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DAYLIGHT & SUNLIGHT

INTERNAL DAYLIGHT AND SUNLIGHT REPORT

Meadows Hall

29 June 2022

GIA No: **17227**

PROJECT DATA:

Client	**Boulter Mossman**
Architect	**Wimshurst Pellereti**
Project Title	**Meadows Hall**
Project Number	**17227**

REPORT DATA:

Report Title	**Internal Daylight and Sunlight Report**
GIA Department	**Daylight & Sunlight**
Dated	**29 June 2022**

Prepared by	**ERLA**
Checked by	**JFRA**
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Map data

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CONTENTS

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.

Therefore, all relevant rooms within the proposed development have been assessed for daylight and sunlight access.

The results of the assessments undertaken demonstrate that all rooms but two exceed the minimum recommendations for daylight quantity and distribution and all units significantly exceed the minimum recommendation for sunlight.

Further details are provided in Section 5 of this report and the full assessment results are provided in Section 7.

Overall, the daylight and sunlight performance of the scheme is very good.

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 Wimshurst Pellereti. GIA was specifically instructed to carry out the following:

- To create a 3D computer model of the proposal based upon drawings prepared by Wimshurst Pellereti.
- Carry out a daylight and sunlight assessment using the methodologies set out in the BRE guidance;
- 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 (BR 209 2022)', guidelines and methodology for the measurement and assessment of daylight and sunlight within proposed buildings.

The BRE published the new edition of 'Site layout planning for daylight and sunlight: a guide to good practice' in June 2022 (BR 209), This is to be read in conjunction with BS EN 17037:2018 "Daylight in buildings", the UK National Annex of the British Standard and the CIBSE publication LG 10 'Daylighting – a guide for designers'.

The BR 209 new edition contains amended methodologies for appraising the daylight and sunlight quality within new developments. Nonetheless, the main aim of the guidance is maintained: *"to help rather than constrain the designer"* as stated in Paragraph 1.5 of the new guidance.

The report provides advice, but also clearly states that it *"is not mandatory and the guide should not be seen as an instrument of planning policy."* The guidance also acknowledges in its introduction that *"Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design (see Section 5). In special circumstances the developer or planning authority may wish to use different target values. For example, in a historic city centre, or in an area with modern high-rise buildings, a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing buildings."* (Paragraph 1.6)

3.1 BS EN 17037:2018 AND THE UK ANNEX

The British Standard BS8206-2:2008 was superseded by the new European Standard on daylight BS EN 17037:2018 "Daylight in buildings".

Following on from the review of the European Standard by a dedicated commission of UK experts, 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 the former BS8206-2:2008.

The BS EN 17037 includes four criteria: daylighting, views, sunlight access and glare. However, daylighting and sunlight access are the only criteria considered relevant for residential buildings and therefore discussed within this report.

View out and Glare are mostly relevant in offices and schools, where occupants are more fixed to a certain location within a room. In residential habitable rooms, occupants tend to move more freely and therefore view out and glare are not assessed within residential buildings.

In relation to sunlight access, the assessment considers the hours of sunlight reaching a window on the 21st March.

3.2 DAYLIGHT

The BRE set out the methods for assessing daylight within a proposed building within section 2.1 and Appendix C of the handbook. This is based on the methods detailed in the BS EN 17037.

BS EN 17037 suggests two possible methodologies for appraising daylight:

- Illuminance Method
- Daylight Factor Method

These methodologies are discussed in more detail below.

Whilst Vertical Sky Component (VSC) is no longer directly used to calculate the levels of daylight indoors, this is still referenced within the BRE guidance as a metric to appraise the level of obstruction faced by a building and the potential for good daylight indoors.

This method of assessment may also be used to appraise the daylight quality in the early stages of the design, when room layouts or window locations are still undecided.

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.

Illuminance method

Climate Based Daylight Modelling (CBDM) is used to predict daylight illuminance using sun and sky conditions derived from standard meteorological data (often referred to as climate or weather data). This analytical method allows the prediction of absolute daylight illuminance based on the location and building orientation, in addition to the building's daylight systems (shading systems, for example). Annex A within the BS EN 17037 proposes values of target illuminances and minimum target illuminances to exceed 50 % of daylight hours.

This is considered to be the most accurate approach when using climate data, however, it provides a very large amount of data for each assessed room, which then needs to be interrogated. One of the methodologies that can be used to interrogate this data is Spatial Daylight Autonomy (sDA).

Spatial Daylight Autonomy (sDA)

The sDA assessment is designed to understand how often each point of the room's task area sees illuminance levels at or above a specific threshold.

BS EN 17037 sets out minimum illuminance levels (300lx) that should be exceeded over 50% of the space for more than half of the daylight hours in the year. It also includes recommendations for medium and high daylighting levels within a space (500lx and 700lx respectively). It should be noted here, however, that these targets are specified irrespective of a space's use or design.

The National Annex suggests that these targets can be challenging to achieve within residential settings, particularly in areas of higher density and so suggests lower targets can be considered in this situation. It should be noted here that the reduced targets suggested within the BS EN 17037:2018 National Annex are provided so as to be comparable with the previous BR209's recommendations for ADF. These targets are:

- 100 lux for bedrooms
- 150 lux for living rooms
- 200 lux for living/kitchen/diners, kitchens, and studios.

