

16. Lighting

Executive Summary

This chapter (Chapter 16) is to address the impacts of lighting applied to the Proposed Development on the surrounding human receptors, ecological receptors and National Landscape (NL). The assessment will apply a method of assessing light, based on the most appropriate industry standard guidance, to conclude the residual effects outcome of the effects of lighting on the surrounding light sensitive receptors.

Multiple editions of the layout have been reviewed and a description of the intent for lighting has been outlined. Based on the layout and the proposed lighting intent, along with assumptions of the likely light levels using British Standards and the Institution of Lighting Professionals (ILP) guidance, to conclude the likely outcome of likely light spill. Should any opportunity to enhance the Proposed Development to reduce potential impact on the surrounding occur, this is then reported back to the applicant, and the approach is review and, in necessary, revised to align to the intended purposes for the application site whilst reducing the potential for negative effects to occur to the surrounding sensitivities.

Based on the information provided, the assumptions used to determine the likely outcome indicate, that after the implementation of the agreed design interventions, the expected outcome of the residual effects will be of a Neutral effect.

Whilst there will be a change in the view upon the landscape, the lighting will be mounted at such a low level and with no upward light directly as a result of the lanterns proposed, this will not significantly alter the nighttime view of the landscape and would comply with dark skies guidance. The proposed lighting will not be obtrusive in nature based on the design brief and the location of the Proposed Development.

Without implementation of the proposed development, the Application Site is not expected to experience any substantive change in artificial lighting, and baseline night-time light levels are therefore predicted to remain effectively unchanged.



16.1. Introduction

- 16.1.1. This chapter presents information required by the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017³⁶⁴. As part of the Environmental Impact Assessment (EIA) process, this Environmental Statement (ES) chapter reports the likely significant effects for lighting as a result of the proposed development. This assessment includes a review of the existing baseline conditions, consideration of the potential impacts and identification of proportionate mitigation for likely significant adverse effects resulting from the proposed development.
- 16.1.2. The approach to this assessment follows the EIA Scoping Report (March 2023) submitted to Pembrokeshire County Council (PCC) and consultation outlined in Table 16.10 and has been prepared in accordance with the EIA Scoping Opinion (May 2023) for the proposed development from PCC.
- 16.1.3. The EIA scoping report stated, 'With regard to lighting impacts, reference will be made to a lighting assessment which will be undertaken as a standalone technical assessment and will be appended to the ES'. Following the EIA Scoping Opinion and further consultation with Pembrokeshire County Council (PCC) (Appendix 2.2: DARC EIA Scoping Opinion Follow Up Letter), a lighting topic chapter was added to the ES.
- 16.1.4. Based on the outcomes of the technical assessment, this chapter of the ES has been prepared in order to robustly assess the potential for likely significant effects of the lighting proposed to ensure safe use of the proposed development.
- 16.1.5. Chapter 3 (Proposed Development) contains a detailed description of the proposed development. This chapter is supported by the following appendices and figures, and includes cross-references to other chapters and figures where appropriate:
- Appendix 16.1 (Sensitivity Receptor Tables);
 - Appendix 16.2 (Site Survey Information); and
 - Appendix 16.3 (Site Information Map).

16.2. Legislation and Policy

Legislation

- 16.2.1. The national legislation and regulatory frameworks applicable in this assessment for lighting are summarised in this section.

Clean Neighbourhoods and Environment Act, 2005

- 16.2.2. Since 2005, artificial light has been incorporated as a potential statutory nuisance. An amendment to section 79³⁶⁵ of the Environmental Protection Act 1990, contained within the Clean Neighbourhoods and Environment Act 2005 states:

“Artificial light emitted from premises so as to be prejudicial to health and nuisance constitutes a ‘Statutory Nuisance’ and it shall be the duty of every local authority to cause its area to be inspected from time to time to detect any statutory nuisances which ought to be dealt with under section 80 and, where a complaint of a statutory nuisance

³⁶⁴ Welsh Government (2017) The Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017. Available at: [The Town and Country Planning \(Environmental Impact Assessment\) \(Wales\) Regulations 2017](#)

³⁶⁵ 2005 Section reference 102 relating to Section 79, Indent reference (fb)

is made to it by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint.”

National Policy

Planning Policy Wales 2024

- 16.2.3. The Planning Policy Wales (PPW) 2024³⁶⁶ sets out the Welsh Government’s planning policy framework for the whole of Wales, including the Welsh Government’s expectation for content and quality of planning applications and local plan policy. The PPW sets out the policy which the proposed development should comply with. It is also the basis for informing a judgement on the impacts of a development, for example whether the proposed development is consistent with the requirements of the PPW.
- 16.2.4. The PPW Edition 12, states that lighting needs to balance its impacts to address safety and security requirements, with the protection of the dark skies environments, negative effects to local human receptors and the sensitivity of the surrounding environments.

Future Wales, The National Plan 2040

- 16.2.5. Future Wales: The National Plan 2040 is the Welsh Government’s national spatial development framework, setting out the strategic direction for land use, infrastructure and development across Wales up to 2040. As the highest tier of the development plan framework, it identifies where growth should be focused and how key national priorities, including sustainable economic development, quality housing, infrastructure provision, environmental protection and climate resilience, are to be addressed through the planning system. Future Wales provides a long-term vision that guides Strategic Development Plans and Local Development Plans, ensuring that subsequent regional and local planning policy conforms with its spatial strategy and objective
- 16.2.6. The Plan seeks to achieve inclusive, well-designed and sustainable places by integrating economic, social and environmental considerations into spatial planning. It responds to national challenges such as climate change, decarbonisation, biodiversity enhancement, and community wellbeing by directing development to appropriate locations and promoting coordinated delivery of infrastructure and services. In doing so, Future Wales supports the statutory planning framework and shapes how planning decisions are made at all levels, reinforcing the role of the planning system in delivering long-term sustainable outcomes for Wales.
- 16.2.7. Policy 18 highlights the need to ensure unacceptable adverse impacts are caused by reflected light.

Technical Advice Note 12, Design, 2016

- 16.2.8. Technical Advice Note (TAN) 12, Design, adopted March 2016, references the sensitive application of lighting, specifically the appearance of lighting applied. This has been used and taken into account during the assessment of the application site:

“Appearance – (exterior design, including materials) means the aspects of a building or place within the development which determine the visual impression of the building or place makes, including external built form of the development, its architecture, materials, decoration, lighting, colour and texture.”

