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· LIGHTING DESIGN · ELECTRICAL · SMART CITIES ·
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LAND WEST OF BINES ROAD, PARTRIDGE GREEN

LIGHTING STRATEGY

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Designs for Lighting (DFL) is a business built on successfully collaborating with our clients. We have over 20 years proven experience in our industry, listening to the challenges our clients face, developing the best solutions and being innovators in our specialism. Our role is to find the most effective and sustainable outcome to enhance and support your projects. We proudly work with recognised industry bodies to promote and shape the future of the industry and ensure our staff are trained to exceed the required competency levels of our industries. Above all, we ensure each project delivers against our values.

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1. INTRODUCTION

1.1. Executive Summary

1.1.1. This Lighting Strategy has been written by DFL (Designs for Lighting Ltd[1]), a lighting design consultancy specialising in Lighting Impact Assessments, obtrusive light mitigation, and detailed lighting design.

1.1.2. The Lighting Strategy proposes good practice and outlines a suitable approach for the proposed lighting at Land west of Bines Road, Partridge Green, for the purpose of safety, security, wayfinding and amenity. The lighting strategy is intended to set out a minimally obtrusive approach to the lighting, whilst ensuring it is necessary and considers the sensitivity of nearby human, environmental and ecological receptors.

1.1.3. Lighting associated with the Proposed Development will comply with relevant British Standards and Institution of Lighting Professionals (ILP) guidance to ensure obtrusive light is minimised in accordance with best practice.

1.1.4. This report outlines the following:

- Relevant obtrusive light policies in direct relation to the Proposed Development;
- Relevant National and Local Policies;
- Why the Proposed Development requires artificial lighting; and
- Details as to how lighting will be implemented for the Proposed Development.

1.1.5. It has been identified that the Application Site is set within a relatively uninhabited rural area (E1).

1.1.6. Through careful design and mitigation, this Lighting Strategy ensures the lighting installation at the proposed development will be in accordance with British Standards, Guidance and Local Policy.

1.1.7. Local Policies implemented by Horsham District Council, Policy 24 and Policy 27, have been discharged by the restriction of the luminaire type, height, output and locations.

[1] https://www.dfl-uk.com/about/

2. LEGISLATIVE FRAMEWORKS AND NATIONAL POLICIES

2.1. Environmental Protection Act 1990 / Clean Neighbourhoods and Environment Act 2005

2.1.1. Since 2005, artificial light has been incorporated as a potential statutory nuisance. An amendment to section 79 of the Environmental Protection Act 1990, contained within the Clean Neighbourhoods and Environment Act 2005 states:

"The following matters constitute "statutory nuisances" for the purposes of this Part, that is to say— [....]

[....] artificial light emitted from premises so as to be prejudicial to health or a nuisance;

[....]and it shall be the duty of every local authority to cause its area to be inspected from time to time to detect any statutory nuisances which ought to be dealt with under section 80 and, where a complaint of a statutory nuisance is made to it by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint".

2.2. National Planning Policy Framework 2023

2.2.1. The National Planning Policy Framework (NPPF) sets out the government's planning policies for England and how they are expected to be applied and provides a framework for local plans. With regard to light pollution, the NPPF was updated in December 2023 and states that the following elements are to be considered:

"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 impacts 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; and*
- *limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."*

2.3. Planning Practice Guidance

2.3.1. Guidance for assessing the effects of proposed artificial lighting is outlined in the planning practice guidance (PPG). The guidance states:

"Does an existing lighting installation make the proposed location for a development unsuitable, or suitable only with appropriate mitigation? For example, this might be because:

- *the artificial light has a significant effect on the locality; and/or*
- *users of the Proposed Development (e.g., a hospital) may be particularly sensitive to light intrusion from the existing light source.*

Where necessary, development proposed in the vicinity of existing activities may need to put suitable mitigation measures in place to avoid those activities having a significant adverse effect on residents or users of the proposed scheme, reflecting the agent of change principle. Additional guidance on applying this principle is set out in the planning practice guidance on noise.

- *Will a new development, or a proposed change to an existing site, be likely to materially alter light levels in the environment around the site and/or have the potential to adversely affect the use or enjoyment of nearby buildings or open spaces?*
- *Will the impact of new lighting conflict with the needs of specialist facilities requiring low levels of surrounding light (such as observatories, airports and general aviation facilities)? Impacts on other activities that rely on low levels of light such as astronomy may also be a consideration but will need to be considered in terms of both their severity and alongside the wider benefits of the development.*
- *Is the development in or near a protected area of dark sky or an intrinsically dark landscape where new lighting would be conspicuously out of keeping with local nocturnal light levels, making it desirable to minimise or avoid new lighting?*
- *Would new lighting have any safety impacts, for example in creating a hazard for road users?*
- *Is a proposal likely to have a significant impact on a protected site or species? This could be a particular concern where forms of artificial light with a potentially high impact on wildlife and ecosystems (e.g. white or ultraviolet light) are being proposed close to protected sites, sensitive wildlife receptors or areas, including where the light is likely to shine on water where bats feed.*
- *Does the Proposed Development include smooth, reflective building materials, including large horizontal expanses of glass, particularly near water bodies? (As it may change natural light, creating polarised light pollution that can affect wildlife behaviour.)"*

3. LOCAL POLICIES

3.1. Horsham District Planning Authority, Horsham District Planning Framework 2015.

3.1.1. The relevant Local Planning Authority (LPA) for the Proposed Development is the Horsham District Council with policies detailed within the Horsham District Planning Framework 2015, applying to the lighting associated with the Proposed Development.

