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BRE Client Report

Daylight and sunlight assessment for proposed development at GA2 Baldoyle

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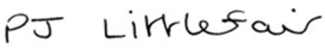
Signature 

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Introduction

It is proposed to develop the GA2 site at Baldoyle. The development includes construction of 1,007 residential apartments. The site is bounded to the south by dwellings on Red Arches Drive. The recently consented GA1 and GA3 developments are to the west. To the north and east of the site is open space.

This report assesses the impact on daylight and sunlight to surrounding areas and provision to rooms at the development itself. The results are compared to the guidelines in the BRE Report “Site layout planning for daylight and sunlight: a guide to good practice” and the standard EN17037:2018 “Daylight in buildings”. The older standard BS8206 Part 2 “Code of practice for daylighting” is also considered.

The calculations in this report are based on 3D models and floor plans of the site and each sector provided by CCH Architects. These included 3D models of each sector with associated floor plans and elevations dated 22/10/21 with minor revisions dated 03/11/2022. These are used in conjunction with site model and site plan and available details of surrounding buildings at Red Arches Park and Red Arches Drive and consented proposals at GA1 and GA3, where available from the respective planning application websites. No site visit was necessary.

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Methodology

Loss of daylight to existing dwellings

Guidance on the loss of light to existing buildings following construction of new development nearby is given in the BRE Report 'Site layout planning for daylight and sunlight: a guide to good practice'. This report is widely used by local authorities to help assess planning applications. This assessment has been carried out with reference to the second edition of the report, which was published in October 2011.

The advice in the BRE Report is widely used throughout Ireland and the United Kingdom to help assess planning applications. The Fingal Development Plan 2017-2023 Development Management Standards recommends the use of the BRE Report.

The guidance in the BRE Report is advisory in nature and is intended to assist with good design. There is no formal requirement to comply with the advice it contains.

The guidelines in the BRE Report usually apply to habitable rooms including living rooms, kitchens and bedrooms.

In the BRE Report loss of daylight (light from the sky, calculated on an overcast day) and sunlight (direct light from the sun) are assessed separately.

Loss of daylight – vertical sky component

The BRE Report recommends the calculation of the vertical sky component to assess loss of daylight. This is the ratio of the direct sky illuminance falling on the outside of a window, to the simultaneous horizontal illuminance under an unobstructed sky. The standard CIE Overcast Sky is used and the ratio is usually expressed as a percentage. The maximum value is almost 40% for a completely unobstructed vertical wall. The vertical sky component on a window is a good measure of the amount of daylight entering it.

A BRE computer program was used to calculate the vertical sky component, which has the same basis as the skylight indicators in the BRE Report.

The BRE Report sets out the following two guidelines for vertical sky component:

a) Where the vertical sky component at the centre of the existing window exceeds 27% with the new development in place, then enough sky light should still be reaching the existing window.

b) Where the vertical sky component with the new development is both less than 27% **and** less than 0.8 times its former value, then the area lit by the window is likely to appear more gloomy, and electric lighting will be needed for more of the time.

Loss of daylight - daylight distribution

The BRE report also gives guidance on the distribution of light in the existing buildings, based on the areas of the working plane (0.85m above floor level) which can and cannot receive direct skylight before and after.

These calculations require knowledge of room geometry. Since access was not available to collect the data for existing buildings, this calculation could not be carried out.

Loss of sunlight - existing dwellings

The BRE Report recommends that loss of sunlight should be checked for main living rooms of dwellings, and conservatories, if they have a window facing within 90° of due south.

If the centre of the window can receive more than one quarter of annual probable sunlight hours, including at least 5% of annual probable sunlight hours in the winter months between 21 September and 21 March, then the room should still receive enough sunlight. If the window already receives less than this, a reduction to less than 0.8 times its current value and a reduction of more than 4% of annual probable sunlight hours over the year may lead to the room it serves appearing colder and less cheerful and pleasant.

Existing buildings on Red Arches Drive and the GA1 development would be to the south of the development site and therefore loss of sunlight would not be an issue.

The nearest relevant windows at GA3 have been assessed for sunlight provision.

Loss of sunlight - existing gardens and open spaces

For outdoor amenity areas, the 2011 edition of the BRE Report 'Site layout planning for daylight and sunlight: a guide to good practice' recommends that at least half of the space should receive at least two hours of sunlight on 21st March.

There are large areas of open space to the north and east of the site. Only spaces close to proposed buildings may lose some sun. There are no existing garden areas with the potential to be impacted.

Impact Assessment

Appendix I of the BRE Report gives advice when assessing a loss of daylight and sunlight for an Environmental Impact Assessment.

Where the loss of skylight or sunlight fully meets the guidelines, the impact is assessed as negligible or minor adverse. Where the loss of light is well within the guidelines, or only a small number of windows or limited area of open space lose light (within the guidelines), a classification of negligible impact is more appropriate. Where the loss of light is only just within the guidelines, and a large number of windows or open space area are affected, a minor adverse impact would be more appropriate, especially if there is a particularly strong requirement for daylight in the affected building or open space.

Where the loss of skylight or sunlight does not meet the guidelines in the BRE Report, the impact is assessed as minor, moderate or major adverse. Factors tending towards a minor adverse impact would be:

- only a small number of windows or limited area of open space are affected
- the loss of light is only marginally outside the guidelines
- an affected room has other sources of skylight or sunlight
- the affected building or open space only has a low level requirement for skylight or sunlight.

Factors tending towards a major adverse impact include:

- a large number of windows or large area of open space are affected
- the loss of light is substantially outside the guidelines
- all the windows in a particular property are affected

- the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight.

Shadow Plotting

The BRE Report states that where a large building or development is proposed which may affect a number of open spaces it is often illustrative to plot a shadow plan showing the location of shadows at different times of day and year.

Shadow plots have been created for 21st March (spring equinox), 21st June (summer solstice) and 21st December (winter solstice) at clock times 8am, 10am, 12pm, 2pm and 4pm (plus 6pm for June only). They are shown in Appendix B.

In an An Bord Pleanála pre-application consultation opinion it was requested that "A month-by-month assessment of average daylight (sic) [sunlight] hours within the public open space should be provided within the daylight and sunlight analysis document to allow for a full understanding of the year round level of overshadowing of the primary outdoor recreation areas for the development should be submitted."

In order to satisfy this, plots are also shown for January, February, April and May. This gives a month-by-month assessment of sunlight provision at and around the site to allow for a full understanding of the year round level of overshadowing.

The shadows for 21st September (autumn equinox) are the same as those for 21st March (spring equinox). The shadows for 21st January, 21st February, 21st April and 21st May are the same as those at or around the 21st of November, October, August and July respectively.

In the plots, the times given are clock times. Between the end of March and the end of October, Irish Standard Time (IST) applies. The plots for September and October therefore correspond to the shadows produced one hour later in summer time; thus at 1pm IST in September/October, the shadows are as plotted on the 12pm GMT diagram for March/February. The March and February plots therefore correspond to 9am, 11am, 1pm, 3pm and 5pm IST in September and October.

The only numerical guidelines for overshadowing of open spaces are those described in the BRE Report for two hours of sunlight on 21st March. The shadow plots are therefore shown for illustrative purposes.

Daylight and sunlight provision to proposed habitable rooms

Guidance on daylight and sunlight to new dwellings, including numerical target values, is given in EN17037:2018 "Daylight in buildings". In the UK, this standard supersedes BS8206 Part 2:2008 Lighting for Buildings, Code of Practice for Daylighting. The Fingal Development Plan 2017-2023 recommends the use of BS8206 or any update on the document.

The Department of Housing, Local Government and Heritage document Sustainable Urban Housing: Design Standards for New Apartments December 2020 states "Where an applicant cannot fully meet all of the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, which planning authorities should apply their discretion in accepting taking account of its assessment of specific. This may arise due to a design constraint associated with the site or location and the balancing of that assessment against the desirability of achieving wider planning objectives. Such objectives might include securing comprehensive urban regeneration and or an effective urban design and streetscape solution."

Daylight provision

EN17037 recommends minimum, medium and high target illuminances over at least 50% of a reference plane (0.85m from the floor) in a room, with further targets for 95% of the reference plane. Equivalent values of daylight factor for locations in Europe are also given. The daylight factor is the ratio of the illuminance at a point in on the working plane in a room divided by the illuminance of an unobstructed

surface outside. It is measured using the CIE standard overcast sky and takes into account factors such as surface reflectances and glazing transmittance.

The assessment has been undertaken using the daylight factor methodology. Table 1 gives the minimum, medium and high target illuminances and equivalent daylight factor values for Dublin to achieve over 50% of the reference plane (median values) and 95% of the reference plane.

Table 1: Daylighting targets in EN17037.

Level of recommendation	To achieve for at least 50% of a reference plane, for at least half of the daylight hours.		To achieve for at least 95% of a reference plane, for at least half of the daylight hours.	
	Target Illuminance (lx)	Equivalent Daylight Factor in Dublin (%)	Target Illuminance (lx)	Equivalent Daylight Factor in Dublin (%)
Minimum	300	2.0%	100	0.7%
Medium	500	3.4%	300	2.0%
High	750	5.0%	500	3.4%

The standard does not give recommendations for individual room types. Daylight would be required in habitable spaces such as living rooms, kitchens and bedrooms. Daylight provision to a living area would usually be considered more important than daylight to a bedroom.

In general, the recommendations are much more ambitious than those in BS8206 Part 2, which the standard supersedes, and were intended for internal areas of all types, not just a domestic setting. The target values would be very difficult to achieve for domestic rooms in an urban environment.

A UK National Annex recognises this and sets alternative targets for living rooms, kitchens and bedrooms. This is based on the equivalent daylight factor needed to achieve a certain illuminance on at least 50% of the reference plane. It is the opinion of the UK committee that the recommendation of a target illuminance level across 95% of the working plane need not be applied in dwellings.

The median illuminances recommended in the UK National Annex to be achieved over half the reference plane are 100 lux in bedrooms, 150 lux in living rooms and 200 lux in kitchens. For Dublin these would correspond to recommended equivalent median daylight factors, over at least 50% of the calculation plane, of 0.7% for a bedroom, 1.0% for a living room and 1.3% for a kitchen. For a room of combined use, the higher value should apply. However, for combined living/dining/kitchen rooms, local authorities may in practice accept the living room value in order to avoid small closed-off kitchen areas to force compliance with the standard.

The results are compared to UK National Annex equivalent targets as these recommendations have replaced those in BS8206 for the UK.

For this assessment the daylight factor was calculated at a series of points spaced at up to 0.3m apart on a reference plane (0.85m from the floor) in example worst-case rooms in each sector using software based on a Radiance ray tracing engine. The reference plane excluded main areas within 0.3m of a room's wall.

Results have also been assessed with reference to the older average daylight factor methodology in BS8206 Part 2. This standard recommended an average daylight factor of 1.0% in bedrooms, 1.5% in living rooms and 2.0% in kitchens. The daylight factor at a series of points in the room has been calculated in a same way as described above, but the entire room is used for the reference plane (areas 0.3m from the walls are not excluded).

The below table summarises the daylight recommendations used in the assessment.

Table 2: Daylight recommendations used for assessment of proposed rooms.

Room	EN17037 UK National Annex equivalent for Dublin. Median daylight factor value	BS8206-2:2008 recommendation. Average Daylight Factor value
Bedroom	0.7%	1.0%
Living Room	1.0%	1.5%
Kitchen	1.3%	2.0%

It would be impractical to analyse all rooms throughout a scheme of this size. In these cases it is usual to analyse a selection of rooms to assess the daylighting potential.

The assessment has been undertaken by analysing a selection of representative rooms on the lowest floor of each sector, including worst-case areas. Where rooms are below the recommendations on the lowest floors, equivalent rooms on higher floors have been analysed until the recommendations are met or the top floor reached. Combined living/dining/kitchen areas have been compared against the living room and kitchen recommendations.

The results have then been used to estimate an extrapolation of the results at other rooms in similar areas or that are similarly, or less, obstructed. For example, if the most obstructed bedrooms in a sector meet the recommendations it would be reasonable to assume that all bedrooms in that sector meet the recommendations. Or if a living/dining/kitchen area meets the recommendations then similar, less deep, or less obstructed rooms on the façade or in the sector would also be assumed to meet the recommendations.

The overall percentage of rooms that appear capable of meeting the recommendations has been estimated based on the above assumptions. These overall estimates carry uncertainty and should be seen as an indication of the overall results, rather than a definitive value.

The following values were used in the daylight factor calculations for internal and external surfaces. All clear glazing, window panels and curtain glazing have been assumed to be standard transparent double glazing.

Table 3: Factors used in daylight factor calculations.

Object / surface	Values used in calculations
Internal walls	Reflectance: 0.7
Internal floors	Reflectance: 0.2
Internal ceilings	Reflectance: 0.9
External walls, surrounding buildings and doors	Reflectance: 0.3
Ground	Reflectance: 0.2
Clear glazing (windows and balcony surrounds)	Transmittance based on a value of 0.68 from Pilkington data for low emissivity double glazing.
Maintenance factors (accounting for dirt on glazing)	Additional maintenance factors based on data in the UK National Annex of EN17037 (based on suburban setting): 0.96 vertical glazing
Window frames	Reflectance: 0.5

Sunlight to proposed dwellings

EN17037 gives minimum, medium and high recommended levels for sunlight exposure. This is measured via the duration received to a point on the inside of a window on a selected date (21st March). This assessment assumes a cloudless sky and therefore represents a maximum possible amount of sunlight. The assessment is undertaken using the calculation of sun position based on the geometrical equations in the standard.

Table 4 gives the recommended values of sunlight exposure. The standard states that at least one habitable room in a dwelling should receive at least the recommended exposure to sunlight.

Table 4: Sunlighting targets in EN17037.

Level of recommended exposure	Sunlight exposure
Minimum	1.5 Hours
Medium	3 Hours
High	4 Hours

The calculation point is 1.2m above the floor level (or 0.3m above sill level) at the middle of the aperture on the position of the inner wall. Frames are not included in the calculations. This point has been used assuming that sunlight would be able to penetrate any glazing or panelling in the aperture.

Using example calculation points, a diagram showing the areas able to receive the recommendations are shown for the worst-case ground floor. In areas where sunlight provision could increase, example points are also calculated on higher floors and a summary of the number of units in each sector with at least one room able to meet at least the minimum recommendation are shown for each sector.

Sunlight to proposed open spaces

The BRE Report 'Site layout planning for daylight and sunlight: a guide to good practice' recommends that at least half of a proposed space should receive at least two hours of sunlight on 21st March.

The courtyard areas at each proposed sector have been assessed using this methodology.

In an An Bord Pleanála pre-application consultation opinion it was requested that “A month-by-month assessment of average daylight (sic) [sunlight] hours within the public open space should be provided within the daylight and sunlight analysis document to allow for a full understanding of the year round level of overshadowing of the primary outdoor recreation areas for the development should be submitted.”

In order to satisfy this, the areas able to receive at least two hours of sunlight on have also been calculated for other months. There are guidelines only for 21st March and therefore the additional analysis is for information purposes only.

The areas of the proposed courtyards able to receive at least two hours of sunlight on 21st December (winter solstice), 21st January, 21st February, 21st April, 21st May and 21st June (summer solstice) have been calculated. The results for 21st September (autumn equinox) are the same as those for 21st March (spring equinox). The shadows for 21st January, 21st February, 21st April and 21st May are the same as those at or around the 21st of November, October, August and July respectively.

Loss of daylight and sunlight to surrounding areas

The below figure shows the site and surroundings. Existing dwellings and potential proposed and consented areas have been analysed. There are existing dwellings to the south east of the site on Red Arches Drive. Future development GA3 is located to the west. The nearest part of consented scheme GA1 is to the south of Sectors 6A/6B.

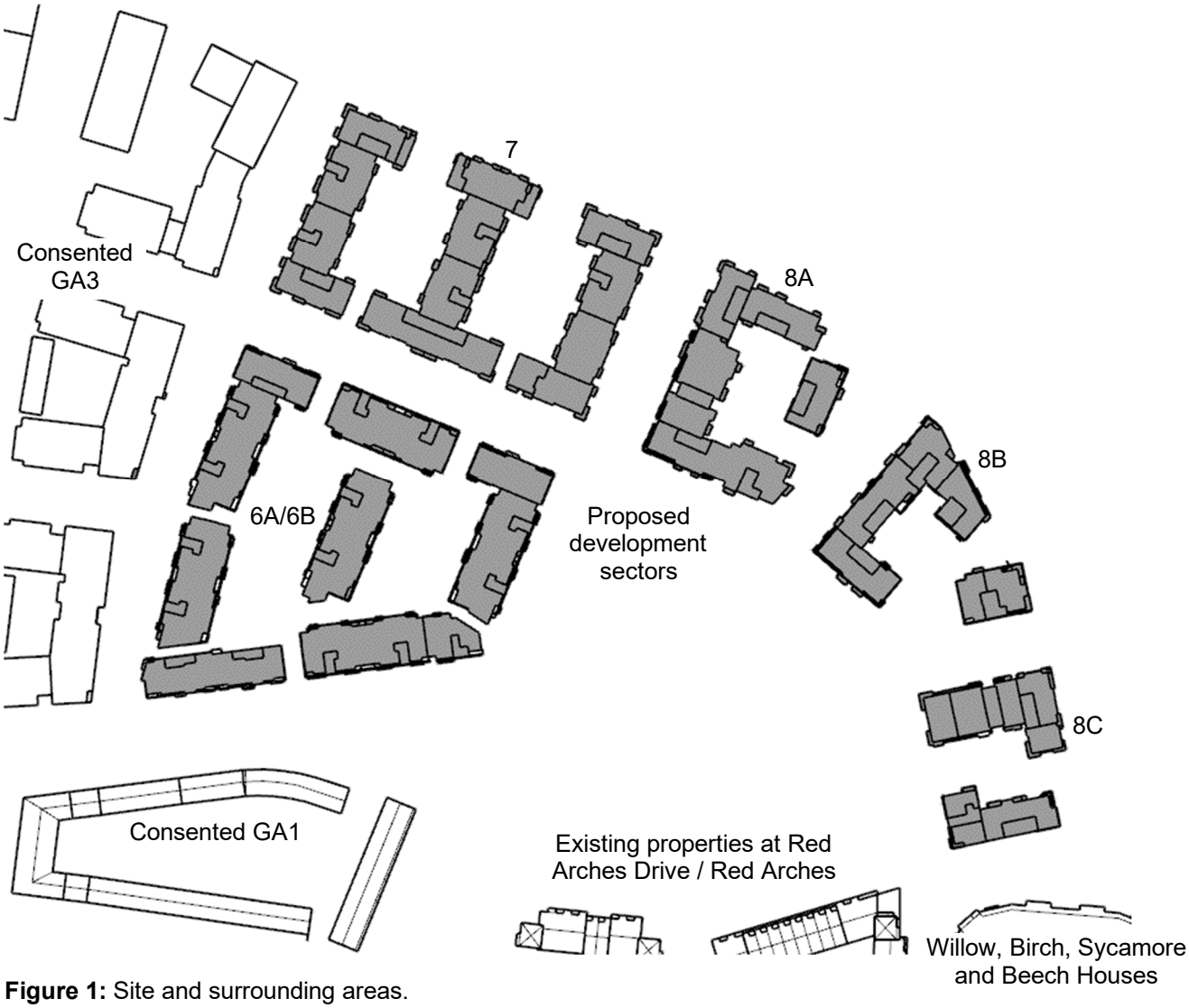


Figure 1: Site and surrounding areas.

