



## **ANNEX 5.6.2**

METHODOLOGY

**Royal Arsenal Riverside**

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## 1.1 DAYLIGHT

The following methodologies are used to assess the daylight effects on the sensitive receptors of surrounding properties when the Proposed Development is completed. :

### Vertical Sky Component (VSC)

The VSC method of assessment is defined in the BRE Guidelines<sup>1</sup> as the:

*"ratio of that part of illuminance at a point on a given vertical plane that is received directly from a CIE [International Commission on Illumination] standard overcast sky, to illuminate on a horizontal plane due to an unobstructed hemisphere of this sky".*

VSC is calculated by using a sky light indicator or 'Waldram Diagram' to establish the VSC and 3D geometric calculations for daylight distribution.

The assessment is calculated from the centre of a window on the outward face and measures the amount of light available on a vertical wall or window following the introduction of visible barriers, such as buildings.

Only those surrounding properties which have windows facing towards the Site were included in the VSC assessment. If a nearby property has no windows facing the Site, these properties would not be affected by the Development in terms of daylight received.

The maximum VSC value is almost 40% for a completely unobstructed vertical wall or window. In terms of assessment criteria, the BRE Guidelines<sup>1</sup> state that:

*"If any part of a new building or extension, measured in a vertical section perpendicular to a main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25° to the horizontal, then the diffuse daylighting of the existing building may be adversely affected. This will be the case if either:*

*the VSC measured at the centre of an existing main*

*window is less than 27%, and less than 0.8 times its former value; and*

*the area of the working plane in a room which can receive direct skylight is reduced to less than 0.8 times its former value."*

The above target values are considered the 'base' criteria for an assessment of VSC.

The BRE Guidelines identify a number of mitigating factors which may affect whether the criteria are met such as:

*"Different criteria may be used based on the requirements for daylighting in an area viewed against other site layout constraints. Another important issue is whether the existing building is itself a good neighbour, standing a reasonable distance from the boundary and taking no more than its fair share of light." (Paragraph 2.2.3)*

*"Existing windows with balconies above them typically receive less daylight. Because the balcony cuts out light from the top part of the sky, even a modest obstruction opposite may result in a large relative impact on the VSC, and on the area receiving direct skylight." (Paragraph 2.2.11)*

*"A larger relative reduction in VSC may also be unavoidable if the existing window has projecting wings on one or both sides of it, or is recessed into the building so that is obstructed on both sides as well as above. (Paragraph 2.2.12)*

### No Sky Line (NSL)

The BRE guidelines state that where room layouts are known, the effect on the daylight distribution can be calculated by plotting the NSL. Obtaining these room layouts enables precise evaluation of the diffuse levels of daylight within each of the rooms via the NSL.

The NSL method is a measure of the distribution of daylight at the 'working plane' within a room. The 'working plane' is a horizontal plane 850mm above finished floor level for residential properties. The NSL divides those areas of the working plane which can

receive direct sky light from those which cannot. If a significant area of the working plane lies beyond the NSL (i.e. it receives no direct sky light), then the distribution of daylight in the room may be poor and supplementary electric lighting may be required.

The potential effects of daylighting distribution in an existing building can be assessed by plotting the NSL in each of the main rooms. For houses, this will include living rooms, dining rooms and kitchens. Bedrooms should also be analysed, although they are less important. The BRE Guidelines identify that if the area of a room that does receive direct sky light is reduced to less than 0.8 times its former value, then this would be noticeable to its occupants.

BS 8206 Part 24 states (para 5.7) that the: *"uniformity of daylight is considered to be unsatisfactory if a significant part of the working plane (normally more than 20%) lies behind the no-sky line".*

Therefore, an NSL of at least 80% would be considered satisfactory.

Paragraph 2.2.9 of the BRE Guidelines<sup>1</sup> states:

*"If, following construction of a new development, the no sky line moves so that the area of the existing room, which does receive direct skylight, is reduced to less than 0.8 times its former value this will be noticeable to the occupants"*

This criterion is considered the 'base' criteria for the NSL assessment.

In relation to deep rooms lit by windows on one side, the BRE Guidelines<sup>1</sup> state (para. 2.2.10):

*"If an existing building contains rooms lit from one side only and greater than 5 m deep, then a greater movement of the no sky line may be unavoidable."*

Rooms over 5 m deep have still been considered, however room depth has been considered when assigning significance criteria.

## 1.2 SUNLIGHT

### Annual Probable Sunlight Hours (APSH)

The APSH is a measure of sunlight that a given window may expect over the period of a year, and where there is no obstruction, equates to a maximum of 1,486 hours. Sunlight is measured using a sun indicator which contains 100 spots, each representing 1% of APSH (i.e. 14.86 hours of the total APSH).

The number of spots is calculated for all scenarios during the year and also during the winter period, and a comparison made between the two. This provides a percentage of APSH for each of the time periods for each window assessed.