The applicable policies are:

POLICY 24

Strategic Policy: Environmental Protection

"The high quality of the district's environment will be protected through the planning process and the provision of local guidance documents. Taking into account any relevant Planning Guidance Documents, developments will be expected to minimise exposure to and the emission of pollutants including noise, odour, air and light pollution and ensure that they:[...]

[....] 2. Are appropriate to their location."

POLICY 27

Strategic Policy: Settlement Coalescence

"Landscapes will be protected from development which would result in the coalescence of settlements. Development between settlements will be resisted unless it can be demonstrated that: [...]

[....] 2. It does not generate urbanising effects within the settlement gap, including artificial lighting, development along key road corridors, and traffic movements."

3.2. West Sussex County Council Highways and Transport, Street Lighting Specification.

3.2.1. Adoptable Lighting associated with the Proposed Development will be designed and installed in accordance with the West Sussex County Council's adoptable specification for Street Lighting, as per policy document:

West Sussex County Council Highways and Transport, Street Lighting Specification

4. BRITISH STANDARDS

4.1. BS 5489-1:2020 - Lighting of Roads and Public Amenity Areas - Code of practice.

4.1.1. This standard gives recommendations on the general principles of road lighting, its aesthetics and technical aspects and provides guidance on operational maintenance. It also provides guidance on means of minimizing energy consumption and limiting the impacts on the environment and adjacent properties.

4.2. BS EN 13201-2:2015 - Road lighting. Performance requirements.

4.2.1. This British and European standard defines the performance requirements specified as lighting classes for road lighting aiming at the visual needs of the road users, as well as the consideration of the environmental aspects of the road lighting to be applied.

5. GUIDANCE

5.1. Guidance Notes for the Reduction of Obtrusive Light (Institution of Lighting Professionals GN01/2021)

5.1.1. The Lighting Strategy is informed by industry guidance notes which aim to reduce the potential for obtrusive light to occur, which is typically caused by poorly designed and installed exterior artificial lighting. The Lighting Strategy is informed by the most relevant sections of GN01/2021 that has recently been published to reduce the potential for obtrusive light from a wide range of exterior lighting applications.

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA Dark Sky Parks.
E1	Natural	Intrinsically dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, 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 or suburban locations.
E4	Urban	High district brightness	Town / City centres with high levels of night-time activity.

Table 1: Environmental Zone Descriptions

Environmental Zones	Sky Glow ULR[2] (Max %)	Light Trespass (Into Windows) E_v (lux)		Building Luminance Average, Pre-curfew
		Pre- Curfew	Post-Curfew[3]	Average L (cd/m^2)
E0	0	0	0	0
E1	0	2	0 (1*)	0
E2	2.5	5	1	5
E3	5	10	2	10
E4	15	25	5	25

Table 2: Obtrusive Light Criteria

5.2. GN08/2023 Bats and Artificial Lighting in the UK – Bat Conservation Trust and Institution of Lighting Professionals.

[2] ULR (Upward Light Ratio) is the maximum permitted percentage of luminaire flux that goes directly into the sky.

[3] Curfew refers to a time when the local planning authority has agreed that the lighting installation should be switched off; this typically refers to 23h00 – 07h00

5.2.1. This document is aimed at lighting professionals, lighting designers, planning officers, developers, bat workers/ecologists and anyone specifying lighting. It is intended to raise awareness of the impacts of artificial lighting on bats, and mitigation is suggested for various scenarios. However, it is not meant to replace site-specific ecological and lighting assessments, which states the following.

"It is acknowledged that, especially for vertical calculation planes, 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 planes 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 adverse behaviour (Stone, 2012)."

"A warm white light source (2700Kelvin or lower) should be adopted to reduce blue light component."

*"A buffer zone subdivided to into smaller zones of increasing illuminance limit further away from the Supporting Habitat would ensure light levels (illuminance - measured in lux) do not exceed certain defined limits. This has the effect of a gradual decrease in lighting from the developed zone, rather than a distinct cut-off, which may provide useable area for the project which also limits lighting impacts on less sensitive species, or less well-used habitat." (see **Figure 1**)."*

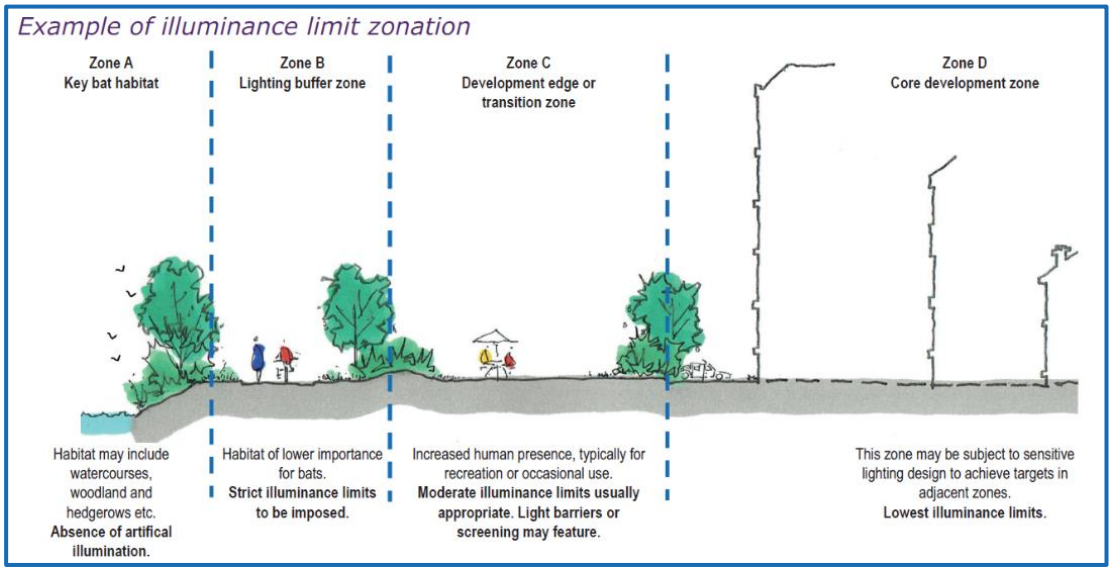

Figure 1: Example of lighting zonation near sensitive boundaries and known ecological habitat