To the south of Sector 8C are properties on the opposing side of Red Arches Drive. These are the closest existing dwellings to the site.

Based on available details and photography of the existing buildings, worst-case windows have been assessed for loss of daylight.

The full results are shown in Appendix A.

Willow, Birch, Sycamore and Beech Houses

Willow, Birch, Sycamore and Beech Houses are blocks of flats in the same building, directly to the south of Sector 8C. West and north facing windows have been analysed for loss of daylight. North east facing windows would have less view of the development site and therefore would be less impacted.

The windows analysed are shown in Figures A1 – A4 in Appendix A. The vertical sky component results before and after development are shown in Table A1 of Appendix A.

The results suggest that 46 windows would be below the BRE vertical sky component guidelines by having values less than 27% and less than 0.8 times those before. However, the design of the existing building has enclosed balconies and overhangs which restrict daylight provision. This can be seen in the existing low values of vertical sky component. Windows that are not part of enclosed balconies or do not have an overhang above them would meet the guidelines. The layout of the building façade, showing the enclosed balconies and overhangs is shown in Figure 2 and Figures A1 to A4 of Appendix A.

Figure 2: View of apartments on Red Arches Drive. The existing set back balconies limit skylight provision and could force a reliance on daylight from the area of Sector 8C.

The BRE Report “Site layout planning for daylight and sunlight: a guide to good practice” gives further advice in these situations and suggests that to assess the impact of existing balconies the calculations could be repeated without them in place.

Windows below the initial BRE guidelines have been recalculated without the balconies and overhangs in place. The results are shown in Table A2 of Appendix A.

Without the balcony overhangs, eight windows would be below the BRE vertical sky component guidelines. However, these windows would still be set back behind the main façade of the building as part of the enclosed area. The obstruction of projecting parts of the building still restricts daylight provision.

When these windows were also analysed on a flat façade, without set back enclosing or overhangs, (shown in Table A3 of Appendix A), all windows would meet the BRE guidelines.

There would be an impact to some existing windows, but these results show that the primary cause of this impact is due to the design of the existing buildings themselves. Windows set back into the building with balconies or overhangs above force a reliance on daylight from the area of the proposal site.

Planning permission exists for a scheme on this site that includes a 5-storey apartment building on Sector 8C (Reg. Ref. F11A/0290/E1 refers). The approved building height ranges from 18.9 metres to 22.1 metres compared with the proposed building height in the area closest to the surrounding properties of 17.2 metres.

Notwithstanding, the impact is assessed as minor adverse.

Loss of sunlight would not be an issue since the proposal site lies to the north.

Properties at Red Arches Drive / Red Arches Park

The closest windows to the proposal site at properties on the corner of Red Arches Drive / Red Arches Park have been analysed for loss of daylight. The windows analysed and vertical sky component results are shown in Figures A5-A6 and Table A4 of Appendix A.

All windows would meet the BRE vertical sky component guidelines since they would have values greater than 27% with the proposed development in place or more than 0.8 times those before. The impact is assessed as negligible.

Loss of sunlight would not be an issue since the proposal site lies to the north.

Future developments to west

GA1

The nearest part of the consented GA1 development is to the south of proposed Sectors 6A/6B. This area contains two storey houses. The worst-case ground floor windows facing Sectors 6A/6B have been analysed for daylight. Vertical sky components have been calculated with the development in place. The results are shown in Table A5 of Appendix A.

All windows would receive at least 27% vertical sky component with the proposed development in place.

The loss of daylight would be assessed as negligible.

Loss of sunlight would not be an issue since the windows face northerly.

GA3

The detailed scheme for GA3 has recently been consented. This is located to the west of the application site. East facing facades of Block F1, F2 and G5 would have a view of the proposed development Sectors 6A/6B and 7. A comparison between the empty site and the proposal is less appropriate here since the development has been designed knowing that a development would be on the site at GA2. The scheme architect issued our client's drawings to Shoreline Properties.

The vertical sky component at all east facing windows to habitable rooms on the ground and first floors have been calculated with the proposed development in place. The calculations have been carried out with any balconies in place, and repeated with them removed. The results are shown in Table A5 in Appendix A.

The BRE states that with a vertical sky component of at least 27% conventional window design will usually give reasonable results. Between 15% and 27% special measures such as changes to room layouts and larger windows may be needed for adequate daylight. Between 5% and 15% it is very difficult to adequate daylighting unless very large windows are used. With a vertical sky component of less than 5% it is often impossible to achieve reasonable daylight.

Of the windows at GA3 on the ground and first floors facing the proposal site, 3% would have values of vertical sky component greater than 27%, 60% would have values between 15% and 27%, 36% would have values between 5% and 15% and 1% would have values less than 5%. These results include balconies at GA3, which restrict daylight provision from higher angles and may force a reliance on an area directly opposite.

If these are theoretically removed, 33% of windows on the ground and first floor would have values of vertical sky component greater than 27%, with 66% of windows with values between 15% and 27%. This suggests that the balconies are responsible for some of the restriction in daylight.

The results suggest that special measures would be needed in the design of GA3. The recently consented development has recognised this, and large floor to ceiling windows are provided to rooms as part of the design.

The proposal for GA3 also contained a daylight and sunlight assessment. Of the worst-case rooms chosen facing GA2, the analysis suggested that daylight provision would be adequate. It is understood this analysis included an account for obstruction from GA2, but not in the exact form now proposed. However, the results and the above assessment does suggest that there is the potential for adequate daylight provision.

When compared to the existing empty site there would be a significant impact to daylight to the east facing façade of GA3. However, this would only be the case if future residents of GA3 experienced conditions with the empty GA2 site; the development has been designed knowing GA2 would be the site of future development. Special measures of larger windows are in place in the design of GA3 and any reduced values of vertical sky component may be at least partly due to existing balconies. The BRE Report suggest the guidelines should be interpreted flexibly. In special circumstances a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing buildings.

Since the east facades of Blocks F1, F2 and G5, looking towards the proposed development, face just south of due east, potential sunlight provision has been assessed. Windows on the ground and first floor have been assessed. The results have been calculated with and without balconies to GA3, and the results are shown in Table A5 of Appendix A.

With balconies to GA3 in place, 36% of windows on the ground and first floor would be able to receive at least 25% annual probable hours, including at least 5% in the winter months, meeting the BRE guidelines. When balconies are removed, 94% of the windows would be able to meet these targets. Adequate sunlight at GA3 is therefore achievable with the proposed development at GA2 in place; any restriction of sunlight appears predominately due to the provision of balconies at GA3, rather than the proposed development.

Daylight and sunlight provision to the proposed development

Daylight provision has been assessed to example rooms in each sector using the methodology in the UK National Annex of EN17037. A comparison to the older BS8206 is also included. Example rooms, including those in worst-case areas, have been analysed on the lowest floors. Where rooms would be below the recommendations, values have been calculated for equivalent rooms on higher floors until the recommendations are met or the top floor is reached.

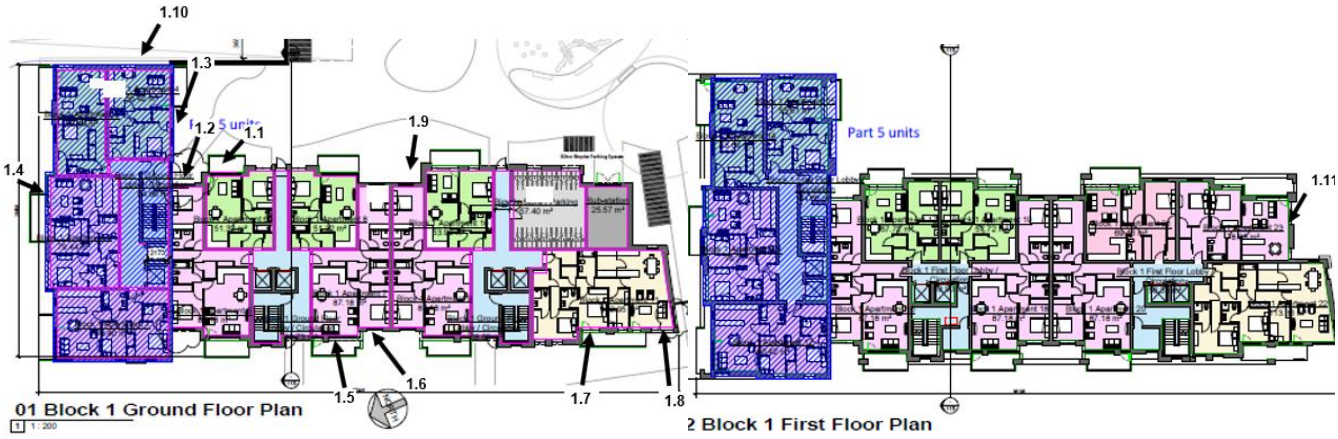
The results have been used to estimate the overall percentage of rooms that appear likely to be able to meet the recommendations. This gives an indication of the overall result across the scheme.

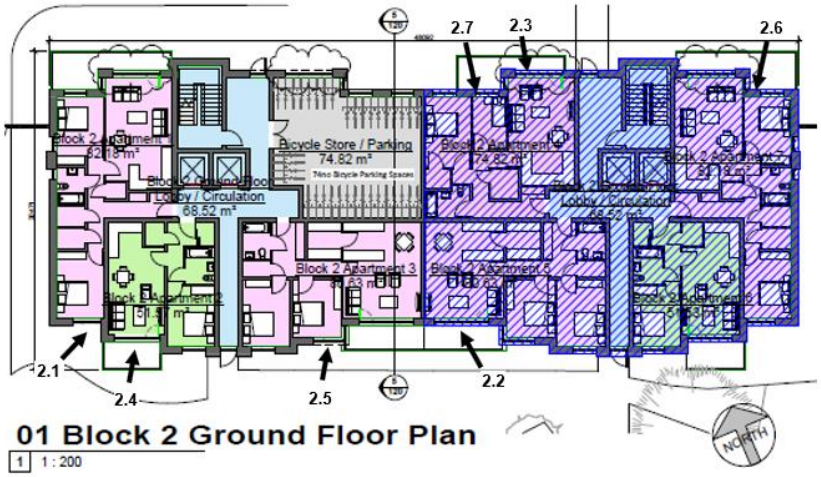
Ground floor windows have also been assessed for sunlight provision in each sector to get an indication of potential provision. Where there is the potential for sunlight to increase on upper floors, higher windows have also been assessed for a summary of the total number of units in each sector with at least one room able to receive at least the minimum 1.5 hours of sunlight recommended in EN17037. Windows facing northerly would be naturally limited for sunlight and therefore may be expected to be below the recommendations. Balconies have been included in the calculations. The calculations assume the whole window aperture is transparent with sunlight able to penetrate. A visual representation of the results is given for each sector.

Sectors 6A/6B

Daylight provision

The representative example rooms analysed for each block at Sectors 6A/6B are shown in Figure 3. The results of the daylight analysis for the lowest floors are given in Table 5.





01 Block 2 Ground Floor Plan

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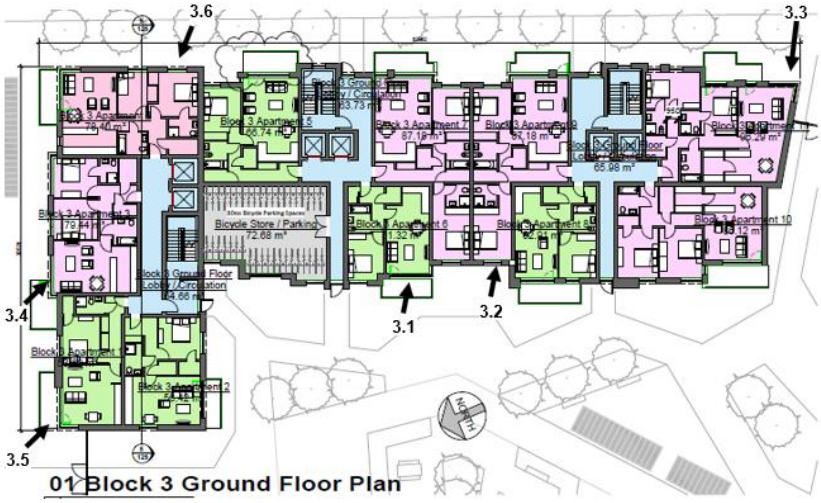
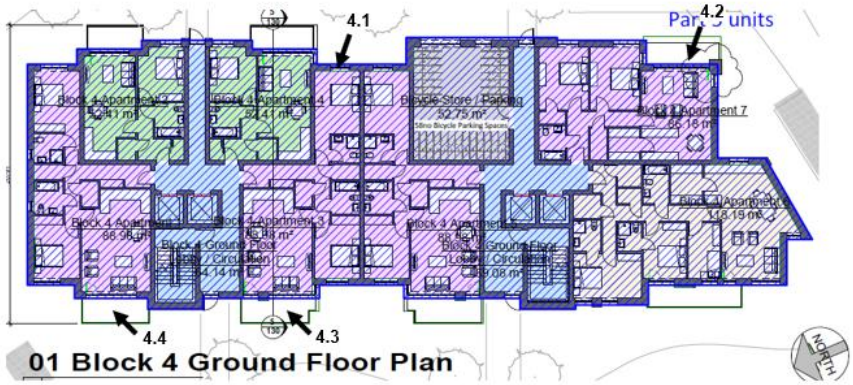


01 Block 3 Ground Floor Plan



01 Block 4 Ground Floor Plan

Figure 3: Layouts of Blocks 1 to 7 of Sectors 6A/6B with example rooms on lowest floors analysed labelled.

Table 5: Daylight factor results for example rooms on lowest floors at Sectors 6A/6B.

Floor	Block / Room	Median Daylight Factor (%)	Recommendation(s) achieved (EN17037 UK National Annex equivalent for Dublin)	Average Daylight Factor (%)	BS8206-2:2008 recommendation achieved
Ground	1.1 Liv/Din/Kit	0.7	-	0.9	-
	1.2 Bed	0.9	UK NA Bed	1.6	Bed
	1.3 Bed	1.9	UK NA Bed	2.5	Bed
	1.4 Liv/Din/Kit	0.9	[Marginal UK NA Liv]	1.4	[Marginal Liv]
	1.5 Liv/Din/Kit	0.7	-	0.9	-
	1.6 Bed	0.8	UK NA Bed	1.4	Bed
	1.7 Bed	0.6	[Marginal UK NA Bed]	0.8	-
	1.8 Liv/Din/Kit	1.1	UK NA Liv	2.1	Liv & Kit
	1.9 Bed	0.7	UK NA Bed	1.0	Bed
	1.10 Liv/Din/Kit	1.6	UK NA Liv & Kit	2.1	Liv & Kit
First	1.11 Liv/Din/Kit	1.2	UK NA Liv	1.7	Liv
Ground	2.1 Bed	2.5	UK NA Bed	3.3	Bed
	2.2 Liv/Din/Kit	0.3	-	0.4	-
	2.3 Liv/Din/Kit	0.8	-	1.2	-
	2.4 Liv/Din/Kit	0.9	[Marginal UK NA Liv]	1.1	
	2.5 Bed	0.8	UK NA Bed	1.0	Bed
	2.6 Bed	0.9	UK NA Bed	0.9	-
	2.7 Bed	0.5	-	0.7	-
Ground	3.1 Liv/Din/Kit	1.0	UK NA Liv	1.5	Liv
	3.2 Bed	1.1	UK NA Bed	1.7	Bed
	3.3 Liv/Din/Kit	1.5	UK NA Liv & Kit	2.5	Liv & Kit
	3.4 Liv/Din/Kit	0.8	-	1.4	[Marginal Liv]
	3.5 Liv/Din/Kit	1.2	UK NA Liv	1.7	Liv
	3.6 Bed	1.5	UK NA Bed	1.8	UK NA Bed
Ground	4.1 Bed	1.2	UK NA Bed	1.5	Bed
	4.2 Liv/Din/Kit	0.6	-	0.8	-
	4.3 Liv/Din/Kit	0.9	[Marginal UK NA Liv]	1.4	[Marginal Liv]
	4.4 Liv/Din/Kit	0.6	-	1.0	-
Ground	5.1 Bed	0.9	UK NA Bed	1.4	Bed
	5.2 Liv/Din/Kit	0.5	-	0.4	-
	5.3 Bed	1.0	UK NA Bed	0.6	-
	5.4 Liv/Din/Kit	1.0	UK NA Liv	1.2	-
	5.5 Liv/Din/Kit	0.6	-	1.0	-
	5.6 Bed	1.0	UK NA Bed	1.5	Bed
Ground	6.1 Liv/Din/Kit	1.3	UK NA Liv & Kit	1.9	Liv [Marginal Kit]
	6.2 Bed	1.3	UK NA Bed	1.6	Bed
	6.3 Liv/Din/Kit	1.0	UK NA Liv	1.2	-
	6.4 Studio	2.5	UK NA Liv & Kit	3.0	Liv & Kit
	6.5 Liv/Din/Kit	1.2	UK NA Liv	1.6	Liv
Ground	7.1 Liv/Din/Kit	0.9	[Marginal UK NA Liv]	1.0	-
	7.2 Liv/Din/Kit	0.6	-	0.9	-
	7.3 Bed	0.7	UK NA Bed	0.9	[Marginal Bed]
	7.4 Liv/Din/Kit	3.1	UK NA Liv & Kit	3.8	Liv & Kit

Where rooms in the selection on the lowest floor are below the recommendations the results have been assessed on the floors above. The table below shows the floor where the recommendations would be met with value attained, or the value for the top floor.