³⁶⁶ Welsh Government, 2024. Planning Policy Wales. Available at:
https://www.gov.wales/sites/default/files/publications/2024-02/planning-policy-wales-edition-12_1.pdf

Local Policy

Pembrokeshire County Council Local Development Plan, 2013³⁶⁷

- 16.2.9. The most relevant policy related to lighting can be found within Chapter 6: General Policies, Policy GN.37 Protection and Enhancement of Biodiversity, section 6.152:

“This policy aims to ensure that species and their habitats in countryside and urban environments are protected from the potentially adverse effects of development, and where possible enhanced. Potentially adverse effects may include disruption to species and habitats prior to, during and / or after construction, or the cumulative impacts of a development, for example unacceptable noise, lighting or traffic impacts.”

- 16.2.10. This chapter makes reference to the current LDP and the planning statement for the proposed development considers emerging policies and therefore considers the LDP Review which is currently being developed.

16.3. Methodology

- 16.3.1. The following section describes the methodology used to determine the likely significant effects on receptors from lighting as a result of the proposed development.

Guidance

Good Practice Guidance: Planning for the Conservation and Enhancement of Dark Skies in Wales, 2025

- 16.3.2. The Good Practice Guidance summarises good lighting practice principles and has been developed collaboratively with a Dark Skies Working Group, including Welsh Government, Natural Resource Wales and PCNP Authority.

BS EN 12464-1:2021 – Light and Lighting – Lighting of workplaces Part 1 Indoor workplaces

- 16.3.3. This British and European standard specifies lighting requirements for indoor workplaces that meet visual and performance needs. All visual tasks are considered with the exclusion of lighting specified for the use of lighting required in an emergency.

BS EN 12464-2:2024 – Light and Lighting – Lighting of workplaces Part 2 Outdoor workplaces

- 16.3.4. This British and European standard specifies lighting requirements for outdoor workplaces that meet visual and performance needs. All visual tasks are considered with the exclusion of lighting specified for the use of lighting required in an emergency.

GN01/21 The Reduction of Obtrusive Light

- 16.3.5. " The Reduction of Obtrusive Light" (Institution of Lighting Professionals GN01/2021), the environmental zone and other restrictions are informed by industry guidance notes which aim to reduce the potential for obtrusive light to occur, typically caused by poorly designed and installed exterior artificial lighting. The lighting parameters included in the proposed development design are informed by the most relevant sections of GN01/2021 that has recently been published to reduce the potential for obtrusive light from a wide range of exterior lighting applications. Table 16.1 outlines a description of the environmental zones.

³⁶⁷ <https://www.pembrokeshire.gov.uk/adopted-local-development-plan>

Table 16.1: Environmental Zone Descriptions

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

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

16.3.6. This document is aimed at lighting professionals and is not meant to replace site-specific ecological and lighting assessments, GN08/2023³⁶⁸ states the following:

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

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

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

16.3.7. See Figure16.1 for an example of zooming near an ecologically sensitive boundary.

16.3.8. Based on the above statements, this assessment will look to establish if there are any likely breaches of the following limitations,

³⁶⁸ GN08/2023 Bats and Artificial Lighting in the UK, Paragraph 4.54.

- Horizontal light levels exceeding 0.2 lux at the location where light sensitive ecological receptors have been identified,
- Vertical light levels 0.4 lux at the location where light sensitive ecological receptors have been identified, and,
- Light source colour temperatures above 2700 K proposed for use.

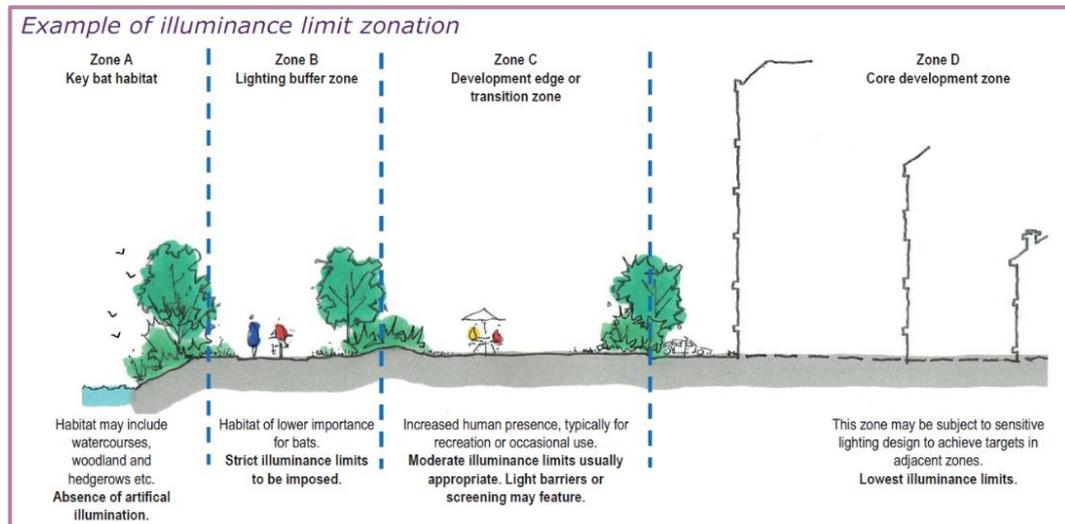


Image 16.1³⁶⁹: Example of Lighting Zonation Near Sensitive Boundaries and Known Ecological Habitat.

Assessment Approach

- 16.3.9. The potential effects on human receptors and the surrounding environment are evaluated based on their adherence to the limitations outlined in the relevant Institution of Lighting Professionals (ILP) guidance. This guidance, GN01/2021³⁷⁰, outlines restrictions on light intrusion, luminous source intensity and upward light spill (or sky glow). Relevant outlining restrictions are presented in Table 16.1 and Table 16.2 of this chapter.
- 16.3.10. The magnitude of lighting impacts and the sensitivity of receptors is derived following the DMRB LA104 matrix and methodological approach. Whilst the proposed development is not a highways scheme, the method used to assess lighting impacts is of the highest industry standard and is therefore used, in conjunction with the ILP PLG04 guidance to make an assessment of likely significant effects/residual effects. The tables used to co-ordinate this cross-method approach are Tables 16.2 to 16.6.

Table 16.2: Criteria for Receptor Sensitivity

Sensitivity	Description of Criteria
High	The environment is fragile, and an impact is likely to leave it in an altered state from which recovery would be difficult or impossible.

³⁶⁹ GN08/2023: Guidance Note 08/23 Bats and Artificial Lighting in the UK – Bat Conservation Trust and Institution of Lighting Professionals Figure 4, Page 29.

