



DAYLIGHT & SUNLIGHT

INTERNAL DAYLIGHT AND SUNLIGHT REPORT

Archway House, Caversham

20 December 2021

GIA No: **18013**

PROJECT DATA:

Client **Hermes**
Architect **Barton Willmore**
Project Title **Archway House, Caversham**
Project Number **18013**

REPORT DATA:

Report Title **Internal Daylight and Sunlight Report**
GIA Department **Daylight & Sunlight**
Dated **20 December 2021**

Prepared by **PDA**
Checked by **PCA**
Type **Planning**

Revisions	No:	Date:	Notes:	Signed:

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SOURCES OF INFORMATION:

Information Received **IR-02-18013**
Release Number **Rel_02_18013_DSD**
Issue Number **01**
Site Photos **GIA**
3D models **VERTEX**
OS Data **FIND Maps**



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1 EXECUTIVE SUMMARY

The purpose of this report is to ascertain whether the residential accommodation proposed under Permitted Development Rights at Archway House, Caversham, will provide adequate daylight and sunlight amenity for future residents.

It is proposed to change the use of the building from the existing offices and chiropractor into four residential units. This report contains the assessments of all proposed habitable rooms within each units proposed.

For daylight, all proposed habitable rooms meet or exceed the BRE's recommendations for Average Daylight Factor (ADF), No-Sky Line (NSL) and Room Depth Criterion (RDC), providing well daylit spaces.

In terms of sunlight, the two living areas relevant for testing far exceed the recommended sunlight levels throughout the year and in winter, providing excellent sunlight amenity.

In conclusion, it is considered that adequate natural light is provided within the proposed accommodation and that residents will be provided with access to very good levels of daylight and sunlight overall.

2 INTRODUCTION

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 Barton Willmore. GIA was specifically instructed to carry out the following:

- To create a 3D computer model of the proposal based upon drawings prepared by Barton Willmore.
- 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.
- Prepare a report setting out the analysis and our findings.

3 LEGISLATION

Applications for Prior Approval are determined against the requirements of the legislation set out in the Town and Country Planning (Permitted Development and Miscellaneous Amendments) (England) (Coronavirus) Regulations (2020).

The Town and Country Planning (Permitted Development and Miscellaneous Amendments) (England) (Coronavirus) Regulations (2020) contain a requirement for **adequate natural light** to be provided to habitable rooms within dwellinghouses, where a conversion from offices to dwellinghouses is proposed.

The relevant extracts are:

"Schedule 2, Part 3 Changes of use, Class O – offices to dwellinghouses O.2–(1) Development under Class O is permitted subject to the condition that before beginning the development, the developer must apply to the local planning authority for a determination as to whether the prior approval of the authority will be required as to–(e) the provision of adequate natural light in all habitable rooms of the dwellinghouses."

The document then continues with:

"(2A) Where the application relates to prior approval as to adequate natural light, the local planning authority must refuse prior approval if adequate natural light is not provided in all the habitable rooms of the dwellinghouses."

GIA note however that the regulations do not state how 'adequate natural light' should be assessed.

We consider that the most appropriate method of assessment is to apply the methods set out in the BRE guidance for new development: 'Site Layout Planning for Daylight and Sunlight a Guide to Good Practice (2011)' as this is the standard approach used by National, Regional and Local Planning Policy.

When assessing the scheme, however, it is important to consider that:

- The BRE guidance is provided for new developments where it is within the gift of a developer to optimise the site layout, massing, orientation, building footprint, internal layouts and fenestration of a proposed building in response to its context, whilst for a permitted development, these aspects are fixed and thus the only aspect that can be optimised for good daylight within a permitted development is its internal layouts.
- the BRE guidance gives numerical guidelines but states that these are intended 'to help rather than constrain the designer' and may be applied flexibly, particularly where a high degree of obstruction may be unavoidable.

4 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)', 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.

4.1 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 daylight. 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.

4.2 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".*

5 METHODOLOGY AND ASSUMPTIONS

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 Barton Willmore. This has been placed in the context of its surrounding buildings which have been modelled from online survey information, aerial images and lidar scanning. 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.

