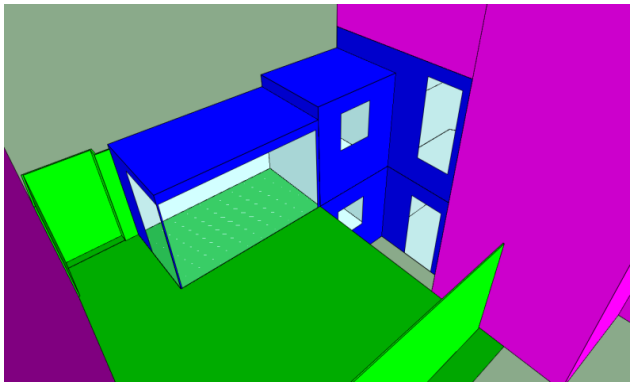

Daylight & Sunlight Simulation Analysis

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EXECUTIVE SUMMARY

A detailed daylight and sunlight study has been carried out on the basement floor dwelling at 93 Camden Street, London, NW1 0HP to check the daylight levels after the proposed ground floor extension.

The analysis is based upon the Building Research Establishment (BRE) guidelines **'Site Layout Planning for Daylight and Sunlight'**, which provides the criteria and methodology for calculation in connection to daylight and sunlight.

The RADIANCE lighting simulation package, developed by the Lawrence Berkeley Laboratory in California, in conjunction with IES modelling software and interface has been used to perform the daylight simulations.

Calculations for Annual Sunlight Availability were performed using IES modelling software SUNCAST.

The overall outcome indicates that all habitable rooms of the basement dwelling at 93 Camden Street will be receiving good levels of daylight to provide well lit spaces, taking into account the orientation and the site location. All rooms are maintaining the same daylight factors as prior to the proposed extension.

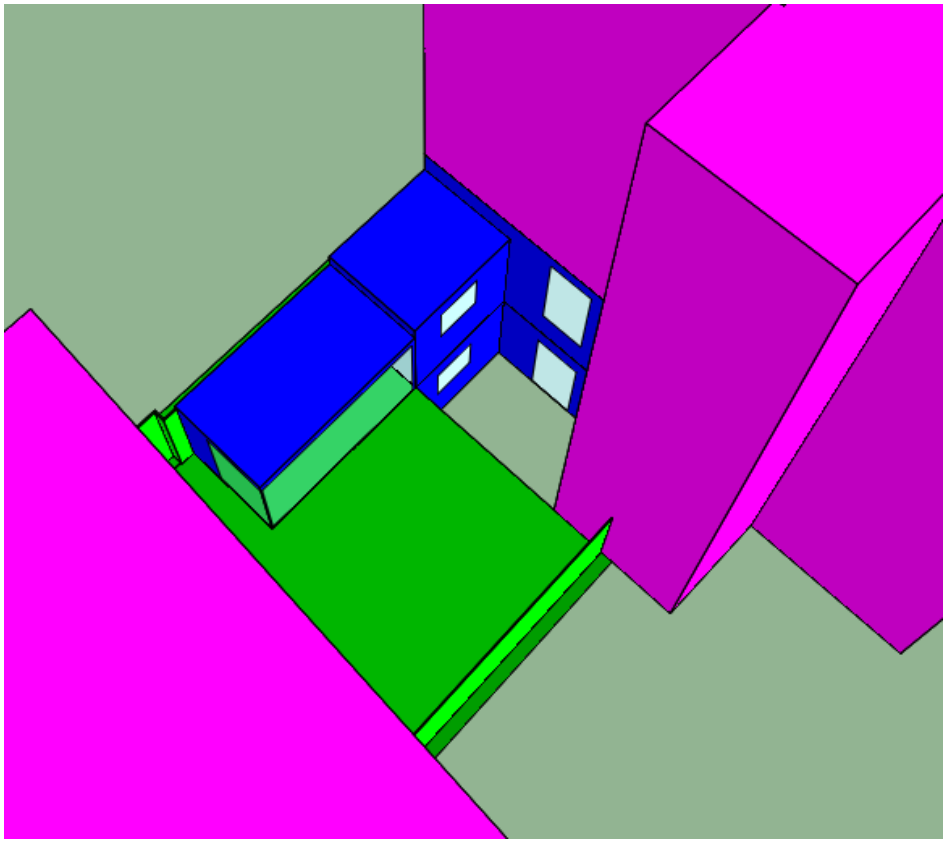

Figure 1: 3D representation of the dwelling and the surrounding area.

