EAL CONSULT BUILDING SUSTAINABILITY SINCE 2008

DAYLIGHT, SUNLIGHT & OVERSHADOWING ASSESSMENT

PROPERTY ADDRESS

No 41 Pield Heath Avenue,
Uxbridge,
UB8 3PD

DATE

Rev I, June 2021

PREPARED BY

EAL Consult

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EXECUTIVE SUMMARY

This daylight, sunlight and overshadowing assessment has been prepared to support the Planning Application for the proposed first floor extension at No 41 Pield Heath Avenue, in Uxbridge, UB8 3PD. This assessment should be consulted in conjunction with the accompanied up-to date planning drawings.

The primary purpose of this daylight, sunlight and overshadowing assessment is to determine any potential loss of light to adjacent buildings because of the proposed development. The main objective to carry out this Daylight & Sunlight assessment is to:

- Assess the impact of the proposed scheme upon the current levels of sunlight & daylight being enjoyed by the existing surrounding buildings.

The methodology set out in this report is in accordance with BRE's 'Site Layout Planning for Daylight and Sunlight' 2nd edition 2011, which is accepted as good practice by Planning Authorities.

The following assessments were carried out:

Daylight & Sunlight Assessment

- **Existing neighbouring properties**

    a. Vertical Sky Component
    b. Annual Probability of Sunlight Hours (APSH) annual and winter calculations

Overshadowing Assessment

- **Existing Open Space - Gardens**

    a. Sunlight hours (on the 21st of March – Equinox)

The assessment of daylight, sunlight and overshadowing to the surrounding properties and open spaces, indicates that the proposal will not cause a change in light levels for the existing neighbouring windows. The existing open spaces will receive the minimum 2 hours of sunlight on the 21st of March (equinox).

TERMS AND DEFINITIONS

Average Daylight Factor (ADF)
The average daylight factor is the average indoor illuminance (from daylight) on the working plane within a room, expressed as a percentage of the simultaneous outdoor illuminance on a horizontal plane under an unobstructed CIE 'standard overcast sky'.

CIE Standard Overcast Sky
A completely overcast sky for which the ratio of its illuminance Ly at an angle of elevation y above the horizontal to the luminance Lz at the zenith is given by: Ly=Lz (1+2siny) /3
A CIE standard overcast sky is darkest at the horizon and brightest at the zenith (vertically overhead).

No-Sky Line
The no-sky line divides those areas of the working plane which can receive direct light from the sky, from those which cannot. It is important as it indicates how good the distribution of daylight is in a room. Areas beyond the no-sky line will generally look gloomy.
As an approximation, obstructions that are parallel to the window can be considered infinite.

Working Plane
The working plane is a notional surface, typically at about desk or table height, at which daylight factor or the 'no-sky line' is calculated or plotted.

For the purpose of assessing useful daylight, a working plane of 850mm above finished floor level is assumed. It is generally expected that ceiling heights will not fall below 2.4m.

Obstruction Angle
The angular altitude of the top of an obstruction above the horizontal, measured from a reference point in a vertical plane in a section perpendicular to the vertical plane.

Probable Sunlight Hours
The long-term average of the total number of hours during a year in which direct sunlight reaches the unobstructed ground (when clouds are taken into account).

Sky Factor
Sky Factor is the ratio of the parts of illuminance at a point on a given plane that would be received directly through unglazed openings from a sky of uniform luminance, to illuminance on a horizontal plane due to an unobstructed hemisphere of this sky. The sky factor does not include reflected light, either from outdoor or indoor surfaces.

Vertical Sky Component (VSC)
Ratio of that 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.

CURRENT POLICIES, REGULATIONS AND BENCHMARKS

Regulations

European workplace directive – Access to daylight required

Building Regulations – No minimum daylight standards

In the UK, the impact of any proposed new development on the sunlight and daylight amenity currently enjoyed by existing properties is usually subject to assessment at planning stage. In the Uxbridge Borough Council, this is controlled through specific policies in the local plan and SPD, indicating that the scale and position of buildings, including window positions, should not create any unacceptable impact on the amenity enjoyed by adjoining occupiers.

Rights of Light

In UK, existing building occupants have their "Rights of Light" legally protected against newly constructed neighbouring development including extensions that may affect their enjoyment of natural daylighting. This is, strictly speaking, a legal easement rather than a material consideration of planning but has nevertheless been considered as part of this assessment.

