MMA LIGHTING CONSULTANCY
Exterior Lighting Design Specialists

Shipley Road, Southwater

Lighting Impact Assessment

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SHIPLEY ROAD, SOUTHWATER

LIGHTING IMPACT ASSESSMENT

1.0 INTRODUCTION

1.1 This lighting impact assessment and strategy document has been prepared for the proposed development located off Shipley Road, Southwater. The land is proposed for the construction of a residential development.

1.2 The report has been prepared to assess, in terms of artificial lighting, the likely effects of the proposed development. The lighting assessment includes information on the baseline lighting conditions within the area and considers possible mitigation measures to reduce potential light spill into neighbouring properties and ecology receptors, upward light (which can create sky glow), and visual source intensity (glare). Lighting class proposals will be included as part of this assessment.

1.3 This new development will require external lighting for all adoptable and non-adoptable areas of the development. The safety of the pedestrians and vehicles within this new development should be considered as one of the priorities along with minimising the impact of the artificial lighting on the 'Dark Skies' and the local wildlife. As such a good quality sustainable external lighting solution will be required to ensure the safety and security of users whilst very carefully considering ecological restraints and local residents.

1.4 As part of an application to Horsham District Council, the Officer responsible for the application has requested that an evidence-based assessment of light levels of the proposed development be produced. The assessment should comprise of a written report and accompanying drawings of the site, with the levels of predicted illuminance and light spill in and adjacent to the dark areas shown by appropriate isolux lines. This report, along with the supporting lighting calculations and drawings, will enable the Officer to make a more informed decision on the proposed lighting and its potential impact.

1.5 The lighting design of this site should be carried out by a competent person governed by the Institution of Lighting Professionals.

1.6 MMA Lighting Consultancy Ltd has been commissioned by Ardent Consulting Engineers to provide a lighting impact assessment for the proposed development off Shipley Road, Southwater.

1.7 MMA Lighting Consultancy Limited accepts no responsibility or liability for:

a) The consequence of this documentation being used for any purpose or project other than that for which it was commissioned.

b) The issue of this document to any third party with whom approval for use has not been agreed.

2.0 SITE DESCRIPTION

Existing site

2.1 The site is located to the east of Shipley Road which runs between Southwater and the A272. A site location plan is shown below in Figure 1:

Figure 1: Site Location

Proposed Development

2.2 Outline Planning Approval for the Site was granted by Horsham District Council (HDC) in July 2021 (Planning reference: DC/21/2180) for 'the erection of up to 73 new dwellings (up to 100% affordable housing) and retention of existing farmhouse building, associated public open space, landscaping, drainage and highway infrastructure works, including vehicular access from Shipley Road, with all matters reserved except for access'.

2.3 The latest development layout shown below in Figure 2:

Figure 2: Latest development layout

3.0 POLICY & GUIDANCE

Environmental Protection Act 1990 / Clean Neighbourhoods and Environment Act 2005

3.1 Light pollution was introduced within the Clean Neighbourhoods and Environment Act (2005) as a form of statutory nuisance under the Environmental Protection Act (the 'EPA', 1990), states: "artificial light emitted from premises so as to be prejudicial to health or nuisance."

National Planning Policy Framework

3.2 The National Planning Policy Framework (NPPF), published in December 2024, sets out the governments planning policies for England and how they are expected to be applied and provides a framework for local plans. 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:

- Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.
- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.
- Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

Relevant British Standards

3.3 The most applicable British Standards for lighting that relates to the proposed development are:

- BS5489-1:2020 Code of practice for the design of road lighting Part 1: Lighting of roads and public amenity areas
- BS EN 13201 2015 – Road Lighting. Performance Lighting
- BS EN 12464-2:2014 – Light and Lighting. Lighting of Work-Places. Outdoor Lighting.

Institution of Lighting Professionals, Bat Conservation Trust Lighting Guidance (August 2023)

3.4 The Bat Conservation Trust and the ILP produced a paper in 2023, "Bats and Lighting in the UK", discussing the appropriate lighting levels, types of lamps, colour temperatures etc. which are suitable for lighting areas adjacent to bat houses.

Bat Conservation Trust 2023 4th Edition Guidance

3.5 The Bat Conservation Trust 2023 guidance provides recommendation to help minimise the impact of artificial lighting.

Guidance Notes for the Reduction of Obtrusive Light; 2021 Institution of Lighting Professionals (ILP)

3.6 Guidance notes produced by the Institution of Lighting Professionals are among the most commonly referenced guidance notes for good practice within the lighting design industry.

