Belmont Street Site, Camden
Internal Daylight, Sunlight & Overshadowing Assessments

October 2020

Vistry
Partnerships

CHARTERED SURVEYORS

DAYLIGHT & SUNLIGHT

INTERNAL DAYLIGHT, SUNLIGHT AND OVERSHADOWING ASSESSMENTS

Charlie Ratchford, Belmont Street

13 August 2020

GIA No: **14018**

PROJECT DATA:

Client	**Vistry Partnerships**
Architect	**HTA**
Project Title	**Charlie Ratchford, Belmont Street**
Project Number	**14018**

REPORT DATA:

Report Title	**Internal Daylight, Sunlight and Overshadowing Assessments**
GIA Department	**Daylight & Sunlight**
Dated	**13 August 2020**
Prepared by	**JF**
Checked by	**SP**
Type	**Planning**

Revisions	No:	Date:	Notes:	Signed:

SOURCES OF INFORMATION:

Information Received	**IR-20-14018**
Release Number	**Rel_09_14018_DSD**
Issue Number	**09**
Site Photos	**GIA**
3D models	**VERTEX**
OS Data	**FIND Maps**

CONTENTS

1 EXECUTIVE SUMMARY ... 2

2 INTRODUCTION AND OBJECTIVE ... 3

3 BRE GUIDELINES ... 4

4 METHODOLOGY ... 8

5 CONCLUSIONS ... 10

6 SITE OVERVIEW ... 12

7 INTERNAL DAYLIGHT AND SUNLIGHT ASSESSMENTS ... 14

8 OVERSHADOWING ASSESSMENTS ... 34

1 EXECUTIVE SUMMARY

The purpose of this report is to ascertain whether the proposed development will provide residential accommodation considered acceptable in terms of daylight and sunlight amenity.

The development site sits very close to the town centre of Camden Town and within a few meters from Chalk Farm underground Station. As such, the site's development potential is considered very high and in-line with the desired urban grain for the area.

The massing is based on London Borough of Camden's Development Brief (Nov 2015) and is arranged in a horseshoe configuration, open to the south, encircling a green open space provided at ground floor.

The design team had to balance architectural features, overheating and daylight requirements when designing the facade and apertures. Furthermore, most units are provided with balconies, which, whilst providing private outdoor space, obstruct the view of the sky lowering the daylight levels indoors.

In order to respond to the above constraints, GIA has worked alongside the design team to optimise the daylight and sunlight performance of the proposed development. This has been achieved through several design amendments which are described in detail in Section 5 of this report.

All relevant rooms within the scheme have been technically assessed for daylight quantum, expressed as Average Daylight Factor (ADF), and distribution, expressed as No Sky Line (NSL) and Room Depth Criterion (RDC).

The assessments show that the proposed development sees good levels of daylight overall with 172 (73%) of the 235 habitable rooms meeting or exceeding the ADF levels recommended by BRE. In terms of daylight distribution, all applicable rooms were designed in accordance with BRE's RDC, and 184 (78%) meet or exceed the BRE recommendation for NSL.

In order to evaluate the sunlight performance of the scheme, as recommended by BRE, all living rooms served by windows facing within 90° of due south have been assessed for Probable Sunlight Hours (PSH).

83% of the assessed rooms (82 out of 99) exceed the minimum recommendations for sunlight both annually and during the winter months.

In addition to the above, the sunlight access of the communal amenity area provided at ground level has been assessed by means of Sun Hours on Ground, and achieves good results, in excess of BRE's recommendation.

Overall, the design has sought to balance the site's constraints and requirements to deliver high-quality accommodation and, as a result, the scheme offers good daylight and sunlight amenity for the enjoyment of future occupants.

2 INTRODUCTION AND OBJECTIVE

GIA has been instructed to provide a report upon the potential availability of Daylight and Sunlight to the proposed accommodation within the residential scheme prepared by HTA. GIA was specifically instructed to carry out the following:

- To create a 3D computer model of the proposal based upon drawings prepared by HTA.
- Carry out a daylight assessment using the methodologies set out in the BRE guidance for Average Daylight Factor, No-Sky Line and Room Depth Criterion.
- Carry out a sunlight assessment using the methodologies set out in the BRE guidance for Annual Probable Sunlight Hours (APSH) to the fenestration facing within 90° of due south.
- Carry out an overshadowing assessment using the methodology set out in the BRE guidance for Sun Hours On Ground (SHOG) for all relevant amenity areas.
- Prepare a report setting out the analysis and our findings.

3 BRE GUIDELINES

The Building Research Establishment (BRE) have set out in their handbook 'Site Layout Planning for Daylight and Sunlight a Guide to Good Practice (2011)' (BRE BR209), guidelines and methodology for the measurement and assessment of daylight and sunlight within proposed buildings.

This document states that it is intended to be used in conjunction with the daylight recommendations found within the British Standard BS8206-2:2008 and The Applications Manual on Window Design of the Chartered Institution of Building Services Engineers (CIBSE. 1999).

The guide also provides advice on site layout planning to determine the quality of daylight and sunlight within open spaces between buildings.

It is important to note, however, that this document is a guide and states that its aim *"is to help rather than constrain the designer"*.

The document provides advice, but also clearly states that it *"is not mandatory and this document should not be seen as an instrument of planning policy."* The report also acknowledges in its introduction that *"in special circumstances the developer or planning authority may wish to use different target values. For example, in a historic city centre a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing buildings."*

It is an inevitable consequence of the built-up urban environment that daylight and sunlight will be more limited in these areas. It is well acknowledged that in such situations there may be many other conflicting and potentially more important planning and urban design matters to consider other than just the provision of ideal levels of daylight and sunlight.

In May 2019 the British Standard BS8206-2:2008 was superseded by the new European Standard on daylight "BS EN 17037:2018 Daylight in buildings". The Standard adopts a new methodology for testing daylight and sunlight in proposed developments based on climatic data as opposed the 'Standard CIE overcast sky' adopted in BS8206-2:2008, and also includes views out and glare.

Following on from the review of the European Standard by a dedicated commission of UK experts (which included the author of the BRE BR209 guidance Dr. Paul Littlefair), the British Standard Institution appended to BS EN 17037:2018 a UK National Annex which brings the recommended light levels in line with those of BS8206-2:2008.

BRE is currently looking to update and re-publish BR209 to align their guidance with the new BS EN 17037:2018 in 2020. Until then, the position of BRE can be summarised from a post by Dr. Littlefair on the LinkedIn Planning Daylight & Sunlight Group (BRE BR209): *"Until BR 209 is rewritten, we are adopting a flexible approach to applying the two standards, for example in assessing the daylight and sunlight available in new buildings. So, for example, if we were reviewing a daylight report for a local authority, we would consider it reasonable to accept either average daylight factor tables using BS 8206 or median daylight factors/median illuminance calculated using EN 17037, provided they were calculated and presented properly".*

Given the above and the reference to the BRE guidance in planning policies, the assessments within this report are carried out with the criteria and methodologies set out in BRE BR209 and BS8206-2:2008. It is not considered that calculations undertaken according to BS EN 17037:2018 would alter the conclusions meaningfully.

3.1 DAYLIGHT

The BRE set out various methods for assessing the daylight within a proposed building within section 2.1 and Appendix C of the handbook. These are summarised below.

Vertical Sky Component (VSC)

This method of assessment can be undertaken using a skylight indicator or a Waldram diagram. It measures from a single point, at the centre of the window (if known at the early design stage), the quantum of sky visible taking into account all external obstructions. Whilst these obstructions can be either other buildings or the general landscape, trees are usually ignored unless they form a continuous or dense belt of obstruction.

The VSC method is a useful 'rule of thumb' but has some significant limitations in determining the true quality of daylight within a proposed building. It does not take into account the size of the window, any reflected light off external obstructions, any reflected light within the room, or the use to which that room is put. Appendix C of the guide goes into more detail on these matters and sets forward alternative methods for assessment to overcome these limitations.

Appendix C of the BRE guide: Interior Daylighting Recommendations, states:

"The British Standard Code of practice for daylighting (BS 8206-2) and the CIBSE Lighting Guide LG 10 Daylighting and window design contain advice and guidance on interior daylighting. The guidance contained in this publication (BR 209) is intended to be used with BS 8206-2 and LG 10. Both these publications refer to BR 209.

For skylight BS 8206-2 and LG 10 put forward three main criteria, based on average daylight factor (ADF); room depth; and the position of the no sky line."

These assessments are set out below.

Average Daylight Factor (ADF)

"If a predominantly daylit appearance is required, then the ADF should be 5% or more if there is no supplementary electric lighting, or 2% or more if supplementary electric lighting is provided. There are additional recommendations for dwellings of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms. These additional recommendations are minimum values of ADF which should be attained even if a predominantly daylit appearance is not achievable."