Guides

- NPPF – Paragraph 123(c)
- GLA Housing SPG
- CIBSE SLL Daylighting and Window Design LG10 1999
- BRE Designing Buildings for Daylight
- BRE Designing with Innovative Daylighting
- BREEAM

Recommendations as to daylight in domestic buildings are to be found in the British Standard BS 8206-02 (BSI, 2002) on Lighting, specifically the section on day lighting, in the publications of the CIBSE and in the publication of BRE (1,2,3).
The recommendations for internal spaces are expressed in three ways:

- A minimum average Daylight Factor (2% for Kitchen, 1.5% for Living Rooms and 1% for Bed Rooms)
- The position of the No-Sky Line at working plane height (0.85m). If the area beyond the No- Skyline is more than 50% the room will look gloomy
- Limiting Depth Criteria

To put the first recommendation in context, a room with an average daylight factor of more than 5% is regarded as well daylit, that is electric lights would be used infrequently during daylight hours, but if it is below 2% electric lights would be used frequently. The requirements are therefore minimal.

These recommendations are illumination based and orientation is not considered a factor.

These recommendations are illumination based and orientation is not considered a factor. However, as perception of the daylighting of a space may still be influenced by orientation, any shading control and viewpoint, these factors can be used to reflect the higher levels of illuminance, for example on South-facing facades. With regard to new development affecting an existing building, the recommendations are based on solar access specific to the UK.

The recommendations require that; any new development should not reduce the Vertical Sky Component (VSC) below 27% or if it does it should not reduce it by more than 20%. Where there is horizontally facing window/skylight VSC can be up to 40%.

In most city centres the Vertical Sky Component is already below 27% at many windows of building. Planning Authorities have therefore tended to use the 20% reduction guideline when assessing planning permission in such areas.

METHODOLOGY

BRE Guide: Site Layout Planning for Daylight and Sunlight, 2011

This assessment would be based on the various numerical tests laid out in the Building Research Establishment (BRE) Guidelines "Site Layout Planning for Daylight and Sunlight: a good practice guide" 2011. It is important to note that BRE tests in general are based on the requirements of the BS Standards 8206 Part 2.

"The guide is intended for building designers and their clients, consultants and planning officials. The advice given here is not mandatory and the guide should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design."

The first step in the methodology is to determine the key sensitive receptors, which windows may be affected by the existing buildings.
Key receptors are windows directly facing and located perpendicular - to the site.

Existing Buildings

Using simple geometry, it will be determined whether the daylight to existing buildings and amenity spaces is adversely affected and this will be done using 25 degree and 45 degree methods.

If new buildings are set out in accordance with the 25 degree method for daylight, this will be sufficient to show that the sunlight to the existing buildings will not be adversely affected.

If these two methods of assessments are satisfied, this will be sufficient in showing that the day lighting to existing buildings and their amenity spaces will not be adversely affected by the new development.

Calculation Method of Daylight to Surrounding Windows

A plane is drawn at 25 degrees from the horizontal, at the centre of an existing window. If a new development intersects with this plane, the internal daylight levels of the surrounding windows may be reduced. When an obstruction of the 25 degree plane occurs, a more detailed assessment involving the Vertical Sky Component of the affected window would need to be carried out.

Calculation Method of Vertical Sky Component (VSC)

The Vertical Sky Component is the ratio of the direct sky illuminance falling on the vertical wall at a reference point, to the simultaneous horizontal illuminance under an unobstructed sky. To maintain good levels of daylight, the Vertical Sky Component of a window needs to be 27% or greater. If the VSC is less than 27%, then a comparison of existing and proposed levels of VSC level would need to be calculated.

VSC can be determined by calculating the Obstruction angle: **Obstruction Angle= tan-1 (H/D)**

Where; H is the height of the obstruction above the middle of the window and D is the horizontal distance from the window to the obstruction

Good levels of daylighting can still be achieved if VSC levels are within 0.8 of their former value. Otherwise, the Average Daylight Factor of the internal rooms would need to be calculated.

Calculation Method of No-Sky Line

The no-sky line test involves the calculation of percentage of a room's area which can receive direct skylight. Diffuse daylight is likely to be adversely affected if after the development the area of a room receiving direct skylight is 0.8 times its former value.

