



Portsmouth City Council

CABBAGEFIELD ROW

Lighting Strategy





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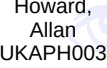
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ILP GN09

1 GLOSSARY OF TERMS AND ABBREVIATIONS

1.1 GLOSSARY OF TERMS

Term	Definition
Colour rendering	Colour rendering (as per BS EN 12665:2002) – Effect of an illuminant on the colour appearance of objects by conscious or subconscious comparison with their colour appearance under a reference illuminant.
High intensity discharge lamp	An electric discharge lamp in which the light producing arc is stabilised by wall temperature and the arc has a bulb wall loading in excess of 3 watts per square centimetre. HID lamps include high pressure mercury, metal halide, high pressure sodium and cosmopolis lamps.
High pressure sodium lamp	A high intensity discharge lamp in which the major portion of the light is produced, indirectly or directly, by radiation from sodium operating at a partial pressure in excess of 10 kilopascals. Note: The term covers lamps with clear or diffusing bulbs.
Illuminance	Quotient of the luminous flux ($d\Phi$) incident on an element of the surface containing the point, by the area (dA) of that element. Equivalent definition: Integral, taken over the hemisphere visible from the given point, of the expression Unit: $L \times \cos \theta \times d\Omega$. Where L is the luminance at the given point in the various directions of the incident elementary beams of solid angle $d\Omega$; and θ is the angle between any of these beams and the normal to the surface at the given point. Unit L_x (lux) or lumens per metre² (lm/m^2)
Illuminance uniformity	Ratio of minimum illuminance to average illuminance on a surface. Note: Use is also made of the ratio of minimum illuminance to maximum illuminance, in which case, this should be specified explicitly.
Light source	Source made in order to produce optical radiation, usually visible.
Light pollution	The spillage of light into areas where it is not desired.
Luminaire	Apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes, except the lamps themselves, all parts necessary for fixing and protecting the lamps and, where necessary, circuit auxiliaries together with the means for connecting them to the electric supply. Note: The term 'light fitting' is deprecated.
Maintained illuminance (E_m or E_{av})	Value below which the average illuminance on the specified area should not fall. It is the average illuminance at the time during which maintenance should be carried out. Unit: L_x (Lux) or lm/m^2

Term	Definition
Minimum illuminance	Lowest illuminance at any relevant point on the specified surface. Unit: Lx or lm/m2 Note: The relevant points at which the illuminances are determined shall be specified in the appropriate application standard.
Obtrusive / nuisance light	Light, outside the area to be lit, which, because of quantitative, directional or spectral attributes in a given context, gives rise to annoyance, discomfort, distraction or a reduction in the ability to see essential information, e.g. at signal lights.

1.2 ABBREVIATIONS

Abbreviation	Definition
CMS	Central Management System
CRI	Colour Rendering Index
ILE	Institute of Lighting Engineers (Former Title)
ILP	Institution of Lighting Professionals
HCC	Hampshire County Council
LED	Light Emitting Diode
PECU	Photo Electronic Cell Unit
SON-TPP / SON-T+	High Pressure Sodium Lamp
SINC	Sites of Importance for Nature Conservation
EHO	Environmental Health Officer
CNEA	Clean Neighbourhoods and Environment Act (2005)
EPA	Environmental Protection Act (1990)
DEFRA	Department of Environment, Food and Rural Affairs
NPPF	National Planning Policy Framework
PIR	Passive Infra-Red
CCT	Correlated Colour Temperature
CEMP	Construction Environmental Management Plan
GN	Guidance Note

2 INTRODUCTION & PROJECT DESCRIPTION

2.1 BACKGROUND

We have been appointed on behalf of Portsmouth City Council to prepare an external lighting strategy in consideration of the requirements of adoptable and non-adoptable specification external lighting at Cabbagefield Row, off Swanmore Road, Havant. The objective of the lighting strategy is to minimise any potential obtrusive lighting to surrounding property owners, potentially sensitive boundaries, and specifically the eastern boundary which has been identified as especially sensitive due to the presence of light sensitive bat species.

The lighting requirements for the Proposed Development are limited to lighting for adoptable highways running through the Application Site, security lighting to individual residential properties and footpath lighting to the footpath at the eastern boundary of the Application Site.

2.2 PROJECT DESCRIPTIONS

2.2.1 THE APPLICATION SITE

The Application Site consists of patches of ruderal vegetation and scrub on poor quality agricultural land at land to the north of Swanmore Road, Havant. The Application Site includes Bracken that forms part of a Site of Importance for Nature Conservation (SINC), however this sits at the north of the Application Site and does not constitute part of the developed area.

2.2.2 THE PROPOSED DEVELOPMENT

The Proposed Development consists of the construction of 150 residential units, with associated gardens, parking, site roads and infrastructure, and the construction of a pedestrian footpath abutting the east of the developed area. Existing SINC designated grassland at the north of the Application Site is to be retained as public open space but will not be developed.

Figure 2-1 - 28079-PD111K Site Layout Plan



PDP Architecture LLP, 2022.

2.3 AIM OF THIS DOCUMENT

We have been appointed to create a lighting strategy for the Proposed Development, to define how lighting should be implemented and outline the lighting levels anticipated at the eastern Application Site boundary (where ecology is most sensitive).

This document outlines:

- Legislation, planning policies and guidance applicable to the type and location of the Proposed Development.
- The existing lighting conditions within and surrounding the Application Site.
- The background to artificial light pollution and associated guidance.
- Environmental limitations that may be placed on the lighting of the Proposed Development, in accordance with current standards and guidance.
- Expected levels of illumination for the activities proposed for the development.
- Equipment performance requirements that are likely to achieve compliance with both lighting and environmental guidance.
- The anticipated lighting levels at the identified potentially sensitive receptors.

Light emitted from within residential properties has not been considered as part of this strategy. Imposing conditions on residents such as using curtains or blinds or using only a certain level or type of lighting within their property, is not enforceable under planning regulations. Should a resident, subsequent to moving in, place or install lighting that causes harm to another resident or sensitive ecology, then this would be an issue to be raised with the Local Authority Environmental Health Unit to be investigated by an Environmental Health Officer (EHO).

3 IMPACTS OF ARTIFICIAL LIGHTING

3.1 POTENTIAL NEGATIVE EFFECTS

A well-designed lighting installation may transform a space after dark; allowing it to be used safely, effectively and for uses that may not otherwise be possible. While road lighting tends to be the dominant type of lighting in most developments, lighting can also consist of public amenity lighting in core spaces, sports lighting, decorative lighting, functional (task) lighting and security lighting across a range of different applications.

The recommended lighting levels for different tasks are outlined in national and international standards, as well as industry standards and guidance documents. Typically, the more complex a task, the greater the required level of illumination and the higher the levels of uniformity in lighting levels required.

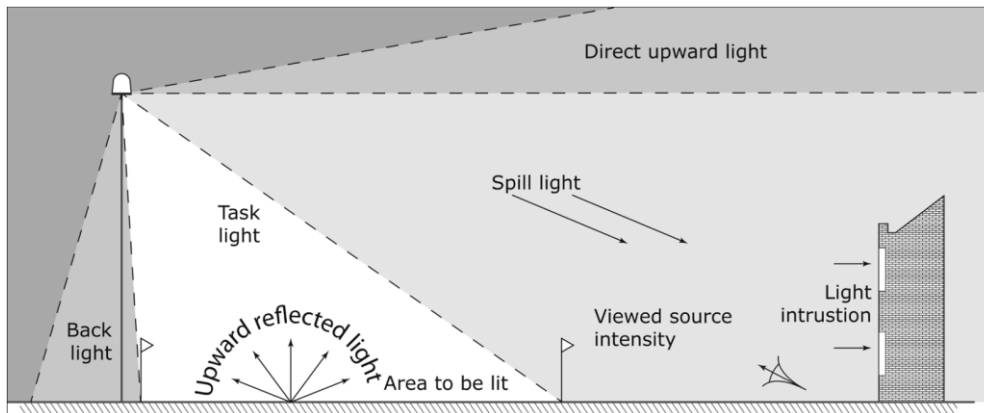
Levels of lighting must be carefully selected to ensure that they are suitable for the task being undertaken whilst ensuring that they are not excessive. Excessive levels of lighting lead to wasted energy, as well as having the potential to negatively impact local ecological receptors, human amenity receptors, and the safety of the surrounding area. In extreme cases, poor lighting may make the task it is provided for more difficult to accomplish and constitute a statutory nuisance on nearby receptors. In the context of light sensitive species (specifically bats) excessive lighting levels may lead to changes in feeding and commuting behaviour, increased risk of predation, or roost abandonment.

The incorrect application of lighting can have a negative effect on the local environment, in the form of light pollution and nuisance light. Light pollution is defined as emitted light that is serving no useful purposes as it falls outside of the area required to be illuminated. This can take several forms:

- Light Spill – Light falling outside of the extents of a site, building or event which falls onto areas not intended for illumination.
- Sky Glow – The emission of upward light into the atmosphere that limits the visibility of the night sky. The cumulative effects of sky glow may be noticeable above urban areas, where several poorly controlled sources combine to create a brightening of the horizon and night sky.
- Glare – The uncomfortable brightness of a light source when viewed against a darker background. Poorly oriented lighting units may exhibit glare and, while the disabling effects of glare diminish with distance, lighting may still cause a nuisance over several hundred metres.

A graphical representation of the types of lighting nuisance is provided in **Figure 3-1**:

Figure 3-1 - Types of light nuisance (ILP GN01:2021)



ILP, 2021.

3.2 STATUTORY REQUIREMENTS AND POLICIES

Details of the pertinent statutory requirements and policies relevant to the Proposed Development are included within this section. These requirements and policies are considered further in this section, **Section 4** which details the baseline lighting conditions and **Section 5** which sets out how lighting should be installed appropriately.

The following information is not exhaustive and further statutory requirements and policies may be applicable.

3.2.1 LEGISLATION

Clean Neighbourhoods and Environment Act (2005)

The Clean Neighbourhoods and Environment Act 2005 (the 'CNEA') gives local authorities powers to deal with artificial lighting by classifying artificial light emitted from defined premises as a statutory nuisance. The CNEA amends Section 79 of the Environmental Protection Act 1990 (the 'EPA') to extend the statutory nuisance regime to include light spill and glare (emitted from certain premises), defined as "*artificial light emitted from premises so as to be prejudicial to health or a nuisance*". Several defined types of premises are exempt from this provision, including premises where higher levels of lighting are to be expected for the purposes of safety, such as airports and lighthouses.

Guidance produced by the Department of Environment, Food and Rural Affairs (DEFRA) on Sections 101 to 103 of the CNEA extends the duty on local authorities to ensure their areas are checked periodically for existing and potential sources of statutory nuisances, including situations where a nuisance arises from the use of artificial lighting.