3.7 Obtrusive light (or sometimes referred to as light pollution) refers to any light emitted in a direction in which it is not required or wanted and as such is detrimental to other users. The assessment has been carried out in accordance with the published guidance documents from the ILP.

3.8 Light intrusion refers to the spilling of light beyond the boundary of the area to be lit. This includes the intrusion of light into bedroom windows.

3.9 Sky glow refers to the brightening of the sky above towns cause by direct or reflected upward light.

3.10 Glare refers to the uncomfortable brightness of a light source when viewed against a dark background. Figure 3: illustrates the different types of intrusive light taken from Guidance Notes for the Reduction of Obtrusive Light; 2021 Institution of Lighting Professionals (ILP).

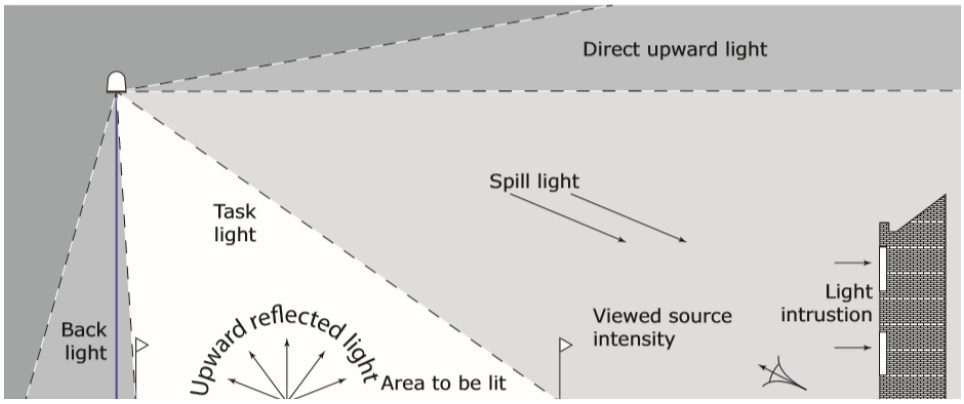

Figure 3: Light Obtrusion characteristics

4.0 ASSESSMENT METHODOLOGY

4.1 A desk-top study has been undertaken to identify relevant legislation, planning policy and good practice guidance in relation to lighting. The methodology takes guidance from the Institution of Lighting Professionals PLG 04 document "Guidance on Undertaking Environmental Lighting Impact Assessments". This sets out good practice which was followed during the assessment.

4.2 The scope of the assessment shall cover the effects of artificial lighting as a result of the proposed development. The assessment will consider the following:

- Assess the existing baseline lighting conditions on the immediate surroundings.
- Assessment of the proposed lighting performance requirements for the various components of the proposed development site, with reference to the Environmental Zone Criteria set out in the Guidance Notes for the Reduction of Obtrusive Light (ILP, 2021)
- To limit light pollution and sky glow.
- To limit obtrusive light, spill light and glare to neighbouring land and properties.
- To limit potential light spill to vegetation.
- To limit the effect of artificial light on local wildlife.

5.0 BASELINE CONDITIONS

5.1 The application site is an arable field south of Southwater in West Sussex.

5.2 The proposed development is accessed via Shipley Road that runs west of the site. Shipley Road is owned and maintained by West Sussex County Council and this section is currently not lit as shown in figure 4:

Figure 4: Shipley Road.

5.3 The environment surrounding the application site is 'Low District Brightness', categorised as an E2 Environmental Zone in accordance with the ILP Guidance Notes.

5.7 Existing lighting in the surrounding area has been designed using the West Sussex County Council standard specification document.

5.8 A desk top assessment of the residential streets in proximity to the development show that it is West Sussex County Council's standard policy to provide adoptable street lighting to new and existing roads.

5.9 It is assessed that the existing lighting in surrounding streets in the area will already produce a certain level of Sky Glow. This should be taken in consideration when assessing the overall impact of the proposed lighting on this site.

6.0 RECEPTOR SENSITIVITY

6.1 There are currently no specific guidance documents or papers available to determine the sensitivity of a receptor in terms of lighting impact. When considering natural resources/ receptors such as the effect on an area in terms of sky glow, it is deemed appropriate to assign sensitivity based on the current baseline conditions and Environmental Zone as detailed in the GN01: 2021 Table 2 - Environmental Zone and the ILP 'Guidance Notes for the Reduction of Obtrusive Light' GN01. This document defines the highest sensitivity being applied as an E0 intrinsically dark zone, and the lowest sensitivity to an E4 urban zone. The Environmental Zones are defined in figure 5 (Section 8) below and the classification of sensitivity of natural resources / receptor will correspond to each Environmental zone as detailed below. For other receptors such as residential receptors the description will be used to determine sensitivity.