This method of assessment takes into account the total glazed area to the room, the transmittance quality of the glazing proposed, the total area of the room surfaces including ceilings and floors, and the internal average reflectance for the room being assessed. The method also takes into account the Vertical Sky Component and the quantum of reflected light off external surfaces.

This is, therefore, a significantly more detailed method of assessment than the Vertical Sky Component method set out above.

Room Depth Criterion (RDC)

Where it has access to daylight from windows in one wall only, the depth of a room can become a factor in determining the quantity of light within it. The BRE guidance provides a simple method for examining the ratio of room depth to window area. However, whilst it does take into account internal surface reflections, this method also has significant limitations in that it does not take into account any obstructions outside the window and therefore draws no input from the quantity of light entering the room.

No Sky Line (NSL)

This third method of assessment is a simple test to establish where within the proposed room the sky will be visible through the windows, taking into account external obstructions. The assessment is undertaken at working plane height (850mm above floor level) and the method of calculation is set out in Appendix D of the BRE handbook.

Appendix C of the BRE handbook states *"If a significant area of the working plane (normally more than 20%) lies beyond the no sky line (ie it receives no direct skylight) then the distribution of daylight in* *the room will look poor and supplementary electric lighting will be required."* To guarantee a satisfactory daylight uniformity, the area which does not receive direct skylight should not exceed 20% of the floor area, as quantified in the BS 8206 Part 2 2008.

Summary

The Average Daylight Factor gives a more detailed assessment of the daylight within a room and takes into account the highest number of factors in establishing a quantitative output.

However, the conclusion of Appendix C of the BRE guide states:

"[All three of] the criteria need to be satisfied if the whole of the room is to look adequately daylit. Even if the amount of daylight in a room (given by the Average Daylight Factor) is sufficient, the overall daylight appearance will be impaired if its distribution is poor."

In most urban areas it is important to recognise that the distribution of daylight within a room may be difficult to achieve, given the built-up nature of the environment. Consequently, most local authorities seek to ensure that there is sufficient daylight within the room as determined by the Average Daylight Factor calculation. However, the additional recommendations of the BRE and British Standard for residential accommodation, set out above, ought not to be overlooked.

3.2 SUNLIGHT

The BRE provide guidance in respect of sunlight quality for new developments within section 3.1 of the handbook. It is generally acknowledged that the presence of sunlight is more significant in residential accommodation than it is in commercial properties, and this is reflected in the BRE document.

It states, *"in housing, the main requirement for sunlight is in living rooms, where it is valued at any time of the day, but especially in the afternoon. Sunlight is also required in conservatories. It is viewed as less important in bedrooms and in kitchens where people prefer it in the morning rather than the afternoon."*

The BRE guide considers the critical aspects of orientation and overshadowing in determining the availability of sunlight at a proposed development site.

The guide proposes minimizing the number of dwellings whose living room face solely north unless there is some compensating factor such as an appealing view to the north, and it suggests a number of techniques to do so. Furthermore, it discusses massing solutions with a sensitive approach to overshadowing, so as to maximize access to sunlight.

At the same time, it acknowledges that the site's existing urban environment may impose orientation or overshadowing constraints which may not be possible to overcome.

To quantify sunlight access for interiors where sunlight is expected, it refers to the BS 82606-2 criterion of Annual Probable Sunlight Hours. APSH is defined as *"the total number of hours in the year that the sun is expected to shine on unobstructed ground, allowing for average levels of cloudiness at the location in question."* In line with the recommendation, APSH is measured from a point on the inside face of the window, should the locations have been decided. If these are unknown, sunlight availability is checked at points 1.6m above the ground or the lowest storey level on each main window wall, and no more than 5m apart. If a room has multiple windows on the same wall or on adjacent walls, the highest value of APSH should be taken into account. If a room has two windows on opposite walls, the APSH for each can be added together.

The summary of section 3.1 of the guide states as follows:

"In general, a dwelling or non-domestic building which has a particular requirement for sunlight, will appear reasonably sunlit provided that:

- *At least one main window faces within 90 degrees of due south, and*
- *The centre of at least one window to a main living room can receive 25% of annual probable sunlight hours, including at least 5% of annual probable sunlight hours in the winter months between 21 September and 21 March. "*

In paragraph 3.1.11 the BRE guidance suggests that if a room faces significantly North of due East or West it is unlikely to meet the recommended levels proposed by the BS 8206-2. As such, it is clear that only windows facing within 90 degrees of due South can be assessed using this methodology.

It is also worth noting how paragraph 5.3 of the BS 8206-2 suggests that with regards to sunlight duration *"the degree of satisfaction is related to the expectation of sunlight. If a room is necessarily north facing or if the building is in a densely-built urban area, the absence of sunlight is more acceptable than when its exclusion seems arbitrary"*.

"3. 3 .17 It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable. If a detailed calculation cannot be carried out, it is recommended that the centre of the area should receive at least two hours of sunlight on 21 March."

3.3 OVERSHADOWING

The BRE guidance in respect of overshadowing of amenity spaces is set out in section 3.3 of the handbook. Here it states as follows:

"Sunlight in the spaces between buildings has an important impact on the overall appearance and ambiance of a development. It is valuable for a number of reasons, to:

- *provide attractive sunlit views (all year)*
- *make outdoor activities, like sitting out and children's play more pleasant (mainly warmer months)*
- *encourage plant growth (mainly spring and summer)*
- *dry out the ground, reducing moss and slime (mainly in colder months)*
- *melt frost, ice and snow (in winter)*
- *dry clothes (all year)"*

Again, it must be acknowledged that in urban areas the availability of sunlight on the ground is a factor which is significantly controlled by the existing urban fabric around the site in question and so may have very little to do with the form of the development itself. Likewise, there may be many other urban design, planning and site constraints which determine and run contrary to the best form, siting and location of a proposed development in terms of availability of sun on the ground.

The summary of section 3.3 of the guide states as follows:

3.4 FURTHER RELEVANT INFORMATION

Further information can be found in The Daylight in Urban Areas Design Guide (Energy Saving Trust CE257, 2007) which provides the following recommendation with regards to VSC levels in urban areas:

"If 'theta' (Visible sky angle) is greater than 65° (obstruction angle less than 25° or VSC at least 27 percent) conventional window design will usually give reasonable results.

If 'theta' is between 45° and 65° (obstruction angle between 25° and 45°, VSC between 15 and 27 percent), special measures such as larger windows and changes to room layout are usually needed to provide adequate daylight.

If 'theta' is between 25° and 45° (obstruction angle between 45° and 65°, VSC from 5 to 15 percent), it is very difficult to provide adequate daylight unless very large windows are used.

If 'theta' is less than 25° (obstruction angle more than 65°, VSC less than 5 percent) it is often impossible to achieve reasonable daylight, even if the whole window wall is glazed."

4 METHODOLOGY

In order to undertake the daylight and sunlight assessments set out in the previous pages, we have prepared a three dimensional computer model and used specialist lighting simulation software.

The three dimensional representation of the proposed development has been modelled using the scheme drawings provided to us by HTA. This has been placed in the context of its surrounding buildings which have been modelled from survey information, photogrammetry and OS. This allows for a precise model, which in turn ensures that analysis accurately represents the amount of daylight and sunlight available to the building facades, internal and external spaces, considering all of the surrounding obstructions and orientation.

4.1 SIMULATION ASSUMPTIONS

Where no values for reflectance, transmittance and maintenance factor were specified by the designer the following values from *BS 8206-2:2008, Annex A, tables A.1-A.6* were used for the calculation of Average Daylight Factor values. These values are shown in Table 1.

Glazing with a Visible Light Transmittance (VLT) of 0.70 has been assumed.

As is common in many contemporary residential developments, kitchens are often located in the rear part of combined living/kitchen/dining rooms or kitchen/dining rooms. Being in the area of the room farthest away from the window, they typically receive lower levels of daylight than the rest of the room and will often require supplementary artificial lighting. Where this is the case, and an area devoted to the kitchen function can be identified that is hierarchically separated from dining and living areas, this has been omitted from the calculations, and just the main habitable living area within the room has been assessed. This is reflected in the room labelling.

A similar situation occurs in through-aspect flats accessible from the distribution decks, where kitchens are separated from the living/dining area and provided with a small window to allow for cross ventilation and active surveillance of the access decks. In this case too, the assessment has focussed on the living/dining area, where daylight is typically enjoyed the most.

