Dyffryn Gwy
Tirwedd Cenedlaethol
Wye Valley
National Landscape

WYE VALLEY NATIONAL LANDSCAPE

POSITION STATEMENT: DARK SKIES & ARTIFICIAL LIGHT POLLUTION

A quick note on terminology

On 22 November 2023, the Wye Valley Area of Outstanding Natural Beauty (AONB), was re-branded as the Wye Valley National Landscape. National Landscapes are designated AONBs. Consequently, the name Wye Valley National Landscape is commonly used throughout this document. However, since 'AONB' remains the legal designation, this term is also used in appropriate places, for example, when referring to the Wye Valley AONB Management Plan, which is a statutory plan, or when quoting directly from older documents. The name used for the organisation associated with the designation is the Wye Valley National Landscape Partnership. National Landscapes are designated AONBs, which are protected under the National Parks and Access to Countryside Act 1949. This protection is further enhanced through the Countryside and Rights of Way Act 2000.

1.0 CONTEXT

1.1 The Wye Valley National Landscape is a landscape whose distinctive character and natural beauty are so outstanding that it is in the national interest to safeguard it[1]. The statutory purpose of the designation of Areas of Outstanding Natural Beauty (AONB) is to protect the land and to conserve and enhance its natural beauty[2]. As a 'protected landscape', the Wye Valley National Landscape represents some of the finest countryside across the UK, with a distinctive landscape, scenic beauty, and rich in biodiversity and cultural heritage.

1.2 But it is not just the daytime views which are an attraction. The Wye Valley National Landscape also has a significant proportion of dark skies, some of which are amongst the darkest across the UK. Dark skies add to natural beauty, tranquillity and a sense of remoteness of place. Looking up at starry skies or across moonlight landscapes

[1] Section 82 of the Countryside and Rights of Way Act (2000).
[2] Defra (2019) Areas of Outstanding Natural Beauty: technical support scheme (England) 2019 to 2020. Planning Policy Wales Edition 11 (2021) - Section 6.3.7.

throughout the National Landscape can be a memorable, magical experience. Dark skies are important for landscape, heritage, wildlife, recreation, tourism, health and well-being.

1.3 Whilst the land has legal protection, the sky above does not in the same manner. The more of us whom experience the magic of dark night skies, the more value we place on it and want to protect. Ensuring the Wye Valley National Landscape remains a place where a sense of remoteness and tranquillity predominates is encouraged, particularly as this is one of the National Landscapes' Special Qualities.

1.4 Many of us rely on light to live our lives. However, wasting light wastes energy, money, and contributes to climate change. Unintended artificial light pollution is taking a silent toll, increasingly eradicating our access to the wonder of beautiful night skies. Excessive artificial light can disrupt sleep, potentially leading to serious health issues. It plays havoc with the feeding and breeding cycles of bats, birds, insects and nocturnal animals. Inappropriate lighting, bad design and incremental development is reducing our ability to appreciate the benefit of dark skies. Lighting on rural roads, village streets, houses and other associated development has the potential to contribute to artificial light pollution. It impacts on our experience of the landscape by altering the naturally changing light levels that occur at dusk and before dawn.

1.5 We recognise there is a genuine need for lighting for the purposes of ensuring safety and security, but such requirements can be met within proactive light management approaches, that are both sensitive and effective, and other means to avoid, minimise and, in many cases, reduce unnecessary artificial light pollution. Lighting needs to be in the right place, the right amount, and the right length of time.

1.6 Unnecessary artificial light pollution is already affecting the quality of our dark skies. Co-ordinated proactive measures are needed to conserve, restore and enhance the dark skies of the Wye Valley National Landscape, through increasing awareness and by following simple key principles.

1.7 This position statement aims to achieve a consistent approach to conserving, restoring and enhancing dark skies using recognised and respected industry standards. This is dovetailed alongside several national resources, including:

- Guidance Note 1 – The reduction of obtrusive light – The Institution of Lighting Professionals (ILP)[3]
- Good Lighting Guide and Blinded by the Light (updated 2020) – The Commission for Dark Skies (CfDS)[4]

[3] https://theilp.org.uk/resources

[4] https://britastro.org/dark-skies

1.8 With regards to adopting good practice, this Position Statement is informed by approaches undertaken by several other 'Protected Landscapes'[5].

1.9 This position statement provides some background to the importance of dark skies, to those who live and work in the National Landscape, and to those who visit to enjoy its natural beauty. It provides recommendations and good practice on proactive measures to protect, conserve, restore and enhance our dark skies. It is also intended to be used to help secure an appropriate planning policy for future iterations of new/reviewed Local Plans being produced by local planning authorities within the Wye Valley National Landscape and its Setting and inform future Wye Valley AONB Management Plans.

1.10 This position statement is also aimed at those who are using, replacing or considering the installation of new lighting in and around the Wye Valley National Landscape and its Setting, as well as those installing new glazing, namely:

- Those seeking to install minor lighting, whom need general advice on lighting and glazing;
- Non-domestic users and schemes which may need planning permission and a more thorough design led by professional principles; and
- Those with responsibility for both plan-making and decision-making.

1.11 Achieving good lighting and glazing design is essential when seeking to protect the landscape. Due to the contrast against a darker landscape setting, the impact of lighting at night will have a larger relative visual impact than daytime views. As such, whilst the Wye Valley National Landscape is largely enclosed in terms of its key and exceptional viewpoints, development that may be some distance from the National Landscape boundary can have considerable adverse visual effects.

1.12 Recommendations:

- The Wye Valley National Landscape Partnership acknowledges there is a genuine need for lighting, often for the purposes of ensuring safety and security, but recognises that such needs can be met through proactive light management approaches, that are both sensitive and effective, and other means to avoid, minimise, reduce and remove unnecessary artificial light pollution.
- The Wye Valley National Landscape Partnership fully recognises the importance of protecting, conserving, restoring and enhancing dark skies across the Wye Valley

[5] This includes the Cotswolds National Landscape Position Statement on Dark Skies and Artificial Light, the North Wessex Downs National Landscape Dark Skies Project, the South Downs National Park – Dark Skies Technical Advice Note, Cranbourne Chase National Landscape Position Statement on Dark Skies (including Developers' Guide), Mendip Hills National Landscape Position Statement on Dark Skies & Light Pollution, and the Dedham Vale and Coast & Heaths National Landscapes Lighting Design Guide. General dark skies supporting information has also been informed by work undertaken by Howardian Hills, South Devon and Surrey Hills National Landscapes, along with Clwydian Range & Dee Valley National Landscape SPG Planning for the Dark Night Sky.

National Landscape, and proactively encourages recognition of this more widely, including residents, workers and visitors to the National Landscape, and the relevant authorities responsible for its management.

- The Wye Valley National Landscape Partnership will proactively work with stakeholders and relevant authorities across the Wye Valley National Landscape and its setting to adopt and promote appropriate and common standards, helping establish practical measures, in reducing artificial light pollution and restoring and enhancing dark skies, which aligns with the Special Quality of "*the overall sense of tranquillity, sense of remoteness and naturalness/wildness*" of the Wye Valley National Landscape, as identified in the Wye Valley AONB Management Plan.
- The Wye Valley National Landscape Partnership will work in collaboration with stakeholders and relevant authorities to monitor and protect this aspect of natural beauty.

2.0 PURPOSE OF THE POSITION STATEMENT

2.1 The primary purpose of Position Statements is to expand on relevant Strategic Objectives within the Wye Valley AONB Management Plan. They provide context, guidance and recommendations in relation to key issues. They do not create new policies.

2.2 The recommendations intend to help local authorities, particularly plan-making and decision-making bodies, as well as relevant stakeholders:

- have regard, and positively contribute, to the purposes of AONB designation;
- ensure the purposes of AONB designation are not compromised by development and that the outstanding natural beauty of the Wye Valley National Landscape is conserved and enhanced;
- fulfil the requirements of the National Planning Policy Framework (NPPF), Planning Policy Wales (PPW), Planning Practice Guidance (or, where relevant, National Policy Statements), and Technical Advice Notes, with regards to the AONB designation and the factors that contribute to natural beauty;
- take account of relevant case law;
- to enhance the resilience of ecosystems and take action towards delivering the Welsh Government's Biodiversity Deep Dive recommendations for nature recovery;
- have regard to and be consistent with the Wye Valley AONB Management Plan and guidance/position statements published by the Wye Valley National Landscape Partnership;
- emulate best practice across the Wye Valley National Landscape and other Protected Landscapes; and

- develop a consistent and coordinated approach to relevant issues across the Wye Valley National Landscape and its setting[6].

2.3 The Wye Valley National Landscape derives much of its natural beauty from its tranquillity and rural character. To help protect these special qualities, with regards to dark skies and artificial light pollution, relevant strategic objectives of the Wye Valley AONB Management Plan include WV-L1, WV-F1, WV-D1, WV-D2, WV-D3, WV-T2, WV-T3, WV-C2, WV-E2, WV-S4, WV-A1 and WV-P1.

2.4 The purpose of position statements is also to promote good practice in external lighting and internal light spill by fostering behavioural change. Effective design will enable many more of us to experience unpolluted night skies more clearly whilst also saving energy, reducing nuisance, and minimising the impact of lighting on wildlife and people. This will also contribute to protecting the wider Special Qualities, defined landscape character and overall sense of tranquillity across the National Landscape.

2.5 By establishing a proactive dark sky mind-set, this means also looking at the impacts beyond the immediate areas being lit or to be lit, ensuring relevant standards, legislation, landscape assessments and other professional guidance is followed. To protect dark skies appropriately, we all need to expand our mind-set from local need to the wider landscape impact using appropriate guidance and standards that should be referenced at different spatial levels.

3.0 STATUS OF THE POSITION STATEMENT

3.1 Position Statements are supplementary to the Wye Valley AONB Management Plan. For development proposals to be compatible with the Wye Valley AONB Management Plan, they should also be compatible with the relevant position statement.

3.2 The Wye Valley AONB Management Plan is a material planning consideration in decision-making. However, it must be acknowledged that in a plan-led planning system, it is the policies of the relevant adopted local authority development plan that have greatest weight. As such, within this planning system, the hierarchy is as follows[7]:

[6] Four local authority areas overlap with the Wye Valley National Landscape, with each with local authority having its own development plan.

[7] In England, Section 38(6) of the Planning and Compulsory Purchase Act 2004 states: "If regard is to be had to the development plan for the purpose of any determination to be made under the Planning Acts the determination must be made in accordance with the plan unless material considerations indicate otherwise." The NPPF (2023) is itself a significant material consideration, although it is acknowledged regarding the presumption in favour of sustainable development under Paragraph 11, particularly in relation to plan-making and decision-making.

On Wednesday 13th September 2023, the DEFRA Secretary of State tabled a Written Ministerial Statement setting out a package of measures to support nature recovery in Protected Landscapes. The package includes a commitment to new legislation through

The adopted development plan comprises the Local Planning Authority Development Plan, 'made' Neighbourhood Development Plans (in England only, when adopted), and Future Wales: The National Plan 2040 (Wales only), in which decision-making is to be taken in accordance with, unless material planning considerations indicate otherwise.
The Wye Valley AONB Management Plan, like the National Planning Policy Framework and Technical Advice Notes, are material planning considerations, but do not form part of the adopted development plan. Wye Valley National Landscape Position Statements and guidance supplement the AONB Management Plan.

4.0 LIGHT POLLUTION

4.1 Defining Light Pollution

4.1.1 There is increasing pressure in the Wye Valley National Landscape to accommodate:

- All types of development, including the expansion of settlements, within and in the setting of the National Landscape
- Demand for standardised highway lighting, particularly at junctions
- Increased use of 'security' lighting on building exteriors
- Floodlighting of sports pitches and riding arenas
- Architectural designs incorporating extensive areas of glazing
- Illuminated advertisements

4.1.2 Artificial light is relied on by many to live our lives. However, light shining where or when it is not required pollutes our highly valued dark skies. Dark skies are important for health, nature and protecting the natural beauty of the National Landscape and wasting energy will incur unnecessary costs.

4.1.3 Artificial light pollution, also known as obtrusive light, is the presence of unwanted, inappropriate, or excessive artificial lighting. It refers to the adverse effects of any artificial light on the environment. Light pollution takes several forms, including, but not limited to:

- Light trespass – when light enters a neighbouring property;
- Over illumination – where there is excessive light;
- Glare – often from an unshielded light source resulting in contrasting dark shadows and excessively bright areas;

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the Levelling Up and Regeneration Act (2023), which will enhance National Park and AONB Management Plans by placing a stronger requirement on partners to contribute to their delivery.

In Wales, national planning guidance prepared by the Welsh Government is taken into account as a material planning consideration, along with policies in the Local Planning Authority development plan for the area, and other material planning considerations.

- Clutter – excessive groupings of lights which can cause confusion and distraction from obstacles intended to be illuminated;
- Sky glow over areas where light is escaping upwards; and
- The possibility of significant residual impacts due to the presence of the lights and the illuminance it provides.

4.1.4 Artificial light pollution is often caused by poorly designed lighting schemes, with inappropriate, excessive or poorly installed lighting equipment. Light pollution is made often made worse by blue-white light which can be found in many Light Emitting Diode (LED) lamps. The blue-white light can penetrate the atmosphere much further than yellow and orange lights. A team of biologists from the University of Exeter recently found that human illumination of the planet is growing in range and intensity at about 2% annually[8]. Yet, human illumination can easily be reduced whilst having enough light for the required task.

4.2 Measuring Sky Quality

4.2.1 A dark sky is a place where the night sky is relatively free of interference from artificial light. Under such conditions, you should be able to see the Milky Way overhead and other astronomical features such as the Andromeda Galaxy with the naked eye.

4.2.2 Sky quality is usually expressed on the 'Bortle Scale', showing the level of stellar visibility measured using naked-eye limiting magnitude (NELM). Under better dark skies the Milky Way will be clearly visible, whereas a suburban sky in the UK will just be dark enough to see the Milky Way. As everyone's eyes varies, we cannot depend on our own perception of sky quality.

4.2.3 To improve the consistency of experience between places, sky quality is normally measured using a hand-held Sky Quality Meter (SQM), a standardised requirement of an International DarkSky Association place application. Most ground measurements use a Sky Quality meter, either with a Unihedron meter, or a TESS photometer (cost around £150). The SQM returns a value of the brightness (magnitudes) of an area (arc second^2) of the sky expressed as a number from 0 to 22 – with the higher the number being the darker the sky. To see the Milky Way, a sky measuring 20.5 and above is needed. 21 and above is rare in the UK although volunteers within the Kerne Bridge Dark Skies Project have measured over 21 in some places in the Wye Valley National Landscape[9]. These measurements indicate that in the skies above the Wye Valley National Landscape, the Milky Way can be clearly visible at 20% contrast to background when overhead. There is no significant variation in Zenith brightness across the National Landscape in the same conditions on the same night. This is because, with few large settlements, the zenith

[8] Home page news - Artificial night lighting has widespread impacts on nature - University of Exeter

[9] http://www.wyevalleysociety.org.uk/events.php

brightness is affected by light pollution from distant cities rather than from local light sources.