6.2 For the purpose of this assessment receptor sensitivity descriptions and criteria have been based on the descriptions shown below.

High Sensitivity

The receptor/ environment is fragile and has limited capability to accommodate change in artificial light conditions without fundamentally altering its present state or character or is of international or national importance. Recovery would be difficult or impossible.

Human (Amenity) – receptors which are sensitive to a change in lighting such that the quality of life would be affected (i.e. lighting is designated a statutory nuisance)

Human (Safety) - receptors where a change in the lighting has the potential to either dramatically improve or reduce safety (for pedestrians, drivers, or workers).

Natural Receptors i.e., Artificial Sky Glow – Sensitivity of receptor based on assigned Environmental Zone – E0 or E1

Ecological – where a change in the lighting affects the habitats, breeding or feeding of fauna (e.g. protected habitats or other special areas) or growth patterns of fauna / crops.

Medium Sensitivity

The receptor/ environment has moderate ability to accommodate change in artificial light conditions without significantly altering its present state/ character. The receptor/ environment has a degree of adaptability and resilience and is likely to accommodate the changes caused by an impact, although there may still be some residual modification as a result.

Human (Amenity) – receptors which are sensitive to a change in lighting however not such that the quality of life would be affected.

Human (Safety) - receptors where a change in the lighting has the potential to either improve or reduce safety (for pedestrians, drivers, or workers).

Natural Receptors i.e., Artificial Sky Glow – Sensitivity of receptor based on assigned Environmental Zone – E2

Ecological – where a change in the lighting affects the movement or feeding patterns of fauna but the receptor can adapt.

Low Sensitivity

The receptor/ environment is tolerant of and can accommodate change in artificial light conditions without detriment to its character or is of low or local importance. The receptor/ environment is adaptable and is resilient to change. Nearly all impacts can be absorbed within it without modifying the baseline conditions.

Human (Amenity) – receptors which would not noticeably be aware of a change in lighting. (i.e. in areas of medium to high luminance)

Human (Safety) - receptors where a change in the lighting has limited potential to affect safety (for pedestrians, drivers, or workers).
Natural Receptors i.e., Artificial Sky Glow – Sensitivity of receptor based on assigned Environmental Zone – E3 or E4

Ecological – area with limited wildlife.

7.0 ECOLOGY

7.1 MMA Lighting Consultancy Ltd has taken ecology into consideration for this development site and considers sensitive receptors to any proposed lighting to be extremely important. Maintaining flight paths, feeding patterns, nesting and mating areas should also be considered when proposing any street lighting to ensure that wildlife continues to flourish.

7.2 The ecological consultant; The Ecology Partnership have confirmed that surveys recorded activity from seven species of bat within the site boundary, they were Common pipistrelle, Soprano pipistrelle, Myotis species, Brown long-eared bat, Serotines, Leisler's, and Noctules. The common and widespread bat; common pipistrelle was by far the most frequently recorded species across the site, whilst other species were recorded in low numbers and infrequently. Levels and patterns of bat activity were broadly consistent across the monthly survey sessions and were typical of small numbers of bats utilising a foraging resource comprising hedgerows, field margins and a large water body.

7.3 The preliminary ecological appraisal undertaken by The Ecology Partnership in November 2019, identified several trees and buildings with potential to support roosting bats within the site boundary. The tree lines, hedgerows and scrub on site were also suitable to support commuting and foraging bats and were well connected to a network of high-quality commuting and foraging habitats in the wider area.

7.4 No details of other surveys have been provided to MMA Lighting Consultancy Ltd at this stage.

7.5 Within the development it is recommended by the Bat Conservation Trust, and guidance documents from the Institution of Lighting Engineers, that a correlated colour temperature (CCT) of 2700k should be used across the site to ensure minimum impact on the sensitive ecology areas.

7.6 In order to minimise the impact of light spill onto the site boundary and any ecologically sensitive areas, integral factory fitted rear light shields should be specified on lighting units where appropriate. Where further rear shielding is required a supplementary external rear shield can also be fitted to further improve on rear shielding of any light spill onto the site boundary or ecologically sensitive areas around the site.

7.7 Any proposed luminaires for this site should come with the option of a side shield so to ensure flexibility and further control of light spill onto the ecologically sensitive areas across the site.

