DAYLIGHT AVAILABILITY AND DAYLIGHT IMPACT STUDY FOR THE PROPOSED EXTENSION ON THE 44 BIRCHINGTON ROAD BUILDING, NW6 4LJ, LONDON

Client:

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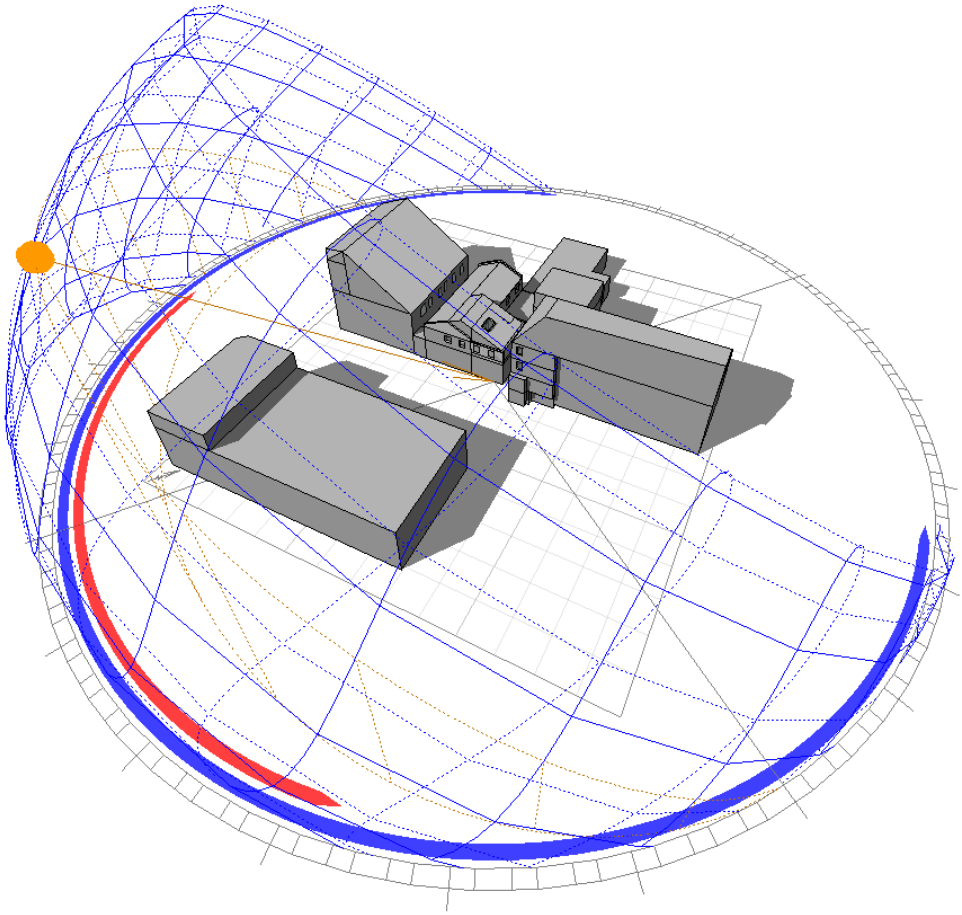
Date: 25/11/2024

PREPARED BY: ECODESIGN LTD



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1. INTRODUCTION

The purpose of this study is to evaluate the daylighting conditions within the habitable spaces of the proposed development, as well as to evaluate the daylight/sunlight impact of the proposed development on existing windows and nearby rooms.

For the first part of the study, this would include a daylight and sunlight analysis for the proposed studio. The proposed studio extension is composed of 1 level (located on the first floor of 44 Birchington Road), which would extend the single story building by adding another level above. The proposed development is one studio and only covers part of the first floor 44 Birchington Road, closer towards the road.

The address of the proposed building is at: 44 Birchington Road, London, NW6 4LJ (see Figure 1). Plans and elevations of the existing building can be seen in Figures 2a,2b and plans and elevations of the proposed studio can be seen in Figures 3a-3c.

The daylighting study focused on the single habitable space of the proposed studio. The purpose of the second part of the study was to evaluate the potential impact of the proposed development (the 1st floor studio) on existing nearby windows and rooms in terms of daylight and sunlight, based on the BRE2022 guide.

