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DAYLIGHT AND SUNLIGHT ASSESSMENT ANALYSIS REPORT

Development: Kilcross, Sandyford, Dublin 18
(RDF Architects Ref 24-001)

Client: Sonas

Date: 23rd February 2024

Executive Summary

Advanced computational methods allow designers to examine real spaces and digitally simulated spaces with emerging luminance-based metrics to assess visual comfort and aspects of quality. This kind of guidance helps designers seeking to refine design solutions based upon these metrics.

The standards for daylight and sunlight access in buildings (and the methodologies for assessment of same) suggested in the BRE Guide (2022) a comprehensive revision of the 2011 edition of Site layout planning for daylight and sunlight: a guide to good practice. The BRE (Building Research Establishment) Guide (2022) does not set out rigid standards or limits, it is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location. This guide gives advice on site layout planning to achieve good daylighting and sun lighting, within buildings and in the open spaces between them. The recommendation is to read the BRE guide in conjunction with the interior daylighting recommendations in BS EN 17037 Daylight in buildings, and in the CIBSE publication LG 10 Daylighting – a guide for designers.

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This report examines how the proposed development performs in terms of light. The report is in accordance with "Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice" 2022 and BS EN 17037 - Daylighting of Buildings.

Preliminary Overview

The aerial photograph shows the context for the site and the closest neighbouring sites. The site outlined in red is located at Killcross, Sandyford, Dublin 18.

Subject site

Aerial Google Earth image of site location at Killcross, Sandyford, Dublin 18.

Design Model

A 3D model of existing site and the surrounding neighbouring properties and the proposed development in place was modelled from survey information and geo-referenced to its correct location and an accurate solar daylight system to provide the analysis of Shadow and Daylight Factor comparing the existing open field x new development impact on the surrounding area.
The “light gray” colour indicates surrounding environment, the proposed building coloured is bounded in red.

Daylight - Internal Spaces

The BRE Guide (2022) states as follows (at paragraph Appendix C: Interior daylighting recommendations) in relation to daylight access within new development. For daylight provision in buildings, BS EN 17037 provides two methodologies. One is based on target illuminances from daylight to be achieved over specified fractions of the reference plane for at least half of the daylight hours in a typical year. The other, alternative, method is based on calculating the daylight factors achieved over specified fractions of the reference plane.

Illuminance factor and Daylight factor method test is mainly used to check the light levels within new developments. The calculations simulate the illuminance or daylight factor at calculation points within a proposed space.

The illuminance method is used in this report which is a ratio that represents the amount of light falling on a surface, usually measured in lux. This method involves using climatic data for the location of the site to calculate the illuminance from daylight at each point on an assessment grid on the reference plane at an at least hourly interval for a typical year. The calculation method used is a grid of calculation points on the reference plane which simulates the illuminance from daylight.

The recommendation for daylight provision in interior spaces are minimum, medium and high. The UK National Annex gives illuminance recommendations of 100 lux in bedrooms, 150 lux in living rooms and 200 lux in kitchens. These are the median illuminances, to be exceeded over at least 50% of the assessment points in the room for at least half of the daylight hours. For compliance with the standard, a daylit space should achieve the minimum level of recommendation. Where a room has a shared use, the highest target should apply.

For Kilcross Development short-term apartments it has used the Illuminance Method to calculate the averages of all the habitable rooms of the building. The results of all apartments tested shows all rooms with numbers bigger than the minimum average required, what means that those spaces have enough daylight averages.