7.8 It is important that the lighting can be minimised by using accepted methods of lighting control, essentially limiting illuminance, and controlling light spill. It is proposed that the external lighting shall be installed on 6m street lighting columns. Generally lighting shall be selected to provide safety and security without polluting the site boundary.

7.9 Dimming and trimming the street lighting output at strategic times of the evening allows for a reduction in the overall lighting impact on ecologically sensitive areas and will help to reduce the general evening ‘sky glow’ from the site. It is recommended that an appropriate ‘Stepped Dimming’ profile be considered for this site and that should look similar to the profile that is set out below: -

Example of suitable Stepped Dimming profile: -

Dusk – 21.00 – 100% output *
21.00 – 00.30 – 75% output *
00.30 – 05.30 – 0% output *
05.30 – 06.00 – 75% output *
06.00 – Dawn – 100% output *

*** To be agreed by the client.**

8.0 LIGHTING DESIGN REQUIREMENTS

8.1 The lighting design of this site should be carried out by a competent person governed by the Institution of Lighting Professionals.

8.2 It is recommended that the street lighting design proposals for this site shall be designed in accordance with BS5489-1:2020 & BS EN 13201-2:2015.

8.3 Institution of Lighting Professionals Guidance Notes for the Reduction of Obtrusive Light (GN01: 2021) should be adhered to. This will ensure that lighting designs produced are suitable and sensitive to their surroundings.

8.4 External street lighting should be designed to ensure that it is focused in the appropriate areas, preventing upward light above the horizontal plane. Design proposals should aim to reduce unnecessary light pollution, energy consumption and nuisance light spill onto neighbouring properties.

8.5 It is assumed that all street lighting will be positioned to avoid light spill into the boundary hedgerows in order to avoid and minimise effects on sensitive ecological habitats.

8.6 Selected luminaires shall prevent upward light spill and should have a colour rendering index (Ra) greater than or equal to 60Ra. Colour rendering index relates to the accuracy of colours perceived, relative to daylight.

8.7 As part of this assessment we consider the use of 6m columns for all non-adoptable roads to suitable.

8.8 All luminaires shall have a 2700 Kelvin Correlated colour temperature (CCT) to minimise impact of the artificial lighting on ecologically sensitive areas.

8.9 The site shall be classed as a “P Class” in accordance with BS5489-1:2020, BS EN 13201-2:2015.

8.10 Guidelines for the environmental zones published by the Institution of Lighting Professionals, provides Guidance Notes for the Reduction of Obtrusive Light (GN01: 2021). The environmental zone for this site is considered to be an E2 Zone as shown in Figure 5 below:

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

Figure 5: Environmental Zone Table from ILP GN01/21

8.11 The current Philips Luma Gen2 luminaires provide a wide range of optics along with the shield options required for this sensitive site, so it is recommended for use on this site. Figure 6 shows image of the luminaire:

Figure 6 Philips Luma Gen 2 LED luminaire.

8.12 Any lantern specified for the new development / scheme will be supplied with DALI or DALI-2 enabled drivers.

8.13 All proposed luminaires should have a minimum IP rating of IP65 which is the recommended minimum requirement for Ingress Protection.

8.14 Luminaires will need to have the facility to enable shields or internal baffles to be fitted to prevent the back / sideways spill of light.

8.15 Proposed luminaires should be designed to fit 'post top' without an outreach bracket.

8.16 Five-degree tilts should **NOT** be applied to the lantern in the lighting design calculations, as tilting the lantern encourages light to spill above the horizontal plane and other light ingress issues.

8.17 Roads proposed to be lit should have SMART Lighting, so that any installed lighting in sensitive areas can be significantly reduced during the hours of darkness or lights switched off entirely. This type of solution could further assist with minimising the potential impact of any proposed lighting on the local wildlife in the surrounding area to the site. Other advantages of SMART Lighting is the financial gain in reducing the electricity consumption across times when lighting systems are dimmed or switched off.

8.18 Final dimming profiles should be as directed by the client.

8.20 Until such times that constant lumen output systems become the 'norm', deterioration of light source flux over time, together with dirt accumulation on fittings, must be taken into account in the design by using the appropriate Maintenance Factor (MF). Where obtrusive lighting calculations are required a MF of 1.0 should always be used in order to present a worst case scenario perspective.

8.21 The following was requested as part of the design by the client:

- Lux levels to the boundary features must not exceed 1 Lux, preferably lower.
- All luminaires should lack UV elements when manufactured. Metal halide, compact fluorescent sources should not be used.
- A warm white light source (2700Kelvin or lower) should be adopted to reduce blue light component.
- Light sources should feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats (Stone, 2012).
- Only luminaires with a negligible or zero Upward Light Ratio, and with good optical control, should be considered - See ILP GN01.