3.2.2 NATIONAL POLICIES

National Planning Policy Framework (2021)

The National Planning Policy Framework (NPPF), prepared by the Ministry of Housing, Communities and Local Government (MHCLG), July 2021 states:

‘Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should: ...

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.’ (NPPF, Paragraph 185, 2021)

Planning Practice Guidance (2019)

The Ministry of Housing, Communities and Local Government provides guidance on light pollution on the gov.uk website (<https://www.gov.uk/guidance/light-pollution>) and details the following:

- What light pollution consideration does planning need to address?
- What factors can be considered when assessing whether a development proposal might have implications for light pollution?
- What factors are relevant when considering where light shines?
- What factors are relevant when considering when light shines?
- What factors are relevant when considering how much the light shines?
- What factors are relevant when considering possible ecological impacts of lighting?
- What other information is available that could inform approaches to lighting and help reduce light pollution?

3.2.3 LOCAL POLICIES

Havant Borough Council (HBC) – Havant Borough Core Strategy (Adopted March 2011)

The Havant Borough Core Strategy is the overarching planning document for Havant borough, and covers the period up to 2026. The key policy relating to lighting within the Core Strategy is **Policy DM10 Pollution**, which states:

“Development that may cause pollution of water, air or soil or pollution through noise, smell, smoke, fumes, gases, steam, dust, vibration, light, heat, electromagnetic radiation and other pollutants will only be permitted where all of the following relevant criteria can be met:

- 1. The health and safety of existing and future users of the site, or nearby occupiers and residents is not put at risk.*
- 2. National air quality standards or objectives would not be breached.*
- 3. The water environment would not be detrimentally affected.*
- 4. It would not lead to an unacceptable deterioration in the quality or potential yield of coastal, surface and ground water resources.*
- 5. External lighting is of the minimum level of illumination and duration required for security and operational purposes.*

6. *External lighting would not interfere with safe navigation in either Chichester or Langstone Harbours and other coastal locations.*”

3.3 GUIDANCE FOR IMPLEMENTATION

Applicable guidance for lighting designers regarding obtrusive light is predominantly covered by the following international documents:

- CIE 150:2017 Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations (International Commission on Illumination, 2017)
- CIE 126:1997 Guidelines for Minimizing Sky Glow (International Commission on Illumination 1997)

National guidance for the United Kingdom is produced by the Institution of Lighting Professionals (ILP) in the following documents:

- Professional Lighting Guide 04, Guidance on Undertaking Environmental Lighting Impact Assessments (PLG04) (ILP, 2013)
- Guidance Note 01/21 Guidance Notes for the Reduction of Obtrusive Light (GN01) (ILP, 2021)
- Bat Guidance Note 08/18 Bats and artificial lighting in the UK (ILP & The Bat Conservation Trust, 2018)

Further guidance has been produced by the Society for Light & Lighting (SLL), with the following documents outlining good lighting practice that will inform the design:

- SLL Lighting Handbook (2018)
- SLL Lighting Guide 6: The Exterior Environment (2016)

3.3.1 ILP GN01:2021 GUIDANCE NOTES FOR THE REDUCTION OF OBTRUSIVE LIGHT

Guidance Notes outlined in ILP GN01:2021 set out what constitutes Obtrusive Light, how it can be limited through the implementation of best practice, and what limits should be imposed upon lighting depending upon the Environmental Zone in which the Application Site is located.

ILP GN01:2021 Table 2 sets out the Environmental Zones against which lighting should be considered:

Table 3-1 – GN01 Table 2: Environmental Zones

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness (SQM ~15 to 20)	Sparsely inhabited rural areas, village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	Urban	High district brightness	Town / City centres with high levels of night-time activity

ILP GN01:2021

ILP GN01:2021 Table 3 (CIE 150 Table 2) sets out the maximum values for vertical illuminance onto nearby premises, depending upon the Environmental Zone in which the premises is located. This limitation is typically considered at windows and apertures, with a focus on bedroom windows (typically at 3.8m and above).

Table 3-2 – ILP GN01:2021 Table 3 (CIE 150 Table 2): Maximum values of vertical illuminance on premises

Light Technical Parameter	Application conditions	Environmental Zone				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane (Ev)	Pre-curfew	n/a	2 lx	5 lx	10 lx	25 lx
	Post-curfew	n/a	<0.1 lx*	1 lx	2 lx	5 lx

ILP GN01:2021

ILP GN01:2021 Table 4 (CIE 150 Table 3) sets out the limits on the luminous intensity of luminaires, to control glare.

Table 3-3 – ILP GN01:2021 Table 4 (CIE 150 Table 3): Limits for the luminous intensity of bright luminaires

Light technical parameter	Application conditions	Luminaire group (projected area A_p in m^2)					
		$0 < A_p \leq 0.002$	$0.002 < A_p \leq 0.01$	$0.01 < A_p \leq 0.03$	$0.03 < A_p \leq 0.13$	$0.13 < A_p \leq 0.5$	$A_p > 0.5$
Maximum luminous intensity emitted by luminaire (I in cd)	E0						
	Pre-curfew	0	0	0	0	0	0
	Post-curfew	0	0	0	0	0	0
	E1						
	Pre-curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	2,500
	Post-curfew	0	0	0	0	0	0
	E2						
	Pre-curfew	0.57 d	1.3 d	2.5 d	5.0 d	10 d	7,500
	Post-curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	500
	E3						
	Pre-curfew	0.86 d	1.9 d	3.8 d	8.5 d	15 d	10,000
	Post-curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	1,000
	E4						
	Pre-curfew	1.4 d	3.1 d	6.3 d	13 d	26 d	25,000
	Post-curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	2,500

ILP GN01:2021

ILP GN01:2021 Table 6 (CIE 150 Table 5) sets out the maximum upward light ratio (ULR) for luminaires depending upon the Environmental Zone in which they are to be used.

Table 3-4 – ILP GN01:2021 Table 6 (CIE 150 Table 5): Maximum values of upward light ratio (ULR) of luminaires

Light Technical Parameter	Environmental Zones				
	E0	E1	E2	E3	E4
Upward light ratio (ULR) / %	0	0	2.5	5	15

ILP GN01:2021

3.3.2 ILP GN08:2018 BATS AND ARTIFICIAL LIGHTING IN THE UK

ILP GN08:2018 is a document intended to raise awareness of the impacts of artificial lighting on bats and outline mitigation options for various scenarios. Work on site should always be informed by site-specific ecological information and lighting assessments.

Whilst the document does not set out a prescriptive limit for light spill onto bat commuting routes, feeding grounds and roosts, it states:

“N.B. It is acknowledged that, especially for vertical calculation plans, very low levels of light (<0.5 lux) may occur even at considerable distances from the source if there is little intervening attenuation. It is therefore very difficult to demonstrate ‘complete darkness’ or a ‘complete absence of illumination’ on vertical plants where some form of lighting is proposed on site despite efforts to reduce them as far as possible and where horizontal plane illuminance levels are zero. Consequently, where ‘complete darkness’ on a feature or buffer is required, it may be appropriate to consider this to be where illuminance is below 0.2 lux on the horizontal plane and below 0.4 lux on the vertical plane. These figures are still lower than what may be expected on a moonlit night and are in line with research findings for the illuminance found at hedgerows used by lesser horseshoe bats, a species well known for its light averse behaviour (Stone, 2012).”

4 RECEPTOR AND BASELINE ASSESSMENT

4.1 METHODOLOGY

A desktop assessment of the Application Site has been prepared to examine the existing baseline lighting conditions both within the Application Site boundary and in the immediate surrounds. This assessment involved the review of publicly available mapping data, sky glow information, environmental sensitivities and consultation with relevant disciplines to build up a picture of the area.

An onsite baseline survey of the Application Site has not been carried out. Sufficient information can be gathered from publicly available sources to build up a picture of the baseline conditions.

Consultation with Ecologists for the scheme (ECOSA Ltd) has informed lighting inputs. An understanding of the ecological sensitivity surrounding the site has been gathered from these conversations and from review of the most up-to-date Landscape and Visual Impact Appraisal, Ecological Impact Assessment Report & Biodiversity Net Gain Assessment Report.

The approach to lighting outlined within this document has been discussed with the Ecology Officer at HCC for the project, to ensure that the approach proposed is broadly consistent with the expectation for the Application Site.

4.1.1 POTENTIALLY SENSITIVE HUMAN RECEPTORS

Potentially sensitive human receptors to changes in lighting can be split into two categories:

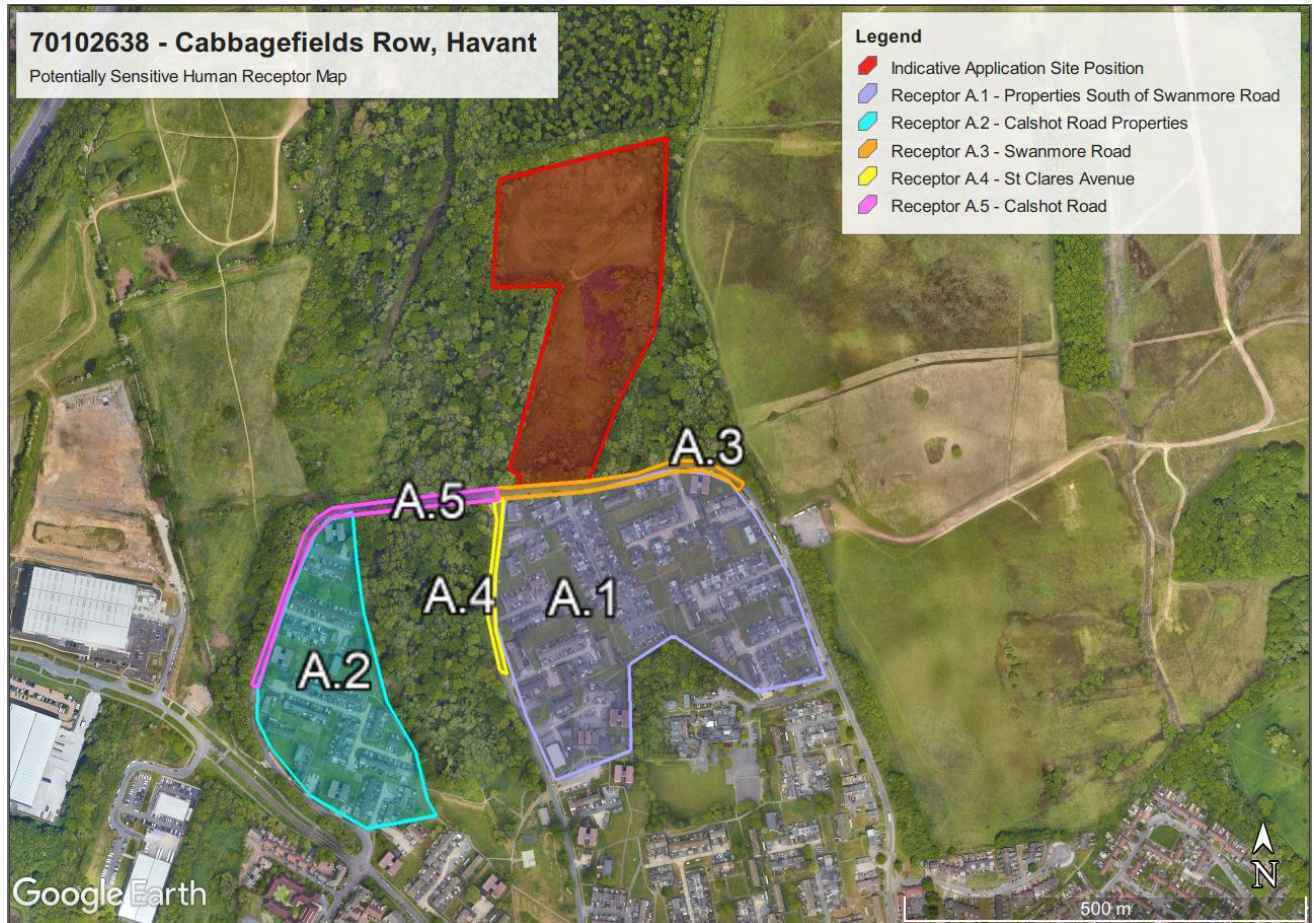
- Human Amenity – Receptors that are sensitive to changes in lighting that can affect the amenity of spaces. E.g. Residential receptors
- Human Safety – Receptors that are sensitive to changes in lighting that can affect the safety of users. E.g. Public highways, Railway lines.