6. DESKTOP STUDY

6.1. Site Description and Context

6.1.1. A desktop assessment was completed to understand its position within the current lit environment.

6.1.2. The Application Site is a large parcel of brown fields to the southwestern edge of Partridge Green-. An indicative boundary of the site and proposed layout can be seen in **Figure 2**.

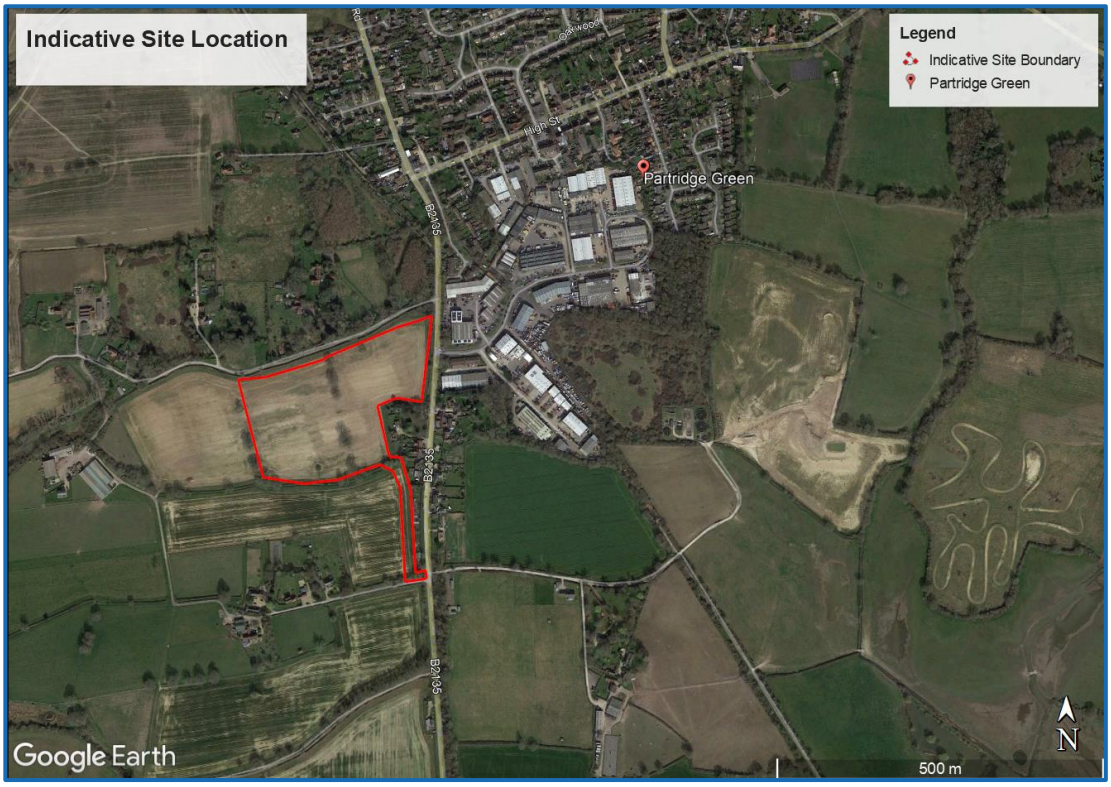

Figure 2: The Application Site location and boundary

6.1.3. The Proposed Development is for the construction of a residential estate including open market dwellings, affordable dwellings and associated infrastructure. The Site Layout Plan is shown in **Figure 3**.

Figure 3: Proposed Development Site layout plan

6.2. Designations

6.2.1. There is not a designated SAC, SSSI or AONB within a radius of approximately 1Km of the Application Site.

6.3. Baseline lighting

6.3.1. The road adjacent to the Application Site is unlit. Artificial light is present in limited quantities and appears to be related to the residential and industrial properties mostly to the east of the site.

6.3.2. The incoming road to the industrial estate is illuminated by street lanterns as seen in **Figure 4**.

Figure 4: View of the lighting on entrance to the industrial estate

6.4. CPRE Night Blight Mapping[4]

6.4.1. To inform our understanding of the nighttime environment, we look to use the CPRE Nightblight map to better appreciate the current baseline light levels. The CPRE Night Blight Mapping confirms the skyward radiance within the vicinity of the Application Site is between 1 - 2 Nano Watts/cm²/sr. As shown in **Figure 5**.