Activity: Calculation 8
Design: 24-001 - Daylight & Shadow
Period: 1/01 - 12/31
Occupancy: European Standard EN17037
Location: 25 Kilcross Lawn, Sandyford, Dublin 18, D18 E1X7, Ireland (53.27°, -6.23°)
North Angle: 0.00°
Sky Type: Climate-based

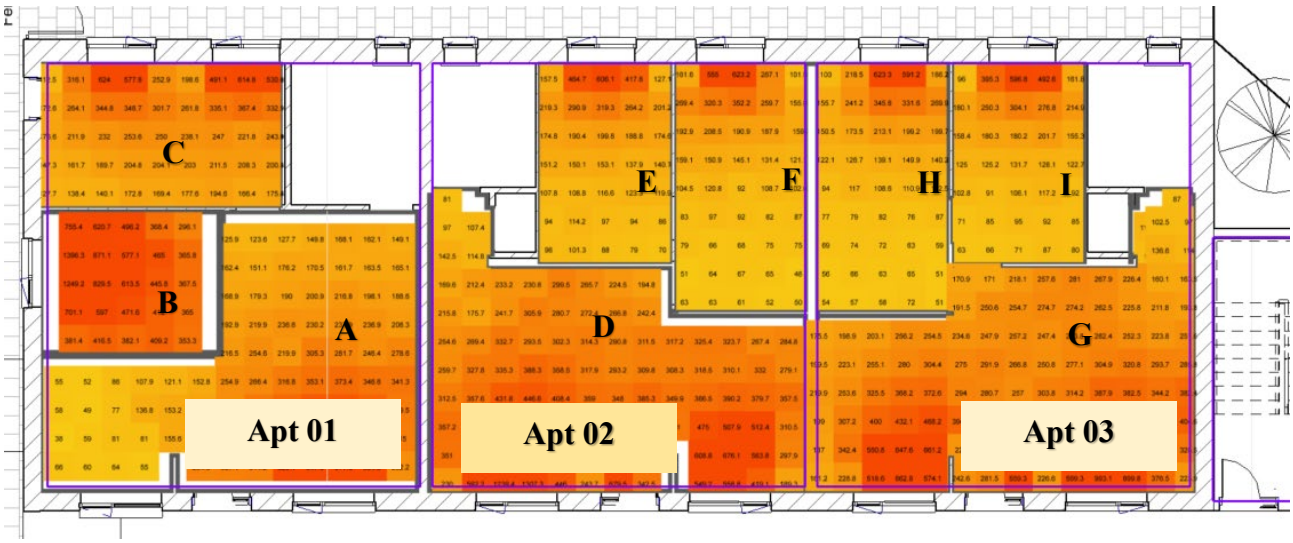
Minimum Illuminance:

Compliance	Illuminance	Area
High	500 lux	95%
Medium	300 lux	95%
Minimum	100 lux	95%

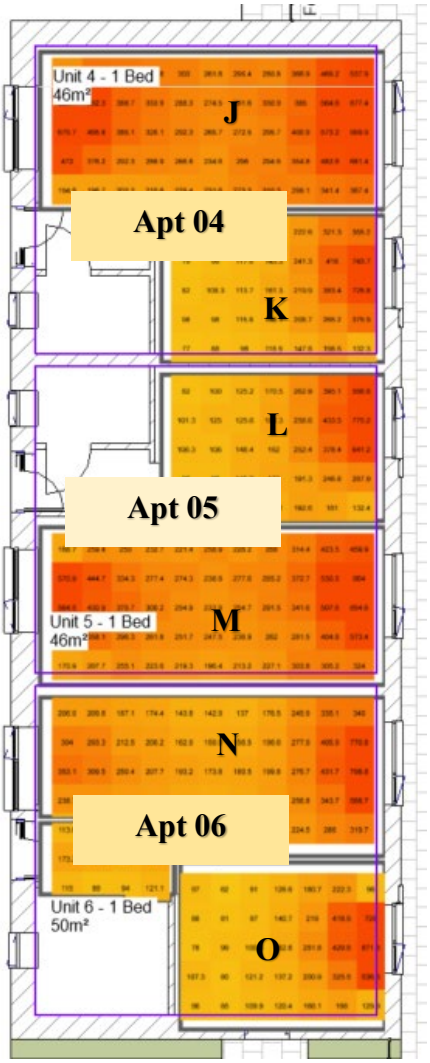
Average Illuminance							
Ground Floor Apartments							
No. Apartment	Orientation Aspect	Apartment Type	Room	Room Type	Illuminance Results		
					Average (lux) annual illuminance	Target Recommendations	Result
Apt 01	N/S Dual	2 Bed	A	Kitchen/Dining	245.92 lux	200 lux	Minimum
			B	Bedroom 1	568.27 lux	100 lux	High
			C	Bedroom 2	260.34 lux	100 lux	Minimum
Apt 02	N/S Dual	2 Bed	D	Kitchen/Dining	370.18lux	200 lux	Medium
			E	Bedroom 1	177.88 lux	100 lux	Minimum
			F	Bedroom 2	147.38 lux	100 lux	Minimum
Apt 03	N/S Dual	2 Bed	G	Kitchen/Dining	321.3 lux	200 lux	Medium
			H	Bedroom 1	145.65 lux	100 lux	Minimum
			I	Bedroom 2	165.13 lux	100 lux	Minimum
Apt 04	E/W Dual	1 Bed	J	Kitchen/Dining	369.89 lux	200 lux	Medium
			K	Bedroom	202.57 lux	100 lux	Minimum
Apt 05	E/W Dual	1 Bed	L	Bedroom	220.47 lux	100 lux	Minimum
			M	Kitchen/Dining	330.23 lux	200 lux	Medium
Apt 06	E/W Dual	1 Bed	N	Kitchen/Dining	234.78 lux	200 lux	Minimum
			O	Bedroom	201.32 lux	100 lux	Minimum