Table 6: Daylight factor results for example rooms below the recommendations on lower floors.

Room	Floor recommendation(s) EN17037 UK National Annex equivalent for Dublin met, with Median Daylight Factor value (%)	Floor BS8206-2:2008 recommendation achieved with Average Daylight Factor value (%)
1.1 Liv/Din/Kit	3rd – UK NA Liv– 1.1 4th – UK NA Kit – 1.7	2nd – Liv– 1.5 4th – Kit – 3.0
1.4 Liv/Din/Kit	2nd – UK NA Liv – 1.0 3rd – UK NA Kit – 1.3	1st – Liv – 1.8 4th - Kit
1.5 Liv/Din/Kit	4th – UK NA Liv & Kit – 2.3	4th – Liv & Kit – 3.7
1.7 Bed	2nd – UK NA Bed – 0.7	2nd – Bed
1.8 Liv/Din/Kit	Meets liv on ground floor 1st – UK NA Kit – 1.3	Meets liv & kit on ground floor
1.11 Liv/Din/Kit	Meets liv on first floor 2nd – UK NA Kit – 1.3	Meets liv on first floor 2nd – Kit – 2.0
2.2 Liv/Din/Kit	4th – UK NA Liv & Kit – 1.7	4th – Kit – 2.9
2.3 Liv/Din/Kit	1st – UK NA Liv – 1.1 2nd – UK NA Kit – 1.4	1st – Liv & Kit – 2.4
2.4 Liv/Din/Kit	1st – UK NA Liv – 1.0 4th – UK NA Kit – 1.8	2nd – Liv – 1.5 4th – Kit – 3.0
2.6 Bed	Meets bed on ground floor	1st – Bed – 1.2
2.7 Bed	1st – UK NA Bed – 0.8	1st – Bed – 1.1
3.1 Liv/Din/Kit	Meets liv on ground floor 3rd – UK NA Kit – 1.4	Meets liv on ground floor 3rd – Kit 2.0
3.4 Liv/Din/Kit	1st – UK NA Liv – 1.1 5th – UK NA Kit – 1.3	1st – Liv – 1.6 5th – Kit – 2.2
3.5 Liv/Din/Kit	Meets liv on ground floor 2nd – UK NA Kit – 1.4	Meets liv on ground floor 2nd – Kit – 2.2
4.2 Liv/Din/Kit	2nd – UK NA Liv– 1.0 5th – UK NA Kit – 2.5	2nd – Liv – 1.5 5th – Kit – 3.8
4.3 Liv/Din/Kit	1st – UK NA Liv – 1.0 3rd – UK NA Kit – 1.3	1st – Liv – 1.5 5th - Kit
4.4 Liv/Din/Kit	2nd – UK NA Liv – 1.0 5th – UK NA Kit – 1.5	3rd – Liv – 1.5 5th – Kit – 2.5
5.2 Liv/Din/Kit	3rd – UK NA Liv	4th – Liv & Kit – 2.2
5.3 Bed	Meets bed on ground	1st – Bed - 1.2
5.4 Liv/Din/Kit	Meets liv on ground 4th – UK NA Kit – 2.0	3rd – Liv – 1.6 4th – Kit – 3.5
5.5 Liv/Din/Kit	4th – UK NA Liv & Kit – 1.5	3rd – Liv – 1.7 4th – Kit – 2.6
6.3 Liv/Din/Kit	4th – UK NA Liv & Kit – 1.8	2nd – Liv – 1.5 4th – Kit – 3.1
6.5 Liv/Din/Kit	Meets liv on ground floor 1st – UK NA Kit – 1.4	Meets liv on ground floor 2nd – Kit – 2.1
7.1 Liv/Din/Kit	1st – UK NA Liv – 1.0 3rd – UK NA Kit – 1.3	2nd – Liv – 1.6 4th – Kit – 2.4
7.2 Liv/Din/Kit	1st – UK NA Liv – 1.0 3rd – UK NA Kit – 1.3	2nd – Liv – 1.6 4th – Kit – 2.4
7.3 Bed	Meets bed on ground floor	1st – Bed – 1.1

The vast majority of bedrooms analysed would meet the recommendations. Using the above results, it is estimated that 99% of bedrooms across Sector 6A/6B would meet the recommendation in the UK National Annex of EN17037. A similar number may be expected to meet the older recommendations in BS8206.

Using the above results it has been estimated that 31% of the combined living areas over the whole of Sector 6A/6B would be able to meet the higher kitchen recommendation in the UK National Annex of EN17037. 83% of the living areas would be able to meet the living room recommendations. The overall

estimate would be similar when compared to the older BS8206 recommendations (28% meeting the higher kitchen recommendation; 78% meeting the living room recommendation).

The results suggest that dual aspect and less obstructed living areas would be able to meet the recommendations. Those rooms below the recommendations have access to a balcony, with the balcony above restricting daylight into the room. Daylight provision would increase with the removal of the balconies, however residents would lose a valuable private amenity space.

Sunlight provision

Figure 4: Visual representation of potential sunlight provision on 21st March – Ground floor at Sectors 6A/6B.

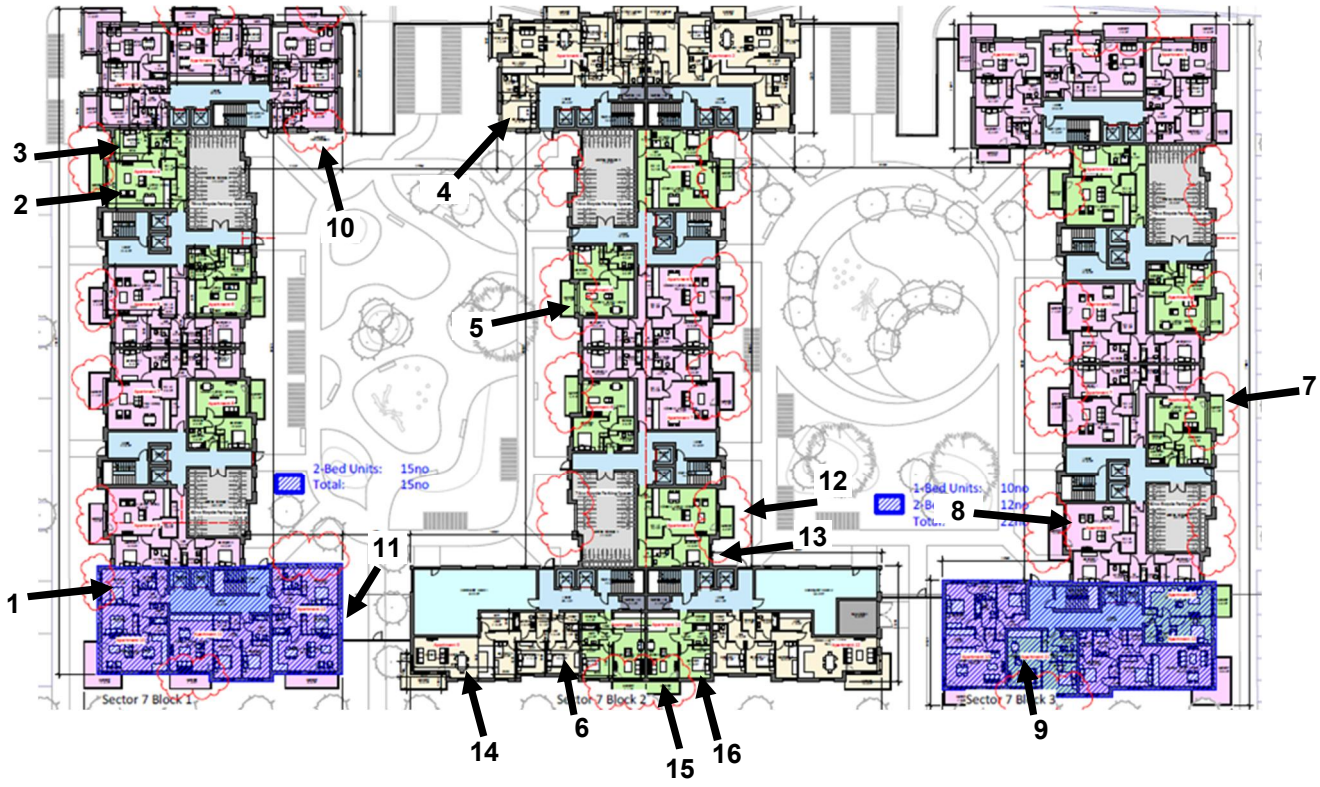
Northerly facing facades would be naturally limited in the sunlight they receive. Results suggest that in general southerly facing outer areas would be well sunlit. The results suggest that a large part of areas facing southerly into the courtyard space could receive at least the minimum 1.5 hours on 21st March. Any areas below the recommendations would be due to orientation or balcony/window position.

Of the 335 units in Sectors 6A/6B, the analysis suggests that 237 (71%) would be expected to have at least one room able to meet at least the minimum recommendation.

Sector 7

Daylight provision

The representative example rooms analysed for each block at Sector 7 are shown in Figure 5. The results of the daylight analysis are given in Table 7.



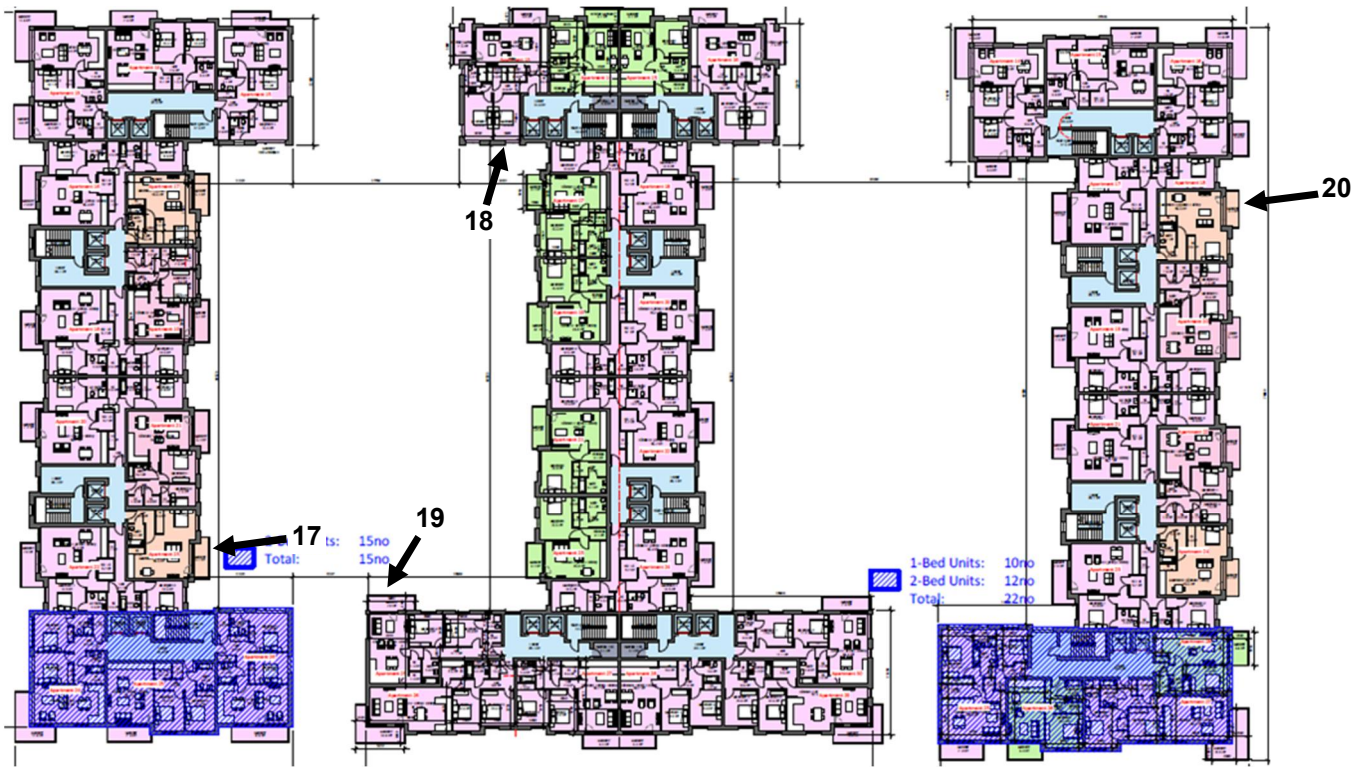


Figure 5: Ground floor (top) and first floor (bottom) layouts of Sector 7 with example rooms analysed labelled.

Table 7: Daylight factor results for example rooms at Sector 7.

Floor	Room	Median Daylight Factor (%)	Recommendation(s) achieved (EN17037 UK National Annex equivalent for Dublin)	Average Daylight Factor (%)	BS8206-2:2008 recommendation achieved
Ground	1 Bed	0.9	UK NA Bed	1.1	Bed
	2 Liv/Din/Kit	0.5	-	0.7	-
	3 Bed	1.1	UK NA Bed	1.5	Bed
	4 Bed	1.9	UK NA Bed	2.4	Bed
	5 Liv/Din/Kit	0.7	-	1.1	-
	6 Bed	1.0	UK NA Bed	1.9	Bed
	7 Liv/Din/Kit	0.7	-	1.3	-
	8 Liv/Din/Kit	0.6	-	1.2	-
	9 Liv/Din/Kit	0.8		1.4	-
	10 Bed	1.3	UK NA Bed	1.6	Bed
	11 Bed	0.8	UK NA Bed	1.0	Bed
	12 Liv/Din/Kit	0.4	-	0.9	-
	13 Bed	1.3	UK NA Bed	1.7	Bed
	14 Liv/Din/Kit	1.6	UK NA Liv & Kit	1.9	Liv
	15 Liv/Din/Kit	0.7	-	1.0	-
	16 Bed	1.8	UK NA Bed	2.3	Bed
First	17 Studio	1.1	UK NA Liv	1.5	Liv
	18 Bed	0.9	UK NA Bed	1.5	Bed
	19 Liv/Din/Kit	1.2	UK NA Liv	1.8	Liv
	20 Studio	1.4	UK NA Liv & Kit	1.7	Liv

Where rooms in the selection on the lowest floor are below the recommendations the results have been assessed on the floors above. The table below shows the floor where the recommendations would be met with value attained, or the value for the top floor.

Table 8: Daylight factor results for example rooms below the recommendations on lower floors.

Room	Floor recommendation(s) EN17037 UK National Annex equivalent for Dublin met, with Median Daylight Factor value (%)	Floor BS8206-2:2008 recommendation achieved with Average Daylight Factor value (%)
2 Liv/Din/Kit	6th – UK NA Liv – 1.0	6th – Liv & Kit – 2.2
5 Liv/Din/Kit	3rd – UK NA Liv – 1.1 5th – UK NA Kit – 1.3	3rd – Liv – 1.5 8th – Kit – 3.5
7 Liv/Din/Kit	3rd – UK NA Liv – 1.0 5th – UK NA Kit - 1.4	2nd – Liv – 1.6 6th – Kit – 3.3
8 Liv/Din/Kit	3rd – UK NA Liv – 1.0 4th – UK NA Kit – 1.3	2nd – Liv – 1.6 4th – Kit – 2.1
9 Liv/Din/Kit	3rd UK NA Liv – 1.0 4th – UK NA Kit – 1.4	2nd – Liv 1.7 3rd –Kit – 2.1
12 Liv/Din/Kit	4th – UK NA Liv – 1.0 6th – UK NA Kit – 2.1	4th – Liv – 1.5 6th – Kit – 3.2
14 Liv/Din/Kit	Meets liv & kit on ground floor	Meets liv on ground floor 1st – Kit - 2.1
15 Liv/Din/Kit	3rd – UK NA Liv - 1.0 4th – UK NA Liv & Kit – 1.9	2nd - Liv – 1.5 4th – Kit – 3.6
17 Studio	Meets liv on 1st floor 2nd – UK NA Kit – 1.3	Meets liv on first floor 3rd – Kit – 2.0
19 Liv/Din/Kit	Meets liv on 1st floor 3rd – UK NA Kit – 1.3	Meets liv on first floor 2nd – Kit – 2.0
20 Studio	Meets liv & kit on 1st floor	Meets liv on 1st floor 4th – Kit – 2.0

All bedrooms in the selection analysed would meet the UK National Annex bedroom recommendation and the older recommendation from BS8206. It is therefore estimated that 100% of the bedrooms in Sector 7 would be able to meet the recommendation.

