 – Floor 01	42%	31%	11%	41%	31%	10%

* 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.

Table 10.1: Potential impact of the proposed development on sunlight access to sample windows in proximity to the application site.

As set out in Table 10.1 above, the potential impact of shadows cast by the proposed development on the studied windows is likely to range from none to “imperceptible” to “not significant”. ARC’s analysis indicates that the construction of the proposed development does not have the potential to result in any measurable change in sunlight access to the sample windows in buildings to the south of the application site (e.g. buildings at Woodbrook Golf Club, Woodbrook House, Corke Lodge and Beauchamp Lodge).

ARC's analysis of sample windows in buildings to the west and northwest of the application site indicates that the potential impact of shadows cast by the proposed development 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 are not likely to be met in the case of the relevant sample windows studied as part of this analysis). All sample windows have the potential 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.

Detailed analysis of the potential impact of shadows cast by the proposed development on gardens / 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, and the area which can receive two hours of sun on 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable." [Emphasis added.] This suggests that where a garden or amenity area can receive two hours of sun over half its area on 21st March notwithstanding the construction of a proposed development, loss of sunlight as a result of additional overshadowing is not likely to be noticed.

Table 10.2 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.

Zone	Time	Existing 21 st March Percentage Area in Sunlight	Proposed 21 st March Percentage Area in Sunlight
The Parsonage Rear Garden	09:00	96%	71%
	10:00	97%	77%
	11:00	99%	82%
	12:00	100%	89%
	13:00	98%	86%
	14:00	94%	86%
	15:00	91%	90%
	16:00	87%	87%
	17:00	81%	81%
Saint James's Lodge Rear Garden	09:00	100%	100%
	10:00	100%	100%
	11:00	100%	100%
	12:00	100%	100%
	13:00	100%	100%
	14:00	99%	99%
	15:00	94%	94%
	16:00	84%	84%
	17:00	66%	66%

Table 10.2: Potential impact of the proposed development on sunlight access to sample neighbouring gardens.

As set out in Table 10.2, ARC's analysis indicates that the proposed development has little or no potential to result in additional overshadowing of the rear gardens of the adjoining houses at The Parsonage and Saint James's Lodge on 21st March. Given that the neighbouring gardens have the potential to 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 does not have the potential to result in any undue adverse impacts on sunlight access to neighbouring gardens throughout the year within the meaning of the BRE Guide. Given this, the potential impact of shadows cast by the proposed development on neighbouring residential gardens is considered to range from none to "slight".

10.5.1.3 Do-Nothing Impact

In a "do nothing" scenario, the existing shadow environment will remain unchanged.

10.5.2 Cumulative – Woodbrook

The subject application comprises the first phase of a two phase development of the Woodbrook lands. As part of this assessment, ARC has assessed the cumulative impact of the development now proposed under the first phase and the emerging design for the second phase of development on sunlight access to lands outside the Woodbrook lands.

10.5.2.1 Construction Stage

The potential cumulative impact of the construction phase of both phases of development on the Woodbrook lands on sunlight access is likely to be, initially, lesser than the impact of the completed development. As the proposed development nears completion, the potential impact of the emerging combined development (i.e. both phases) is likely to be similar in all material respects to that of the completed development. It is noted that temporary structures and machinery (e.g. hoarding, scaffolding, cranes, etc.) also have the potential to cast shadows, although any additional impacts arising from temporary structures or machinery are likely to be temporary and minor.

10.5.2.2 Operational Stage

All impacts described in this section will be permanent. Impacts described as "imperceptible" or "not significant" are considered to be neutral in character. Any reduction in sunlight access resulting in a "slight", "moderate", "significant", "very significant" or "profound" impact would usually be considered to be negative in character, unless otherwise indicated. Any increase in sunlight access resulting in a "slight", "moderate", "significant", "very significant" or "profound" impact would usually be considered to be positive in character, unless otherwise indicated.

Overview of the potential cumulative impact of shadows cast by the both phases of development on the Woodbrook lands on lands outside the application site.

Shadows cast by the both phases of proposed development on the Woodbrook lands have the potential to extend to a minor extent into lands associated with St James Church and The Parsonage to the northwest of the application site during the mornings and early afternoons throughout the year. There is also a potential that shadows cast by both phases of development of the Woodbrook lands will extend across the Dublin Road (e.g. to Beauchamp Lodge) for a short time during the very early mornings of the spring, summer and autumn months). The extent of additional overshadowing arising as a result of the construction of both phases of proposed development on the Woodbrook lands is likely to be minor and has the potential to result in an "imperceptible" to "slight" impact on sunlight access on lands to the west and northwest of the application site.

ARC's analysis indicates that the construction of the both phases of the Woodbrook development is not likely to interfere with the potential of relevant windows within the existing buildings on the Dublin Road and their associated rear gardens 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.