- Luminaires should always be mounted horizontally, with no light output above 90° and/or no upward tilt.
- The use of bollard or low-level downward-directional luminaires is strongly discouraged. This is due to a considerable range of issues, such as unacceptable glare, poor illumination efficiency, unacceptable upward light output, increased upward light scatter from surfaces and poor facial recognition which makes them unsuitable for most sites.
- An ancient woodland is located directly North East of the site. This and the connecting boundary hedgerows would be of greatest importance when it comes to lighting impacts. Ideally, I'd like there to be zero lighting on the ancient woodland.
- Details of external lighting and proposed operating hours.
- Beam orientation plan.
- Information on light spillage.
- Lighting contour plans and Isolux drawings, to indicate intensity and spread.
- Support with identifying features on the site that are particularly sensitive for bats and routes for foraging.
- Specifications for lighting columns and associated equipment.

9.0 LIGHTING LEVELS

9.1 Artificial lighting will be required as part of amenity, safe passage, security and health and safety requirements during periods of darkness. The associated potential obtrusive light effects toward surrounding light-sensitive receptors would be minimised through the controlled application of lighting in accordance with current best practice.

9.2 The indicative lighting criteria adopted for the purposes of this assessment are taken from relevant British Standards and recognised national guidance documentation. All criteria adopted for the final scheme of lighting shall be subject to appropriate risk assessment and technical approval by the adopting local authority where required.

9.3 All roads within the site have been identified as a 'subsidiary access roads', with the development deemed to be within an 'E2' Environmental Zone (Figure 5 above) with normal traffic flow at a speed limit ≤ 30mph. Therefore, in accordance with BS 5489-1:2020 Table A.5 (as seen below) a 'P5' lighting class has been deemed to be suitable as seen in Figure 7 below:

Lighting classes for subsidiary roads

Traffic flow	Lighting class		
	E1 to E4[A)]	E1 to E2[A)]	E3 to E4[A)]
	Pedestrian and cyclists only	Speed limit $v \leq 30$ mph	Speed limit $v \leq 30$ mph
Busy [B)]	P5	P4	P3
Normal [C)]	P5	P5	P4
Quiet [D)]	P6	P5	P4

Figure 7 Table A5 – Lighting classes for subsidiary roads.

9.4 Where the proposed lighting Class of 'P5' has been selected for the internal roads within the site, horizontal lighting illuminance levels are set out in the British Standards, these would be required as a minimum and are detailed below: -

P5

Average maintained illuminance (Eav) = 3.00 Lux – 4.50 Lux
Minimum illuminance (Emin) = 0.60 Lux
Overall Uniformity = 0.20 Uo

10.0 IMPACTS

During Construction

10.1 During construction phase, it is likely that the site will be affected through the use of temporary site lighting either for health and safety purposes, site security, or both. It is assumed that the main impacts will be spill light and luminous intensity. These levels relate to residential areas.

10.2 Lighting for health and safety will be needed where work is required to take place during the hours of diminishing ambient lighting levels which is likely to occur if the construction works are carried out in the winter months or if night-time working is required. Security lighting is often required to deter crime in both compounds and in areas where plans and materials are stored overnight.

10.3 Any and all temporary lighting installed within the site should meet all requirements set out in the above 'Section 8.0 Lighting Design Requirements'.

Post Construction

10.4 The site is classified as Environmental Zone E2, with the proposed lighting for the site being assessed in accordance with the limiting criteria for that zone, Figure 8 illustrates GN01:2021 Table 2 – Obtrusive light limitations for exterior installations.

Table 3 (CIE 150 table 2): Maximum values of vertical illuminance on properties.

Light technical parameter	Application conditions	Environmental zone				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane (E_V)	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

Figure 8 GN01:2011 Table 3 – Obtrusive light limitations for exterior installations

10.4 **Notes to table:**

- Ev is Vertical illuminance in Lux measured flat on the glazing at the centre of the window.
- Curfew = the time after which stricter requirements (for the control of obtrusive light) will apply subject to the conditions of the local planning authority.

10.5 The effect of artificial light associated with the site is predicted to have a minor adverse effect on the environment. Modern road lighting luminaires, when mounted with 0° tilts, do not typically produce significant upward light, therefore the effects of upward light/ULR (upward light ratio) are predicted to be negligible.

10.6 Any and all temporary lighting installed within the site should meet all requirements as set out in the above 'Section 8.0 Lighting Design Requirements'.