The north facade of the building has an unobstructed view of the park to the north. Rooms would be likely to meet the recommendations here. The results suggest that some living areas on lower floors may be below the recommendations when the windows look out onto a balcony and face neighbouring buildings or blocks. Obstruction from neighbouring areas in an urban scheme like this would be unavoidable. The provision of balconies restricts daylight into rooms, but does provide a valuable amenity for future residents. Daylight could be improved by removing balconies, but the private amenity would be lost.

Based on the above results it is estimated that 56% of living areas over the whole of Sector 7 would be able to meet the kitchen target in the UK National Annex of EN17037, with 74% able to meet the living room target. Using the older BS8206 standard, 47% of living areas would be predicted to meet the kitchen target, with 78% meeting the living room target.

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Sunlight provision

Figure 6: Visual representation of potential sunlight provision on 21st March – Ground floor at Sector 7.

The ground floor south west facing facades (outer and courtyards) would mostly meet the recommendations with a mix of minimum, medium and high levels of sunlight provision. This is due to the position and size of the windows and balconies. The ground floor south east façade is limited for sunlight due partly to balcony provision and partly to the presence of the neighbouring block. Some ground floor spaces facing south east into courtyard areas may have limited sunlight. Provision would increase on upper floors.

Of the 333 units in Sector 7, the analysis suggests that 243 (73%) would be expected to have at least one room able to meet at least the minimum recommendation.

Sector 8A

Daylight provision

The worst-case example rooms analysed for each block at Sector 8A are shown in Figure 7. The results of the daylight analysis are given in Table 9.

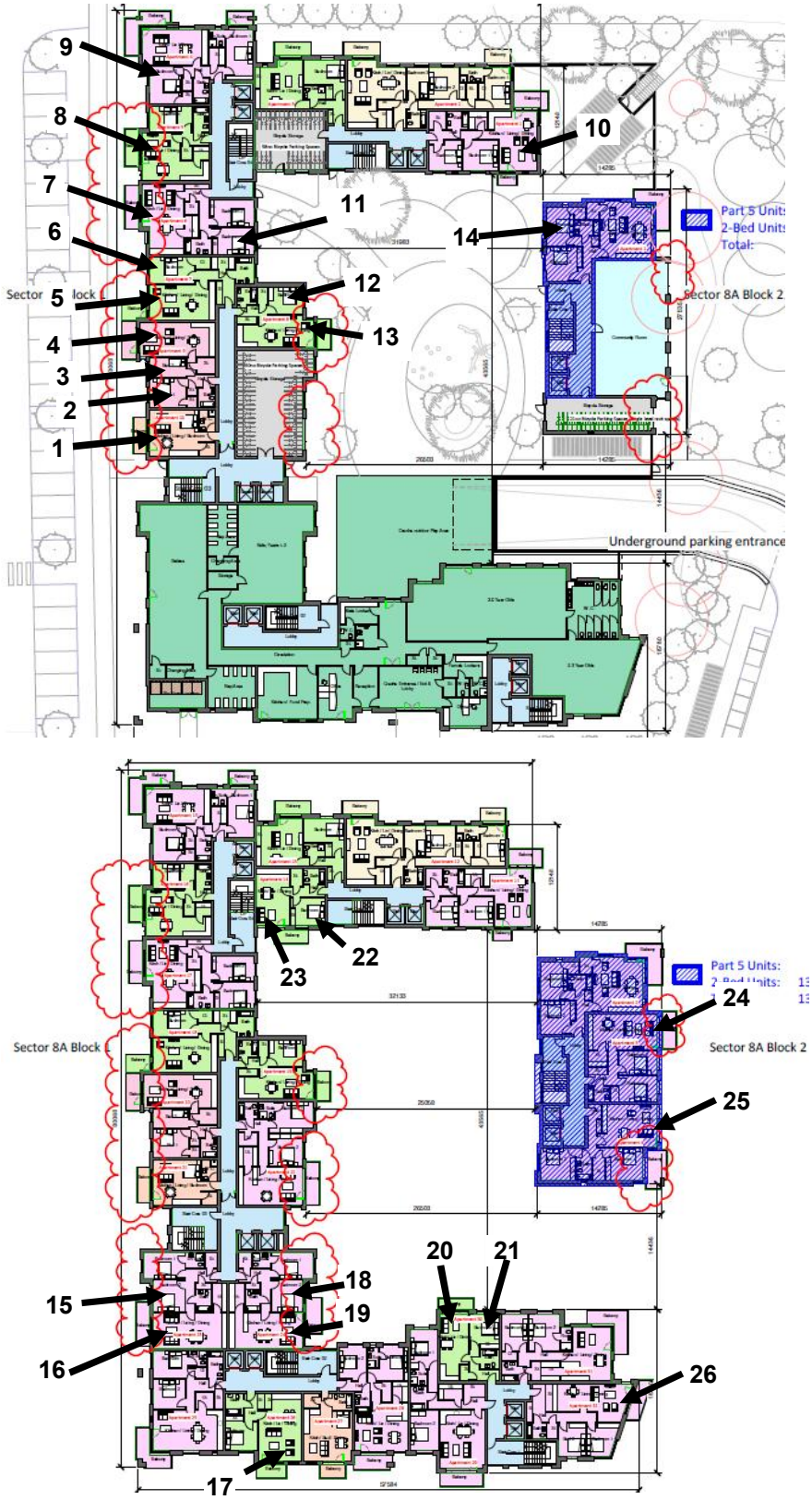

Figure 7: Ground floor (top) and first floor (bottom) layouts of Sector 8A with worst-case example rooms analysed labelled.

Table 9: Daylight factor results for example rooms at Sector 8A.

Floor	Room	Median Daylight Factor (%)	Recommendation(s) achieved (EN17037 UK National Annex equivalent for Dublin)	Average Daylight Factor (%)	BS8206-2:2008 recommendation achieved
Ground	1 Studio	0.9	-	1.0	-
	2 Bed	1.0	UK NA Bed	1.6	Bed
	3 Bed	1.0	UK NA Bed	1.3	Bed
	4 Liv/Din/Kit	0.6	-	0.7	-
	5 Liv/Din/Kit	0.7	-	0.9	-
	6 Bed	1.4	UK NA Bed	2.2	Bed
	7 Liv/Din/Kit	1.2	UK NA Liv	1.3	-
	8 Liv/Din/Kit	1.1	UK NA Liv	1.1	-
	9 Bed	1.4	UK NA Bed	2.1	Bed
	10 Liv/Din/Kit	2.0	UK NA Liv & Kit	2.7	Liv & Kit
	11 Bed	1.1	UK NA Bed	1.6	Bed
	12 Bed	1.1	UK NA Bed	1.9	Bed
	13 Liv/Din/Kit	0.6	-	0.7	-
	14 Bed	2.1	UK NA Bed	2.5	Bed
First	15 Bed	1.1	UK NA Bed	1.7	Bed
	16 Liv/Din/Kit	0.7	-	0.8	-
	17 Liv/Din/Kit	1.4	UK NA Liv & Kit	2.0	Liv & Kit
	18 Bed	1.2	UK NA Bed	1.5	-
	19 Liv/Din/Kit	0.4	-	0.6	-
	20 Liv/Din/Kit	0.9	[Marginal UK NA Liv]	1.4	[Marginal Liv]
	21 Bed	1.6	UK NA Bed	2.3	Bed
	22 Bed	1.0	UK NA Bed	1.2	Bed
	23 Liv/Din/Kit	0.5	-	0.7	-
	24 Liv/Din/Kit	1.1	UK NA Liv	1.6	Liv
	25 Liv/Din/Kit	1.3	UK NA Liv & Kit	2.0	Liv & Kit
	26 Liv/Din/Kit	1.0	UK NA Liv	1.5	Liv

Where rooms in the selection on the lowest floor are below the recommendations the results have been assessed on the floors above. The table below shows the floor where the recommendations would be met with value attained, or the value for the top floor.

Table 10: Daylight factor results for worst-case rooms below the recommendations on lower floors.

Room	Floor recommendation(s) EN17037 UK National Annex equivalent for Dublin met, with Median Daylight Factor value (%)	Floor BS8206-2:2008 recommendation achieved with Average Daylight Factor value (%)
1 Studio	1st – UK NA Liv – 1.1 3rd – UK NA Kit – 1.4	2nd – Liv – 1.6 4th – Kit – 2.2
4 Liv/Din/Kit	5th – UK NA Liv – 1.2	5th – Liv & Kit – 1.3
5 Liv/Din/Kit	4th – UK NA Liv – 1.1 5th – UK NA Kit - 1.6	4th – Liv - 1.5 5th – Kit – 2.2
7 Liv/Din/Kit	Meets UK NA Liv on Ground 2nd – UK NA Kit - 1.4	2nd – Liv– 1.5 5th – Kit – 2.0
8 Liv/Din/Kit	Meets UK NA Liv on Ground 3rd – UK NA Kit – 1.3	3rd – Liv – 1.6 6th – Kit - 2.1
13 Liv/Din/Kit	4th – UK NA Liv – 1.0 5th – UK NA Kit – 1.5	5th – Liv & Kit – 2.5
16 Liv/Din/Kit	5th – UK NA Liv & Kit - 1.5	5th – Liv & Kit – 2.5
19 Liv/Din/Kit	5th – UK NA Liv & Kit – 3.2	5th – Liv & Kit – 3.9
20 Liv/Din/Kit	2nd – UK NA Liv - 1.1 3rd - UK NA Kit – 1.3	2nd – Liv – 1.5 4th – Kit – 3.7
23 Liv/Din/Kit	5th – UK NA Liv - 1.0 6th – UK NA Kit – 1.4	6th – Liv & Kit - 2.0
24 Liv/Din/Kit	Meets UK NA Liv on First 4th - UK NA Kit – 1.5	Meets Liv on First 4th – Kit – 2.9
26 Liv/Din/Kit	Meets UK NA Liv on First 4th – UK NA Kit – 2.0	Meets Liv on First 4th – Kit – 3.1

The results suggest that all bedrooms analysed would meet the 0.7% bedroom median daylight factor recommendations in the UK National Annex of EN17037. It is therefore estimated that 100% of the bedrooms in Sector 8A would meet the UK National Annex of EN17037. All bedrooms are also estimated as able to meet the older average daylight factor target in BS8206.

The results for living areas suggest that those facing southerly towards the open space (and by extension also northerly open space facing) would be able to meet the living room and kitchen recommendations in the UK National Annex of EN17037. Dual aspect rooms and those without direct access to a balcony would also be expected to meet these recommendations. In more obstructed areas there would be rooms below the recommendations on lower floors. Areas of higher obstruction may be unavoidable in urban schemes. The provision of balconies also restricts daylight into rooms. Daylight could be improved by the removal of the balconies, but residents would lose a valuable private amenity space.

Using the above results it is estimated that 66% of combined living areas over the whole of Sector 8A would be able to meet the kitchen recommendation in the UK National Annex of EN17037, with 80% able to meet the living room recommendation. The overall estimate if the older average daylight factor recommendations are used from BS8206, is 61% to meet the kitchen target, and 73% to meet the living room target.

Sunlight provision

Figure 8: Visual representation of potential sunlight provision on 21st March – Ground floor at Sector 8A.

The main south west facing facade would meet at least the minimum recommendation. North facing facades are naturally limited. South east areas are obstructed on the ground floor, but provision increases on higher floors.

Of the 144 units in Sector 8A, the analysis suggests that 96 (66%) would be expected to have at least one room able to meet at least the minimum recommendation.

Sector 8B

Daylight provision

The worst-case example rooms analysed for each block at Sector 8B are shown in Figure 9. The results of the daylight analysis are given in Table 11.

Figure 9: Ground floor and first floor layouts of Sector 8B with worst-case example rooms analysed labelled.

Table 11: Daylight factor results for example rooms at Sector 8B.

Floor	Room	Median Daylight Factor (%)	Recommendation(s) achieved (EN17037 UK National Annex equivalent for Dublin)	Average Daylight Factor (%)	BS8206-2:2008 recommendation achieved
Ground	1 Liv/Din/Kit	1.0	UK NA Liv	1.6	Liv
	2 Bed	1.1	UK NA Bed	1.4	Bed
	3 Bed	1.7	UK NA Bed	1.8	Bed
	4 Liv/Din/Kit	1.6	UK NA Liv & Kit	1.9	Liv [Marginal Kit]
	5 Liv/Din/Kit	1.5	UK NA Liv & Kit	2.8	Liv & Kit
	6 Liv/Din/Kit	0.7	-	1.2	-
	7 Liv/Din/Kit	1.1	UK NA Liv	2.0	Liv & Kit
	8 Liv/Din/Kit	1.7	UK NA LIV & Kit	2.3	Liv & Kit
	9 Studio	1.3	UK NA LIV & Kit	1.8	Liv
	10 Liv/Din/Kit	1.5	UK NA LIV & Kit	2.1	Liv & Kit
First	11 Liv/Din/Kit	0.7	-	1.3	-
	12 Liv/Din/Kit	0.9	-	1.3	-

Where rooms in the selection on the lowest floor are below the recommendations the results have been assessed on the floors above. The table below shows the floor where the recommendations would be met with value attained, or the value for the top floor.

Table 12: Daylight factor results for worst-case rooms below the recommendations on lower floors.

Room	Floor recommendation(s) EN17037 UK National Annex equivalent for Dublin met, with Median Daylight Factor value (%)	Floor BS8206-2:2008 recommendation achieved with Average Daylight Factor value (%)
1 Liv/Din/Kit	1st - UK NA Liv - 1.0 3rd - UK NA Kit - 1.3	1st - Liv - 1.5 4th – Kit - 2.3
6 Liv/Din/Kit	4th - UK NA Liv - 1.0 5th - UK NA Kit - 1.3	1st – Liv - 1.5 5th – Kit – 2.8
7 Liv/Din/Kit	Meets UK NA Liv on Ground 1st – UK NA Kit – 1.4	Meets Liv and Kit on ground floor
9 Studio	Meets UK NA Liv & Kit on Ground	Meets Liv on ground floor 1st – Kit - 2.1
11 Liv/Din/Kit	4th - UK NA Liv - 1.2 5th – UK NA Kit - 1.3	2nd – Liv - 1.5 5th – Kit - 2.4
12 Liv/Din/Kit	2nd - UK NA Liv - 1.0 5th - UK NA Kit - 1.6	3rd – Liv - 1.6 5th – Kit - 2.9

Both of the worst-case bedrooms assessed would meet the UK National Annex recommendation for a bedroom. Other bedrooms appear to be similarly, or less, obstructed. It is therefore estimated that 100% of the bedrooms in Sector 8B seem likely to be able to meet the recommendations in the UK National Annex of EN17037 and the older BS8206.

The results suggest that the vast majority of outward facing living areas would be able to meet the living room recommendation in the UK National Annex of EN17037 and generally also be able to meet the kitchen recommendation too. The results suggest that analysed room 6 and the neighbouring living room would be below the recommendations on lower floors, but other living rooms on the façade would meet at least the living room recommendation on all floors. Internally facing living areas (as analysed by room 11 and 12) would meet the recommendations on higher floors. Living areas below the recommendations have access to a balcony area. The balcony above restricts daylight into the room, but provides an amenity area for residents

An indication of the overall percentage of rooms able to meet the recommendations has been assessed using the above results and extrapolating to similar rooms. It is estimated that 82% of the living/dining/kitchen areas in Sector 8B would be able to meet the higher kitchen recommendation in the UK National Annex of EN17037, with 90% able to meet the living room recommendation. The overall percentage estimate when compared to the older BS8206 average daylight factor recommendations would be 81% meeting the kitchen average daylight factor recommendation and 96% meeting the living room recommendation.

Sunlight provision

Figure 10: Visual representation of potential sunlight provision on 21st March – Ground floor at Sector 8B.

Results suggest that the outer south east and south west facing facades would be well sunlit. Southerly facing areas looking into the central courtyard may receive the recommended hours on 21st March in some areas. Provision improves on higher floors to the south east facing courtyard section.

Of the 125 units in Sector 8B, the analysis suggests that 82 (66%) would be expected to have at least one room able to meet at least the minimum recommendation.

Sector 8C

Daylight provision

The worst-case example rooms analysed for each block at Sector 8C are shown in Figure 11. The results of the daylight analysis are given in Table 13.

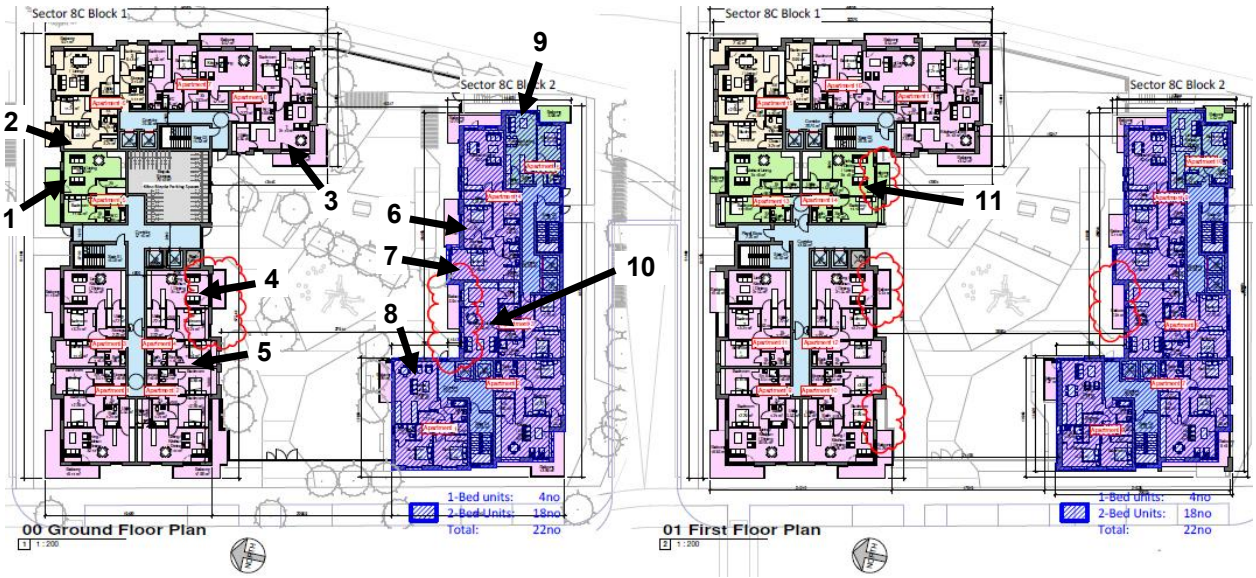

Figure 11: Ground floor and first floor layouts of Sector 8C with worst-case example rooms analysed labelled.