Reference
Lx for 95% of assessment grid - Minimum average of illuminance **100**

Illuminance recommendations of 100 lux in bedrooms, 150 lux in living rooms and 200 lux in kitchens. These are the median illuminances, to be exceeded over at least 50% of the assessment points in the room for at least half of the daylight hours.



Block 1 -GF



Block 2 - GF

Key Plan

Ground Floor Plans

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North Angle: 0.00°
Sky Type: Climate-based

Minimum Illuminance:

Compliance	Illuminance	Area
High	500 lux	95%
Medium	300 lux	95%
Minimum	100 lux	95%

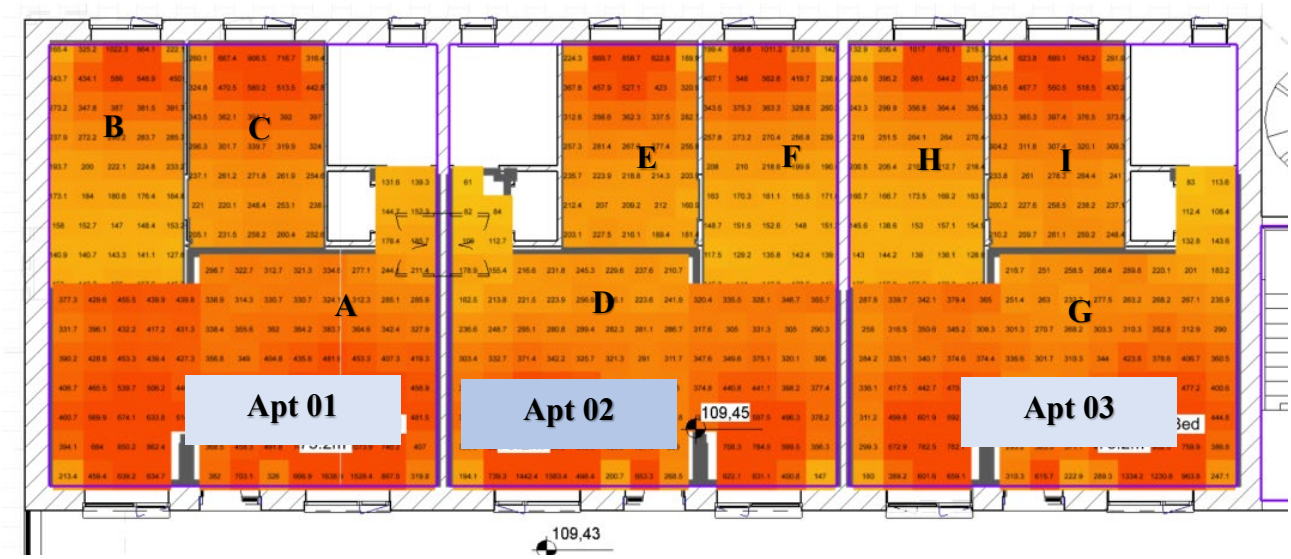
Average Illuminance

First Floor Apartments

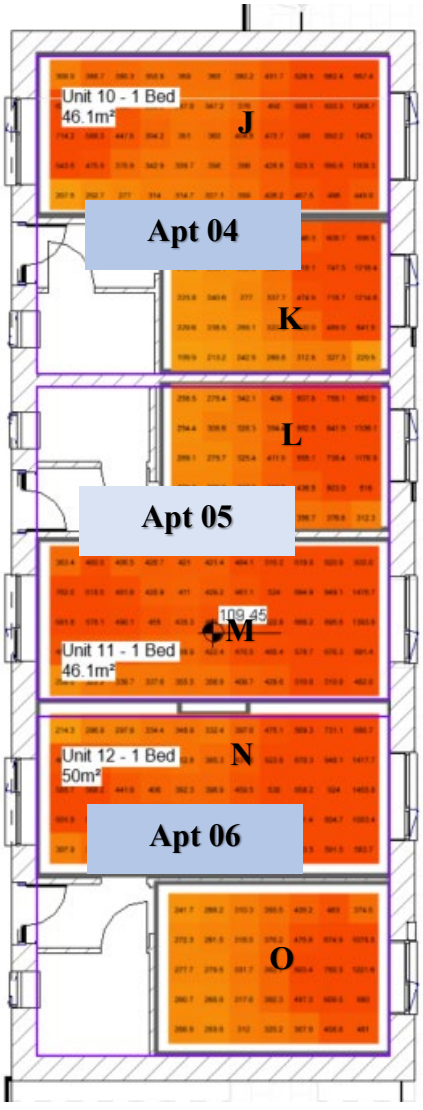
No. Apartment	Orientation Aspect	Apartment Type	Room	Room Type	Illuminance Results		
					Average (lux) annual illuminance	Target Recommendations	Result
Apt 01	N/S Dual	2 Bed	A	Kitchen/Dining	470.32 lux	200 lux	High
			B	Bedroom 1	352.71 lux	100 lux	High
