East Midlands Gateway
Phase 2 (EMG2)

Document [6.12]

ENVIRONMENTAL STATEMENT

Volume 1 Main Statement

Chapter 11

Lighting

[January] 2025

11

The East Midlands Gateway Phase 2 and Highway Order 202X and The East Midlands Gateway Rail Freight and Highway (Amendment) Order 202X

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11. Lighting

11.1. Introduction

11.1.1. This chapter forms the Lighting Impact Assessment for the **Scheme** and is based on both a Lighting Strategy (**Appendix 11a**) and a Lighting Baseline Assessment (**Appendix 11b**).

11.2. Scope and Methodology of the Assessment

11.2.1. The EIA Regulations require the description of the forecasting methods used to assess the effects on the environment. Therefore, this assessment has been based on a widely used and accepted 'significance matrix assessment approach' which is based on the characteristics of the impact (magnitude and nature) and the sensitivity of the receptor as set out in **Chapter 1**. This allows the relative significance of effects to be determined on a scale and ultimately the significant effects determined, as further explained in the following subsections.

Scope

11.2.2. The scope of this Chapter includes the assessment of the operational external lighting for the component parts of the **Scheme** that are detailed within **Chapter 1** and **Chapter 3**. These are:

1. **EMG2 Main Site**
2. **Highways Works**
3. **EMG1 Works**

11.2.3. Assessment is also carried out on the potential effects of the lighting that will facilitate the construction phase of the **Scheme**.

Methodology

[section to be finalised to incorporate review of PINS Scoping Opinion]

11.2.4. The assessment has been carried out in accordance with the published guidance documents from the Institution of Lighting Professionals (ILP) and Highways standards. These quantify impacts to surroundings, the levels of direct upward light, light intrusion, viewed source intensity and glare regarded as acceptable for varying environmental zones.

11.2.5. The methodology employed for this Lighting Impact Assessment is appropriate to the location of the **Scheme**.

11.2.6. It comprises a review of the legislative, policy and guidance context, consultation with the design team and relevant stakeholders, a desktop study and site survey in which the baseline conditions were established (Environmental Zone), and modelling of the proposed lighting to assesses the effects of the identified receptors.

11.2.7. The methodology takes guidance from the ILP PLG 04 document "Guidance on Undertaking Environmental Lighting Impact Assessments" and the Highways standard DMRB V11(LA104) model of assessing impact. These documents also provide the process of assessing the significance of an effect as detailed in **Table 11.1** – **Table 11.5**.

11.2.8. The Environmental Protection Team at North West Leicestershire District Council have confirmed that the methodology use for the lighting assessment is acceptable. This was confirmed on the 21st November 2024 as per **Appendix 11c**.

Study Area

11.2.9. The study area of lighting effects extends 4km from the centre of the **Scheme** as outlined within **Appendix 11c**.

11.2.10. This area includes all receptors that could experience effects of lighting and includes the towns/villages of:

- Castle Donington;
- Lockington;
- Kegworth;
- Long Whatton;
- Diseworth;
- Kingston on Soar; and
- Sutton Bonington.

Classification of Environmental Zone

11.2.11. To understand the restrictions needed to keep the implementation of lighting to a minimum we use what is classified as an environmental zone. These zones are rated from E0 to E4, and are given their designation based on the context of the surrounding environment as defined within ILP in GN01:2021.

11.2.12. To determine the environmental zone applicable to the **Scheme** both desktop sources and lighting baseline surveys have been used (**Appendix 11b**).

Potential Effects from Artificial Light

11.2.13. The potential effects on human receptors and the surrounding environment are evaluated based on their adherence to the limitations outlined in the relevant ILP guidance. This guidance, GN01:2021, outlines restrictions on such things as light intrusion, luminous source intensity, upward light spill (or sky glow).

11.2.14. As the needs of ecology differ from those of a human amenity or human safety receptor a separate set of guidance, GN08/2023, is used to evaluate the effects of lighting on the most light sensitive ecology receptors (Bats). This document gives recommendations on the acceptable levels of illuminance that can reach areas of ecological interest.

Significance Criteria

11.2.15. 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.

11.2.16. The sensitivity of the receptor is classified as either Very High, High, Medium, Low, or Negligible according to the descriptions provided in **Table 11.1**.

11.2.17. The magnitude of change is determined as being Major, Moderate, Minor, Negligible, or No Change. Descriptions for each are provided in **Table 11.2.**

11.2.18. The significance of effect is derived through a matrix by comparing the sensitivity of the receptor with the magnitude of change (**Table 11.3**). This then provides the residual effect, the descriptions of which are detailed in **Table 11.4**.

11.2.19. The criteria for the assessment of significance are taken from Institution of Lighting Professionals (ILP) PLG 04 document "Guidance on Undertaking Environmental Lighting Impact Assessments" and the Highways standard DMRB V11(LA104) model of assessing impact.