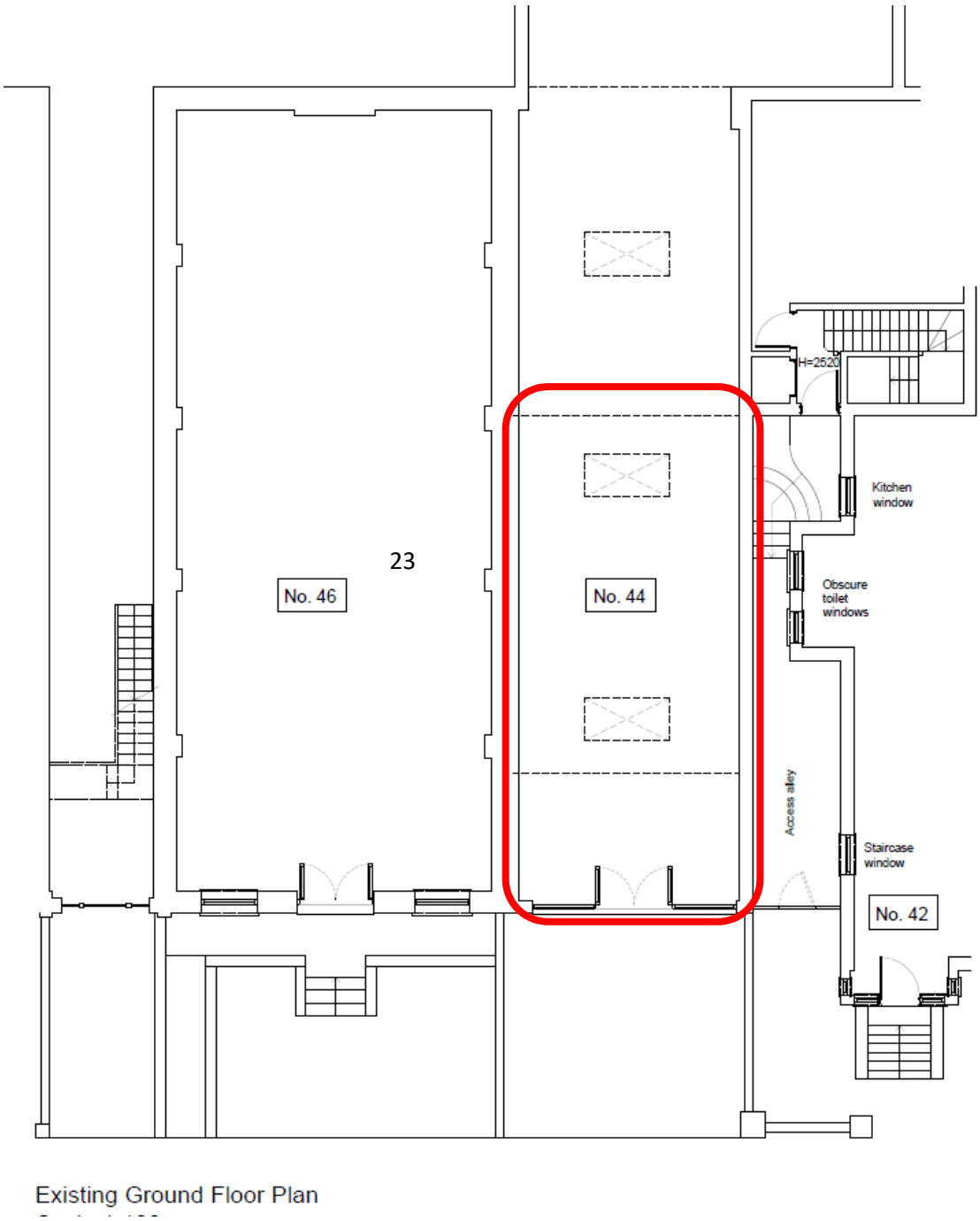


Figure 1: *No44 Birchington Road (highlighted in red on the site)*

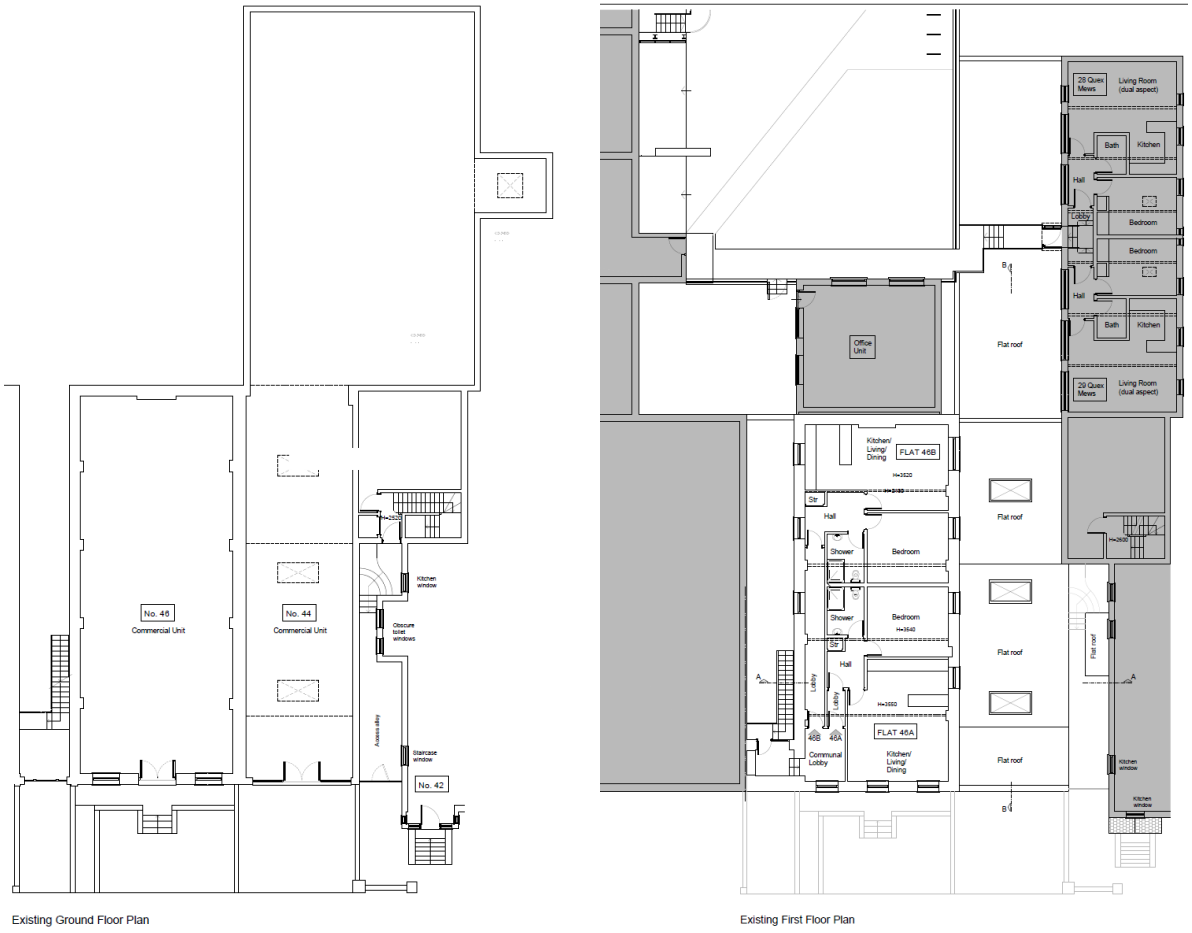


Figure 2a: *Existing building plan for ground and 1st floors (No 42,No44,No46)*

Figure 2b: *Existing roof plan and elevants*

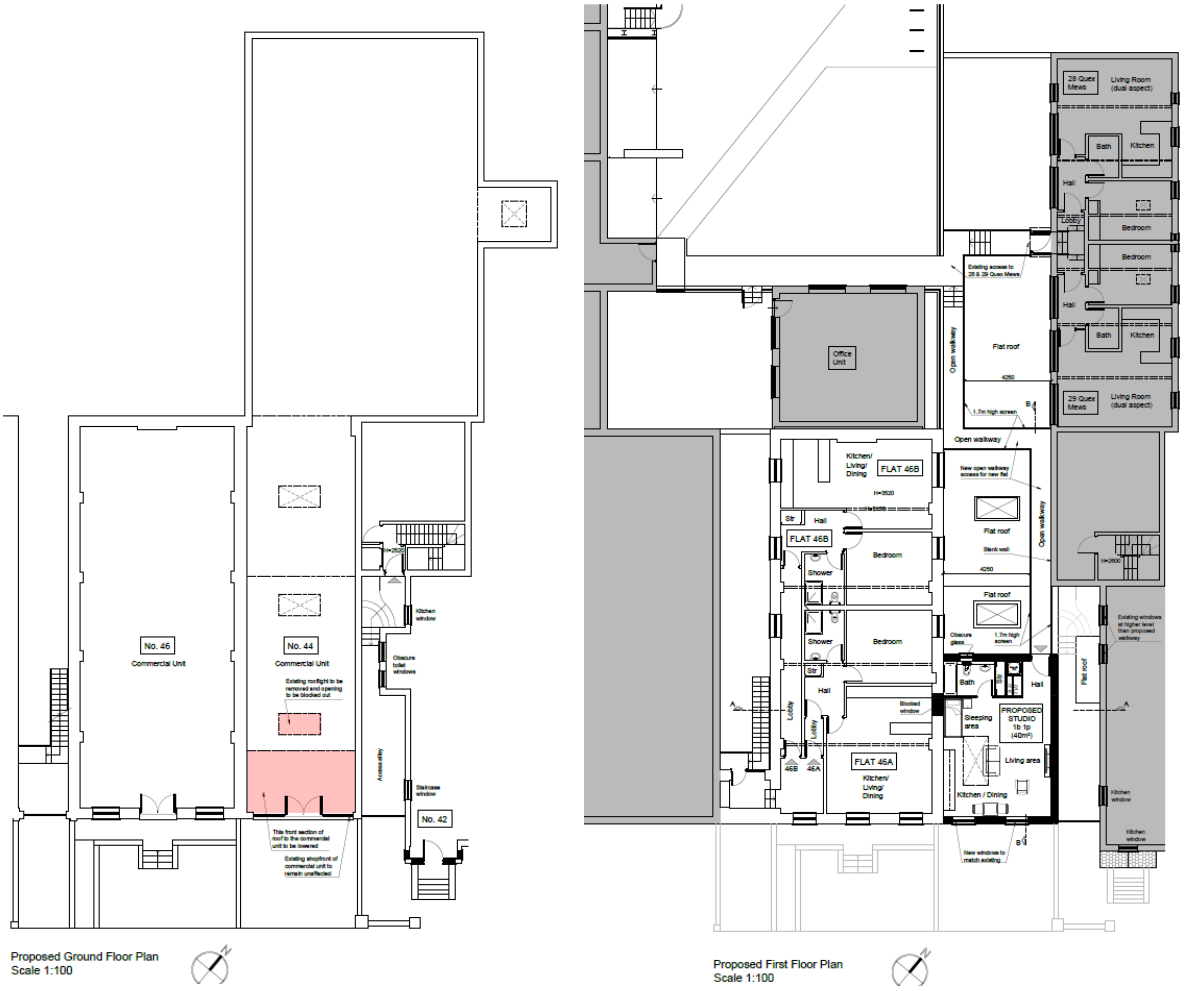


Figure 3a: *Proposed Ground and 1st Floors for No44 and adjacent buildings*

Figure 3b: *Proposed Roof plan and elevations*

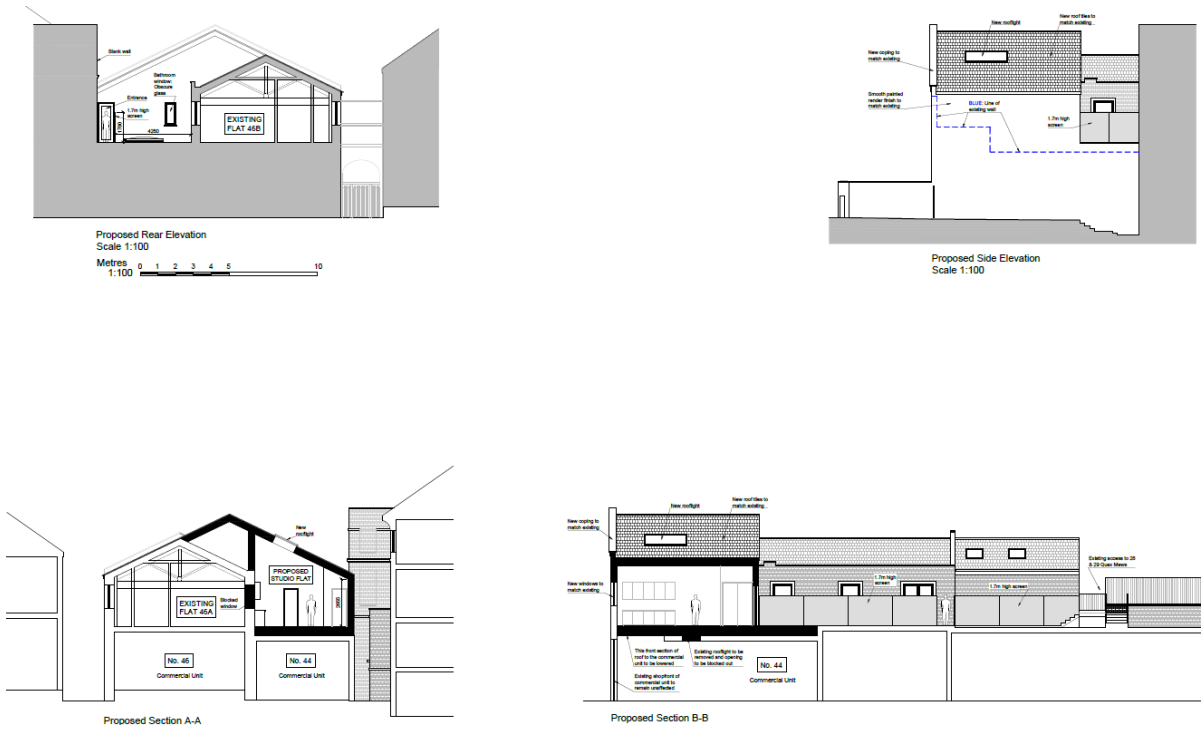


Figure 3c: *Proposed elevations*

2. APPROACH

In order to evaluate the daylight impact of the proposed design, first the daylight impact of the existing building on relevant windows was evaluated so that a base case scenario for the existing situation is established. This was done in accordance with the BRE 209 Daylight and Sunlight Planning Guide (2022). Afterwards, the impact on the same windows was again evaluated when the proposed development was present and the results were compared.

The existing and proposed designs are surrounded by a range of buildings, as can be seen from Figures 4-7. Some of the existing neighbouring properties are too far away to experience any impact from the proposed two new floors hence they were not made part of the analysis. This was in line with section 2.2.4 of the guide (see Appendix A of this report), where windows located too far away should not be considered as they will not experience any impact. The study will therefore focus on the impact of the proposed design on the adjacent properties and more specifically on No42, No46 and No 46 Birchington Road buildings.