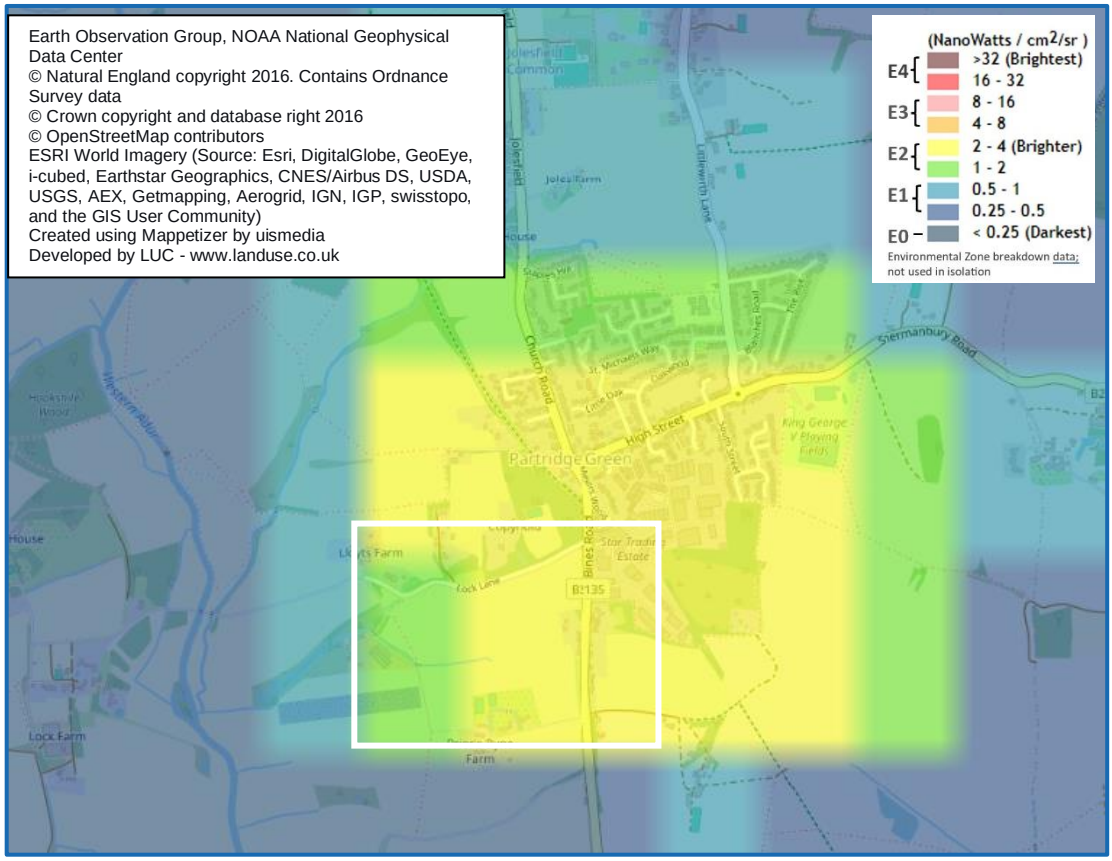

Figure 5: Surrounding areas/roads

[4] NightBlight Map is a visual representation of light pollution as a view from above the earth's atmosphere and indicates upward light spill based on sky glow.

6.5. Environmental Zone Classification

6.5.1. Whilst the upward light spill is more typically those seen in an E2 environmental zone, the surrounding area is by description, more in-line with an E1 environmental zone.

6.5.2. Based on the evidence of the existing baseline lighting (seen in Section 6.3) and the description of the surrounding environment (seen in Section 6.2), the area is similar to those expected within an E1 and E2 zone.

6.5.3. As the site borders the description of multiple environmental zones the more rigorous limitations will be applied. As such the Application Site will be deemed an E1 environmental zone.

6.5.4. The Environmental Zone criteria detailed within **Table 1** and **Table 2** informs the basis of the Lighting Strategy. The Application Site is considered to be located within an E1 Environmental Zone.

Zone	Surrounding	Examples	Limitations		Sky Glow ULR (Max)
			Pre-curfew	Post-curfew	
E1	Natural	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, etc.	2	0.1 (1*)	0%

Table 3: Limitations of identified environmental zone.

7. IDENTIFIED RECEPTORS

7.1. Receptor identification

7.1.1. **Table 4** below outlines the criteria used to define the sensitivity of the receptors.

Sensitivity	Description of Criteria	
High	The environment is fragile, and an impact is likely to leave it in an altered state from which recovery would be difficult or impossible.	
	Human Amenity (PHAR)	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 (PSR)	receptors where a change in the lighting has the potential to either dramatically improve or reduce safety (for pedestrians, drivers or workers).
	Ecological (PSER)	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	The 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 (PHAR)	receptors which are sensitive to a change in lighting however not such that the quality of life would be affected
	Human Safety (PSR)	receptors where a change in the lighting has the potential to either improve or reduce safety (for pedestrians, drivers or workers).
	Ecological (PSER)	where a change in the lighting affects the movement or feeding patterns of fauna but the receptor can adapt
Low	The environment is adaptable and is resilient to change. Nearly all impacts can be absorbed within it without modifying the baseline conditions.	
	Human Amenity (PHAR)	receptors which would not noticeably be aware of a change in lighting. (i.e. in areas of medium to high luminance) .
	Human Safety (PSR)	receptors where a change in the lighting has limited potential to affect safety (for pedestrians, drivers or workers).
	Ecological (PSER)	The environment is adaptable and is resilient to change. Nearly all impacts can be absorbed within it without modifying the baseline conditions.
Negligible	Receptor has little or no night-time activity	

Table 4: descriptions of criteria for identifying sensitivity.

7.2. Ecological

7.2.1. The north, west and south boundary(s) of the Application Site have been identified by the Ecological Partnership, in the Ecological Impact Assessment, Land at Partridge Green, Horsham *(October 2024), as areas where potentially sensitive ecological receptors maybe present, as shown in **Appendix 3**. Therefore, this lighting strategy has been written in accordance with GN08/2023.

7.2.2. Existing trees through the site will be protected as they have been identified to also offer the ability to retain a degree of ecological enhancement.