Table 01: Typical reflectance, transmittance and maintenance factors

REFLECTANCE VALUES:	
Surrounding	0.2
Pavement	0.2
Grass	0.1
Water	0.1
Yellow brick	0.3
Red brick	0.2
Portland Stone	0.6
Concrete	0.4
Internal walls (light grey)	0.68
Internal ceiling (white paint)	0.85
Internal floor (medium veneer)	0.3
Internal floor (light veneer)	0.4

TRANSMITTANCE VALUES	TV
Triple glazing (Low-E): Pilkington K Glass 4/12/4/12/4 Argon filled 90%	0.63
Double glazing (Low-E): Pilkington K Glass 4/16/4 Argon filled 90%	0.75
Single glazing: Pilkington Optifloat Clear 4mm Annealed	0.90
Translucent glazing (Low-E): Pilkington Optifloat Opal - 4mm K /16/4mm Opal	0.74

MAINTENANCE FACTORS: GLAZING TYPE	TV (Normal)	A.3	A.4	A.5	A.6	TV (Total)
Triple Low-E (frames modelled)	0.63	8	1	1	1	0.58
Triple Low-E (frames not modelled)	0.63	8	1	1	0.8	0.46
Triple Low-E (inclined, frames modelled)	0.63	8	2	1	1	0.53
Triple Low-E (inclined, frames not modelled)	0.63	8	2	1	0.8	0.42
Triple Low-E (horizontal, frames modelled)	0.63	8	3	1	1	0.48
Triple Low-E (horizontal, frames not modelled)	0.63	8	3	1	0.8	0.38
Double Low-E (frames modelled)	0.75	8	1	1	1	0.69
Double Low-E (frames not modelled)	0.75	8	1	1	0.8	0.55
Double Low-E (inclined, frames modelled)	0.75	8	2	1	1	0.63
Double Low-E (inclined, frames not modelled)	0.75	8	2	1	0.8	0.50
Double Low-E (horizontal, frames modelled)	0.75	8	3	1	1	0.57
Double Low-E (horizontal, frames not modelled)	0.75	8	3	1	0.8	0.46
Single (frames modelled)	0.9	8	1	1	1	0.83
Single (frames not modelled)	0.9	8	1	1	0.8	0.66
Single (inclined, frames modelled)	0.9	8	2	1	1	0.76
Single (inclined, frames not modelled)	0.9	8	2	1	0.8	0.60
Single (horizontal, frames modelled)	0.9	8	3	1	1	0.68
Single (horizontal, frames not modelled)	0.9	8	3	1	0.8	0.55
Double Translucent Low-E (frames modelled)	0.74	8	1	1	1	0.68
Double Translucent Low-E (frames not modelled)	0.74	8	1	1	0.8	0.54
Double Translucent Low-E (inclined, frames modelled)	0.74	8	2	1	1	0.62
Double Translucent Low-E (inclined, frames not modelled)	0.74	8	2	1	0.8	0.50
Double Translucent Low-E (horizontal, frames modelled)	0.74	8	3	1	1	0.56
Double Translucent Low-E (horizontal, frames not modelled)	0.74	8	3	1	0.8	0.45

5 CONCLUSIONS

The purpose of this report is to assess and comment upon the daylight, sunlight and overshadowing performance of the proposed scheme at Belmont Street (Charlie Ratchford site) in the London Borough of Camden.

The development is located very near Camden Town centre and within a few meters from Chalk Farm underground Station. As such, the site's development potential is considered very high and in-line with the desired urban grain for the area.

The massing is based on London Borough of Camden's Development Brief (Nov 2015) and is arranged in a horseshoe configuration, open to the south, encircling a green open space provided at ground floor.

One of the main architectural features of the building is the access deck within the courtyard, which facilitates over 90% dual or triple-aspect units, high levels of private amenity space and a large, overlooked open-space courtyard at the heart of the development. Notwithstanding these key residential amenity benefits, the deck causes a continuous obstruction to the windows looking into the courtyard, thus restricting their access to daylight.

Furthermore, all units are provided with balconies, in accordance with the London Housing Design Guide. Whilst providing private outdoor space, balconies obstruct the view of the sky lowering the daylight levels indoor. However, this is a typical trade-off of amenities generally considered acceptable.

In addition to the above, the design team had to balance overheating and daylight when designing the facade and apertures serving the proposed rooms.

In order to respond to the above constraints, GIA has worked alongside the design team to optimise the daylight and sunlight performance of the proposed development through an iterative process of technical assessment, feedback and design amendments. As a result, the following strategies have been implemented:

- Fenestration has been enlarged or additional windows have been provided in selected areas, where the daylight and sunlight availability is lowest while balancing overheating requirements;
- Living rooms, where daylight is mostly appreciated, have been located in the areas of greater daylight and sunlight availability;
- Where rooms are located behind balconies, care has been taken to provide additional windows flush with the facade wherever possible, to increase the daylight and sunlight ingress;
- Internal layouts have been amended, where needed, to reduce room depths and ensure a more uniform distribution of light;
- Non-habitable uses such as storage spaces and built-in wardrobes have been located to the rear of rooms located in the most obstructed areas. This has helped reduce the room depths and the partitions of such spaces will help reflect more light into the main habitable space, thus increasing the daylight levels;
- Light-coloured finishes have been specified for the internal floors to maximise reflected light into and within the rooms.

The above amendments have resulted in an optimised proposal from a daylight and sunlight perspective. Further details are provided in the following sections.

4.2 CONCLUSIONS ON DAYLIGHT

In order to ascertain the levels of daylight within the proposed development, all relevant rooms have been assessed for daylight quantum (expressed as Average Daylight Factor or ADF) and distribution (expressed as No Sky Line or NSL, and Room Depth Criterion or RDC).

The assessment results are provided in Section 7 of this report and they show that, of the 235 tested rooms:

- 73% (172) of habitable rooms meet or exceed the recommendations for daylight quantity (ADF);
- 78% (184) of habitable rooms achieve sky visibility (NSL) in line with or above guidance;
- all rooms have been designed with good proportions for uniform daylight distribution in accordance with BRE's RDC, where applicable.

39 of the assessed rooms are open plan living/kitchen/dining rooms, where it is generally accepted that the kitchen area, typically located at the back, will occasionally require additional artificial lighting. The front part of those rooms accommodates the living area which, on the other hand, enjoys higher levels of daylight, being located nearer the window. Six of these rooms, whilst falling slightly short of the 2% ADF

recommended for rooms including a kitchen, would all meet or exceed the minimum recommendation for living rooms of 1.5% ADF, and can be therefore considered acceptably daylit living areas. On that basis, 76% of all habitable rooms would be considered in line with ADF recommendations.

Of the remaining 57 rooms below guidance for ADF, 21 are living rooms, six are living/kitchen/dining rooms and 30 are bedrooms.

Of the 27 living rooms and living/kitchen/dining rooms the majority (18) fall only marginally short of the 1.5% recommended for living areas (with levels between 1.2% and 1.5%). In addition, 15 of these 27 rooms will see levels of annual sunlight in line with or above guidance and thus will appear much brighter on sunny days.

The remaining 30 rooms are all bedrooms, which have been located where the daylight availability is lower to prioritise the main living spaces. Those falling short of the daylight recommendation (30 out of 120) predominantly do so owing to being located behind a recessed balcony or on one of the lowest storeys where the obstruction is greatest

Overall, the design has successfully balanced architectural features, overheating and daylight and achieved a good overall performance for a scheme of this nature.

4.3 CONCLUSIONS ON SUNLIGHT

BRE states that sunlight is most appreciated in living areas and the greatest expectation of sunlight is within south-facing rooms. Therefore, Probable Sunlight Hours (PSH) assessments have been undertaken for all living rooms with a window facing within 90 degrees of due south, both annually (APSH) and in winter (WPSH). The assessment results are provided in Section 7, alongside the daylight metrics discussed in the previous paragraphs.

Most units have been provided with balconies, which, while providing private amenity space for the enjoyment of future occupants, act as shading devices and inherently restrict sunlight availability to the rooms set behind or below them, especially from high-angle summer sunlight.

However, to maximise the sunlight ingress, most living rooms have been designed with a dual aspect and provided with at least one window flush with the façade.

As a result, 86% will see levels above the minima recommended throughout the year and 95% will do so during winter months, when passive solar heating is preferred.

All the rooms falling short of guidance are located on the lowest storeys (up to the third floor), where lower levels of sunlight to some units are expected in any development of this type.

Overall, we can conclude that the proposed development offers good levels of sunlight.

4.4 CONCLUSIONS ON OVERSHADOWING

BRE recommends that for an open space to be well sunlit throughout the year, at least 50% of its area should see two or more hours of sunlight on the equinox. An overshadowing assessment has therefore been undertaken for the area of communal amenity provided within the scheme. The results of this assessment are shown in Section 8 of this report.