			C	Bedroom 2	270.75 lux	100 lux	Minimum
Apt 02	N/S Dual	2 Bed	D	Kitchen/Dining	383.62 lux	200 lux	Medium
			E	Bedroom 1	307.69 lux	100 lux	Medium
			F	Bedroom 2	257.41 lux	100 lux	Minimum
Apt 03	N/S Dual	2 Bed	G	Kitchen/Dining	394.42 lux	200 lux	Medium
			H	Bedroom 1	347.24 lux	100 lux	Medium
			I	Bedroom 2	256.34 lux	100 lux	Minimum
Apt 04	E/W Dual	1 Bed	J	Kitchen/Dining	548.41 lux	200 lux	High
			K	Bedroom	461.88 lux	100 lux	High
Apt 05	E/W Dual	1 Bed	L	Bedroom	437.37 lux	100 lux	Medium
			M	Kitchen/Dining	528.14 lux	200 lux	High
Apt 06	E/W Dual	1 Bed	N	Kitchen/Dining	491.08 lux	200 lux	High
			O	Bedroom	403.13 lux	100 lux	Medium

Reference
Lx for 95% of assessment grid - Minimum average of illuminance **100**

Illuminance recommendations of 100 lux in bedrooms, 150 lux in living rooms and 200 lux in kitchens. These are the median illuminances, to be exceeded over at least 50% of the assessment points in the room for at least half of the daylight hours.