4.2.4 Sky Quality can also be measured either by looking down at the Earth from above and measuring the upward light or by measuring the brightness of the sky from the ground. One can get a rough estimation of sky quality by counting the number of stars in the constellation of Orion which can be seen in winter months. Observers can count the number of stars within the rectangle formed by the shoulders and feet. In a city centre you will be lucky to make out 10 stars, whereas under a good Milky Way dark sky in the UK you should be able to see around 25-30. Theoretically, there are 40 stars visible to the naked eye within Orion, but one would need to be in a very dark place and have excellent eyes to see them all.

4.3 Dark Skies across the Wye Valley National Landscape

4.3.1 The sky at night (or by day), together with basic landform are the only physical aspects of the present-day environment of inland Britain that are still fundamentally largely natural in character as vegetation, land use, fields and settlements have been shaped into their present character or created through human influences over the last 12,000 years.

4.3.2 As a typically rural landscape, the skies across the Wye Valley are of regional importance to residents, workers and visitors to and surrounding the National Landscape. Whilst the Wye Valley does not have International Dark-Sky Association (IDA) place status, other UK protected landscapes have achieved such designation. It is important to protect skies that could qualify for such accreditation in future.

4.3.3 The conservation and enhancement of dark night skies brings several benefits:

- Landscape – Dark skies are characteristic of most of the National Landscape and covered by the primary purpose of ‘conserving and enhancing’. The Wye Valley AONB Management Plan references dark sky outcomes and Strategic Objectives pertaining to light pollution follow on from this. Recognition of this should encourage local authorities to take dark skies into account when plan-making and decision-making. It provides opportunities for communities, individuals and businesses to take account of dark skies and adopt good practices.
- Enjoyment and understanding – There is increasing public interest in night skies, in part encouraged by television programmes such as Stargazing Live and the Sky at Night. Stargazing events organised by astronomical societies are proving popular. Areas of dark skies are increasingly important for people to experience natural darkness and see a starlit sky.
- Wildlife – Life on earth has evolved with the natural cycle of day and night. Species have evolved to cope with and take advantage of natural darkness. Artificial lighting

has an impact on species and ecosystems interrupting migration patterns, predator-prey relationships and the circadian rhythm of many organisms leading to stress and disruption of breeding patterns.

- Heritage assets – The Wye Valley has a wealth of historic sites for which the night sky together with natural topography are the only largely unchanged aspects of their surroundings. An important characteristic of the Wye Valley is the strong character of historic settlements set within their rural surroundings with (until recent years) little expansion. Dark skies are therefore an important aspect to the setting of many historic monuments and places and how they are experienced and appreciated within the National Landscape.
- Human health and well-being – Humans have also evolved with the natural cycle of light and dark, naturally adhering to a circadian rhythm. Photoreceptors in the human eye regulate the circadian rhythm which controls biological functions including alertness, temperature regulation and melatonin production.
- Economic benefit – Evidence from existing Dark Sky Parks and Reserves show that such designation has led to 'Dark Sky Tourism', particularly in winter months. This is providing businesses and benefiting the local economy in an otherwise quiet time of year, particularly as Dark Sky tourism will often involve overnight stays.

4.3.4 The overall sense of tranquillity, sense of remoteness and naturalness/wildness is one of the 'Special Qualities[10]' of the Wye Valley National Landscape[11]. Artificial light pollution is recognised as a particular pressure within the National Landscape. In terms of effects upon the National Landscape:

- Poorly designed and/or standardised lighting can degrade landscape character;
- Poorly designed or directed lighting can disrupt biodiversity and disturb species behaviour, particularly bats;
- Poorly located or directed lighting can confuse motorists, degrade landscape character and waste energy;
- Modern architectural designs with large areas of glazing can appear as boxes of light in the countryside at night, and glinting glazing in the daytime; and
- Heritage assets and their significance can be lost.

4.3.5 The Countryside Charity CPRE campaigns to raise awareness about light pollution. In 2015, with support from several AONB Partnerships, they used Land Use Consultants to create a Night Blight map showing the relative darkness of the night sky at an effective resolution down to 500 metres (Figure 1). This scale makes it invaluable at a local level,

[10] Those aspects of the area's natural beauty, wildlife and cultural heritage, that make the area distinctive and are valuable, particularly at a national scale.

[11] As identified as SQ12 within the Wye Valley AONB Management Plan 2021-2026.

providing a consistent baseline mapping. The mapping was based on satellite images showing light pollution from the sky; not light meter readings taken at ground level.

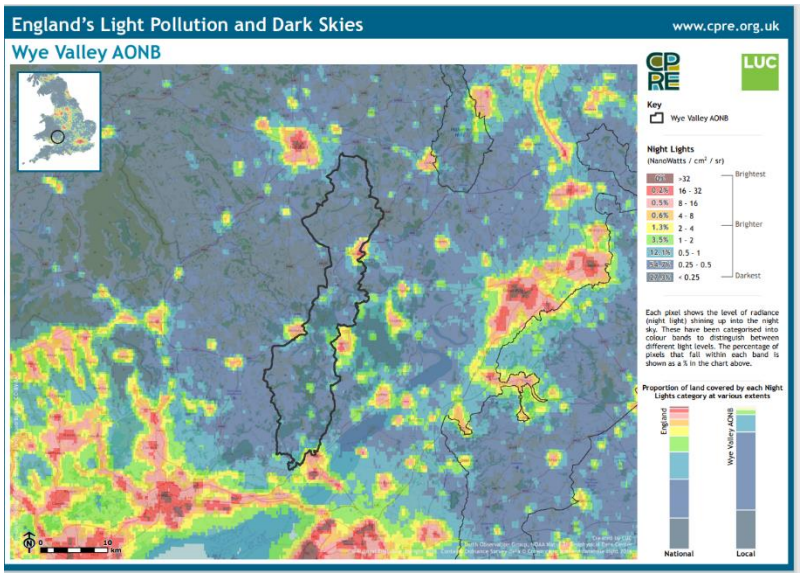

Figure 1 – Light pollution and dark skies in the Wye Valley National Landscape. To expand the map and find out more information about the Night Blight mapping go to: [England's Light Pollution and Dark Skies Map (cpre.org.uk)]

4.3.6 The map, along with more recent work undertaken through the Kerne Bridge Dark Skies Project, shows the Wye Valley National Landscape is suffering from artificial light pollution, particularly in some settlements, service stations and economic hubs. Artificial light pollution is also particularly an issue from the surrounding urban areas which form the 'setting' to the National Landscape. Nevertheless, 27.3% of the sky over the Wye National Landscape is as dark as any in the UK, and another 54.7% falls into the next darkest category (there are nine categories altogether). There are clearly significant areas of quality dark skies to protect from excessive artificial light pollution.

4.3.7 Recommendations:

- The Wye Valley National Landscape Partnership recognises that dark skies can bring benefits to landscape, enjoyment and understanding, wildlife, heritage, human health and well-being, as well as economic gain and tourism.
- The Wye Valley National Landscape Partnership acknowledges that there are areas of the Wye Valley National Landscape and its Setting which suffer from artificial light pollution. However, there are significant areas of quality dark skies to protect, conserve, restore and enhance within the National Landscape from excessive artificial light pollution, to improve the overall sense of tranquillity, sense of remoteness and naturalness/wildness of the Wye Valley National Landscape.
- In being consistent with the Wye Valley AONB Management Plan 2021-2026, the Wye Valley National Landscape Partnership considers that lighting should be

reduced where practically possible and only be installed where and when needed, following good practice for intrinsically dark protected landscapes.

5.0 THE EFFECTS OF LIGHT POLLUTION

5.1 Nature and Wildlife

5.1.1 In a paper published in Nature Ecology and Evolution (November 2020[12]), biologists from the University of Exeter concluded that artificial light pollution is impacting the hormone levels, breeding cycles, activity patterns and predator-prey interactions of a broad range of species.

5.1.2 Artificial light pollution impacts wildlife in several ways:

- Songbirds – lighting at night triggers a dawn response, so they become exhausted, affecting feeding and breeding cycles.
- Frogs and toads – having artificial lights where amphibians live can disrupt nocturnal activity, interfering with reproduction and reducing populations.
- Bats – artificial light on a bat roost disturbs bats and may lead them to desert it. Light falling on the access point of a roost delays bats from emerging, shortening the time they have for feeding and, in turn, reducing their reproductive rates. Light on the flightpath of bats can also lead to them deserting their roost[13].
- Insects – it is estimated that a third of insects attracted to artificial lights will die because of such encounters. Reflected light can also be a problem because illuminated shiny surfaces look like water. This attracts aquatic insects, such as egg-laying female dragonflies, leading to unsuccessful breeding.
- Trees – trees have evolved with a regular, predictable transition from day to night, following the natural patterns of the sun and moon. Artificial light extends the natural day, changing the flowering patterns of trees, promoting continued growth. This however prevents them from having dormant periods, which trees need to thrive.

5.1.3 The Wildlife and Countryside Act 1981 is the principal mechanism for the protection of wildlife in Great Britain. Under the Act, it is illegal to disturb certain species, including bats, and artificial lighting can constitute an offence. All wildlife and their habitats can be disrupted by artificial light. The Institution of Lighting Professionals and the Bat Conservation Trust recently updated their guidance note on 'Bats and artificial lighting' in the UK to help guide lighting assessments of bat species[14].

[12] Volume 4 Issue 11, November 2020 (nature.com)

[13] Because artificial light is a particular issue for bats, the Institute of Lighting Professionals (ILP) and Bat Conservation Trust have produced Guidance Note 8 Bats and artificial lighting https://theilp.org.uk/resources/

[14] Guidance Note 8 Bats and Artificial Lighting | Institution of Lighting Professionals (theilp.org.uk)

5.1.4 Unnecessary lighting also contributes to climate change via energy generation and carbon emissions. Moreover, disruption to habitats via artificial lighting contributes to biodiversity decline which in turn has climate (and wider environmental) implications. For instance, declining pollinator and other animal populations may lead to degradation of plant biodiversity in the area, which in turn may be linked to carbon sequestration potential of the ecosystem.

5.2 Health and Well-being

5.2.1 Lights shining directly into windows can cause disruption such as finding it difficult to get to sleep. However, there are other less obvious health issues artificial light pollution can cause.

5.2.2 Humans have evolved with the natural cycle of light and dark that comes from the sun, so adhere to a circadian rhythm or body clock. Artificial light at the wrong time disrupts the production of a hormone called melatonin. Melatonin is important as it induces sleep, boosts the immune system, lowers cholesterol, and helps with the function of the thyroid and pancreas, amongst other things. When our natural cycle is disrupted, it can lower immunity, increase risk of diseases, mood instability and risk mental illness. It is important to maintain bright natural light during the day and relative darkness at night[15].

5.3 Safety

5.3.1 To road users, glare can be highly dangerous. Glare and insensitive artificial lighting can cause accidents when motorists are distracted or blinded by artificial light spilling out onto the road.

5.4 Crime

5.4.1 It is not a complete given that installing lighting for 'security' deters crime. There is no proven link between lighting levels and crime rates. In trials where street lighting has been switched off, there has been no increase in crime rates. In fact, bright exterior lights may create contrasting dark spots that criminals can hide in.

5.5 Cost

5.5.1 It costs considerable money to power the grid system to provide lighting. Wasted power through badly designed, installed or used lighting presents an unnecessary cost to businesses, homes and public utilities.

5.6 Energy and carbon emissions

5.6.1 Wasted energy from power used for excessive lighting contributes to carbon emissions and climate change. LED lighting can reduce energy consumption significantly

[15] http://www.bre.co.uk/filelibrary/Briefing%20papers/Lighting-and-health-infographic2.pdf

and, therefore, the amount of carbon dioxide (CO_2) emitted. However, low-energy bright light is often achieved by using a blue-white LED which can be very damaging to human and wildlife health.

5.7 Landscape, cultural value and science

5.7.1 Artificial lighting is degrading the character of rural landscape, eroding and destroying tranquility and a sense of remoteness. As the number of places we can appreciate dark skies reduces, it makes it increasingly difficult to view the sky at night. These differences are clearly shown in the Bortle Dark-Sky Scale[16]. Light pollution is also seriously undermining the ability of British-based astronomers, both professional and amateur, to lead on this expanding field of science.

5.8 Heritage assets

5.8.1 Historic buildings are increasingly jostling for space and acknowledgment in the National Landscape against increasing development. It has been established that lighting a historic building, such as a church for example, will elevate its presence in the community. It should be remembered that external lighting can not only augment the view of a historic building but when done badly it produces the opposite effects by enhancing the negative aspects.

5.8.2 Because a building is listed or scheduled is not necessarily a good enough reason to proceed with installing artificial lighting. A scheme must not only illuminate but make the building or place more interesting, assist in making visitors feel safe by putting people back at the centre of all public spaces, help tell a story, boost the building or area's identity and assist visitors in appreciating the night by only using light where needed.

5.9 Recommendation:

- The Partnership acknowledges that artificial light pollution throughout the Wye Valley National Landscape and its Setting is undermining and adversely affecting wildlife and nature, health and well-being, safety, crime, energy and carbon emissions, as well as landscape and visual amenity, cultural value and science, and heritage assets.

6.0 LIGHT POLLUTION CONTROL IN THE UK

6.1 Light Pollution and the Law

6.1.1 There are limited laws dealing with light pollution. In 2005, the Clean Neighbourhoods and Environment Act 2005 – Statutory Nuisance (para 79-fb) was

[16] The Bortle Dark-Sky Scale (umt.edu)

extended to include light nuisance, *"fb – artificial light emitted from premises so as to be prejudicial to health or a nuisance"*

6.1.2 Local authorities must take reasonable steps to investigate complaints of artificial light nuisances. If a nuisance exists or occurs, an abatement notice to cease will be issued. Lights shining into neighbouring properties can be considered a 'statutory nuisance' under the Environmental Protection Act 1990.

6.1.3 It is important to note that the threshold and process for nuisance lighting is different from the planning regime. A nuisance requires a 'victim' who can show that they are being negatively impacted by lighting that has probably not received any obtrusive light reduction design. The harm is quantified by directly measuring obtrusive light spill metrics that fall into internal spaces by Environmental Health Officers. In contrast, planning controls requires that light spill is reduced, ideally before lighting is installed, and to comply with obtrusive light requirements.

6.1.4 The Wildlife and Countryside Act 1981 is the principal mechanism for the protection of wildlife in Great Britain. Under the Act, it is illegal to disturb certain species, including bats, and artificial light can constitute an offence. Under the Act, it is illegal to disturb certain species, including bats, and artificial light can constitute an offence.

6.2 Light Pollution and the Planning Framework

6.2.1 It is accepted that some lighting can be installed without requiring planning permission, under permitted development rights. Lighting that does require explicit permission includes for instance:

- Lighting installations which materially alters the external appearance of a building
- Lighting installations on Listed Buildings which affects their character or fabric
- Illumination of outdoor advertisements
- Most forms of lighting on columns [e.g. sports, arena, street, security lighting].

6.2.2 The National Planning Policy Framework (NPPF) for England provides the baseline for local authorities when developing planning policy, including light pollution:

"*191. 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: a) 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; b) 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 c) limit the impact of light pollution*

from artificial light on local amenity, intrinsically dark landscapes and nature conservation."