Table 13: Daylight factor results for example worst-case rooms at Sector 8C.

Floor	Room	Median Daylight Factor (%)	Recommendation(s) achieved (EN17037 or UK National Annex equivalent for Dublin)	Average Daylight Factor (%)	BS8206-2:2008 recommendation achieved
Ground	1 Liv/Din/Kit	1.1	UK NA Liv	1.3	-
	2 Bed	1.1	UK NA Bed	1.2	Bed
	3 Liv/Din/Kit	1.6	UK NA Liv & Kit	2.6	Liv & Kit
	4 Liv/Din/Kit	0.8	-	1.4	-
	5 Bed	1.2	UK NA Bed	2.1	Bed
	6 Bed	0.9	UK NA Bed	1.1	Bed
	7 Bed	1.0	UK NA Bed	2.1	Bed
	8 Liv/Din/Kit	1.2	UK NA Liv [Marginal UK NA Kit]	2.0	Liv & Kit
	9 Liv/Din/Kit	1.8	UK NA Liv & Kit	2.7	Liv & Kit
	10 Liv/Din/Kit	1.4	UK NA Liv & Kit	1.8	Liv
First	11 Liv/Din/Kit	0.7	-	0.8	-

Where rooms in the selection on the lowest floor are below the recommendations the results have been assessed on the floors above. The table below shows the floor where the recommendations would be met with value attained, or the value for the top floor.

Table 14: Daylight factor results for worst-case rooms below the recommendations on lower floors.

Room	Floor recommendation(s) in EN17037 UK National Annex equivalent for Dublin met, with Median Daylight Factor value (%)	Floor BS8206-2:2008 recommendation achieved with Average Daylight Factor value (%)
1 Liv/Din/Kit	Meets liv on ground floor 2nd - UK NA Kit - 1.4	2nd – Liv – 1.6 4th – Kit - 2.6
4 Liv/Din/Kit	1st - UK NA Liv - 1.1 2nd – UK NA Kit - 1.3	1st – Liv - 1.7 2nd – Kit - 2.0
8 Liv/Din/Kit	1st - UK NA Liv & Kit - 1.7	Meets on ground floor
10 Liv/Din/Kit	Meets liv and kit on ground floor	Meets liv on ground floor 1st - Kit - 2.2
11 Liv/Din/Kit	Third UK NA Liv - 1.1 Fourth UK NA Kit - 2.4	Fourth Liv & Kit - 2.9

All of the worst-case example bedrooms analysed would meet the daylight factor recommendations in the UK National Annex of EN17037 and the old BS8206. These results suggest that all 100% of the 132 bedrooms would be seem likely to be able to meet the recommendations in either standard.

Both of the two worst-case dual aspect living areas (rooms 3 and 8) would meet at least the UK National Annex living room recommendation. Room 3 also meets the kitchen recommendation from the ground floor upwards. Room 8 meets the kitchen recommendation from the first floor upwards. These results suggest that dual aspect rooms on the less obstructed outer edges of the sector are likely to meet the living room and kitchen recommendation.

The results for room 9 suggest that single aspect north east facing living areas would be able to meet the living room and kitchen recommendations.

The results for room 1 suggest that single aspect north west facing living areas appear likely to meet the living room UK National Annex recommendation from the ground floor, with the kitchen recommendation also met from the second floor.

Courtyard facing living areas have been analysed with rooms 4, 10 and 11. Room 4 would meet the living room UK National Annex recommendation on the first floor. Room 10 would meet the living room and kitchen recommendations from the ground floor. Room 11 would meet the living and kitchen recommendations on the third and fourth floors respectively.

Using the above worst-case analysis it is estimated that around 86% of the living/dining/kitchen areas over the whole of Sector 8C would meet the UK National Annex kitchen recommendation. 94% of these living areas have been estimated to meet the living room recommendations.

It is estimated that 81% of the living/dining/kitchen areas would meet the older BS8206 average daylight factor recommendations for a kitchen. 89% have been estimated to meet the recommendation for a living room.

Sunlight provision

Figure 12: Visual representation of potential sunlight provision on 21st March – Ground floor at Sector 8C.

North facing facades would be naturally limited and therefore would be expected to receive less than the minimum 1.5 hours of sunlight. The majority of the southern façade should be able to receive at least four hours of sunlight. The southern facing courtyard façade receives at least recommended levels to most portions. East and west facing facades should be able to receive at least the minimum recommendation for the most part.

Of the 70 Units in Sector 8C the analysis suggests 60 (86%) would be expected to have at least one room able to meet at least the minimum recommendation.

Daylight summary

Overall estimates for the percentages of rooms able to meet the recommendations in either the UK National Annex of EN17037 or the older BS8206 have been calculated based on example rooms analysed across the proposed sectors.

93% of rooms would meet the recommendations in the UK National Annex of EN17037 using the bedroom target and living room target for combined living/dining/kitchen areas. 83% of rooms meet these recommendations with the higher kitchen target used for combined spaces. Overall results are similar using the older BS8206 recommendations (92% using the bedroom target and living room target for combined rooms and 81% using the kitchen target for combined rooms).

The vast majority of bedrooms would appear likely to meet the bedroom recommendations.

Although a high proportion of living areas seem likely to be able to meet the living room or kitchen recommendation in either standard, there would be a number below the recommendation. However, these requirements would need to be balanced with other benefits of the scheme.

The Department of Housing, Local Government and Heritage document Sustainable Urban Housing: Design Standards for New Apartments December 2020 states “Where an applicant cannot fully meet all of the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, which planning authorities should apply their discretion in accepting taking account of its assessment of specific. This may arise due to a design constraint associated with the site or location and the balancing of that assessment against the desirability of achieving wider planning objectives. Such objectives might include securing comprehensive urban regeneration and or an effective urban design and streetscape solution.”

The analysis suggests the majority of living areas below the recommendations would be on lower floors and have access to a balcony area. To improve daylight provision an alternative would involve removal of balconies. Although this would improve daylight provision future residents would lose a valuable private amenity space.

Sunlight summary

The sunlight analysis has calculated potential provision to the worst-case ground floor. In areas where sunlight may increase on upper floors further analysis has also been undertaken to get an understanding of sunlight provision across all units.

Northerly facing facades would be naturally limited in the sunlight they receive, but would have a view of the park to the north.

In general, southerly facing outer facades have the potential to meet the recommendations. Sunlight to these areas is impacted by balcony/façade design and proximity to other blocks. Areas facing into courtyards are more obstructed, but provision improves on upper floors.

Overall, the analysis suggests that around 70% of proposed units will have at least one habitable room able to receive at least the minimum 1.5 hours sunlight recommendation in EN 17037.

Sunlight to proposed courtyards

An assessment of sunlight provision to the proposed internal courtyards / amenity areas at each sector has been carried out. The areas able to receive at least two hours of sunlight on 21st March have been calculated. The BRE Report states that to be adequately sunlit, a space should be able to receive at least two hours of sunlight over at least half of its area.

A visual representation and numerical values are given in Figure 13 and Table 15 below.

Figure 13: Sunlight provision to proposed courtyards. Areas in orange would receive more than two hours of sunlight on 21st March. Areas in blue would receive less than two hours sunlight on 21st March.

Table 15: Sunlight provision results for proposed courtyards.

Sector Courtyard	Percentage of space able to receive at least two hours on 21st March (%)
6A/6B West side	74%
6A/6B East side	58%
7 West side	55%
7 East side	53%
8A	60%
8B	82%
Between 8B and 8C	83%
8C	64%

The results suggest that the courtyards at all Sectors would meet the BRE guidelines, as more than half of their areas would be able to receive more than two hours of sunlight on 21st March.

In order to respond to an An Bord Pleanála pre-application consultation opinion request “for a full understanding of the year round level of overshadowing of the primary outdoor recreation areas for the development” the areas able to receive at least two hours of sunlight have also been calculated for other months. There are guidelines only for 21st March and therefore the additional analysis is for information

purposes only. To further illustrate overshadowing, monthly shadow plotting has also been carried out (see next section and Appendix B).

The areas of the proposed courtyards able to receive at least two hours of sunlight on 21st December (winter solstice), 21st January, 21st February, 21st April, 21st May and 21st June (summer solstice) have been calculated. The results are shown in Figures 14 to 19 and Table 16. The results for 21st September (autumn equinox) are the same as those for 21st March (spring equinox). The shadows for 21st January, 21st February, 21st April and 21st May are the same as those at or around the 21st of November, October, August and July respectively.

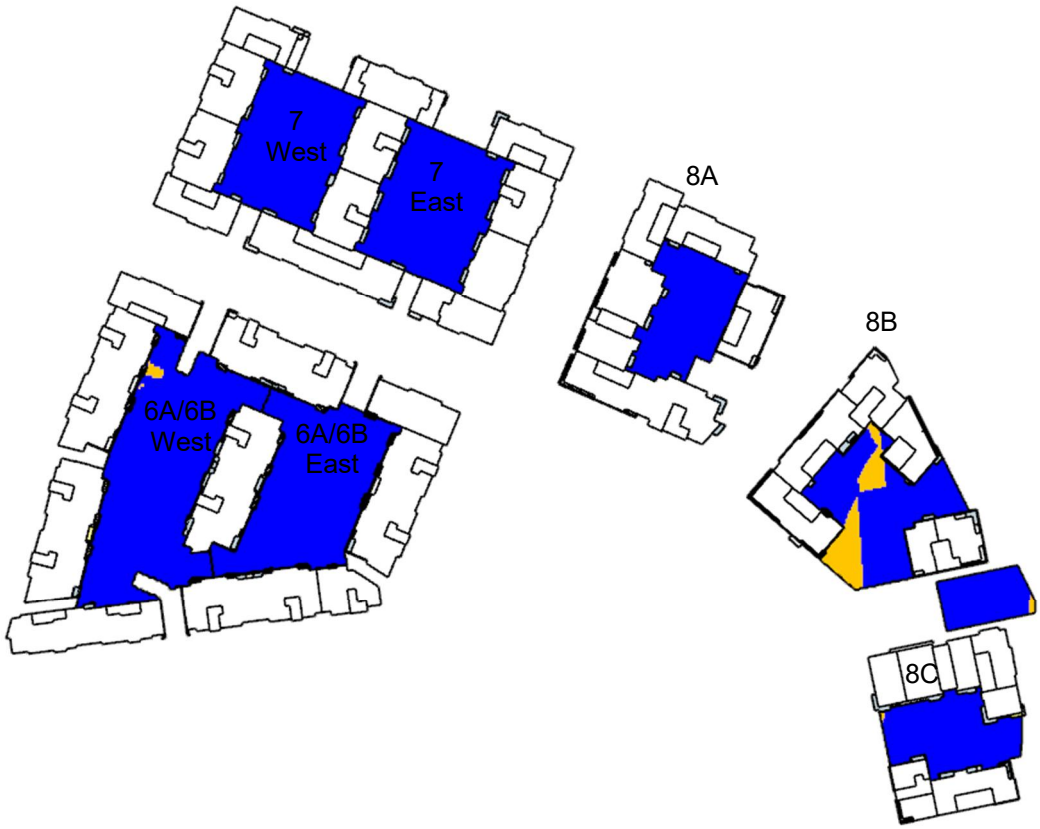

Figure 14: 21 December (winter solstice) – two hours of sunlight. Areas in orange would receive more than two hours of sunlight. Areas in blue would receive less than two hours sunlight.

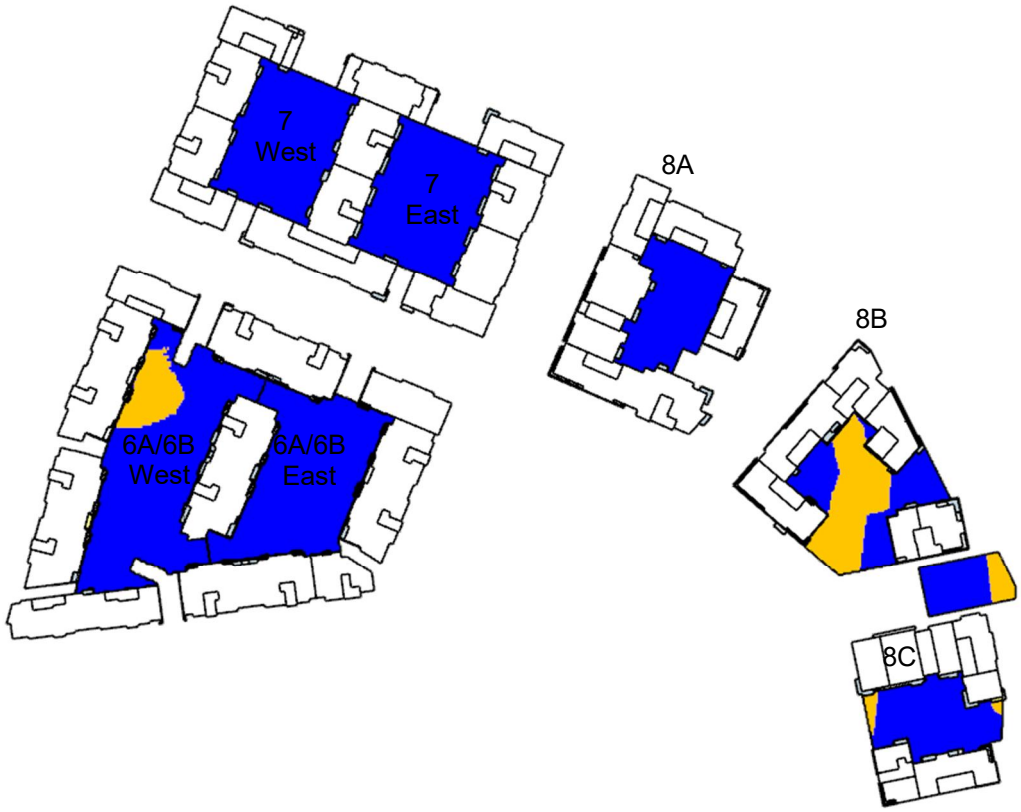

Figure 15: 21 January (and November) – two hours of sunlight. Areas in orange would receive more than two hours of sunlight. Areas in blue would receive less than two hours sunlight.

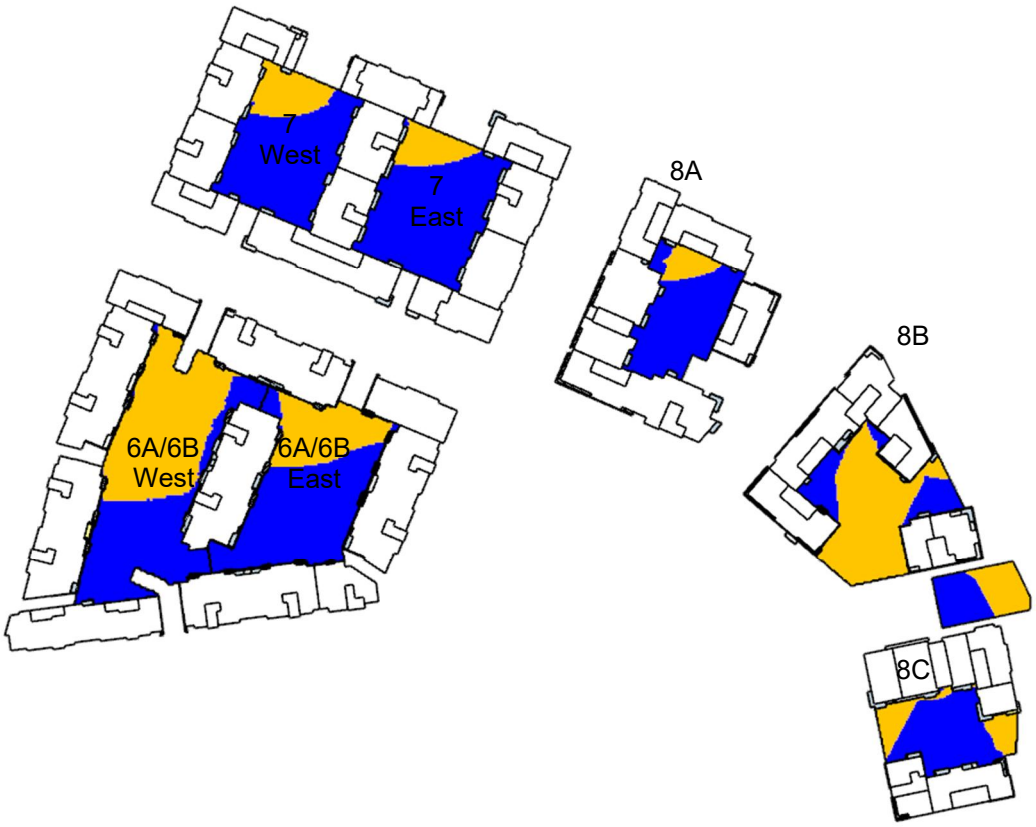

Figure 16: 21 February (and October) – two hours of sunlight. Areas in orange would receive more than two hours of sunlight. Areas in blue would receive less than two hours sunlight.