Table 11.1: Criteria for receptor Sensitivity

Sensitivity	Description of Criteria
Very High	Very high importance and rarity, international scale and very limited potential for substitution. The environment is fragile, and an impact is likely to leave it in an altered state from which recovery would likely be impossible.
High	High importance and rarity, national scale, and limited potential for substitution. The environment is fragile, and an impact is likely to leave it in an altered state from which recovery would be difficult or impossible.
Medium	Medium or high importance and rarity, regional scale, limited potential for substitution. 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.
Low	Low or medium importance and rarity, local scale. The environment is adaptable and is resilient to change. Nearly all impacts can be absorbed within it without modifying the baseline conditions.
Negligible	Very low importance and rarity, local scale. Receptor has little or no night-time activity.

Table 11.2: Criteria for Magnitude of change (+/- = Baseline – Proposed Design)

Magnitude of Change		Definition of Change
Major	Adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements.
	Beneficial	Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality.
Moderate	Adverse	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.
	Beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Minor	Adverse	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse	Very minor loss or detrimental alteration to one or more characteristics, features or elements.
	Beneficial	Very minor benefit to or positive addition of one or more characteristics, features or elements.
No Change		No Change from baseline condition, this will be deemed "negligible" when assessed as a magnitude of change.

Table 11.3: Significance of Effect Matrix (Score +/- based on Magnitude of Impact)

Significance of Effect Matrix		Magnitude of Change				
		No Change	Negligible	Minor	Moderate	Major
Sensitivity	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

11.2.20. Significant effects typically comprise residual effects that are within the moderate, large or very large categories.

Table 11.4: 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 to be 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.

Table 11.5: Definitions of Duration of Impacts

Duration	Definition
Short Term	The effects would be of short duration and would not last more than 2-5 years
Medium Term	The effects would take 5-15 years to be mitigated
Long Term	The effects would be reasonably mitigated over a long period of time (15 years or more)

11.3. Policy, Guidance and Legislative Context

Environmental Protection Act 1990 / Clean Neighbourhoods and Environment Act 2005

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

> *"The following matters constitute "statutory nuisances" for the purposes of this Part, that is to say— [….]*
>
> *[….] artificial light emitted from premises so as to be prejudicial to health or a nuisance;*
>
> *[….]and it shall be the duty of every local authority to cause its area to be inspected from time to time to detect any statutory nuisances which ought to be dealt with under section 80 and, where a complaint of a statutory nuisance is made to it by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint".*

National Policy Statement National Networks

[section to be completed]

11.3.2. The National Networks National Policy Statement (NPS) (Department for Transport, 2024) sets out the UK Government's policy for the delivery of nationally significant road and rail networks. It sets out requirements for a range of emissions, including artificial light at Paragraphs 5.117 – 5.125. The NPS makes note that:

> *5.117. The construction and operation of national networks infrastructure has the potential to create a range of emissions such as odour, dust, steam, smoke and artificial light. All have the potential to have a detrimental impact on amenity or cause a common law nuisance or statutory nuisance under Part III, Environmental Protection Act 1990.*

11.3.3. Paragraphs 5.120 – 5.122 requires the applicant to assess the potential for emissions of artificial light to have a detrimental impact on amenity. The assessment should describe:

- the type and quantity of emissions;
- aspects of the development which may give rise to emissions during;
- construction, operation and decommissioning;
- premises, locations or species that may be affected by the emission;

- effects of the emission on identified premises or locations; and
- measures to be employed in preventing or mitigating the emissions.

11.3.4. The NPS also states that the applicant provides sufficient information to show that any necessary mitigation will be put into place. In particular, the Secretary of State should consider whether to require the applicant to abide by a scheme of management and mitigation concerning emissions of artificial light from the development to reduce any loss to amenity which might arise during the construction and operation of the development.

National Planning Policy Framework 2024

11.3.5. The National Planning Policy Framework (NPPF) sets out the government's planning policies for England and how they are expected to be applied and provides a framework for local plans. With regard to light pollution, the NPPF was updated in December 2024 and states that the following elements are to be considered:

> *198. 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."*

Planning Practice Guidance

11.3.6. Guidance for assessing the effects of proposed artificial lighting is outlined in the planning practice guidance (PPG) published in November 2019. In paragraph 002 Reference ID: 31-002-20191101, the guidance states:

> *"Does an existing lighting installation make the proposed location for a development unsuitable, or suitable only with appropriate mitigation? For example, this might be because:*
>
> *the artificial light has a significant effect on the locality; and/or*
>
> *users of the Proposed Development (e.g., a hospital) may be particularly sensitive to light intrusion from the existing light source.*
>
> *Where necessary, development proposed in the vicinity of existing activities may need to put suitable mitigation measures in place to avoid those activities having a significant adverse effect on residents or users of the proposed scheme, reflecting the agent of*

change principle. Additional guidance on applying this principle is set out in the planning practice guidance on noise.

Will a new development, or a proposed change to an existing site, be likely to materially alter light levels in the environment around the site and/or have the potential to adversely affect the use or enjoyment of nearby buildings or open spaces?