It is however stated in paragraph C17 of the BRE that: "*Where a room has a shared use, the highest target should apply. For example in a bed sitting room in student accommodation, the value for a living room should be used if students would often spend time in their rooms during the day. Local authorities could use discretion here. For example, the target for*

a living room could be used for a combined living/dining/kitchen area if the kitchens are not treated as habitable spaces, as it may avoid small separate kitchens in a design".

Daylight Factor method

This method involves calculating the median daylight factor on a reference plane (assessment grid).

"The daylight factor is the illuminance at a point on the reference plane in a space, divided by the illuminance on an unobstructed horizontal surface outdoors. The CIE standard overcast sky is used, and the ratio is usually expressed as a percentage."

This method of assessments considers an overcast sky, and therefore the orientation and location of buildings is not relevant. In order to account for different climatic conditions, Annex A within the BS EN 17037 sets equivalent daylight factor targets (D) for various locations in Europe.

The median daylight factor (MDF) should meet or exceed the target daylight factor relative to a given illuminance for more than half of daylight hours, over 50% of the reference plane.

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 minimising 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 EN 17037 criterion that the minimum duration of sunlight exposure in at least one habitable room of a dwelling should be 1.5 h on March 21st. Table A.5 also establishes medium and high sunlight targets (3 and 4 hours).

This is to be checked at a reference point located centrally to the window's width and at the inner surface of the aperture (façade and/or roof). For multiple apertures in different facades it is possible to cumulate the time of sunlight availability if not occurring at the same time. The reference point is minimum 1.2 m above the floor and 0.3 m above the window sill if present.

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*

- *a habitable room, preferably a main living room, can receive a total of at least 1.5 hours of sunlight on 21 March. This is assessed at the inside centre of the window(s); sunlight received by different windows can be added provided they occur at different times and sunlight hours are not double counted.. "*

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 and around buildings has an important impact on the overall appearance and ambience 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. 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 that can receive two hours of sun on 21 March is less than 0.80 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.."

3.4 FURTHER RELEVANT INFORMATION

CIBSE LG 10 'Daylighting – a guide for designers'.

This guide details the process of designing for daylighting. It outlines considerations of form, orientation, and other aspects involved in designing the building envelope to optimise natural light.

The guidance in this document is written primarily for buildings located within the UK, and will be most applicable to projects in northern hemisphere. However, the principles are universal, and can be applied to other locations if the appropriate weather data is used and local standards and regulations are respected

4 SIMULATION 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.

Calculation model

The three dimensional representation of the proposed development has been modelled using the scheme drawings provided to us by Wimshurst Pellereti. This has been placed in the context of its surrounding buildings which have been modelled from 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 façades, internal and external spaces, considering all of the surrounding obstructions and orientation.

The weather file recorded at Gatwick Airport was considered the most relevant for this assessment.

Surfaces reflectance

In general, reflectance value to be applied to surfaces in the computational modelling follows the BR 209 Annex C, unless specified by the design team.

Assumptions applied are:

- Interior walls - 0.7
- Ceilings - 0.8
- Floors - 0.2
- Exterior walls - 0.2
- Exterior ground and external obstructions -0.2

Glazing transmittance

Glazing transmission and maintenance factors have been calculated and are detailed in Table 1 below.

A double glazing with a g-value of 0.55 has been specified so a 0.70 VLT has been assumed, before maintenance factors.

Assessments grid

For the daylight assessments, an analysis 'grid' is located within each room at working plane height (850 mm from FFL) and offset by 0.3m from the walls as recommended by BR 209.

Grid points are spaced by 0.2m .

GLAZING TYPE AND MAINTENANCE FACTORS:	TV (Normal)	FRAMING FACTOR	DIRT FACTOR	POSITION	TV (Total)
TYPE 1	0.70	0.75	8%	1	0.48
TYPE 2	0.70	0.80	8%	1	0.52
TYPE 3	0.70	0.70	8%	3	0.37
TYPE 4	0.70	0.70	8%	1	0.45

Table 01: Typical transmittance and maintenance factors

5 CONCLUSIONS

The purpose of this report is to determine whether the proposed Meadows Hall development will offer acceptable daylight and sunlight amenity for the enjoyment of future occupants.

In order to ascertain the levels of daylight within the proposed development, all habitable rooms with an expectation of daylight have been assessed for daylight and sunlight availability.

The full assessment results are provided in Section 7 of this report.

The results show that all rooms but two not only meet but exceed, often significantly, the minimum recommendation for dwellings suggested within the UK National Annex.

Both rooms falling short are bedrooms, where daylight is generally considered less important than within living areas. One is located on ground floor within the Support Accommodation unit. The staff office and communal room within the same unit, however, see excellent daylight levels.

The other bedroom is located within the Mews Block, on the first floor. 36% of this room, rather than the 50% recommended, will exceed the suggested light levels for at least half of the daylight hours.

In addition to the above, the sunlight access of the proposed accommodation has been assessed against BRE's criterion of at least one of the rooms seeing 1.5 hours of direct sunlight on the spring equinox. Will all proposed rooms seeing well above this, we can conclude that the proposed accommodation will be excellently sunlit.

Overall, the scheme performs very well from a daylight and sunlight perspective.