The BRE Guidelines note on page 22 that:

*"In housing, the main requirement for sunlight is in living rooms, where it is valued at any time of day, but especially in the afternoon."*

*"all main living rooms and conservatories 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".*

*"If the main living room to a dwelling has a main window facing within 90° of due north, but a secondary window facing within 90° of due south, sunlight to the secondary window should be checked."*

*"Normally loss of sunlight need not be analysed to kitchens and bedrooms, except for bedrooms that also comprise a living space."*

In regard to existing surrounding receptors, the BRE Guidelines provide that a window may be adversely affected if a point at the centre of the window receives for the whole year, less than 25% of the APSH, including at least 5% of the APSH during the winter months (21 September to 21 March) and less than 0.8 times its former sunlight hours during either period, and if there is a reduction in total APSH which is greater than 4%.

## 1.3 OVERSHADOWING

Two assessments have been undertaken to ascertain

the overshadowing effects on the neighbouring areas of amenity. These are Transient Overshadowing and Sun Hours on Ground.

### Transient Overshadowing

The BRE guidelines suggest plotting a series of shadow plans illustrating the location of shadows cast from the proposed buildings at different times of the day and periods of the year to assess the potential overshadowing effects. For the purpose of this assessment, the overshadowing has been mapped for the following three key dates in the year:

- 21st March (Spring Equinox);
- 21st June (Summer Solstice); and
- 21st December (Winter Solstice).

The 21st September (Autumn Equinox) is not assessed owing to the identical solar altitude and therefore equivalent outcomes of overshadowing to those presented for 21st March.

For each of these dates, the overshadowing is calculated at hourly intervals throughout daylight hours from sunrise to sunset. On 21st December, the sun is at its lowest altitude, consequently creating long shadows to be cast, and therefore this date represents the worst-case scenario in terms of overshadowing.

The analysis described above varies according to different latitudes. The Site is located within London, which is at a latitude of 51.5° north.

### Sun Hours on Ground

The BRE Guidelines suggest that Sun Hours on Ground assessments should be undertaken on the Equinox (21st March and 21st September). Using specialist software, the path of the sun is tracked to determine where the sun would reach the ground and where it would not.

It is recommended that at least half of a garden or amenity area should receive at least 2 hours of sunlight on 21st March or the area which receives

2 hours of direct sunlight should not be reduced to less than 0.8 times its former value (i.e. there should be no more than a 20% reduction).

The 3D model used for the assessments (which is orientated to north by the use of OS information) enables the path of the sun to be tracked throughout the year to establish the shadow cast by the existing and proposed buildings, and thus calculate the sun hours on ground in each scenario.

## 1.4 DAYLIGHT, SUNLIGHT AND OVERSHADOWING SUMMARY

The daylight and sunlight summary criteria is set out below:

METHOD	BRE GUIDANCE CRITERIA
VSC	A window may be adversely affected if its VSC measured at the centre of the window is less than 27% and less than 0.8 times its former value.
NSL	A room may be adversely affected if the daylight distribution (NSL) is reduced beyond 0.8 times its existing area
APSH	A window may be adversely affected if a point at the centre of the window received for the whole year, less than 25% of the APSH including at least 5% of the APSH during the winter months (21 September to 21 March) and less than 0.8 times its former sunlight hours during either period, and for existing neighbouring buildings, if there is a reduction in total APSH which is greater than 4%.
SHOG	An area may be adversely affected if the the a proposed development reduces the amount of area receiveing 2 hours of sun on March 21st by 0.8 times, and if less than 50% of the areas receives at least 2 hours of sun on March 21st.

## 1.5 SIGNIFICANCE CRITERIA

### Effect Significance Terminology Overview

In terms of sensitivity, surrounding properties are considered highly sensitive to daylight and sunlight levels, and specifically habitable rooms within the properties such as living rooms, kitchens and bedrooms, in accordance with the BRE Guidelines. All existing residential receptors, assessed within this chapter are considered highly sensitive due to the expectation of natural light and given equal weighting, and therefore each individual receptor is not assigned a level of sensitivity as per the usual EIA methodology i.e. high, medium, low or very low. However, buildings with transient occupants such as student accommodation, educational facilities and

hospitals are considered lower sensitivity as they are not permanent residences and are transient in nature.

For transient overshadowing, all public areas of open space such as parks, squares and private gardens in proximity to the Site are considered highly sensitive and are considered within the assessment.

The key terminology to be used to describe the magnitude of effects is as follows and is further described in the below sections of this chapter:

- Major;
- Moderate;
- Minor; and
- Negligible.

The nature of the effects may be either adverse (negative) or beneficial (positive).

Following the classification of an effect using this methodology, a clear statement is then made as to whether the effect is significant or not significant. As a general rule, in relation to sunlight, daylight, overshadowing and solar glare the following criteria is applied:

'Moderate' or 'Major' effects are deemed to be 'significant';

'Minor', or 'Negligible' effects are considered to be 'not significant'.