To the north and east, the potential impact of both phases of proposed development on the Woodbrook lands on lands at Shanganagh Cemetery and Woodbrook Golf Course is likely to be minimal. While shadows from both phases of development of the Woodbrook lands have the potential to extend into Woodbrook Golf Course during the late afternoons and evenings throughout the year, the golf course will likely continue to receive a level of sunlight very considerably in excess of the level recommended by the BRE Guide after the completion of the development envisaged for the Woodbrook lands. Similarly, notwithstanding additional overshadowing during the winter months (e.g. November, December and January), ARC's analysis indicates that the construction of both phases of proposed development on the Woodbrook lands is not likely to interfere with the potential of Shanganagh Cemetery to receive a level of sunlight in excess of the level recommended by the BRE Guide to achieve an appearance of adequate sunlighting over the course of the year. Given this, ARC's analysis indicates that both phases of proposed development on the Woodbrook lands, when considered in combination, have the potential to have an "imperceptible" to "slight" impact on lands to the north and east of the site.

ARC's analysis indicates that shadows cast by both phases of proposed development on the Woodbrook lands do not have the potential to result in material impacts on sunlight access on lands to the south (e.g. lands associated with Woodbrook House and Corke Lodge, protected structures, and Woodbrook College).

Detailed analysis of the potential cumulative impact of shadows cast by both phases of development on the Woodbrook lands on existing buildings outside the application site

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 cumulative impact of shadows cast by both phases of development on the Woodbrook lands on lands 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 both phases of development on the Woodbrook lands 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 Figure 1 above). That representative sample of buildings includes, where relevant, a worst case scenario, whereby windows at the lowest levels of accommodation were analysed.

The British Standard and the BRE Guide recommend that, where a window with a reasonable expectation of sunlight is capable of receiving 25% of annual probable sunlight hours (including 5% of annual probable sunlight hours during the winter months), that window will be adequately sunlit throughout the year. The BRE Guide indicates that "*sunlighting of the existing dwelling may be adversely affected*" if, after the construction of a proposed development a window with a reasonable expectation of sunlight (i.e. facing within 90 degrees of due south) the following three criteria are met: (i) the centre of the window receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between 21st September and 21st March; and (ii) receives less than 0.8 times its former sunlight hours during either period; and (iii) has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.

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. as is the case for all sample windows except the window at Zone 08) and does not set out a recommended level of sunlight access for such windows. However, this detailed quantitative analysis includes analysis of these windows in the interests of completeness.

For the purposes of this analysis, all studied sample windows have been assessed as if these windows have a reasonable expectation of sunlight and the recommendations of the BRE Guide at Section 3.2.1 have been applied. 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 10.3 below.

Zone	Existing			Proposed - Cumulative		
	Probable Sunlight Hours Received			Probable Sunlight Hours Received		
	Annual	Summer*	Winter*	Annual	Summer*	Winter*
Zone 01 – Floor 00	17%	17%	0%	17%	17%	0%
Zone 02 – Floor 00	5%	5%	0%	5%	5%	0%
Zone 03 – Floor 00	14%	14%	0%	14%	14%	0%
Zone 04 – Floor 00	14%	14%	0%	14%	14%	0%
Zone 05 – Floor 00	13%	13%	0%	13%	13%	0%
Zone 06 – Floor 00	42%	31%	11%	42%	31%	11%
Zone 07 – Floor 00	36%	29%	7%	30%	24%	6%
Zone 08 – Floor 00	47%	34%	13%	40%	33%	7%
Zone 09 – Floor 00	41%	31%	10%	36%	30%	6%
Zone 10 – Floor 00	39%	29%	10%	38%	29%	8%
Zone 11 – Floor 00	42%	31%	11%	40%	31%	9%
Zone 12 – Floor 01	42%	31%	11%	41%	31%	10%

* 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.

Table 10.3: Potential cumulative impact of both phases of development on the Woodbrook lands on sunlight access to sample windows in proximity to the application site.

As set out in Table 10.3 above, the potential cumulative impact of shadows cast by both phases of development on the Woodbrook lands on the studied windows will range from none to “imperceptible” to “not significant”. The construction of the now proposed and envisaged developments for the Woodbrook lands do not have the potential to result in any measurable change in sunlight access to the sample windows in buildings to the south of the application site (e.g. buildings at Woodbrook Golf Club, Woodbrook House, Corke Lodge and Beauchamp Lodge) when considered in combination.

ARC's analysis of sample windows in buildings to the west and northwest of the application site indicates that the potential impact of shadows cast by both phases of development on the Woodbrook lands is not likely 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 are not likely to be met in the case of the relevant sample windows studied as part of this analysis). All relevant sample windows will have the potential to receive 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 both phases of development on the Woodbrook lands.