6 SITE OVERVIEW

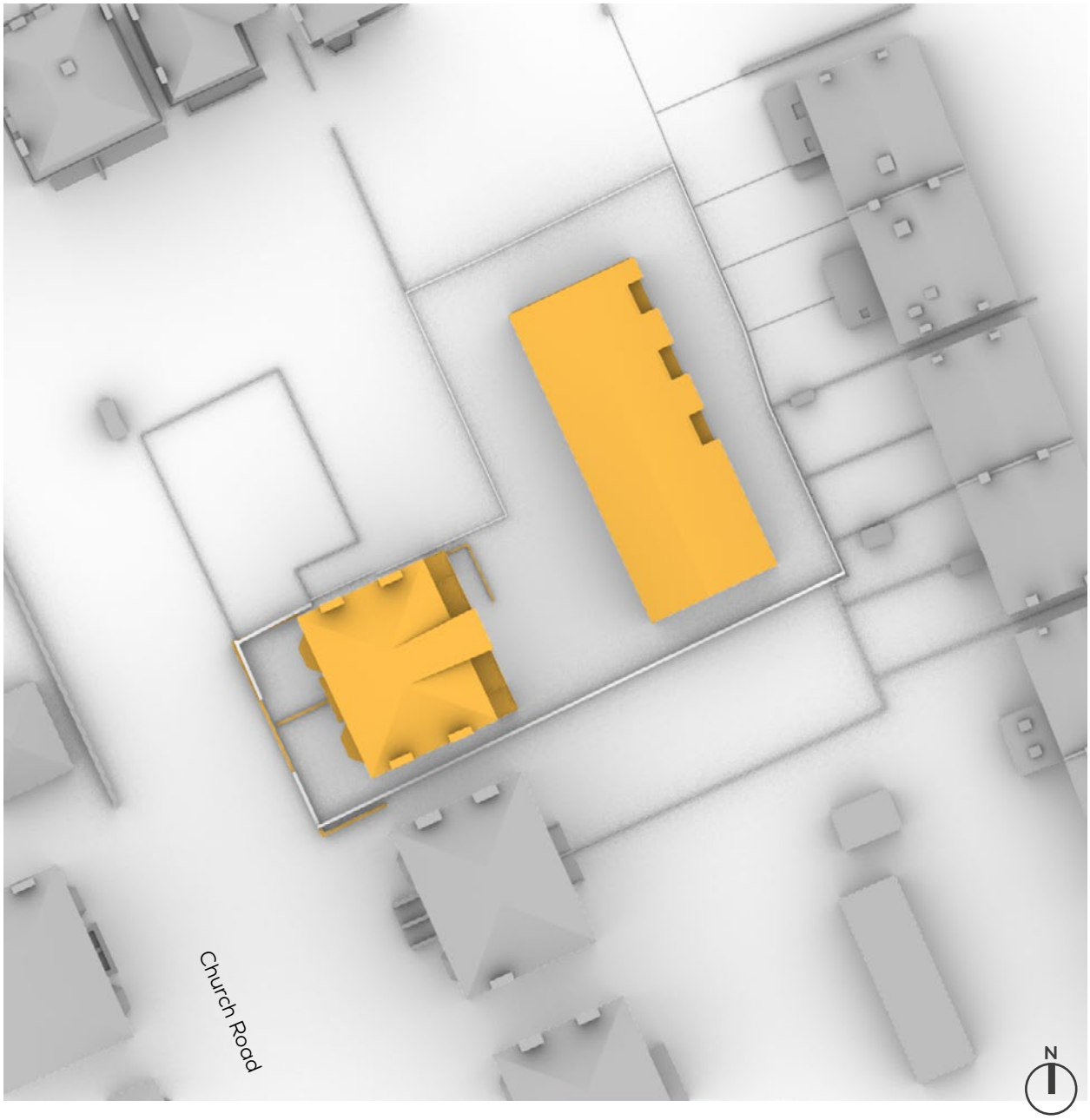

Fig. 01: Top view

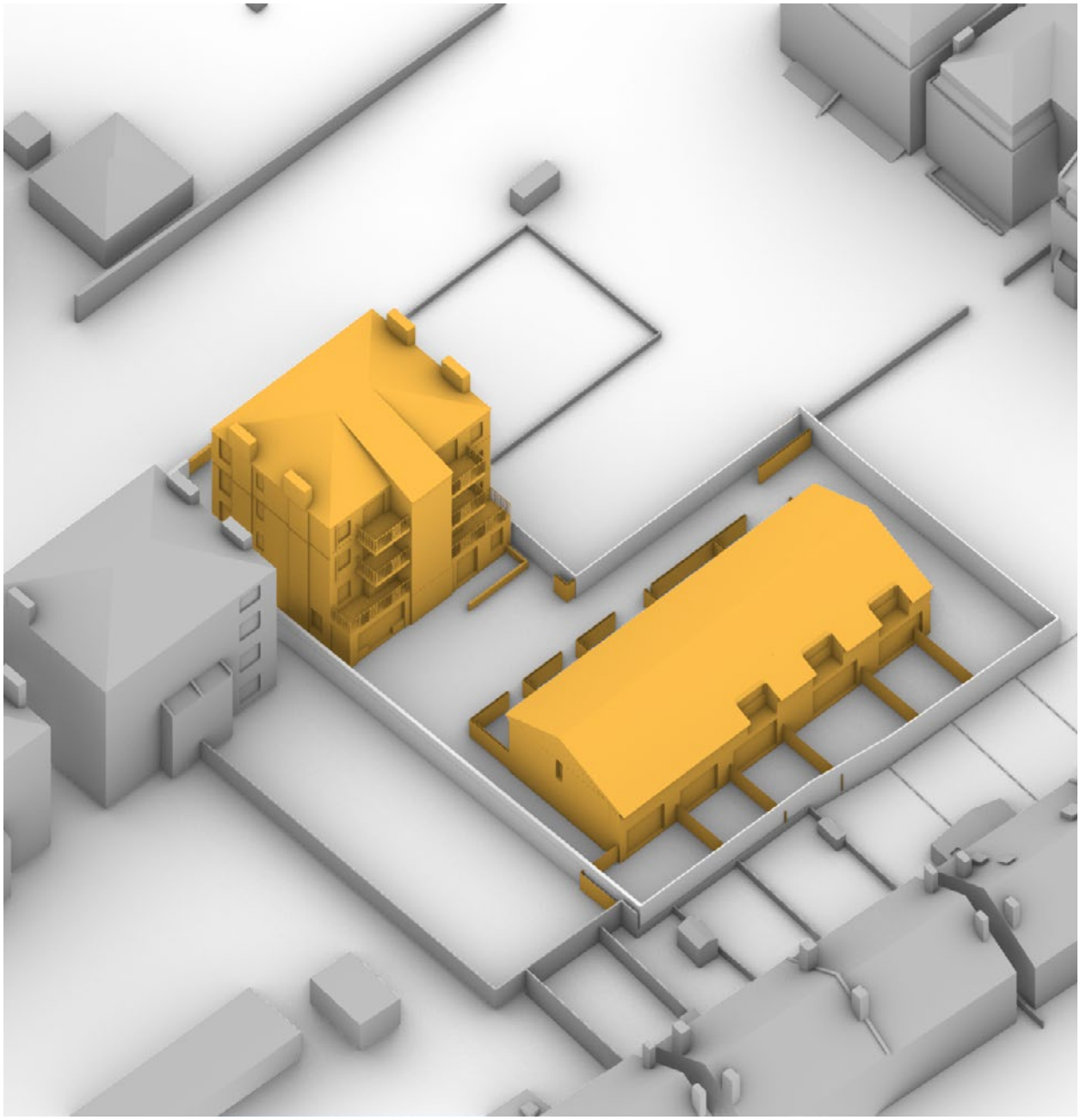

Fig. 02: Perspective view

7 INTERNAL DAYLIGHT AND SUNLIGHT ASSESSMENTS

Mansion Block - Ground Floor

		DAYLIGHT			SUNLIGHT
ROOM REF.	ROOM USE	EN SPATIAL DAYLIGHT AUTONOMY % of room achieving target illuminance for 50% of daylit hours Weather File: GBR_Gatwick			HOURS:MIN
		TARGET [lux]	RELEVANT ENSDA		21 MAR
MANSION BLOCK - GROUND FLOOR					
1	BEDROOM	100	100.0		02:57
2	L/K/D	200	72.3		06:27
3	STUDY	150	100.0		06:20
4	BEDROOM	100	0.0		01:37
5	LIVING ROOM	150	100.0		03:29