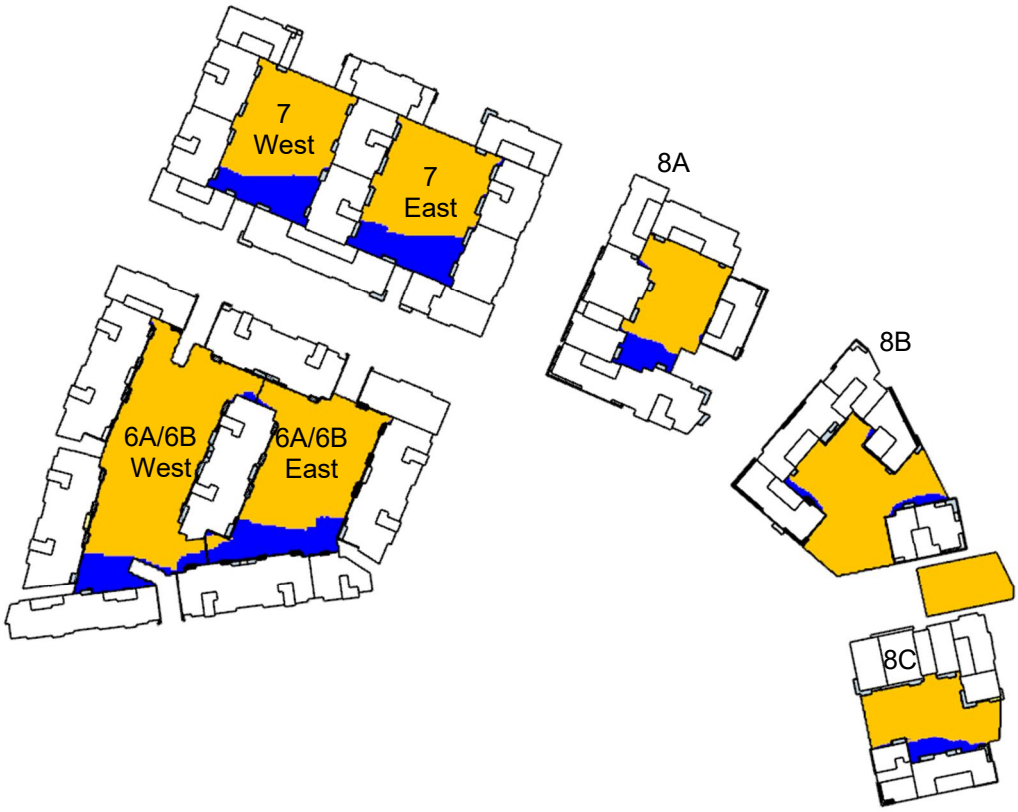

Figure 17: 21 April (and August) – two hours of sunlight. Areas in orange would receive more than two hours of sunlight. Areas in blue would receive less than two hours sunlight.

Figure 18: 21 May (and July) – two hours of sunlight. Areas in orange would receive more than two hours of sunlight. Areas in blue would receive less than two hours sunlight.

Figure 19: 21 June (summer solstice) – two hours of sunlight. Areas in orange would receive more than two hours of sunlight. Areas in blue would receive less than two hours sunlight.

Table 16: Areas able to receive at least two hours of sunlight in proposed courtyards throughout the year.

Sector Courtyard	Percentage of space able to receive at least two hours of sunlight						
	21 December	21 January / November	21 February / October	21 March / 21 September	21 April / August	21 May / July	21 June
6A/6B West side	1%	13%	54%	74%	88%	94%	96%
6A/6B East side	0%	0%	31%	58%	78%	92%	95%
7 West side	0%	0%	21%	55%	75%	85%	88%
7 East side	0%	0%	16%	53%	73%	84%	88%
8A	0%	0%	14%	60%	82%	91%	93%
8B	21%	52%	74%	82%	94%	99%	100%
Between 8B and 8C	2%	23%	48%	83%	100%	100%	100%
8C	0%	6%	29%	64%	87%	95%	98%

As expected, the courtyards would receive less sunlight in the winter due to the lower angle sun. The BRE guidelines would be met on 21 March and sunlight provision would increase throughout spring. In the summer months the vast majority of the courtyard spaces would be able to receive at least two hours of sunlight.

Shadow Plotting

Shadow plots have been created for 21st March (spring equinox), 21st June (summer solstice) and 21st December (winter solstice) at clock times 8am, 10am, 12pm, 2pm and 4pm (plus 6pm in summer).

Plots are also shown for January, February, April and May. This gives a month-by-month assessment of sunlight provision at and around the site to allow for a full understanding of the year round level of overshadowing.

The shadows for 21st September (autumn equinox) are the same as those for 21st March (spring equinox). The shadows for 21st January, 21st February, 21st April and 21st May are the same as those at or around the 21st of November, October, August and July respectively.

In the plots, the times given are clock times. Between the end of March and the end of October, Irish Standard Time (IST) applies. The plots for September and October therefore correspond to the shadows produced one hour later in summer time; thus at 1pm IST in September/October, the shadows are as plotted on the 12pm GMT diagram for March/February. The March and February plots therefore correspond to 9am, 11am, 1pm, 3pm and 5pm IST in September and October.

The plots are shown in Appendix B.

The below discussion focuses on the equinoxes and solstices, since they are the midpoint and extremes of shading conditions.

Spring / Autumn equinoxes

The shadow plots for 21st March suggest that around the equinoxes the proposed courtyards would be mostly shaded in the early morning, but large areas would receive sun as the day progresses, as can be seen in the above results for areas able to receive at least two hours of sunlight on this date. Only areas directly to the north of blocks would be prevented from receiving any sun at this time.

Although the shadow of the proposed buildings would reach neighbouring areas, it would mostly be confined to roadways and areas close to the buildings.

Summer solstice

The shadow plots for 21st June show that there would only be significant shading of the courtyard areas in the early morning and evening. For the majority of the day, large areas of the courtyards would be able to receive sun.

Shading of surrounding areas would mostly be confined to roadways and areas close to the proposed buildings.

Winter solstice

The shadow plots for 21st December show that the low angle winter sun would mean that all buildings, either proposed, existing or potential future developments, would cast longer shadows. Some courtyard areas would be able to receive at least some sun in this worst-case condition.

Conclusions

This report has assessed daylight and sunlight for GA2, Baldoyle. The results have been compared to the guidelines in the BRE Report “Site layout planning for daylight and sunlight: a guide to good practice” and the UK National Annex of EN17037 “Daylight in Buildings”.

The calculations have used the 3D models and plans of the scheme as provided to BRE.

There would be a minor adverse loss of daylight impact to some existing properties at Willow, Birch, Sycamore and Beech Houses. The primary cause of the loss of daylight is due to the design of the existing buildings themselves. Windows set back into the building with balconies or overhangs above force a reliance on daylight from the area of the proposal site. At other existing properties on Red Arches Park and Red Arches Drive there would be a negligible impact. Loss of sunlight would not be an issue to existing buildings, as the development site is to the north.

There would be a negligible impact on daylight to the consented GA1 scheme. Loss of sunlight would not be an issue since the proposed development site is to the north.

When compared to the existing empty site there would be a significant impact to daylight to the east facing façade of GA3. However, this would only be the case if future residents of GA3 experienced conditions with the empty GA2 site. Special measures of larger windows are in place in the design of GA3 and any reduced values of vertical sky component may be at least partly due to its balconies. The BRE Report also suggest the guidelines should be interpreted flexibly. In special circumstances a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing buildings.

An assessment of daylight provision to example worst-case and example rooms in the proposed development has been used to estimate the overall percentages of rooms able to meet the recommendations for domestic rooms types in the UK National Annex of EN17037 and the older BS8206.

93% of rooms are estimated to meet the recommendations in the UK National Annex of EN17037 using the bedroom target and living room target for combined living/dining/kitchen or studio areas. 83% of rooms meet these recommendations with the higher kitchen target used for combined spaces. Overall results are similar using the older BS8206 recommendations (92% using the bedroom target and living room target for combined rooms and 81% using the kitchen target for combined rooms). For combined living/dining/kitchen rooms, local authorities may in practice accept the living room value in order to avoid small closed-off kitchen areas to force compliance with the standard.

The vast majority of bedrooms would appear likely to meet the bedroom recommendations in either standard.

The analysis suggests the majority of living areas below the recommendations would have access to a balcony area. The requirements may need to be balanced with other benefits of the scheme. For example, the removal of balconies would mean occupants would not have private amenity and increased glazing could create privacy concerns.

Overall, analysis of sunlight provision to rooms suggests that around 70% of proposed units will have at least one habitable room able to receive at least the minimum 1.5 hours sunlight recommendation in EN 17037.

Sunlight provision to courtyards has also been assessed. All courtyards would meet the BRE guidelines as more than half of their areas would be able to receive more than two hours of sunlight on 21st March.

Appendix A Loss of daylight results

Willow, Birch, Sycamore and Beech Houses

Analysed section A

Figure A1: Analysed section A. West facing to Red Arches Park. Windows analysed labelled. Via Google 2021.

Analysed section B

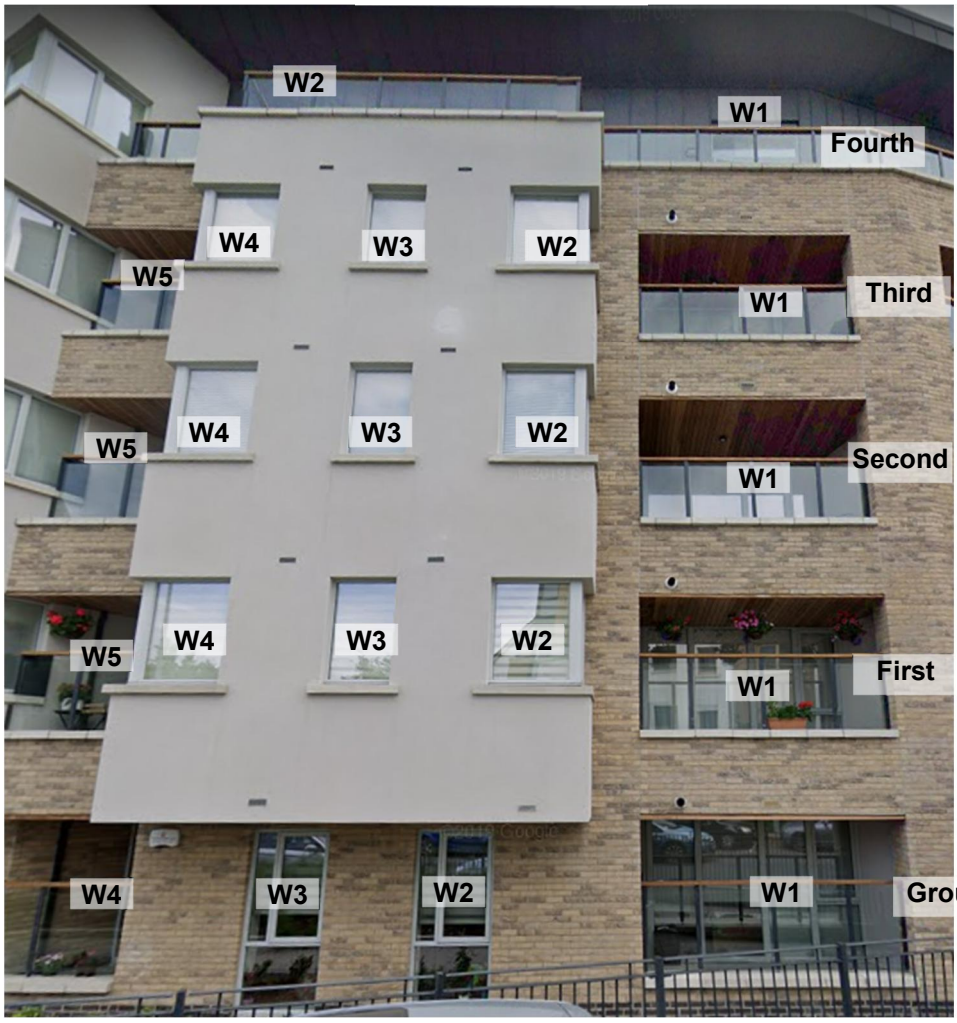

Figure A2: Analysed section B. North west facing to Red Arches Park / Red Arches Drive. Windows analysed labelled. Via Google 2021.

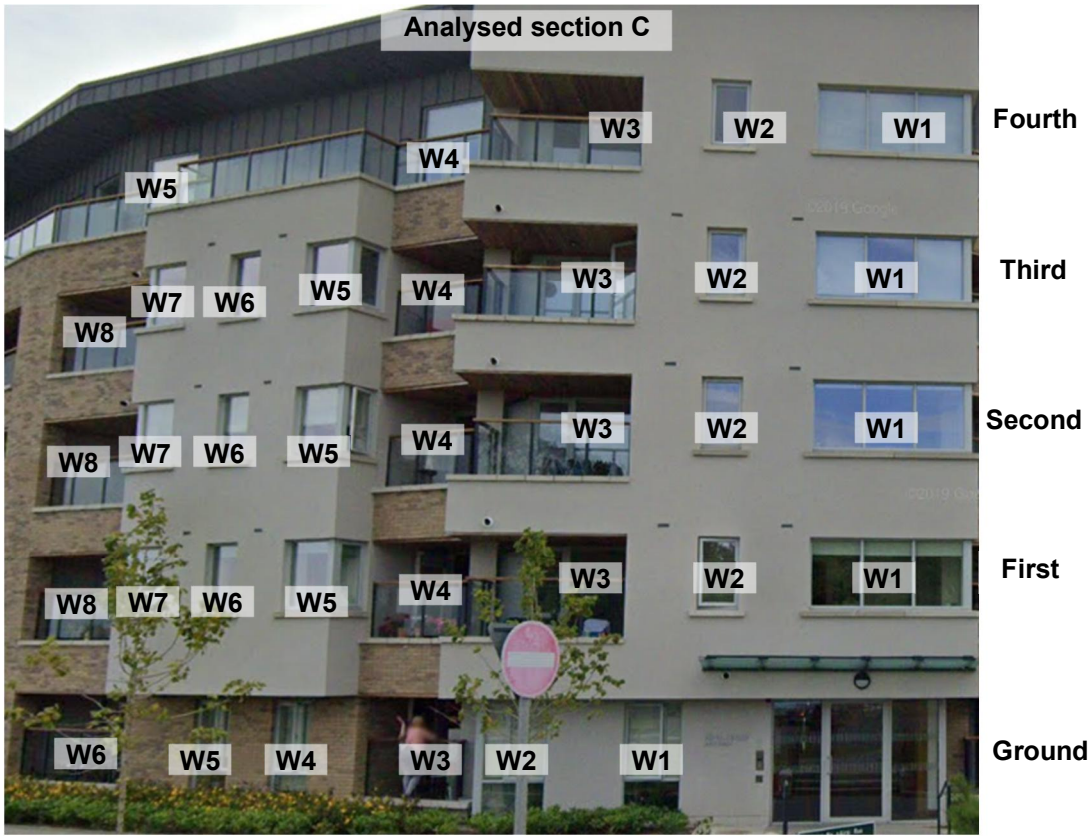

Figure A3: Analysed section C. North west facing to Red Arches Park / Red Arches Drive. Windows analysed labelled. Via Google 2021.

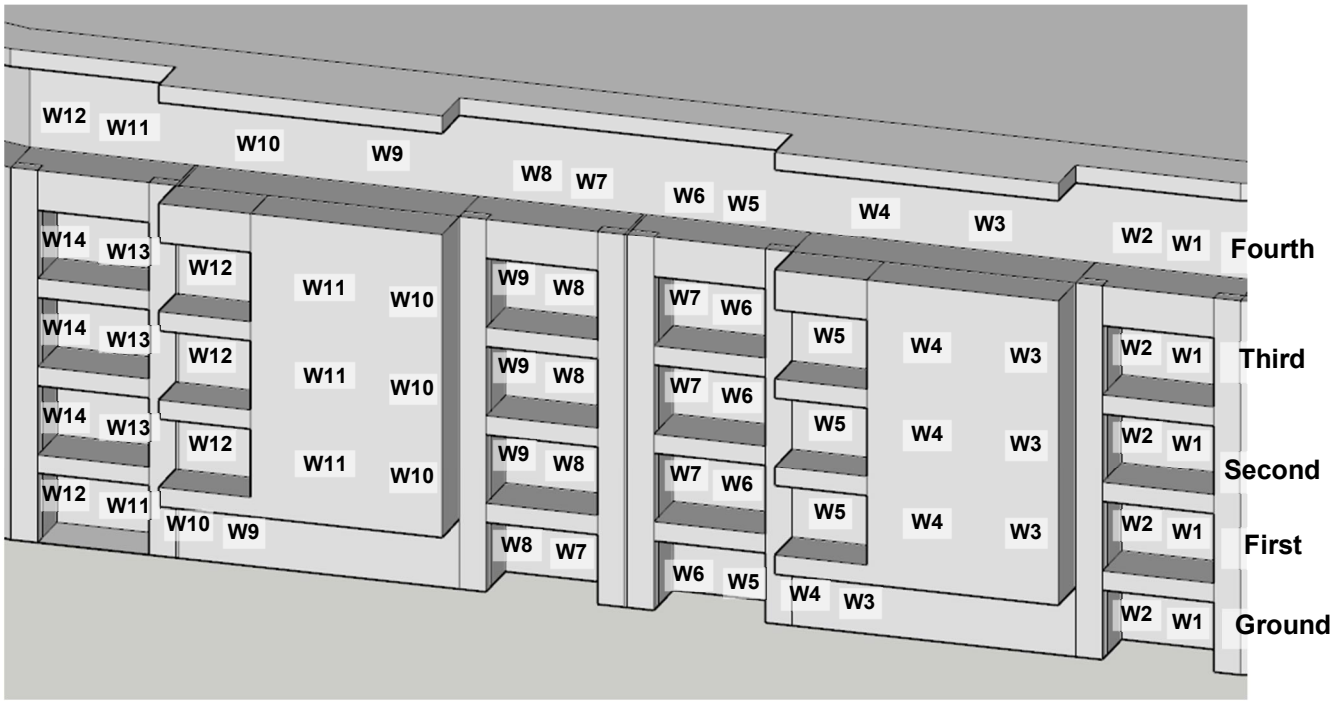

Figure A4: Analysed section D. North facing to Red Arches Drive and Sector 8C. Window positions analysed labelled. Via calculation model.