Due to the location of the building, as well as the orientation, few buildings and windows are going to be impacted in terms of daylight. Windows that were not going to be impacted from the proposed development due to orientation, were not included as part of the analysis. Also, all windows that related to toilets, corridors, or generally not living spaces, are not considered by the BRE guide and do not form part of this analysis.

In order to perform the necessary calculations, building performance modelling was used, in the form of building simulation software, specialising in lighting simulation. In this case AUTODESK ECOTECT Analysis was used to setup the required 3D models.

Drawings, in order to construct 3D models, were provided by the client and their architect: Wave Architects. Additional information was obtained through online sources and a site survey, which then further instructed the 3D model.

The 3D models constructed for simulations were optimised for a daylight impact study analysis, thus the models were constructed in such a way so that the massing of buildings was captured, with window details on the surrounding properties to be investigated. Geometric detail that would not impact on the analysis was not included.

Vegetation (including small and large trees) is present in the wider area, but this was not included in the analysis, in order to investigate the maximum potential for daylight on surrounding properties and the effect the proposed new floor will have on them. This is in line with Section G3.2 and G3.3 from the BRE Lighting and Daylight Planning Guide (2022).

The BRE 209 guide, that this daylight impact assessment is based on, provides some recommendations in terms of targets and acceptable limits. More specifically, the Vertical Sky component is used, with a recommended level of 27%. Thus, windows in existing buildings with VSC of 27% of higher will have enough skylight reaching the window. If the VSC of an existing window is both less than 27% and less than 0.8 times its former value, then significant reductions in daylight will occur. This is based on section 2.2.7 of the guide, an excerpt of which can be found in Appendix A.

The above guidance applies to the windows of living rooms, kitchens and bedrooms in surrounding properties. Windows to non-living rooms such as corridors and toilets need not be analysed as the guide suggests (see section 2.2.2 in Appendix A of this report).

As per the recommendations of the guide, the 25 degree line was tested for nearby windows that were located far enough to check if the proposed development lies below

this line or not. The guide suggests that if all of the proposed development lies below the 25 degree line, then the development is unlikely to have a substantial effect on the diffuse skylight enjoyed by such windows (see section 2.2.2 in Appendix A).

As per the recommendations of the guide, the VSC for surrounding windows was calculated. Firstly, this was done for the existing situation (i.e. considering the building as it currently is without the proposed development) in order to establish the base case scenario. Then, the VSC for all these windows was calculated again with the addition of the proposed new floors and the results were compared. Exactly the same analysis was conducted for the Annual Probable Sunlight Hours (APSH).

For any windows where the reduction in VSC and ASPH was beyond the recommended levels, then the No-Sky-Line will have to be calculated for the rooms behind such windows where the acceptable range is within 0.8 of the NSL area of the former value.

In terms of daylight performance of the proposed new development, all the habitable rooms (the studio) were calculated and more specifically the daylight factors over a grid of points was calculated for this habitable room.

The reflection of surfaces is very important for daylight performance. The intention of the architects is to specify white colours for walls and ceiling on all proposed new rooms. As a worst case scenario though, it was decided that the reflectance values on surfaces as proposed by the BRE 209 Guide were used: Floors: 0.2, Interior Walls: 0.5, Ceilings: 0.7. The reflection levels could potentially represent a fairly dark carpet, a coloured wall and a white ceiling. This represents a common scenario in terms surface reflection for simulations at this stage in a design. As the architects intend to use white colour on ceiling and walls, then the daylight levels inside the room would be slightly higher than what is predicted in this report. As instructed by the architect a

double glazing system with clear glass was simulated as part of the model for all windows.

The targets set in terms of daylight performance were provided by the Building Research Establishment (BRE) 209 guide (2022), that suggests a minimum daylight factors for habitable rooms for new developments, as can be seen in the following table.

Summary of requirements
BRE 209 Guidance (2022) Appendix C -UK National Annex (Table C3) Specific recommendations for daylight provision in UK dwellings Minimum daylight provisions in all UK dwellings: Target daylight factors to achieve over at least 50% of the assessment grid in UK domestic habitable rooms with vertical and/or inclined daylight apertures -For kitchens: **1.4%** -For living rooms: **1.1 %** -For bedrooms: **0.7%**

The above table lists the main targets to be met by the proposed rooms, as minimum requirements. On this basis, a series of calculations and simulations were performed in order to determine the daylight performance of the proposed rooms. The simulations, included a calculation of daylight factors over a grid of points (set at 850mm above floor level – desk level), and have incorporated all simulation recommendations from the BRE209 (2022) guide.

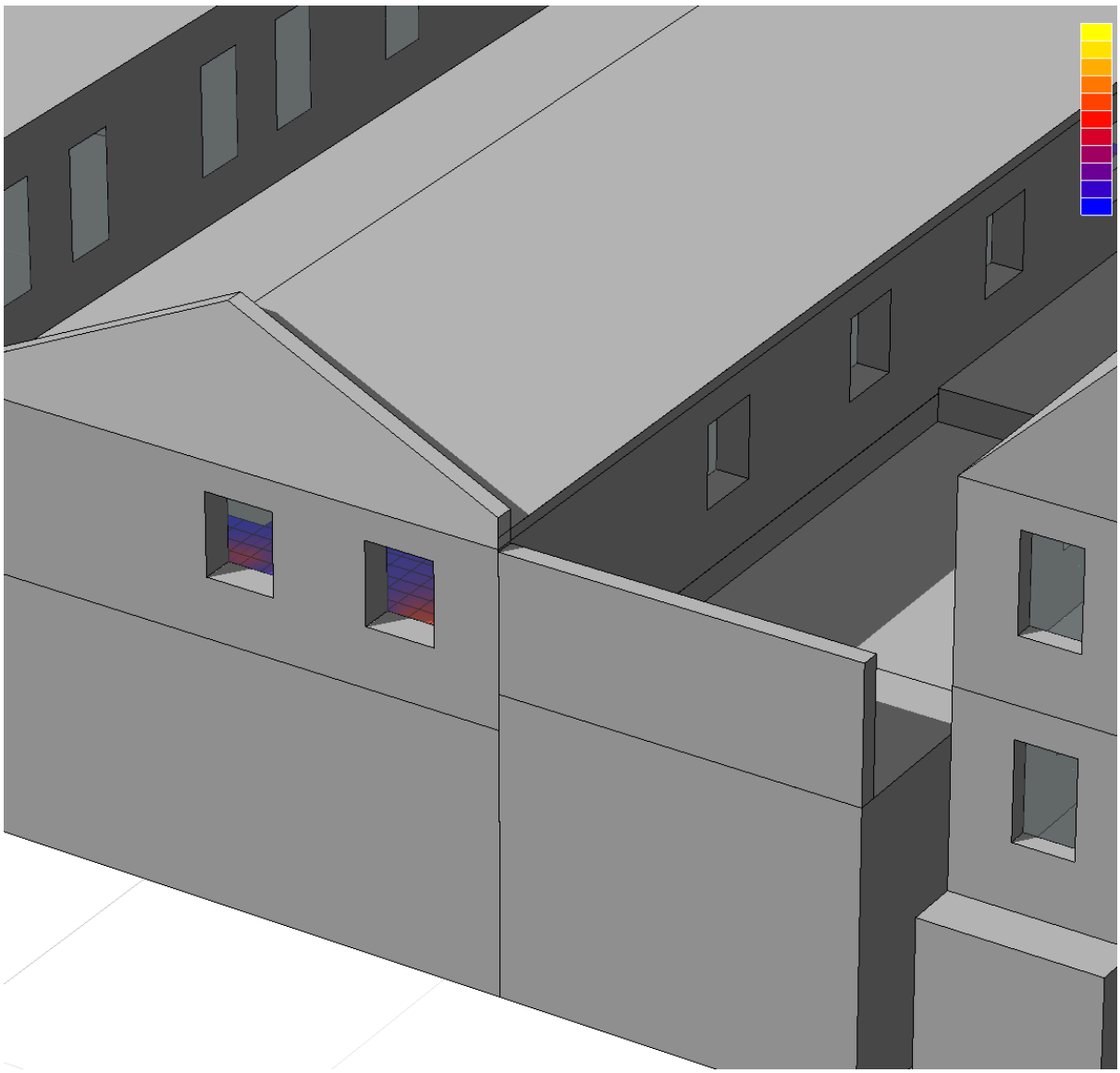


Figure 4: *3D model constructed in an optimised way for daylight simulations. All the inside wall surfaces were modelled and the wall thicknesses were represented.*