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SECTION 1 INTRODUCTION

GENERAL

- Energy Rating Services has been appointed to carry out an assessment of the daylight and sunlight available at the basement flat at 93 Camden Street, London.
- The BRE document; 'Site Layout Planning for Daylight and Sunlight' has been used as the base for this assessment.
- The proposed building has been modelled using Integrated Environmental Solutions Virtual Environment (IES-VE), version 2017.3.0.0.
- Each individual window and glazed door has been tested, the location of each of those windows/doors can be identified in the location plan as shown in Fig 3.
- Based on the BRE document, the following methods were used for measuring the daylight and sunlight:
    - Vertical Sky Component (VSC)
    - No Sky Line
    - Average Daylight Factor (ADF)
    - Annual Probable Sunlight Hours (APSH)

THE SITE

The site is located in London (at 93 Camden Street, London, NW1 0HP) the location in the IES model was assigned as London. The proposal includes a rear extension of the ground floor dwelling in order to create a new sunroom.

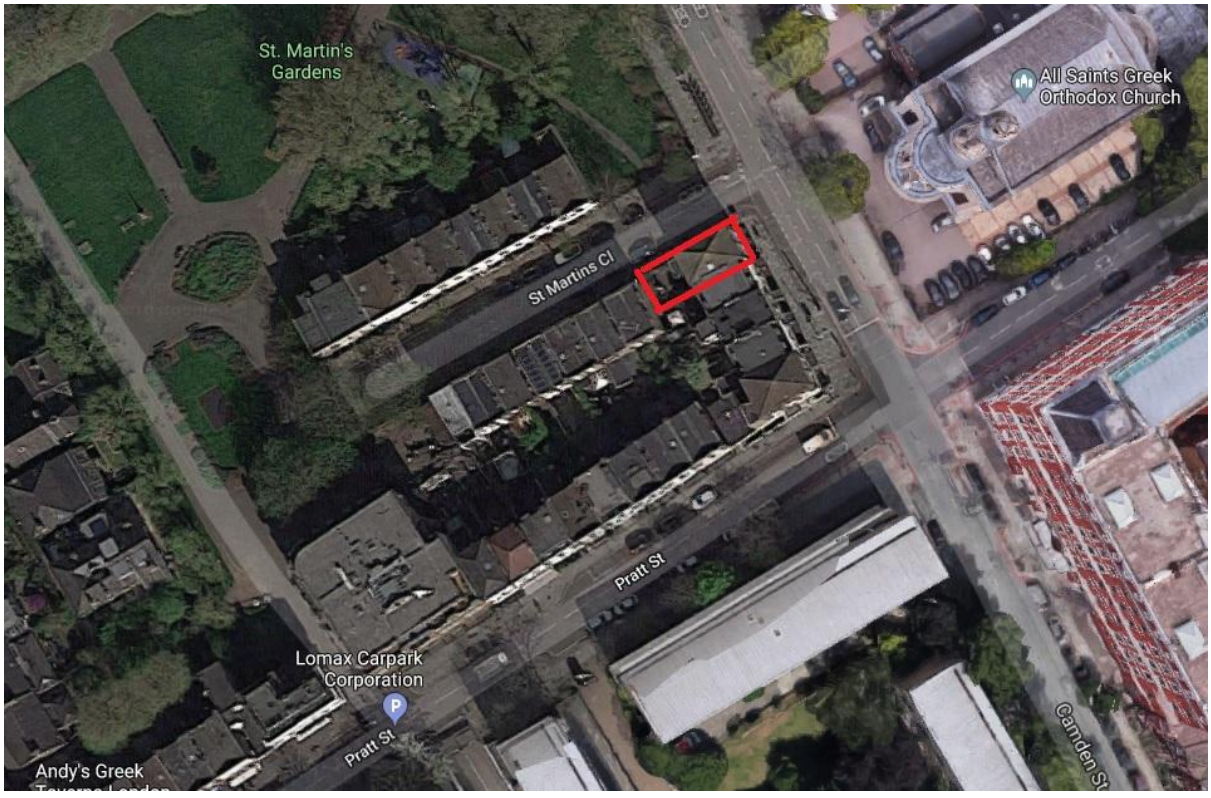

Figure 2: Location of Proposed Site

DOCUMENTS CONSIDERED

The model has been constructed based on the architectural drawing provided. A list of the drawing references are listed in Table 1 below.