6.2.3 The NPPF also references the importance of conserving and enhancing landscape and scenic beauty (Section 15), which would include dark skies, and in respect of the historic environment (Section 16). Paragraph 182 requires that 'great weight should be given to conserving and enhancing' designated AONBs which, along with National Parks, have the highest status of protection in relation to landscape and scenic beauty issues. Paragraph 182 also requires that development is limited and sensitively designed to 'avoid or minimise adverse effects' when considering development in the setting of the designated AONB. This would include well designed lighting and understanding the full effects on dark skies. Paragraph 183 also note that permission for major development in designated AONBs should be refused other than in exceptional circumstances.

6.2.4 Planning Policy Wales (PPW) provides further baseline for Welsh local authorities in terms of plan-making:

"*6.8.3 Lighting to provide security can be particularly important in rural areas or for specific purposes such as defence or to create calming environments. Where this is the case, planning authorities should adopt policies for lighting, including the control of light pollution, in their development plans. 6.8.4 Planning authorities can attach conditions to planning permissions for new developments that include the design and operation of lighting systems, for example, requiring energy-efficient design and to prevent light pollution.*" (Planning Policy Wales). This also applies to development affecting the historic environment (see Section 6.1 of Planning Policy Wales).

6.2.5 Going further, PPW recognises the importance of designated AONBs, stating that planning authorities should give great weight to conserving and enhancing natural beauty (6.3.7), and should have regard to the wildlife, cultural heritage and social and economic well-being of these areas. At 6.3.8, along with National Parks, designated AONBs are of equal status in terms of landscape and scenic beauty and must be afforded the highest status of protection from inappropriate developments. The special qualities of designated areas should be given weight in plan-making and the decision-making process. Proposals in designated AONBs must be carefully assessed to ensure that their effects on those features which the designation is intended to protect are acceptable. The contribution that development makes to the sustainable management of the designated area must be considered (6.3.9, PPW).

6.2.6 Section 85 of the Countryside Rights of Way Act 2000 places a requirement of a general duty of public bodies on land in a designated AONB in England, which should include the impact of light pollution. "*In exercising or performing any functions in relation to, or so as to affect, land in an area of outstanding natural beauty in England, a relevant*

authority other than a devolved Welsh authority must seek to further the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty".

6.2.7 Section 85 of the Countryside Rights of Way Act 2000 places a requirement of a general duty of public bodies on land in a designated AONB in Wales, which should include the impact of light pollution. "*In exercising or performing any functions in relation to, or so as to affect, land in an area of outstanding natural beauty in England, a devolved Welsh authority must have regard to the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty*".

7.0 MEASURING LIGHT

7.0.1 Light is composed of individual wavelengths across the electromagnetic spectrum that give lamps their colour and strength. To ensure lighting designs are effective in reducing light pollution, it is useful to understand the different measurements of light and how they impact on artificial light pollution. Any manufacturer/supplier reference to fittings being 'Dark-Sky friendly', or similar wording, should not be taken as an assumption of acceptability.

7.0.2 To specify appropriate lighting according to the need and situation, it is helpful to understand the different measures of light – Lumens, Kelvins, Lux and Candela:

- Lumens measures how much light is emitted from a light source in all directions.
- Kelvins measures the colour correlated temperature of the light.
- Lux measures the amount of light that falls on a surface.
- Candela is the intensity of light as visible to the human eye in a specific direction.

7.1 Lumens

7.1.1 Bulbs used to be sold according to 'watts', which is the amount of energy input to the bulb or light fitting. The light output however is now categorised by their lumens. Figure 2 shows the approximate levels of lumen output from different types of bulbs, and the amount of energy that can be saved in comparison to a standard bulb.

7.1.2 Figure 2 also provides power wattages for different types of bulb brightness that can be found in most retailers. For most minor domestic purposes, 500 lumens are more than enough. For lighting greater than 500 lumens, one should use shielding or luminaires that direct all light downward, although this should be a last resort.

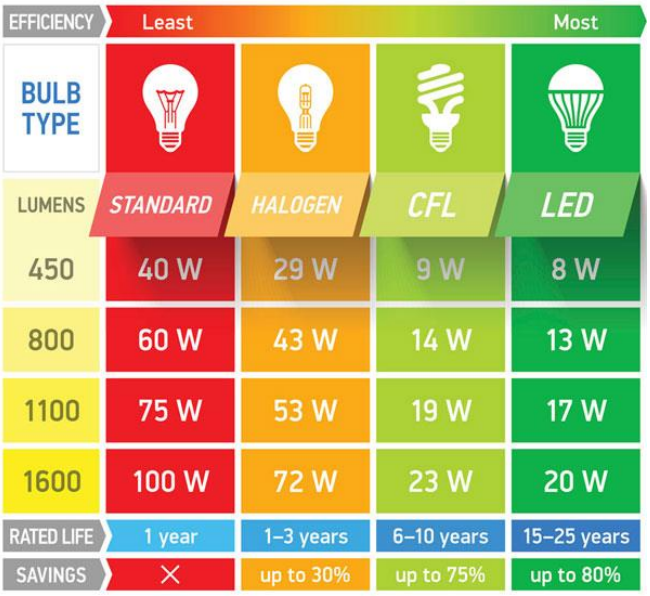

Figure 2 – Bulb output in lumens[17]

7.2 Kelvins

7.2.1 Manufacturers describe light bulbs using phrases such as 'cool white' and 'warm light'. A temperature measure known as the Kelvin scale (K) is used to determine the colour of the light. Colour Correlated Temperature (CCT), which is also measured in K, describes the colour appearance of light. The higher the colour temperature, the bluer the light will appear. It is blue-white light that is particularly damaging to dark skies and should be avoided. Many lamps will state their colour temperature with some abbreviating as 'cool' (5000K or more) or 'warm' white (3000-4000K).

7.2.2 It is regarded that 3000K and less is appropriate for dark skies, ideally 2700k. For lighting near key ecological receptors such as wildlife sites, further reductions are recommended, ideally <2200K. Figure 3 shows the CCT in more detail.

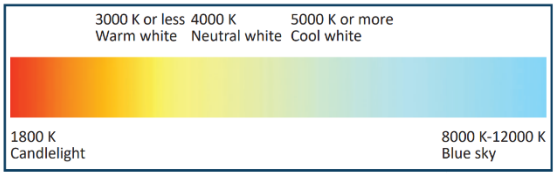

Figure 3 – Colour Correlated Temperature diagram

7.3 Lux

[17] What Are Lumens And Why Do They Matter - Universal Lighting (universal-lighting.co.uk)

7.3.1 Lux is a measurement of illuminance (E_m) – the amount of light on a surface to do a particular task. A single lux is equal to one lumen per square metre. Lux level will change with changes in distance or bulb type.

7.3.2 For comparison, a sunny day can be 10000 lux, a cloudy day 1000 lux and a full moon 0.3 lux. 15 lux is more than sufficient for a rural car park, with 5 lux for rural domestic lighting, although lighting should only be installed where clearly justifiable.

7.4 Candela

7.4.1 Candela is a base measurement for describing luminous intensity. It states how bright a light source is and, therefore, how far away an object can still be seen. It is the light intensity from any point in a single direction from the light source.

7.4.2 High levels of intensity in any direction can contribute to obtrusion and glare issues. The internal optics and lenses of the whole light – the luminaire – will direct lamp light into a beam direction.

7.5 Watts and Lumens

7.5.1 To achieve the appropriate illumination (lux), Table 1 recommends LED wattages (W) and lumen values (lm) to achieve approximate levels of illuminance for certain standardised tasks. Whilst some may be more relevant to non-domestic installations, any householder should aim to purchase LEDs at the lowest recommended level to achieve the necessary lighting footprints required.

Table 1 - Approximate Target illumination levels

	Approximate Target illumination levels (Typical levels as listed in BSI and HSE documents)				
Area to be lit m^2	(5 lux) DOMESTIC areas, walkways	(10 lux) DOMESTIC driveways, small car parks, traffic areas for slow moving vehicles	(20 lux) Farmyards, clearance and excavation	(50 lux) Loading and unloading, vehicle turning, construction areas, equipment sheds	(100 lux) Sports, fine detail and precision work
25	**3w 400lm**	**6w 500lm**	**11w 1000lm**	30w 3000lm	CONSULT LIGHTING SPECIALIST

50	**5w 500lm**	**11w 1000lm**	23w 2500lm	60w 6500lm	CONSULT LIGHTING SPECIALIST
100	**11w 1000lm**	23w 2300lm	50w 5000lm	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST
250	30w 3000lm	60w 6500lm	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST
500+	60w 6500lm	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST	CONSULT LIGHTING SPECIALIST

7.5.2 As a general guide, lighting using 11W or 1000 lumens or less is generally a low risk (Green cells). Lighting above 11W and 1000 lumens but less than 60W and 6500 lumens is considered a medium risk (Orange cells). Lighting above 60W and 6500 lumens is considered high risk (Red Cells) and that the lighting installation in such instances should be properly designed, in consultation with a lighting specialist.

7.6 Recommendations:

- The Wye Valley National Landscape Partnership recognises that to specify appropriate lighting according to the need and situation, t is helpful to understand the different measures of light – Lumens, Kelvins, Lux and Candela.
- Colour Correlated Temperature (CCT), which is measured in K, describes the colour appearance of light. It is regarded that 3000K and less is appropriate for dark skies, ideally 2700k, although should be around 2200k when nearby key ecological receptors.
- To achieve the right illumination, Table 1 is advised by the Wye Valley National Landscape Partnership for recommended LED wattages and lumen values to achieve approximate levels of illuminance for certain standardised tasks. Users should aim to purchase LEDs at the recommended low-risk level to achieve necessary lighting footprints. For most minor domestic purposes, 500 lumens are normally more than enough. For lamps greater than 500 lumens, one should use shielding or luminaires that directs all light downward, although should be considered a last resort after other options have been considered.

8.0 PRINCIPLES OF GOOD LIGHTING

8.1 To minimise light pollution, the following good practice design principles should be followed to ensure good lighting reduces artificial light pollution. With all installations, the aim should be **the right light, in the right place, for the right time:**

- **Principle 1 – Useful** – Any light should be justified with a clear purpose and benefit. The overall lighting impact should be appropriate for both task and local setting, regardless of design.
- **Principle 2 – Targeted** – Light should be directed to where it is needed and not spill into neighbouring spaces. All light above the horizontal should be avoided. Zero upward light is essential. Asymmetric lights should be used where possible to reduce light spill, lower mounting heights, improving efficiency and eliminating upward light.
- **Principle 3 – Low light** – Lights should provide the right illuminance referenced against design standards where appropriate. Do not use needlessly over-bright lights as there will be more pollution and unnecessary glare. Use 500 lumens and less for domestic lighting. Lights should be installed at their lowest practical height.
- **Principle 4 – Controlled** – Turn off when not needed with manual switches, timers or proximity (PIR) sensors. Ensure lights are dimmed or selectively activated when activity is low, to reduce light and energy use.
- **Principle 5 – Designed** – For larger non-domestic installations, professional designers should be consulted to ensure illuminance, and control of spill light and glare, are appropriate for the task. Use the minimum possible number of lights and adhere to relevant standards.
- **Principle 6 – Colour** – Lamps should be 3000K or less and ideally 2700K. These are sometimes described as 'warm white'. Lamps above 4000K described as 'neutral' and 'cool' should be avoided as they generally have more blue light within the spectrum.

8.2 Cranborne Chase National Landscape Partnership have a helpful factsheet giving examples of appropriate dark-sky light fittings, along with manufacturers and distributors[18], including fittings for use on new builds and refurbishments[19].

8.3 A well-designed and installed dark-sky friendly lighting unit will not need any shielding. In certain circumstances, however, a shield may be useful, such as when lights can be seen from surrounding key viewpoints or when up-lights cannot be avoided. Shielding usually takes the form of cowls, louvres (or baffles), and/or shields.

8.4 When selecting a shield, choose types that are sympathetically designed to their surroundings. In situations where lights will be seen from surrounding key viewpoints, it may be possible to add a physical barrier, such as planting a hedge or tree line to soften the impact of lighting. Existing woodland or wildlife areas should not be used as a barrier, as light shining into these can be harmful. New planting should be of native species and

[18] Good Lighting Advice - Chasing Stars Cranborne Chase AONB Dark Skies Bid

[19] Feb-22-Good-Practice-7b1-DNS-fittings.pdf (cranbornechase.org.uk)

in accordance with the relevant landscape management zone, as identified within the Wye Valley AONB Management Plan.

8.5 Other lighting considerations

- Low-level pathway lighting – Paths do not always need bright lights. In fact, bright lights can often be uncomfortable or dazzle. Low-level bollards with shielded lights can be considered, but should not shine upwards or sideways.
- Upgrading existing lighting – Replacement lighting may provide an opportunity to reduce artificial light pollution. Relocating, adjusting direction, and installing sensors are all ways to improve upon the existing situation.
- Surfaces – Different surfaces reflect light differently, so the type of surface required for an installation should be considered. Darker colours, such as dark greens or asphalt greys and blacks will reflect less light, cause less glare, and reduce the visibility of the installation. White or mirrored surfaces will reflect more light which can be a problem for some wildlife, who often mistake reflected surface for water.
- Garden Lighting – Decorative garden lights also add to the overall impact of lighting. The same principles as for light fittings should be considered.
- Visual impact of lighting equipment – During the day, the visual impact of lighting equipment including poles, brackets and cabling, should be considered, especially in protected and/or historic landscapes. Tall columns may give less glare at night because floodlights may have a steeper downward angle, but they will be more intrusive by day because of their visual effects.
- New technology – Innovations are constantly and becoming increasingly commercially viable although must be assessed to ensure that by solving one problem, it is not creating another.
- Windows and internal lights – Allowing daylight into a building is crucial for our circadian rhythm as, with our busy lives, most of us do not get enough daylight. However, internal light overspilling from buildings can add significantly to artificial light pollution. In general, internal lights shine horizontally and, in the case of sky/roof lights, directly upwards. To reduce light pollution from buildings:
  - Ensure windows have curtains/blinds that stop light spilling out and are used.
  - Use electronically timed lighting and blinds/shutters linked to ‘smart home’ systems to allow flexible operation.
  - Face glazing into courtyards or associated buildings, rather than towards green spaces or neighbours.
  - Try ‘smart glass’, which is made by passing electrical current through the material to change its transparency.

8.6 **Recommendations:**

- To minimise light pollution, the Wye Valley National Landscape Partnership advocates following the following best practice design principles when considering new lighting to ensure the right light, in the right place and for the right time (refer to Section 8.1):
    - Useful
    - Targeted
    - Low light
    - Controlled
    - Designed
    - Colour
- Shielding may be useful, when lighting can be seen from surrounding key viewpoints, but should be sympathetically designed to their surroundings and have regard to material planning considerations which avoid creating a persistent and dominant feature out of keeping with the landscape of the National Landscape, and/or damage Special Qualities in the National Landscape. Shielding should be a last resort, and only used, if necessary, in the interests of landscape and visual effects and consideration of other lighting considerations should be factored in.