In addition, sun exposure assessments have also been undertaken for the equinox and summer solstice in order to provide a better understanding of the sunlight availability throughout the year.

Overall, the area exceeds the minimum recommendation set out by BRE, with 55% seeing two or more hours of direct sunlight on 21st March, and as such can be considered well sunlit.

The sun exposure diagram provided for March shows that the vast majority of the area will see at least one hour of direct sunlight, with the southern portion seeing in excess of four. In June, when open spaces are more likely to be utilised, over six hours will be available to the southern end, whilst the area to the north will more shaded, offering some shelter on particularly hot days.

Overall, the scheme performs well and will offer a well sunlit amenity area.

6 SITE OVERVIEW

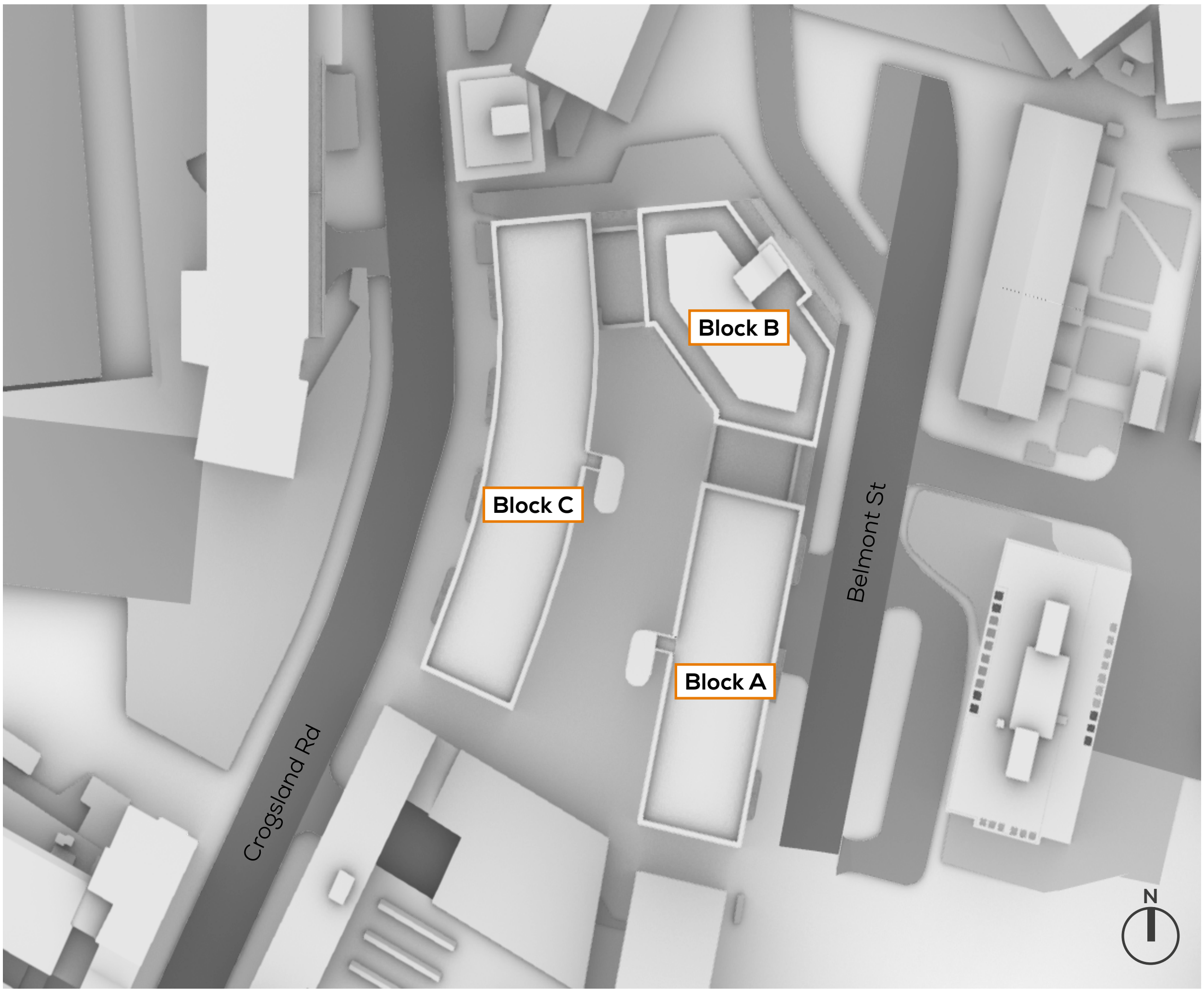


Fig. 01: Top view

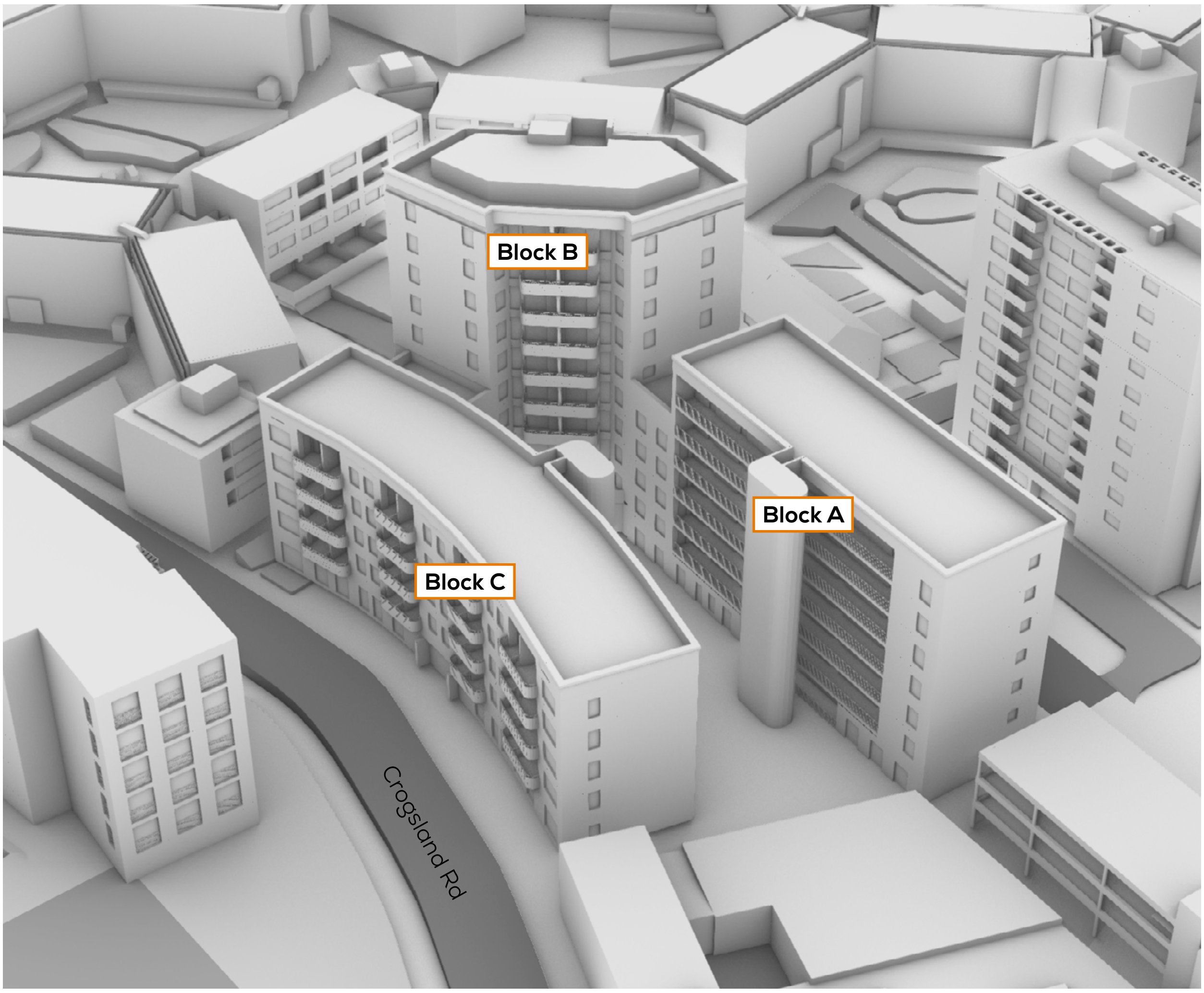


Fig. 02: Perspective view

7 INTERNAL DAYLIGHT AND SUNLIGHT ASSESSMENTS

Ground Floor

		DAYLIGHT QUANTUM	DAYLIGHT DISTRIBUTION		SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS)	
ROOM REF.	ROOM USE	ADF (%)	NSL (%)	RDC	ANNUAL	WINTER
0F						
1	Bedroom	1.1	34	MET		
2	L/K/D	2.7	100	N/A	56	13
3	Bedroom	1.6	81	MET		
4	Living Room	2.2	96	MET		
5	Living Room	2	96	MET		
6	Living Room	1.5	65	MET		
7	Bedroom	0.1	0	MET		
8	Bedroom	2	77	MET		
9	Living Room	1.6	57	N/A	25	9
10	Bedroom	0.5	29	MET		
11	Bedroom	1.4	86	MET		
12	Bedroom	0.8	98	MET		
13	L/K/D	1.3	84	N/A	23	3
14	Bedroom	0.6	95	MET		
15	Bedroom	0.6	99	MET		
16	L/K/D	1.8	99	MET	25	9
17	Bedroom	0.6	94	MET		
18	Bedroom	1.6	96	MET		
19	Bedroom	1.6	98	MET		
20	L/K/D	2	98	N/A	48	13
21	Bedroom	1.6	98	MET		