The depth of no-sky line (d) is calculated as: **d=X(H/Y)**

Where; X is the distance from the outside wall to the obstruction, H is height of the window head above the working plane and Y is the height of obstruction above the window head.

From the depth of no-skyline we can calculate "The percentage of working plane that receives direct light from the sky (D)" which can be calculated as: **D= (d/rd) x 100**

Where d is the depth of no-skyline and rd is the room depth.

Guide Values

Guide values for a typical dwelling with light-coloured walls are as follows:

- Area weighted average reflectance of the room surfaces: R = 0.5
- Correction factor for dirt: M = 1.0 (vertical glazing that can be cleaned easily)
  M = 0.8 (sloping glazing)
  M = 0.7 (horizontal glazing)
- Transmission factor of glazing: T = 0.7 (double glazing)
  T = 0.6 (double glazing with low emissivity coating)
  T = 0.6 (triple glazing)
- Angle of visible sky u = 65˚ (vertical glazing)(default value when there are no obstructions)

  Angle of Visible Sky: For rooms with obstructions were calculated taking into account the Distance from Obstruction and Obstruction Height in order to calculate the a and b.
  Then u = 90 - a - b

SITE

The proposed site is in a predominantly residential area and therefore, a daylight, sunlight and overshadowing assessment was undertaken to determine the potential impact of the proposed scheme on these neighbouring areas.

The proposal includes the enlargement of the existing dwelling by providing an additional floor; the ridge height will thus increase by one storey as the existing building currently on site consists of a ground floor level only. (existing ridge height: 5.4m, proposed: 7.6m)

Two neighbouring properties were identified located close to the proposed site. Therefore, this assessment has been carried out to demonstrate the daylight and sunlight levels being enjoyed by the neighbouring properties.

Figure 1 - Site Location

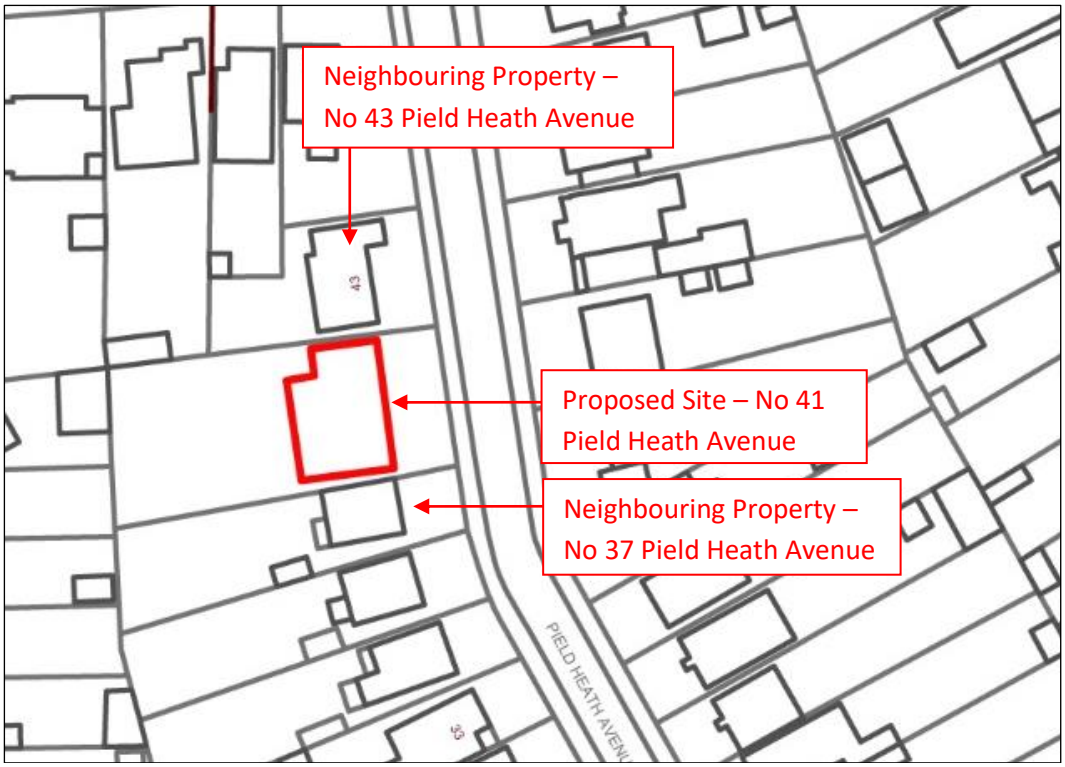

Figure 2 - Neighbouring Properties

Neighbouring properties:

- No 37 Pield Heath Avenue
- No 43 Pield Heath Avenue

Proposed Site:

- No 41 Pield Heath Avenue

Additional Notes:

Please note: neighbouring property No 37 Pield Heath Avenue has been excluded from this assessment. The property is located on the south side of the proposed dwelling and thus, no impact on the natural light levels will occur. In addition to this, there are no windows from this neighbouring property directly facing the proposed site.

DAYLIGHT & SUNLIGHT ASSESSMENT

Vertical Sky Component (VSC)

VSC analysis of each window was carried out. The results are listed in the following pages. If the VSC is greater than 27%, then enough skylight will still be reaching the window and the levels of daylight experienced in the space should not be seriously affected.

Vertical Sky Component Assessment

Table 1 – Vertical Sky Component for the existing properties, Pre & Post development

Vertical Sky Component		Pre development	Post development	VSC after Proposal	Comments
Assessed neighbouring property:	**Window no.**	**BRE VSC %**	**BRE VSC %**	**>27**	
No 43 Pield Heath Avenue	**Ground Floor**				
	Win01 (front)	27.8%	27.8%	Yes (Pass)	**No Impact**
	Win02 (front)	27.9%	27.9%	Yes (Pass)	**No Impact**
	Win03 (front)	27.9%	27.9%	Yes (Pass)	**No Impact**
	Win04 (front)	27.6%	27.6%	Yes (Pass)	**No Impact**
	Win05 (rear)	27.4%	27.3%	Yes (Pass)	**Negligible Impact**
	Win06 (rear)	27.6%	27.5%	Yes (Pass)	**Negligible Impact**
	Win07 (rear)	27.5%	27.5%	Yes (Pass)	**No Impact**
	1st Floor				
	Win08 (side)	25.4%	24.6%	Yes (Pass)	**Minor Impact**

Results demonstrate the minimum difference of the VSC between pre- and post-construction phase for all neighbouring windows. For window 08 (which is facing directly the proposed site), results show that the proposed development may cause a minor change in the natural light levels for the existing occupants. This is due to unavoidable site constraints. However, it should be noted that the proposed first floor extension has been re-designed and, is located approximately 5.8m away from the neighbouring window to allow sufficient daylight levels for No 43 Pield Heath Avenue.

Sunlight Assessment – Annual Probable Sunlight Hours

The Annual probable sunlight hours (APSH) is a measure of sunlight that a given window may expect over a year period. The BRE guidance recognises that sunlight is less important than daylight in the amenity of a room and is heavily influenced by orientation. North facing windows may receive sunlight on only a handful of occasions in a year, and windows facing eastwards or westwards will only receive sunlight for some of the day. Therefore, BRE guidance states that only windows with an orientation within 90 degrees of south need be assessed. For sunlight studies the APSH (annual probable hours) test calculates the percentage of statistically probable hours of sunlight received by each window in both the summer and winter months. From March 21st to September 21st – Summer period and from the 21st September to 21st of March – Winter period.
Sunlight is measured using a sun indicator which contains 100 spots, each representing 1% of APSH. Therefore, where no obstruction exists the total annual probable sunlight hours would amount to 1486 and therefore each spot equates to 14.86 hours of the total annual sunlight hours.
Following are the recommended Sunlight hours for London. Total recommended sunlight hours:

= 25% of APSH for London
= 25% of 1468hrs
= (25/100) x 1486
= 371.5hrs/yr

Recommended sunlight hours for winter

= 5% of APSH for London
= 5% of 1486hrs
= (5/100) x 1486
= 74.3hrs/yr

Table 2 – Annual Probable Sunlight Hours for existing properties, after the proposed development

Annual Probable Sunlight Hours		**Post development**
Assessed neighbouring property:	**Window no.**	**>371.5hrs**
No 43 Pield Heath Avenue	**Ground Floor**	
	Win01 (front)	Yes (Pass)
	Win02 (front)	Yes (Pass)
	Win03 (front)	Yes (Pass)
	Win04 (front)	Yes (Pass)
	Win05 (rear)	Yes (Pass)
	Win06 (rear)	Yes (Pass)
	Win07 (rear)	Yes (Pass)
	1st Floor	
	Win08 (side)	Yes (Pass)

Results show that all neighbouring windows will receive the minimum sunlight hours throughout the year.