Block 1 - FF



Block 2 – FF

Key Plan

First Floor Plans

Other Results Assessed

Daylight Autonomy (DA) – This score represents the whole building average percentage of occupied hours that meet or exceeds 300 lux.

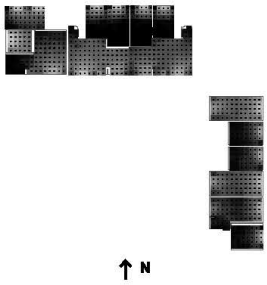
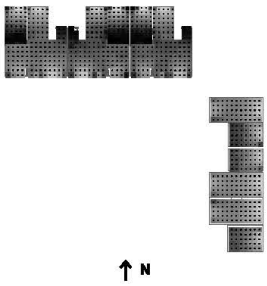
The result below shows that the building have a reasanable illuminance values on average.

- On ground floor 27.8% of the daylight hours have illuminance greather or equals to 300 lux.
- On first floor 43.7% of the daylight hours have illuminance greather or equals to 300 lux.

As per Average Illuminance results above all the rooms pass the minimum target values. The darker rooms which are facing North on Ground Floor have less grid points with illuminance over 100 lux, these points are deep inside in the room, but even though the average result for each of these rooms meet the criteria as described in the BRE 2022.

Daylight Autonomy$_{300}$
Overall Average = 35.90%

ALL AUTO FLOOR 1 AUTO FLOOR 2

Name	Area (m²)	Results	Average percentage of hours ≥ 300 lux
		0 100%	
Auto Floor 1	620.7		27.81%
Auto Floor 2	618.4		43.76%

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North Angle: 0.00°
Sky Type: Climate-based
Illuminance Target: 300 lux

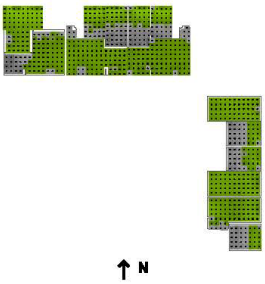
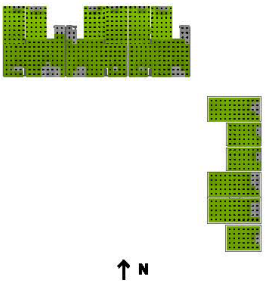
Useful Daylight Illuminance (UDI) – This score represents the whole building average percentage of grid points that are between 100 – 750 lux for greater or equal to 50% of the hours.

The result below proves that the building is well balance for illuminance factor, as the complete floor levels have a high percentage of illuminance between 100 lux and 750 lux, which are the minimum and high targets for the calculation.

- The ground floor level has 75.77% of the floor area with indices between 100 -750 lux for greater or equals to 50% of the daylight hours.
- The first floor level has 90.82% of the floor area with indices between 100 -750 lux for greater or equals to 50% of the daylight hours.

Useful Daylight Illuminance$_{100/750/50\%}$
Averages = UDI-a (100 - 750 lux ≥50% of hours): 83.41%
UDI-s (<100 lux ≥50% of hours): 12.02%
UDI-e (>750 lux ≥50% of hours): 1.71%

ALL AUTO FLOOR 1 AUTO FLOOR 2

Name	Area (m^2)	Results	Percentage of analysis points in each illuminance bin for ≥ 50% of the hours
		Below Above	
Auto Floor 1	620.7		UDI-a (100 - 750 lux): 75.77% UDI-s (<100 lux): 22.59% UDI-e (>750 lux): 0.25%
Auto Floor 2	618.4		UDI-a (100 - 750 lux): 90.82% UDI-s (<100 lux): 1.77% UDI-e (>750 lux): 3.12%

Activity: Calculation 8
Design: 24-001 - Daylight & Shadow
Period: 1/01 - 12/31
Occupancy: European Standard EN17037
Location: 25 Kilcross Lawn, Sandyford, Dublin 18, D18 E1X7, Ireland (53.27°, -6.23°)
North Angle: 0.00°
Sky Type: Climate-based
Lower Bound: 100 lux
Upper Bound: 750 lux
Time Threshold: 50%

Conclusion for Average Daylight Factor

The light study analysis over all the short-term apartments shows that the development has a good annual sunlight exposure for the units specially because all the apartments are dual aspect and presents illuminance over the recommended targets for daylight for at least half of the daylight hours in a typical year.