Will the impact of new lighting conflict with the needs of specialist facilities requiring low levels of surrounding light (such as observatories, airports and general aviation facilities)? Impacts on other activities that rely on low levels of light such as astronomy may also be a consideration but will need to be considered in terms of both their severity and alongside the wider benefits of the development.

Is the development in or near a protected area of dark sky or an intrinsically dark landscape where new lighting would be conspicuously out of keeping with local nocturnal light levels, making it desirable to minimise or avoid new lighting?

Would new lighting have any safety impacts, for example in creating a hazard for road users?

Is a proposal likely to have a significant impact on a protected site or species? This could be a particular concern where forms of artificial light with a potentially high impact on wildlife and ecosystems (e.g. white or ultraviolet light) are being proposed close to protected sites, sensitive wildlife receptors or areas, including where the light is likely to shine on water where bats feed.

Does the Proposed Development include smooth, reflective building materials, including large horizontal expanses of glass, particularly near water bodies? (As it may change natural light, creating polarised light pollution that can affect wildlife behaviour.)"

Local Policy

North West Leicestershire Local Plan (2021)

11.3.7. The relevant Local Authority for the **Scheme** is North West Leicestershire District Council. The adopted Local Plan (2011-2031) provides the current planning policies for the District. The most relevant policies to lighting within the North West Leicestershire District Council Local Plan are:

Policy D2 - Amenity

Policy D2 states the following*:*

"Proposals for development should be designed to minimise their impact on the amenity and quiet enjoyment of both existing and future residents within the development and close to it. As such, development proposals will be supported where:

1) They do not have a significant adverse effect on the living conditions of existing and new residents through loss of privacy, excessive overshadowing and overbearing impact.

2) They do not generate a level of activity, noise, vibration, pollution or unpleasant odour emission, which cannot be mitigated to an appropriate standard and so, would have an adverse impact on amenity and living conditions.

Development which is sensitive to noise or unpleasant odour emissions will not be permitted where it would adversely affect future occupants.

Proposals for external lighting schemes should be designed to minimise position pollution from glare or spillage of light. The intensity of lighting should be necessary to achieve its purpose, and the benefits of the lightings scheme must be shown to outweigh any adverse effects.

The council will prepare a Supplementary Planning Document which will include new Development Guidelines."

Policy Ec5 – East Midlands Airport: Safeguarding

Policy Ec5 states the following:

"(1) Development which would adversely affect the operation, safety or planned growth of East Midlands Airport will not be permitted.

(2) The outer boundary of the Safeguarded Area is shown on the Policies Map and within this area consultation with East Midlands Airport is required on the following proposals:

(a) All buildings, structures, erections and works that exceed the height specified on the safeguarding map;

(b) Any proposed development in the vicinity of East Midlands Airport which may have the potential to interfere with the operation of its navigational aids, radio aids and telecommunication systems;

(c) The lighting elements of a development which may have the potential to distract or confuse pilots, particularly in the immediate vicinity of the aerodrome and of the aircraft approach paths;

(d) Any proposal for aviation use within a 13km circle centred on East Midlands Airport;

(e) Any proposal within a 13km circle centred on East Midlands Airport which has the potential to attract large numbers of birds. Such proposals include:

(i) significant landscaping or tree planting;

(ii) minerals extraction or quarrying;

(iii) waste disposal or management;

(iv) reservoirs or other significant water bodies;

(v) land restoration schemes;

(vi) sewage works;

(vii) nature reserves;

(viii) bird sanctuaries.

(f) Any proposal for a wind turbine development within a 30km circle centred on East Midlands Airport."

British Standards

11.3.8. The British Standards relevant to the lighting of the **Scheme** are detailed in **Appendix 11a**, and therefore are not repeated here.

Guidance

Guidance Notes for the Reduction of Obtrusive Light (Institution of Lighting Professionals GN01:2021)

11.3.9. This Chapter is informed by industry guidance notes which aim to reduce the potential for obtrusive light to occur, which is typically caused by poorly designed and installed exterior artificial lighting.

11.3.10. This Chapter is informed by the most relevant sections of GN01:2021 that has been published to reduce the potential for obtrusive light from a wide range of exterior lighting applications.

Table 11.6: Environmental Zone Descriptions

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

Table 11.7: Obtrusive Light Criteria

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

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

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

Table 11.8: Ecology Lighting Guidance

Guidance Parameter	GN08:2023 Description
Illuminance (Lux) Levels	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).
Lighting Zonation	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."

ASAN:2024 Aerodrome Safeguarding Advice Note – Combined Aerodrome Safeguarding Team April 2024

11.3.12. This advice note considers the location, height, brightness, type, and pattern of lights around the aerodrome, with an overall caveat that no light should be directed or pointed towards any aircraft.

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

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

11.3.13. This guidance document has informed the assessment of effects on Aerodrome Safeguarding.

Guidance on Undertaking Environmental Lighting Impact Assessments (Institution of Lighting Professionals PLG04:2013)

11.3.14. This document focuses on the assessment of the lighting aspects of development applications, including design and assessment. While most of these are effects on people, their perception of the surroundings and the direct effects of lighting on them, guidance is also provide on assessing effects on flora and fauna.