³⁷⁰ GN01/2021: Guidance Note 01/21 The Reduction of Obtrusive Light - Institution of Lighting Professionals

Sensitivity	Description of Criteria
	Human Amenity (PHAR) Receptors which are sensitive to a change in lighting such that the quality of life would be affected (i.e. lighting is designated a statutory nuisance)
	Human Safety (PSR) Receptors where a change in the lighting has the potential to either dramatically improve or reduce safety (for pedestrians, drivers or workers).
	Ecological Where a change in the lighting affects the habitats, breeding or feeding of fauna (e.g. protected habitats or other special areas) or growth patterns of fauna / crops.
Medium	The environment has a degree of adaptability and resilience and is likely to accommodate the changes caused by an impact, although there may still be some residual modification as a result.
	Human Amenity (PHAR) Receptors which are sensitive to a change in lighting however not such that the quality of life would be affected
	Human Safety (PSR) Receptors where a change in the lighting has the potential to either improve or reduce safety (for pedestrians, drivers or workers).
Low	Ecological Where a change in the lighting affects the movement or feeding patterns of fauna but the receptor can adapt
	The environment is adaptable and is resilient to change. Nearly all impacts can be absorbed within it without modifying the baseline conditions.
	Human Amenity (PHAR) The environment is adaptable and is resilient to change. Nearly all impacts can be absorbed within it without modifying the baseline conditions.
Negligible	Human Safety (PSR) Receptors which would not noticeably be aware of a change in lighting. (i.e. in areas of medium to high luminance)
	Ecological Receptors where a change in the lighting has limited potential to affect safety (for pedestrians, drivers or workers).
	Receptor has little or no night-time activity

16.3.11. Criteria for receptors is a DFL matrix generated to align the outcomes based on the guidance compliance with the DRMB LA104³⁷¹ matrix and PLG 04: 2013³⁷² protocol.

³⁷¹ Highways England, Transport Scotland Comhdhail Alba, Llywodraeth Cymru Welsh Government, department for Infrastructure An Roinn Bonneagair, Design Manual for Roads and Bridges, Sustainability & Environment Appraisal, LA104 Environmental assessment and monitoring (formerly HA 205/08, HD 48/08, IAN 125/15, and IAN 133/10), Revision 1, copyright Crown copyright 2019

³⁷² Institution of Lighting Professionals, Professional Lighting Guide, PLG 04, Guidance on Undertaking Environmental Lighting Impact Assessments, copyright 2013 ILP

Table 16.3: Criteria for Magnitude of Impact of the Proposed Development

Magnitude of Impact	Definition of Impact
Major	Adverse A large change compared to the natural variations in background levels. A clear breach of limits and standards. For example, levels of obtrusive light in the form of sky glow, light trespass or glare towards a receptor which exceeds the limits set within the ILP guidance for a higher Environmental Zone might classify as a high magnitude of change.
	Beneficial A large change compared to the natural variations in background levels. A clear and obvious decrease in light applied to the Application when compared to the existing baseline. For example, the removal of a large obtrusive light source for one that results in a surrounding compliant with the relevant standards and guidance.
Moderate	Adverse Change which is noticeable and may be a breach of limits and standards. In terms of the limits set in the ILP guidance this might equate to exceeding the limit but within the limits set for the next Environmental Zone.
	Beneficial Change that results in a slight improvement on the existing baseline. This may bring a site that is in minor breach of guidance but the new application results in a surrounding that is compliant or closer to compliant.
Minor	Adverse Change which, when compared to background levels, is only just noticeable but does increase the surrounding light levels
	Beneficial Change which, when compared to background levels, is only just noticeable but does decrease the light impacting the surrounding environment.
Negligible	Localised change which, when compared to background levels, is only just noticeable but does not increase the surrounding light levels
No Change	No observable impact and within guidance levels.

16.3.12. The criteria for magnitude of impact is adapted from the DMRB LA104 table 3.4N. The magnitude of change describes what kind of change artificial light will have when applied to an area, this impact can be either beneficial and result in betterment to the surrounding based on the existing or an adverse impact, again based on the existing baseline light level.

Table 16.4: Definitions of Significance Categories (magnitude of change x receptor sensitivity)

Significance Category	Typical Description
Very Large	Effects at this level are material in the decision-making process.
Large	Effects at this level are likely to be material in the decision-making process.
Moderate	Effects at this level can be considered material decision-making factors.
Slight	Effects at this level are not material in the decision-making process.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

16.3.13. The definitions of significance are adapted from DMRB LA104 table 3.7.

Table 16.5: Significance of Effect Matrix (score +/- based on magnitude of impact)

		Magnitude of Impact				
		No change	Negligible	Minor	Moderate	Major
Sensitivity of Receptor	Very high	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or very large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

16.3.14. The significance matrix is adapted from DMRB LA104 table 3.8.1.

Table 16.6: Residual Effect Description

Significance of Effects		
DMRB Descriptions	PLG04:2013 Description	Description
Very large Large or very large (beneficial)	Major (beneficial)	Substantial reduction in obtrusive light at sensitive receptors and/or users of the site such that large scale improvements to visual amenity, human safety or health is delivered. Significantly improves ecological habitats
Moderate or Large Moderate Slight or Moderate (beneficial)	Moderate (beneficial)	Moderate reduction in obtrusive light at sensitive receptors and/or users of the site such that noticeable improvements to visual amenity, human safety or health are delivered. Improves ecological habitats
Slight (beneficial)	Minor (beneficial)	Minor reduction in obtrusive light at sensitive receptors and/or users of the site such that perceptible improvements to visual amenity, human safety or health is delivered; perceptible improvement to ecological habitats.
Neutral or Slight Neutral	Neutral/ Not significant	No appreciable effect on sensitive receptors. Effects are reversible.
Slight (adverse)	Minor (adverse)	Minor increase in obtrusive light at sensitive receptors and / or users of the site such as an increase in Glare, Light Trespass to properties, increase in Sky Glow or effects on flora and fauna. Effects are reversible or temporary.
Moderate or Large Moderate Slight or Moderate	Moderate (adverse)	Moderate increase in obtrusive light at sensitive receptors and / or users of the site such as an increase in Glare, Light Trespass to properties, increase in Sky Glow or effects on flora and fauna. Requires monitoring

Significance of Effects		
DMRB Descriptions	PLG04:2013 Description	Description
(adverse)		and local remedial work. For example, lighting which is visible and causes nuisance to a sensitive receptor outside the site.
Very large Large or very large (adverse)	Major (adverse)	Major increase in obtrusive light at sensitive receptors and / or users of the site such as an increase in Glare, Light Trespass to properties, increase in Sky Glow or effects on flora and fauna. Requires extensive remedial works. For example, a floodlighting installation which directs light into the eyes of oncoming motorists causing disability glare and potential reduction in visual performance leading to an increased risk of collision.