Table 02: Assessment Data

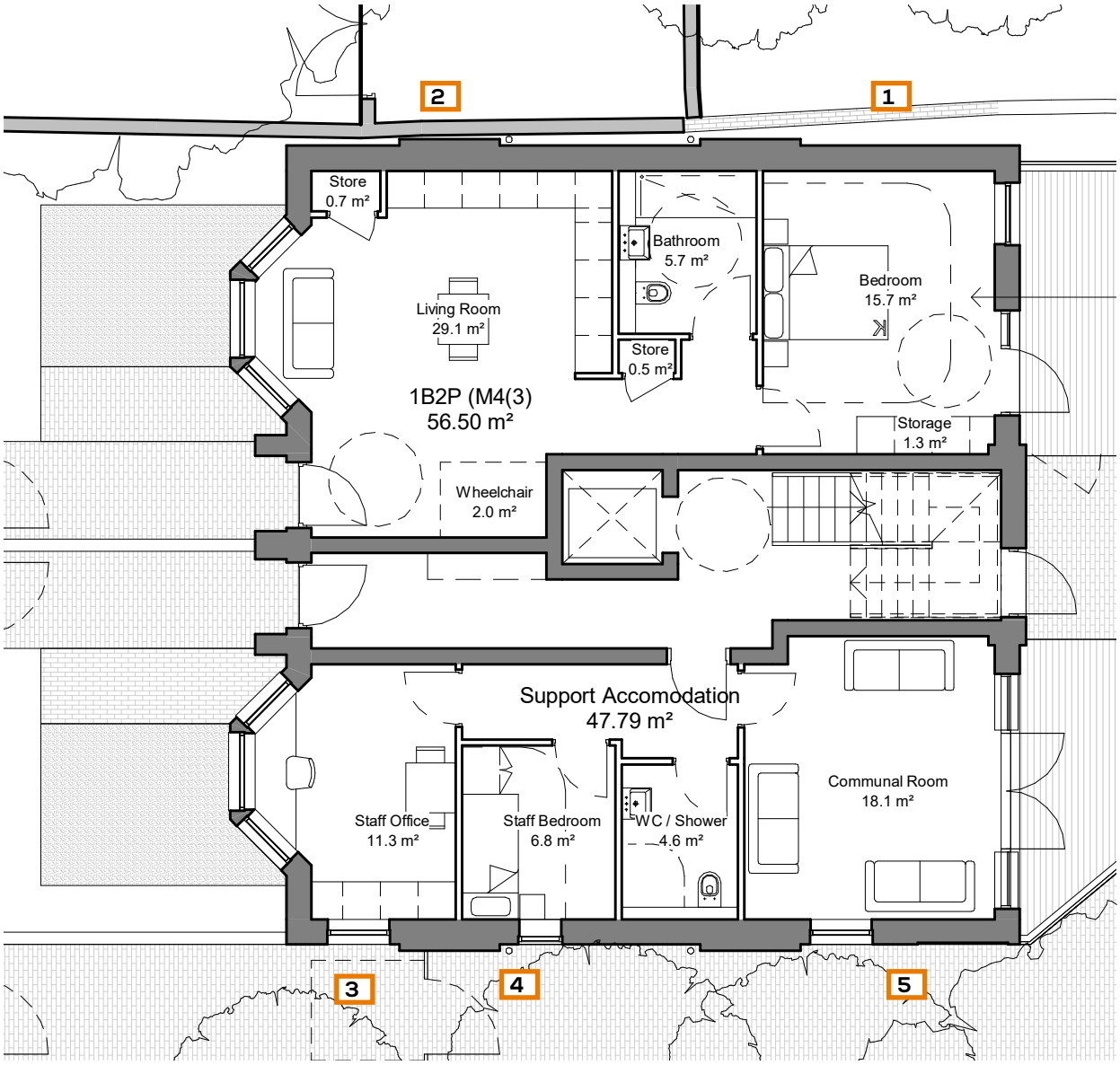

Fig. 03: Floor Plan

Mansion Block - First Floor

ROOM REF.	ROOM USE	DAYLIGHT			SUNLIGHT
		EN SPATIAL DAYLIGHT AUTONOMY % of room achieving target illuminance for 50% of daylit hours Weather File: GBR_Gatwick			HOURS:MIN
		TARGET [lux]	RELEVANT ENSDA		21 MAR
MANSION BLOCK - FIRST FLOOR					
6	BEDROOM	100	100.0		01:54
7	L/K/D	200	100.0		07:27
8	L/K/D	200	100.0		07:48
9	BEDROOM	100	100.0		04:14

Table 03: Assessment Data

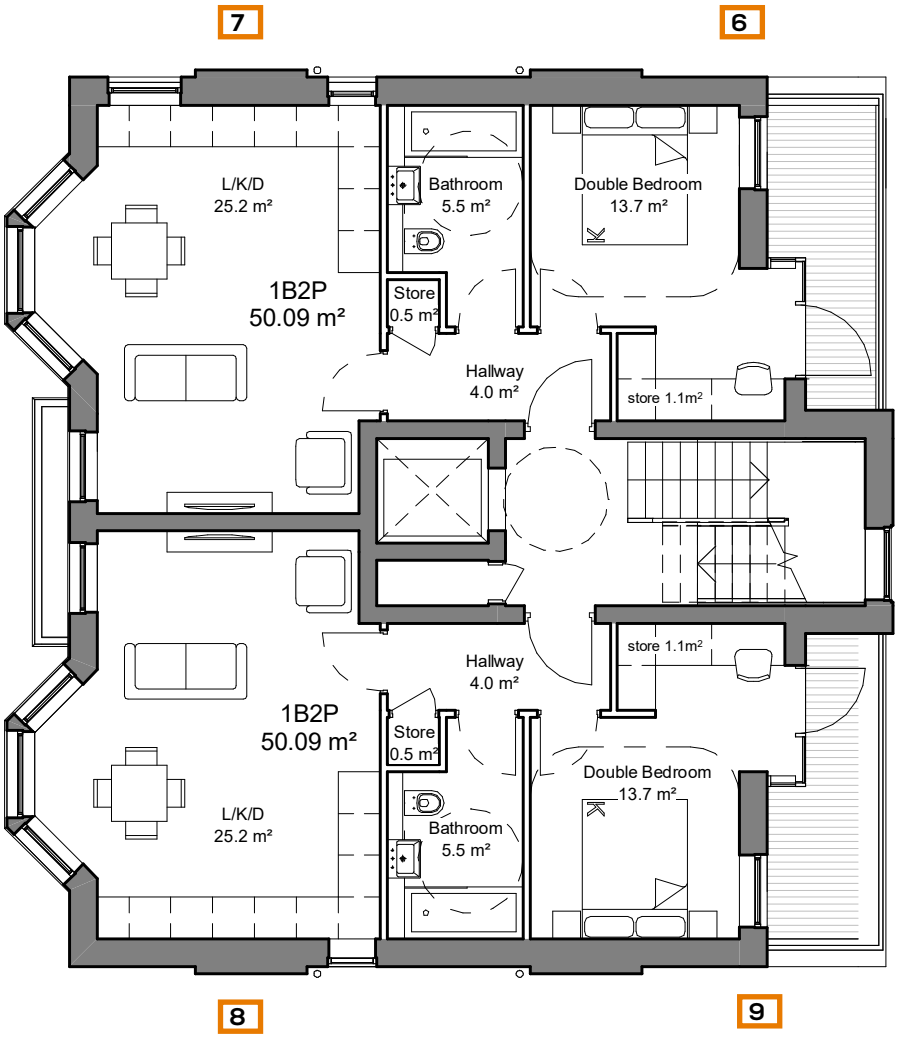

Fig. 04: Floor Plan

Mansion Block - Second Floor

ROOM REF.	ROOM USE	DAYLIGHT			SUNLIGHT
		EN SPATIAL DAYLIGHT AUTONOMY % of room achieving target illuminance for 50% of daylit hours Weather File: GBR_Gatwick			HOURS:MIN
		TARGET [lux]	RELEVANT ENSDA		21 MAR
MANSION BLOCK - SECOND FLOOR					
10	BEDROOM	100	100.0		02:12
11	L/K/D	200	100.0		06:36
12	L/K/D	200	91.8		07:21
13	BEDROOM	100	100.0		04:07