Table 02: Assessment Data

Fig. 03: Floor Plan

First Floor

		DAYLIGHT QUANTUM	DAYLIGHT DISTRIBUTION		SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS)	
ROOM REF.	ROOM USE	ADF (%)	NSL (%)	RDC	ANNUAL	WINTER
1F						
22	Bedroom	1.3	38	MET		
23	L/K/D	3	100	N/A	69	22
24	Bedroom	1	68	MET		
25	Living Room	1.7	93	N/A	23	5
26	Living Room	1.6	94	N/A		
27	Bedroom	0.6	77	MET		
28	Living Room	1.8	97	N/A	27	8
29	Bedroom	0.5	19	MET		
30	Living Room	1.2	66	N/A	21	7
31	Living Room	1.1	47	N/A	25	8
32	Bedroom	0.4	21	MET		
33	Living Room	2.5	78	N/A	26	8
34	Bedroom	1.3	72	MET		
35	Bedroom	0.8	80	MET		
36	L/K/D	1.1	96	N/A	22	4
37	Bedroom	1.7	94	MET		
38	Bedroom	1.8	88	MET		
39	L/K/D	2.3	99	N/A		
40	Living Room	0.6	65	N/A	17	5
41	Bedroom	0.5	42	MET		
42	Bedroom	0.7	71	MET		
43	Living Room	0.8	53	N/A	18	6
44	L/K/D	2.2	99	N/A	35	5
45	Bedroom	2	82	MET		
46	Bedroom	1.6	84	MET		
47	Bedroom	1.4	89	MET		
48	Bedroom	1	34	MET		
49	L/K/D	1.2	85	N/A	25	3
50	Living Room	1.2	89	N/A	20	6
51	Living Room	1	75	N/A	25	9
52	Living Room	1.5	88	N/A	21	9
53	Bedroom	0.3	29	MET		
54	Bedroom	0.4	37	MET		
55	L/K/D	1.4	94	N/A	33	14
56	Living Room	1.3	90	N/A	32	11
57	Living Room	1.9	98	N/A	65	12
58	Bedroom	2	96	MET		

Table 03: Assessment Data

Fig. 04: Floor Plan

Second Floor

ROOM REF.	ROOM USE	DAYLIGHT QUANTUM ADF (%)	DAYLIGHT DISTRIBUTION NSL (%)	DAYLIGHT DISTRIBUTION RDC	SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS) ANNUAL	SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS) WINTER
2F						
59	Bedroom	1.5	45	MET		
60	L/K/D	3.3	100	N/A	73	26
61	Bedroom	1.1	75	MET		
62	Living Room	1.8	96	N/A	24	6
63	Living Room	1.7	96	N/A		
64	Bedroom	0.7	79	MET		
65	Living Room	2	98	N/A	28	8
66	Bedroom	0.6	29	MET		
67	Living Room	1.4	76	N/A	25	7
68	Living Room	1.3	63	N/A	30	8
69	Bedroom	0.6	34	MET		
70	Living Room	3.2	96	N/A	30	8
71	Bedroom	1.9	96	MET		
72	Bedroom	1.2	97	MET		
73	L/K/D	1.5	97	N/A	25	3
74	Bedroom	2.1	98	MET		
75	Bedroom	2.1	93	MET		
76	L/K/D	2.4	99	N/A		
77	Living Room	0.8	74	N/A	22	5
78	Bedroom	0.7	44	MET		
79	Bedroom	0.9	75	MET		
80	Living Room	1.1	71	N/A	22	6
81	L/K/D	2.3	99	N/A	39	6
82	Bedroom	2.1	84	MET		
83	Bedroom	1.6	85	MET		
84	Bedroom	1.5	89	MET		
85	Bedroom	1.3	49	MET		
86	L/K/D	1.3	85	N/A	30	4
87	Living Room	1.3	90	N/A	23	6
88	Living Room	1.1	78	N/A	26	9
89	Living Room	1.6	88	N/A	23	9
90	Bedroom	0.4	29	MET		
91	Bedroom	0.4	37	MET		
92	L/K/D	1.5	94	N/A	34	14
93	Living Room	1.3	93	N/A	32	11
94	Living Room	2.3	100	N/A	83	27
95	Bedroom	2.2	98	MET		

Table 04: Assessment Data

Fig. 05: Floor Plan

Third Floor

ROOM REF.	ROOM USE	DAYLIGHT QUANTUM ADF (%)	DAYLIGHT DISTRIBUTION NSL (%)	DAYLIGHT DISTRIBUTION RDC	SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS) ANNUAL	SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS) WINTER
3F						
96	Bedroom	1.7	57	MET		
97	L/K/D	3.4	100	N/A	73	26
98	Bedroom	1.2	89	MET		
99	Living Room	1.9	98	N/A	24	6
100	Living Room	1.8	99	N/A		
101	Bedroom	0.8	88	MET		
102	Living Room	2.2	98	N/A	30	8
103	Bedroom	0.7	62	MET		
104	Living Room	1.6	97	N/A	27	7
105	Living Room	1.5	89	N/A	32	8
106	Bedroom	0.8	77	MET		
107	Living Room	3.8	100	N/A	33	8
108	Bedroom	2.3	97	MET		
109	Bedroom	2.2	97	MET		
110	L/K/D	2.4	98	N/A	36	10
111	Bedroom	2.3	98	MET		
112	Bedroom	2.3	93	MET		
113	L/K/D	2.6	100	N/A		
114	Living Room	1.1	92	N/A	32	9
115	Bedroom	1	61	MET		
116	Bedroom	1.2	86	MET		
117	Living Room	1.4	90	N/A	32	8
118	L/K/D	2.4	99	N/A	42	8
119	Bedroom	2.2	88	MET		
120	Bedroom	1.7	87	MET		
121	Bedroom	1.6	90	MET		
122	Bedroom	1.8	78	MET		
123	L/K/D	1.4	85	N/A	36	5
124	Living Room	1.4	90	N/A	26	6
125	Living Room	1.2	79	N/A	31	9
126	Living Room	1.7	88	N/A	26	9
127	Bedroom	0.4	30	MET		
128	Bedroom	0.4	37	MET		
129	L/K/D	1.6	94	N/A	34	14
130	Living Room	1.4	93	N/A	32	11
131	Living Room	2.5	100	N/A	85	28
132	Bedroom	2.4	98	MET		

Table 05: Assessment Data

Fig. 06: Floor Plan

Fourth Floor

ROOM REF.	ROOM USE	DAYLIGHT QUANTUM ADF (%)	DAYLIGHT DISTRIBUTION NSL (%)	DAYLIGHT DISTRIBUTION RDC	SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS) ANNUAL	SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS) WINTER
4F						
133	Bedroom	2	80	MET		
134	L/K/D	3.6	100	N/A	73	26
135	Bedroom	1.9	93	MET		
136	Living Room	2.5	99	N/A	29	6
137	Living Room	2.4	99	N/A		
138	Bedroom	1.5	97	MET		
139	Living Room	2.6	98	N/A	33	8
140	Bedroom	1.4	96	MET		
141	Living Room	2.4	99	N/A	35	9
142	Living Room	2.2	98	N/A	36	9
143	Bedroom	1.8	97	MET		
144	Living Room	4.4	100	N/A	43	12
145	Bedroom	2.5	97	MET		
146	Bedroom	2.5	98	MET		
147	Bedroom	2.4	93	MET		
148	L/K/D	2.7	100	N/A		
149	Living Room	1.4	98	N/A	43	14
150	Bedroom	1.8	99	MET		
151	Bedroom	1.6	98	MET		
152	Living Room	1.7	97	N/A	38	9
153	L/K/D	2.4	99	N/A	42	8
154	Bedroom	2.3	91	MET		
155	Bedroom	1.8	90	MET		
156	Bedroom	2.7	96	MET		
157	Bedroom	2.4	98	MET		
158	L/K/D	2.3	88	N/A	52	6
159	Living Room	1.5	90	N/A	30	6
160	Living Room	1.3	89	N/A	34	9
161	Living Room	1.9	88	N/A	29	9
162	Bedroom	0.5	31	MET		
163	Bedroom	0.5	37	MET		
164	L/K/D	1.7	94	N/A	36	14
165	Living Room	1.5	94	N/A	33	11
166	Living Room	2.6	100	N/A	86	29
167	Bedroom	2.5	99	MET		