Table 4-1 – Potentially Sensitive Human Receptors

Receptor No.	Receptor Name	Description	Receptor Type	Receptor Sensitivity
A.1	Properties south of Swanmore Road	Mix of residential semi-detached & terraced houses and flats, with windows facing towards the Application Site.	Human Amenity	Medium
A.2	Calshot road Properties	Mix of residential semi-detached & terraced houses and flats, with windows facing towards the Application Site. Views predominantly blocked by trees.	Human Amenity	Medium
A.3	Swanmore Road	Motorists, cyclists and pedestrians on Swanmore Road that may be sensitive to glare.	Human Safety	Low
A.4	St Clares Avenue	Motorists, cyclists and pedestrians on St Clares Avenue that may be sensitive to glare.	Human Safety	Low
A.5	Calshot Road	Motorists, cyclists and pedestrians on Calshot Road that may be sensitive to glare.	Human Safety	Low

The locations of potentially sensitive receptors outlined in **Table 4-1** are shown in **Figure 4-1**:

Figure 4-1 - Potentially Sensitive Human Receptor Map



Google, 2022.

4.1.2 POTENTIALLY SENSITIVE ECOLOGICAL RECEPTORS

Ecology information for the Proposed Development is being prepared by ECOSA Ltd, in consultation with Hampshire County Council (HCC). An Ecological Impact Assessment (EIA) and Biodiversity Net Gain Assessment (BNG) has been prepared for the Proposed Development by ECOSA, which outlines the key areas of sensitivity and habitats to be protected.

The Application Site is situated close to areas of bat activity, particularly among bat species that are sensitive to changes in lighting. As a result, the boundaries of the Application Site should be considered sensitive to changes in lighting, with the eastern boundary considered particularly sensitive.

A landscape buffer has been implemented between the built form of the Proposed Development and the sensitive boundary. Light spill across this buffer should be limited, and light spill at the eastern boundary should be reduced as much as is reasonably practicable (to nil if possible).

The EIA associated with the scheme states the following with regards to exterior lighting:

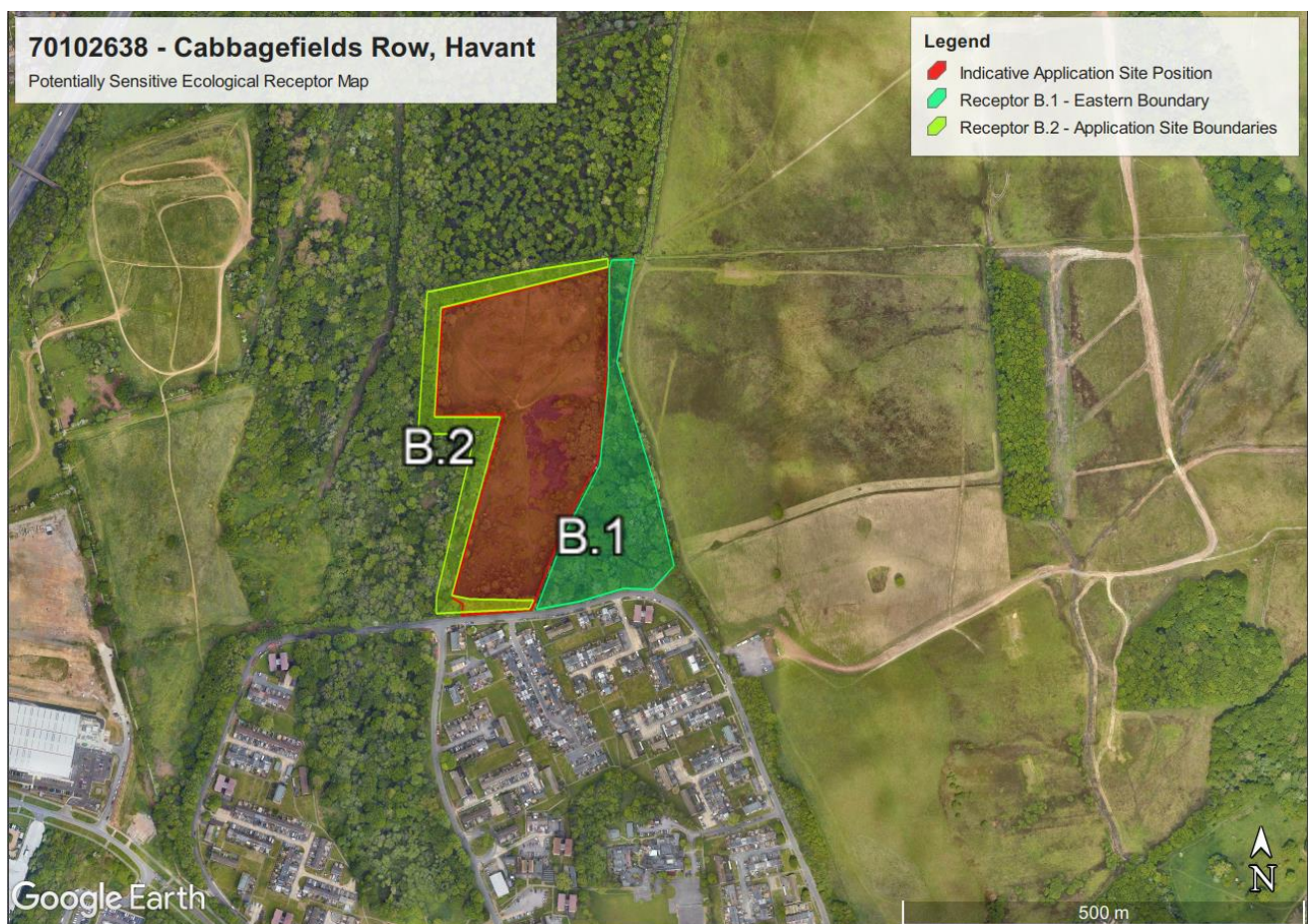
“Key foraging and commuting habitats (woodland edge habitat and unmanaged grassland) will be predominantly retained. Any external lighting strategy associated with the development has the potential to result in disturbance to foraging and commuting bats, as light-averse species may avoid areas subject to significant light spill, reducing the habitat resource available to this species group and potentially fragmenting woodland-edge commuting habitat.”

Table 4-2 – Potentially Sensitive Ecological Receptors

Receptor No.	Receptor Name	Description	Receptor Type	Receptor Sensitivity
B.1	Eastern Boundary	Identified sensitive ecology at eastern boundary of the Application Site	Ecological	High
B.2	Application Site Boundaries	Northern, western and southern Application Site boundaries which are potentially sensitive.	Ecological	Medium

The locations of potentially sensitive receptors outlined in **Table 4-2** are shown in **Figure 4-2**:

Figure 4-2 - Potentially Sensitive Ecological Receptor Map



Google, 2022.

4.2 SITE CLASSIFICATION

The classification of the Environmental Zone is made in accordance with the criteria set out in **Table 3-1**, taken from ILP GN01:2021.

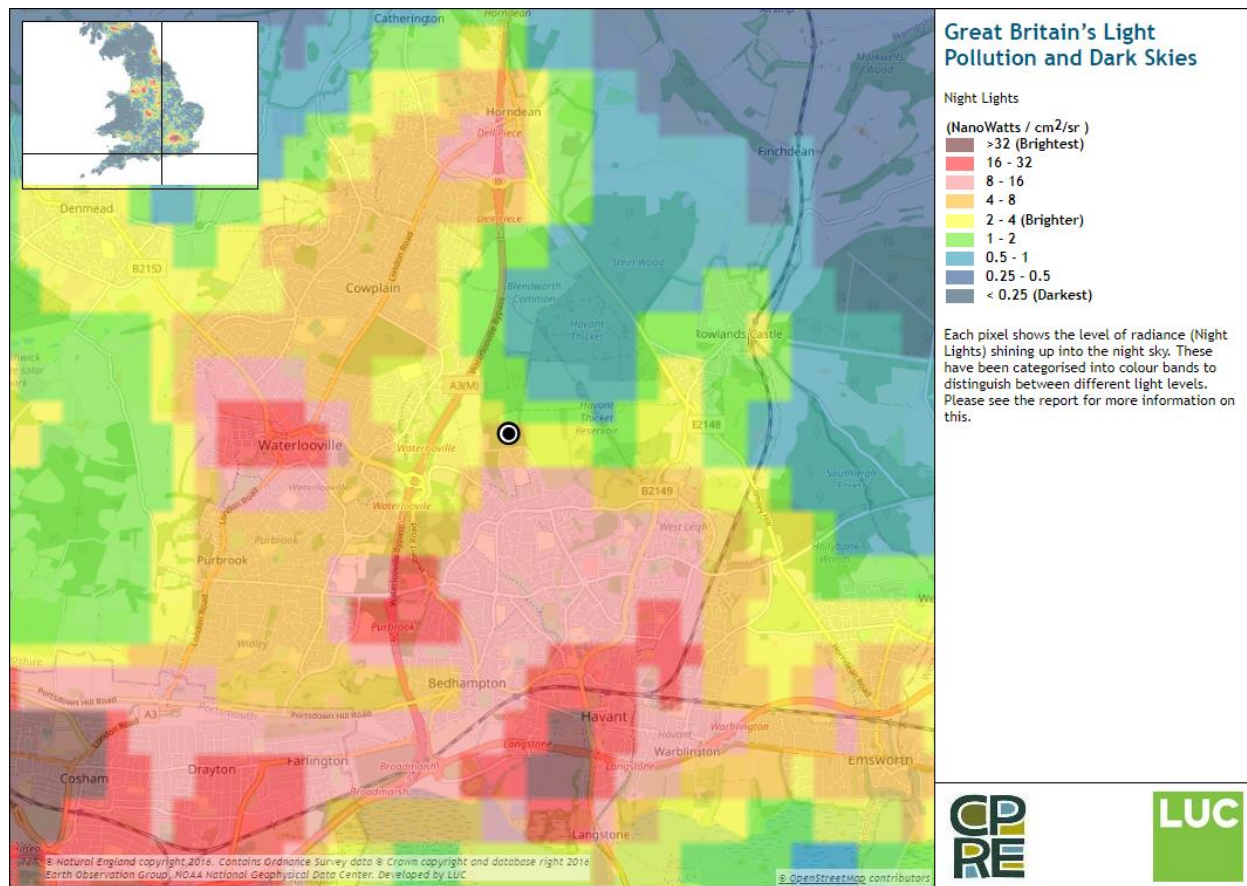
The character of the area surrounding the Application Site is suburban bordering rural, with the built form of Havant / Leigh Park directly abutting the Application Site to the south, and undeveloped land abutting the Application Site to the west, north and east.