Table 04: Assessment Data

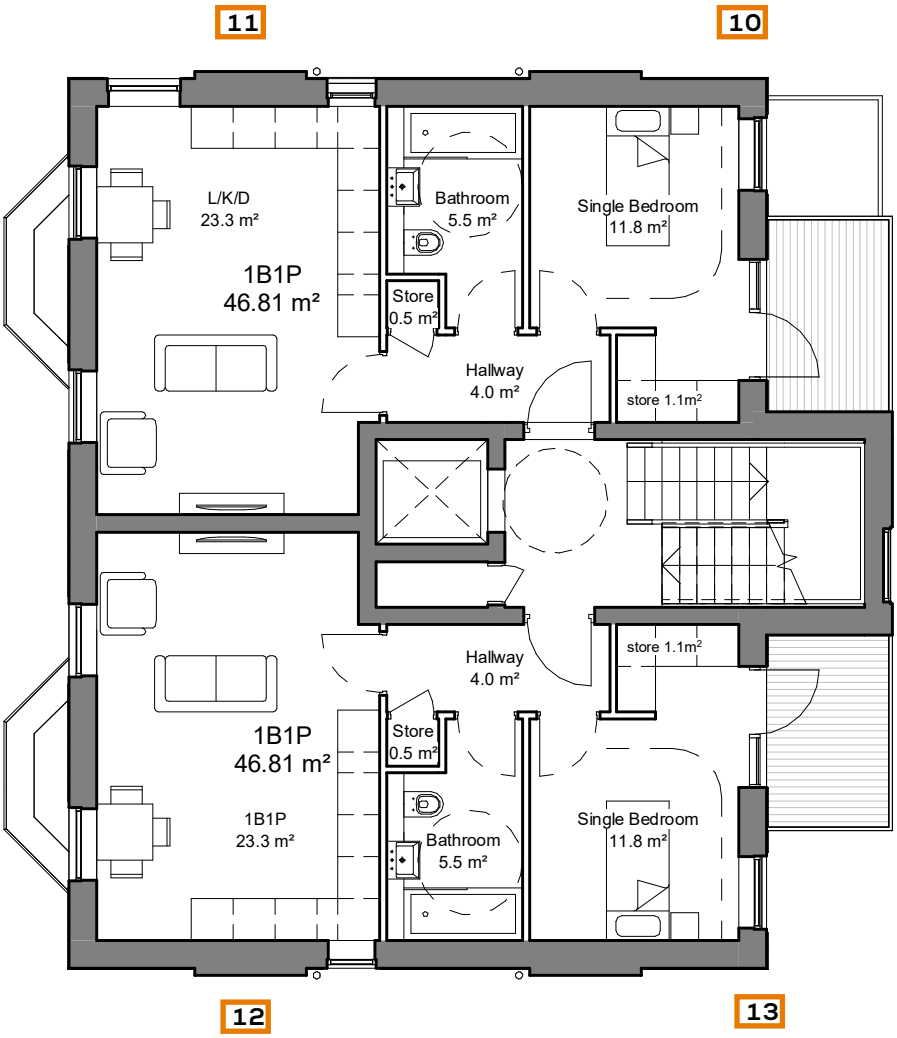

Fig. 05: Floor Plan

Mansion Block - Third Floor

ROOM REF.	ROOM USE	DAYLIGHT			SUNLIGHT
		EN SPATIAL DAYLIGHT AUTONOMY % of room achieving target illuminance for 50% of daylit hours Weather File: GBR_Gatwick			HOURS:MIN
		TARGET [lux]	RELEVANT ENSDA		21 MAR
MANSION BLOCK - THIRD FLOOR					
14	BEDROOM	100	100.0		03:42
15	L/K/D	200	100.0		06:36
16	L/K/D	200	79.4		11:01
17	BEDROOM	100	100.0		04:08