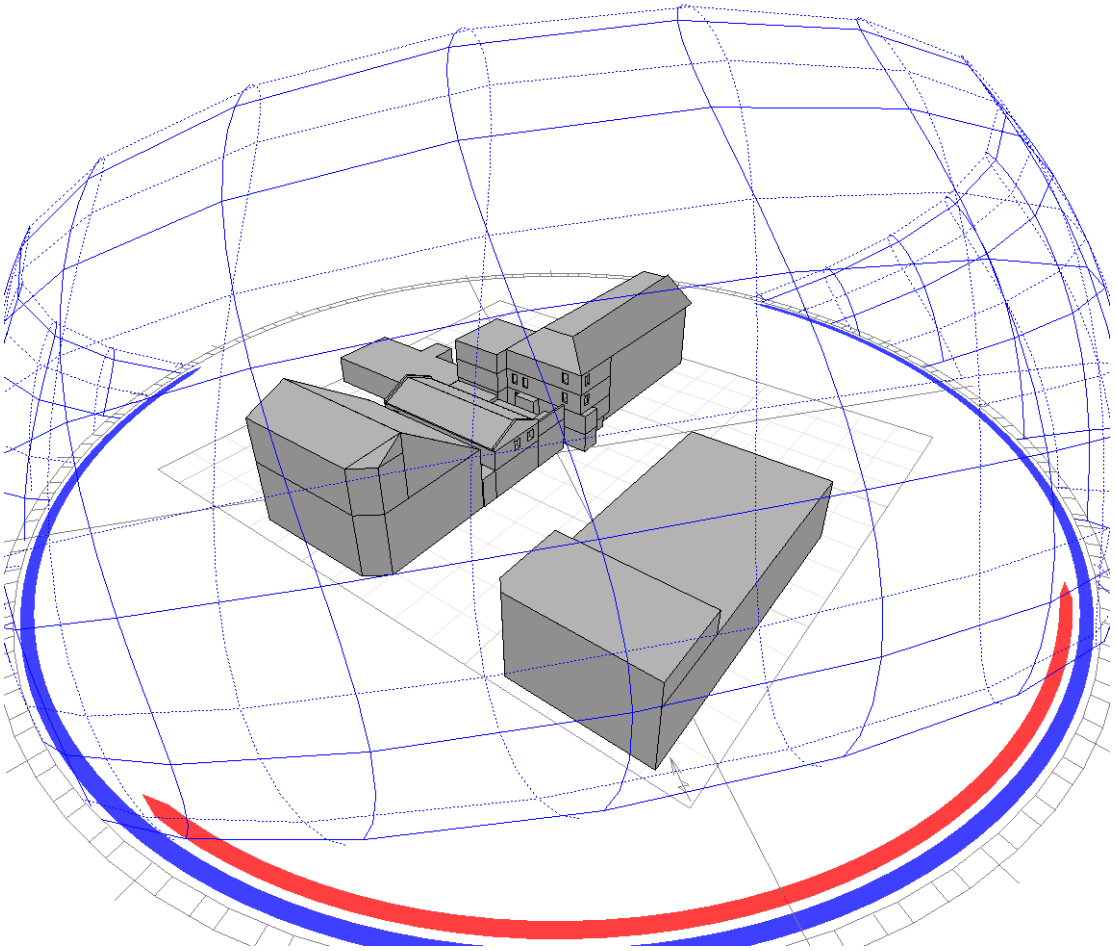


Figure 5. *Model view of the existing site and surrounding buildings.*

Figure 6. *Views of 3D model used for the existing scenario.*

Figure 7: *Satellite image of the site*

3. RESULTS AND DISCUSSION

3.1 Daylight Factors of proposed habitable room

The approach this report takes, is that if there are rooms that combine various functions with different daylight requirements, the highest requirements are applied as targets. For example for a studio room, the target would be 1.4%.

The results of the daylight factor simulations revealed that the proposed studio room, that consists of a combined kitchen/dining/living/sleeping area achieves more than the minimum recommended levels of average daylight factor as can be seen in Table 2.

Table 2. *Average daylight factors achieved for all living spaces of the proposed 3rd floor*

Floor	UNIT	ROOM	Target DF to achieve over at least 50% of the assessment grid	% of area of grid (in a room) that meets target DF minimum
1st	Studio	Kitchen/living/Sleeping	1.4%	100%

In order to provide a more qualitative view of the results, a graph of the DF results for each of the proposed habitable rooms can be seen in Figures 14 and 15, where the distribution of daylight over a working place can be seen in plan view, as well as the daylight factor achieved for every sample grid point.