7.2.3. A description of the potential ecological receptors, as well as their likely sensitivity to light based on the desktop assessment of the surrounding environment, can be seen in **Table 5.**

Receptor Type	Receptor No. (Appendix 3)	Description	Sensitivity
Ecology	PSER 001	Southern tree line	Medium
Ecology	PSER 002	Northern tree line	Medium
Ecology	PSER 003	Western boundary	Medium
Ecology	PSER 004	Southern boundary	Medium
Ecology	PSER 005	Area adjacent to the allotment	Medium
Ecology	PSER 005	Northern tree line	Medium

Table 5: Potentially Sensitive Ecological Receptors (PSER)

7.3. Human Amenity

7.3.1. To the north, south and east of the Application Site, Potential Human Amenity Receptors (PHAR) have been identified as shown in **Appendix 3**. Therefore, this lighting strategy has been written in accordance with GN01/2021 (Table 2 - Obtrusive Light Criteria).

7.3.2. A description of the potential human receptors and their likely sensitivity to light can be seen in **Table 6**.

Receptor Type	Receptor No. (Appendix 3)	Description	Sensitivity
Human Amenity	PHAR 001	Residential dwellings adjacent to Lock Lane	Medium
Human Amenity	PHAR 002	Residential dwellings along the northeast B2135	Medium
Human Amenity	PHAR 003	Residential dwellings along the east B2135	Medium
Human Amenity	PHAR 004	Private property to the south of the Application Site	Medium

Table 6: Potential Human Amenity Receptors (PHAR)

8. LIGHTING STRATEGY

8.1. Summary

8.1.1. The Proposed Development will require lighting for safety and amenity at limited times during the hours of darkness. Lighting will be fit for purpose and sensitive to nearby human and ecological receptors.

8.1.2. Lighting will be of an appropriate specification and designed in accordance with British Standards.

8.1.3. Amenity lighting for the Proposed Development will be applied sensitively to account for the receptors identified bounding the Application Site and within the Proposed Development.

8.1.4. Luminaires will be used with integral LEDs and only where the luminaire photometry is available from the manufacturer. This is to ensure the photometric footprint of the luminaires can be modelled to ensure the potential effects of light spill are minimised or mitigated.

8.1.5. The following criteria seeks to ensure that the lighting is not outside of the obtrusive light limits for the Environmental Zone in which the Application Site is located, is sensitive to the area, and provides a recognised standard level of lighting for all adoptable areas requiring illumination. Luminaires will distribute light downwards only to reduce the potential for light spill onto the boundaries surrounding the buildings and upwards towards the sky.

8.1.6. Streetlights are to be in accordance with the local adoptable specification, as such will be a cooler colour temperature (4000K), this will not comply with the guidance GN08/2023. It is advised that further consultation is undertaken to agree a lower colour temperature more in line with the relevant guidance (≤2700K).

8.1.7. Lighting in adopted areas will be required in the following application areas:

- Spine Road

8.1.8. Lighting in unadopted areas will be required in the following task areas:

- Property Frontages
- Property Rears
- Cycle Path

8.1.9. The shared surfaces will remain unlit in order to offer the most sensitive lighting approach possible.

8.2. Spine Road

8.2.1. The Spine road running through the Application Site will be illuminated in accordance with BS 5489-1:2020 and BS EN 13201-2:2015 for amenity and safety purposes. The lowest possible lighting levels are proposed within this Lighting Strategy.

8.2.2. Performance requirements for the Spine road-(s) are outlined in **Figure 6.**

8.2.3. Following a risk assessment, the lighting class will remain as recommended in BS 5489-1:2020.

8.2.4.

Table A.5 — *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 6: Performance requirements

8.3. Cycle Path

8.3.1. The cycle path running from the north to south of the Application Site is to be illuminated in accordance with BS 5489-1:2020 and BS EN 13201-2:2015 for amenity and safety purposes. The lowest possible lighting levels are proposed within this Lighting Strategy.

8.3.2. Performance requirements for the Spine road(s) are outlined in **Figure 7.**

Table A.5 — *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: Performance requirements

8.4. Property Frontages

8.4.1. The property frontages will require lighting for wayfinding and amenity purposes only, as such will not adhere to a specific standard or guidance but will be limited in specification to reduce the opportunity for the Proposed Developments to generate unwanted light.

8.5. Property Rears

8.5.1. Much like the property frontages, lighting will be of limited use, meaning the lighting will only be required for wayfinding, amenity and safety purposes. The lighting to the rear of the properties will not adhere to a specific guidance or standard, but a specification limitation will be implemented to reduce the opportunity for the Proposed Development to generate unwanted light.

8.5.2. Luminaire performance requirements are outlined in **Appendix 5.**

9. SUMMARY OF RESULTS

9.1. Overview

9.1.1. The Light Spill Diagram shown in **Appendix 1** and **2** demonstrates that the Light Spill Levels associated with the proposed lighting would comply with the obtrusive light guidance set out in ILP GN01/2021, at sensitive receptors.

9.1.2. To ensure the worst-case scenario has been modelled, the highest potential light levels have been modelled / presented in the light spill diagram, with the project maintenance factors set at MF = 1.0[5]. This demonstrates the light levels at their highest (initial light levels at the start of luminaire life).

9.2. Summary of Results

9.2.1. The summarised results with a relevant maintenance factor applied, for the British Standards and guidance compliance can be seen in **Tables 7, 8** and **9** below.

Area	Class	BS5489-1 Requirements		MF used	Pass/fail
		Eav Lux	Min[6]		
Spine road	P5	3-4.5	0.6	0.93	Pass
Cycle path	P6	2-3	0.4	0.93	Pass

Table 7: BS5489-1 compliance P Class.