The illuminated Swanmore Road runs adjacent to the southern Application Site boundary, with residential dwellings and illuminated roads beyond to the south, southeast and southwest.

More broadly, the Application Site sits approximately 600 metres to the southeast of the A3 (M). The Application Site sits approximately 3.5 km northwest of the centre of Havant and approximately 2.5 km east of the centre of Havant. The closest developed area to the east / northeast is Red Hill / Rowlands Castle approximately 2 km northeast of the Application Site boundary.

Sky glow mapping prepared by the CPRE in 2016 indicates that the skies above the Application Site are brighter towards the south of the Application Site, darkening towards the north. A screenshot from the CPRE Night Blight Map is shown in **Figure 4-3**:

Figure 4-3 - CPRE Night Blight Mapping (Application Site shown by black mark)



CPRE, 2022.

Whilst the Application Site is currently unlit, there are moderate levels of skyward radiance present in the skies above, due to adjacent development. Once completed, the Proposed Development will

form part of the contiguous form of Havant, which generates a dome of sky glow alongside Cosham, Gosport, Portsmouth, Waterlooville and Fareham.

Views taken from publicly available photography on the public highways to the south of the Application Site are shown in **Figure 4-4** & **Figure 4-5**.

Figure 4-4 - Swanmore Road (Adjacent to southern boundary)



Google, 2022.

Figure 4-5 - Elderfield Road (Facing North)



Google, 2022.

The character of the Application Site and its surrounds is considered to move between ‘Suburban’ and ‘Rural’, as the Application Site is bounded by residential development to the south, but predominantly undeveloped land to the west, north and east. As such, the Application Site and the skies above could be considered consistent with either ‘Medium district brightness’ or ‘Low district brightness’ as outlined within ILP GN01:2021 Table 2 (**Table 3-1** within this document).

Note 1 to ILP GN01:2021 Table 2 states: “Where an area to be lit lies close to the boundary of two zones the obtrusive light limitation values used should be those applicable to the most rigorous zone”.

As such, the Application Site is classified as being within an **E2** Environmental Zone.

4.3 SITE LIMITATIONS

The limitations imposed upon the exterior lighting within an E2 Environmental Zone are provided in the tables below, extracted from ILP GN01:2021. Further guidance on limitations and how these are calculated is provided in CIE 150:2017.

The following tables are extractions of parameters which are applicable to the lighting design for the Proposed Development, with every effort to implement best design practice being taken in order to ensure a design that is compliant with the outlined parameters as far as is reasonably practicable.

Where a curfew is included, this refers to the time after which stricter requirements for the control of obtrusive light will apply, as stipulated by the Local Planning Authority. Unless otherwise stated, this is typically considered to be between the hours of 23:00 and 05:00.

Table 4-3 – Limitation on Illuminance in the Vertical Plane (E2 Environmental Zone)

Light Technical Parameter	Application conditions	E2
Illuminance in the vertical plane (E _v)	Pre-curfew	5 lx
	Post-curfew	1 lx

ILP GN01:2021

Table 4-4 – Limitation on Luminous Intensity (E2 Environmental Zone)

Light technical parameter	Application conditions	Luminaire group (projected area A _p in m ²)					
		0 < A _p ≤ 0.002	0.002 < A _p ≤ 0.01	0.01 < A _p ≤ 0.03	0.03 < A _p ≤ 0.13	0.13 < A _p ≤ 0.5	A _p > 0.5
Maximum luminous intensity emitted by luminaire (I in cd)	E2						
	Pre-curfew	0.57 d	1.3 d	2.5 d	5.0 d	10 d	7,500
	Post-curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	500

ILP GN01:2021

Table 4-5 – Limitation on Upward Light (E2 Environmental Zone)

Light Technical Parameter	E2
Upward light ratio (ULR) / %	2.5

ILP GN01:2021

Proposals do not include the illumination of building façades, and as such, limitations on building façade luminance are not relevant to the Proposed Development.

5 LIGHTING STRATEGY

5.1 ENVIRONMENTAL PRINCIPLES

All lighting should be designed with the key principles of good lighting design outlined in ILP GN01:2021 which states:

“Good Lighting practice is the provision of the right light, at the right time, in the right place, controlled by the right system.”

This means:

- **Right Light:** Look to the correct application of the lighting standards, defining the required lighting levels dependent on the task being undertaken and the level of activity and risk. Right light refers to the correct selection of light source, with due consideration of the most energy efficient modern sources, such as LED. Balanced against these requirements is the need to consider the impact of lighting on local sensitive flora and fauna, especially bats.
- **Right Time:** The lighting standards permit levels to be adjusted dependent on the use of an area, such as when traffic or pedestrian activity falls. Lowering levels to the minimum required for safety and security, or even full switch-off regimes may be considered at certain times. Such an approach may be across the Proposed Development or suitably zoned.
- **Right Place:** Ensure that only the areas required are illuminated. Reductions in spill and obtrusive light to at least the constraints imposed by the applicable Environmental Zone should be achieved through the careful consideration of luminaires and how they are installed.
- **Right System:** The most energy efficient lighting installations require a suitable control system. Dependent on the operator and operating regime, a system that allows monitoring and control may be considered.

5.1.1 APPLICATION AREAS

The Proposed Development consists of residential properties, with associated highways throughout the site. Furthermore, a footpath to the east of the Application Site is to be lit; and security lighting is to be provided to each residential property.

Whilst it would not be typical to consider security lighting at this stage, this is being considered as part of the proposals in order to ensure that the lighting that is implemented is sensitive to adjacent ecological sensitivity. By implementing security lighting as part of this strategy, it is less likely that individual residents will install poorly controlled, overly bright, or inappropriately coloured lighting in the future. The approach for implementing security lighting will be informed by ILP Guidance Note 09 – *Domestic exterior lighting: getting it right!*.

Lighting to the roads throughout the site will be required for safety, enabling use during the hours of darkness. Lighting for this area will be provided in accordance with the requirements set out in BS 5489-1:2020 Table A.5 – Lighting classes for subsidiary roads. In accordance with the requirements in this table, the roads will be lit to class P4 (E3/E4 Environmental Zone, Normal/Quiet usage, Speed limit $v \leq 30$ mph), with the equivalent class of C5 to be used for conflict areas.

Lighting to the pedestrian footpaths will also be implemented in accordance with the requirements set out in BS 5489-2:2020 Table A.5, and these areas will be lit to P6 (E1 to E4 Environmental Zone, Quiet usage, Pedestrian and cyclists only).

Security lighting will not be implemented in accordance with the requirements for a recognised standard; instead, being provided for wayfinding purposes.

5.2 MITIGATION BY DESIGN – HUMAN RECEPTORS

The impacts of lighting upon potentially sensitive human receptors can be effectively mitigated through lighting design, luminaire selection and by minimising the levels of lighting used.

The following measures will be employed to reduce the potential impact of lighting:

5.2.1 EQUIPMENT

- The extents of the lit sections will be constrained to the minimum required for safety,
- Selected lighting levels will be the lowest possible required for safety,
- LED luminaires will be specified with good optical control, to reduce light spill and other obtrusive parameters,
- Luminaires will have a 0% Upward Light Ratio (ULR),
- Luminaires utilised should have a minimum luminous intensity class of G4 (refer to BS EN 13201-2:2015, Table A. 1), to remove any light emission above the horizontal and reduce source intensity over greater distances,
- Luminaires should be installed at 0° to the horizontal to preserve their luminous intensity class; and
- Shields and baffles to be used where levels of obtrusive light cannot be limited through good lighting design.

5.2.2 CORRELATED COLOUR TEMPERATURE (CCT)

All light sources have an associated colour temperature. This is a measure of how cool or warm the colour appears when viewed and is measured in Kelvin. Lighting which appears warm has a lower colour temperature and lighting which appears cool has a higher colour temperature.

Generally, the higher the colour temperature, the bluer the light (shorter wavelength) is present in the distribution. The amount of power emitted at each wavelength by a light source is known as the spectral power distribution and is discussed in more detail below.

It is preferable to use warmer sources when trying to limit short wavelength ('blue') output, to create a more comfortable environment for humans and an acceptable installation for local ecology. While cooler sources are typically more efficient, advances in LED technology reduce the efficiency gap between cooler and warmer sources over time.

- Luminaires for the adoptable highways are to have a maximum correlated colour temperature (CCT) of 4000K. Hampshire County Council Technical Guidance Note TG13 (Street Lighting) states that *"It may be possible to mitigate lighting impacts, in consultation with HCC's Street Lighting Section, through other measures such as ... c) Light sources may be altered to different colour temperature and spectral distribution"*. This option should be explored with HCC at the detailed design stage, with a target CCT of 2700K.
- Footpath luminaires at the eastern boundary are to have a maximum CCT of 4000K in accordance with the Hampshire County Council Technical Guidance Note TG13, however, it should be stressed that the CCT in this area should be reduced to 2700K or lower to limit potential 'Blue' light impacts on sensitive bat species.

If a deviation in the adoptable CCT cannot be secured, the primary impacts of light pollution should be mitigated through good lighting design, minimising the lighting levels at the boundaries.