Calculations below demonstrate if the windows will also achieve the recommended sunlight hours during the winter period.

Table 3 – Winter Probable Sunlight Hours for existing properties, after the proposed development

Winter Probable Sunlight Hours		Post development
Assessed neighbouring property:	**Window no.**	**>74.3hrs**
No 43 Pield Heath Avenue	**Ground Floor**	
	Win01 (front)	Yes (Pass)
	Win02 (front)	Yes (Pass)
	Win03 (front)	Yes (Pass)
	Win04 (front)	Yes (Pass)
	Win05 (rear)	Yes (Pass)
	Win06 (rear)	Yes (Pass)
	Win07 (rear)	Yes (Pass)
	1st Floor	
	Win08 (side)	Yes (Pass)

Results show that all existing windows will achieve the recommended 74.3hours of sunlight during the winter period.

OVERSHADOWING ASSESSMENT

Sunlight to Amenity Spaces

An assessment of the sunlight levels of the open spaces was undertaken. Only one neighbouring open space was identified in close proximity to the proposed site – No 43 Pield Heath Avenue.

BRE guidance states that the test should be run on 21 March which is the midpoint between the summer and winter solstices (equinox). According to BRE, the sunlight hours on this day should be no less than 2 hours.

Calculations confirm that the existing rear garden will receive the recommended sunlight hours.

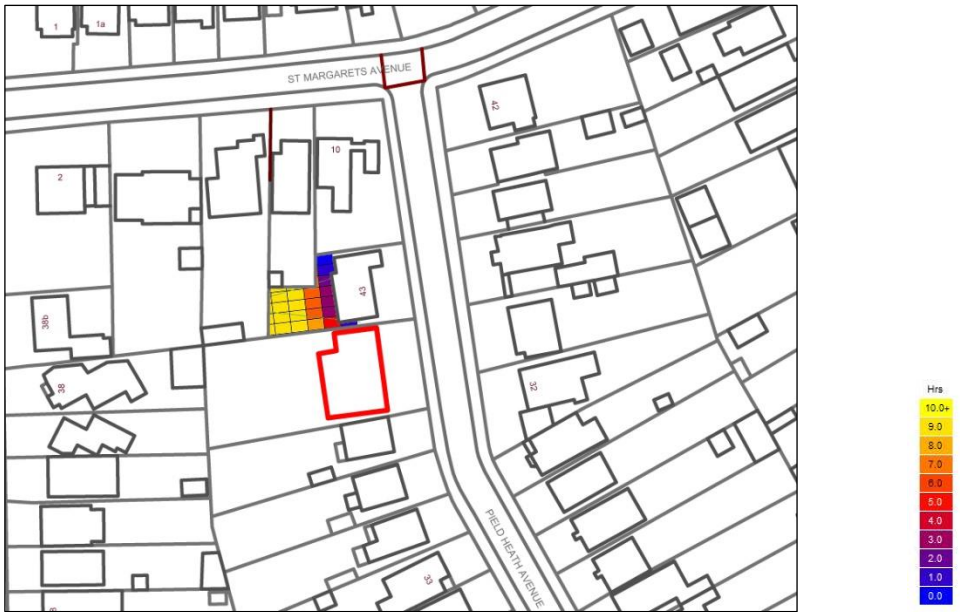

Figure 3 - Open spaces

Detailed model study in Ecotect Analysis demonstrates that more than 50% of the neighbouring rear garden will receive a minimum 2hrs of sunlight on the 21st March. Therefore, the proposed scheme will not have an impact on the amenity spaces.

Specifically:

- **No 43 Pield Heath Avenue**: Approximately 6.43hours of sunlight

CONCLUSION

The proposed development has been designed with care so that it has minimum visual impact on its surroundings, achieving as much sunlight hours as possible despite un-avoidable site constraints and limitations.

From initial assessment 1 neighbouring property was identified that could be affected from the proposed scheme. Calculations confirmed that all existing neighbouring windows receive and will still receive adequate annual probable sunlight hours and adequate sunlight hours during the winter period.