9.2.2. The proposed lighting within the task area(s) is complaint to the relevant policies, standards and guidance, except for the following areas:

- Adoptable luminaire colour specification (4000K) is not compliant with the relevant guidance (GN08/2023).

9.2.3. However, the non-compliances are unlikely to affect sensitive receptors.

9.2.4. Where ecological receptors are potentially sensitive to vertical light spill, a vertical illumination grid has been modelled, as shown in **Appendix 2**. The light levels based on the modelling do not exceed 0.4 Lux, keeping the light levels within the guidance given within GN08/2023.

[5] https://www.dfl-uk.com/knowledge-hub/faqs/
[6] Minimum required lux level

9.2.5. In line with section 4.56 of GN08/2023, the vertical grids will be mounted at a height of 1.5 metres above the ground level to simulate the likely flight path of a light sensitive bat.

Receptor No	GN08/2023 requirements	Maximum vertical Illuminance (Lux)	Pass/fail
PSER 001	0.40	0.06	Pass
		0.01	Pass
		0.01	Pass
PSER 002	0.40	0.13	Pass
		0.17	Pass
		0.19	Pass
PSER 003	0.40	0.01	Pass
PSER 004	0.40	0.01	Pass
		0.02	Pass
PSER 005		0.29	Pass
		0.20	Pass
		0.40	Pass
		0.17	Pass
		0.38	Pass
PSER 006		0.17	Pass
		0.20	Pass
		0.12	Pass

Table 8: PSER results table, maximum illuminance.

9.2.6. Where human receptors are potentially sensitive to vertical light spill, a vertical illumination grid has been modelled, as shown in **Appendix 2**. The light levels based on the modelling do not exceed 0.1 (1*) Lux, keeping the light levels within the guidance given within GN01/2021 for an area identified as an E1 environment.

Receptor No	GN01/2021 requirements		Maximum vertical Illuminance (Lux)	Pass/fail
	Pre-curfew	Post Curfew		
PHAR 001	2 Lux	<0.1 Lux	0.00	Pass
PHAR 002	2 Lux	<0.1 Lux	0.06	Pass
	2 Lux	<0.1 Lux	0.01	Pass
PHAR 003	2 Lux	<0.1 Lux	0.01	Pass
	2 Lux	<0.1 Lux	0.03	Pass
	2 Lux	<0.1 Lux	0.00	Pass
PHAR 004	2 Lux	<0.1 Lux	0.00	Pass

Table 9: PHAR results table, maximum illuminance

9.3. Mitigation and Enhancements

9.3.1. Careful design ensures the lighting has been minimised onto sensitive receptors in accordance with standards and guidance.

9.3.2. Where applicable, shields are proposed in particularly sensitive areas to further minimise spill.

9.3.3. Through the use of the control methods detailed in **Appendix 4,** it limits the amount of light in the affected Application Area to minimum amount of time for amenity and safety purposes.

9.3.4. The detailed design is to be completed by a competent person or persons in accordance with the details within this Lighting strategy.

9.3.5. Where a break in the hedge line (to the south of the Proposed Developments) is proposed for the cycle path connection, it has been proposed that a hop over is to be installed, a location where two trees will form an opportunistic location for bats to connect to the flight path.

10. CONCLUSION

10.1. General

10.1.1. Lighting associated with the Proposed Development shall be designed in accordance with the Lighting Strategy for the Application Site outlined in **Section 8.**

10.1.2. This lighting strategy has been written in accordance with the relevant British Standards, industry guidance and local policies to ensure it is unlikely to give rise to obtrusive light with the potential to affect human, environmental and ecological receptors.

10.1.3. Through the application of this lighting strategy sensitive receptors will not be adversely affected by obtrusive light, as shown in **Appendix 1** and **2**.

10.1.4. Where a break in the hedgerow is present near the allotments two established trees will remain offering the opportunity for foraging bats to complete the flight path via a “hop over”.

10.1.5. The scheme will not be able to comply with the limitations outlined within GN08/2023 due to the colour temperature requirements of the local adoptable specification, whilst it advised that for consultation is had to allow the alteration of the CCT (correlated colour temperature) to a warmer colour (≤2700K), the scheme is unlikely to be impacted by this factor as the light levels are compliant.

10.1.6. Through careful design and mitigation, this Lighting Strategy ensures the lighting installation at the proposed development will be in accordance with British Standards, Guidance and Local Policy (Policy 24 and Policy 27).

APPENDIX 1 – LIGHT SPILL DIAGRAM

See accompanying document 3321-DFL-ELG-XX-LD-EO-13001-S3

APPENDIX 2 – VERTICAL LIGHT SPILL DIAGRAM

See accompanying document 3321-DFL-ELG-XX-LD-EO-13002-S3 and 3321-DFL-ELG-LD-EO-13003-S3