11.0 MITIGATION MEASURES

During Construction

11.1 Mitigation of the effects of the lighting installation during construction phase will include the following:

- Specifying working hours, use of lighting, location of temporary floodlights in the construction compound and agreeing these with the local council. Lighting to be switched off when not required specifically for construction activities or required health and safety or security.

- Adhere to best practice measures as recommended by the Institution of Lighting Professionals (ILP), Health & Safety Executive (HSE) and CIE (International Commission on Illumination) guidance. Lighting solutions will be selected to reduce light pollution.

- Specifically, designed luminaires will be selected to minimise upward spread of light. The optics in the lanterns will control the distribution of light to avoid overspill, sky glow and glare.

- Glare will be kept to a minimum by ensuring the main beam angle of all lights directed towards any potential observer is not more than 70°. Higher mounting heights allow lower main beam angles, which can assist in reducing glare.

- Restrict lighting to the task area using horizontal cut-off optics and zero tilts.

- Operate curfew and minimise the duration of any lighting (switch off or part-night dimming).

Post Construction

11.2 The detailed lighting design will be designed to use current best practice and technology. The impacts of external lighting will be minimised by the installation of lighting to the minimum specification required to provide a safe night-time environment for residents, therefore lighting will be designed to comply with the minimum illuminance levels given within the appropriate guidance. The detailed lighting design will be in keeping with the ecology report in order to maintain the integrity of habitats for wildlife around the site.

11.3 Designing out and minimising the need for lighting to be installed is always the best method of reducing light pollution. However, where this is not possible, the careful choice of illuminance and luminance criteria is key to successfully limiting the impact that light may have on its surrounding environment.

11.4 Care should be taken to minimise glare from all luminaires installed, by ensuring the correct luminaires are selected and suitably installed, in line with the recommendations within the ILP Guidance Notes for the Reduction of Obtrusive Light.

11.5 Restriction of luminaire mounting heights would be one of the key means of mitigating the environmental impact of external lighting. Luminaires that are column mounted can be restricted to a maximum height of 6 metres to all non-adoptable roads. It should be noted that if the mounting height is reduced there may be the requirement for the number of luminaires to be increased.

11.6 Lighting would need to be provided in the form of column mounted luminaires. Where possible, and if appropriate, luminaires would need to be pointed into the

development and away from the adjacent sites. The optics in the lanterns would need to be specified to control the distribution of light avoiding overspill, sky glow and glare. Back shields shall be fitted to columns where appropriate.

11.7 Where lighting is installed within the site it should meet all the requirements as set out in the above ‘Section 8.0 Lighting Design Requirements’.

12.0 UPWARD LIGHT RATIO (ULR)

Definition and Relevance

12.1 The **Upward Light Ratio (ULR)** is defined as the maximum permitted percentage of luminaire flux for the total installation that is emitted directly into the sky. ULR is a critical parameter in exterior lighting design, as it quantifies the proportion of light that escapes above the horizontal plane of the luminaire. This metric is referenced in both **BS 5489-1:2020** and the **Institution of Lighting Professionals (ILP) Guidance Note 01/21 (GN01/21)** and is a key consideration in planning policy and environmental assessments.

Importance in Lighting Strategy and Planning

12.2 A low ULR is essential for several reasons:

- **Sky Glow Mitigation:** Upward-directed light contributes to sky glow, which can obscure views of the night sky, impact astronomical observations, and reduce the quality of life for local residents.
- **Environmental Protection:** Excessive sky glow can disrupt nocturnal wildlife, particularly in sensitive ecological zones, and is contrary to the aims of the National Planning Policy Framework (NPPF) and local planning policies that seek to protect dark skies and biodiversity.
- **Compliance with Standards:** Both BS 5489-1:2020 and ILP GN01/21 set strict ULR limits for different environmental zones. For an E2 (Rural) zone, the maximum permitted ULR is 2.**5%**.
- **Best Practice and Sustainability:** Minimizing upward light is aligned with best practice for sustainable development and supports the achievement of BREEAM or similar environmental credits.

ULR Achieved in This Scheme

12.3 The proposed lighting design for the Shipley Road, Southwater scheme achieves a **ULR of 0%**. This is accomplished through the following measures:

- **Luminaire Selection:** All luminaires specified are flat-glass, full cut-off types with zero upward light emission above the horizontal plane.
- **Installation Practice:** All lanterns are installed at a 0° tilt, ensuring no direct upward light is emitted.
- **Rear Shields:** Factory-fitted rear shields further control and minimize any potential backward or upward spill.
- **Design Verification:** The lighting calculations and manufacturer photometric data confirm that the total upward light from the installation is zero.