The Vertical Sky Component calculations focus on the minimum difference between pre- and post-construction. Results show that the impact is considered negligible and minor for all neighbouring windows.

One rear garden was also identified at No 43 Pield Heath Avenue and an overshadowing assessment was carried out. Results demonstrate that more than 50% of the open space will receive the minimum of 2hours of sunlight on the 21st of March (Equinox).

The assessment of daylight, sunlight and overshadowing indicates that the proposed scheme which includes the enlargement of the existing dwelling by the addition of one storey, will not cause a major impact on the daylight levels enjoyed by the existing neighbouring occupants.

APPENDIX A

Figure 4 – Neighbouring Property & Windows (No 43 Pield Heath Avenue)

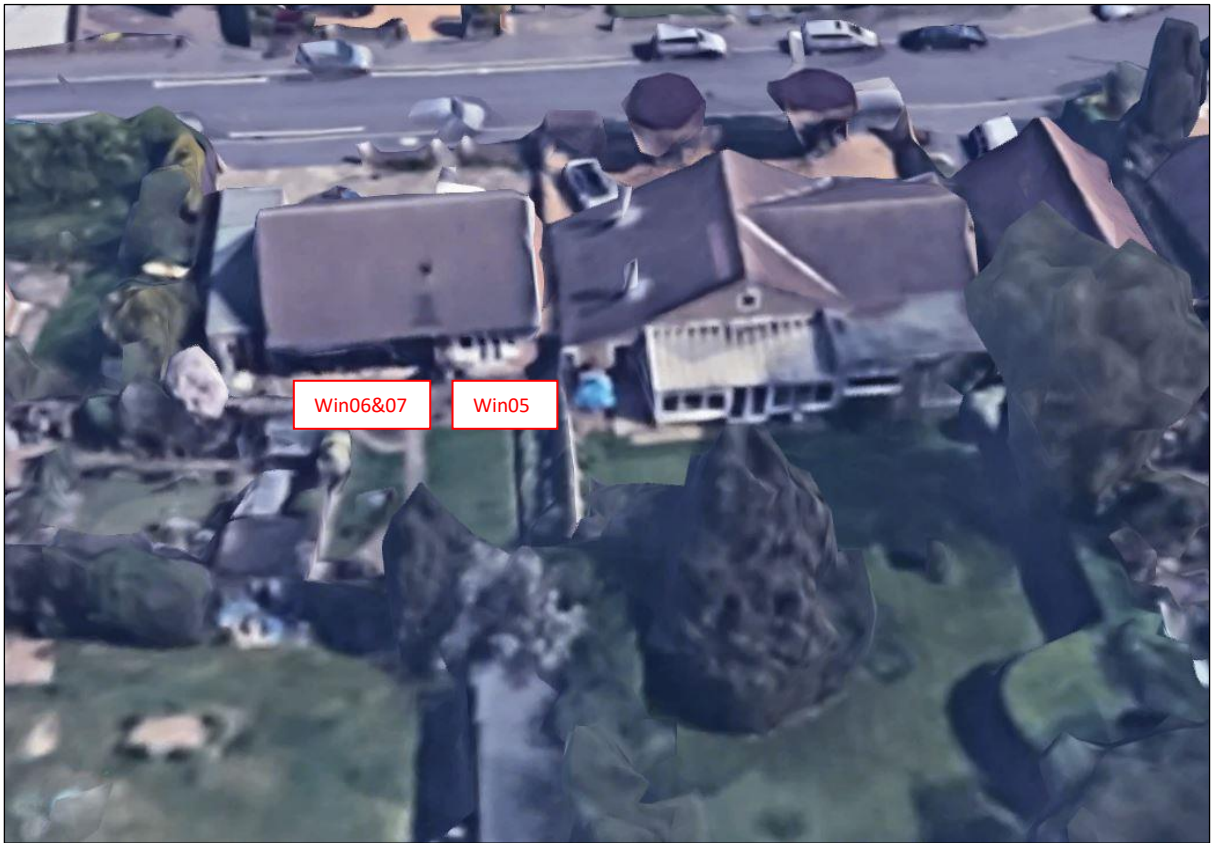

Figure 5 – Neighbouring Property & Windows (No 43 Pield Heath Avenue)