Table 1: Drawings reference

Description	Drawing Reference
Floor Plan	P1.00 Site Plan
	P1.01 Existing Plan
	P1.02 Existing Plan Roof
	P2.01 Proposed Plan
	P2.02 Proposed Plan Roof
Elevations & Sections	P1.21 Existing Elev St Martin's Close
	P1.22 Existing Elev – Sect Garden
	P2.21 Proposed Elev St Martin's Close
	P2.23 Proposed Elev - Sect Garden
	P2.24 Proposed X Sect
	P2.25 Proposed Proposed Elev50 Garden
	P2.30 Proposed Daylight Sunlight

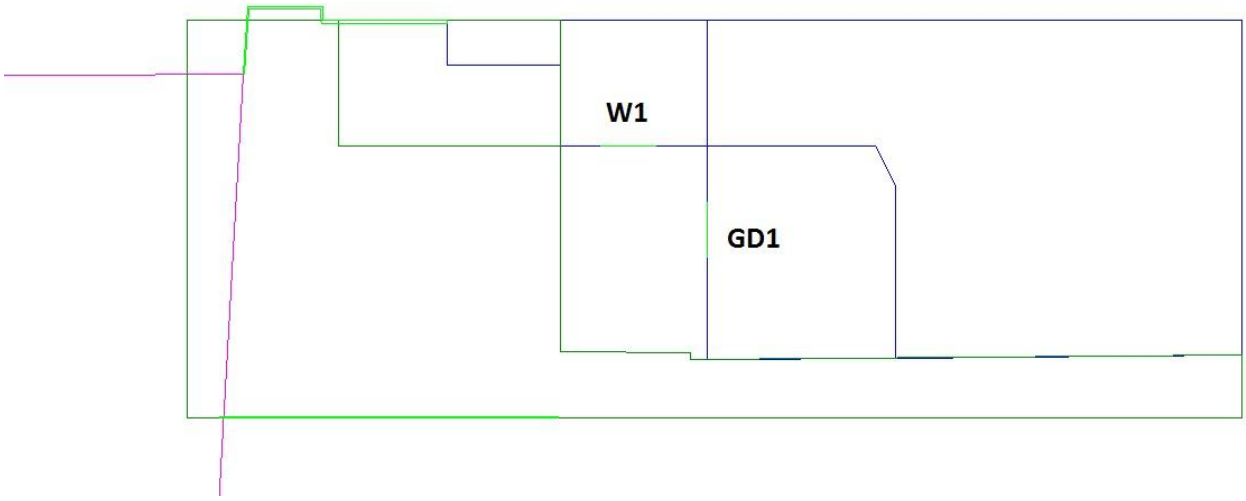

Figure 3. Tested openings of basement flat

SECTION 2 TESTS & RESULTS

VERTICAL SKY COMPONENT (VSC)

The BRE document definition of the (VSC) is: Ratio of the part of illuminance, at a point on a given vertical plane, that is received directly from a CIE standard overcast sky, to illuminance on a horizontal plane due to an unobstructed hemisphere of this sky. Usually the 'given vertical plane' is the outside of a window wall. The VSC does not include reflected light, either from the ground or from other buildings.

The VSC is usually expressed as a percentage and the maximum value for a completely unobstructed window is slightly less than 40%. The recommendations set down in the BRE report,' Site layout for daylight and sunlight, a guide to good practice', would indicate, for residential properties, that a VSC value of greater than 27% is acceptable. However, a 20% VSC is considered to be good for an urban area.

It should be noted that the Guide itself, within the introduction, states that the advice given was not mandatory and the Guide should not be seen as an instrument of planning policy, its aim being to help rather constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly.

The introduction of the BRE guide, gives an example of urban areas being a case where there is a need for flexibility and altering the target values criteria where appropriate. Appendix F of the BRE guide is dedicated to the use of alternative values and demonstrates the manner in which the criterion for skylight was determined. The RADIANCE lighting simulation package in IES-VE, has been used to perform the daylight simulations. The windows analysed are shown in Figure 2, and the room function is listed in Table 3.