All the individual rooms achieved/overpassed the light targets of living, kitchen, dining & bedroom spaces. The quality and quantity of natural light in the habitable rooms verified shows the development achieves a good daylight and sunlight averages.

The results satisfied the minimum requirements of the BRE Guide (2022) and BS EN 17037 Daylight in buildings.

Overshadowing - External Spaces

The availability of sunlight should be checked for all open spaces where sunlight is required. This would normally include Gardens, usually the main back garden of a house; Parks and playing fields; Children's playgrounds; Outdoor swimming pools and paddling pools; Sitting out areas, such as those between non-domestic buildings and in public squares; Focal points for views such as a group of monuments or fountains.

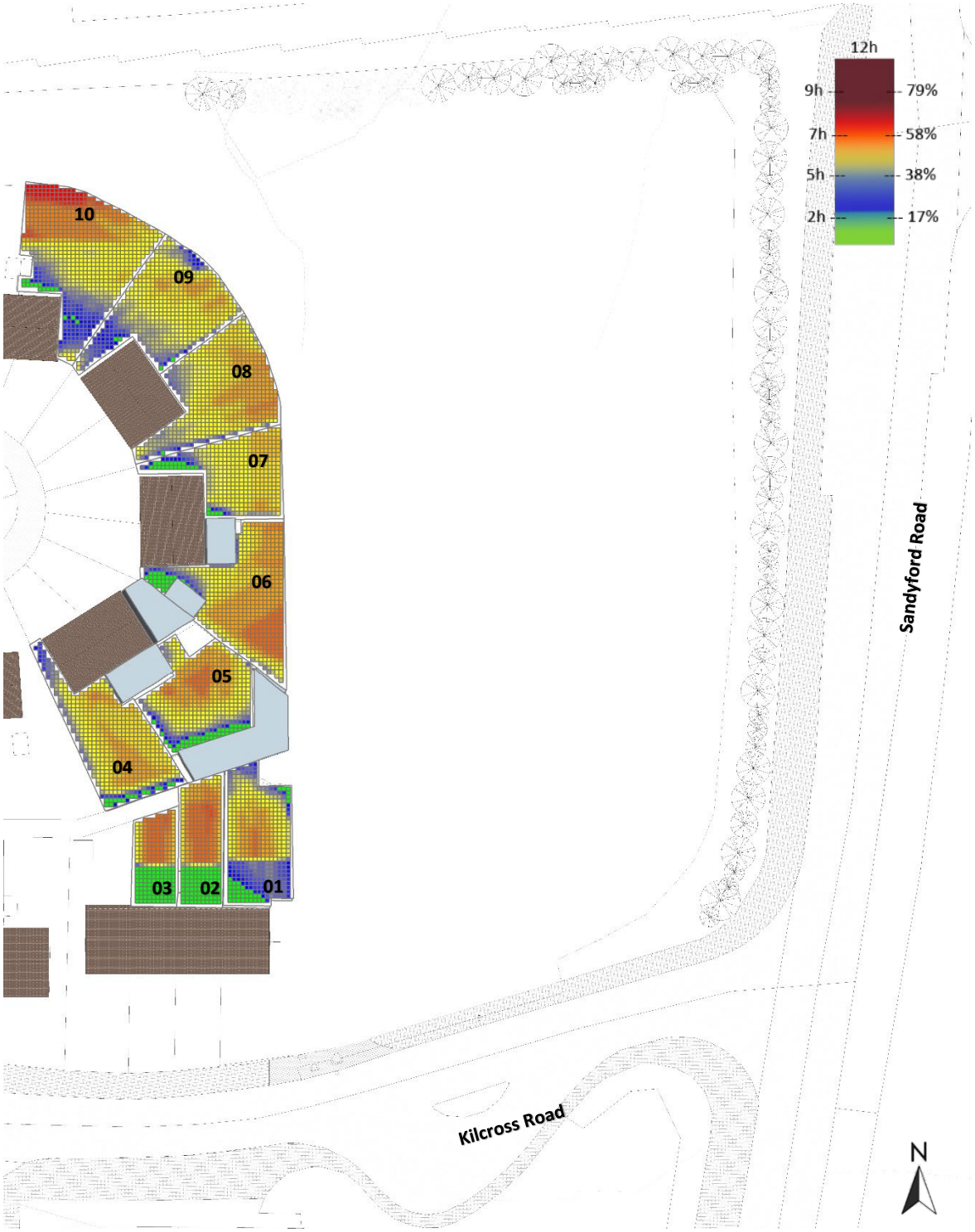
When planning new amenity areas, the BRE guide recommends at least 50% of the area of each amenity space listed above should receive at least two hours of sunlight on 21st March. The 50% criteria are also applicable when assessing the impact of a development on an existing neighbouring amenity area. If, as a result of a new development, an existing garden or amenity area does not meet the 50% criteria, and the area which can receive two hours of sunlight on 21st March is less than 0. 8 times its former value, then the loss of sunlight is likely to be noticeable.