11.3.15. The aim of this document is to outline good practice in lighting design an provide practical guidance on producing assessment of lighting impacts with new developments.

LA 104 Environmental Assessment and Monitoring (Design Manual for Roads and Bridges (DMRB))

11.3.16. This document sets out the requirements for environmental assessment of projects, including reporting and monitoring of significant adverse environmental effects.

11.3.17. This document is uses as supplementary guidance to ILP PLG04:2013.

11.4. Baseline Conditions

Summary of Lighting Baseline

11.4.1. The lighting baseline conditions within and surrounding the **Scheme** are detailed in **Appendix 11b** and are summarised here.

11.4.2. The area surrounding the **Scheme** is a broad mixture of commercial uses, rural settlement and more suburban settlement interspersed with agricultural land.

11.4.3. There is a large volume of existing artificial lighting in the area, but this is primarily concentrated on the East Midland Airport, its associated infrastructure and the highway network. This existing lighting is visible across the landscape and is affecting the district brightness of the surrounding area.

11.4.4. Due to the above the **Scheme** and the surrounding area can be classified as either an E2 or E3 environmental zone based on the descriptions from ILP GN01:2021 **Table 11.6**.

11.4.5. Guidance from ILP GN01:2021 recommends that in cases such as this, that the environmental zone with the most rigorous restrictions is used. As such, the **Scheme** will be assessed against E2 environmental zone limitations. The use of an E2 environmental zone was confirmed as acceptable with the Environmental Protection Team at North West Leicestershire District Council on the 21st November 2024 (**Appendix 11b**).

Lighting Receptor Identification

11.4.6. Receptors for the effects of lighting have been identified surrounding the **Scheme**.

11.4.7. These receptors are organised into three main categories:

- Human Amenity Receptors (PHAR)
- Human Safety Receptors (PSR)
- Ecology Receptors (PSER)

11.4.8. The receptor table have been spilt into different section based on the proximity of the receptors to different components of the **Scheme** and whether the receptor has potential views of the different components of the **Scheme**.

11.4.9. The locations of all the identified receptors to lighting are detailed in **Appendix 11c**.

EMG2 Main Site Receptors

Table 11.9: EMG2 Main Site Identified Human Amenity Receptors (PHAR)

Receptor Number	Description	Sensitivity
PHAR 001	Dwellings in Diseworth	Medium
PHAR 002	The Birches	Medium
PHAR 003	Dwellings in Long Whatton	Medium
PHAR 004	Farmhouse off The Grn	Medium
PHAR 009	Night Sky	Low

Table 11.10: EMG2 Main Site Identified Human Safety Receptors (PSR)

Receptor Number	Description	Sensitivity
PSR 001	East Midlands Airport (Air Traffic)	High
PSR 002	Motorists on the A435 and M1 Roundabout	Low
PSR 003	Motorists on the A435	Low
PSR 004	Motorists on the A435 and M1	Low
PSR 005	Motorists on the M1	Low

Table 11.11: EMG2 Main Site Identified Ecology Receptors (PSER)

Receptor Number	Description	Sensitivity
PSER 001	Green Space within the Main Site	High
PSER 002	Existing Green Space East of the Main Site	High

Highway Works Receptors

Table 11.15: Highways Identified Human Amenity Receptors (PHAR)

Receptor Number	Description	Sensitivity
PHAR 003	Dwellings in Long Whatton	Medium
PHAR 004	Farmhouse off The Grn	Medium
PHAR 007	Dwellings in Lockington	Medium
PHAR 008	Dwellings in Kegworth	Medium
PHAR 009	Night Sky	Low

Table 11.16: Highways Identified Human Safety Receptors (PSR)

Receptor Number	Description	Sensitivity
PSR 001	East Midlands Airport (Air Traffic)	High
PSR 002	Motorists on the A435 and M1 Roundabout	Low
PSR 003	Motorists on the A435	Low
PSR 004	Motorists on the A435 and M1	Low
PSR 005	Motorists on the M1	Low

Table 11.17: Highways Identified Ecology Receptors (PSER)

Receptor Number	Description	Sensitivity
PSER 002	Existing Green Space East of the Main Site	High
PSER 003	March Covert Ancient Woodland	High
PSER 004	Woodland adjacent to Plot 16 001	High

EMG1 Works Receptors

Table 11.12: EMG1 Works Identified Human Amenity Receptors (PHAR)

Receptor Number	Description	Sensitivity
PHAR 005	Dwellings in Castle Donington	Medium
PHAR 006	Dwellings in Hemmington	Medium
PHAR 007	Dwellings in Lockington	Medium
PHAR 008	Dwellings in Kegworth	Medium
PHAR 009	Night Sky	Low

Table 11.13: EMG1 Works Identified Human Safety Receptors (PSR)

Receptor Number	Description	Sensitivity
PSR 001	East Midlands Airport (Air Traffic)	High
PSR 005	Motorists on the M1	Low

Table 11.14: EMG1 Works Identified Ecology Receptors (PSER)

Receptor Number	Description	Sensitivity
PSER 003	March Covert Ancient Woodland	High
PSER 004	Woodland adjacent to Plot 16 001	High
PSER 005	Woodland adjacent to Plot 16 002	High

11.5. Potential Impacts

11.5.1. The potential effects on the identified receptors are assessed using the results of indicative lighting calculations, and qualitative assessment where these calculations have not been possible to complete.