9.0 PROMOTING GOOD PRACTICE

9.0.1 The following section provides advice for different users and types of situations.

9.1 Domestic/Householder

9.1.1 Light should be avoided unless it has a clear, necessary purpose. As minor fittings are not generally subject to planning control or need a lighting designer, it is important that those installing domestic lights understand the difference between good and bad lighting. What may seem an enticing deal at the retailer can turn out to be inappropriate, a nuisance to neighbours and overly polluting. Following these simple steps can ensure good domestic/householder lighting that protects dark skies. Figure 4 also provides a useful visual illustration.

9.1.2 Minor Lights Specifications:

- Lamps of less than 500 lumens (~5W LED) is fine for navigating a garden path, and 1,000 lumens (11W LED) is acceptable for those requiring a little extra light for most uses, like car parking.
- Homeowners do not need lighting greater than 1,500 lumens (~15w LED) for domestic use.
- Anything above 500 lumens, where justified, should be fully shielded so all light goes downwards with no upward light ratio. LEDs are best to achieve downward light.

- Proximity sensors such as infra-red (PIR) should be used to light only when needed. Separate sensors can also angle the light without comprising its function.
- Check light does not overspill into surrounding vegetation/natural areas or neighbours.

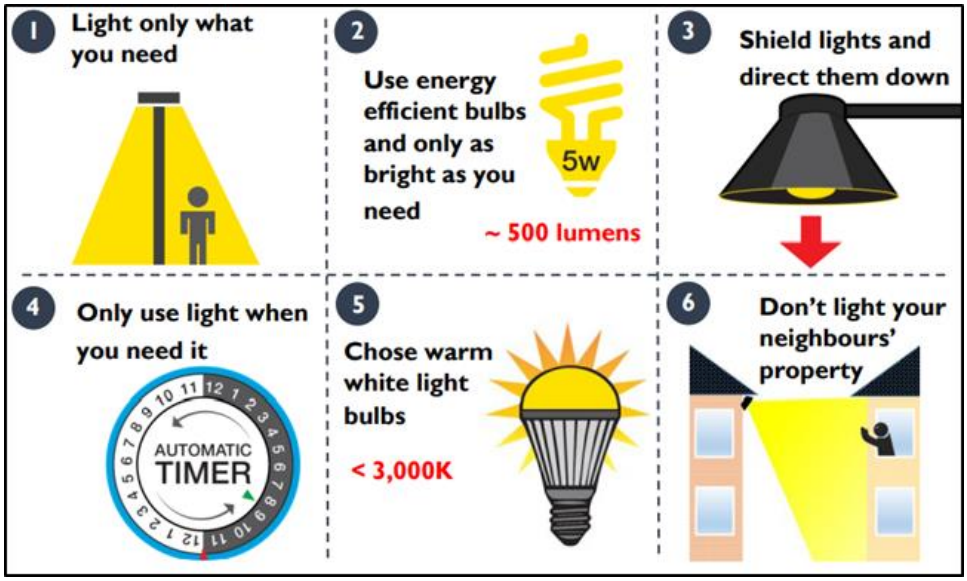

Figure 4 – Best principles for minor and domestic lighting – International Dark-Sky Association and South Downs National Park Authority

9.1.3 Domestic lighting and internal light spill can be relatively unobtrusive provided they are low powered and installed correctly. In addition to the above, the Institution of Lighting Professionals has produced further domestic guidance. ILP - GN09: Domestic exterior lighting: getting it right!. This short leaflet advises on appropriate lighting for the task in hand, providing the level of illumination required but not becoming a cause for concern to adjacent residents or affecting the natural environment. Figure 5 shows how applying such principles can improve dark skies across the Wye Valley National Landscape.

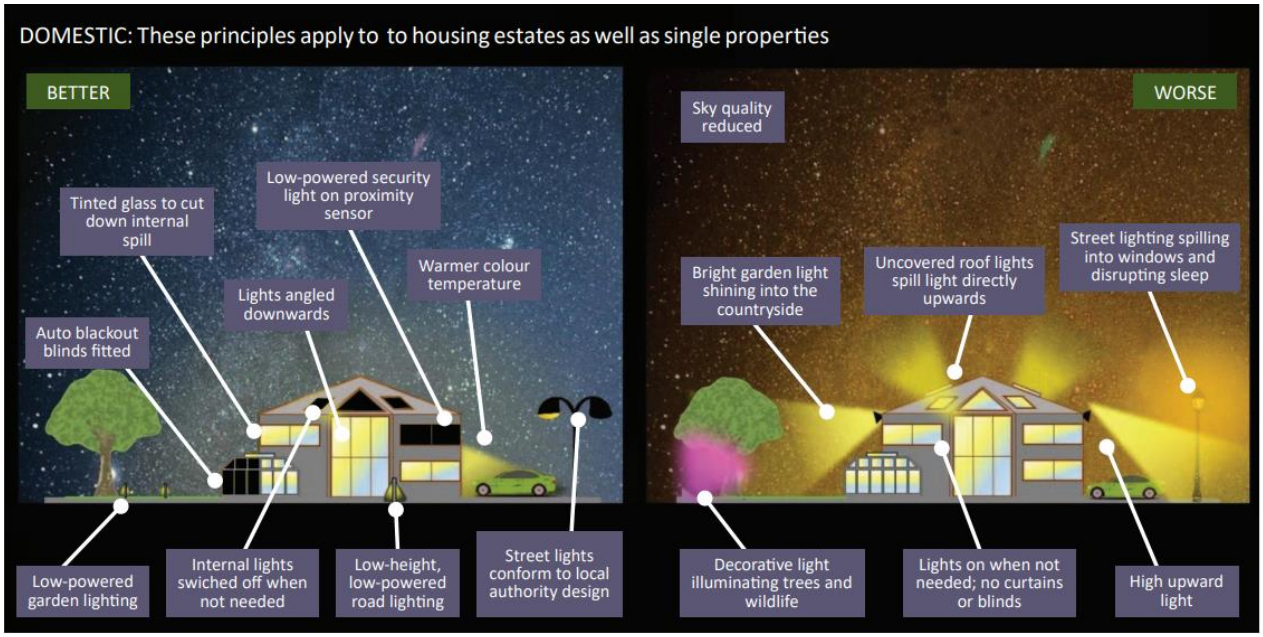

Figure 5: Minimising light pollution from domestic lighting (from South Downs National Park Authority: Dark Skies Technical Advice Note 2018)

9.1.4 Key considerations for external householder lighting includes:

- Nuisance to neighbours – Badly installed lighting will almost always annoy neighbours. Ensure lighting is 500 lumens or less, pointed downwards and away from other properties, and use proximity sensors to turn off when not needed. Install at the lowest practical height to reduce nuisance. If too powerful and proven to be disruptive, one may risk breaching environmental nuisance laws.
- Over lighting in domestic luminaires – While tempting to get value for money, many domestic options are over bright and too powerful for domestic purposes. 500-1000 lumens will be sufficient for most domestic uses and aesthetics. Overbright and badly directed light can also be a hazard to oncoming drivers as the glare could be dangerous. If needing more light to illuminate an area, it is better to use more lower powered lights rather than one over-bright luminaire.
- Using minor domestic style lights for small commercial needs – Commercial lighting needs are often guided by illuminance standards and often require a lighting designer but there may be circumstances where domestic and minor lights installed by the owner without using a lighting designer are more appropriate. For example, office doors, a shed entrance or a small pathway may require one single luminaire rather than a complex design. In these circumstances, this section on minor lighting and the section on commercial lighting should provide sufficient guidance to install the right lighting.
- Aesthetic lights – Whilst exterior lights do change the look and feel of a building or garden, it is important to do this with the ‘less-is-more’ adage in mind. Mood lighting

has a better impact when it can be clearly perceived and appreciated and not lost in unnecessary clutter. Garden wildlife and up lighting of trees should be avoided to benefit wildlife, especially with lighting over 500 lumens. However, using red colours will also help as it disrupts wildlife less and ensure to turn off when not needed.

9.1.5 Internal light spill through domestic glazing can also have a great impact on the night sky quality and the integrity of a dark landscape, particularly as architecture increasingly moves towards full height glazed elevations. If glazing is excessive, of poor quality or points upwards such as rooflights, internal light will present obtrusive light sources, reducing dark skies and disrupting the continuity of the landscape.

9.1.6 Figure 5 taken together with the following can help reduce visual landscape effects:

- Avoid sky lanterns.
- Appropriate visual light transmission (VLT) should be considered to reduce amount of light passing through glazing.
- Louvres can limit the glazing extent.
- Internal lights installed further away from glazing.
- Curtain and blinds used.
- Glazing extent meets thermal efficiency building regulations.
- Interior lighting should be compliant with BS workplace standards.
- High gable glazing should be avoided.
- Automated black out blinds used.
- Reduce number of rooflights.

9.1.7 Key considerations for internal light spill include:

- Visible Light Transmission (VLT) is the amount of light that passes through glazing. The VLT level can be selected to reduce the amount of internal spill. For domestic glazing, a VLT of 0.65 is preferred with 0.5 for roof lights.
- The use of automated black out blinds can considerably reduce the amount of internal light spill from rooflights. Some manufacturers produce smart systems that trigger on the onset of darkness and can be controlled from mobile devices. There is a need to ensure that the fabric eliminates all internal spill. Exterior louvres can be used and may be preferred for walled glazing rather than rooflights.
- Excessive glazing can cause thermal issues as large extents of glazing that let in a large amount of solar radiation can cause houses to overheat. Building regulations require that glazing should not exceed 25% of the floor area to meet energy efficiency building regulations (depending on thermal properties of the glass). This can be avoided by reducing the glazing extent or using external shielding/blinds to reduce

solar input. Modern glazing is improving thermal regulation, but limits to the glazing should be considered.

- Large continuous areas of glazing can cause obtrusive landscape impacts. The modern 'grand design' to have large glass walls and gable ends to new dwellings and barn conversions means there is considerable potential for internal domestic light to 'spill out'. Linear extents with high levels of internal lighting can be highly visible within a landscape, especially from view tops. Consideration should be given to reduce this impact by adopting a more characteristic design process, reducing the glazing extent or using external louvres or shielding to reduce the landscape impact.
- Turn off internal lights when not needed.
- For new development or when considering alterations/extensions, design internal lighting away from windows.

9.1.8 **Recommendations**:

- The Wye Valley National Landscape Partnership advises that whilst domestic lighting may not normally require planning permission, consideration in plan-making and decision-making should have regard to Section 9.1 of this position statement and the following specific material lighting considerations:
    - Lighting of 500 lumens or less is only needed for most domestic uses, with shielding above 500 lumens.
    - Downward pointing luminaires is required with no upward light ratio.
    - Less than or equal to 3000K Colour Correlated Temperature (warm white) though ideally 2700K should be secured.
    - Have a clear purpose and illumination area.
    - Switch lighting off when not needed.
- Within any planning application, applicants should ensure to include and make clear:
    - Justification for the lighting describing the relevant task areas.
    - Lumen and Colour Correlated Temperature levels are provided.
    - Pictures/details of the proposed luminaires are provided.
    - Any deviation from best practice, e.g. using heritage style lanterns on listed buildings, is given and clearly justified.
    - Lighting is not obtrusive under ILP GN01 guidance to neighbours.
- The Wye Valley National Landscape Partnership recognises that internal light can also lead to significant landscape and visual effects through glazing and other transparent surfaces. Users can reduce the impact of internal light spill by:
    - Using an appropriate visible light transmission (VLT) solution.
    - Limiting the scale, continuity and size of the glazing.
    - Using automated black-out blinds on rooflights.
    - Using curtains and blinds to reduce internal spill.
    - Switch lighting off when not needed.

9.2 **Commercial and Industrial**

9.2.1 Many of the key points for reducing light pollution from domestic/householder (Section 9.1) applies to both commercial and industrial uses but there are some differences. Commercial developments present some of the largest challenges to a dark landscape. Owners tend to install their own lighting, assuming more is better and offering a competitive advantage. However, due to these assumptions, commercial properties often install over bright artificial lighting, generating numerous sources of artificial light pollution. Common problems include festoon lighting, overbright and upward light, floodlighting over bright and badly installed, building luminance not directed, façade high level aesthetic lighting, trees up-lit, excessive clutter and up-lights above 500 lumens.

9.2.2 It is considered that applying these key points for small business lighting can still achieve intended outcomes without adversely contributing to artificial light pollution:

- Shielding lights above 500 lumens;
- Use proximity sensors or timers;
- Angle lights downwards;
- Turn off at close of business;
- Avoid uncontrolled decorative lighting

9.2.3 It would also be appropriate to apply these key considerations for industrial lighting:

- Design scheme in accordance with best standards;
- Turn off when not needed;
- Angle lights downwards;
- Situate further away from rural locations;
- Avoid tall lighting columns in open areas

9.2.4 Figures 6 and 7 visually show how light pollution could be minimised for both commercial and industrial lighting.

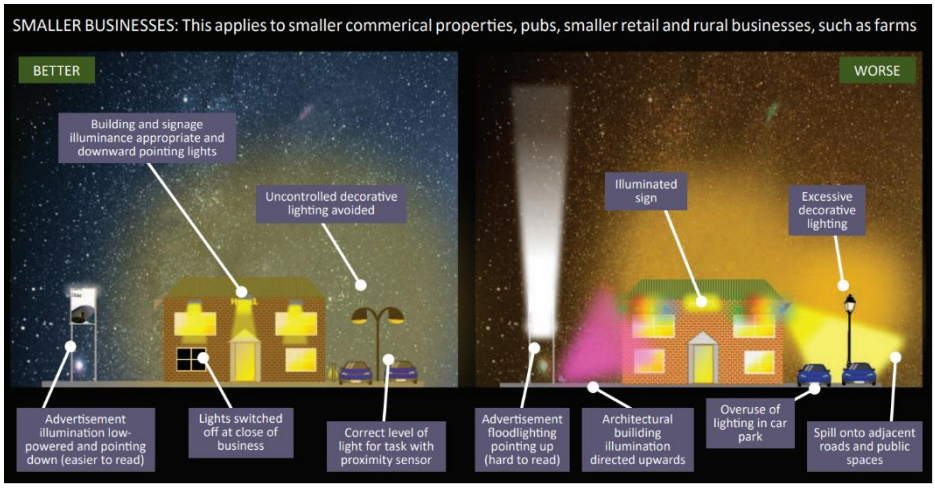

Figure 6 – Minimising light pollution from commercial lighting (from South Downs National Park Authority: Dark Skies Technical Note 2018)

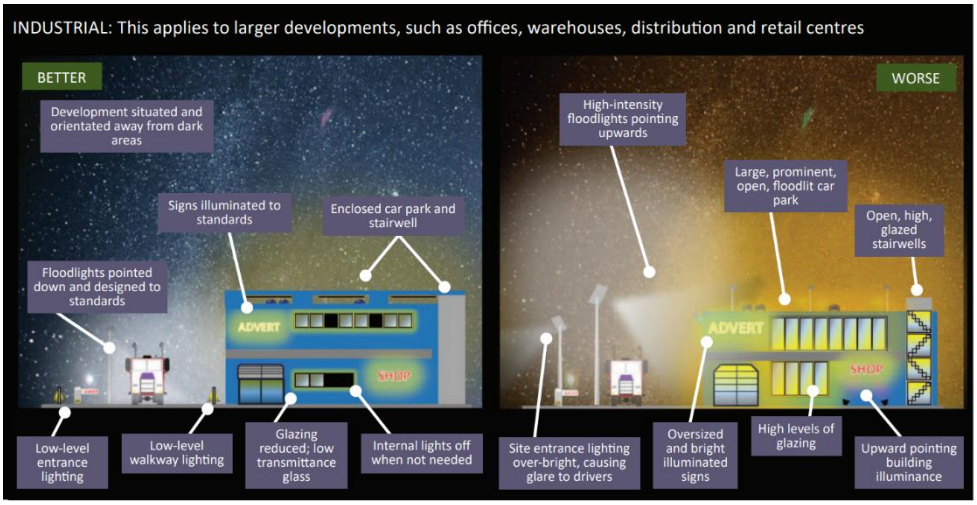

Figure 7 – Minimising light pollution from industrial lighting (from South Downs National Park Authority: Dark Skies Technical Note 2018)

9.2.5 Commercial lighting is different from normal domestic lighting because it tends to have a greater impact and owners may be obligated under a ‘duty of care’ or insurance needs to provide lights for other users. It is also often on a larger scale, using multiple light sources and more complex. This means that they should consider a professionally led design because they may need to achieve more precise levels of illuminance, reduce pollution and light to meet the needs of users, seeking the professional input from a qualified lighting designer.