Planning and Environmental Benefits

12.4 Achieving a ULR of 0% ensures that the scheme:

- **Fully complies** with BS 5489-1:2020 and ILP GN01/21 for the E2 zone.
- **Minimizes the contribution to sky glow** and protects the character of the local night-time environment.

- **Supports local and national planning objectives** to reduce light pollution and protect ecological and residential receptors.
- **Demonstrates best practice** in sustainable and responsible lighting design.

Conclusion

12.5 By achieving a ULR of 0%, the proposed lighting strategy not only meets but exceeds statutory and best practice requirements. This approach provides robust assurance to planning authorities, local stakeholders, and environmental consultees that the scheme will have a negligible impact on sky glow and will contribute to the sustainable management of the night-time environment.

13.0 CUMUATIVE EFFECTS AND RESIDUAL EFFECTS

Cumulative

13.1 The appearance of sky glow was considered as part of the assessment of the external lighting conditions. During the lighting assessment, it was noted that the Shipley Road, Southwater site is in proximity to an existing lit environment to the north.

13.2 Although the introduction of artificial lighting at the site could have an effect, the mitigation measures incorporated into the lighting strategy would mean that the significance of the overall impact is reduced.

Residual during construction

13.3 It is considered that following the implementation of the mitigation measures outlined in Section 8.0 and 11.0 of this document. Overall, there will be minor adverse residual effect of lighting during the construction phase of the development site. Subject to sensitive lighting design, the effects on key areas of wildlife habitat identified in the ecology report is expected to be negligible.

Residual post construction

13.4 It is considered that there will be overall minor negative effects from the lighting of the proposed scheme on residential receptors and road users. The use of well located, modern light fittings, will minimise glare, light spill and reduce sky glow contributions to the existing sky glow above Southwater as a whole. Subject to sensitive lighting design, including positioning and design of luminaires and use of remote monitoring systems, the effects on key areas of wildlife habitat identified in the ecology report is expected to be negligible.

14.0 EXPLANATION ON THE OUTLINE DESIGN

14.1 Horizontal illuminance calculations have been provided for all roads across the site. The calculations are shown with horizontal illuminance with values ranging from 5.0 Lux down to 0.1 Lux. This is to demonstrate the light falling at the site boundary at ground level.

14.2 Any lantern in the design shown as backing on to a dark corridor, boundary or sensitive area is proposed to be fitted with a factory fitted rear shield, this is denoted in the lighting key with the words ‘back light in the ‘type’ row.

14.3 Supplementary exterior shields can be proposed to the rear of lanterns in sensitive areas in order to achieve a further reduction of rear light spill. This reduction would be achieved both in the horizontal and vertical illuminance plane.

14.4 All luminaires across the site have been proposed using a 2700 Kelvin Correlated colour temperature (CCT) to minimise impact of the artificial lighting on ecologically sensitive areas. This goes over and above the recommended 3000 Kelvin Correlated colour temperature (CCT) units that are recommended and meets the requirements as set out in the Institution of Lighting Engineers Guidance Note Bats and artificial lighting in the UK. This CCT also meets the requirements of the Bat Conservation Trust.

14.5 The main area of concern regarding lighting was the ancient woodland to the North East of the site.

14.11 Enhance quick view compliance table below

Requirement	Standard/Guidance	Target Value	Achieved Value	Compliant?
Average Illuminance (Eav)	BS5489-1:2020	≤4.50 lux	3.33 lux (max)	Yes
Uniformity (Emin/Eav)	BS5489-1:2020	≥0.20	0.20 (min)	Yes
Upward Light Ratio (ULR)	ILP GN01/21 (E3)	≤2.5%	0%	Yes
Colour Temperature	ILP GN08/BCT	≤2700K	2700K	Yes
Glare Limitation	BS EN 13201-2:2015	As per standard	G3	Yes

15.0 CONCLUSION AND SUMMARY

15.1 In conclusion, subject to the implementation of the above proposals and agreements with the adopting Highway Authority, a compliant lighting scheme can be designed and installed with an acceptably low impact on the surrounding residential properties, sensitive boundaries, and wildlife. The likely cumulative effect of artificial lighting may be a slight increase in sky glow. However, given the baseline situation in the surrounding area to the development overall effects are not likely to be visual.