5.2.3 LIGHTING CONTROLS

Lighting will be suitably controlled depending upon the application area to limit the hours of illumination to those needed for the intended use.

Lighting to the adoptable highway and footpaths will be controlled via Mayflower CMS nodes, in accordance with the HCC TG13 document. Luminaires will be operated in accordance with the part-night switching regime for Hampshire, switching ON at dusk, OFF at 1am, ON at 4am, and OFF at dawn.

Security lighting to property frontages and rears will be controlled via Passive InfraRed (PIR) motion sensors with inbuilt photoelectric control units (PECUs). Lighting will therefore only be provided during the hours of darkness and will only activate when movement is detected.

PIR sensors will switch luminaires on at 100% output when movement is detected, remaining at 100% output for 2 minutes, before dimming to 0% output. If movement is detected during the 2 minute activation period, the timer will be reset at 2 minutes.

PIR sensors should have an appropriate detection radius and sensitivity, ensuring that lighting switches on when needed, but is not erroneously activated by nearby pedestrians, cars, or movements from objects in the wind e.g. Trees.

Whilst dimming and switching will further reduce the potential impacts of lighting within the landscape, it is not anticipated that the dimming/switching is a necessary measure to achieve the Environmental Zone limitations for the Environmental Zone in which the Application Site is located.

5.3 MITIGATION BY DESIGN – ECOLOGICAL RECEPTORS

Ecological guidance for the Application Site has identified potentially sensitive receptors that are outlined in **Section 3**. Further detail on the ecological constraints associated with the Application Site should be sought from suitably qualified ecology professionals associated with the project.

The key areas of sensitivity outlined are the eastern Application Site boundary, which is deemed to be of **high** sensitivity; and the southern, western and northern Application Site boundaries, which are deemed to be of **medium** sensitivity.

Artificial lighting has the potential to affect sensitive fauna at habitats for light sensitive species, including impacting roosts, commuting routes and dark corridors. It is useful in most situations to establish primary mitigation by assessing the impact of lighting proposals on the most sensitive local fauna, typically bats. If a lighting scheme can be developed that is sensitive to the most sensitive fauna, it is likely that the proposed installation will not present additional harm to other species.

Different species are affected by lighting in different ways. Reducing the spectral output of the proposed units is an effective method of reducing the number of species that are affected by changes in lighting. In addition, shorter wavelength sources should be avoided. Therefore, the use of warmer white LED sources, which may inherently have a more limited spectral distribution and naturally limit shorter wavelength outputs, is recommended.

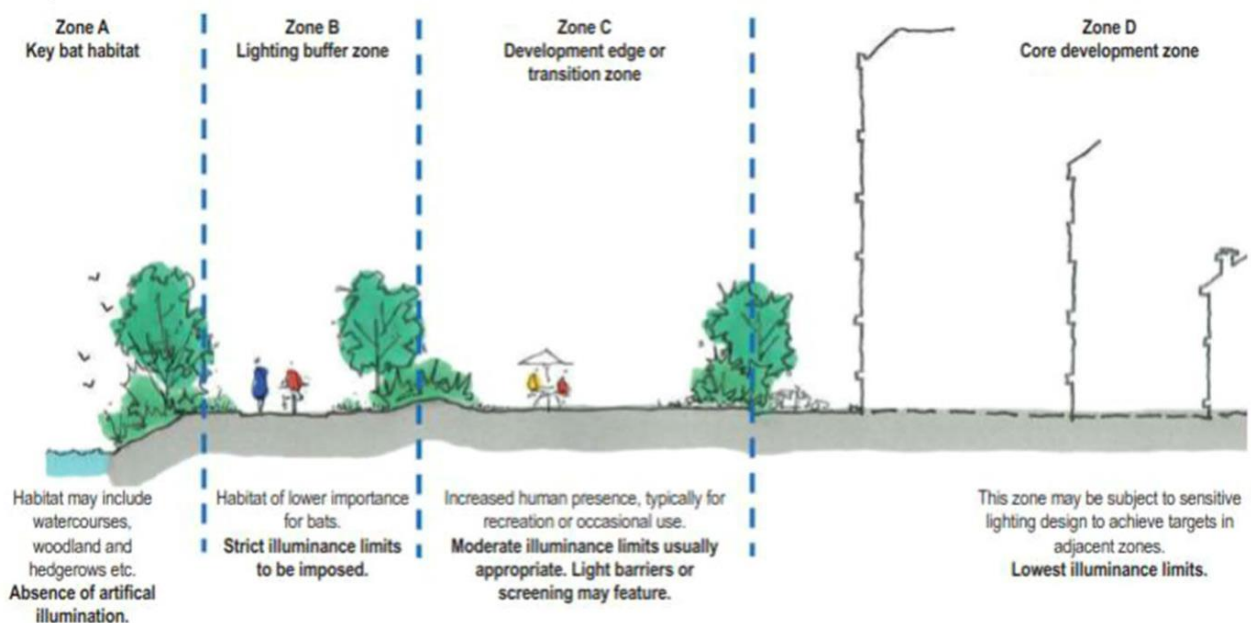
In addition to the measures outlined for reduction of impacts on Human Receptors, the following measures should be implemented to reduce impacts upon Ecological Receptors:

- Light spill onto confirmed, suspected or introduced roosts, boxes and other key light sensitive ecological features should be avoided, primarily through good lighting design and by the implementation of shields where necessary.
- Light spill onto trees and hedgerows should be limited through good lighting design and by the implementation of shields where necessary.
- A 'buffer zone' of very low illuminance (if any) is to be created at the eastern boundary of the Application Site, with the purpose of reducing light spill onto the eastern boundary to within the levels outlined in ILP GN08:2018 (and to zero if possible).
- Landscaping features such as shrubs and trees should be retained where possible to limit the potential impacts of artificial lighting by blocking light spill.

To minimise the effects on foraging and commuting bats (and other nocturnal species) as a result of light spill, a lighting design for the Proposed Development will be prepared at the detailed design stage, incorporating measures to reduce the effects of lighting on bats. This will be reviewed by a suitably qualified ecologist to ensure that effects on sensitive habitats are avoided.

Further advice on limiting the impact of lighting on bats is provided in Bat Conservation Trust and ILP Guidance Note 08/18 Bats and Artificial Lighting in the UK (ILP, 2018). A graphic from ILP GN08 shown in **Figure 5-1** demonstrates the principles of the implementation of buffer zones to reduce the impacts of artificial lighting:

Figure 5-1 - Buffer Zones (ILP GN08:2018)



ILP, 2018.

5.4 RECOMMENDED SOLUTIONS – CONSTRUCTION

Construction lighting may be required to enable construction works to be completed during the hours of darkness, or for security lighting to construction compounds, the effects of which may be assessed as part of a temporary lighting design which should be undertaken by a suitably qualified lighting professional. As such, lighting should meet the constraints of the applicable Environmental Zone and equipment requirements detailed above. Temporary task lighting may not be subject of a design process and should adhere to the same constraints during its operation. Further details regarding construction lighting should be provided in the Construction Environmental Management Plan (CEMP), which should include the following measures:

- Lighting levels should be appropriate to the task being undertaken to ensure the safety of works and general users of the site, in accordance with BS EN 12464-2:2014,
- Lighting should be designed such that, where practicable, all luminaires are installed internal to the Application Site (such as on the inside of hoarding) and are directed towards the working area,
- Lighting should be operational only during construction works, except where lighting is required for out-of-hours security or safety reasons,
- Lighting should adhere to best practice, including guidance from industry bodies (such as the Construction Industry Research and Information Association, CIRIA). CIRIA guidance, for example, notes that lighting on construction sites is typically required for safety and security, while at the same time being required to minimise impacts on surrounding receptors in accordance with current best practice,
- Lighting should be mindful of temporary impacts on sensitive flora and fauna and limit the intensity and duration of lighting to the minimum required; and
- Construction compounds should not be located near to the most sensitive areas.

5.5 RECOMMENDED SOLUTIONS – OPERATION

5.5.1 LUMINAIRES

LED technology offers tighter optical control when compared with traditional lamp sources, with enhanced potential to minimise all forms of obtrusive light.

Examples of the types of luminaires that should be employed as part of the Proposed Development are outlined below. All lighting should be subject to a detailed lighting design at the detailed design stage. All lighting installed as part of the Proposed Development should limit light spill to within the levels achievable with the luminaires listed below.

5.5.2 ADOPTABLE HIGHWAY

Lighting to adoptable highways will be provided in accordance with the requirements set out in BS 5489-1:2020 Table A.5, for an E3/E4 Environmental Zone, with Normal/Quiet usage, and a speed limit $v \leq 30\text{mph}$. This results in a lighting class of P4 (5.00 lux Maintained Average Illuminance, 1.00 lux Maintained Minimum Illuminance). This class will be achieved through the use of lighting equipment installed in accordance with the Hampshire County Council (HCC) Street Lighting Specification, as HCC specify what equipment for installation on the network they will adopt.

The HCC adoptable specification for this application is outlined in **Table 5-1**:

Table 5-1 – Luminaire Specification – Adoptable Highway

Specification Parameter	Description
Luminaire Manufacturer	Philips Lighting
Luminaire Model	Micro Luma
Lumen Output	4.40 klm
Optical Distribution	DX10
Correlated Colour Temperature (CCT)	4000K (Adoptable) – 2700K (Preferable for the protection of ecology)
Upward Light Ratio % (ULR)	0% (Maximum)
Tilt	0° (Maximum)
Controls	Mayflower CMS. Dusk: 100% Output 1am: 0% Output 4am: 100% Output Dawn: 0% Output
Mounting Height	6.0m
Other	Philips BL1 / BL2 Louvres as required to limit light spill

5.5.3 FOOTPATH

Lighting to the adoptable footpath will be provided in accordance with the requirements set out in BS 5489-1:2020 Table A.5, for an E1 to E4 Environmental Zone, with Quiet usage, Pedestrian and cyclists only. This results in a lighting class of P6 (2.00 lux Maintained Average Illuminance, 0.40 lux Maintained Minimum Illuminance).

The HCC adoptable specification for this application is outlined in **Table 5-2**:

Table 5-2 – Luminaire Specification - Footpath

Specification Parameter	Description
Luminaire Manufacturer	Philips Lighting
Luminaire Model	Micro Luma
Lumen Output	0.80 klm
Optical Distribution	DN 25
Correlated Colour Temperature (CCT)	4000K (Adoptable) – 2200K (Preferable for the protection of ecology)
Upward Light Ratio % (ULR)	0% (Maximum)
Tilt	0° (Maximum)
Controls	Mayflower CMS. Dusk: 100% Output 1am: 0% Output 4am: 100% Output Dawn: 0% Output
Mounting Height	5.0m
Other	Philips BL1 / BL2 Louvres as required to limit light spill

5.5.4 SECURITY LIGHTING

Security lighting is to be provided to the fronts and rears of each residential property, for the purpose of security and to enable wayfinding during the hours of darkness. The specification for security lighting is being set out at this stage in order to ensure that lighting is implemented in accordance with a sensitive specification; and to reduce the instance of individuals installing their own security lighting post-occupation.