9.2.6 There are also important principles to consider on non-domestic lighting and luminaires. Whilst the advice for domestic users is still applicable to non-domestic uses, there are additional principles that should be followed:

- Upward light ratio – Under ILP GN01/23, designs should calculate the upward flux ratio, which allows the effect of both direct and reflected components of the whole installation to be considered. It accounts for the contribution of the reflectance from the illuminated area and spill areas and ensures that the overall level of upward light aims to reduce the impact of sky glow.
- Asymmetric luminaries – Asymmetric luminaires are very useful in controlling lighting, particularly in non-domestic settings. These luminaires have optics that internally bend the emitted light from the lamp and direct it to specific areas reducing waste light, for example long thin paths. Symmetric luminaires have no directing optical controls which means that the light is distributed more evenly over wider angles, usually 120 degrees. The benefit of asymmetric lights is that they can be installed flat so upward light and spill is reduced. They can also be installed at a lower height as the light is more efficient in illuminating the right area. Many new LEDs in streetlights and floodlights have asymmetric beams to achieve more efficient illuminance standards.
- Illuminance appropriate and visual impact – Higher levels of illuminance will be more prominent in darker landscapes, introducing more adverse levels of visual effect. Regardless of the efficiency of the lighting scheme to reduce obtrusive light, the residual level of luminance (the light coming from a surface) which cannot be avoided, may still present an inappropriate visual impact. Generally, illuminances levels (light shining on a surface) of over 10 lux will begin to create a noticeable luminous landscape impact. While much depends on the size, extent and intensity of a lighting scheme, illuminances requirements over 10 lux may need to be avoided due to the inherent harm.

9.2.7 To aid the assessment of non-domestic planning applications, it is encouraged that applications ensure that key information is clearly expressed in any lighting design. Equally, decision-makers should be able to understand and access the same metrics to make an assessment.

9.2.8 Larger scale commercial lighting can have a large impact due to scale, use and requirement. A lighting designer is needed in nearly all cases. The range of luminaires used can be complex to meet the needs of illuminance standards for different work and public areas. Bulkhead, street, floodlight, bollards and advertisements are all typically used, all requiring a specific purpose and need. Luminaires are often mounted at increased height (up to 15 metres) and will be more powerful to ensure illuminance levels under British Standards BS EN 12464-2 2014 Light and Lighting of workplaces, are met. The levels of illuminance can be higher than most single commercial designs and over wider areas. This means that the generated sky glow is larger and more intense, and the visual intrusion of lights can have wider landscape impacts. Larger, glazed buildings and industrial complexes can generate significant internal spill, particularly if larger single elevations are used that appear as linear blocks of light in the landscape. There may also

be additional impacts from increased traffic flow, particularly if the development is new. The light of headlights can create noticeable landscape impacts even though the effect is temporary.

9.2.9 **Recommendations:**

- In respect of commercial and industrial lighting, the Wye Valley National Landscape Partnership recommends that consideration in plan-making and decision-making should have regard to Sections 9.1 and particularly 9.2 of this position statement and the following considerations:
    - Shielding of lights should be used above 500 lumens;
    - Use proximity sensors or timers;
    - Angle lights downwards;
    - Turn off lighting at close of business;
    - Avoid uncontrolled decorative lighting;
    - Situate further away from rural locations;
    - Avoid tall lighting columns in open areas.
    - Upward light ration, asymmetric luminaries and illuminance appropriate.
- Within any planning application, applicants should ensure to include and make clear, in consultation with a lighting designer as appropriate:
    - Justification for the lighting describing the relevant task areas
    - Lumen and Colour Correlated Temperature levels are shown.
    - Pictures/details of the luminaires are provided.
    - Any deviation from best practice, e.g., using heritage style lanterns on listed buildings, is given and clearly justified.
    - The design scheme to be in accordance with best standards, ensuring that upward light is zero, consideration of asymmetric luminaries and visual impacts.

9.3 Car Parking, roads and paths

9.3.1 Car parks may need lighting as they either need to provide adequate light for workers or for the public pedestrians walking to and from their vehicles. The level of illumination depends on the location of the parking and level of use, although only if lighting is justified in the first instance.

9.3.2 If lighting is justified, small, quiet car parks in rural areas should have a recommended 5 lux-maintained average with larger car urban parks receiving 15 lux preferably using bollard lighting rather than column mounted luminaires. Proximity sensors should also be used. For illuminance levels, refer to BS EN 12464-2:2014. Road or path lighting may also be required which needs to comply with design requirements of

road lighting, covered in BS 5489-1-2020 – TC and BS EN 13201-2: 2015 - TC – Road Lighting Performance requirements.

9.3.3 In addition to the considerations identified under the domestic, commercial and industrial lighting sections in 9.1 and 9.2 of this position statement, specific key considerations for car park lighting includes:

- Over lighting – glare-intense luminaires installed badly can create glare issues for users. This can be a particular issue when lights point directly towards entrances where oncoming vehicles users may suffer glare, increasing the potential of harm to other users and amounting to a statutory nuisance.
- Over illuminance – Many non-designer led car parks tend to use lights that are over bright for the appropriate illuminance and situation. This will increase the surface luminosity and sky glow impact. Luminaire power should be appropriate for the level of illuminance (refer to Table 1).
- Asymmetric Luminaires: Upward light – As car park floodlighting typically uses higher strength luminaires, there is more availability to use asymmetric luminaires than symmetric. Asymmetric luminaires will direct the light better and avoid the potential for creating upward light.
- Bollards or poles – Low level bollards are also useful as they reduce the height of luminaires, reducing intensity. However, bollards can be susceptible to damage and don't spread the light as effectively over larger areas than pole mounted lights. Care should be taken to use bollards in appropriate spaces, or as navigation aids around the parking area.
- Ecological and Landscape Visual Impact – Car parks can be quite large, well-used and require high pole mounted luminaires. The visual impact on the landscape and ecology can be high and often adverse. Although car park lighting can comply with standards, the overall presence of the lighting can produce significant residual impacts that may be difficult to overcome. Additional mitigations should include using a CCT of 3000K and under to reduce sky glow, shielding prominent and potentially obtrusive luminaires from view and – importantly – using timers or sensors to ensure that lights are off when not needed.
- Upward Flux – ILP GN01 21 assumes that amenity lighting is not expected in the National Landscape. While this may be difficult in practice, as there is a legislative driver to provide lighting for public car parks, every effort should be made to use low reflectance surfaces for new car parks to reduce the creation of sky glow and the upward flux ratio. The overall landscape impact, including the residual impact will also determine the acceptability of amenity lighting in these zones.
- Architectural Façade Lighting – The intentional illumination of building facades should be avoided, especially in rural areas where the luminance of buildings can be very

prominent in the landscape. Modern alternatives such as low powered unobtrusive window lighting, should be considered.

- Walkways and bulkheads – Avoid circular or other “window” shaped bulkhead lights that emit light upward. Use bulkhead lights that direct light downwards or have shielding. Ensure that emergency luminaires on batteries follow these principles.
- Historic environment – Any successful lighting design scheme must involve artistry as well as technical expertise. The main objectives of a good external lighting scheme should be to create the desired aesthetic presentation of the building and its surroundings; to give a building an added dimension and greater night time presence and which enhances its key architectural features as well as its social and heritage significance; to elevate the ‘after darkness’ experience and promote a more inclusive and safe night-time local economy with more people enjoying a vibrant cultural life; to improve and promote the observation and experience of the heritage building or setting against the night sky; to ensure that the right quality, quantity and colour of light is used to give the best lighting experience; to ensure that the daytime view of the building or space is not marred by poorly located electric light units (which are technically called ‘luminaires’); and that sufficient protection against potential vandalism to the installation has been taken.

9.3.4 **Recommendations:**

- In respect of car parking lighting, the Wye Valley National Landscape Partnership recommends that consideration in plan-making and decision-making should have regard to Section 9.3 of this position statement and the following considerations:
    - Lux should be the following, depending on usage:
        - High usage: 20 lux,
        - Medium: 10 lux
        - Low: 5 lux
    - Over lighting – glare and illuminance;
    - Asymmetric luminaires – upward light;
    - Bollards and poles;
    - Ecological and Landscape Visual Impact; and
    - Upward Flux – Amenity Light.
- Within any planning application, applicants should therefore ensure to include and make clear, in consultation with a lighting designer:
    - Justification for the lighting describing the relevant task areas
    - Lumen and Colour Temperature levels are shown.
    - Pictures of the luminaires are provided.
    - Any deviation from best practice, e.g., using heritage style lanterns on listed buildings, is given.

- Design scheme in accordance with best standards, ensuring that upward light is zero, asymmetric luminaries and consideration of visual impacts.
- Within any planning application, the Wye Valley National Landscape Partnership would expect to see the following specific details provided:
  - Location of supporting columns
  - Mounting height of luminaire
  - Tile angle of luminaire – 0-degree tilt with luminaire parallel to ground
  - Detail of precise type of luminaire
  - Wattage or colour correlated temperature (degrees kelvin) of luminaire
  - Colour of supporting columns
  - Any cowling to prevent back-spill or upward spill (although not required if tilt angle is 0 degrees).

9.4 Farms

9.4.1 Farms have some permitted development rights for lighting on existing buildings, which means that luminaires could be installed that have little consideration for design. Due to their rural location, the contrast between a dark landscape and lighting means that the visual impact can often appear relatively higher than urban settings. Principles of good lighting should be followed to avoid landscape impacts.

9.4.2 As a farm is a place of business, owners must be careful to illuminate different areas of the farm properly. According to HSE Lighting at work HSG38 and British Standards BS EN 12464-2 2014 *Light and Lighting of workplaces*, farmyards have two general areas of varying illuminance:

- Farm-yards: with moving vehicle, machines and people – require 20 lux average
- Equipment sheds and Animal sorting pens: with movement in hazardous area – require 50 lux average.

9.4.3 Other lighting criteria such as uniformity, glare and CRI values are also recommended in BS EN 12464-2 2014. This provides some LED purchasing recommendations for achieving different illuminance levels for simple applications. Larger, complex and more hazardous areas may need a lighting designer.

9.4.4 Specific key considerations for farms also includes:

- Farmyard Floodlighting – Lighting of farmyards is usually achieved with area floodlights. It is important to consider asymmetric luminaires to reduce upward light and ensure glare is not an issue. Badly installed bright lights can cause glare issues where unwanted visitors and workers can become hidden – this is also a safety, security and crime issue. They can also cause significant visual intrusion in a dark landscape, which can be detrimental to wildlife and visual intrusion. Areas that are

more hazardous or have more conflicted uses with people and machinery should receive greater attention. Floodlights should be installed at the lowest practical height to achieve the illumination (refer to Table 1).

- Farm Building Roof Lights and Greenhouses – Greenhouses, open barns, polytunnels or sheds with large amounts of glazing and roof-lights can introduce significant visual impacts. Whilst natural light and artificial light is important to operate in all hours, internally installed luminaires should be lower than roof lights to avoid direct upward light spill. For new buildings and improvements, black out blinds should be considered to activate upon the onset of darkness. This is particularly important for greenhouses as the internal light spill can reduce sky quality for many miles. Operational open barn elevations may be more difficult to shield due to the need for natural light during the daytime. External louvres can be used in addition to turning off lights at night when they are not needed, all of which can benefit farm animals.
- Wildlife – The rural location of farms means that they will be surrounded by wildlife and darkness where even the smallest lights can be more visually obtrusive than urban settings, even having effects on farmers' own animals. As a growing amount of evidence is showing, light pollution disrupts wildlife just as much as people. As such, it is important that lights do not unnecessarily illuminate or shine into wildlife area, waterways and the open countryside.
- Ecological and Landscape Impact Assessment – Due to the location of farms in the rural landscape, an ecological and landscape impact assessment such as the Institution of Lighting Professionals Guidance on undertaking environmental lighting impact assessments should be undertaken. For more remote farms away from the urban fringe, consideration to the wider environment should be made and should include an assessment of the impact through ecological receptors and the view from the surrounding landscape. More consideration of the illumination levels, hours of use and intensity should be considered.
- Lighting for Security – Security is undoubtedly an important consideration for a farm. The document 'Secured By Design – Lighting Guide' by the Police gives general advice for security lighting. However, such lighting should be considered carefully and complemented by supplementary systems, e.g., smart alarms. Any lighting should still be of the right brightness, colour to avoid upward light spill.
- Other Considerations – Farms may also require lighting for car parking, roads, advertisements, small business premises or ménage lighting. Other good and bad practices chapter should be referenced when considering such lighting schemes. Likely references will include small commercial lighting, parking and roads/paths.

9.4.5 Luminaire Advice

- Area Floodlights – Avoid symmetrical halogen security lights with high colour temperatures and a fixed PIR Sensor. Use tiltable warm white LED lights with a separate PIR sensor. You can position PIR sensors to trigger for people not wildlife.
- Temporary Floodlights – Lights on mobile generators should follow good practice. Care should be made to ensure that the lights are pointing downward, and the minimum amount of light is used to perform the task. Temporary lights can be capable of producing very high brightness to cover many different tasks. Try and use as few individual lamps as possible.

9.4.6 **Recommendations:**

- In respect of farm lighting, the Wye Valley National Landscape Partnership recommends that consideration in plan-making and decision-making should have regard to Section 9.4 of this position statement and the following considerations:
    - For farm-yards with moving vehicle, machines and people, this requires a 20 lux average
    - For equipment sheds and animal sorting pens or with movement in hazardous area, this requires a 50 lux average.
    - Over lighting – glare and illuminance;
    - Asymmetric luminaires – upward light;
    - Farm building rooflights and greenhouses;
    - Ecological and Landscape Visual Impact;
    - Lighting for security; and
    - Upward Flux – Amenity Light.
- Within any planning application, applicants should therefore ensure to include and make clear, in consultation with a lighting designer:
    - Justification for the lighting describing the relevant task areas
    - Lumen and Colour Temperature levels are shown.
    - Pictures of the luminaires are provided.
    - Any deviation from best practice, e.g. area and temporary floodlight luminaire advice, is given.
    - Design scheme in accordance with best standards, ensuring that upward light is zero, asymmetric luminaries and consideration of visual impacts.