Daylight Assessments

Daylight tests are carried out under an overcast condition, meaning that the orientation of the rooms is not relevant. This represents a typical condition of the UK climate and the worst-case scenario in terms of daylight availability.

Where an open plan combined living/kitchen/dining area includes a kitchen located at the back of the room and has a breakfast bar, a side wall, or a return that visually separates the kitchen area from the rest of the room, this has been assessed as a living room. This means that only the front portion of the room is considered relevant for assessment, as the kitchen area at the back of the room is considered to borrow light from the main living and dining space. This is an accepted industry standard.

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.

Table 01: Typical reflectance, transmittance and maintenance factors

REFLECTANCE VALUES:		MAINTENANCE FACTORS: GLAZING TYPE		TV (Normal)	A.3	A.4	A.5	A.6	TV (Total)
Surrounding	0.2	Triple Low-E (frames modelled)	0.63	8	1	1	1	1	0.58
Pavement	0.2	Triple Low-E (frames not modelled)	0.63	8	1	1	1	0.8	0.46
Grass	0.1	Triple Low-E (inclined, frames modelled)	0.63	8	2	1	1	1	0.53
Concrete	0.4	Triple Low-E (inclined, frames not modelled)	0.63	8	2	1	1	0.8	0.42
Internal walls (light grey)	0.68	Triple Low-E (horizontal, frames modelled)	0.63	8	3	1	1	1	0.48
Internal ceiling (white paint)	0.85	Triple Low-E (horizontal, frames not modelled)	0.63	8	3	1	1	0.8	0.38
Internal floor (medium veneer)	0.3								
Internal floor (light veneer)	0.4								
		Double Low-E (frames modelled)	0.75	8	1	1	1	1	0.69
		Double Low-E (frames not modelled)	0.75	8	1	1	1	0.9	0.62
		Double Low-E (inclined, frames modelled)	0.75	8	2	1	1	1	0.63
		Double Low-E (inclined, frames not modelled)	0.75	8	2	1	1	0.8	0.50
		Double Low-E (horizontal, frames modelled)	0.75	8	3	1	1	1	0.57
		Double Low-E (horizontal, frames not modelled)	0.75	8	3	1	1	0.8	0.46
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								

6 CONCLUSIONS

6.1 CONCLUSIONS ON DAYLIGHT

In order to ascertain the levels of daylight within the proposed accommodation, technical assessments have been undertaken within all the proposed habitable rooms with reference to the BRE tests for Average Daylight Factor (ADF), No-Sky Line (NSL) and Room Depth Criterion (RDC).

All proposed rooms meet BRE's recommendations for ADF, NSL and RDC and, as such, are considered well daylight.

The proposal is therefore considered to provide good levels of daylight to all units.

In conclusion, it is considered that adequate natural light is provided within the proposed accommodation and that residents will be provided with access to very good levels of daylight and sunlight overall.

6.2 CONCLUSIONS ON SUNLIGHT

To ascertain the levels of sunlight within the proposed residential accommodation, all living spaces with a main window facing within 90° of due south have been assessed for Probable Sunlight Hours (PSH), both annually (APSH) and in winter (WPSH).

The results show that the two living areas relevant for testing far exceed the recommended sunlight levels throughout the year and in winter.

It is considered that the scheme will provide future occupants with excellent levels of sunlight overall.