Security lighting will be provided by a single, 0% ULR downlight to the front and rear of each residential property. Downlights will be of relatively low output and have a narrow beam to ensure that the extents of the lit area are contained.

The specification or similar to be used for this application is outlined in **Table 5-3**:

Table 5-3 – Luminaire Specification – Security Lighting

Specification Parameter	Description
Luminaire Manufacturer	Ligman (Or equivalent approved)
Luminaire Model	Ligman Jet-4 (Or equivalent approved)
Lumen Output	1.00 klm (Maximum)
Optical Distribution	Narrow downward beam
Correlated Colour Temperature (CCT)	2700K (Maximum)
Upward Light Ratio % (ULR)	0% (Maximum)
Tilt	0° (Maximum)
Controls	To be controlled via PIR sensor.
Mounting Height	2.00m
Other	N/A

Figure 5-2 - Example Downlight



Ligman Lighting, 2022.

It should be noted that it is recommended that a downward lighting only option be utilised. Further guidance on types of suitable fittings has been produce by the ILP in the form of GN09 'Domestic Security Lighting: Getting it Right'. Please refer to Appendix D for the full guidance note.

5.5.5 MOUNTING HEIGHTS

Luminaires are to be mounted at the lowest practicable level to ensure operational levels of lighting are achieved in the designated areas.

- Street Lighting luminaires are to be mounted at a height not exceeding 6.00 metres.
- Footpath luminaires are to be mounted at a height not exceeding 5.00 metres.
- Security lighting to property frontages and rears is to be mounted at a height not exceeding 2.00 metres.

5.5.6 COLOUR TEMPERATURE

Street Lighting luminaires are to have a maximum CCT of 4000K. If possible, this should be reduced at the detailed design stage following consultation with HCC to a preferred CCT of 2700K; for the protection of local ecological receptors.

Footpath luminaires are to have a maximum CCT of 4000K. If possible, this should be reduced at the detailed design stage following consultation with HCC to a preferred CCT of 2200K; for the protection of local ecological receptors.

Security lighting is to be provided in a CCT not exceeding 2700 Kelvin. Where possible, luminaires are to be procured in 2200 Kelvin or warmer to further limit the potential impacts upon potentially sensitive ecology receptors.

5.5.7 LIGHTING CONTROLS

Street lighting luminaires are to be controlled via Mayflower CMS, switching on at 100% output at dusk, switching off at 1am, switching on at 100% output at 4am, and switching off at dawn.

Footpath luminaires are to be controlled via Mayflower CMS, switching on at 100% output at dusk, switching off at 1am, switching on at 100% output at 4am, and switching off at dawn.

Security lighting is to be controlled via Passive InfraRed (PIR) sensor. PIR sensors will switch luminaires on at 100% output when movement is detected, remaining at 100% output for 2 minutes, before dimming to 0% output. If movement is detected during the 2-minute activation period, the timer will be reset at 2 minutes.

5.5.8 LUMINAIRE G CLASS

The G Class (or G rating) of a luminaire relates to the luminous intensity of the light emitted at angles of 70, 80 and 90 degrees when the luminaire is mounted at a tilt of zero degrees to the horizontal. The G rating of a luminaire will alter as tilt is applied to the fitting; this is generally determined through calculation software packages. The classification ranges from G1 to G6, with G6 being the most stringent requirement that will most significantly limit glare. The G6 class is typically specified for motorway lighting, with classifications between G4 and G6 being used for this application, and where the cumulative light pollution from a significant number of light sources has the potential to cause a significant effect. HCC require a G4 or greater rated luminaire to be used.

5.6 LIGHT SPILL RESULTS

Calculations of vertical and horizontal illuminance at the most sensitive boundary were undertaken to validate the approach outlined in the above Lighting Strategy.

A light spill diagram showing the horizontal illuminance at the Application Site boundaries is presented in **Appendix B**. This diagram demonstrates that Horizontal Illuminance at the eastern boundary falls below the 0.20 lux level identified in ILP GN08:2018.

Calculations of vertical illuminance were made at the eastern Application Site boundary, beyond the Ancient Woodland Landscape Buffer. The locations of grids used to calculate vertical illuminance are shown in **Figures 5-3** and **5-4**. The results of the vertical illuminance calculations are shown in **Table 5-4** with the full calculations presented in **Appendix C**.

Figure 5-3 - Vertical Illuminance Grids 2 to 4

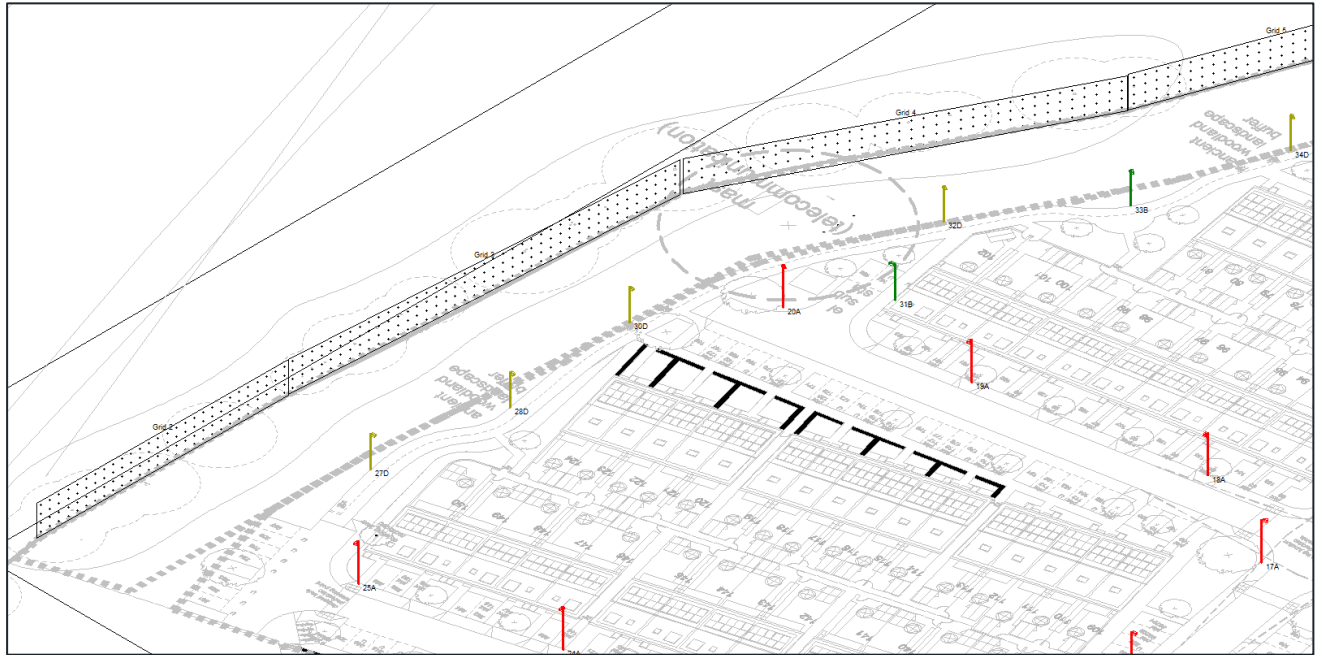


Figure 5-4 - Vertical Illuminance Grids 5 to 8

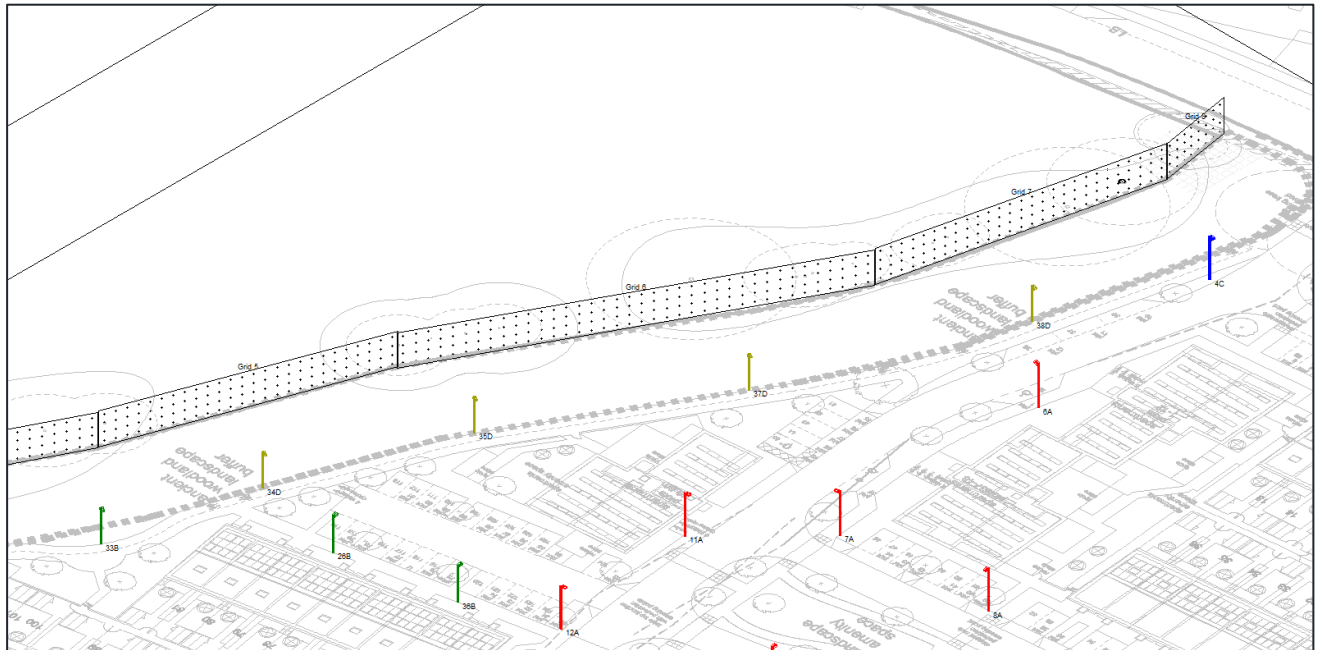


Table 5-4 – Vertical Illuminance Calculation Results (Receptor B.1)

Grid Number	Vertical Illuminance Maximum (lux)	Vertical Illuminance Maximum (lux) (4m west of boundary)	Compliance with ILP GN08:2018 “Absolute Darkness”
2	0.05	0.20	Yes
3	0.17	0.31	Yes
4	0.08	0.15	Yes
5	0.04	0.08	Yes
6	0.10	0.15	Yes
7	0.17	0.30	Yes
8	0.18	0.34	Yes

The results of these calculations demonstrate that light spill to the identified sensitive boundary will fall below the limitations outlined in ILP GN08:2018 in all places. Further reductions in the potential impacts could be assured through negotiation with HCC on the colour temperature of the luminaires to be used, and through descoping the footpath at the east of the site from the lighting design.