The results of the VSC for the windows and glazed doors are shown in Table 3 below. According to the BRE document, any room with two or more windows of equal size, the mean of their VSCs is taken.

The results indicate that the basement windows already have a low VSC. It is clearly shown that the VSC results after the proposed extension are maintained at the same level with any occurring change to be negligible.

Table 2: VSC Results

Reference	Room	Elevation	VSC Existing	VSC Proposed
Dwelling	Bedroom	West /GD1	6.17%	4.94%
	Study Bedroom	South/ W1	5.13%	5.13%

AVERAGE DAYLIGHT FACTOR (ADF)

The BRE document defines ADL as: The ratio of total daylight flux incident on the working plane to the area of the working plane, expressed as a percentage of the outdoor illuminance on a horizontal plane due to an unobstructed CIE standard overcast sky.

In housing BS 8206-2 gives minimum values of ADF of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms.

The results of the ADF for the tested rooms are shown in Table 3 below, with Fig (4-9) showing the detailed results of the room daylight factors from the model. Results are showing that the Average Daylight Factors for all rooms are maintaining the same level, indicating that the spaces will not be affected by the proposed ground floor extension.

Table 3: ADF Results

Reference	Room	Elevation	ADF Existing	ADF Proposed
Dwelling	Bedroom	West /GD1	0.7%	0.6%
	Study Bedroom	South/ W1	1.2%	1.1%