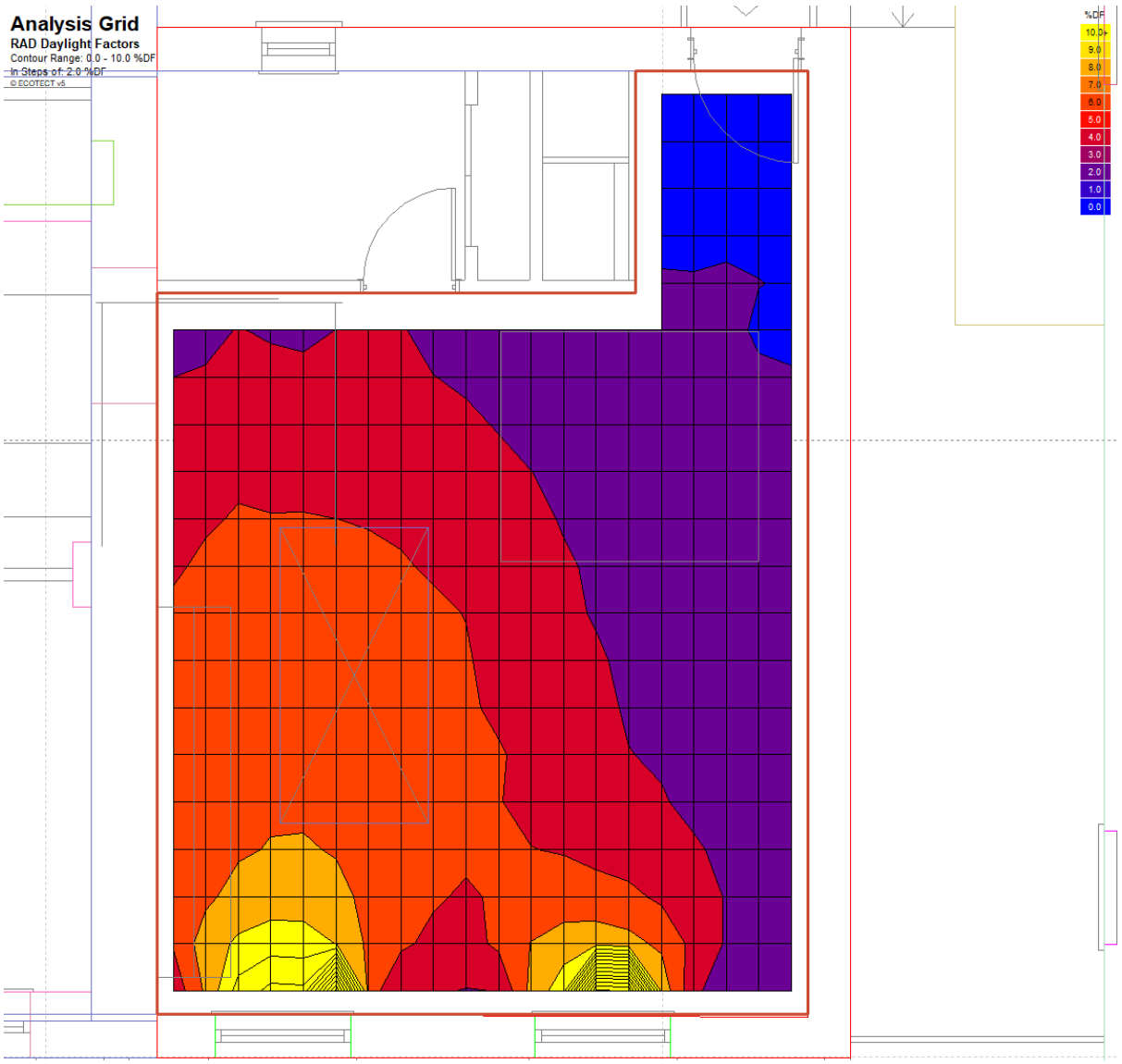


Figure 8: *Daylight factors plot for the proposed studio*

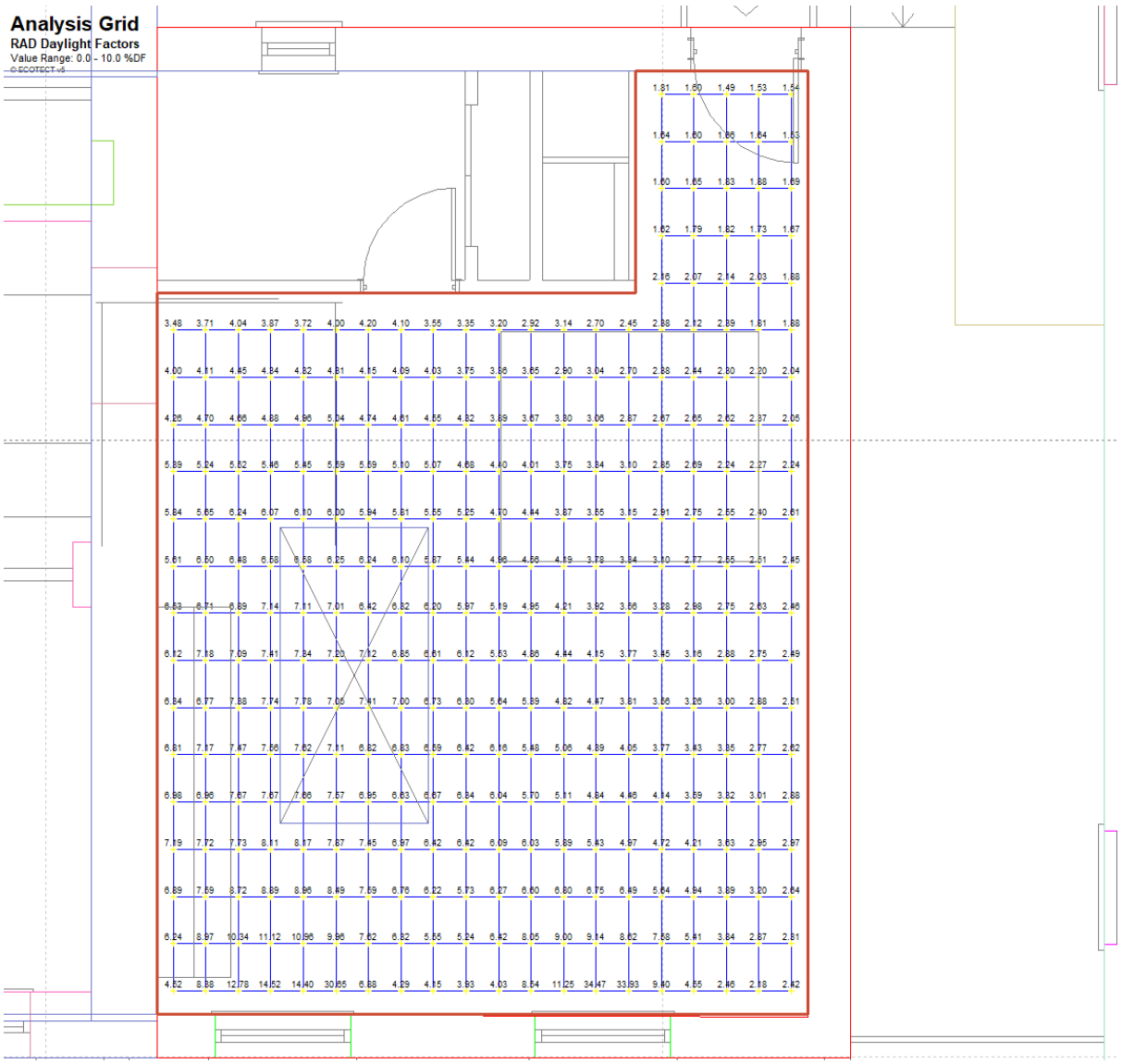


Figure 9: *Daylight factors plots for the proposed studio, shown in text format as individual values*

3.2 Sunlight to windows of proposed habitable rooms

The BRE 209 (2022) suggests that at least one main window wall faces within 90 degrees of due South and that a habitable room (preferably living room) can receive a total of at least 1.5 hours of sunlight on the 21st of March (section 3.1.15 of the BRE guide). This can be from any of the windows say in a living room.

From the results in Table 3 it can be seen that one window panel (the sky light) receives 3.3 hours of sunlight on the 21st of March, thus meeting the criteria. The two vertical windows receive 3.5 and 3.8 respectively. Figure 10 provides a visual of which window panels receive sunlight and how much on the 21st of March.

Table 3. *Sunlight Hours for proposed habitable windows on 21st of March*

Floor	Flat	Room	Window Orientation	Window ID	Sunlight Hours on 21/March (hours)
1st	Studio	Kitchen-Living-Dining-Sleeping	South-East	8775	3.28
1st	Studio	Kitchen-Living-Dining-Sleeping	South-East	8776	3.48
1st	Studio	Kitchen-Living-Dining-Sleeping	Sky	8828	3.84

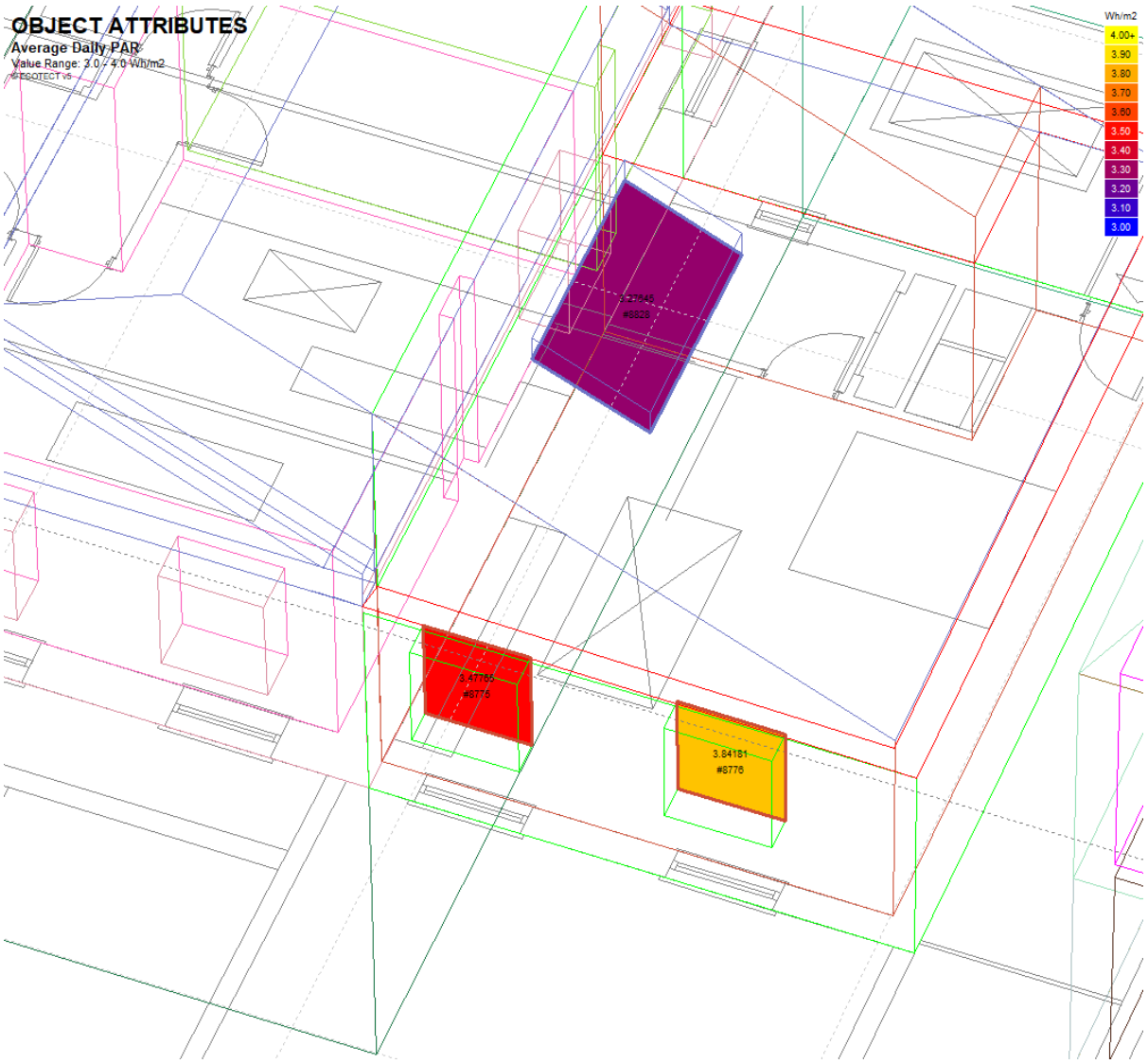


Figure 10: *Sunlight Hours received on windows on the 21st of March*

3.2 25 degree line

The 25 degree line test, is one of the tests required by BRE2022 to check the potential effect of a new development on existing windows. If the proposed development is below the 25 degree line (in this case presented as a 25 degree plane), then there will be no significant impact on these windows an no further tests are needed. If the proposed development is beyond the 25 degree line, then additional tests need to be performed.

Figure 11 shows the results for windows located on No48 Birchington Road building and shows that the proposed development is below this plane, hence no further tests needed for those windows.

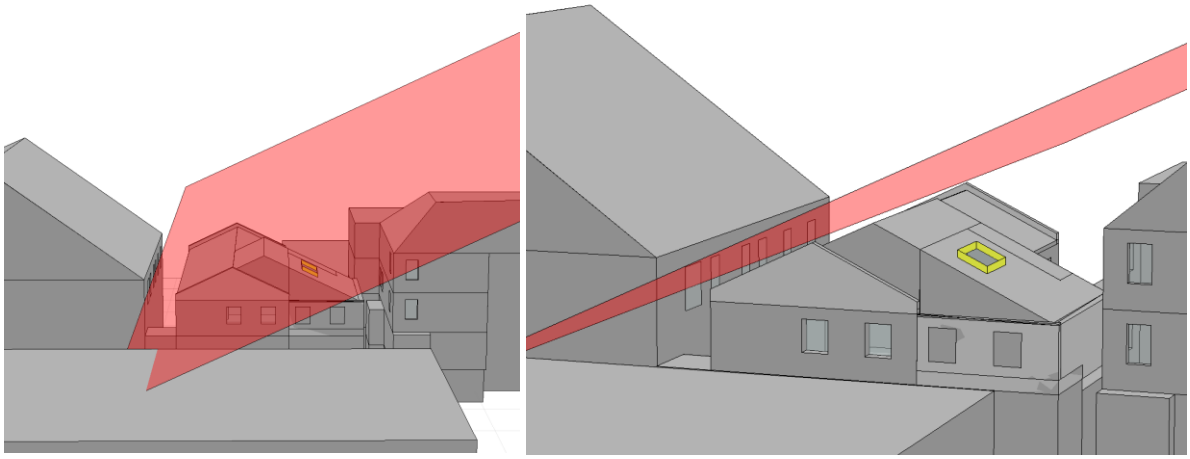


Figure 11: *25 degree plane for the No48 Birchington Road building windows*

3.3 Vertical Sky Components (VSC)

The results are presented in a table format (Table 4), with accompanying images to help locate the windows in the 3D model (Figures 12-13). In the table, the window ID is presented, which is the unique object ID that the software has assigned to each window. Next to it the VSC of the existing situation is presented. This is the VSC that all windows are currently experiencing on the site. The next column presents the VSC results for each window when the proposed development is included in the analysis. Finally, the last column presents the ratio between the proposed and existing situation. All windows are presented in the same manner.

From Table 4 it can be seen that the effect of the proposed building on the VSC of the windows is in the majority of cases negligible. Many windows receive 27% or more VSC both on the existing situation and the proposed new situation with the proposed new addition in place. In all other cases of windows where the VSC is below 27%, the difference between the existing situation and the proposed one for most windows is higher than 80% (or 0.8) of the original (existing) case.