16.3.15. The residual effects table is adapted from a combination of the PLG04:2013 figure 4 table and DMRB LA104 table 3.4N.

16.3.16. The assessment of effects on ecological receptors differs from those of human receptors. A separate set of guidance, GN08/2023³⁷³ Bats and Artificial Lighting in the UK – Bat Conservation Trust and Institution of Lighting Professionals, is used to evaluate the effects of lighting on Potentially Sensitive Ecological Receptors (PSER) – bats, a light sensitive ecological receptor, are considered a reasonable worst case proxy to assess lighting impacts on other ecological receptors. An explanation of the implementation and restrictions to protect light-sensitive ecology is outlined in section 16.3.6 (GN08/2023 Bats and Artificial Lighting in the UK – Bat Conservation Trust and Institution of Lighting). Further detail on the assessment of light impacts on ecological receptors is provided within Chapter 8 (Biodiversity).

16.3.17. The process assesses whether or not the lighting is appropriately or poorly designed when compared to the existing surrounding. Poorly designed lighting can contribute the following obtrusive light components:

- Light spill onto windows: this is typical of wall mounted- or pole mounted luminaires with high tilt angles;
- Upward light causing sky glow: this is typical of up-lighting;
- Glare: due to high light source intensity from floodlights or luminaires used for highway lighting; and
- Intrusive light affecting ecology: caused by excessive height and tilt.

16.3.18. To identify the potential effects of the proposed development, the existing lighting baseline is compared with the proposed lighting. This allows an assessment to be made of whether, and to what extent, existing receptors would be affected by changes in lighting levels. The study area and baseline conditions are used to establish current light levels, against which the scale, distribution and installation of the proposed lighting are evaluated.

Study Area

16.3.19. A 2.5 km radius has been adopted for the lighting study area in order to capture all locations where the development could reasonably give rise to perceptible changes in the night-time environment. Artificial light, particularly from elevated or high-output luminaires, can be visible over several kilometres in clear atmospheric conditions, especially in otherwise dark rural or

³⁷³ GN08/2023: Guidance Note 08/23 Bats and Artificial Lighting in the UK – Bat Conservation Trust and Institution of Lighting Professionals

semi-rural landscapes. Sky glow, glare and visible light sources are not constrained by site boundaries and can affect receptors well beyond the immediate vicinity of a development.

- 16.3.20. The selected radius ensures that all sensitive visual and ecological receptors potentially affected by light spill, glare or night-time visibility of the scheme are included within the assessment. This includes residential areas, transport routes, designated landscapes and dark ecological corridors which may lie at some distance from the Application Site but remain susceptible to cumulative or indirect lighting effects. A 2.5 km study area therefore represents a **precautionary and proportionate approach** based on the research for visual impacts on open Landscape³⁷⁴, consistent with good practice in lighting impact assessment and the long-range nature of light propagation in the night-time environment
- 16.3.21. The applicable receptors can be seen in Tables 16.7 to 16.9.
- 16.3.22. The term PHAR (Potential Human Amenity Receptor) is an abbreviated term used by DFL to define a location where the presence of human, has the potential to be affected either positively or negatively by the impacts of artificial lighting.
- 16.3.23. Where a PHAR does not have direct line of site and a PHAR has already been assessed as “Neutral/Negligible” (see Table 16.6 for definitions), the receptor has not been assessed separately. An example of this is Newgate Farm, where receptors, PHAR 005, 010, 003, 007 and 009 have already been assessed, and therefore is considered representative of Newgate Farm (see Appendix 16.1).
- 16.3.24. Receptors PHAR 014 and PHAR 015 have been classified as low sensitivity due to the nature of the area in question. As PHAR 014 is the Barracks, an already highly illuminated environment with ongoing activity throughout the period of darkness, this has likely altered the adaptability of the occupants of this area. PHAR 015, while not highly illuminated, is occupied only temporarily. As such, occupants are expected to have a relatively high adaptability to any additional light, given that exposure will be brief and they will return to their usual environment thereafter.

Table 16.7: Identified Potentially Human Amenity Receptors (PHARs)

Receptor No.	Description	Sensitivity
PHAR 001	Newgate Lodge	Medium
PHAR 002	Hilcroft Escapes	Medium
PHAR 003	Residential dwellings south of Erw Lon (along A487)	Medium
PHAR 004	Dwelling along A487 south of Application Site	Medium
PHAR 005	Brawby Farm and surrounding Braby dwellings	Medium
PHAR 006	Dwelling north-west of Application Site	Medium
PHAR 007	Properties 1 -28 Erw Lon	Medium
PHAR 008	Dwellings in proximity of D & G James	Medium

³⁷⁴ Based on empirical thresholds from visual impact studies, tall slender structures in open landscapes are typically prominent up to about 2 km, still relatively prominent between 2 and 5 km, and beyond this distance their prominence declines significantly, based on statements within *Wind Turbine Visibility and Visual Impact Threshold Distances in Western Landscapes* study (U.S.BLM-sponsored)

Receptor No.	Description	Sensitivity
PHAR 009	38 Erw Lon and residential dwellings to the immediate north	Medium
PHAR 010	Dill Cottage, Cwmheldeg, Highfield House, Llareggub	Medium
PHAR 011	Properties to the North Erw Lon	Medium
PHAR 012	Farmhouse dwelling and nearing dwellings to the north-east of the Application Site	Medium
PHAR 013	Bungalow to the north-east of the Application Site	Medium
PHAR 014	Cawdor Barracks	Low
PHAR 015	Park Hall Village	Low
PHAR 016	Maerdy Lodge	Medium
PHAR 017	Dwellings upon entrance to Cawdor Barracks	Medium
PHAR 018	Paran Chapel	Medium
PHAR 019	Curlew Rise	Medium
PHAR 020	1-8 Sunnyview	Medium
PHAR 021	Upper Vanley and immediate surrounding dwellings	Medium
PHAR 022	Dwellings at Trefgarn Owen	Medium
PHAR 023	Derche	Medium
PHAR 024	Hedre Cross Farm	Medium
PHAR 025	The Moat House	Medium
PHAR 026	Dwelling north of Mount House	Medium

- 16.3.25. The term PSER (Potentially Sensitive Ecological Receptor) is an abbreviated term used by DFL to define a location where the presence of light sensitive ecological receptors, has the potential to be affected or displaced by the impacts of artificial lighting. Where a PHAR is addressed as low sensitivity this is based on its likely proximity to existing high levels of artificial light.
- 16.3.26. PSERs are based on the nearest hedgerows with the potential for use by potentially light sensitive species.
- 16.3.27. The potentially sensitive ecological receptor (PSER 004) to the west of the application site has been reduced from a highly sensitive receptor to a medium sensitivity, this is based on the information provided by the project ecologist, which has stated that there is not high levels of bat activity in this direction, but as there is potential for the hedge line to be used as a foraging path a medium sensitivity has been selected to retain any potential for the area to be used by light sensitive ecology.