9.5 Sports

9.5.1 Amenity floodlighting, particularly sports pitches, are one of the biggest threats to dark skies. Such lighting has a very high impact in dark sky places and a lighting designer is needed. These developments often reduce sky quality and can be seen for miles in the surrounding landscape. This is due to the high illuminance and colour needs to enable users to play safely. Luminaires are often installed at high levels to ensure correct illuminance even with asymmetric lights, which means the lamps can be very bright and

visible. As such, the lowest practical mounting height should be used in achieving the designed illuminance. Different sports require different levels of illuminance and colour depending on the skill level, intensity and ability to see play. Community level sports, such as football tennis and hockey, will require illuminance levels of 300 lux with appropriate uniformity of around 0.7. Lighting requirements can be found in the Sports England Artificial Lighting Guide 2012.

9.5.2 Horse arenas and equestrian ménages can also have a significant impact on the dark rural landscape. The illuminances needed can range from 100 to 500 lux (BS EN 12193) and can be very prominent even if low reflectance material is used. A lighting designer should be used to ensure that luminaires are installed correctly, and suitable curfews are used. Luminaires should not be erected 'ad-hoc' on existing structures as they will probably not achieve appropriate illuminances and limit obtrusive light. Using trees as fixing points should also be avoided. Temporary lighting should not be used as the luminaires are general in purpose and will not be appropriate for this type of activity. Within any planning application, the following details should be provided:

- Location of supporting columns
- Mounting height of luminaire
- Tile angle of luminaire – 0-degree tilt with luminaire parallel to ground
- Detail of precise type of luminaire
- Wattage or colour correlated temperature (degrees kelvin) of luminaire
- Colour of supporting columns
- Any cowling to prevent back-spill or upward spill (not required if tilt angle 0 degrees).

9.5.3 Further specific key considerations in respect of sports and arena lighting include:

- Nuisance – Sports lighting near residential areas can cause nuisance due to intensity and glare. Designs should reference ILP GN01 (2021) 'The reduction of obtrusive light' which recommends levels of intrusion into windows and boundaries.
- Sky Glow: Asymmetric Sports Lights – High powered symmetric lights can cause significant sky glow, particularly if the main beam points to the middle of the playing surface. Modern asymmetric LEDs should be used to direct light more efficiently without causing upward light. They are designed to be installed flat and at the correct lowest height to reduce intensity and upward light.
- Colour in Sports Lighting – Sports illuminance needs a high level of colour rendition index (CRI) to allow players to sight the play properly and pick a ball out from the background. This means that higher colour temperature LED (5000K+) are often used to achieve higher colour rendition which exacerbates the impact of skyglow as the light penetrates further into the atmosphere. This effect can be avoided as modern

LEDs have much better range of colour rendition with lower colour temperatures which is stated on the product specification. CRI levels of 60 are normally required for most community levels of play. The spectral range should also be checked to avoid blue colours with higher colour temperature needs.

- Landscape Visual Impact on Special Qualities – Due to the higher levels of illuminance, sports pitches can have a significant impact on the National Landscape and the Special Qualities even if the design of the lights is compliant with standards. For example, a pitch may have compliant lighting in terms of illuminance, colour rendition and colour temperature but due to the light presence of the illuminated surface, it can create a significant visual landscape impact. The residual impact could be of such significance that it may present a threat to dark skies and may need to be reconsidered or avoided.
- Upward Flux – ILP GN 01/21 assumes that sports lighting is not expected in National Landscapes such as the Wye Valley. Whilst this may be difficult in practice, every effort should be made to use low reflectance surfaces to reduce the creation of sky glow and the upward flux ratio. The overall landscape impact, including the residual impact, will also determine the acceptability of sports lighting in these zones. It is always preferable to site sports lighting in urban areas where it is accessible and has a much-reduced impact due to the high ambient lighting level.

9.5.4 **Recommendations**:

- In respect of sports lighting, the Wye Valley National Landscape Partnership recommends that consideration in plan-making and decision-making should have regard to Section 9.5 of this position statement and the following considerations:
    - Over lighting – glare and illuminance;
    - Nuisance;
    - Sky Glow;
    - Asymmetric luminaires – upward light;
    - Ecological and Landscape Visual Impact, particularly on Special Qualities;
    - Colour Temperature; and
    - Upward Flux – Amenity Light.
- Within any planning application, applicants should therefore ensure to include and make clear, in consultation with a lighting designer:
    - Justification for the lighting describing the relevant task areas
    - Lumen and Colour Temperature levels are shown.
    - Pictures of the luminaires are provided.
    - Any deviation from best practice, is given.
- Design scheme in accordance with best standards, ensuring that upward light is zero, asymmetric luminaries, smart switches, and consideration of visual impacts and cultural heritage and the historic environment.

- Within any planning application, the Wye Valley National Landscape Partnership would expect the following details to be provided:
    - Location of supporting columns
    - Mounting height of luminaire
    - Tile angle of luminaire – 0-degree tilt with luminaire parallel to ground
    - Detail of precise type of luminaire
    - Wattage or colour correlated temperature (degrees kelvin) of luminaire
    - Colour of supporting columns
    - Any cowling to prevent back-spill or upward spill (although not required if tilt angle is 0-degrees).

9.6 Illuminated advertisements

9.6.1 Although subject to separate regulations, steps should be taken to illuminate advertisements only when needed, using low powered downward lights, such as LED strips. If you wish to install an illuminated advertisement, it is likely to need advertisement consent and possibly Listed Building Consent (if property is listed). Nevertheless, illuminated advertisements would be discouraged throughout all areas of the Wye Valley National Landscape, particularly in Conservation Areas or if it relating to a designated heritage asset.

9.6.2 If the local planning authority considers the advertisement necessary, then it should: be no higher than the property; not face towards areas of darkness; use lights that point down; use low-powered lights; and be switched off at the close of business.

9.6.3 Where an advertisement sign does not need illuminating, the local planning authority may make this a condition of the consent, so that lighting cannot be added later on. The luminance of lights is addressed in ILP PLG 05: The Brightness of Illuminated Advertisements.

9.6.4 **Recommendations**:

- The Wye Valley National Landscape Partnership does not recommend illuminated advertisements be installed in the National Landscape.
- If a local planning authority considers an advertisement necessary, then it should:
    - All illuminated advertisements installed on properties should be switched off on close of business.
    - Any installations on properties should not exceed the height of the property.
    - Any peripheral sites with installations should not face towards areas of darkness or lower environmental zones.
    - Up lighters should not be used.

- Where advertisement consents are granted that do not need illumination, the Wye Valley National Landscape Partnership recommends that decision-makers make this a condition of any such consent.
- There is a need to also consider heritage implications, particularly where a (non-)designated asset and its setting is being considered as part of an advertisement both directly and indirectly.

9.7 Temporary Lighting

9.7.1 Temporary lighting impacts should be part of the core planning for any project. Users should apply the following good practice to minimise light pollution and potential nuisance to others:

- Ensure that the power and installation of the equipment are appropriate for the task.
- Use lights with 3000K or less.
- Switch off the lighting when not in use.
- Avoid temporary lighting in the winter months when the impact is greatest due to the longer, darker nights, and the lack of deciduous vegetation acting as a barrier.
- Avoid using sources of light that penetrate deep into the sky, such as scanners or lasers.
- Where possible, use existing lit access routes to reduce the need for additional lighting.
- Keep light festivals to urban areas where there is already a high level of sky glow.

9.7.2 Other key considerations in respect of temporary lighting:

- Illuminance levels – The illuminance of areas should be appropriate for the task with reference to British Standards BS EN 12464- 2 lighting of outdoor workplaces. Care should be taken to ensure that the minimum amount of light is provided to workers, but it is not over illuminated. The choice of LEDs power should reflect this.
- Upward Light – All lights should be pointing downwards to avoid the generation of sky glow. Fixtures that cannot be adjusted downwards should be avoided.
- Colour Temperature – High colour correlated temperatures above 3000K should be avoided. LEDs with 3000K should have sufficient CRI to achieve lighting requirements for CCTV.
- Security and night lights – Care should be taken to ensure that any security lights are on suitable timers and sensors to trigger on the detection of movement. Construction tasks lights should be off at close of work leaving only essential security lighting that should comply with lighting requirements on upward light and colour temperature.
- Using a lighting designer – A lighting designer can produce an appropriate lighting plan that achieves illuminance levels but does not necessarily pollute the sky. The

construction lighting should be considered within a landscape and visual impact assessment (LVIA) or landscape and visual appraisal (LVA) and within the lighting plan luminaire details.

9.7.3 **Recommendations**:

- In respect of temporary lighting, the Wye Valley National Landscape Partnership recommends that consideration in plan-making and decision-making should have regard to Section 9.7 of this position statement and the following considerations:
    - Over lighting – glare and illuminance;
    - Illuminance levels;
    - Asymmetric luminaires – upward light;
    - Ecological and Landscape Visual Impact, particularly on Special Qualities;
    - Colour Temperature of 3000k or less; and
    - Security and night lights.
- Design scheme in accordance with best standards, ensuring that upward light is zero, asymmetric luminaries, smart switches, and consideration of visual impacts, along with cultural heritage and the historic environment.
- Lighting designs should be in accordance with the British Standards for exterior lighting (BS5489).

9.8 Street Lighting

9.8.1 Illumination of residential roads is generally the responsibility of the Local Highways Authority (usually the County Council) or the relevant National Highways Agency for larger/strategic roads. Lighting that is in the public domain has been receiving close attention and scrutiny in recent years.

9.8.2 New developments that require street lighting should comply with the Local Authority's Lighting design guidance for ongoing maintenance. The installation of street lighting for roads is not a legal requirement and you don't have to provide lighting unless there is a clear safety need, and it is justified. However, if lighting is installed, there is a legal responsibility for the owners to maintain it according to British Standards. As such, a lighting designer should be consulted.

9.8.3 The design requirements of road lighting are covered in BS 5489-1-2020: Design of road lighting and BS EN 13201-2:2015 – Road Lighting Performance requirements. Lighting of roads and public amenity areas - Code of practice. The illuminance of roads depends on the traffic use and the mix of pedestrian needs, (road class). Both standards should be used to determine road class.

9.8.4 Key considerations in respect of street lighting include:

- Justification – Streetlights are a key determinant of sky quality, so it is important that there a clear, essential need for the lighting. Adding streetlights is often an ‘expectation’ but this should be assessed for actual need. The need for lighting could be avoided with effective consideration at the initial development design phase.
- Low Mounting Height: Bollards – For quiet residential access roads or pathways, low bollards could be used instead of higher column mounted streetlights. Bollards will help reduce the source intensity and visibility whilst keeping illuminance levels. Spill can also be limited using asymmetric optics. Bollards also reduce the generation of sky glow as the lamp is relatively less bright than pole/column mounted lights. Bollards should be used in areas where the risk of vehicular damage or vandalism is low. The Secured by Design guide provides more information.
- Illuminance Curfews – Modern LEDs can be dimmed down to achieve different levels of illuminance. As roads and paths will have a mixed level of usage, it is recommended that LEDs be dimmed to different road classes that reflect the changing use. Lights can also be subject to a part-night lighting regime where some lights are switched off when usage is low. Whilst consultation is needed to achieve this, it will reduce the night-time impact, saving money and energy.
- Colour Correlated Temperature – Some LEDs will have high colour correlated temperature and a blue-white spectrum. They should be avoided as they contribute to the sky glow effect. The British Standards refer only to Colour Rendition levels (CRI) rather than colour correlated temperature, as colour rendition can be achieved with different levels of colour correlated temperature. In this respect it is recommended that colour temperatures of 3000K and 2700K, with low blue-light should be used in achieving British Standard CRI levels.
- Low reflectance surfaces – Road and path materials reflect light differently. To reduce the indirect scatter of lights, low reflectance road and path surfaces should be used to reduce the light scattering into the atmosphere. Black and dark grey asphalt has a much lower reflectance compared to grey cement concrete.
- Lighting for wildlife corridors – In some places, road lighting may need to be installed close to highly sensitive wildlife routes, where priority species, such as bats, may be disrupted by lighting. Following examples from other places in the UK, such as Worcestershire, red luminaires could be used.
- Upward Flux – ILP GN01/21 assumes that road lighting is not expected in the Wye Valley National Landscape. Whilst this is difficult in practice, accounting for the strategic position of the Wye Valley in proximity to strategic towns and cities, every effort should be made to use low reflectance surfaces to reduce the creation of sky glow and the upward flux ratio. The overall landscape impact, including the residual impact will also determine the acceptability of road lighting in these zones.

- Street lighting designs – to include equipment specifications and a set of lighting intensity calculations, including lighting level contours, but not necessarily beam orientation.

9.8.5 It is not always necessary to have street lighting in a development. Where larger developments require street lighting, it can be designed to minimise artificial light pollution including features like dimming or part-night schemes. In some situations, the use of full cut-off, low-level bollards may be more appropriate than tall, brighter columns. This will limit the total lumens output and possible glare, scattering and reduce the impact of lighting on the surrounding area. The ILP Guidance Note 1 for the reduction of obtrusive light references British Standards on road lighting.

9.8.6 The ever-increasing cost of electricity has caused many councils to reconsider keeping inefficient streetlights on all night, and many are now turning them off. Large amounts of money and energy have been saved, and councils' carbon footprints have partly been reduced. Trials have shown that energy-saving dimming (to over 30%) is hardly noticed by residents[20]. Concerns are often expressed that turning off streetlights could lead to an increase in crime. However, a study published in the Journal of Epidemiology and Community Health in 2015 found little evidence of harmful effects of switch-off, part night lighting, dimming or reducing the colour temperature (kelvin) on road collisions or crime in England and Wales[21].

9.8.7 Technology also enables lighting to be off or dimmed until movement is registered and the brighter light needed. Low-energy LED lights should be 3000K or below (warm white) to prevent any adverse effects on animals and humans[22].

9.8.8 **Recommendations**:

- In respect of street lighting, the Wye Valley National Landscape Partnership recommends that consideration in plan-making and decision-making should have regard to Section 9.8 of this position statement and the following considerations:
    - The installation of street lighting for roads not a legal requirement and should only be installed unless there is a clear safety need. However, if lighting is installed, there is a legal responsibility for the owners to maintain it according to British Standards.
    - Potential use of low mounting height bollards in preference to tall columns.
    - Illuminance Curfews and dimming/switching off streetlights.
    - Colour Correlated Temperature of 3000K and 2700K, with low blue-light should be used in achieving British Standard CRI levels.

[20] https://britastro.org/dark-skies/pdfs/CfDS1703_E5_Good_Lighting_Guide.pdf

[21] https://jech.bmj.com/content/69/11/1118

[22] Worcestershire County Council recently installed bat-friendly, red streetlights along a 60 metre stretch of the A4440, near to Warndon Wood. The road is a flight path for bats and white streetlights disrupt their feeding, especially the rarer, slower-flying species. Yet, red lights are proving to have little or no adverse impact on them.