There is one case with window 7918 (the side window of the first floor Flat 46A) facing the new proposed studio, where the proposed VSC is zero, this is because in the proposed scenario this window is blocked and hence to light will come through. The potential of blocking this window in Flat 46A is assessed and discussed in more detail in the following sections.

Table 4. *VSC for all windows under consideration located on No42 and No46 Birchington Road Facades*

Window ID	VSC – Existing	VSC – Proposed	Proposed/Existing
	%	%	Ratio
7918	22.14	0.00	0.00
7919	21.12	16.94	0.80
7920	20.89	20.15	0.96
7921	24.54	24.32	0.99
7938	36.84	36.84	1.00
7939	36.98	36.98	1.00
7948	17.03	17.03	1.00
8835	14.38	13.33	0.93
8856	38.52	38.52	1.00
8857	33.57	32.21	0.96
8880	27.45	26.74	0.97
8881	22.79	22.25	0.98
8906	39.49	39.49	1.00
8907	37.16	37.10	1.00

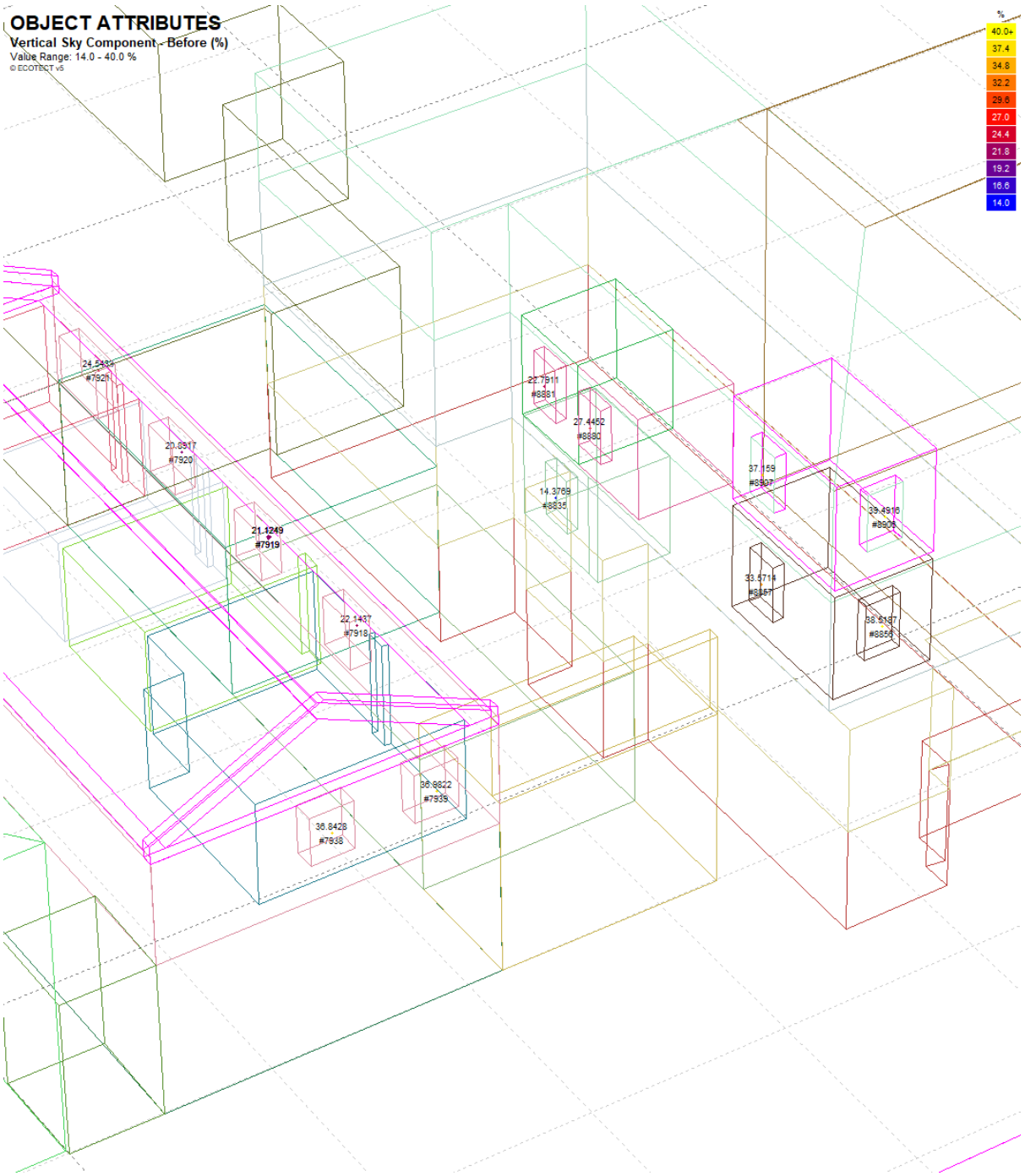


Figure 12: *Windows under consideration from No42 and No44 Birchington Road buildings, showing window ID and VSC value of the existing scenario*

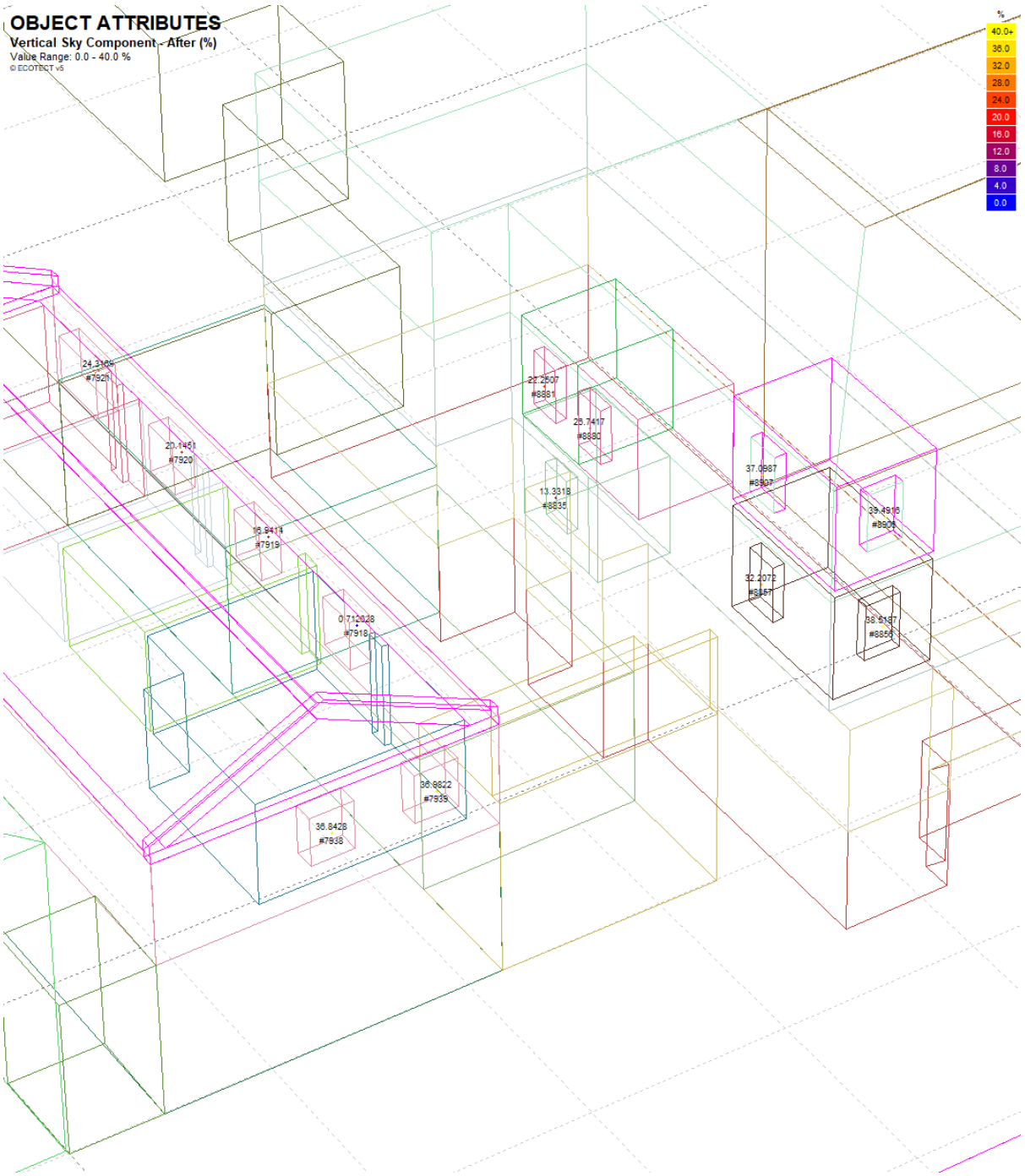


Figure 13: *Windows under consideration from No42 and No44 Birchington Road buildings, showing window ID and VSC value of the proposed scenario*

3.3 Annual Probable Sunlight Hours (APSH)

The results for APSH are presented in a table format for all relevant windows in Table 5, with Figures 12-13 showing the location of each window and ID number. The BRE guide suggests that only windows within 90 degrees from South should be considered, as other windows will not receive enough sunlight anyway due to orientation and as such only such windows are tested (Table 4 provides a list of excluded windows based on orientation).

Table 4 presents the calculations required by the BRE guide in columns B-F. The BRE guide (section 3.2.13) suggests that there will be significant reduction in sunlight if:

-results in Column B are less than 25% and column C results are less than 0.80, or less than 5% in Column D and less than 0.80 in column E

-and column F results are greater than 4%.