11.5.2. To ensure the worst-case scenario has been modelled, the highest potential light levels have been modelled. This means the maintenance factors of all luminaires has been set at MF = 1.0 with the cleaning frequency assumed to be 72 months. This demonstrates the light levels at their highest (initial light levels at the start of luminaire life).

11.5.3. Full details of the obtrusive light calculations that have been conducted for this assessment can be found in **Appendix 11d** and these are summarised in this section.

Construction Phase

Magnitude of Change

11.5.4. The magnitude of change resulting from the construction phase of the **Scheme** is assessed qualitatively. This is based on the typical illuminance levels used for construction tasks, the types of luminaires typically used, the lighting baseline assessment that has been carried out, and with consideration of the embedded mitigation.

.Table 11.18: Construction Phase Assessment of Magnitude of Change

Receptor No.	Description of Change	Magnitude of Change	Duration of Effect
PHAR 001	This receptor location will not have views of the majority of the Highway Work and will have no views of the EMG1 Works. This receptor is, however, adjacent to the **EMG2 Main Site**. The area of the **EMG2 Main Site** directly adjacent to this receptor is proposed as open land/landscaping areas and landscape screen bunding. These areas are not likely to require night working, so construction lighting will not be used adjacent to this receptor.	Minor Adverse	Medium Term

	This means that direct effects of lighting on this receptor during construction will not alter the lighting baseline in this location, and the mitigation detailed in **Table 11.28** and **Appendix 11a** will ensure this is the case by requiring lighting to be aimed away from this receptor. It is likely that this receptor will experience an increase in the visibility of lighting in the landscape during construction, but the effects of this will be reduced by the embedded mitigation. Therefore, the magnitude of change is assessed as Minor.		
PHAR 002	This receptor location will not have views of the majority of the **Highway Works** and will have no views of the **EMG1 Works**. This receptor is, however, within 160m of the **EMG2 Main Site** and **Highway Works**. The area of the **EMG2 Main Site** directly adjacent to this receptor is proposed as open land/landscaping areas and landscape screen bunding. These areas are not likely to require night working, so construction lighting will not be used adjacent to this receptor. In addition to this, the areas of highway immediately to the northeast of this receptor contains existing lighting, and the **Highways Works** in this location will be viewed against this existing lighting. The proposed **Highway Works** are approximately 200m from this receptor, and any lighting used for these work will not increase the lighting baseline at this receptor over this distance. This means that direct effects of lighting on this receptor during construction will not alter the lighting baseline in this location, and the mitigation detailed in **Table 11.28** and **Appendix 11a** will ensure this is the case. It is likely that this receptor will experience an increase in the visibility of lighting in the landscape during construction, but the effects of this will be reduced by the embedded mitigation.	Minor Adverse	Medium Term

	Therefore, the magnitude of change is assessed as Minor.		
PHAR 003	This receptor location will not have views of the majority of the **Highway Works** and will have no views of the **EMG1 Works**. This receptor may have partial views of the **EMG2 Main Site** works, but only across the existing lit M1 and A42, and through a significant volume of existing landscape screening outside the **Scheme**. This receptor is approximately 640m from the closest area of works (that being the **EMG2 Main Site**), at this distance there will be no measurable change in the lighting baseline at this receptor location. Due to the above, the magnitude of change is assessed as Negligible.	Negligible Adverse	Medium Term
PHAR 004	This receptor location will not have views of the **Highway Works** or the **EMG1 Works**. It will however, have views of the **EMG2 Main Site** works. This receptor location is approximately 450m from the south boundary of the **EMG2 Main Site**. At this distance there will be no change in the lighting baseline at this location from the construction lighting. There will be an increase in the visibility of lighting in the landscape at this receptor during the construction phase, however this will only be minimally visible because of the distance between the **EMG2 Main Site** and the undulation of the topography between this receptor and the **EMG 2 Main Site.** As this change in lighting will only be minimally visible and there will be no change in the lighting baseline at this receptor location, the magnitude of change is assessed as Minor.	Minor Adverse	Medium Term
PHAR 005	No dwellings within this receptor location will have views of the **EMG2 Main Site**, the **EMG1 Works** or the **Highway Works**. This is due to the screening effects of two existing areas of woodland, the East Midlands Airport and the existing commercial facilities between the receptor location and the proposed works. As such, the magnitude of change is assessed as Negligible.	Negligible Adverse	Medium Term