Table A1: Vertical sky component results Willow, Birch, Sycamore and Beech Houses – including overhangs.

Section	Floor	Window	Vertical sky component, % BEFORE	Vertical sky component, % AFTER	Ratio AFTER/BEFORE
Section A	Ground	W1	0.2	0.2	1.00
		W2	0.1	0.1	1.00
		W3	0.7	0.4	0.58
		W4	2.5	2.1	0.87
		W5	0.6	0.6	0.90
		W6	0.0	0.0	-
	First	W1	0.9	0.9	1.00
		W2	0.6	0.6	1.00
		W3	28.2	28.0	0.99
		W4	28.4	28.1	0.99
		W5	2.3	2.0	0.84
		W6	1.2	1.1	0.92
		W7	0.6	0.6	1.00
	Second	W1	3.4	3.4	1.00
		W2	2.9	2.9	1.00
		W3	32.3	32.1	0.99
		W4	32.4	32.1	0.99
		W5	5.4	5.0	0.94
		W6	3.4	3.3	0.98
		W7	3.0	3.0	1.00
	Third	W1	5.8	5.8	1.00
		W2	5.5	5.5	1.00
		W3	36.2	36.0	0.99
		W4	36.3	36.1	0.99
		W5	8.3	8.0	0.97

Section	Floor	Window	Vertical sky component, % BEFORE	Vertical sky component, % AFTER	Ratio AFTER/BEFORE
		W6	5.6	5.5	0.99
		W7	5.3	5.3	1.00
	Fourth	W1	27.4	27.2	0.99
		W2	24.8	24.5	0.99
		W3	19.4	19.1	0.99
		W4	18.9	18.7	0.99
		W5	25.2	25.0	0.99
		W6	27.3	27.1	0.99
Section B	Ground	W1	2.2	2.0	0.89
		W2	12.4	11.2	0.91
		W3	12.9	11.6	0.90
		W4	3.5	3.3	0.94
	First	W1	2.7	2.6	0.94
		W2	32.4	31.1	0.96
		W3	32.9	31.6	0.96
		W4	33.4	32.0	0.96
		W5	4.0	3.8	0.94
	Second	W1	4.7	4.5	0.97
		W2	34.9	33.9	0.97
		W3	35.2	34.1	0.97
		W4	35.5	34.4	0.97
		W5	4.5	4.3	0.96
	Third	W1	6.5	6.3	0.98
		W2	37.2	36.4	0.98
		W3	37.4	36.5	0.98
		W4	37.5	36.6	0.98
		W5	5.0	4.8	0.97
	Fourth	W1	28.1	27.5	0.98
		W2	16.5	16.3	0.98
Section C	Ground	W1	9.0	5.3	0.59
		W2	11.2	5.9	0.53
		W3	5.1	1.6	0.32
		W4	23.9	13.8	0.58
		W5	24.0	13.6	0.57
		W6	7.2	0.6	0.08
	First	W1	36.7	32.8	0.89
		W2	37.2	32.8	0.88
		W3	10.4	6.0	0.58
		W4	4.8	1.7	0.35
		W5	39.0	30.7	0.79
		W6	39.1	30.5	0.78
		W7	39.1	30.3	0.77
		W8	7.2	0.7	0.09
	Second	W1	37.6	34.6	0.92
		W2	38.0	34.6	0.91
		W3	10.5	6.7	0.64
		W4	4.8	1.9	0.40
		W5	39.1	33.0	0.84
		W6	39.2	32.9	0.84
		W7	39.2	32.8	0.84
		W8	7.2	1.9	0.26
	Third	W1	38.5	36.3	0.94
		W2	38.7	36.2	0.94
		W3	10.6	7.8	0.74
		W4	4.8	2.8	0.58

Section	Floor	Window	Vertical sky component, % BEFORE	Vertical sky component, % AFTER	Ratio AFTER/BEFORE
		W5	39.2	35.0	0.89
		W6	39.3	35.0	0.89
		W7	39.3	35.0	0.89
		W8	7.2	3.6	0.50
	Fourth	W1	39.2	37.7	0.96
		W2	39.2	37.6	0.96
		W3	12.9	11.1	0.86
		W4	25.6	23.2	0.91
		W5	28.3	25.9	0.91
Section D	Ground	W1	6.7	1.8	0.26
		W2	6.9	0.5	0.07
		W3	10.8	4.6	0.43
		W4	12.6	6.9	0.55
		W5	7.0	4.5	0.65
		W6	7.0	3.4	0.48
		W7	6.5	5.0	0.76
		W8	7.0	3.7	0.52
		W9	10.9	7.6	0.70
		W10	12.5	9.4	0.76
		W11	6.8	6.3	0.94
		W12	6.8	4.8	0.71
	First	W1	6.5	1.8	0.27
		W2	6.9	0.7	0.10
		W3	39.4	31.6	0.80
		W4	39.4	32.5	0.82
		W5	10.7	6.4	0.59
		W6	7.0	4.8	0.68
		W7	6.7	3.3	0.49
		W8	6.3	5.0	0.78
		W9	7.0	3.9	0.56
		W10	39.4	35.8	0.91
		W11	39.4	36.2	0.92
		W12	10.5	8.9	0.84
		W13	6.8	6.4	0.95
		W14	6.8	5.1	0.75
	Second	W1	6.5	3.1	0.47
		W2	6.9	2.0	0.29
		W3	39.4	33.8	0.86
		W4	39.4	34.4	0.87
		W5	10.7	7.5	0.70
		W6	7.0	5.3	0.76
		W7	6.7	4.1	0.61
		W8	6.3	5.2	0.83
		W9	7.0	4.7	0.66
		W10	39.5	36.8	0.93
		W11	39.5	37.0	0.94
		W12	10.5	9.2	0.88
		W13	6.8	6.4	0.95
		W14	6.8	5.4	0.80
	Third	W1	6.5	4.2	0.65
		W2	6.9	3.5	0.51
		W3	39.5	35.8	0.91
		W4	39.5	36.2	0.92
		W5	10.7	8.6	0.80
		W6	7.0	5.7	0.82

Section	Floor	Window	Vertical sky component, % BEFORE	Vertical sky component, % AFTER	Ratio AFTER/BEFORE
		W7	6.7	4.8	0.72
		W8	6.3	5.4	0.86
		W9	7.0	5.4	0.77
		W10	39.5	37.7	0.95
		W11	39.5	37.8	0.96
		W12	10.5	9.6	0.91
		W13	6.8	6.5	0.96
		W14	6.8	5.8	0.85
	Fourth	W1	26.6	24.4	0.92
		W2	24.4	22.3	0.91
		W3	18.6	16.7	0.90
		W4	19.5	17.8	0.91
		W5	24.5	23.0	0.94
		W6	26.1	24.6	0.94
		W7	26.1	24.8	0.95
		W8	24.3	23.1	0.95
		W9	18.6	17.5	0.94
		W10	19.5	18.5	0.95
		W11	24.7	23.8	0.96
		W12	26.6	25.8	0.97

Table A2: Vertical sky component results Willow, Birch, Sycamore and Beech Houses – Recalculation of windows below initial guidelines without overhangs (but still including any set back enclosure).

Section	Floor	Window	Vertical sky component, % BEFORE	Vertical sky component, % AFTER	Ratio AFTER/BEFORE
Section A	Ground	W3	25.9	25.6	0.99
		W6	15.6	15.6	1.00
Section C	Ground	W1	36.5	30.9	0.84
		W2	36.9	30.5	0.83
		W3	17.3	12.2	0.70
		W4	38.6	28.4	0.74
		W5	38.8	28.4	0.73
		W6	24.2	15.1	0.62
	First	W3	37.6	32.5	0.86
		W4	17.4	13.1	0.76
		W8	24.4	17.2	0.70
	Second	W3	38.2	34.3	0.90
		W4	17.5	14.2	0.81
		W8	25.0	19.7	0.79
	Third	W3	38.8	36.0	0.93
		W4	18.5	16.2	0.88
		W8	39.3	35.0	0.89
Section D	Ground	W1	24.6	18.3	0.74
		W2	24.5	15.6	0.63
		W3	39.4	31.5	0.80
		W4	39.4	32.3	0.82
		W5	24.6	21.7	0.88
		W6	25.6	20.7	0.81
		W7	23.9	22.2	0.93
		W8	24.9	20.9	0.84
		W9	39.4	35.6	0.90
		W10	39.4	35.9	0.91
		W12	24.9	22.5	0.90

Section	Floor	Window	Vertical sky component, % BEFORE	Vertical sky component, % AFTER	Ratio AFTER/BEFORE
	First	W1	24.8	19.9	0.80
		W2	24.7	17.7	0.72
		W5	39.4	33.8	0.86
		W6	24.8	22.5	0.91
		W7	24.7	20.9	0.84
		W8	24.1	22.7	0.94
		W9	25.1	21.9	0.87
		W14	25.1	23.2	0.92
	Second	W1	25.4	21.9	0.86
		W2	25.3	20.2	0.80
		W5	39.4	35.3	0.89
		W6	25.4	23.7	0.93
		W7	25.3	22.5	0.89
		W9	25.7	23.4	0.91
	Third	W1	29.1	26.8	0.92
		W2	29.1	25.7	0.88
		W7	29.1	27.1	0.93
		W9	29.5	27.9	0.94

Table A3: Vertical sky component results Willow, Birch, Sycamore and Beech Houses – Recalculation of windows below guidelines without overhangs to also exclude any set back enclosure.

Section	Floor	Window	Vertical sky component, % BEFORE	Vertical sky component, % AFTER	Ratio AFTER/BEFORE
Section C	Ground	W3	37.3	27.6	0.74
		W6	39.0	28.1	0.72
	First	W4	37.4	29.6	0.79
		W8	39.1	30.4	0.78
	Second	W8	39.2	32.9	0.84
Section D	Ground	W1	39.4	29.0	0.74
		W2	39.4	29.4	0.75
	First	W2	39.4	31.6	0.80

Properties at Red Arches Drive / Red Arches Park

Figure A5: Analysed section E. East facing on corner of Red Arches Drive and Red Arches Park. Windows analysed labelled. Ground W1 is obscured by a wall. Via Google 2021.

Figure A6: Analysed section F. North facing on corner of Red Arches Drive and Red Arches Park. Windows analysed labelled. Ground windows W1-W4 are obscured by a wall. Via Google 2021.

Table A4: Vertical sky component results for closest windows on the corner of Red Arches Drive and Red Arches Park.

Section	Floor	Window	Vertical sky component, % BEFORE	Vertical sky component, % AFTER	Ratio AFTER/ BEFORE
Section E	Ground	W1	7.5	7.5	1.00
		W2	28.0	25.5	0.91
		W3	19.8	17.8	0.90
		W4	24.3	22.5	0.93
		W5	20.8	19.3	0.93
	First	W1	23.9	21.8	0.91
		W2	30.4	28.4	0.94
		W3	28.0	26.2	0.94
		W4	21.2	19.6	0.93
		W5	27.2	25.8	0.95
		W6	23.8	22.6	0.95
	Second	W1	33.5	32.0	0.95
		W2	30.6	29.2	0.95
		W3	31.8	30.5	0.96
		W4	24.3	23.1	0.95
		W5	30.6	29.7	0.97
		W6	28.9	28.1	0.97
	Third	W1	36.1	35.1	0.97
		W2	34.0	33.1	0.97
		W3	35.5	34.6	0.98
		W4	35.2	34.4	0.98
Section F	Ground	W1	9.7	9.7	1.00

Section	Floor	Window	Vertical sky component, % BEFORE	Vertical sky component, % AFTER	Ratio AFTER/ BEFORE
		W2	27.4	26.1	0.95
		W3	24.3	22.6	0.93
		W4	19.9	18.2	0.92
		W5	38.6	34.3	0.89
		W6	37.7	33.6	0.89
		W7	27.7	25.4	0.92
	First	W1	29.3	27.1	0.92
		W2	12.8	10.4	0.81
		W3	29.4	25.6	0.87
		W4	23.5	20.1	0.86
		W5	38.8	35.2	0.91
		W6	38.0	34.6	0.91
		W7	28.3	26.2	0.93
	Second	W1	34.0	32.3	0.95
		W2	34.6	32.8	0.95
		W3	35.3	33.2	0.94
		W4	39.1	36.2	0.93
		W5	38.9	36.1	0.93
		W6	33.5	31.8	0.95
	Third	W1	36.3	35.3	0.97
		W2	36.7	35.5	0.97
		W3	37.0	35.6	0.96

GA1

The closest part of the GA1 site is to the south of Sectors 6A/6B. Ground floor windows and rooms are assessed for daylight via the vertical sky component with the proposed development in place.

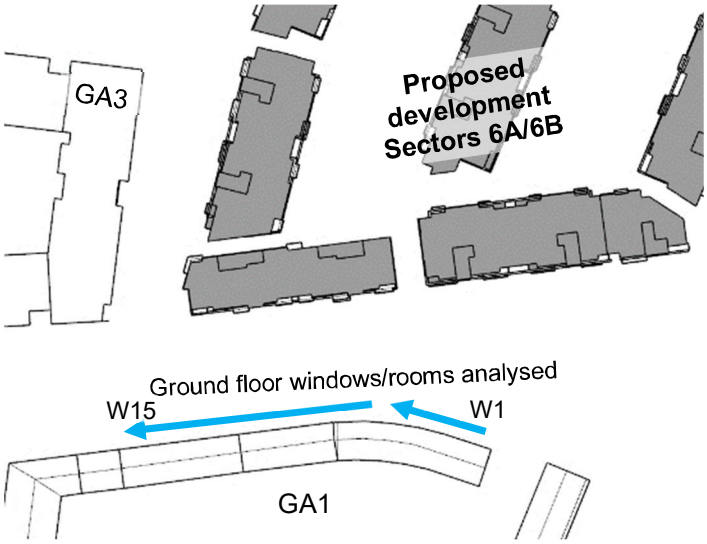

Figure A7: Areas analysed to the nearest consented parts of GA1.

Table A5: Vertical sky component and daylight distribution results for nearest parts of GA1.

Section	Floor	Window	Vertical sky component, %
			AFTER
GA1	Ground	W1	32.0
		W2	31.6
		W3	31.0
		W4	30.1
		W5	29.1
		W6	28.5
		W7	28.4
		W8	28.5
		W9	28.7
		W10	29.0
		W11	29.4
		W12	29.9
		W13	30.4
		W14	30.8
		W15	31.2

GA3

GA3 is to the west of the proposed development site. Vertical sky components have been calculated with the proposed development in place. The results are shown with and without balconies.

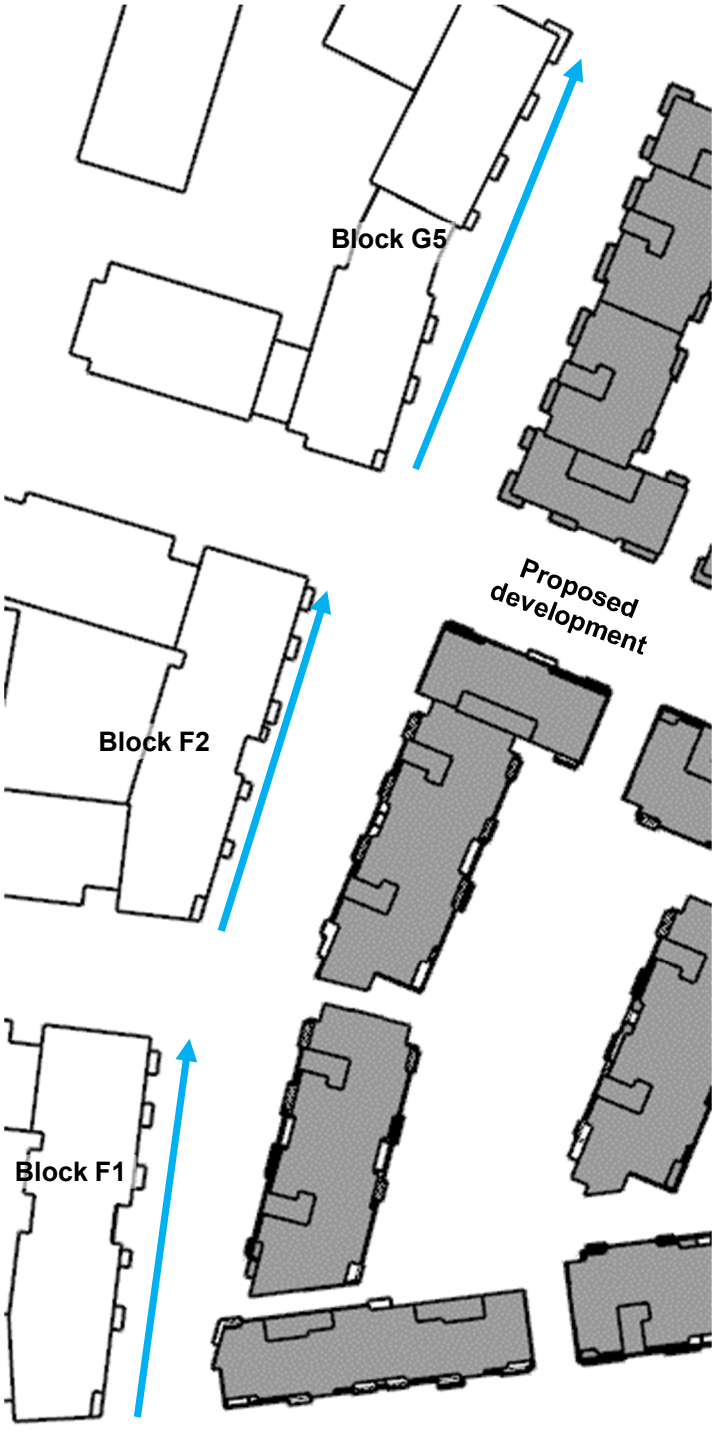

Figure A7: Analysed sections at windows facing the development at GA3 to the west. Blue arrows show order of windows analysed at each block.