Table 16.8: Identified Potentially Sensitive Ecology Receptors (PSERs)

Receptor No.	Description	Sensitivity
PSER 001	Treeline and hedges to the north of the Application Site	High
PSER 002	Treeline and hedges to the north-east of the Application Site	High
PSER 003	Treeline and hedges to the east of the application site	High
PSER 004	Treeline and hedges to the west of the application site	Medium

- 16.3.28. The term PLR (Potentially Landscape Receptor) is an abbreviated term used by DFL to define a location where an element of the landscape may be impacted by artificial light in comparison to the existing baseline conditions and the proposed lighting levels.
- 16.3.29. The PLR in this instance is used to address the impacts on the night sky and the ability of the Application Sites to align with the PCNPA intentions to protect the night sky.
- 16.3.30. Although the receptor is considered sensitive to changes in light levels, its susceptibility is intrinsically linked to luminaire mounting height, intensity, and the proportion of upward light output. Any alteration to the baseline night-time landscape character would be reversible, as removal of the proposed lighting would allow the receptor to return to its original condition without long-term residual effects. In addition, the perceptibility of change is influenced by prevailing atmospheric and seasonal conditions, introducing a degree of variability and subjectivity to visual and landscape responses. On this basis, the receptor is appropriately classified as being of **medium sensitivity**.

Table 16.9: Identified Potential Landscape Receptor (PLR)

Receptor No.	Description	Sensitivity
PLR 001	The Night Sky above the Application Site	

- 16.3.31. Visual representation of the human and ecology receptors can be seen in Appendix 16.3. As the landscape receptor is the night sky itself visual representation has not been provided.
- 16.3.32. The location of the application site and key environmental constraints can be found in ES Figure 3.1 (Environmental Constraints).

Baseline

- 16.3.33. The boundary of the application site is outlined within Appendix 16.1 (Sensitive Receptor Tables). The study area extends past this to the locations of the nearest Potential Human Amenity receptors (PHAR) and Potentially Sensitive Ecological Receptors (PSER). The PHAR and PSER are also described, and their locations identified in Appendix 16.1 (Sensitive Receptor Tables).
- 16.3.34. A desktop assessment identified the potential receptors that could be affected by a change in the baseline lighting levels within the study area.
- 16.3.35. The desktop work was completed in conjunction with a site survey undertaken on the 26th of February 2024 (further detail in Appendix 16.2: Site Survey Information).
- 16.3.36. Receptors with a clearly obstructed view, for example due to being located behind another solid structure, were discounted as they are considered unlikely to be affected by artificial lighting from the development.



- 16.3.37. The desktop study is based on relevant legislation, policy, and guidance (see paragraphs 16.3.5 to 16.3.12) relating to obtrusive light. It involved studying ordnance survey maps, plans, and aerial photography views to identify likely receptor locations.
- 16.3.38. During the desktop study, publicly accessible sources were used to gain an understanding of the surrounding environment and used in conjunction with the baseline site survey undertaken to conclude the likely existing baseline. The following sources were used to gain an impression of the surrounding environment.
- Google Earth Pro; was used to confirm the number of properties surrounding the application site, as well as to take an in depth view of the street lighting and any other light sources viable on the landscape;
 - Google Maps; was used to get a desktop view of various potential viewing angles of the application site and potential objects that could obstruct the view of potential human receptors; and
 - Natural Resources Wales; was used to confirm the location and status of local protected areas.
- 16.3.39. The baseline study revealed a mixed-light environment surrounding the Application Site. Cawdor Barracks is situated directly adjacent to the site and exhibits medium to high levels of illumination, consistent with typical development of this nature. Additionally, isolated pockets of residential areas were observed in the vicinity, which are likely to have medium to low levels of artificial lighting, similar to that associated with amenity or security lighting schemes.

Consultation

- 16.3.40. An EIA Scoping Report was submitted to PCC in March 2023. A Scoping Opinion was received in response to the EIA Scoping Report (May 2023). The applicant's responses to the Scoping Opinion are contained in the Scoping Opinion Response, Appendix 2.1 (Scoping Opinion Response).
- 16.3.41. Table 16.10 summarises the consultation that has been undertaken since the receipt of the EIA Scoping Opinion.

Table 16.10: Summary of Consultation

Consultee	Form of Consultation	Topics Discussed and Actions Agreed
PCC	Letter dated March 2024	Agreed lighting topic chapter to be included in the scope (see Appendix 2.2: DARC EIA Scoping Opinion Follow Up Letter) and set out outline methodology.

Assessment Criteria

- 16.3.42. An environmental zone classification is applied to minimise the implementation of lighting. An environmental zone, rated from E0 to E4, is given Based on the information present within the guidance section of 16.3.
- 16.3.43. Compliance to GN01/2021 addresses the concerns of obtrusive light (often referred to as light pollution) is artificial light that intrudes areas causing nuisance, disruption, or adverse environmental effects, as explained in the following definition:

“Obtrusive light³⁷⁵ whether it keeps you awake through a bedroom window, impedes your view of the night sky or adversely affects the performance of an adjacent lighting installation, is a form of pollution. It may also be a nuisance in law and can be substantially mitigated without detriment to the requirements of the task”.

- 16.3.44. The assessment is then carried out to align with the Assessment Approach previously stated.
- 16.3.45. The significance of an effect from artificial lighting has been based upon the sensitivity of the receptor and the magnitude of impact at that receptor due to the revised conditions.
- The sensitivity of the receptor can be classified as High, Medium, or Low and defined in Table 16.2 (Appendix 16.2: Site Survey Information);
 - The magnitude of impact can be classified as Major, Moderate, Minor Negligible or No change and defined in Table 16.3 (Appendix 16.2: Site Survey Information);
 - The significance of effect is derived through a matrix, Table 16.5, comparing the sensitivity of the receptor, with the magnitude of the impact;
 - Identify whether a method of mitigation can improve the potential effects; and
 - Conclude as to the significance of any residual effects, Table 16.6.