APPENDIX 3 – SENSITIVE RECEPTORS

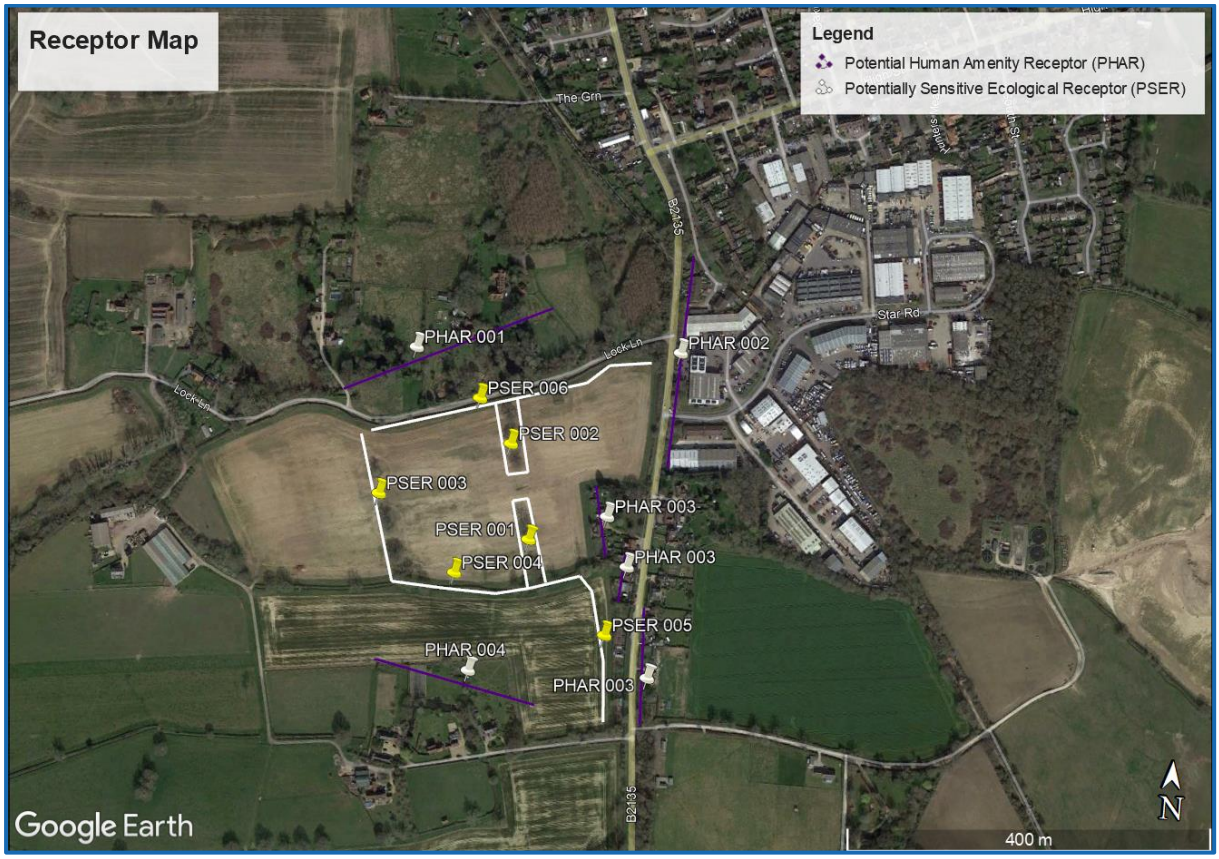

Figure 8: Sensitive receptors

APPENDIX 4 – EQUIPMENT SPECIFICATION

10.2. Luminaire and control specification

10.2.1. Performance requirements are outlined in **Table 1.1, Table 1.2 and Table 1.3.**

Equipment Specification	
Application Area	Spine road
Correlated Colour Temperature (Kelvin)	≤ 4000 K
Luminaire Manufacturer	Urbis Schréder (Or Similar Approved)
Luminaire Model	Axia 3 (Or Similar Approved)
Light Source	LED ≤ 1580 Lumens
Reference	Type A and B
Height	≤ 6 mtrs
Mounting Arrangement	Column mounted, post top
Luminaire Tilt	0%
Upward Light Output Ratio **E1 < 0%**	0%
Example Luminaire Image	
Controls[7]	To be controlled via CMS (as per adoptable specification)

Table 1.1: Luminaire performance requirements

[7] Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

Equipment Specification	
Application Area	Cycle path
Correlated Colour Temperature (Kelvin)	≤ 2700 K
Luminaire Manufacturer	Philips (Or Similar Approved)
Luminaire Model	LumiStreet DN09 (BL2 shielded) (Or Similar Approved)
Light Source	LED ≤ 1000 Lumens
Reference	Type F and G
Height	≤ 6 mtrs
Mounting Arrangement	Column mounted, post top
Luminaire Tilt	0%
Upward Light Output Ratio **E1 < 0%**	0%
Example Luminaire Image	
Controls[8]	Photocell on at 35 lux off at 18lux (as per the adoptable specification)

Table 1.2: Luminaire performance requirements

[8] Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

Equipment Specification	
Application Area	Frontage
Correlated Colour Temperature (Kelvin)	≤ 2700 K
Luminaire Manufacturer	Ligman (Or Similar Approved)
Luminaire Model	JET narrow beam(Or Similar Approved)
Light Source	LED ≤ 350 Lumens
Reference	Type D
Height	≤ 2 mtrs
Mounting Arrangement	Wall Mounted
Luminaire Tilt	0%
Upward Light Output Ratio **E1 < 0%**	0%
Example Luminaire Image	
Controls	Motion detector, on for 60 seconds when motion is detected.

Table 1.3: Luminaire performance requirements

Equipment Specification	
Application Area	Frontage
Correlated Colour Temperature (Kelvin)	≤ 2700 K
Luminaire Manufacturer	Ligman (Or Similar Approved)
Luminaire Model	Gino T4 Optic (Or Similar Approved)
Light Source	LED ≤ 1100 Lumens
Reference	Type E
Height	≤ 2 mtrs
Mounting Arrangement	Wall Mounted
Luminaire Tilt	0%
Upward Light Output Ratio **E1 < 0%**	0%
Example Luminaire Image	
Controls	Motion detector, on for 60 seconds when motion is detected, manual override.