Table A5: Vertical sky component results at example points on worst-case facades at the potential development to the west. Where the façade would face within 90° of due south, sunlight provision is also assessed.

Block / Floor	Window	Daylight - Vertical sky component, % AFTER		Sunlight – probable sunlight hours, % AFTER			
		With balconies	Without balconies	ANNUAL with balconies	WINTER with balconies	ANNUAL without balconies	WINTER without balconies
Block F1 Ground	W1	12.7	25.3	26	16	39	16
	W2	17.1	24.8	18	12	39	15
	W3	20.9	24.3	23	9	38	15
	W4	12.6	23.8	19	9	36	13
	W5	11.9	24.3	19	6	34	10
	W6	16.4	24.4	12	5	35	10
	W7	18.1	24.7	24	4	35	10
	W8	18.0	24.9	12	3	35	10
Block F1 First	W1	12.5	28.3	24	15	49	19
	W2	30.8	31.0	46	19	46	19
	W3	29.0	30.0	44	18	44	18
	W4	23.9	29.5	44	17	44	17
	W5	8.2	29.0	19	15	44	17
	W6	23.2	28.4	21	6	43	15
	W7	22.7	28.0	34	9	42	14
	W8	8.6	27.9	14	9	41	14
	W9	22.8	22.8	20	2	20	2
	W10	22.2	22.2	32	8	32	8
	W11	22.7	27.6	40	12	40	12
	W12	7.0	27.8	12	7	40	12
	W13	22.5	27.9	18	2	40	12
	W14	22.5	28.1	32	6	40	12
	W15	7.2	28.2	10	4	41	12
	W16	22.6	28.4	20	3	41	12
	W17	7.6	28.6	12	6	41	12
Block F2 Ground	W1	12.8	23.2	31	11	37	11
	W2	18.0	23.3	18	7	37	11
	W3	20.7	23.3	25	6	37	11
	W4	12.5	23.5	20	8	38	11
	W5	12.0	19.4	14	0	14	0
	W6	12.9	23.6	15	6	35	8
	W7	13.1	24.8	24	7	39	11
	W8	15.3	25.0	17	6	40	11
	W9	20.9	25.5	27	4	42	11
	W10	15.6	26.5	20	6	44	11
Block F2 First	W1	6.0	23.4	14	8	45	14
	W2	26.4	27.2	44	14	44	14
	W3	22.8	27.2	44	14	44	14
	W4	8.3	27.3	18	13	45	14
	W5	23.8	27.3	27	5	44	14
	W6	23.0	27.4	35	8	45	14
	W7	8.5	27.5	15	9	44	13
	W8	22.9	22.9	25	3	25	3
	W9	21.9	21.9	37	9	37	9
	W10	22.9	27.5	45	14	45	14
	W11	7.2	27.7	14	8	45	14
	W12	23.8	27.9	25	4	45	14
	W13	23.6	28.1	36	8	46	14
	W14	7.9	28.3	17	9	47	14

Block / Floor	Window	Daylight - Vertical sky component, % AFTER		Sunlight – probable sunlight hours, % AFTER			
		With balconies	Without balconies	ANNUAL with balconies	WINTER with balconies	ANNUAL without balconies	WINTER without balconies
	W15	21.3	28.7	21	3	48	14
	W16	9.0	29.5	18	9	49	14
Block G5 Ground	W1	25.6	25.8	41	14	41	14
	W2	9.8	21.0	16	8	35	12
	W3	18.5	20.8	20	5	36	12
	W4	16.5	16.5	14	0	14	0
	W5	20.1	20.1	30	8	30	8
	W6	20.0	20.0	31	9	31	9
	W7	16.7	16.7	33	10	33	10
	W8	9.4	19.6	21	11	34	11
	W9	16.1	19.2	22	7	35	11
	W10	14.9	19.0	28	8	35	10
	W11	8.1	18.7	14	8	34	10
	W12	14.7	18.8	17	6	34	10
	W13	15.6	19.2	28	7	36	10
	W14	9.2	19.7	19	8	36	10
	W15	15.9	20.7	18	5	37	10
	W16	18.5	21.9	28	6	37	10
	W17	13.2	24.0	23	8	39	10
Block G5 First	W1	28.7	28.9	46	16	46	16
	W2	21.7	26.4	44	16	44	16
	W3	6.4	25.8	15	10	44	15
	W4	19.5	25.3	19	5	43	15
	W5	18.8	24.8	33	10	43	15
	W6	5.3	24.4	12	8	42	15
	W7	21.2	24.0	24	5	42	14
	W8	19.1	19.1	17	1	17	1
	W9	23.1	23.1	35	10	35	10
	W10	23.0	23.0	36	11	36	11
	W11	19.5	19.5	39	12	39	12
	W12	5.3	22.5	13	11	40	13
	W13	18.2	22.0	24	6	40	13
	W14	16.7	21.7	32	9	40	12
	W15	4.3	21.3	7	6	40	12
	W16	15.7	21.3	17	3	39	12
	W17	16.9	21.4	32	9	40	13
	W18	5.1	21.8	11	7	40	12
	W19	16.0	22.5	15	2	39	12
	W20	19.4	23.5	28	6	39	11
	W21	8.6	25.3	17	6	42	12

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Appendix B Shadow Plotting

Shadow plots have been created for 21st March (spring equinox), 21st June (summer solstice) and 21st December (winter solstice) at clock times 8am, 10am, 12pm, 2pm and 4pm (plus 6pm in summer).

Plots are also shown for January, February, April and May. This gives a month-by-month assessment of sunlight provision at and around the site to allow for a full understanding of the year round level of overshadowing.

The shadows for 21st September (autumn equinox) are the same as those for 21st March (spring equinox). The shadows for 21st January, 21st February, 21st April and 21st May are the same as those at or around the 21st of November, October, August and July respectively.

In the plots, the times given are clock times. Between the end of March and the end of October, Irish Standard Time (IST) applies. The plots for September and October therefore correspond to the shadows produced one hour later in summer time; thus at 1pm IST in September/October, the shadows are as plotted on the 12pm GMT diagram for March/February. The March and February plots therefore correspond to 9am, 11am, 1pm, 3pm and 5pm IST in September and October.

The shadow diagrams in this appendix are shown in order from December to June.


North
21st Dec
08:00GMT
Proposed development site


North
21st Dec
10:00GMT
Proposed development site

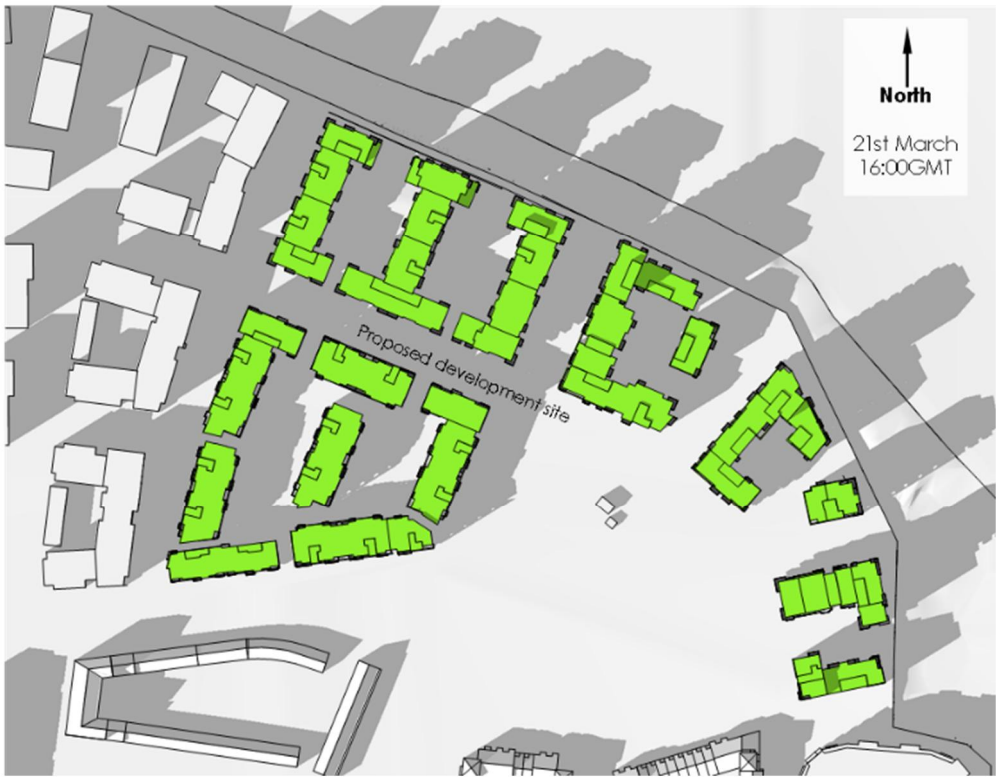

North
21st Jan
14:00GMT
Proposed development site

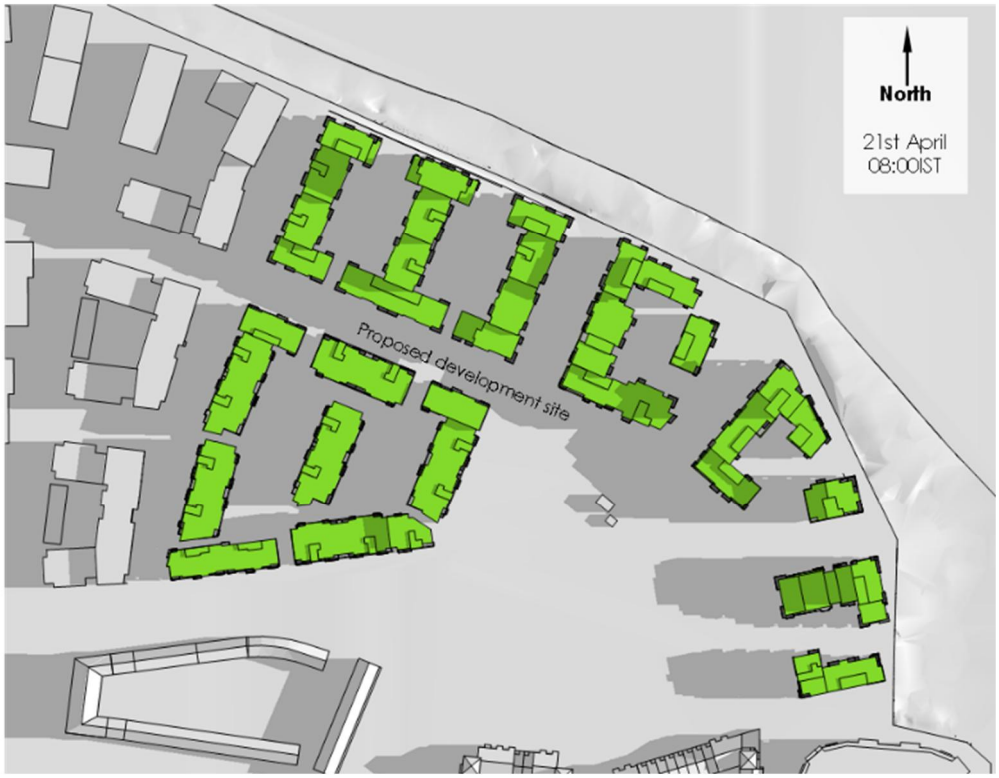

North
21st Jan
16:00GMT
Proposed development site


North
21st March
10:00GMT
Proposed development site


North
21st March
12:00GMT
Proposed development site


North
21st March
14:00GMT
Proposed development site

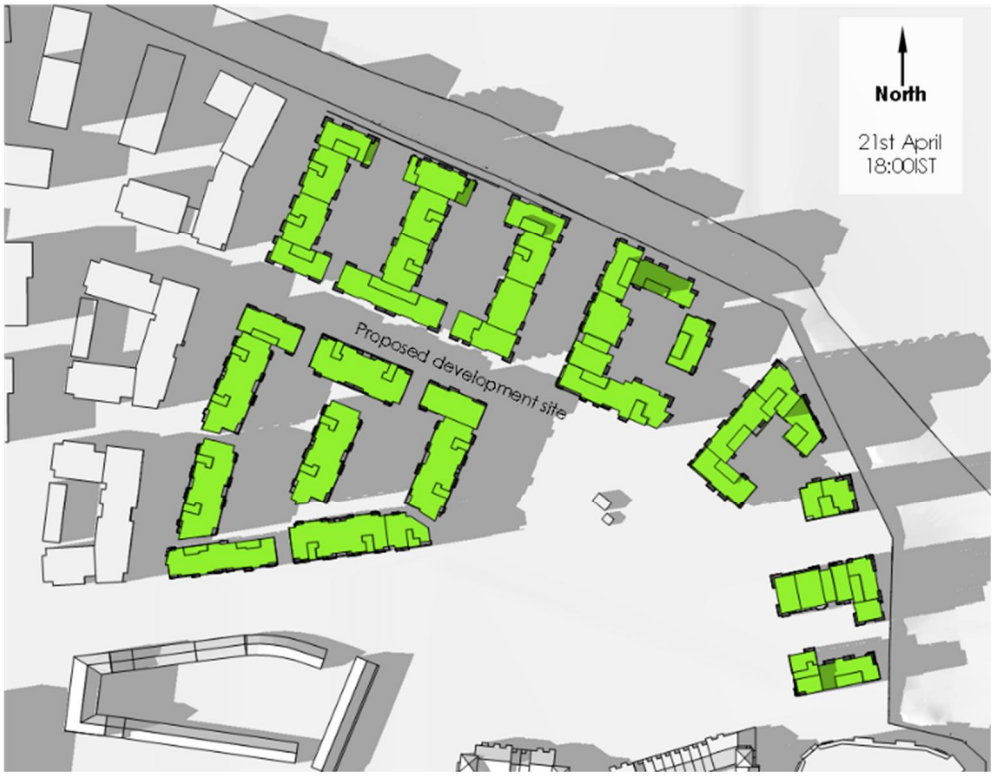

North
21st March
16:00GMT
Proposed development site




North
21st April
12:00IST
Proposed development site


North
21st April
14:00IST
Proposed development site


North
21st April
16:00IST
Proposed development site

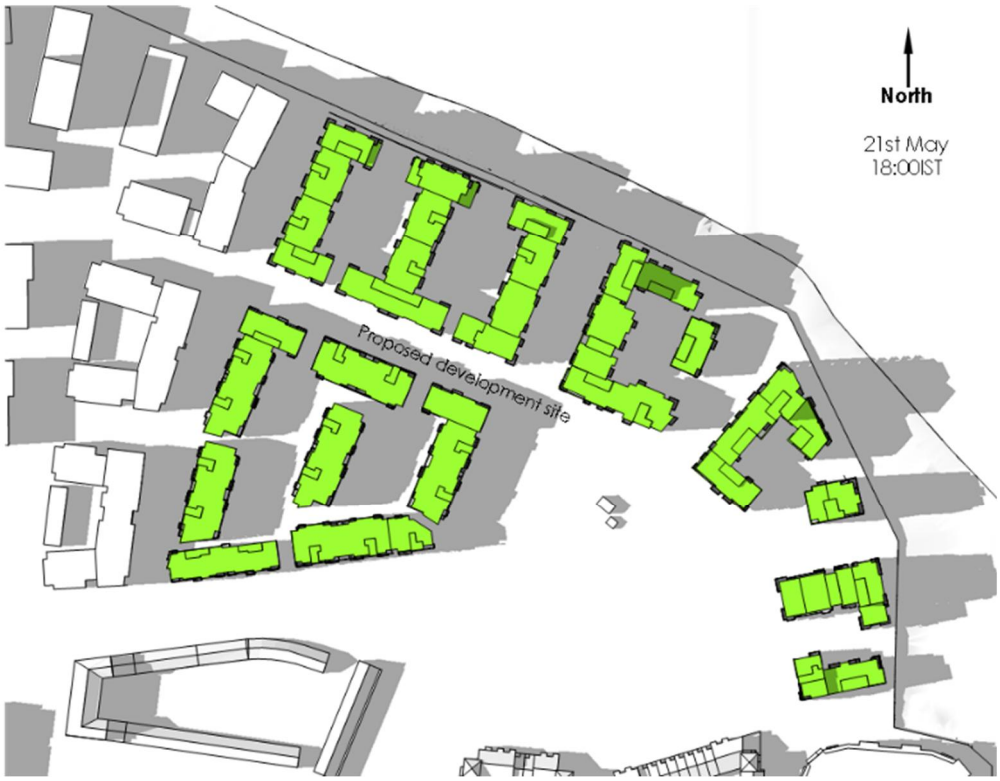

North
21st April
18:00IST
Proposed development site


North
21st May
08:00IST
Proposed development site


North
21st May
10:00IST
Proposed development site


North
21st May
12:00IST
Proposed development site


North
21st May
14:00IST
Proposed development site




North
21st June
08:00IST
Proposed development site


North
21st June
10:00IST
Proposed development site


North
21st June
12:00IST
Proposed development site


North
21st June
14:00IST
Proposed development site