Assumptions & Limitations

- 16.3.46. The construction phase and operational phase assessments have been based on the proposed development description presented in Chapter 3 (Proposed Development) and the design presented in Figure 3.1 (Proposed Development Overview) and Figure 3.2 (Proposed Construction Overview) to establish a realistic worst-case assessment scenario. As a detailed lighting strategy has not been developed, assumptions have been made regarding the likely projection/footprint of light on both horizontal and vertical planes, the potential for significant differences between background light levels and projected light sources (leading to glare), and the sensitivity of surrounding receptors to light sources. These assumptions have been informed by professional judgment to conclude a likely worst-case scenario.
- 16.3.47. During the assessment process, a number of assumptions have been made and limitations acknowledged based on the design information that is available at the time of the assessment. These assumptions are outlined within this section.
- In the absence of a detailed lighting model, the assessment assumes an appropriate lighting strategy is in place, which outlines the relevant output and photometric data. This ensures that all the assumptions made in this chapter are met during the construction phase.
 - The installation is to be overseen and undertaken by a competent person or people with the required qualifications and in accordance with any requirements that have been imposed on the application site; Electrical operatives must be able to demonstrate appropriate trade competence for work on Ministry of Defence premises, which shall include, but not be limited to: current scheme membership (e.g. NICEIC, NAPIT or ECA), successful completion of AM2 or AM2S³⁷⁶, up-to-date knowledge of BS 7671

³⁷⁵ GN01/2021: The Reduction of Obtrusive Light, Paragraph 3, Page 3.

³⁷⁶ An industry-standard, practical assessments for electricians in the UK, testing competence for qualified status

³⁷⁷(IET Wiring Regulations), certification in inspection and testing (City & Guilds 2391 ³⁷⁸or equivalent), and valid public liability insurance.

- The operational lighting will comply with the lighting parameter proposed such as a limited mounting height on structures of 2.75 m (Above Finished Grade for building mounted lights at personnel doors), 4.6 m mounting height for pole mounted lighting, the Ops security lighting will be not be mounted greater than 2.4 m and all exterior lighting will be controlled via a photocell (see Chapter 3: Proposed Development);
- All site lighting shall be compliant with the requirements of a dark-sky approved³⁷⁹ luminaire, ³⁸⁰ restricted upward directed light, avoids glare, avoids over lighting, utilizes appropriate lighting controls and minimizes short wavelength light source.
- All lighting fixtures to have an upward light output ratio (ULOR) of 0%;
- All outdoor lighting will be on motion detectors except for the entry control point which will have a dimmer as it controls entry and egress of vehicles.
- Building mounted light provide low level cutoff led fixture on building to provide operations and security lighting. Photocell controlled (dusk to dawn);
- Security lighting will not be installed to the security fence, security will be maintained via CCTV monitoring;
- The construction lighting will comply to the same restrictions as the operational lighting from 20:00 to 07:00. Any work done between these hours are expected to be done inside a temporary workshop or office area;
- The construction lighting used between 7:00 to 20:00 will be pointed inward to the proposed development and downwards; and
- Is it assumed that the contractor would engage with a qualified ecological specialist in advance of the construction phase to undertake pre-construction surveys and activities as per set out in Appendix 3.1 (Framework CEMP).

16.4. Baseline Conditions

- 16.4.1. The study area is predominantly unlit; however, the built-up area of Cawdor Barracks is well-lit as part of the security requirements and nature of the functionality of the facility. The view of artificial lighting on the surrounding area and points within the barracks is shown in Appendix 16.1 (Sensitive Receptor Tables).
- 16.4.2. The application site is located within an E1 environmental zone as defined within Table 16.9 of the ILP GN01/2021 (Table 16.11).

Table 16.11: Limitations of identified environmental zone.

Zone	Surrounding	Examples	Limitations		Sky Glow ULR (Max)
			Pre-curfew	Post-curfew	

³⁷⁷ Requirements for Electrical Installation, IET Wiring Regulations Eighteenth Edition, ISBN 978-75861-170-4 (paperback) ISBN 978-1-78561-171-1 (electronic)

³⁷⁸ NVQ Level 3 qualification for electricians

³⁷⁹ <https://darksky.org/what-we-do/darksky-approved/> [last visited 13/01/2026]

³⁸⁰ <https://darksky.org/what-we-do/darksky-approved/luminaires/> [last visited 03/03/2025]

E1	Natural	Relatively un-inhabited rural areas, national parks Areas of Outstanding Natural Beauty, etc	2	0.1	0%
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16.4.3. The application site is near two Special Areas of Conservation (SAC). These are roughly 1 km, south and south-west of the application site boundary and have been considered within this assessment. These SACs are:

- Pembrokeshire Marine / Sir Benfro Forol, Designated site code UK0013116; and
- West Wales Marine / Gorllewin Cymru Forol, designated site code UK0030397.

16.4.4. The application site sits to the north of the Pembrokeshire Coast National Park (PCNP) boundary (roughly 0.6 km) and as such has been considered within the assessment.

16.5. Design Interventions and Controls

Design Interventions

16.5.1. The development of the proposed design has been an iterative process. The environment team has worked in close collaboration with the infrastructure design team to avoid or reduce environmental impacts through the proposed development design. This is referred to as embedded (or design) interventions/mitigation. The principles of the design and mitigation hierarchy outlined in Chapter 2 (Methodology) have been followed. The first principle being to avoid potential adverse effects, if at all feasible, before seeking to minimise or mitigate for any unavoidable impacts. Design interventions for the proposed development are reported in Chapter 2 (Proposed Development). Chapter 4 (Alternatives and Design Evolution) details the design alternatives that have been considered, including the environmental factors which have influenced the decision-making.

Design Interventions - Operation

16.5.2. The initial concept design proposed potential luminaire locations, mounting types, and specifications that, whilst not inherently negative, may have produced a potentially negative impact on the surrounding environment, including light spill into the surrounding area and upward light spill contributing to skyglow above the application site.

16.5.3. Through engagement with the design team, the following design interventions have been adopted into the proposed development:

- initially, the proposed lighting design specified a cool white colour temperature of 4000K. However, to align with the Dark Sky International Initiative³⁸¹, adhere to good practice guidance, and minimise potential impacts on light-sensitive ecological receptors, the proposed lighting has been revised to a warm white correlated colour temperature (CCT) not exceeding 2700K. The revised colour temperature (CCT) is expected to decrease the emission of blue light from the luminaires, thereby reducing the likelihood of light scattering into the night sky and potentially mitigating adverse effects on bat populations.
- At the early concept stage, the proposed development included lighting mounted on poles up to 15ft (4.5 metres) in height. Lighting is required for the entry control facility and must comply with JSP440 and JSP 850 to ensure the safety and security of the application site. To minimise potential impacts on the surrounding environment, the

^{381 381} <https://darksky.org/what-we-do/darksky-approved/luminaires/> [last visited 03/03/2025]



following design interventions have been implemented: Any requirement for light to be tilted above 0 degrees from the horizontal, it will not face eastwardly from the application site, peak beam when tilted will not exceed 70 degrees, mounting height will be lower than 4.5 metres and the light source must be cowled to protect the night sky. Should there be a requirement for a light source to be tilted facing east of the application site from the Entry control facility, it will be mounted no higher than 2.75 metres, peak beam when tilted will not exceed 70 degrees and the light source must be cowled to protect the night sky. Additionally, dimming will be implemented in accordance with operational needs. These measures ensure compliance with safety and security requirements while minimising light spill, glare, and impacts on the surrounding environment, including the night sky.