This report examines all the closest neighbouring areas which are likely to be amenity areas. The test verifies the levels of sunlight hours over the area in the existing x proposed situation. The results are shown in a colour scale of direct Sunlight on 21st March. Green colour represents less than 2h of sunlight and dark red represents more than 9h of sunlight.

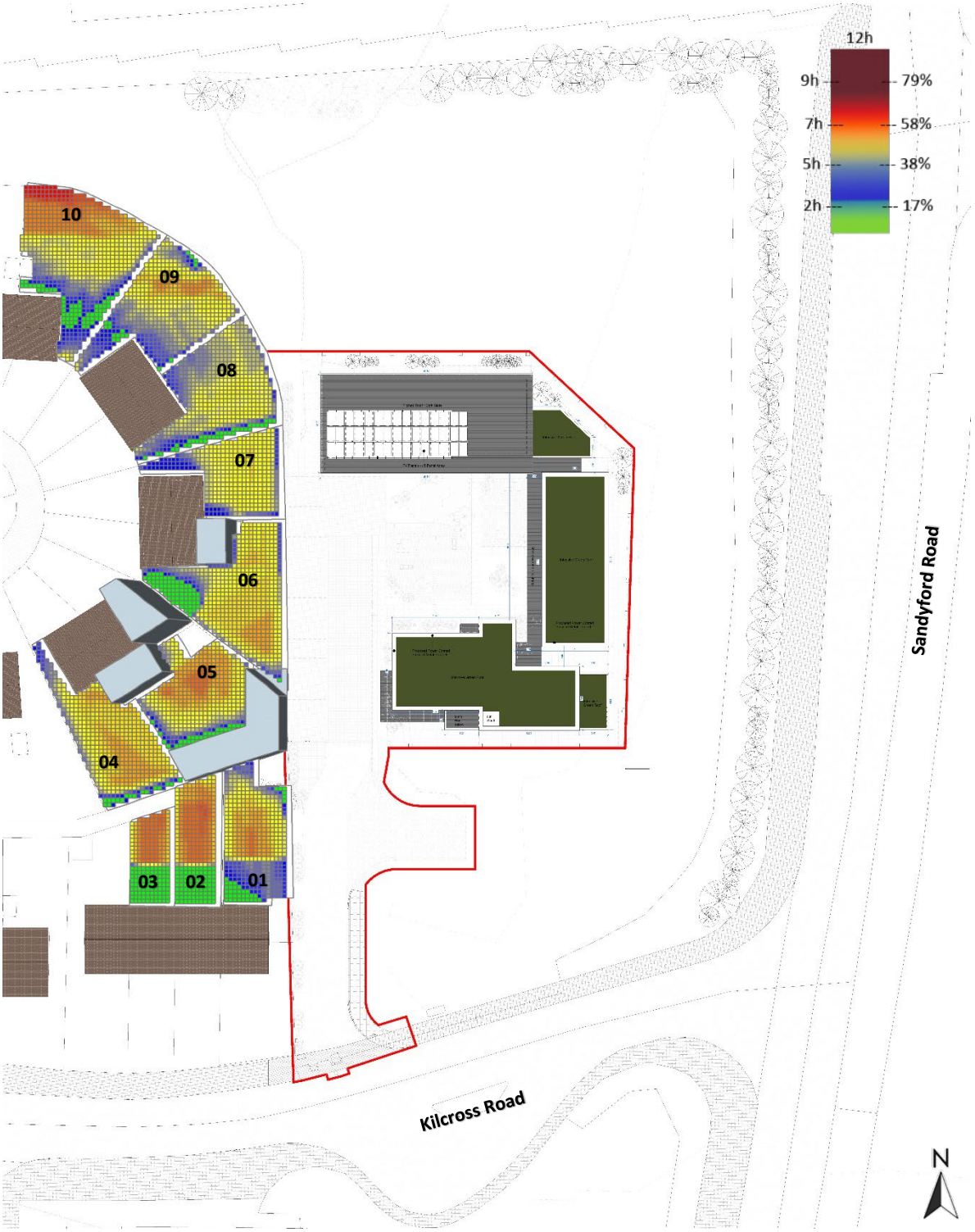
Shadow Impact on Neighbours					
2-hour Sunlight - 21st March					
Reference	Description	Total Analysed Area m²	Shadow		
			Existing direct light over 5 hours	Proposed direct light over 5 hours	Result
01	External area/Rear garden	114 m²	52 %	52%	Pass
02	External area/Rear garden	75 m²	64 %	64%	Pass
03	External area/Rear garden	51 m²	52%	52%	Pass
04	External area/Rear garden	134 m²	73%	72%	Pass
05	External area/Rear garden	123m²	67%	66%	Pass
06	External area/Rear garden	179 m²	78%	76%	Pass
07	External area/Rear garden	100 m²	80%	77%	Pass
08	External area/Rear garden	149 m²	63%	59%	Pass