Evaluating Effects and Significance – Daylight, Sunlight and Overshadowing

### Daylight and Sunlight

For daylight and sunlight, the BRE Guidelines outline the approach within the accompanying Appendix I, in terms of assigning criteria to assess the effects:

Section 3 of Appendix H states:

*"Adverse impacts occur when there is a significant decrease in the amount of skylight and sunlight reaching an existing building where it is required, or in the amount of sunlight reaching an open space... The assessment of impact will depend on a combination of factors, and there is no simple rule of thumb that can be applied."*

*"Where the loss of skylight or sunlight fully meets the guidelines, the impact is assessed as negligible or minor adverse. Where the loss of light is well within the guidelines, or only a small number of windows or limited area of open space lose light (within the guidelines), a classification of negligible impact is more appropriate. Where the loss of light is only just within the guidelines and a larger number of windows or open space are affected, a minor adverse impact would be more appropriate, especially if there is a particularly strong requirement for daylight and sunlight in the affected building or open space."*

*"Where the loss of skylight or sunlight does not meet the guidelines in this book, the impact is assessed as minor, moderate or long-term, local, adverse of major significance. Factors tending towards a minor adverse impact include:*

- Only a small number of windows or limited area of open space are affected;
- The loss of light is only marginally outside the guidelines;
- An affected room has other sources of skylight or sunlight; and
- The affected building or open space only has a low level of requirement for skylight or sunlight."

The classification of major adverse is documented at Paragraph 7:

*"Factors tending towards a major adverse impact include:*

- a large number of windows or large area of open space are affected;
- the loss of light is substantially outside the guidelines;
- all the windows in a particular property are affected; and
- the affected indoor or outdoor spaces have a particular strong requirement for skylight or sunlight, e.g. a living room in a dwelling or a children's playground".

Where the BRE Guidelines are met, the effects would be considered Negligible.

With regard to the BRE Guidelines, professional

judgement has been used to determine whether the potential effects would result in adverse or beneficial effects. The initial numerical criteria for determining the category of effect is based on percentage alterations, as follows:

- 0 – 19.9% alteration = Insignificant;
- 20 – 29.9% alteration = Minor;
- 30 – 39.9% alteration = Moderate; and
- Greater than 40% alteration = Major.

For instances where existing VSC, NSL and APSH levels within a property are low, any alteration may result in a disproportionate percentage change, whereby the actual change in daylight or sunlight within the property experienced by the occupant may not be as noticeable as the percentage change would suggest. This is one example of when professional judgement is taken into account.

Therefore, when assigning an overall significance per property, consideration has been given to the proportion of rooms / windows affected, as well as the percentage alterations, absolute changes, and any other relevant factors, such as there may be mitigating factors such as balconies, overhangs or design features which may also affect the determination of assigning the criteria.

Where the scale of VSC levels and NSL levels within a property differ, professional judgement has also been used to determine an overall significance. In addition, if the scale of total APSH and Winter PSH differ greatly, professional judgement has also been used to determine the significance of the effect. This has been based on the factors previously stated.

### Overshadowing

#### Transient Overshadowing

The BRE Guidelines do not include criteria for the significance of transitory overshadowing other than to identify the different times of the day and year when shadow would be cast over a surrounding area. This is used as a screening test to determine which sensitive areas surrounding the site would see shading from a proposal. The significance of effect is ascribed as per BRE’s criteria and professional judgement as described in the following section.

#### Sun Hours on Ground

It is suggested in the BRE guidelines that for an area to appear adequately sunlit throughout the year, at least half (50%) of any assessment area should see direct sunlight for at least two hours on the 21st March. If, as a result of new development, an existing assessment area will not meet BRE guidelines and the area which can receive two hours of direct sunlight on the 21st March is reduced to less than 0.8 times its former area, then the loss of sunlight is likely to be noticeable.

Where the results show compliance with the BRE guidelines criteria, the occupants are unlikely to experience any noticeable change to their sunlight amenity levels. For the purposes of this assessment, such an effect would be considered insignificant. Should the relevant criteria not be achieved, a judgment has to be made as to the significance of the effect based on the level of loss, retained sunlight levels and the relevant baseline scenario.

The table below sets out the numerical criteria adopted in relation to the sun on ground assessment

SIGNIFICANCE	NUMERICAL CRITERIA
NEGLIGIBLE	Over 50% of the amenity area will receive 2 hours of sunlight or less than 20% alteration in area which receives 2 hours of direct sunlight.
MINOR ADVERSE	20-29.9% reduction in the area which receives 2 hours of direct sunlight (and below 50% retained area).
MODERATE ADVERSE	30-39.9% reduction in the area which receives 2 hours of direct sunlight (and below 50% retained area).
MAJOR ADVERSE	40%+ reduction in the area which receives 2 hours of direct sunlight (and below 50% retained area).

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