PHAR 006	This receptor will not have direct views of the **Scheme**. The proposed lighting may be partially visible through existing woodland between this receptor location and the **Scheme**, but compared to the existing views of lighting this receptor has this will be a negligible change. Therefore, the magnitude of change is assessed as Negligible.	Negligible Adverse	Medium Term
PHAR 007	This receptor is approximately 260m from the closest area of the **Scheme** to it. At this distance there will be no measurable change in the lighting baseline at this receptor location. Several dwellings within this receptor location will have views of the proposed lighting for the **EMG1 Works** and some areas of **Highways Works**. This receptor will not have views of the **EMG2 Main Site**. This receptor location benefits from existing screening that is outside of the **Scheme** in the form of woodland. This will partially reduce views of any proposed lighting. The proposed lighting is also only visible in the context of a significant volume of existing lighting, which the proposed lighting will only result in a minor change against. Therefore, the magnitude of change is assessed as Minor.	Minor Adverse	Medium Term
PHAR 008	This receptor is approximately 170m from the closest area of the **Scheme**, this being the proposed **Highway Works** on the M1. The area of the M1 visible from this receptor location is already lit, and the construction lighting will not significantly change the effect of lighting on the M1 and therefore will not result in a change in the lighting baseline at this receptor location at this distance. Other than the proposed highway work, the closest area of proposed work in the Gantry Cranes for the **EMG1 Works**. These are unlikely to require additionally lighting over the existing lighting to be installed and therefore there will be no effect on this receptor from construction lighting in this location.	Negligible Adverse	Medium Term

	This receptor is also likely to have some partial views of the works at **Plot 16**. The construction lighting in this location is too far from this receptor to result in a change in the lighting baseline, but may be visible when in use. This construction lighting will only be visible against the existing lighting which will reduce its presence in views by reducing contrast. As such, the magnitude of change is assessed as Negligible.		
PHAR 009	The construction lighting will use luminaires with a 0% upward light output ratio, and the tilt of all luminaires will be limited to a maximum of 5° and only where this can be demonstrated not to result in significant effects. This will prevent all direct upward light. There will be some effects of reflected lighting, but this will be limited by ensuring that no area is over lit by only achieving the minimum safe and acceptable light levels detailed in British Standards. The baseline sky quality in the area surrounding the **Scheme** is low, with the existing sky brightness being very high. The **Scheme** is likely to result in some minor increase in sky brightness compared to the baseline, so this change is assessed as Minor.	Minor Adverse	Medium Term
PSR 001	As the use of lighting within the construction site will follow the phases of construction, the whole **Scheme** will not be lit at once or throughout the night. Additionally, the lighting for the construction phase will not use the same colours in the same arrangement as that for the East Midlands Airport Runway. These two things will prevent pilots being distracted by the construction lighting, and it will remain clear where the runway for the East Midlands Airport is. No lighting during the construction phase will be aimed into the sky, and no luminaires will have the lumen output required to cause glare to pilots. As such, the magnitude of change is assessed a Negligible.	Negligible Adverse	Medium Term

PSR 002	This receptor location will not have direct views of the **EMG1 Works**, but will have views of the EMG2 Access Works and the **Highway Works**. This receptor is an existing part of the highway network and the proposed changes to the highway will be integrated into this network. Lighting for the proposed highway work will be to the National Highway standard and will not result in any change to the safety of drivers in this location. Therefore, the magnitude of change is assessed as No Change.	No Change	Medium Term
PSR 003	These receptor locations are near the **EMG2 Main Site**, but will have no direct views of the **EMG1 Works**. This section of highway is adjacent to a section of highway that will be changed as part of the EMG2 Access Works, and the construction lighting for these proposals will be integrated into this section of highway. This will not result in a change in the safety of drivers in this location. Therefore, the magnitude of change is assessed as No Change.	No Change	Medium Term
PSR 004		No Change	Medium Term
PSR 005	This receptor will not have direct views of the **EMG2 Main Site** or the proposed works at **Plot 16**. It does, however, pass the existing EMG1 rail yard, and will have partial views of the proposed terminal gantry crane proposed within the **EMG1 Works**. This proposed lighting for the terminal gantry crane is likely to be minimally visible through existing boundary planting from this receptor. However, these are unlikely to require additionally lighting over the existing lighting to be installed and therefore there will be no effect on this receptor from construction lighting in this location. As this proposed lighting will only be minimally visible through boundary planting and contrast with this proposed lighting will be reduced by existing lighting, there will not be a change in driver safety resulting from the proposed lighting. As such, the magnitude of change is assessed as No Change.	No Change	Medium Term