Therefore, in order to simplify the presentation of these conditions Table 5 has been setup in such a way so that if there is a window that has highlighted numbers in Columns B+C+F, or highlighted numbers in Columns D,E and F, then it will experience a significant reduction in sunlight.

The results presented in Table 4 suggest that there are some individual window cases where one individual criterion is failed, but not in the combination with other criteria that would constitute a significant reduction based on BRE criteria. In all cases there is no situation where the criteria listed above are met and thus there is no case where a significant reduction in sunlight is expected, based on the BRE209(2022) guidance.

Table 5. *APSH for all windows under consideration based on BRE209(2022)*

A	A1	A2	B	C	D	E	F
Window ID	Orientation	Include in Analysis?	% of Annual Max(4100) for proposed	Ratio Annual Proposed/ Existing	% of Annual Max(4100) for proposed (between Sep-Mar)	Ratio Winter Proposed/ Existing	Loss in APSH
	Degrees from North		%	%	%	%	
7918	53	NO					
7919	53	NO					
7920	53	NO					
7921	53	NO					
8835	-127	YES	20.22%	0.89	6.41%	1.00	0.11
8856	143.02	YES	77.98%	1.00	0.00%	0.00	0.00
8857	-127	YES	56.20%	0.95	34.95%	1.00	0.05
8880	-127	YES	49.10%	0.98	22.63%	0.91	0.02
8881	-127	YES	44.44%	1.00	16.95%	0.93	0.00
8906	143.02	YES	77.98%	1.00	16.59%	0.99	0.00
8907	-127	YES	63.29%	1.00	34.95%	1.00	0.00

3.5 No-Sky-Line Calculations

From the Vertical Sky Component (VSC) Analysis, seven windows were identified as having less than 27% VSC after the new proposed development was put in place (note than in 6 out of 7 cases the VSC was already below 27% in the existing case). For all the rooms behind those five windows, the No-Sky-Line (NSL) calculation was performed. Plans of the rooms affected from this building were presented in Figure 2.

In addition, rooms from the existing and adjacent building (No46) on the first floor were calculated for NSL, as the Kitchen-living area of flat 46B will have one window blocked and other rooms towards the back are close to the proposed development.

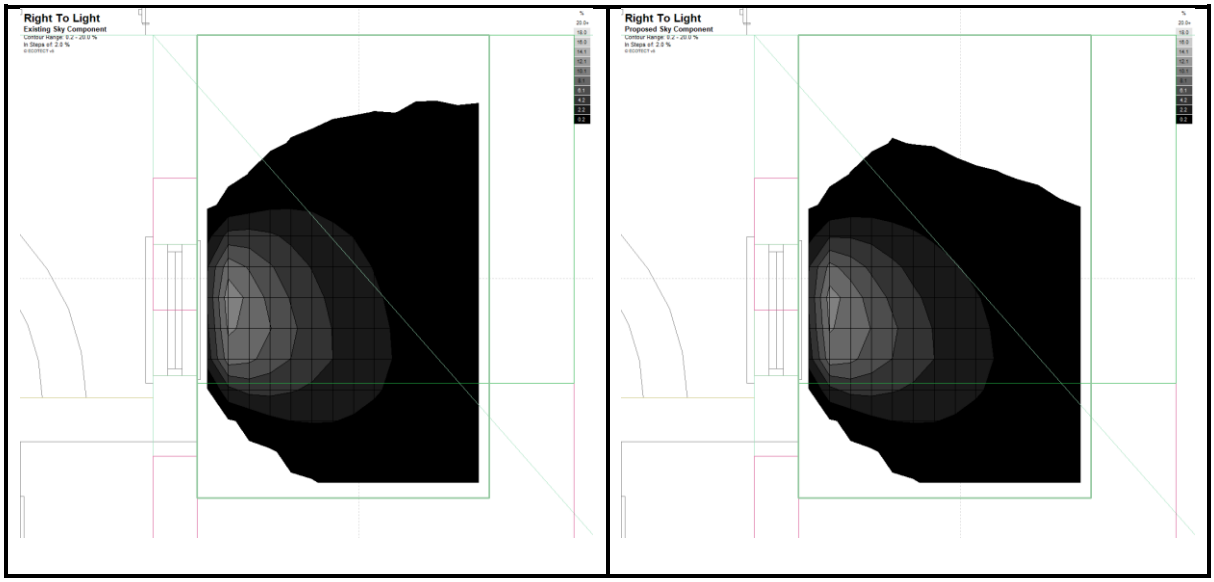
There are situations however where an exact plan is not known precisely, as limited information existed, specifically for No 42 Birchington Road. A background research and a site visit have revealed some information that was used to construct rooms geometries for habitable rooms and some of this information is presented in Appendix B.

Table 6 presents the NSL areas (in m^2) of each room where there is a view to the sky for the existing and proposed cases and the ratio between them. Figures 14-16 present the NSL calculation for each of these rooms for the existing case (left) and the proposed case (i.e. with the proposed development taken into account) to the right.

The results presented in Table 5 suggest that the reduction in NSL areas for each room due to the proposed development are higher than 0.8 times (or 80%) of their original value and hence not a significant reduction will be caused.

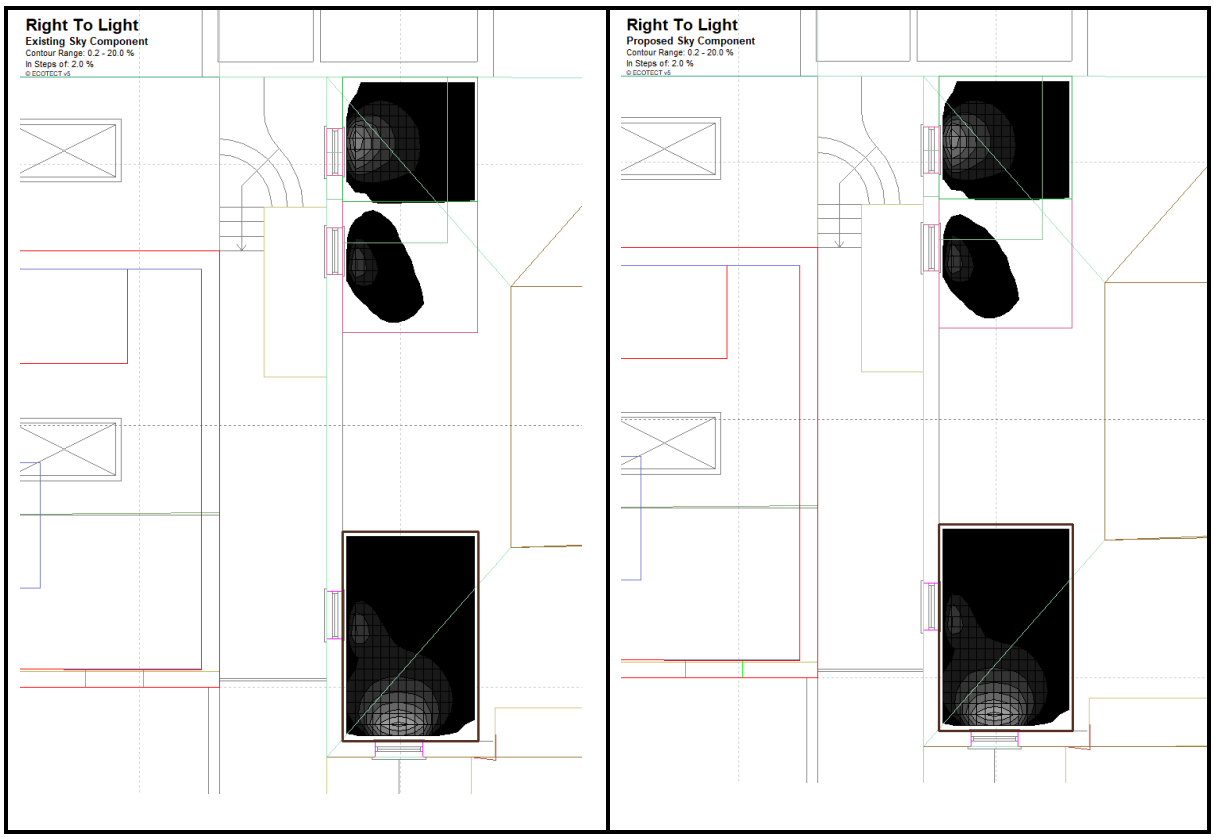
Table 6. *No-Sky-Line for all rooms under consideration on 59-61 Dartmouth Road*

Building, Floor	Room	NSL Area - Existing	NSL Area – Proposed	Proposed/Existing
		m^2	m^2	Ratio
No42, Ground Floor	Kitchen	4.36	3.91	0.90
No42, 1st Floor	Kitchen	9.72	9.72	1.00
No42, 1st Floor	Bedroom 1	2.35	2.24	0.95
No42, 1st Floor	Bedroom 2	5.74	5.72	1.00
No46, 1st Floor, Flat46A	Kichen-Living-Dining	18.52	17.71	0.96
No46, 1st Floor, Flat46A	Bedroom	0.52	0.49	0.94
No46, 1st Floor, Flat46B	Bedroom	0.46	0.45	0.98
No46, 1st Floor, Flat46B	Kichen-Living-Dining	13.22	13.211	1.00
No46, 1st Floor, Flat46A	Kichen-Living-Dining	18.52	17.71	0.96