7 DAYLIGHT AND SUNLIGHT ASSESSMENTS

Second Floor

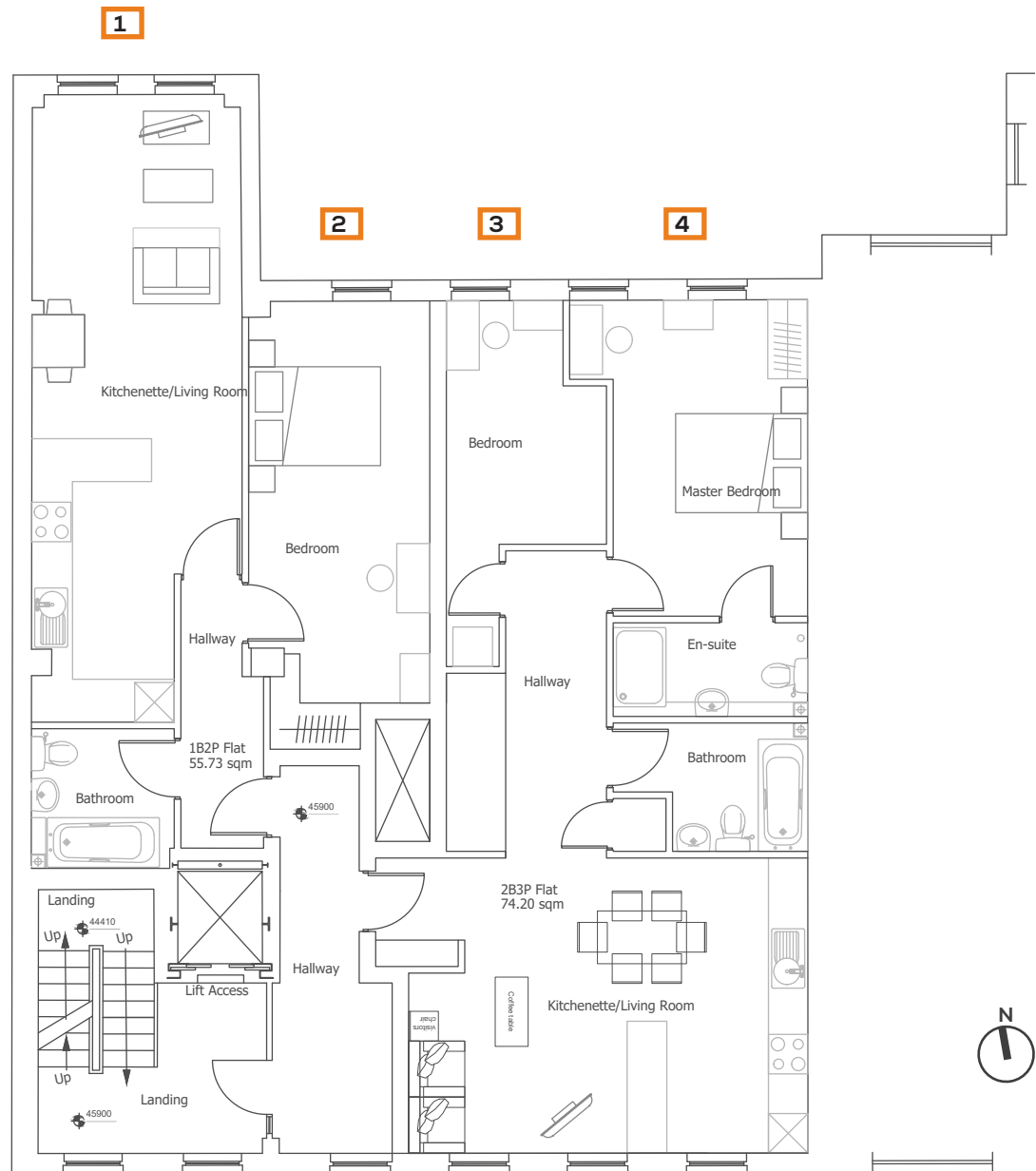


Fig. 01: Floor Plan

Fig. 01: Floor Plan

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		DAYLIGHT QUANTUM	DAYLIGHT DISTRIBUTION		SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS)	
ROOM REF.	ROOM USE	ADF (%)	NSL (%)	RDC	ANNUAL	WINTER
SECOND FLOOR						
1	Living Room	1.9	98	MET		
2	Bedroom	1	96	MET		
3	Bedroom	1.5	94	MET		
4	Bedroom	1.9	97	MET		
5	L/K/D	2.2	98	MET	73	28