Table 05: Assessment Data

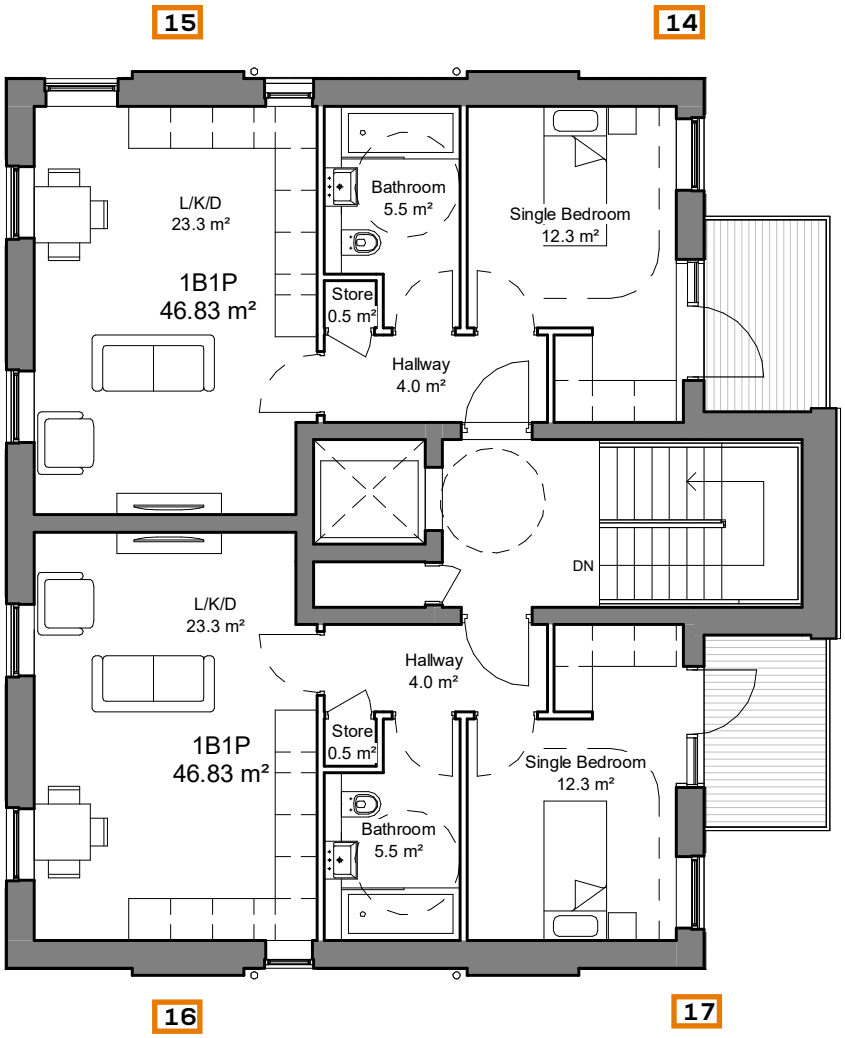

Fig. 06: Floor Plan

Mews Block - Ground Floor

ROOM REF.	ROOM USE	DAYLIGHT			SUNLIGHT
		EN SPATIAL DAYLIGHT AUTONOMY % of room achieving target illuminance for 50% of daylit hours Weather File: GBR_Gatwick			HOURS:MIN
		TARGET [lux]	RELEVANT ENSDA		21 MAR
MEWS BLOCK - GROUND FLOOR					
18	L/K/D	200	87.7		09:03
19	L/K/D	200	62.9		08:22
20	L/K/D	200	65.5		06:55
21	L/K/D	200	62.8		05:17
22	L/K/D	200	61.1		06:00