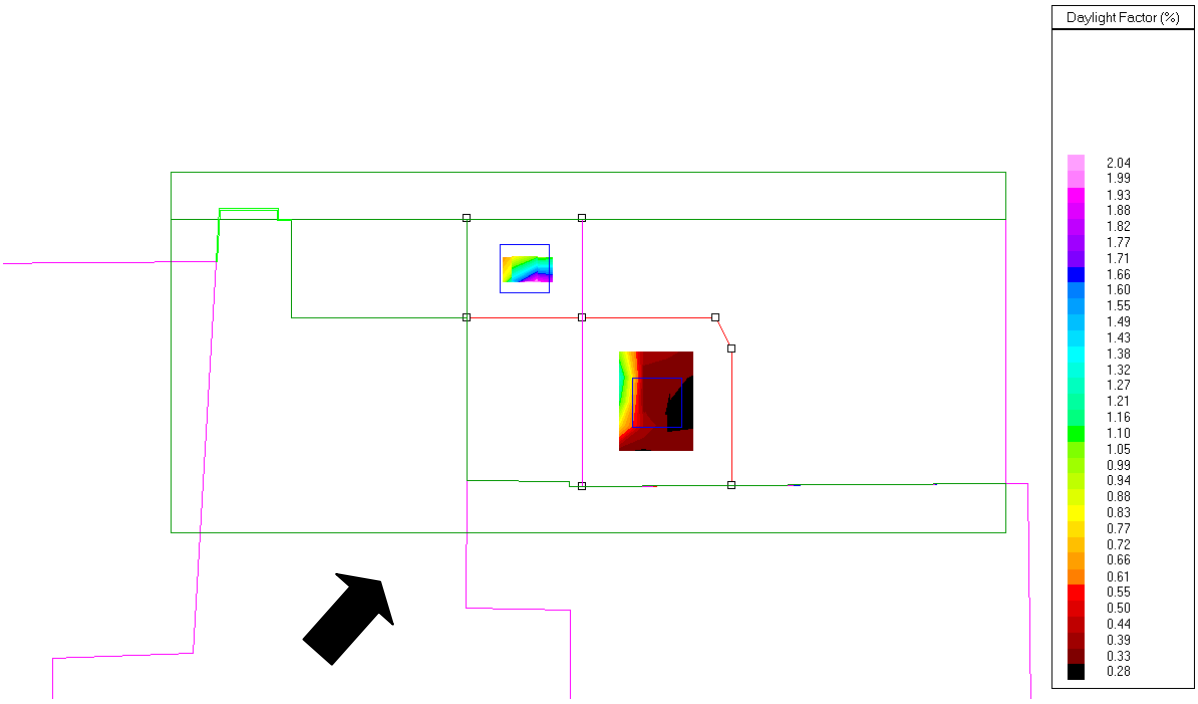

Figure 4: Daylight factor Contours for Basement Floor - Proposed

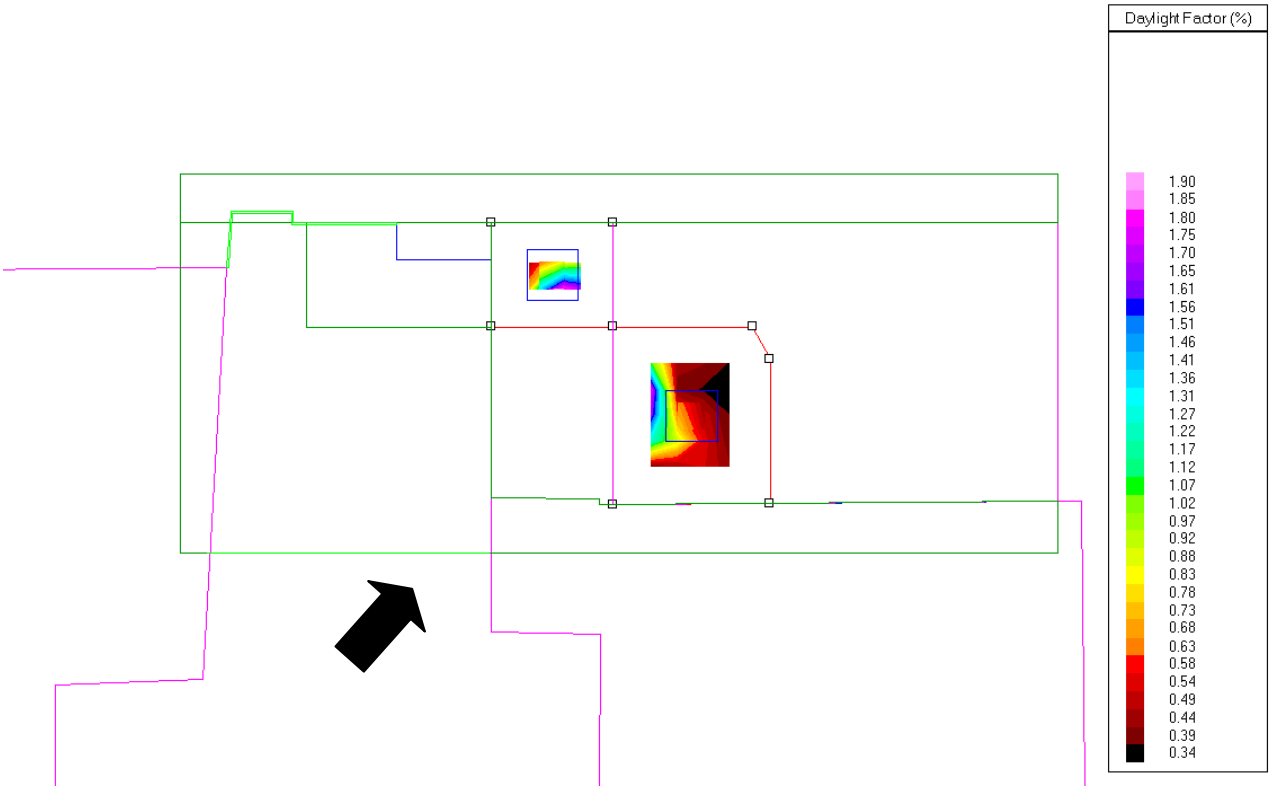

Figure 5: Daylight factor Contours for Basement Floor - Existing

Surface	Quantity	Values			Uniformity (Min./Ave.)	Diversity (Min./Max.)
		Min.	Ave.	Max.		
Working plane 1 Reflectance=0% Transmittance=100% Grid size=0.50 m Area=5.037m² Margin=0.50 m	Daylight factor	0.4 %	0.7 %	1.8 %	0.51	0.20
	Daylight illuminance	43.23 lux	84.64 lux	220.55 lux	0.51	0.20
	Sky view	0.00	0.65	1.00	0.00	0.00

Figure 6: Daylight Factor Results (Basement Floor Bedroom - Existing)