09	External area/Rear garden	147 m²	71%	66%	Pass
10	External area/Rear garden	197 m²	85%	78%	Pass
Average direct sunlight			68.5%	66.2%	Pass

Reference:
Check proposed > 50% or Ratio > 0.8
Note: When the proposed value exceeds the minimum requirement the ratio is not required
Less than 2h direct Sunlight in a 50% maximum area



Existing Site Plan & Shadow Impact on Neighbours



Proposed Site Plan & Shadow Impact on Neighbours

Conclusion for Shadow Impact

The external areas tested in the neighbouring gardens are not affected by the proposed development by shadow. As the development is only 2 storey high and it`s position do not shade those spaces.

The gardens or private amenities in the surrounding are mostly facing south-east, and the development is located north-east in relation to the analysed spaces and they are not causing any shadow impact.

The areas analysed in majority have around 52-85% of the space illuminated more than 5h direct sunlight in the existing context. The result shows that the test is almost the same considering the new development, the gardens have between 52-78% of the spaces illuminated more than 5h direct sunlight in the proposed situation. These areas receive qualifying sunlight in either the existing or proposed situation.

The proposed development complies with the requirements of the BRE guidelines in relation to shadow.

As demonstrated in the present shadow report the daylight impact analysis shows no impact on adjoining properties. The existing buildings surrounding this application are similar in scale and heights and are not affected by the position and scale of the new buildings.

The proposed application is well within acceptable BRE guidelines and should be acceptable to Cork County Council when the provision of high-quality accommodation is proposed in this urban location.

References

BRE_Site_Layout_Planning_for_Daylight_and_Sunlight.

Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice.

BS 8206 Lighting for Buildings, Part 2: Code of Practice for Daylighting.