Detailed analysis of the potential cumulative impact of shadows cast by both phases of development on the Woodbrook lands on gardens / 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, and the area which can receive two hours of sun on 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable.” [Emphasis added.] This suggests that where a garden or amenity area can receive two hours of sun over half its area on 21st March notwithstanding the construction of a proposed development, loss of sunlight as a result of additional overshadowing is not likely to be noticed.

Table 10.4 sets out the likely proportion of these gardens in sunlight before and after the construction of both phases of development on the Woodbrook lands throughout the day on 21st March.

Zone	Time	Existing 21 st March Percentage Area in Sunlight	Proposed 21 st March Percentage Area in Sunlight
The Parsonage Rear Garden	09:00	96%	71%
	10:00	97%	77%
	11:00	99%	82%
	12:00	100%	89%
	13:00	98%	86%
	14:00	94%	86%
	15:00	91%	90%
	16:00	87%	87%
	17:00	81%	81%
Saint James’s Lodge Rear Garden	09:00	100%	100%
	10:00	100%	100%
	11:00	100%	100%
	12:00	100%	100%
	13:00	100%	100%
	14:00	99%	99%
	15:00	94%	94%
	16:00	84%	84%
	17:00	66%	66%

Table 10.4: Potential cumulative impact of both phases of development on the Woodbrook lands on sunlight access to sample neighbouring gardens.

As set out in Table 10.4, ARC’s analysis indicates that the combined effects of both phases of proposed development on the Woodbrook lands have little or no potential to result in additional overshadowing of the rear gardens of the adjoining houses at The Parsonage and Saint James’s Lodge on 21st March. Given that the neighbouring gardens have the potential to remain capable of achieving a level of sunlight very considerably in excess of that recommended by the BRE Guide after the construction of all envisaged development on the Woodbrook lands, ARC’s analysis indicates that both phases of proposed development on the Woodbrook lands do not have the potential to result in any undue adverse impacts on sunlight access to neighbouring gardens throughout the year within the meaning of the BRE Guide. Given this, the potential impact of shadows cast by both phases of proposed development on the Woodbrook lands on neighbouring residential gardens is considered to range from none to “slight”.

10.5.2.3 Do-Nothing Impact

In a “do nothing” scenario, the existing shadow environment will remain unchanged.

10.6 Ameliorative, Remedial or Reductive Measures

The subject application proposes the development of a greenfield site identified for major new development under statutory planning policy (i.e. the *Woodbrook – Shanganagh Local Area Plan 2017-2023*). In these circumstances, during the construction or operational phases scope for mitigation measures, which would preserve a sustainable level of density, is limited. As noted in the BRE Guide, *“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.”*

10.7 Residual Impact of the Proposed Development

10.7.1 Proposed Development

10.7.1.1 Construction Stage

As no ameliorative, remedial or reductive measures are now proposed, the residual impact of the proposed development on sunlight access is predicted to be as described under Section 10.5.1.1 above.

10.7.1.2 Operational Stage

As no ameliorative, remedial or reductive measures are now proposed, the residual impact of the proposed development on sunlight access is predicted to be as described under Section 10.5.1.2 above.

10.7.1.3 Worst Case Impact

Under a worst case scenario, the proposed development is predicted to result in an “imperceptible” to “slight” impact on sunlight access to lands outside the application site.

10.7.2 Cumulative – Woodbrook

10.7.2.1 Construction Stage

As no ameliorative, remedial or reductive measures are now proposed, the residual cumulative impact of both phases of development on the Woodbrook lands on sunlight access is predicted to be as described under Section 10.5.2.1 above.

10.7.2.2 Operational Stage

As no ameliorative, remedial or reductive measures are now proposed, the residual cumulative impact of both phases of development on the Woodbrook lands on sunlight access is predicted to be as described under Section 10.5.2.2 above.

10.7.2.3 Worst Case Impact

Under a worst case scenario, the cumulative impact of both phases of development on the Woodbrook lands on sunlight access to lands outside the application site is predicted to range from “imperceptible” to “slight”.

10.8 Monitoring

Monitoring of avoidance, remedial and mitigation measures is not relevant to the assessment of impacts on sunlight access in the case of the subject application.

10.9 Reinstatement

Reinstatement is not relevant to the assessment of impacts on sunlight access in the case of the subject application. It is intended that the proposed development will be permanent.

10.10 Difficulties Encountered

It was neither possible nor practical for the Design Team to gain unfettered access to every parcel of private property within the study area surrounding the application site in order to carry out measured building survey. Therefore, while ARC has confidence that the three dimensional model used in the assessment of the impact of the proposal on sunlight access achieves a high degree of accuracy, it should be noted that some level of assumption was necessary in completing the model.