All calculations show the worst-case scenario, demonstrating horizontal and vertical illuminance in a 2d plane. Calculations do not account for variations in topography or for light limiting objects that may screen or filter the amount of light reaching potentially sensitive receptors. As a result, the actual levels onto adjacent potentially sensitive receptors are likely to be lower than those modelled.

5.7 SUMMARY

We have developed a Lighting Strategy and Light Spill Model on behalf of Portsmouth City Council for a Proposed Development at land north of Swanmore Road, Havant. The Proposed Development is for the construction of residential dwellings, with associated infrastructure and highways.

The boundaries of the Application Site have been identified as being potentially sensitive to changes in lighting, particularly the eastern boundary which is identified as a commuting route for light sensitive bat species. A Lighting Strategy has been prepared to reduce potential impacts on this boundary, which sets out the types, positions, outputs, mounting heights and shielding requirements of luminaires to be used as part of the Proposed Development.

Modelling was undertaken of the eastern boundary to demonstrate the likely impacts of lighting associated with the Proposed Development. Modelling showed that light levels at the eastern boundary are likely to fall below the limitations outlined in ILP GN08:2018, and therefore will have a limited impact upon ecological receptors.

Further reduction in impacts could be achieved through the reduction in the Correlated Colour Temperature of luminaires to be used as part of the Proposed Development, however, this requires consent from Hampshire County Council to deviate from the adoptable specification for Hampshire.

5.8 REFERENCES

Stone, E.L., Jones, G. and Harris, S. (2012), Conserving energy at a cost to biodiversity? Impacts of LED lighting on bats. *Glob Change Biol*, 18: 2458-2465. <https://doi.org/10.1111/j.1365-2486.2012.02705.x>

Appendix A

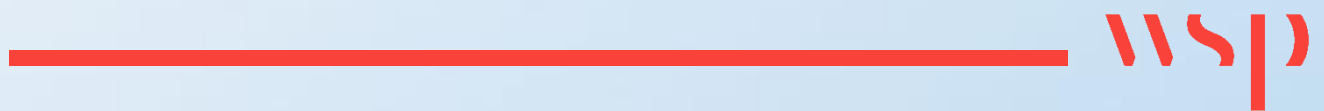
SITE LAYOUT PLAN





Appendix B

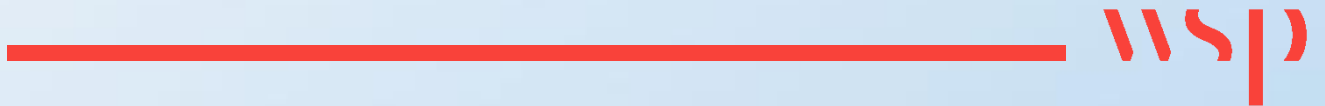
LIGHT SPILL DIAGRAM





Appendix C

VERTICAL ILLUMINANCE CALCULATIONS



DATE: 13 December 2022
DESIGNER: Toby Penter
PROJECT No: 70102638
PROJECT NAME: Cabbagefield Row



Outdoor Lighting Report

PREPARED BY: Toby Penter BA (HONS) IENG MILP
Senior Lighting Designer
Lighting & Energy Solutions
WSP-UK
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Layout Report

General Data

Dimensions in Metres Angles in Degrees

Calculation Grids

ID	Grid Name	X	Y	X' Length	Y' Length	X' Spacing	Y' Spacing
1	Grid 1	470517.71	109352.08	215.32	305.29	1.50	1.50
2	Grid 2	470725.90	109653.12	4.36	5.00	0.17	0.20
3	Grid 3	470726.81	109648.86	99.69	5.00	1.49	1.25
4	Grid 4	470722.90	109549.22	51.81	5.00	1.52	1.25
5	Grid 5	470698.95	109503.24	38.55	5.00	1.38	1.25
6	Grid 6	470685.83	109467.05	54.15	5.00	1.59	1.25
7	Grid 7	470659.58	109419.69	43.09	5.00	1.39	1.25
8	Grid 8	470649.62	109377.76	11.60	5.00	1.29	1.25

Luminaires

Luminaire A Data



Supplier	Philips
Type	BGP702 DX10
Lamp(s)	LED-HB 5.2S 740
Lamp Flux (klm)	4.40
File Name	Luma Gen2 Micro_BGP702_DX10_4400_20LED_5.2S_CLO_L90_740.ies
Maintenance Factor	1.00
Imax70,80,90(cd/klm)	522.9, 97.5, 0.0
No. in Project	23

Luminaire B Data



Supplier	Philips
Type	BGP702 DN25
Lamp(s)	LED-HB 5.2S 740
Lamp Flux (klm)	0.80
File Name	Luma Gen2 Micro_BGP702_DN25_800_6LED_5.2S_CLO_L90_740.ies
Maintenance Factor	1.00
Imax70,80,90(cd/klm)	727.1, 89.8, 0.0
No. in Project	5

Luminaire C Data

Supplier	
Type	BGP702 DX10 BL1
Lamp(s)	LED-HB 5.2S 740
Lamp Flux (klm)	4.40
File Name	Luma Gen2 Micro_BGP702_DX10 BL1_4400_20LED_5.2S_CLO_L90_740.ies
Maintenance Factor	1.00
Imax70,80,90(cd/klm)	503.9, 72.3, 0.0
No. in Project	2

Luminaire D Data

Supplier	
Type	BGP702 DN25 BL2
Lamp(s)	LED-HB 5.2S 740
Lamp Flux (klm)	0.80
File Name	Luma Gen2 Micro_BGP702_DN25 BL2_800_6LED_5.2S_CLO_L90_740.ies
Maintenance Factor	1.00
Imax70,80,90(cd/klm)	633.3, 47.4, 0.0
No. in Project	8

Layout

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
1	A	470544.35	109381.63	6.00	274.00	0.00	0.00	0.40			
2	A	470573.18	109391.04	6.00	276.00	0.00	0.00	0.40			
3	A	470607.66	109394.25	6.00	276.00	0.00	0.00	0.40			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
4	C	470636.07	109387.69	6.00	170.00	0.00	0.00	0.40			
5	A	470628.67	109368.85	6.00	357.00	0.00	0.00	0.40			
6	A	470631.98	109419.41	6.00	349.00	0.00	0.00	0.40			
7	A	470630.16	109453.25	6.00	9.00	0.00	0.00	0.40			
8	A	470607.59	109451.90	6.00	98.00	0.00	0.00	0.40			
9	A	470581.62	109462.62	6.00	2.00	0.00	0.00	0.40			
10	A	470613.92	109480.52	6.00	279.00	0.00	0.00	0.40			
11	A	470642.59	109465.95	6.00	193.00	0.00	0.00	0.40			
12	A	470639.62	109488.92	6.00	191.00	0.00	0.00	0.40			
13	A	470621.87	109511.49	6.00	15.00	0.00	0.00	0.40			
14	A	470617.35	109535.91	6.00	10.00	0.00	0.00	0.40			
15	A	470567.27	109544.61	6.00	326.00	0.00	0.00	0.40			
16	A	470598.68	109548.97	6.00	282.00	0.00	0.00	0.40			
17	A	470627.59	109553.87	6.00	214.00	0.00	0.00	0.40			
18	A	470644.28	109545.96	6.00	105.00	0.00	0.00	0.40			
19	A	470676.67	109552.07	6.00	102.00	0.00	0.00	0.40			
20	A	470702.62	109556.88	6.00	154.00	0.00	0.00	0.40			
21	A	470622.35	109580.35	6.00	198.00	0.00	0.00	0.40			
22	C	470616.72	109616.44	6.00	300.00	0.00	0.00	0.40			
23	A	470650.37	109617.00	6.00	111.00	0.00	0.00	0.40			
24	A	470672.24	109623.10	6.00	106.00	0.00	0.00	0.40			
25	A	470698.23	109630.52	6.00	99.00	0.00	0.00	0.40			
26	B	470668.72	109496.61	5.00	281.00	0.00	0.00	0.40			
27	D	470713.42	109613.38	5.00	193.00	0.00	0.00	0.40			
28	D	470710.77	109593.29	5.00	175.00	0.00	0.00	0.40			
30	D	470713.03	109571.51	5.00	174.00	0.00	0.00	0.40			
31	B	470694.55	109546.70	5.00	13.00	0.00	0.00	0.40			
32	D	470701.65	109531.66	5.00	156.00	0.00	0.00	0.40			
33	B	470688.65	109514.12	5.00	148.00	0.00	0.00	0.40			
34	D	470683.38	109493.27	5.00	155.00	0.00	0.00	0.40			
35	D	470674.05	109468.52	5.00	155.00	0.00	0.00	0.40			
36	B	470562.31	109369.28	5.00	5.00	0.00	0.00	0.40			
36	B	470651.67	109493.49	5.00	278.00	0.00	0.00	0.40			
37	D	470657.87	109440.31	5.00	149.00	0.00	0.00	0.40			
38	D	470644.53	109407.91	5.00	167.00	0.00	0.00	0.40			

Horizontal Illuminance (lux)

Grid 1



Results

Eav	7.64
Emin	1.04
Emax	21.07
Emin/Emax	0.05
Emin/Eav	0.14

Illuminance (lux)

Grid 2

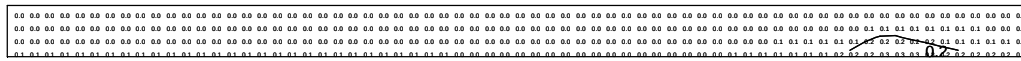
[illegible]

Results

Eav	0.04
Emin	0.00
Emax	0.20
Emin/Emax	0.01
Emin/Eav	0.03

Illuminance (lux)

Grid 3



Results

Eav	0.05
Emin	0.00
Emax	0.31
Emin/Emax	0.01
Emin/Eav	0.05

Illuminance (lux)

Grid 4

[illegible]

Results

Eav	0.05
Emin	0.00
Emax	0.15
Emin/Emax	0.02
Emin/Eav	0.07

Illuminance (lux)

Grid 5

[illegible]

Results

Eav	0.02
Emin	0.00
E _{max}	0.08
Emin/E _{max}	0.04
Emin/Eav	0.16

Illuminance (lux)

Grid 6

[illegible]