15.2 During the construction phase, the lighting impacts are likely to be associated with the requirements for temporary lighting to illuminate the contractor's compound and work areas. Installed lighting will involve the use of well located, modern light fittings which are directionally controlled and will be in accordance with current best practice standards and the developers' requirements. Overall, where an effect arises the effect on sensitive receptors during the construction phase will be short term and temporary in nature and considered to be of minor negative significance. However, as lighting would be temporary and mobile, units can and should be relocated if recognised as having a negative impact on sensitive receptors.

15.3 During the operational phase, the likely impacts include the introduction of artificial light sources as part of the proposed development, which will result in changes to the current baseline conditions. The proposed lighting scheme will comply with all relevant British Standards and the Institution of Lighting Professionals lighting guidelines and will serve to ensure that the safety and security of all areas of the development can be effectively maintained.

15.4 Potential effects would be managed such that the potential increase in the general ambience of the area would be balanced against the overall existing illuminance in order to minimise sky glow.

15.5 The effects on sensitive receptors will be mitigated through following all the principles set out in this document and by the implementation of a stringent final detail lighting design.

15.6 Suitable detailed designs should meet all standard criteria as set out in the current local authority standard specification documents, current guidance documents from all appropriate and relevant institutes and all relevant British Standards that are appropriate to lighting.

15.7 All final detailed designs should be subject to a design check by the adopting local authority. Once detailed designs are checked and agreed then technical approval will be provided by the local authority. No lighting should be installed on site unless technical approval has been granted by the local authority.

15.8 This report has been prepared to the best of our knowledge, any lighting designs proposed shall be carried out by a competent lighting person in accordance with the Institution of Lighting Professionals guidance and recommendations.

Prepared By: -

Ben Tavill 2nd October 2025

…… (Signed) …… (Print Name) …… (Date)

Reviewed By: -

Mark Chandler 2nd October 2025

…… (Signed) …… (Print Name) …… (Date)

APPENDIX A LIGHTING TERMINOLOGY

Glossary of terms

For the purpose of this report, the definitions given below apply. For further definitions the International Lighting Vocabulary (ILV), published by the CIE, can be found at http://eilv.cie.co.at/

Colour Rendering Index (CRI): A scale of the colour appearance of an object under a particular light source compared to its colour appearance under a reference light source. Expressed on a scale of 1 to 100 Ra, where 100 Ra represents the colour rendering of natural daylight i.e. perfect colour.

Curfew: The time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by a government controlling authority, usually the local government (CIE, 2003).

Disability Glare: Glare which impairs the vision of objects but may not cause discomfort.

Discomfort Glare: Glare causing discomfort which may not impair the ability to see objects.

Environmental Zones: Area where specific activities take place or are planned and where specific requirements for the restriction of obtrusive light are recommended. Zones are indicated by the zone rating (E1… E4) (CIE, 2003).

Illuminance: Illuminance is the quantity of light, or luminous flux, falling on a unit area of a surface. It is designated by the symbol E. The unit is the lux (lx). One lux equals one lumen per square metre (lm/m²).

Horizontal Illuminance: Illuminance incident on a horizontal surface or calculation plane.

Vertical Illuminance: Illuminance incident on a vertical surface or calculation plane.

Isolux Diagram: A diagram showing lines joining points of equal illuminance. Sometimes also referred to as Isolines.

Light Pollution: The spillage of light into areas where it is not required.

Light Intrusion: Light that impacts on a surface outside of the area designed to be lit by a lighting installation.

Obtrusive Light: Spill light 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 (CIE, 2003).

Photocell: A unit which senses light to control luminaires.

Residential Property: Land upon which a dwelling exists (CIE, 2003).

Sky Glow: The brightening of the night sky caused by artificial lighting resulting from the reflection of radiation (visible and non-visible), scattered from the constituents of the atmosphere (gas molecules, aerosols and particulate matter), in the direction of observation. It comprises two separate components as follows:

(a) Natural sky glow - That part of the sky glow which is attributable to radiation from celestial sources and luminescent processes in the Earth's upper atmosphere.

(b) Man-made sky glow - That part of the sky glow which is attributable to man-made sources of radiation (e.g. outdoor electric lighting), including radiation that is emitted directly upwards and radiation that is reflected from the surface of the Earth (CIE, 2003).

Spill Light (Stray Light): Light emitted by a lighting installation which falls outside the boundaries of the property for which the lighting installation is designed (CIE, 2003).

Upward Light Ratio: The maximum permitted percentage of luminaire flux for the total installation that goes directly into the sky.

Abbreviations

CIBSE Chartered Institute of Building Services Engineers

CIE International Commission on Illumination

CNEA Clean Neighbourhoods and Environment Act

ILP Institute of Lighting Professionals

SLL Society of Light and Lighting

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