Table 06: Assessment Data

Fig. 07: Floor Plan

Fifth Floor

		DAYLIGHT QUANTUM	DAYLIGHT DISTRIBUTION		SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS)	
ROOM REF.	ROOM USE	ADF (%)	NSL (%)	RDC	ANNUAL	WINTER
5F						
168	Bedroom	4.6	100	N/A		
169	Bedroom	2.5	93	MET		
170	L/K/D	2.7	100	N/A		
171	Living Room	3	99	N/A	56	19
172	Bedroom	2.2	99	MET		
173	Bedroom	2	99	MET		
174	Living Room	2.3	98	N/A	63	14
175	L/K/D	2.5	99	N/A	44	10
176	Bedroom	2.4	96	MET		
177	Bedroom	2.6	93	N/A		
178	Living Room	1.6	93	N/A	36	7
179	Living Room	1.5	91	N/A	41	10
180	Living Room	2.1	88	N/A	34	9
181	Bedroom	0.6	37	MET		
182	Bedroom	0.6	42	MET		
183	L/K/D	1.9	94	N/A	40	14
184	Living Room	1.7	97	N/A	36	11
185	Living Room	2.7	100	N/A	86	29
186	Bedroom	2.6	99	MET		

Table 07: Assessment Data

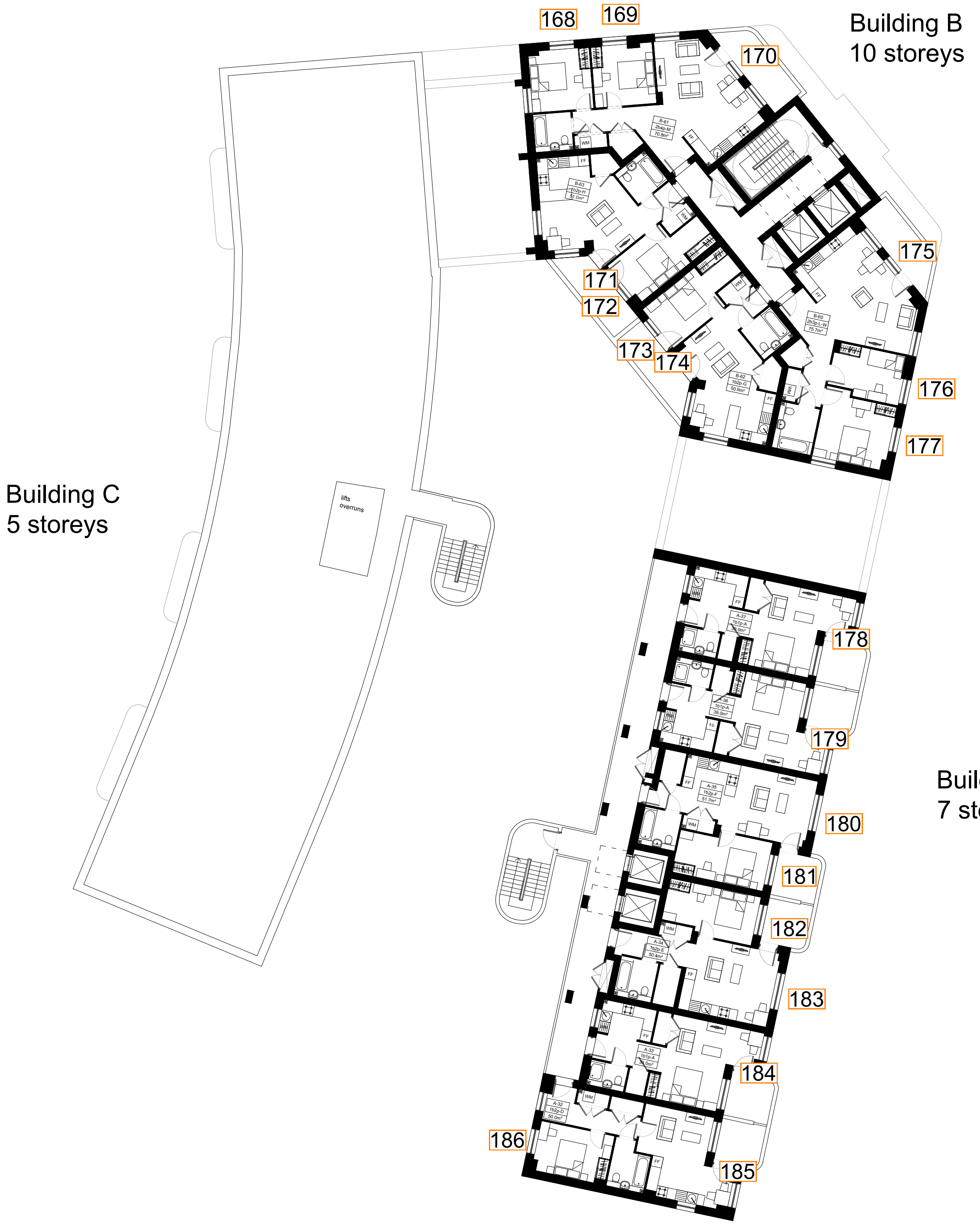


Fig. 08: Floor Plan

Sixth Floor

		DAYLIGHT QUANTUM	DAYLIGHT DISTRIBUTION		SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS)	
ROOM REF.	ROOM USE	ADF (%)	NSL (%)	RDC	ANNUAL	WINTER
6F						
187	Bedroom	4.8	100	N/A		
188	Bedroom	2.5	93	MET		
189	L/K/D	2.8	100	N/A		
190	Living Room	3.3	100	N/A	58	21
191	Bedroom	2.4	99	MET		
192	Bedroom	2.1	99	MET		
193	Living Room	3	98	N/A	78	24
194	L/K/D	2.5	99	N/A	47	13
195	Bedroom	2.4	97	MET		
196	Bedroom	3.4	99	N/A		
197	Living Room	2.2	98	N/A	42	10
198	Living Room	2.1	99	N/A	43	11
199	Living Room	2.4	90	N/A	40	12
200	Bedroom	1.2	76	MET		
201	Bedroom	1.2	80	MET		
202	L/K/D	2.2	97	N/A	43	15
203	Living Room	2.3	99	N/A	41	13
204	Living Room	3.2	100	N/A	87	30
205	Bedroom	2.6	99	MET		

Table 08: Assessment Data

Fig. 09: Floor Plan

Seventh Floor

		DAYLIGHT QUANTUM	DAYLIGHT DISTRIBUTION		SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS)	
ROOM REF.	**ROOM USE**	**ADF (%)**	**NSL (%)**	**RDC**	**ANNUAL**	**WINTER**
7F						
206	Bedroom	4.8	100	N/A		
207	Bedroom	2.5	93	MET		
208	L/K/D	2.8	100	N/A		
209	Living Room	3.3	100	N/A	58	21
210	Bedroom	2.4	99	MET		
211	Bedroom	2.2	99	MET		
212	Living Room	3.2	98	N/A	81	27
213	L/K/D	2.6	99	N/A	47	13
214	Bedroom	2.5	97	MET		
215	Bedroom	3.8	99	N/A		