- Low Reflectance surfaces – black and dark grey asphalt has a much lower reflectance compared to grey cement concrete.
- Lighting for Wildlife Corridors – where road lighting may need to be installed close to highly sensitive wildlife routes, where priority species, such as bats, may be disrupted by lighting.
- Upward Flux.
- Consideration of both cultural heritage and the historic environment.
- Street lighting designs – to include equipment specifications and a set of lighting intensity calculations, including lighting level contours, but not necessarily beam orientation.

- The Wye Valley National Landscape Partnership would encourage the de-lighting and subsequent removal of street lighting, in instances where it is no longer justified.

9.9 Telecommunications

9.9.1 Tall structures like telecommunications masts can have more significant impacts in views as they are discernible at considerable distances in favourable weather conditions, typically project above the skyline, and can stand out in their colour in the otherwise muted earth tones of the landscape. Such manmade features and vertical elements are rare and can have consequences for the perceptions of the landscape as wild and remote which are fundamental to the purposes of the AONB designation, which can be further undermined by the introduction of lighting.

9.9.2 Considering the design of the network means being able to choose options that have the lowest overall impact. Advances in technology or developments in the network have been able to rationalise equipment: remove redundant, prominent or intrusive elements. The advancement of share masts unless this leads to unacceptable levels of clutter on an individual mast, has been increasingly considered.

9.9.3 Consider whether lighting is necessary at all on telecommunication masts, and if it is, where it is needed and why.

10. WYE VALLEY NATIONAL LANDSCAPE AMBIENT LIGHTING ZONES

10.1 Light Control Zones

10.1.1 Whilst the guidance of Section 9 should be adhered to, appropriate lighting will differ according to the context of the scheme. The Institution of Lighting Professionals (ILP) recommends using ‘light control zones’ to determine the appropriateness of proposed lighting schemes within different surroundings. ILP guidance sets out zones and the limitations of light parameters for each zone.

10.1.2 The standard practice in external lighting design is to apply ambient lighting environment zones (E-zones) to set different lighting requirements under different sky conditions. Due to differences in ambient lighting between urban and rural settings, different levels of obtrusive light are allowed though zero upward light is preferred in all zones. The Institution of Lighting Professionals guidance on the reduction of obtrusive light (GN01 ILP: 2021) recommends lighting specifications based on these ambient zones. They state different levels of upward light, intensity, glare and building luminance for these zones should be followed in any lighting design.

10.1.3 ILP Guidance Note 1 for the reduction of obtrusive light[23] recommends the following light control zones in Table 2. The National Landscape is either a rural zone, incorporating E0/E1, or an urban zone E3, with an additional caveat on upward light.

Table 2 – ILP Light Control Zones

Zone	Surrounding	Lighting Environment	Examples	Sky Quality
E0	Protected	Dark	Designated Dark Sky Reserves and astronomical observable dark skies	20.5+ (*)
E1	**Natural**	**Dark**	**Rural areas, National Landscapes (AONBs) and National Parks**	**20 to 20.5 (*)**
E2	Rural	Low district brightness	Rural settlements or relatively dark outer suburban locations	15 to 20
E3	Suburban	Medium district brightness	Small town centres/suburban locations	<15
E4	Urban	High district brightness	Town centres with high levels of night-time activity	<15

(*) - This table references ILP GN01 2021 and the sky quality relating to ambient lighting zones. To be consistent with IDA places minimum sky quality for Parks and Places (2018 guidelines), a lower value of 21.2 is required. ILP GN01 2021 has a lower limit of 20.5 reflecting earlier IDA guidelines.

10.1.4 Refer to the ILP guidance note to see tables with the recommended limitations or maximum values of light parameters in each zone for:

- The illumination on surrounding properties
- Brightness of luminaires (light fittings)
- The effects on transport systems
- Sky glow
- The effect of over-lit building façades and signs

[23] Resources | Institution of Lighting Professionals (theilp.org.uk)

- Upward light ratio (ULR) of luminaires

10.1.5 By identifying ambient lighting zones, this will aim to help:

- Prevent unnecessary artificial light pollution from surrounding towns in the setting of the National Landscape encroaching on and into the National Landscape.
- Minimise artificial light pollution from rural settlements, economic hubs and infrastructure within and surrounding the National Landscape.
- Reduce existing light pollution from sources within the National Landscape by:
    - removal of lighting where possible;
    - reduction of lighting (e.g. of intensity or duration, using sensors and timers where practical); and
    - improvement of existing lighting (e.g. better designed and installed luminaires and warmer lights).

10.1.6 Using Table 2, the Wye Valley National Landscape can be categorised into two main rural and urban zones based upon the use of County Council and Authority owned road street lighting. Street lighting has a clear, measurable impact on sky quality and a useful demarcation between ambient lighting environments. The environment zones are set as follows:

- A rural zone which includes areas of the National Landscape that has sky quality measurements satisfying:
    - E0 – Rural landscape, open countryside, very little lighting, isolated buildings
    - E1 – Rural landscape, small villages, very little street lighting
- An urban zone to include:
    - E3 – Urban/Suburban settlements, towns, villages using street lighting.

10.1.7 For all lighting development within the rural setting (not within urban areas using Local Authority streetlighting) it is expected that plans will aim to achieve E0 compliance under ILP GN01 2021 as a matter of principle. Use of E1 criteria instead of E0 should be made clear in the design justification.

10.1.8 The need for E0 compliance is particularly relevant to road, amenity, and sports lighting where residual effects are likely to cause significant adverse landscape impacts. E1 areas are expected to reside between the urban fringe boundaries and the darker rural setting. The E0 zone and 20.5+ measurements are likely to begin within 2km of the edge of the street-lit urban fringe (E3) boundary. If in doubt, you should consult the Wye Valley National Landscape Team to determine zone compliance requirements.

10.1.9 In all zones, an installed upward light level of zero is sought in all cases, irrespective of ambient lighting zone. Whilst this contrasts with the ILP GN 01 guidance which allows positive values of ULR in E3/4, the Wye Valley National Landscape

Partnership seeks zero upward lighting in all cases and supersedes the ILP guidance on this technical respect.

10.2 The Setting of the Wye Valley National Landscape

10.2.1 The setting of the National Landscape is not formally defined[24]. Consideration should be given to the impact any lighting will have on the National Landscape itself and the AONB designation. Proposals for changes in the setting of the National Landscape should consider the relationship of the setting with the protected landscape, its landscape character and the National Landscapes' special qualities for why the Wye Valley National Landscape is designated an AONB. The setting is not a delineated geographical boundary, but it is defined by the area surrounding the National Landscape where proposed development could negatively impact on the natural beauty and special qualities.

10.2.2 With regards to lighting, the impact upon the National Landscape will vary in each case but will particularly depend on topography and the design and use of the lighting.

10.3 **Recommendations**:

- The Wye Valley National Landscape Partnership supports The Institution of Lighting Professionals 'Light Control Zones' guide namely ambient lighting environment zones (E-zones), as per Table 2 and 10.1.6 within this Position Statement to determine the appropriateness of proposed lighting schemes within different surroundings to inform lighting specifications based on these ambient zones for lighting assessments to support planning applications.
- Upward Light Ratio (ULR) in all zones an installed upward light level of ZERO should be sought in all cases, irrespective of the ambient lighting zone.
- Lighting proposals in the setting of the Wye Valley National Landscape should consider the relationship of the setting with the protected landscape of the National Landscape, its landscape character and its special qualities. To accord with this aim, no external lights should be erected or installed in, or within the setting of, the National Landscape unless:
    - They can be shown to be essential for security or safety, and the minimum necessary to achieve it;
    - They are directed downwards and designed or shielded to prevent upward, sideways, and outward spillage;
    - They give a light whose colour and intensity are appropriate for the wider setting and for wildlife;
    - They do not highlight a structure or feature that would have an adverse visual impact on the surrounding landscape; and

[24] Further guidance on the 'Setting' of the Wye Valley National Landscape can be found within the Wye Valley AONB Management Plan 2021-2026.

    - They utilise the most energy- and pollution-efficient equipment that is reasonably available.
- Where existing lighting is identified as having an adverse effect on the character of the National Landscape, the Wye Valley National Landscape Partnership would encourage the removal or modification of the lighting units.
- Plan-makers and decision-makers should address tranquillity to ensure development, either individually or cumulatively, does not degrade the tranquillity of the National Landscape. Local plans should require developments in the National Landscape to be designed to prevent impacts of light pollution from artificial light on intrinsically dark landscapes and nature conservation interests. Decision-takers should ensure that development either individually, collectively and cumulatively, does not degrade the tranquillity of the National Landscape.
- Plan-makers and decision makers should also consider the effects upon cultural heritage and impacts on the historic environment and associated considerations.

11.0 HISTORIC ENVIRONMENT

11.1 The historical use of a landscape will have been shaped by its fields, woods, tracks, lanes, villages and hamlets, defining its present-day character. It is important to consider both the impact of light pollution and the design of light fittings on historic landscape character, as well as on Listed Buildings, Registered Parks and Gardens, and other sites of historical interest, including Scheduled Monuments. Conservation Areas are designated for their special architectural or historic interest and are given a broader protection than Listed Buildings. Conservation Area designation requires planning decisions to address the quality of the landscape in its broadest sense, including protection from light pollution.

11.2 Any lighting proposal should ensure that the historic environment and heritage assets within the National Landscape and its setting are fully considered and protected, conserved and enhanced. Through considering the impacts for the historic environment and appropriate measures to reduce any potential harm, the Partnership recognises the idea of heritage as a component of landscape as well as referencing the contribution that landscape setting makes to the significance of heritage assets, recognising their combined role and effect on each other.

12.0 DARK SKY STATUSES

12.1 The International Dark Skies Association (IDA) is the recognised authority globally for night sky protection and is dedicated to protecting the night skies for present and future generations. There are three international Dark Sky Place designations: Dark Sky Sanctuary, Dark Sky Park and Dark Sky Reserve. Designation is by the IDA follows a rigorous application process supported by survey evidence, a lighting inventory and a

Lighting Management Plan. There is growing interest in Dark Sky Place designation in the UK with several Dark Skies Parks and Dark Skies Reserves already and further applications currently being prepared.

12.2 The IDA defines an International Dark Sky Reserve as "*a public or private land possessing an exceptional or distinguished quality of starry nights and nocturnal environment*." It awards areas Dark Sky status based on scientific, natural, educational, cultural or heritage value, and/or their value to public enjoyment. It is an area recognised as having exceptionally high-quality starry nights and a nocturnal environment that is protected for its scientific, natural and cultural heritage as well as public enjoyment.

12.3 Achieving such statuses consist of a core area meeting minimum criteria for sky quality and natural darkness, and a peripheral area that supports dark-sky preservation in the core. They set higher standards and planning requirements for preventing light pollution and place a 'duty of regard' on everyone to protect them. The IDA also awards other types of Dark Sky Place designations, such as a Dark Sky Community/Town. Currently, there are no Dark Sky Reserves in the Wye Valley National Landscape, but there are Reserves nearby in Cranborne Chase National Landscape and the Bannau Brycheiniog National Park Authority.

12.4 To achieve a consistent approach to managing dark skies across the Wye Valley National Landscape, it is desirable that recognised standards should be strived for and applied. In the long term, this could be defined in an area specific dark skies management plan (e.g. as part of the requirements for a possible future Dark Skies Reserve). For current purposes, the widely respected sets of standards developed by the Institute of Lighting Professionals and Commission for Dark Skies should be used, unless otherwise superseded in this Position Statement.

12.5 The aspiration for the Wye Valley National Landscape to achieve International Dark Sky Status could be considered and be a realistic aspiration.

12.5 **Recommendation:**

- The Wye Valley National Landscape Partnership aspires for the Wye Valley National Landscape to achieve International Dark Sky Status by way of becoming a Dark Sky Sanctuary, Dark Sky Park and/or Dark Sky Reserve and would support settlements within the Wye Valley National Landscape to become an IDA Dark Sky Community/Town.

13.0 LIGHTING POLICY FOR LPAS

13.1 Justification for a Lighting Policy

13.1.1 This position statement can also be used to develop policy for new/reviewed Local Plans and Neighbourhood Development Plans. There is a potential mismatch between the proactive policies to cut light pollution and enhance dark skies at national level, and more cautious policies to control unnecessary light intrusion at a more local level, which allow, but do not promote proactive management to enhance dark skies. Local planning and highways authorities and other decision-makers are actively aware of and interested in proactive management of dark skies, but in the absence of proactive co-ordination of effort, it has proved difficult to do much more than control new light pollution on a case-by-case basis.

13.1.2 It is only when light is obtrusive, by finding its way into areas not intended to be lit, that it starts to have an adverse and unreasonable impact.

13.1.3 All relevant authorities down to town/parish/community council level have their duty to consider the AONB designation in any land use/environment decisions, referring to Section 85 of the Countryside and Rights of Way Act 2000.

13.1.4 Local authorities have a responsibility to support the protection of human health, nocturnal wildlife habitats, public enjoyment of the night sky and its heritage, and/or areas ideal for professional and amateur astronomy. Local planning authorities should have a lighting policy with the aim of preventing or minimising light pollution to the area.

13.1.5 Suggested wording for a new Local planning authority lighting policy and conditions in support of a Lighting Policy is identified in recommendation 13.1.6. When determining planning applications, the local planning authority may seek to minimise light pollution through planning 'conditions', such as limiting the hours of illumination. Planning authorities should also be aware that giving permission for certain uses, such as sports facilities, community halls, or the reuse of farm buildings, can give rise to lighting demands later on. It is important to therefore note that a planning authority cannot influence existing lighting unless there is a planning variation and they can add a condition, especially if policy has changed since the original lights were installed. Planning conditions can help ensure policy is adhered to, good lighting design is used, and light pollution is minimised from a lighting scheme on a new development or when there is a planning variation to an existing scheme. The need to apply conditions and the precise wording will depend on the proposed development, such as location and intended use.

13.1.6 **Recommendation**:
The Wye Valley National Landscape Partnership supports the following suggested wording for a Lighting Policy to be incorporated into future new or reviewed Local Plans, Neighbourhood Plans and planning application decision-making:

Light Pollution and Promoting Dark Skies

"*Proposals for lighting schemes will be permitted where it is demonstrated that the development could not proceed without lighting, and the scheme is appropriate to its surroundings by ensuring, as a minimum:*

- *it is the minimum necessary for its intended purpose;*
- *the measured and observed sky quality in the surrounding area is not reduced;*
- *lighting is not unnecessarily visible in nearby designated and key habitats;*
- *the visibility of lighting from surrounding landscape is avoided;*
- *building design avoids increased light spill from internal lighting;*
- *it will have no significant adverse effects (individually or cumulatively) to the character of the area, the safety of vehicle users and pedestrians, the amenity of local residents, or the diurnal/seasonal rhythms of the biodiversity, and;*
- *any adverse impacts that cannot be avoided are mitigate with suitable measures.*

The correlated colour temperature (CCT) of outdoor lighting (including street lighting) should not exceed 2700 Kelvins in order to limit the effects of known environmental hazards associated with short-wavelength visible light.

Proposals where external lighting is required should include a full lighting scheme that provides information about its purpose, hours of use, layout and beam orientation, and a schedule of the light equipment proposed including luminaire type, mounting height, aiming angles and lumen unit levels.