- Where lighting had previously been proposed on the security fencing or on proposed internal roads, this will no longer be installed. Instead, roadside lollipops and reflective paint will be used restricting the potential for light spill onto surrounding ecological and human receptors, this will also limit potential for upward light spill.
- All lighting will have a cut off at 90 degrees to ensure that light does not spill into the night sky (0% upward light spill from the luminaire).
- Building lights have now been agreed to have a restricted mounting height of 2.75 m (Above Finished Grade for building mounted lights) to the ingress and egress points of the buildings where lighting is required.
- Where lighting is required to complete a task, the light level selected from BS EN 12464-2, will be the lowest applicable light level.
- Where lighting may have been proposed near a highly reflective object such as the Rx and Tx Array, lighting facing the object or structure is to be avoided.
- The Rx and Tx antenna pedestals will have infrared illuminators in lieu of LED pole lights for security cameras that are manually switched.

Controls

- 16.5.4. Controls are included in the Environmental Management Measures Table contained within Annex A of the Framework Construction Environmental Management Plan (Framework CEMP). The Framework CEMP has been produced in support of the planning application to present the controls and mitigation identified in this assessment. The controls include best practice measures to protect receptors from the effects of lighting and controls to achieve compliance with any relevant legislation and standards. The Framework CEMP will be developed into the Detailed CEMP for implementation during construction and is secured by an appropriately worded planning condition. Further information on the Framework CEMP is provided in Chapter 3 (Proposed Development).

Controls during Construction

- 16.5.5. For the purposes of the assessment, it has been considered that the construction activities will comply with:
- BS EN 12464-1:2021 – Light and Lighting – Lighting of workplaces Part 1 Indoor workplaces; and
 - BS EN 12464-2:2024 – Light and Lighting – Lighting of workplaces Part 2 Outdoor workplaces.
- 16.5.6. In addition, the construction lighting used being pointed inward to the proposed development and downwards. With all lighting having a 0% upward light output ratio (ULOR), this would

negate the potential for onlookers to be affected by sources of glare and comply with dark skies guidance.

- 16.5.7. Lighting is to only be used for limited time during the hours of darkness for the purpose of task illumination, in accordance with the Appendix 3.1 (Framework CEMP). When lighting is not in use it is to be switched off.

16.6. Potential Significant Effects

- 16.6.1. The proposed development lighting approach as described in Chapter 3 (Proposed Development) includes the measures as described in the design intervention and controls section of this ES chapter. Should lighting be applied without any additional mitigation measures, based on the existing proposal as is, the following effects are considered likely to occur:

Construction Phase

- 16.6.2. The assessment is based on the construction phase lighting implemented as per the Framework CEMP (Chapter 3: Proposed Development) correctly and in accordance with the assumptions (Section 16.3).
- 16.6.3. Based on the information provided, it is likely that isolated instances of skyglow over the construction site would occur for short periods of time where tasks require specific lighting levels for safety, particularly during seasonal periods when working hours extend into the hours of darkness.
- 16.6.4. The initial testing works will include handheld torches / headlamps to visually inspect the antennas. The nature and scale of the activity is considered negligible and **not significant**.
- 16.6.5. The assembly works are located in and around an enclosed temporary structure see Chapter 3: Temporary Antenna Integration Shelter (AIS)). The associated light levels required for task illumination³⁸² are likely to be high to be functional for the anticipated construction tasks in this context (i.e. assembling a 15.6 m diameter dish). However, as the temporary unit is enclosed preventing the artificial light used within the unit from extending past the structure, the potential for light spill is limited and as such is unlikely to be viewed by ecological or human receptors within the study area.
- 16.6.6. The potential effects from construction phase lighting in general, through the assessment of potential light spill in conjunction with a qualified ecological specialist, is likely to be temporary in nature and of neutral significance, therefore **not significant**.
- 16.6.7. The potential effect from obtrusive lighting associated with assembly works for PHAR, without further mitigation, is likely to be temporary in nature, within guidance limitations (GN01:2021) and result in a **not significant** outcome.
- 16.6.8. The potential effects for PSER and PHAR during the construction phase are summarised in Table 16.12.

³⁸² See British Standard BS EN 12464-1/2021, Light and lighting – lighting of work places, Part 1: indoor work places and BS EN 12464-2/2024, Light and lighting – lighting of work places, Part2: Outdoor work places, for relevant light levels.



Table 16.12: Likely Significance Effects - Construction Stage

Receptor	Sensitivity	Magnitude of Impact	Significance of effect	Mitigation required (yes/no)
PSER 001- PSER 003	High	No Change	Neutral	No
PSER 004	Medium	No Change	Neutral	No
PHAR 001 to PHAR 013	Medium	Negligible	Neutral or Slight	No
PHAR 014 and PHAR 015	Low	Negligible	Neutral or Slight	No
PHAR 016 to PHAR 026	Medium	Negligible	Neutral or Slight	No
PLR 001	Medium	Negligible	Neutral or Slight	No

Operation Phase

- 16.6.9. The assessment is based on the operation phase lighting implemented as per the proposal (Chapter 3: Proposed Development) correctly and in accordance with the assumptions (Section 16.3).
- 16.6.10. As a result of the exterior lighting detailed through the design intervention process, there is minimal potential for obtrusive light to occur.
- 16.6.11. Glare from the application site will be mitigated through the measures previously outlined. All lighting is to be 0% ULOR negating the potential for onlookers to be affected by sources of glare.
- 16.6.12. The mounting heights of the lighting fixtures has been restricted as part of the design interventions in order to reduce the horizontal footprint of the artificial lighting produced by the proposed development.
- 16.6.13. Through the sensitive application of lighting, it would be possible to keep the horizontal light spill to less than 0.5 lux from 10 m distance of the application site boundaries ensuring that the horizontal light spill will not exceed the guidance outlined within GN08/23³⁸³.
- 16.6.14. Through the restriction of mounting heights, where possible, vertical light spill will be greatly restricted within the surrounding environment ensuring compliance with the limitations outlined in GN01/21³⁸⁴.
- 16.6.15. The potential effects from the lighting without further mitigation are likely to be permanent in nature and at worst, neutral, and therefore **not significant** (see Table 16.13).