Table 1.4: Luminaire performance requirements

TECHNICAL DECRIPTIONS, DEFINITIONS AND ABBREVIATIONS

PHAR: is an abbreviation for a potential human amenity receptor, a location where an observer could have the potential to be affected by the proposed lighting to be installed *Abbreviation used by DFL LI andP.*

PSER: is an abbreviation for an area identified as or treated as a location that may host a potentially sensitive ecological receptor. This is generally used where light sensitive bats have the potential to live, forage or use as a flight path, other ecologically sensitive receptors such as (but not limited to) the Great Crested Newt may also be identified by this term. *Abbreviation used by DFL LI andP.*

PSR: is an abbreviation for an area where an individual maybe susceptible to light brightness (Light intensity) which may have the potential to cause a hazardous situation. *Abbreviation used by DFL LI andP.*

Obtrusive Light: refers to excessive or bothersome artificial light that goes where it shouldn't, causing discomfort and disruption. *Spill light which because of quantitative, directional or spectral attributes in a given context gives rise to annoyance, discomfort, distraction or reduction in the ability to see essential information.* CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Sky glow: When lights are directed upwards or light is scattered by particles in the air, like dust or water droplets, it creates a glow that makes it hard to see stars. *The increase in diffuse illuminance of the night sky above that produced by natural sources such as the moon and visible star.* CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Vertical Illuminance: is how much light lands on upright surfaces like walls. It's measured in lux or footcandles and matters for places where the view from a vertical angle is important. *Lighting of vertical surfaces such as walls, windows, statues, sculptures and people's faces*. CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Correlated colour temperature (CCT): the appearance of light emitted by a light source measured in Kelvin (K), Lower CCT values such as 2700K represent warmer, more yellowish light, *similar to the light from older incandescent lamps. (Tcp)The temperature of the Planckian radiator whose perceived colour most closely resembles that of a given stimulus at the same brightness and under specified viewing conditions, measured in absolute temperature on the kelvin (K) scale.* CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Lux: measures the brightness of light as perceived by the human eye at a specific point on a surface. *The SI derived unit of illuminance, measuring luminous flux per unit area (1 lux =1 lumen/m2).* CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Lumens: measure how bright a light appears to our eyes. *The SI derived unit of luminous flux; a measure of the total quantity of visible light emitted by a source or received by a surface (unit: lumen).* CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Glare: refers to an excess of bright light that makes you uncomfortable or hinders your vision. It happens when there's a big difference between a bright light and the rest of the surroundings. *Glare: condition of vision in which there is discomfort or a reduction in the ability to see details or objects, caused by an unsuitable distribution or range of luminance, or by extreme contrasts.* BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.1.8

Luminous intensity: is light brightness or how intense the light source is. light intensity is how intense a light source is emitted or received in a particular direction, this is measured candelas and is termed as luminous intensity *Iv <of a source, in a given direction> quotient of the luminous flux, dΦv, leaving the source and propagated in the element of solid angle dΩ containing the given direction, by the element of solid angle (unit: cd =lm · sr -1.* BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.2.

Candela: is a measurement for the brightness of a light source, taking into account the direction in which the light is emitted. *Base unit of luminous intensity in the International System of Units (SI); the luminous power per unit solid angle emitted by a point light source in a particular direction.* CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

Uniformity (Uo): is an explanation for the even distribution of light across an area or surface. *The overall uniformity shall be calculated as the ratio of the lowest luminance, occurring at any grid point in the field of calculation, to the average luminance.* BS EN 13201-3-2015, Calculation of Performance Section 8.3.

Luminance: is how bright a surface appears to our eyes. It considers the light coming from or reflected by an object. *Lv <in a given direction, at a given point of a real or imaginary surface> quantity defined by the formula (unit: cd · m-2 = lm · m-2 · sr-1)* BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.3.

Illuminance is how much light lands on a surface per square meter. It's measured in lux. More lux means a brighter area. *Ev (unit: lx = lm · m-2) 1. <at a point of a surface> quotient of the luminous flux dΦv incident on an element of the surface containing the point, by the area dA of that element 2. <at a point of a surface> equivalent definition: integral, taken over the hemisphere visible from the given point, of the expression.* BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.10.

Luminaire: a light fixture, this is also sometimes referred to as a lantern or a light fitting, is a product that produces artificial light. *apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes, except the lamps themselves, all the parts necessary for fixing and protecting the lamps and, where necessary, circuit auxiliaries together with the means for connecting them to the electric supply* BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.3.3

ULOR: upward light output ratio or ULOR refers to the amount of light the light fixture will produce upwards as a percentage of its total light output. *RULO <of a luminaire> ratio of the upward luminous flux of the luminaire, measured under specified practical conditions with its own lamp(s) and equipment, to the sum of the individual luminous fluxes of the same lamp(s) when operated outside the luminaire with the same equipment, under specified conditions* BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.3.12.

Maintenance factor (MF): is an allowance for how well the lights keep working overtime. It considers things like dirt on the light fittings and "wear and tear". *DEPRECATED: light loss factor ratio of illuminance produced by the lighting installation after a certain period to the illuminance produced by the installation when new Note 1 to entry: The term depreciation factor has been formerly used to designate the reciprocal of the above ratio. Note 2 to entry: The maintenance factor takes into account light losses caused by dirt accumulation on luminaires and room surfaces (in interiors) or other relevant surfaces (in exteriors, where appropriate), and the decrease of the luminous flux of lamps*. BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.5.18.

***Tilt**: is how much the luminaire is lifted based on the fitting facing flat to the ground.*

***Outreach:** how far away the fitting is from the column/wall its mounted on to the light source*.

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