Surface	Quantity	Values			Uniformity (Min./Ave.)	Diversity (Min./Max.)
		Min.	Ave.	Max.		
Working plane 1 Reflectance=0% Transmittance=100% Grid size=0.50 m Area=1.422m² Margin=0.50 m	Daylight factor	0.7 %	1.2 %	2.0 %	0.53	0.32
	Daylight illuminance	80.13 lux	150.79 lux	247.68 lux	0.53	0.32
	Sky view	0.00	0.83	1.00	0.00	0.00

Figure 7: Daylight Factor Results (Basement Floor Study/Bedroom - Existing)

Surface	Quantity	Values			Uniformity (Min./Ave.)	Diversity (Min./Max.)
		Min.	Ave.	Max.		
Working plane 1 Reflectance=0% Transmittance=100% Grid size=0.50 m Area=5.037m² Margin=0.50 m	Daylight factor	0.4 %	0.6 %	1.4 %	0.68	0.29
	Daylight illuminance	51.07 lux	75.24 lux	176.91 lux	0.68	0.29
	Sky view	0.00	0.55	1.00	0.00	0.00

Figure 8: Daylight Factor Results (Basement Floor Bedroom - Proposed)

Surface	Quantity	Values			Uniformity (Min./Ave.)	Diversity (Min./Max.)
		Min.	Ave.	Max.		
Working plane 1 Reflectance=0% Transmittance=100% Grid size=0.50 m Area=1.422m² Margin=0.50 m	Daylight factor	0.5 %	1.1 %	1.9 %	0.46	0.27
	Daylight illuminance	63.41 lux	137.27 lux	235.30 lux	0.46	0.27
	Sky view	0.00	0.83	1.00	0.00	0.00

Figure 9: Daylight Factor Results (Basement Floor Study/Bedroom -Proposed)

ANNUAL PROBABLE SUNLIGHT HOURS (APSH)

APSH is the total number of hours in the year that the sun is expected to shine on the centre of each window, allowing for average levels of cloudiness for the location in question. **This test is used to test façade within 90 degrees of due south.**

The BRE Handbook notes that:

"*…a south facing window will, in general, receive most sunlight, while a north facing one will receive it only on a handful of occasions. East and west facing windows will receive sunlight only at certain times of day*".

For existing residential buildings, the BRE Handbook suggests that: "*all main living rooms of dwellings… should be checked if they have a window facing within 90° of due south. Kitchens and bedrooms are less important, although care should be taken not to block too much sun*".

Results indicate that all the windows of the development will be receiving adequate sunlight. According to BRE Handbook , the west facing windows were not tested as the façade is not within 90° of due south . As seen at table 4, all the tested windows are getting the same sunlight levels in both the existing situation and after the proposed rear extension of the ground floor flat.

Table 4: Annual Probable Sunlight Hours Percentages

Room	Window	Existing Average Probable Sunlight Hours			Proposed Average Probable Sunlight Hours		
		Summer	Winter	Average	Summer	Winter	Average
Study/Bedroom	W1/S	4.38	0.61	4.99	4.38	0.61	4.99

No Sky Line

The No sky line is the outline on the working plane of the area from which no sky can be seen. This is to determine the light distribution in a room. The IES-ve calculation method is to define the sky view factor, which is the factor from the surface to the sky, this is *the ratio of the diffuse sky radiation received by the surface to that which would be received by the same surface if it were completely exposed to the sky* (The theory assumes that the diffuse sky radiation is isotropic).

The percentage area of no sky view is shown for each room in Table 5 below. That is based on the IES results, sky view results are also shown in Figures 6-9.

The results indicate the rooms achieved the required sky view percentage on the working plane level, as shown in Table 5, taking into account the surrounding external elements.

Table 5: Sky View Area Results

Flat	Room	Elevation	Existing sky view area (Working Plane)	Proposed sky view area (Working Plane)
Dwelling	Bedroom	West	65%	55%
	Study/Bedroom	South	83%	83%

Conclusion

The vertical sky component daylight assessment results show that the windows and glazed doors will receive the same levels of daylight after the proposed extension to the rear of the building. The daylight levels are acceptable, especially when taking into account the urban area and location in which the flats are located, and the flexibility that should be applied to the BRE guidelines in such circumstances.

The Average Daylight Factors in all rooms were maintained at the same level. As well as the Sky view percentage and the Annual Probable Sunlight Hours.

Overall, the habitable rooms of the basement dwelling at 93 Camden Street, London, will not be affected in regards to the daylight reception from the proposed ground floor extension to the rear of the building.