Schemes must meet or exceed the level of protection appropriate to the environmental light control zones of the Wye Valley National Landscape in which an application is proposed. Specifications for the zones are contained in the Institute of Lighting Professionals (ILP) GN01 Guidance note for the reduction of obtrusive light."

Further suggested conditions in support of a Lighting Policy

"No building or use herby permitted shall be occupied or use commenced until a report detailing the lighting scheme and predicted light levels has been submitted to, and been approved in writing, by the local planning authority. Artificial lighting to the development must conform to requirements to meet the obtrusive light limitations for exterior lighting installations for environmental zones – E0/E1/E2 [delete as appropriate] and the ILP GN01 Guidance note for the reduction of obtrusive light. Reason: In order to preserve the special qualities of the Wye Valley National Landscape including dark skies and tranquillity.

No external lighting shall be installed on site unless details of such lighting, including the intensity of illumination and predicted lighting contours [insert extra requirements],

have been first submitted to, and approved in writing by, the local planning authority prior to first occupation/use of the site. Any external lighting that is installed shall accord with the details so approved. Reason: In order to preserve the special qualities of the Wye Valley National Landscape including dark skies and tranquillity.

No development shall take place until a Construction Environmental Management Plan has been submitted to, and been approved in writing, by the local planning authority. The plan must demonstrate the adoption and use of the best practicable means to reduce the effects of noise, vibration, dust and site lighting. Reason: In order to minimise light pollution and other disturbance to people and wildlife during the construction."

Other suggested conditions might also include:

- "*Not permitting any form of external lighting. Especially appropriate to developments in environmental light control zone E0 areas.*
- *Specifying the hours of illumination.*
- *Requiring non-domestic facilities to install electronically controlled blackout blinds that operate automatically to prevent internal light spilling outside at night.*
- *Specifying the height and/or number of lighting columns.*"
- *External lighting to operate on a sensor system and limit the length of time before the light turns off.*

14.0 EXTERNAL LIGHTING DESIGNERS

14.1 It is acknowledged that a lighting designer is not normally needed for most minor and single use external lights for homes or small businesses. The domestic lighting advice in this position statement should be sufficient to follow and adopt. A qualified lighting designer is generally needed when lighting needs are complex, and where it is essential to meet a specified level of illuminance. Designers will ensure that the luminaires achieve all the necessary requirements to satisfy both lighting needs and dark sky compliance. Larger scale sports, commercial, industrial, road lighting or public realm lighting should employ the services of a competent lighting designer.

14.2 A lighting designer should:

- Undertake an environmental lighting impact assessment that covers the lighting needs within its setting, and any residual impacts on the landscape. It should identify the quality of dark skies over the development, the ambient lighting level (E-zone) and any sensitive receptors that surround it.
- Produce a lighting plan and luminaire schedule that clearly shows how the lighting complies with relevant guidance's and standards, such as British Standards for roads or workplaces or Sports England guidance for sports lighting.

- Show that key obtrusive lighting metrics comply with the Institution of Lighting Guidance on the reduction of Obtrusive light GN01-21[25] for the location. Care should be taken to clearly show planners who should then be able to assess key dark sky metrics that include:
- Upward Light Ratio of luminaires and the overall scheme should be zero.
- Colour Temperature (K). It should be less than or equal to 3000 kelvins, although bat advice (GN/23) states colour temperature should be ideally 2700 kelvins.
- Task Illuminance (Lux). It should meet the relevant illuminance standards.
- Light Spill and intensity on human and natural receptors.
- Building Luminance.
- Show any mitigations that have been used to reduce the impact. This would include proximity controls, reduced illuminance levels throughout the night or additional shielding.

14.3 Designers may also wish to refer to the ILP Guidance Note 9 on 'Domestic Exterior Lighting: Getting it right (GN 09/19). ILP consultant register, SLL or LIA, is generally needed when lighting needs are more complex, and where there is a need to achieve a specified level of illuminance. Designers will ensure that the luminaires achieve all the necessary requirements to satisfy both lighting needs and dark sky compliance. Larger scale sports, commercial, industrial, road lighting or public realm lighting should employ the services of a competent lighting designer. It is noted that occasionally, it may be necessary to carry out a separate technical assessment of the effects of lighting on both landscape character and views/visual amenity. In such circumstances, a qualified landscape architect with experience in the subject should be engaged to work in close collaboration with the lighting designer/effects assessor in accordance with the 3rd Edition Guidelines on Landscape and Visual Impact Assessment (GLVIA3)[26]

14.4 It is recommended that lighting installations that are close to or within key receptor sites should also consult with specialist ecologists to ensure that biodiversity concerns are integrated into the design. Ecological Constraints and Opportunity Plans should be created to identify key and supporting species and priority habitats.

15.0 LIGHTING PURCHASING RECOMMENDATIONS

15.1 Minor lamps: brightness and approximate power

15.1.1 Table 3 provides the power wattages for different types of bulb brightness that you will find in most retailers. As a reminder, for most minor domestic purposes, 500 lumens

[25] Guidance Note 1 for the reduction of obtrusive light 2021 | Institution of Lighting Professionals (theilp.org.uk)

[26] See Paragraph 6.12 of GLVIA3

are normally more than enough. For lamps greater than 500 lumens, you should use shielding or luminaires that direct all the light downward.

Table 3 – Power wattages for different types of bulb brightness

BULB BRIGHTNESS (lumens)	220+	400+		700+	900+	1300+
Incandescent	25W	40W		60W	75W	100W
Halogen	18W	28W		42W	53W	70W
CFL	6W	9W		12W	15W	20W
LED	4W	6W		10W	14W	18W
LED GU10	3W	5W		8W	10W	12W

16.0 USING VISIBLE LIGHT TRANSMISSION (VLT)

16.1 Not all glazing is the same. Depending on internal space requirements, glazing will use different methods to control the transmission of visible light through the glass. This 'VLT' value of glass can be selected to minimise glazing impact while providing sufficient visible light for the purpose (tints provide a similar function). From a distance in a dark landscape, the impact from glazing spill can be similar to light emitted from an appropriately designed illuminated advertisement. Glazing should aim to meet the 'target VLT' for typical glazing types shown below, especially remote dark landscapes.

16.2 Visible Light Transmission (VLT) is a ratio/percentage that indicates the proportion of light passing through. It is usually expressed as a number between 0 and 1 where the higher the value, the more light passes through**.**

16.3 Glazing manufacturers provide a range of VLT and tint options for a variety of needs. The recommendations above have been cross-referenced against retail options for their intended purposes to ensure optimal function.

16.4 All glazing has a potential landscape impact either by disrupting the dark landscape with point sources, or through the spill of light into the air. Generally, smaller glazing with lower internal illuminance levels will disrupt the landscape less and have a low impact. Larger glazed elevations with brighter internal illuminance will stand out and pollute more.

16.5 Black out blinds should also be used where the lowest VLT targets are not available or practical. This will be more relevant to larger and more commercial uses of glazing where other considerations such as natural daylight or heating is important.

16.6 Table 4 helps to identify VLT targets for several glazing types.

Table 4 – Visible Light Transmission (VLT) targets by glazing type including potential landscape impact and Target VLT.

Glazing Type	**Potential Landscape Impact**	**Target VLT**
Normal Domestic Glazing	Low impact	~0.65
Large, continuous open domestic glazing	Medium impact	0.4 to 0.65
Domestic roof lights, conservatories and lanterns	Medium impact	0.4 to 0.5
Commercial sky lights	High Impact	~0.3
Small office and shop fronts	Low Impact	~0.65
Structural glazing	Very high impact	~0.4

*Note: For practical considerations of product options, the acceptable target and range is the **target VLT +/- 0.05**. The landscape impact of glazing will also depend upon the urban or rural setting which should be taken into account.*

17.0 SUPPORTING INFORMATION

17.1 This position statement is also supported by several appendices which provide:

- Example Lighting Assessment (Appendix 1).
- Planning Officer checklist (Appendix 2).
- Publicly available evidence base provided by Natural Resources Wales (NRW) for Wales only (Appendix 3).
- Links to other useful websites:
    - The Commission for Dark Skies provides information and advice on light pollution and how to minimise it.
    - The International Dark-Sky Association works to protect the night skies for present and future generations. Website has lots of information and resources.

- Institute of Lighting Professionals aimed mainly at lighting professionals, but has a lot of useful articles, free and charged resources relating to lighting its impact and minimising pollution.
- (CPRE) Night Blight for interactive maps of England's light pollution and dark skies from the countryside charity.
- Chasing Stars Cranborne Chase AONB International Dark Sky Reserve.
- Dark Night Skies – South Downs National Park Authority South Downs International Dark Sky Reserve.
- APPG for Dark Skies Follow the work of the UK Parliament's only all-party group dedicated to reducing light pollution including the 'Ten Dark Sky Policies for the Government' publication (external link) Policy Plan — APPG for Dark Skies (appgdarkskies.co.uk)
- British Astronomical Association (BAA): workshops, tutorials, and information – britastro.org
- CIBSE: SLL: LG06: The Exterior Environment (2016): This guide provides a firm foundation from which to approach exterior lighting design.
- Discovery in the Dark Wales: Night Time Adventures, a Toolkit for the Trade Discovery in the Dark - National Parks Wales.

Appendix 1 – Lighting Assessment and Plans

Regardless of whether a lighting scheme requires planning permission, it may need a lighting assessment and/or plan. These are created by professional lighting engineers and/or designers. When choosing an engineer or designer, it is good to ask them about their experience of lighting schemes that minimise light pollution. ILP Guidance Note 1 For the Reduction of Obtrusive Light lists the relevant British Standards and publications from The International Commission on Illumination (CIE). BRE, who provide standards for the built environment, also have a download available[27].

Local planning authorities may require lighting assessments to be carried out as part of a planning application proposing to install lighting. Information can also be found in the ILP Professional Lighting Guide 04: Guidance on Undertaking Environmental Lighting Impact Assessments[28] and in Appendixes 1 and 3 of the Commission for Dark Skies' Blinded by the Lights[29].

A lighting assessment focuses on the lighting aspects of new development and includes design and assessment methodology. Light control zones should be adhered to, and light parameters (see ILP Guidance Note 1) given. In addition to light parameters, a lighting

[27] https://www.brebookshop.com/details.jsp?id=327145
[28] https://theilp.org.uk/resources
[29] https://britastro.org/dark-skies/pdfs/HANDBOOKTEXT.pdf

assessment needs to evaluate the spectral power distributions (the amount of blue light) and the polar intensity (the light distribution), to ensure that the scheme is not emitting unnecessary harmful light nor light beyond the area intended. Planners need to quickly but clearly understand how a lighting plan complies with relevant standards and how it will not cause harm to the landscape through unnecessary artificial light pollution. The more clearly one can show this information, the better. A lighting assessment should include and make clear the following to planning officers.

1	Site Description	A summary of visual impact assessment description adapted for lighting, including indication of applicable environmental zone.
2	Assessment Method	A description of the methodology for site visits, design and evaluation.
3	Baseline Assessment	An assessment of the current lighting at site, identification of sensitive ecological receptors, special qualities, viewpoints and general dark sky conditions.
4	Proposed Development	This is the main technical part of the plan. It should include: • Design objectives • Task requirements • Relevant guidance, standards and legislation that relate from local to landscape • Task calculations • Obtrusive light calculations • Luminaire schedules and installation plans • Luminaire specifications (lumens, CCT, CRI, spectral distribution)
5	Residual Effects	Assessment of the changes caused by the lighting, including during the construction and operational phases. This should also include effects to the dark landscape and wildlife and overall visibility after installation and mitigations.
6	Potential Mitigation	A description of any potential mitigations used, including curfews, reduced illuminances, or shielding.
7	Conclusions	A summary of the report covering installation and operational phases. This should summarise the main technical requirements and be clearly presented to a planner.

The ILP Professional Lighting Guide 04[30] – Guidance on undertaking environmental lighting impact assessments, has additional information on these elements.

[30] PLG04 GUIDANCE ON UNDERTAKING ENVIRONMENTAL LIGHTING IMPACT ASSESSMENTS | Institution of Lighting Professionals (theilp.org.uk)

CIBSE LG06: The exterior environment (2016[31]) has further general guidance for lighting the exterior environment.

Appendix 2 – Planning Officer Checklist

The following flow charts aim to provide designers and planners with the basic steps to develop and assess lighting installations and internal glazing.

External Lighting

JUSTIFIED LIGHTING • There must be a clear justification for lighting with full consideration to mitigate at the design phase. It should serve a beneficial purpose and be necessary. • The need for planning permission should be checked.

DETERMING LIGHTING TASKS NEEDS
• Ensure that lighting conforms to recommend illuminance, spill and glare levels in appropriate key documents, e.g. BS 5489 – 12464 using lowest illuminance levels as necessary.
• Ensure that critical dark skies criteria are included
  ○ Upward Light Ratio = zero
  ○ <3000K CCT or less, aiming for <500lum spectrum

ASSESS LOCAL IMPACT • Nearby locations where lighting could be a direct or indirect visual nuisance for both humans and wildlife are identified. • Lighting has regard to obtrusion and nuisance in key documents, ILP GN01, Building Regulations
ASSESS LANDSCAPE IMPACT • Sensitive receptor sites and dark area have been assessed and identified. • Use a lighting impact assessment.

APPLY MITIGATIONS
• Appropriate mitigations have been considered.
  ○ Curfews and dimming regimes
  ○ Proximity sensors
  ○ Additional shielding and louvres

CHECK THE PRESENCE AND RESIDUAL IMPACT • Does the residual lighting impact still represent a significant intrusion into the landscape even if lighting complies with obtrusion and illuminance standards? • Is there a reduction in sky quality and an increase in sky glow domes?

[31] Lighting Guide 06: The exterior environment (2016) | CIBSE

Internal Lighting

DETERMINE THE GLAZING TYPE • What is the intended purpose of the glazing? Domestic/Commercial? • Are there alternatives?

ASSESS THE GLAZING EXTENT
• Is the amount of glazing appropriate for the use and location?
• The decision should be based on analysis of the development in the landscape taking to account:
  ○ Landscape impact
  ○ Disruption to dark landscapes
  ○ Visible intrusion
  ○ Urban/rural density and remoteness
  ○ Shielding by vegetation and buildings

SET RECOMMENDATONS FOR VLT • Use the table to set recommended factors for visible light transmission
APPLY MITIGATIONS • Determine and set additional mitigations (e.g. blackout blinds, hours of use)

Appendix 3 - Publicly available evidence base provided by Natural Resources Wales (NRW) for Wales only

In relation to development in Wales, Natural Resources Wales have advised the following publicly available evidence base to support planning applications, which includes:

- LANDMAP. Natural Resources Wales / LANDMAP - the Welsh landscape baseline
- Evidence on tranquillity and place: Tranquillity and Place (arcgis.com)
- Evidence on dark skies: Wales Dark Skies (arcgis.com)
- Evidence on visible settings of designated landscapes: Natural Resources Wales / Considering the visible setting when choosing your development site
- Evidence in relation to the Sustainable Management of Natural Resources within the State of Natural Resources Report (SoNaRR) for Wales. Natural Resources Wales / State of Natural Resources Report (SoNaRR) for Wales 2020
- Natural Resources Wales / Area Statements and Designated Landscapes