PSER 001	This receptor is a proposed part of the **EMG2 Main Site**, and therefore will require construction works within it during the construction phase. These works are not likely to require construction lighting, or at least not likely to require construction lighting across its whole area. The mitigation embedded into the lighting strategy (**Appendix 11a**) combined with the above, will ensure that large areas of darkness are maintained in this area during construction. As such, the magnitude of change is assessed as Minor.	Minor Adverse	Medium Term
PSER 002	This receptor location is adjacent to the east boundary of the **EMG2 Main Site** and is between this are the **Highway Works** on the M1 J23a. The approach to the M1 J23a is lit by an existing lighting system, and any construction lighting in this location will not noticeably alter the light level reaching the boundary of this receptor. Construction lighting may be installed within the **EMG2 Main Site** near this location, and is likely to result in isolated illuminance levels along the boundary that would exceed 0.5 Lux. Due to the proposed mitigation, this will not extend across this receptor location and the vast majority of this location will be maintained as dark. Therefore, the magnitude of change at this receptor is assessed a Minor.	Minor Adverse	Medium Term
PSER 003	This receptor is too far from the **EMG2 Main Site** and the **EMG1 works** to experience any effects of lighting from them. It is, however, approximately 100m from the nearest proposed **Highway Works**. These proposed highway works are taking place in an area that contains existing lighting for the approach to the M1 J24 roundabout. The construction lighting in this location will not significantly change the lighting levels here, or produce changes in lighting levels at this receptor. Therefore, the magnitude of change is assessed as No Change.	No Change	Medium Term

PSER 004	This receptor location is directly adjacent to the **EMG1 Works**. The mitigation embedded into the lighting strategy (**Appendix 11a**) will reduce the effects of lighting on this receptor, but there is likely to be locations on the northeast boundary of this receptor that exceed 0.5 Lux bellow the mounting height of the luminaires. Due to the proposed mitigation, this will not extend across this receptor location and the vast majority of this location will be maintained as dark. Therefore, the magnitude of change at this receptor is assessed a Minor.	Minor Adverse	Medium Term
PSER 005	This receptor location is approximately 180m from the closest area of the **Scheme**. At this distance, there will be do effect of lighting on this receptor and the illuminance levels in this location will not exceed 0.5 Lux from the construction phase. The mitigation embedded into the lighting strategy (**Appendix 11a**) will ensure that there is not a change in the lighting baseline along the boundary of this receptor locations. Therefore, the magnitude of change is assessed as No Change.	No Change	Medium Term

Significance of Effect

11.5.5. The significant of effect is calculated using the matrix in **Table 11.19** by comparing the sensitivity of a receptor with the magnitude of change.

Table 11.19: Construction Phase Assessment of Significance of Effect

Receptor No.	Sensitivity	Magnitude of Change	Significance of Effect
PHAR 001	Medium	Minor Adverse	Slight
PHAR 002	Medium	Minor Adverse	Slight
PHAR 003	Medium	Negligible Adverse	Neutral
PHAR 004	Medium	Minor Adverse	Slight
PHAR 005	Medium	Negligible Adverse	Neutral
PHAR 006	Medium	Negligible Adverse	Neutral
PHAR 007	Medium	Minor Adverse	Slight
PHAR 008	Medium	Negligible Adverse	Neutral
PHAR 009	Low	Minor Adverse	Neutral

PSR 001	High	Negligible Adverse	Neutral
PSR 002	Low	No Change	Neutral
PSR 003	Low	No Change	Neutral
PSR 004	Low	No Change	Neutral
PSR 005	Low	No Change	Neutral
PSER 001	High	Minor Adverse	Slight
PSER 002	High	Minor Adverse	Slight
PSER 003	High	No Change	Neutral
PSER 004	High	Minor Adverse	Slight
PSER 005	High	No Change	Neutral

Operational Phase

Obtrusive Light Calculations

11.5.6. The embedded mitigation for the lighting design has been included in the Obtrusive light Calculations that form part of the lighting effects assessment. As such, embedded mitigation in is included in the assessment of effects.

11.5.7. The obtrusive light calculations have been conducted for the **EMG2 Main Site** and **EMG1 Works** (specifically Plot 16) only.

11.5.8. Full details of the obtrusive light calculations and the horizontal light spill diagram can be seen in **Appendix 11d**.

Table 11.20: Human Amenity Illuminance Receptors

Receptor No.	GN01:2021 Recommendation (Lux)		Maximum Calculated Vertical Illuminance (Lux)	Compliance with Guidance
	Pre-Curfew	Post-Curfew		
PHAR 001	5	1	0.01	Yes
PHAR 002	5	1	0.01	Yes
PHAR 003	5	1	0.00	Yes
PHAR 004	5	1	0.01	Yes
PHAR 005	5	1	0.00	Yes
PHAR 006	5	1	0.00	Yes
PHAR 007	5	1	0.01	Yes
PHAR 008	5	1	0.00	Yes

Notes to **Table 11.20**:

- The results for PHAR 005 and PHAR 006 are based on the result for PHAR 007 and PSER 005. These receptors are significantly closer to any proposed lighting than PHAR 005 and PHAR 006, therefore the lighting effects on PHAR 005 and PHAR 006 will be lower by comparison.