Table 02: Assessment Data

Third Floor

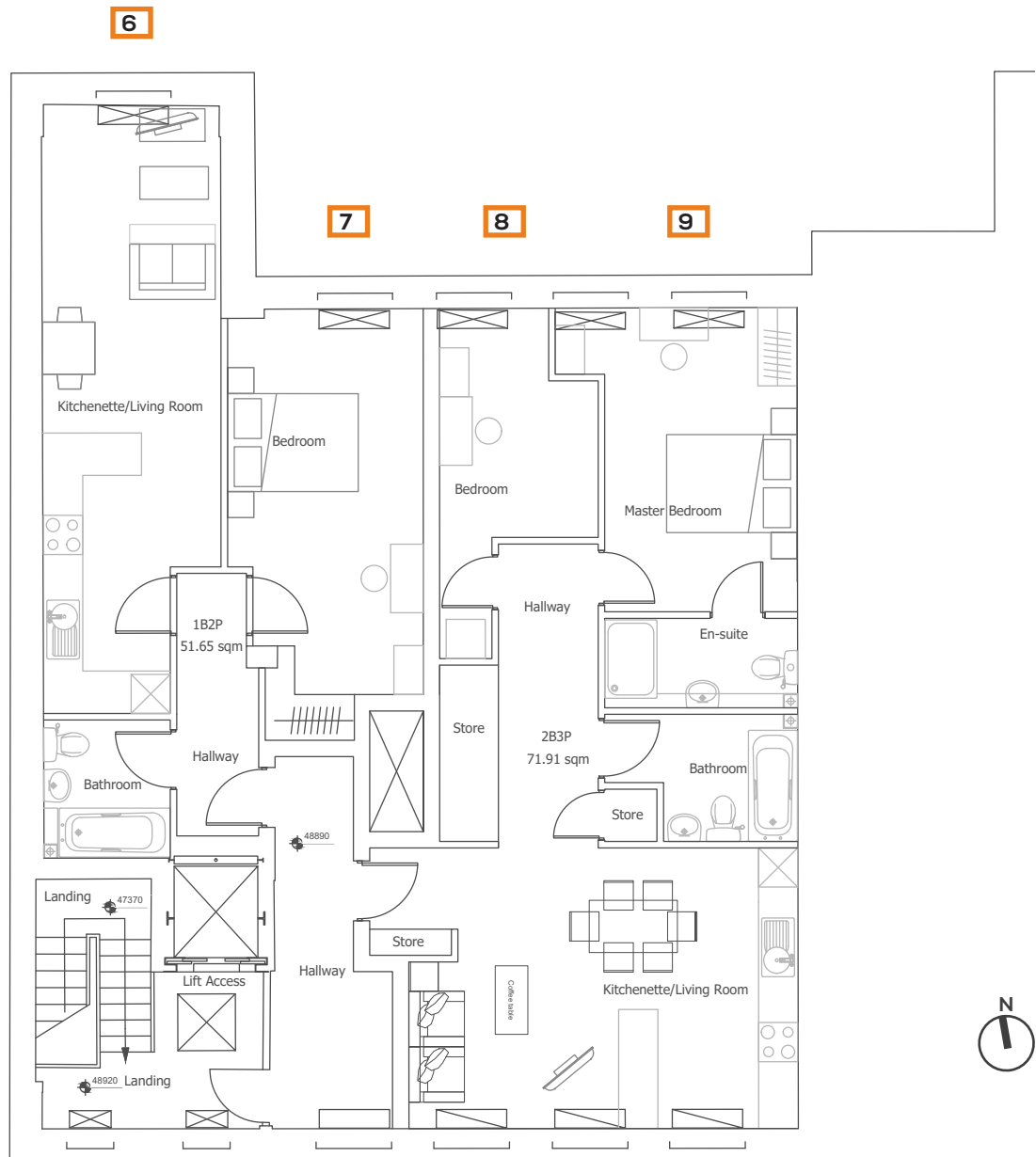


Fig. 02: Floor Plan

Fig. 02: Floor Plan

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		DAYLIGHT QUANTUM	DAYLIGHT DISTRIBUTION		SUNLIGHT QUANTUM (PROBABLE SUNLIGHT HOURS)	
ROOM REF.	ROOM USE	ADF (%)	NSL (%)	RDC	ANNUAL	WINTER
THIRD FLOOR						
6	Living Room	1.5	90	MET		
7	Bedroom	1	87	MET		
8	Bedroom	1.7	96	MET		
9	Bedroom	2.2	97	MET		
10	L/K/D	2.3	98	MET	73	28

Table 03: Assessment Data



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