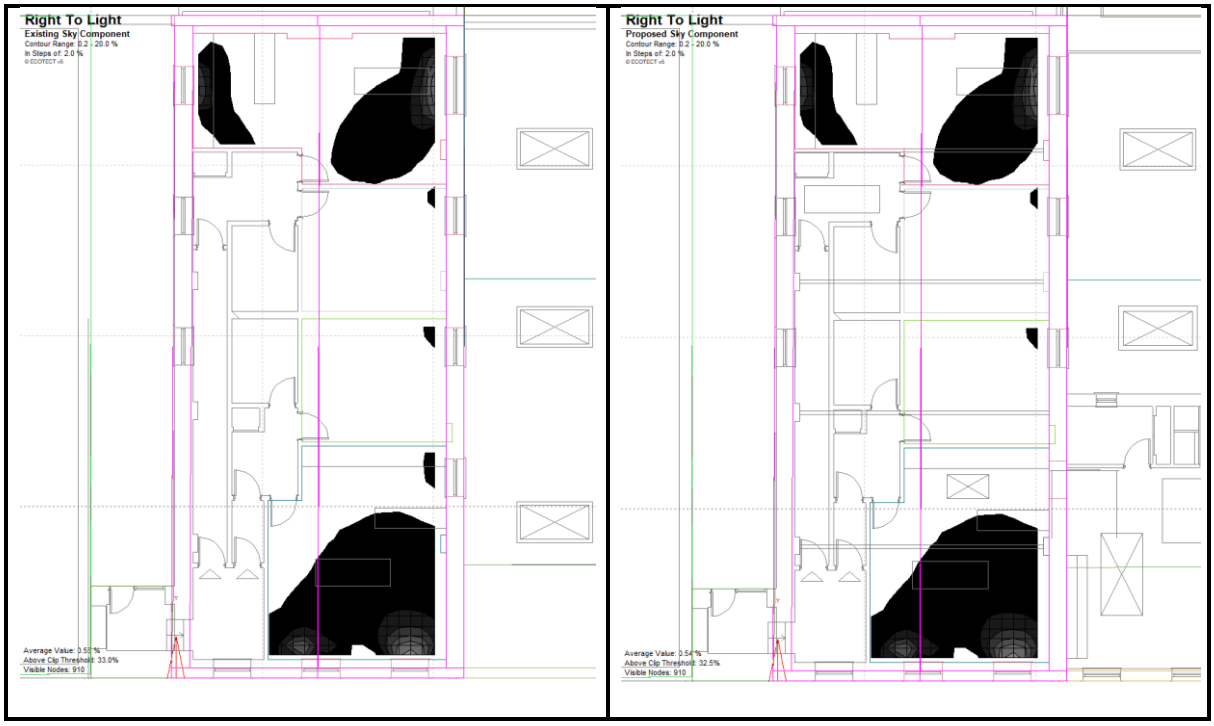
Existing Proposed

Figure 14: *NSL areas for the kitchen area on the ground floor of No 42 Birchington*



Existing Proposed

Figure 15: *NSL for the first floor habitable rooms of No42 Birchington Road*



Existing Proposed

Figure 16: *NSL areas for the first floor habitable rooms of No46 Birchington Road (flats 46A and 46B)*

4. CONCLUSIONS

This daylight availability and daylight impact study looked into the daylight performance of a proposed 1st floor extension of a studio to the No44 Birchington Road building. The assessment was carried out by calculating daylight factors of the proposed studio, VSCs of existing nearby windows, APSHs of existing nearby windows and NSLs for existing nearby habitable rooms.

It was found that the habitable space of the proposed studio (i.e. the combined kitchen-living-dining-sleeping room), received more than the required minimum recommend daylight factor levels indoors. In fact, the daylight factor levels far exceeded the minimum. As far as sunlight on the 21st of March, the proposed studio surpasses the required minimum of 2 hours.

In terms of daylight and sunlight impact to existing windows on the site (existing windows of No42, No46, No47 Birchington Road buildings), it was found that all windows were within allowed reduction limits in VSC and APSH when the proposed development was taken into account. In terms of the NSL calculations, all relevant rooms tested were found to be at least 80% (or at least 0.8 times) the original NSL area and hence within allowed limits of reduction.

APPENDIX A

Excerpts from the BRE Lighting and Site Layout Planning Guide (2022)

2.2.2 ' The guidelines given here are intended for us for rooms in adjoining dwellings, where daylight is required, including living rooms, kitchens and bedrooms. Windows to bathrooms, toilets, storerooms, circulation areas and garages need not be analysed.

2.2.4 ‘Loss of light to existing windows need not be analysed if the distance of each part of the new development from the existing window is three or more times its height above the centre of the existing windows. In these cases the loss of light will be small.’

2.2.7 ‘If this VSC is greater than 27% then enough skylight should still be reaching the window of the existing building. This value of VSC typically supplies enough daylight to a standard room when combined with a window of normal dimensions, with glass area around 10% or more of the floor area. Any reduction below this level should be kept to a minimum. If the VSC, with the new development in place, is both less than 27% and less than 0.80 times its former value, occupants of the existing building will notice the reduction in the amount of skylight. The area lit by the window is likely to appear gloomier, and electric lighting will be needed more of the time. In presenting results, ratios of VSC should be given to at least two decimal places (for example 0.79 or 0.81) or as the equivalent percentage loss (for example 21% or 19%).'

3.1.10 ‘For interiors, access to sunlight can be quantified. BS EN 17037[1] recommends that a space should receive a minimum of 1.5 hours of direct sunlight on a selected date between 1 February and 21 March with cloudless conditions. It is suggested that 21 March (equinox) be used. The medium level of recommendation is three hours and the high level of recommendation four hours. For dwellings, at least

one habitable room, preferably a main living room, should meet at least the minimum criterion.'

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

- at least one main window wall faces within 90° 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

3.2.13 'If a living room of an existing dwelling has a main window facing within 90° of due south, and any part of a new development subtends an angle of more than 25° to the horizontal measured from the centre of the window in a vertical section perpendicular to the window, then the sunlighting of the existing dwelling may be adversely affected. This will be the case if the centre of the window:

-receives less than 25% of annual probable sunlight hours and less than 0.80 times its former annual value; or less than 5% of annual probable sunlight hours between 21 September and 21 March and less than 0.80 times its former value during that period;

- and also has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours.'

3.3.7 'As a check, it is recommended that at least half of the amenity areas listed above should receive at least two hours of sunlight on 21 March. It is instructive to draw the 'two hours sun contour' which marks this area on plan, because the use of specific parts of a site can be planned with sunlight in mind.'

Appendix C15: ‘C15 A UK National Annex gives specific minimum recommendations for habitable rooms in dwellings in the United Kingdom. These are intended for ‘hard to light’ dwellings, for example in basements or with significant external obstructions or with tall trees outside, or for existing buildings being refurbished or converted into dwellings. The National Annex therefore provides the UK guidance on minimum daylight provision in all UK dwellings.’

Table C3 – Target daylight factors (D_T) to achieve over at least 50% of the assessment grid in UK domestic habitable rooms with vertical and/or inclined daylight apertures			
Location	**D_T for 100 lx (Bedroom)**	**D_T for 150 lx (Living room)**	**D_T for 200 lx (Kitchen)**
St Peter (Jersey)	0.6%	0.9%	1.2%
London (Gatwick Airport)	0.7%	1.1%	1.4%

APPENDIX B

Photos taken from the site, as well as an old drawing of No42.

Figure B1: *Photos from the site, from building No42 façade, facing the proposed development. A number of windows were identified as toilets/circulation,etc*

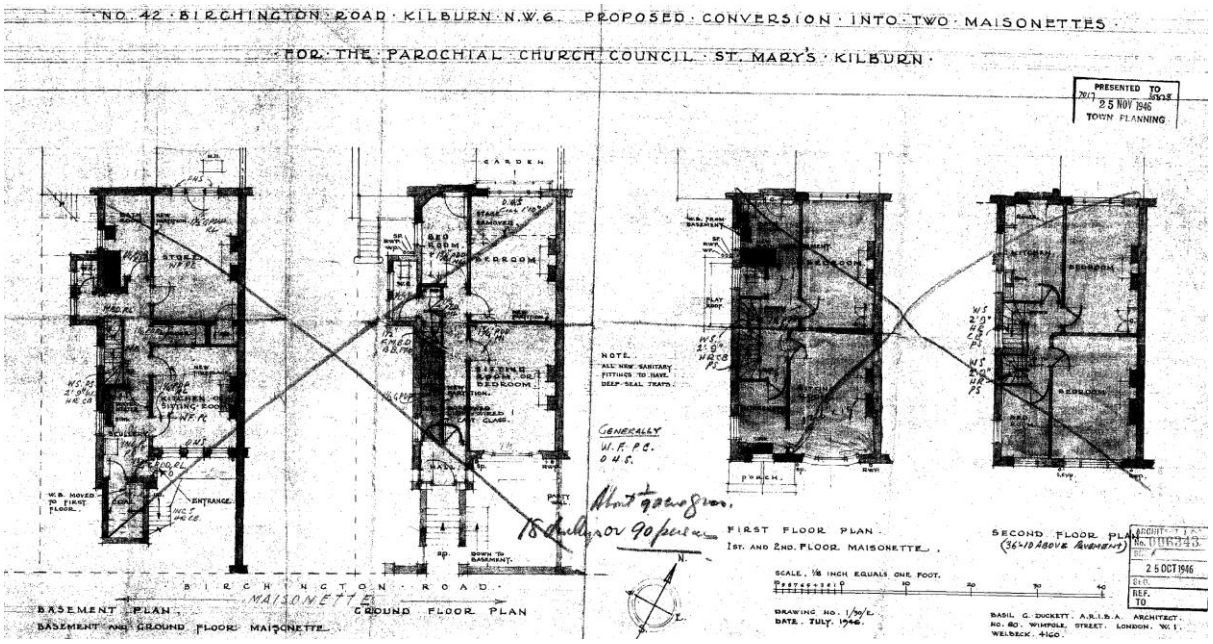


Figure B1: *Plans for No42*