Results

Eav	0.04
Emin	0.00
E _{max}	0.15
Emin/E _{max}	0.03
Emin/Eav	0.12

Illuminance (lux)

Grid 7

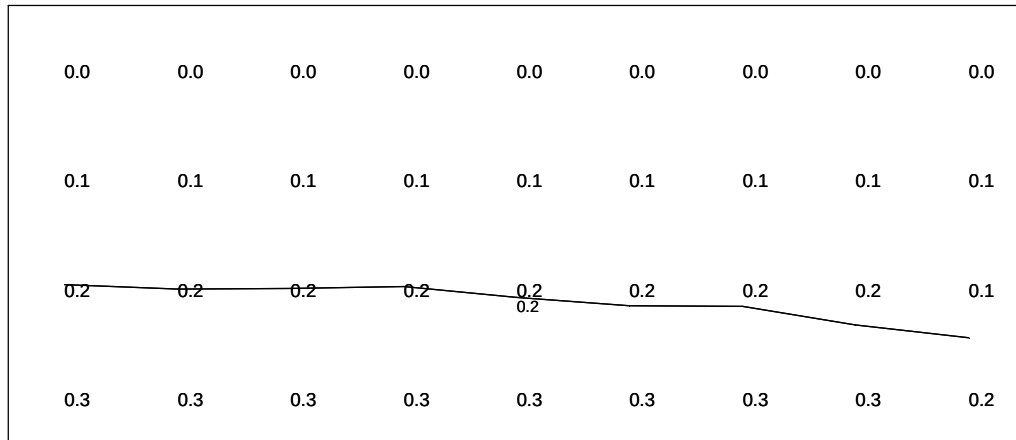
[illegible]

Results

Eav	0.08
Emin	0.01
E _{max}	0.30
Emin/E _{max}	0.03
Emin/Eav	0.11

Illuminance (lux)

Grid 8



Results

Eav	0.15
Emin	0.02
E _{max}	0.34
E _{min} /E _{max}	0.05
E _{min} /E _{av}	0.11

Appendix D

ILP GN09



Guidance Note 9/19

Domestic exterior lighting: getting it right!



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Introduction

Well designed, installed and maintained domestic exterior and security lights bring comfort and wellbeing to our lives, providing us with a sense of security and pleasure in our homes. However, much domestic exterior lighting is installed without due consideration of its suitability for the task and its effect on neighbours and the environment.

This leaflet advises on how such lighting can be considered to ensure that it serves the required purpose, providing the level of illumination required, but does not become a cause for concern to adjacent residents or affect the natural environment surrounding your property. Whilst you may be happy with a light that illuminates half the street, your neighbours may not be.

the atmospheric conditions (humidity, aerosols, clouds, haze, atmospheric pollution, etc). Artificial light propagating into the atmosphere – either directly from upward-directed or incompletely shielded sources, or after reflection from the ground or other surfaces – contributes to sky-glow, however it is predominantly light emitted from 85 through to 100 degrees from the downward vertical that is the main cause of sky-glow as it is this light that is mainly scattered back towards observers on the ground. The sky-glow/glare weighting/effect of light emitted from various angles from the luminaire is shown in table 1.

It is therefore important to consider the luminaire, its light distribution, how it is installed and how it is set up. Mounting height has minimal effect.

Mitigating obtrusive light and sky glow

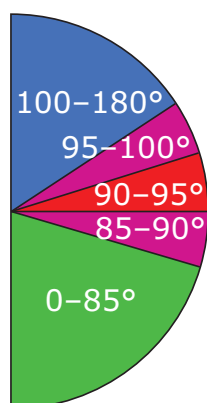
Artificial light can be a source of discomfort or disability glare, obtrusive light and loss of darkness. It can also affect fauna and flora. This intrusion of light represents 'obtrusive light' and all these effects may have negative monetary and environmental effects.

Sky-glow is the general diffuse sheen that is visible in the direction of large cities, airports, and industrial complexes. It occurs from both natural and artificial light sources and does not depend exclusively on the lighting design. It also depends on

Mitigating obtrusive lighting effects

It should be noted that artificial light emitted from premises which affects someone's enjoyment of their own premises can be considered as a legal nuisance.

The Clean Neighbourhoods and Environment Act (CNEA) 2005 provides local authorities and the Environment Agency with powers to deal with a wide range of lighting-related issues by classifying artificial light emitted from premises as a statutory nuisance or as prejudicial to health where it affects



Indicative diagram

Table 1: The effect on the ability to view the night sky at various angles

Angle of light emitted (degrees)	Sky glow effect	Glare effect
100 – 180	Local	Little
95 – 100	Significant	Some
90 – 95	High	High
85 – 90	Significant	High
0 – 85	Minimal	Some

someone's enjoyment of their own premises.

This essentially has two components, which are light spill on to windows and source intensity, the uncomfortable brightness of the light source against the background.

The legalisation does not deal with sky glow or other environmental effects and these should be managed through good design practice and planning based on the Institution of Lighting Professionals 'Guidance notes for the reduction of obtrusive light' document. See <https://www.theilp.org.uk/documents/obtrusive-light/>

Domestic Security

Well designed, installed and maintained security lights bring comfort and well-being to our lives, providing us with a sense of security in our homes. However, much security lighting is chosen and installed without due consideration of its suitability for the task and its effect on neighbours and the environment. Domestic security lights should provide the minimum level of illumination necessary to light a property and not half of the street and neighbouring properties.

Because of price and ease of installation, many people have installed tungsten

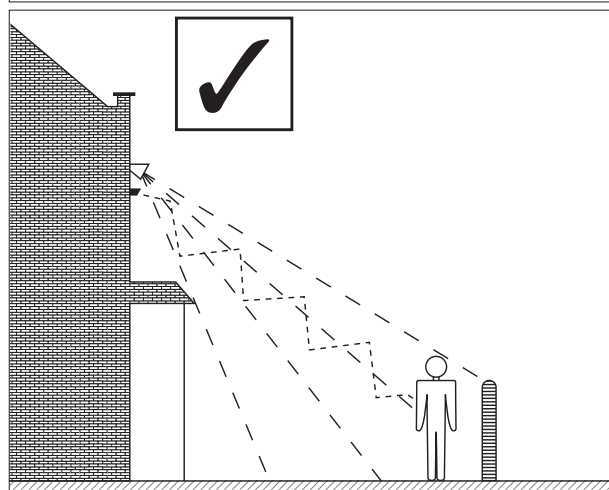
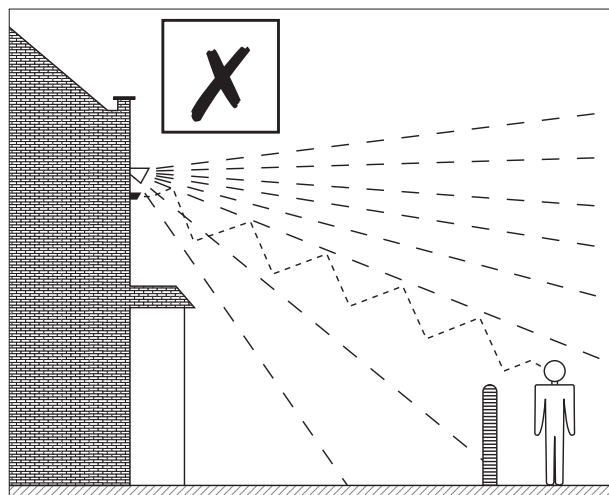


Cheap (£15 – £25) flood light, with very limited optical control



Security light, light source and sensor can be aimed separately (£45 to £120). When installed the LEDs should be directed downwards.

halogen floodlights. These units can provide satisfactory security lighting if correctly installed and aimed. However, it is rarely necessary to use a lamp of greater than 2000 lumens (150W) in such fittings. The use of a higher power only causes more glare and darker shadows.



Poor and good practice for aiming of domestic security lighting

The same principle applies to modern LED security lighting and perhaps more so as many of the products readily available on the market have little, if any, optical control.

Many of these floodlights are fitted with detectors to sense the movement of intruders. These can be useful if they are correctly installed and aimed.

Unfortunately, many products do not allow the detector to be separately aimed from the floodlight and the detector's physical location on the floodlight may prevent it from being aimed correctly.

Floodlights and detectors should be chosen and installed to detect and light only people on your property. The aiming and adjustment is best undertaken at dusk when the area being lit can be assessed.

Porch lighting

For many properties, a better solution for security lighting is to use a bulkhead or porch light fitted with a low-power 600–900 lumens (9/11w) compact fluorescent or LED lamp. These units can be left lit all night, providing all night security, for only a few pounds of electricity per year.

Besides being cheap to run, this type of light is kinder to the environment providing a gentle wash of light with reduced glare. Bulkhead and porch lights cast fewer shadows, reducing the hiding places for criminals. These units can be

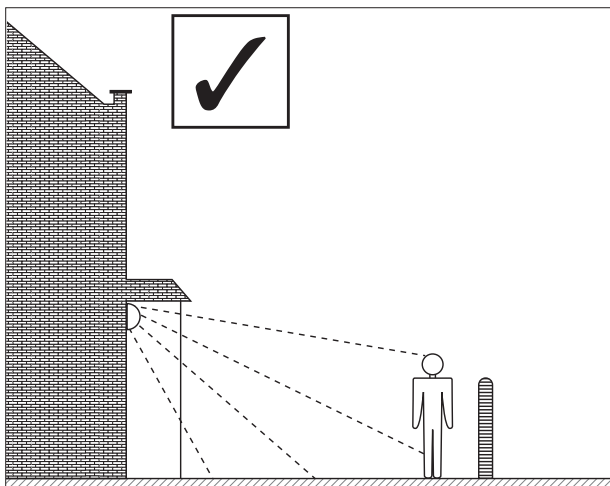
fitted with a movement detector if required and are generally mounted lower and are therefore less susceptible to nuisance switching on/off and complaints from neighbours.



Typical porch light, up & down projector



Poor porch lighting using up & down projector



However, a recent move towards 'up and down' projector porch lights such as those shown above do not really light the porch area and also produce a considerable amount of un-controlled upward light.

Garden general/exterior area lighting

When considering lighting an area, the same principles apply to those discussed for domestic security lighting. It is a matter of considering the height at which the lighting will be mounted and the spacing between luminaires.

For such areas using readily available domestic lighting equipment a spacing between luminaires of around 2.5 times the mounting height should provide the right lighting performance.

Route lighting

The use of low-level bollard lighting can be useful when looking to light a garden or



Typical low-level bollard lighting.

footway. When considering such features, it is important to consider the light distribution from them and ensure that the light is directed downwards. This will ensure a level of light on the pathway/feature and avoid any glare towards the user/observer. Due to the short height and local distribution of the light, these may be required at a fairly close spacing.

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