Table 06: Assessment Data

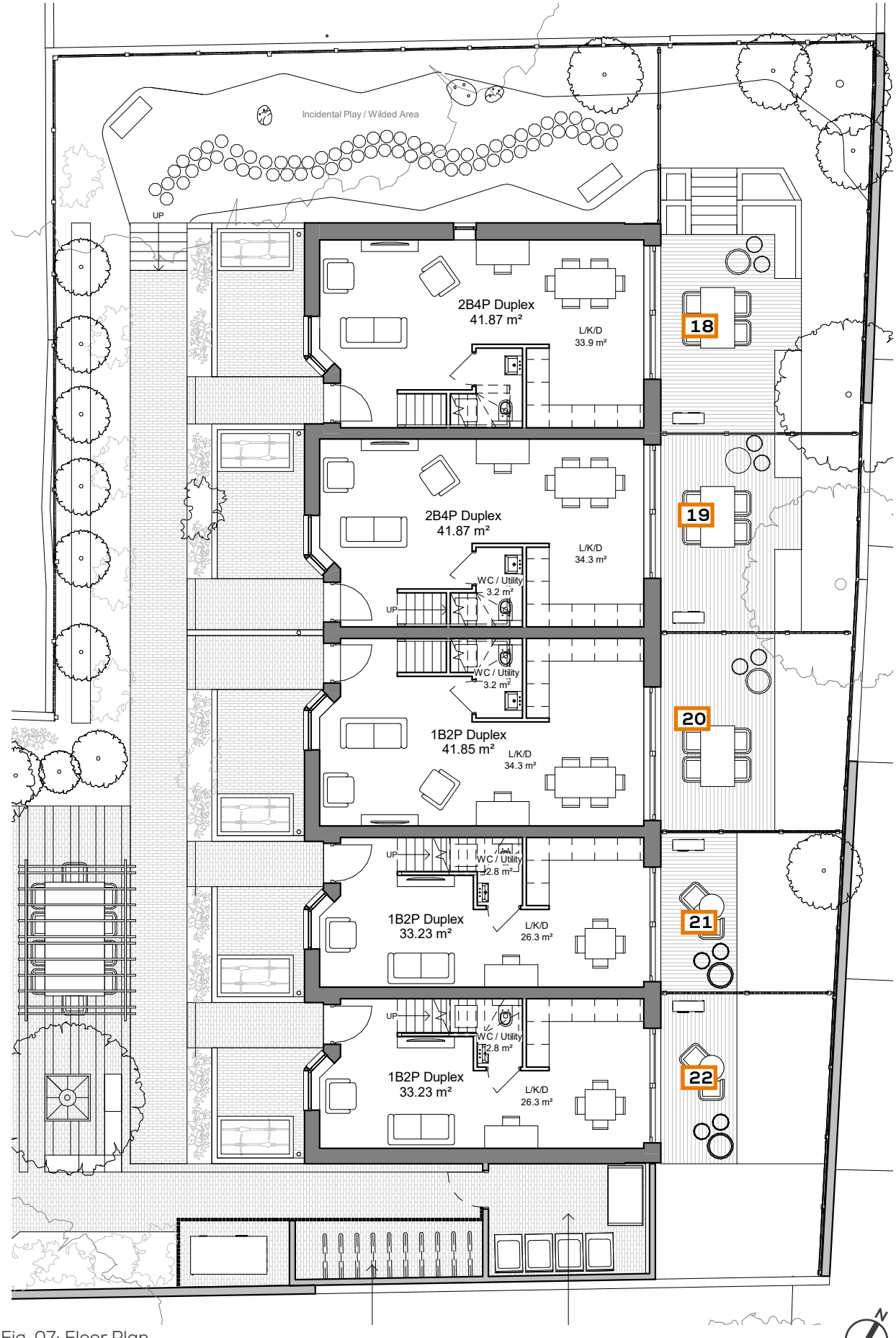

Fig. 07: Floor Plan

Mews Block - First Floor

ROOM REF.	ROOM USE	DAYLIGHT			SUNLIGHT
		EN SPATIAL DAYLIGHT AUTONOMY % of room achieving target illuminance for 50% of daylit hours Weather File: GBR_Gatwick			HOURS:MIN
		TARGET [lux]	RELEVANT ENSDA		21 MAR
MEWS BLOCK - FIRST FLOOR					