Table 09: Assessment Data

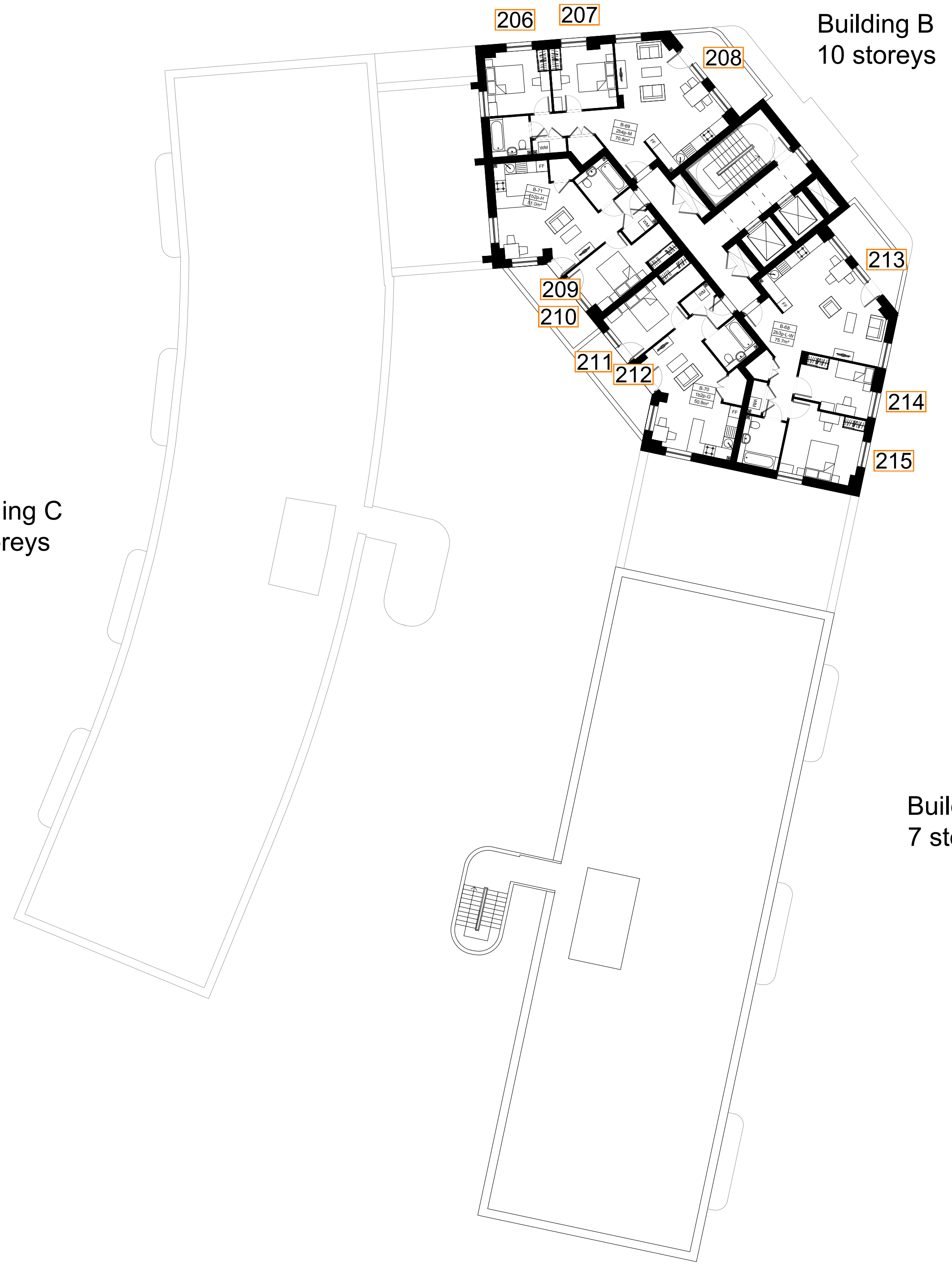


Fig. 10: Floor Plan

Eighth Floor

		DAYLIGHT QUANTUM	DAYLIGHT DISTRIBUTION			SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS)	
ROOM REF.	ROOM USE	ADF (%)	NSL (%)	RDC		ANNUAL	WINTER
8F							
216	Bedroom	4.9	100	N/A			
217	Bedroom	2.5	93	MET			
218	L/K/D	2.8	100	N/A			
219	Living Room	3.4	100	N/A		60	21
220	Bedroom	2.4	99	MET			
221	Bedroom	2.2	99	MET			
222	Living Room	3.3	98	N/A		81	27
223	L/K/D	2.6	99	N/A		48	14
224	Bedroom	2.6	97	MET			
225	Bedroom	3.9	99	N/A			

Table 10: Assessment Data

Fig. 11: Floor Plan

Ninth Floor

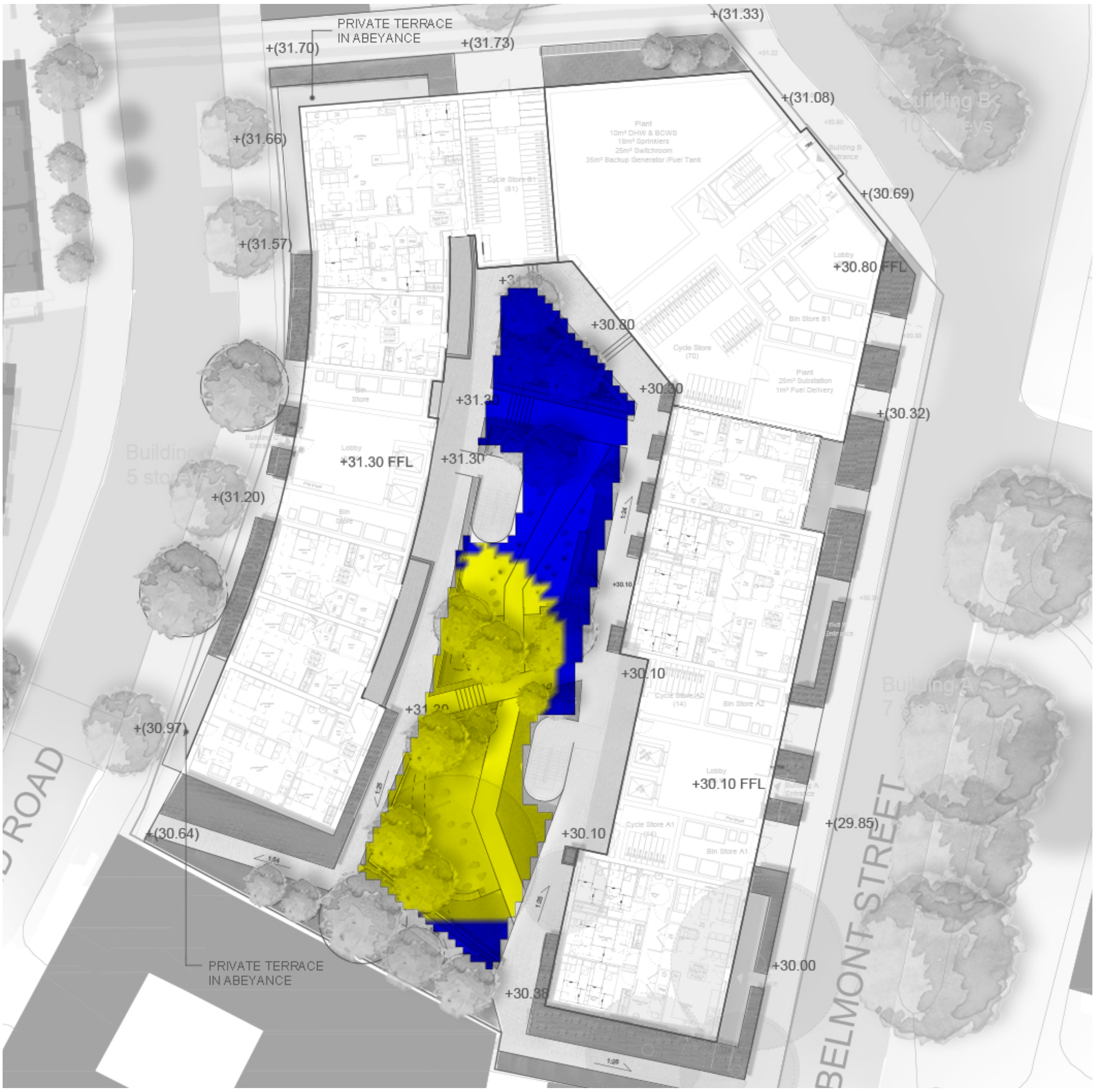
		DAYLIGHT QUANTUM	DAYLIGHT DISTRIBUTION			SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS)	
ROOM REF.	ROOM USE	ADF (%)	NSL (%)	RDC		ANNUAL	WINTER
9F							
226	Bedroom	4.9	100	N/A			
227	Bedroom	2.6	93	MET			
228	L/K/D	4.1	100	N/A			
229	Living Room	3.3	100	N/A		59	23
230	Bedroom	2.8	99	MET			
231	Bedroom	2.7	99	MET			
232	Living Room	3.2	98	N/A		82	28
233	L/K/D	3.9	99	N/A		48	14
234	Bedroom	2.6	97	MET			
235	Bedroom	3.9	99	N/A			