³⁸³ GN08/2023 Bats and Artificial Lighting in the UK Paragraph 4.54 page 38.

³⁸⁴ GN01/2021: Guidance Note 01/21 The Reduction of Obtrusive Light - Institution of Lighting Professionals.

Table 16.13: Likely Significance Effects - Operation Stage

Receptor	Sensitivity	Magnitude of Impact	Significance of effect	Mitigation required (yes/no)
PSER 001- PSER 003	High	Negligible	Neutral or Slight	No
PSER 004	Medium	Negligible	Neutral or Slight	No
PHAR 001 to PHAR 013	Medium	Negligible	Neutral or Slight	No
PHAR 014 and PHAR 015	Low	Negligible	Neutral or Slight	No
PHAR 016 to PHAR 026	Medium	Negligible	Neutral or Slight	No
PLR 001	Medium	Negligible	Neutral or Slight	No

16.7. Mitigation & Enhancement

Construction Phase

- 16.7.1. Based on the design work undertaken to date, no specific mitigation or enhancement measures are currently required; however, ongoing monitoring during the construction phase is proposed to ensure that, if temporary lighting is required in proximity to a Potentially Sensitive Ecological Receptor (PSER), appropriate responsive mitigation can be implemented as necessary.

Operation Phase

- 16.7.2. As part of an integrated design process, design intervention and enhancements have already been included to avoid likely significant adverse effects. No further mitigation or enhancements are considered necessary at this stage

16.8. Cumulative Effects

- 16.8.1. As part of the EIA process, the environment teams have undertaken a coordinated, multidiscipline approach to ensure cumulative effects are considered across disciplines and influenced design where appropriate.
- 16.8.2. The assessment on cumulative effects is presented in Chapter 17 (Cumulative Effects Assessment).
- 16.8.3. No significant intra-cumulative or inter-cumulative effects for this environmental topic are anticipated as a result of the proposed development due to the proposed lighting restrictions and, proximity of the Application Site to existing permitted developments.

16.9. Residual Significant Effects

16.9.1. Table 16.14 and Table 16.15 summarise the likely residual effects of the proposed development during construction and operation respectively.

Table 16.14: Likely Residual Effects Construction Stage

Receptor	Sensitivity	Magnitude of Impact	Scale of effect	Residual Effect
PSER 001- PSER 003	High	No Change	Neutral or Slight	Neutral/Not significant
PSER 004	Medium	No Change	Neutral or Slight	Neutral/Not significant
PHAR 001 to PHAR 013	Medium	Negligible	Neutral or Slight	Neutral/Not significant
PHAR 014 and PHAR 015	Low	Negligible	Neutral or Slight	Neutral/Not significant
PHAR 016 to PHAR 026	Medium	Negligible	Neutral or Slight	Neutral/Not significant
PLR 001	Medium	Negligible	Neutral or Slight	Neutral/Not significant

Table 16.15: Likely Residual Effects Operation Stage

Receptor	Sensitivity	Magnitude of Impact	Scale of effect	Residual Effect
PSER 001- PSER 003	High	Negligible	Neutral or Slight	Neutral/Not significant
PSER 004	Medium	Negligible	Neutral or Slight	Neutral/Not significant
PHAR 001 to PHAR 013	Medium	Negligible	Neutral or Slight	Neutral/Not significant
PHAR 014 and PHAR 015	Low	Negligible	Neutral or Slight	Neutral/Not significant
PHAR 016 to PHAR 026	Medium	Negligible	Neutral or Slight	Neutral/Not significant
PLR 001	Medium	Negligible	Neutral or Slight	Neutral/Not significant

16.10. Monitoring

16.10.1. The lighting effects will be reviewed following the results of the pre-construction ecology surveys.

16.10.2. Monitoring should be undertaken by the construction site manager during the construction phase, in conjunction with a qualified ecological specialist. These measures are discussed further in Chapter 8 (Biodiversity) and requirements set out in Appendix 3.1 (Framework CEMP). Summary and Conclusions This is to ensure that artificial lighting is used appropriately and does not impact areas of ecological sensitivity as temporary lighting gets moved to the

appropriate task location within the Application Site. Should the requirements of the task lighting conflict with the requirements to protect ecological receptors, dynamic mitigation should be implemented under the instructions of the qualified ecological specialist to resolve any concerns.

16.11. Summary and Conclusion

- 16.11.1. The potential lighting effects as a result of the proposed development on human receptors and the surrounding environment are evaluated based on their adherence to the limitations outlined in the relevant Institution of Lighting Professionals (ILP) guidance.
- 16.11.2. The assessment of effects on ecological receptors differs from those of human receptors. As part of the assessment, and in line with best practice, bats are used as a reasonable worst case proxy to assess lighting impacts on other wildlife species.
- 16.11.3. As all luminaires have been specified with 0% upward light spill produced from the fitting itself, along with the restricted colour temperature (CCT less than 2700 K), the only potential light spill into the night sky will be limited to the small pockets of reflected light, as such the impact to the potential landscape receptor (the night sky (PLR 001)) would be negligible.
- 16.11.4. The built-up area of Cawdor Barracks, adjacent to the application site is well-lit as part of the security requirements and function of the facility. The area surrounding the application site is predominantly unlit and the study area includes to PCNP. The baseline assessment defines this as an E1 environmental zone i.e. relatively un-inhabited rural areas, National Parks Areas of Outstanding Natural Beauty, etc. The view of artificial lighting on the surrounding area and points within the barracks is shown in Appendix 16.1 (Sensitive Receptor Tables).
- 16.11.5. As part of an integrated design process, there have been opportunities to embed mitigation, reduce lighting in the design and avoid adverse effects.
- 16.11.6. During construction, it is likely that isolated instances of skyglow over the application site would occur for short periods of time where tasks require specific lighting levels for safety. This would mainly occur seasonally where the working hours extend out in to limited periods of darkness.
- 16.11.7. Lighting impacts from the assembly works have the potential to negatively impact the surrounding human receptors. To address this the temporary structure used to assemble highly crafted elements will be fully enclosed. As such the outcome, results in a **not significant** effect. At this point in the design, no further mitigation is required.
- 16.11.8. The potential operational effects from the lighting **without further mitigation** are likely to be permanent in nature and at worst, Slight, and therefore **not significant**.
- 16.11.9. No cumulative significant effects are anticipated.
- 16.11.10. Monitoring requirements are captured in Appendix 3.1 (Framework CEMP).
- 16.11.11. Without implementation of the proposed development, the Application Site is not expected to experience any substantive change in artificial lighting, and baseline night-time light levels are therefore predicted to remain effectively unchanged.