23	BEDROOM	100	79.1		05:43
24	BEDROOM	100	100.0		03:37
25	BEDROOM	100	76.8		05:44
26	BEDROOM	100	100.0		03:37
27	BEDROOM	100	100.0		03:22
28	BEDROOM	100	80.7		04:49
29	BEDROOM	100	35.6		03:28
30	BEDROOM	100	91.5		07:30

Table 07: Assessment Data

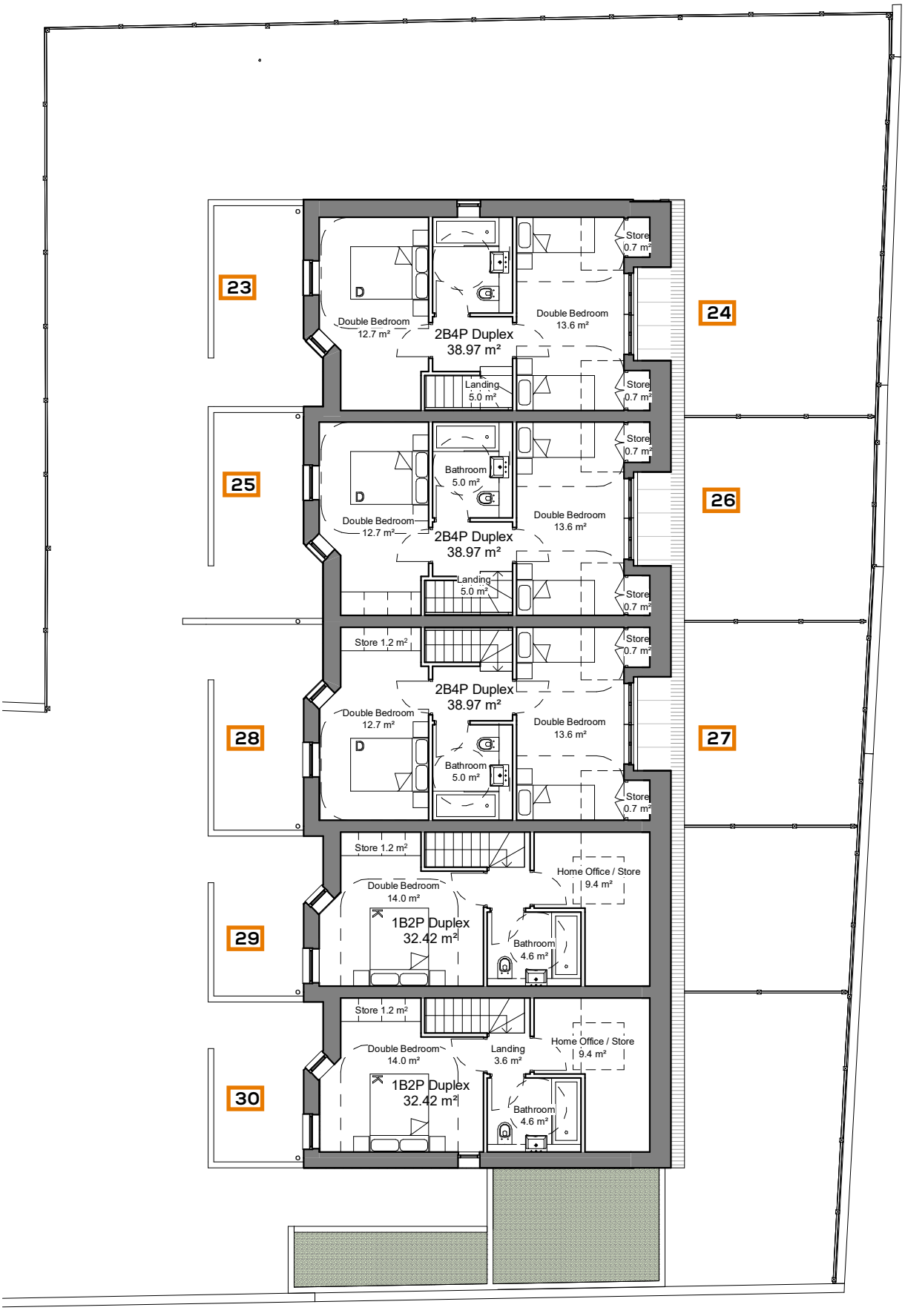

Fig. 08: Floor Plan

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