Table 11: Assessment Data

Fig. 12: Floor Plan

8 OVERSHADOWING ASSESSMENTS

OVERSHADOWING ASSESSMENT
SUN HOURS ON GROUND - 21ST MARCH - BRE TEST



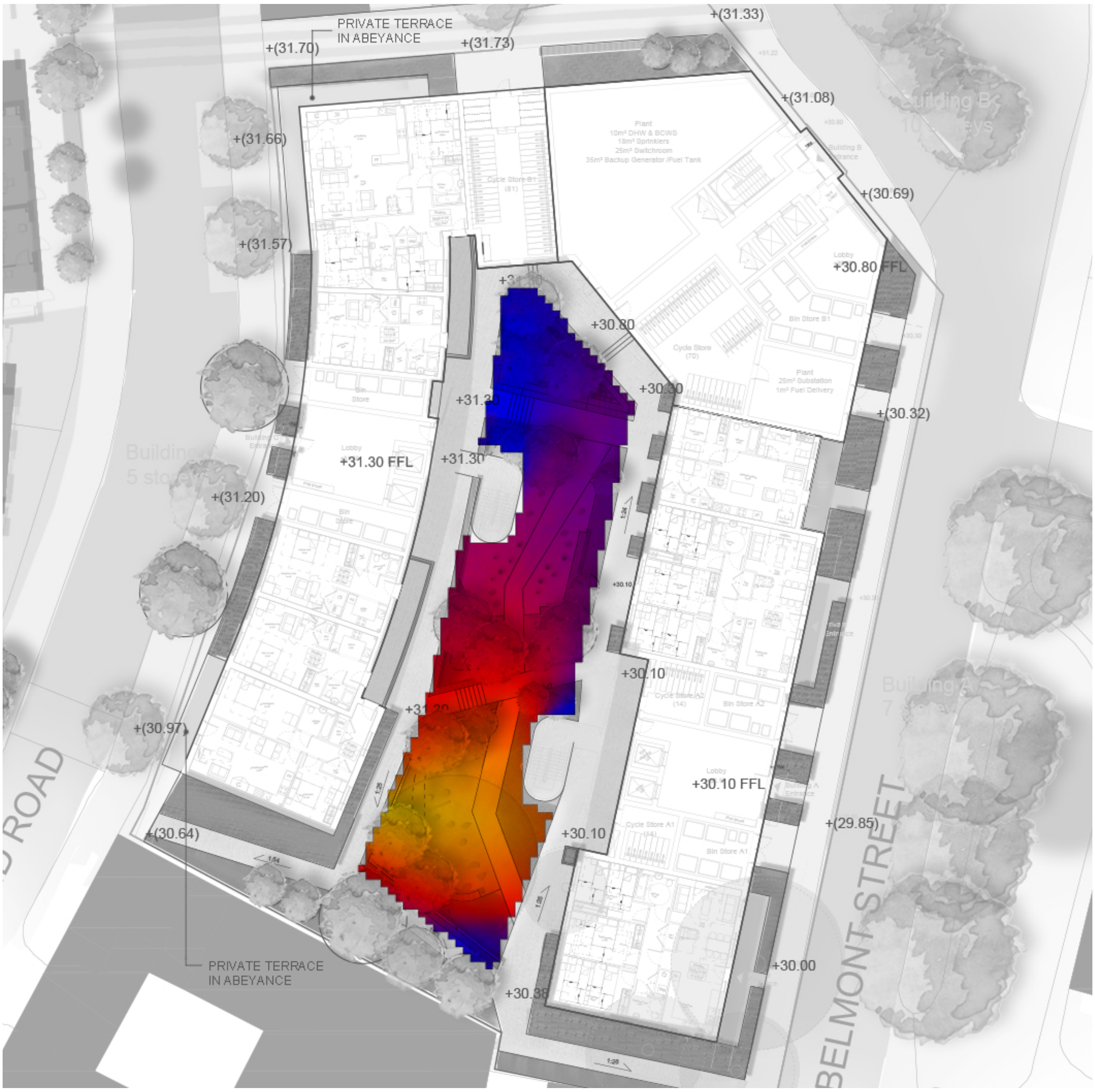
(BRE RECOMMENDS 2+ HOURS OF SUNLIGHT ON 21ST MARCH FOR AT LEAST 50% OF THE OPEN SPACE)

AREA 1: 55%

SUN HOURS ON GROUND
BRE TEST - 21ST MARCH

<2	2+

SUN EXPOSURE ON GROUND - 21ST MARCH



SUN EXPOSURE
TOTAL HOURS

0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5 5.5 6.0+

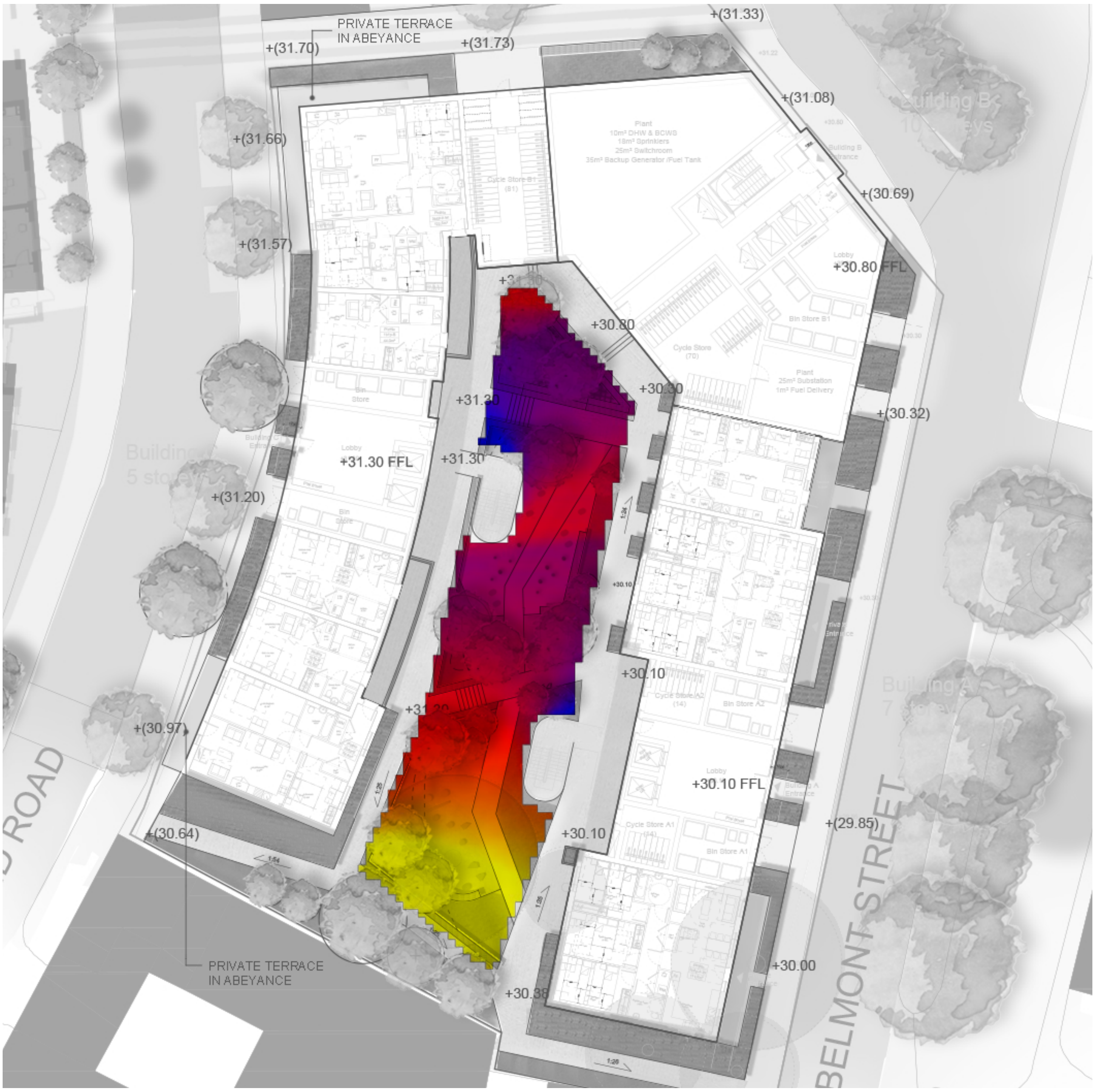
21st MARCH (SPRING EQUINOX)

LONDON

Latitude:	51.4
Longitude:	0.0
Sunrise:	06:02 GMT
Sunset:	18:14 GMT

Total Available Sunlight:
12hrs 12mins

OVERSHADOWING ASSESSMENT
SUN EXPOSURE ON GROUND - 21ST JUNE



21st JUNE (SUMMER SOLSTICE)

LONDON
Latitude: 51.4
Longitude: 0.0
Sunrise: 04:43 BST
Sunset: 21:21 BST

Total Available Sunlight:
16hrs 38mins

SUN EXPOSURE
TOTAL HOURS

0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5 5.5 6.0+

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