Table 11.21: Upward Light Ratio Assessment

Receptor No.	GN01:2021 Recommendation (ULR %)	Proposed ULR based on Luminaire Specifications	Compliance with Guidance
PHAR 009	2.5	0%	Yes

Table 11.22: Ecology Receptors Illuminance Calculations

Receptor No.	GN08:2023 Recommendation (Lux)	Maximum Calculated Vertical Illuminance (Lux)	Compliance with Guidance
PSER 001	0.40	The effects on this receptor are assessed using the Light Spill Diagram shown in **Appendix 11d** for the **EMG2 Main Site**.	
PSER 002	0.40	0.02	Yes
		0.17	Yes
PSER 003	0.40	0.00	Yes
PSER 004	0.40	0.79	These illuminance levels are reached on the northeast boundary only and the rest of the receptor location is maintained below 0.5Lux.
PSER 005	0.40	0.01	Yes

Magnitude of Change

11.5.9. The magnitude of change is assessed using on the lighting baseline at the identified receptors, the obtrusive lighting calculations that have been conducted for the identified receptors, and a qualitative assessment of the likely perception of change by the receptor.

11.5.10. The operation lighting for the proposed **Highway Works** will be fully incorporated into the highway networks at operational stage, and therefore will be providing a function for roadway users including assisting in hazard identification. The effects of highway lighting on areas of highway is therefore not assessed, and the assessment on highways safety is from the lighting for the **EMG2 Main Site**, the proposed gantry cranes and Plot 16 components of the **EMG1 Works**.

Table 11.23: Operational Phase Assessment of Magnitude of Change

Receptor No.	Description of Change	Magnitude of Change	Duration of Effect
PHAR 001	As shown in **Table 11.20** and **Appendix 11d**, the illuminance levels reaching PHAR 001 from the proposed lighting reaches a maximum of 0.01 Lux. This is significantly lower than the post-curfew E2 environment zone limit, and will not result in a change in the lighting baseline at this location. Several dwellings within this receptor location will have views of the proposed lighting for the **EMG2 Main Site** and some areas of **Highways Works**.	Minor Adverse	Long Term

	This receptor will not have views of the **EMG 1 Works**. These views of the **EMG2 Main Site** will be reduced by the proposed landscape screening and the retained and improved green space in the west of the **EMG2 Main Site**. As such, the magnitude of change is assessed as Minor.		
PHAR 002	As shown in **Table 11.20** and **Appendix 11d**, the illuminance levels reaching PHAR 002 from the proposed lighting reaches a maximum of 0.01 Lux. This is significantly lower than the post-curfew E2 environment zone limit, and will not result in a change in the lighting baseline at this location. Several dwellings within this receptor location will have views of the proposed lighting for the **EMG2 Main Site** and some areas of **Highway Works**. This receptor will not have views of the **EMG 1 Works**. These views of the **EMG2 Main Site** will be reduced by the proposed landscape screening and the retained and improved green space in the south and west of the **EMG2 Main Site**. As such, the magnitude of change is assessed as Minor.	Minor Adverse	Long Term
PHAR 003	As shown in **Table 11.20** and **Appendix 11d**, the illuminance levels reaching PHAR 003 from the proposed lighting reaches a maximum of 0.00 Lux. This is significantly lower than the post-curfew E2 environment zone limit, and will not result in a change in the lighting baseline at this location. Several dwellings within this receptor location may have partially views of the **EMG2 Main Site**, but only across the existing lit M1 and A42, and through a significant volume of existing landscape screening outside the **Scheme**. These views of the **EMG2 Main Site** will be reduced by the proposed landscape screening and the retained and improved green space in the south and east of the **EMG2 Main Site**. As such, the magnitude of change is assessed as Negligible.	Negligible Adverse	Long Term
PHAR 004	As shown in **Table 11.20** and **Appendix 11d**, the illuminance levels reaching PHAR 004 from the proposed lighting reaches a maximum of 0.01 Lux. This is significantly lower than the post-curfew E2	Negligible Adverse	Long Term

	environment zone limit, and will not result in a change in the lighting baseline at this location. Several dwellings within this receptor location will have partial views of the proposed lighting for the **EMG2 Main Site** and some areas of **Highway Works**. This receptor will not have views of the **EMG1 Works**. These views of the **EMG2 Main Site** will be reduced by the proposed landscape screening and the retained and improved green space in the south and east of the **EMG2 Main Site.** In addition to this, the section of the M1 near this receptor location contains existing lighting, which all the lighting for the **EMG2 Main Site** and the proposed highways works will be viewed against. This will reduce contrast with the proposed lighting, making it visibility less noticeable. As such, the magnitude of change is assessed as Negligible.		
PHAR 005	As shown in **Table 11.20** and **Appendix 11d**, the illuminance levels reaching PHAR 005 from the proposed lighting reaches a maximum of 0.00 Lux. This is significantly lower than the post-curfew E2 environment zone limit, and will not result in a change in the lighting baseline at this location. No dwellings within this receptor location will have views of the **EMG2 Main Site**, the **EMG1 Works** or the **Highway Works**. This is due to the screening effects of two existing areas of woodland, the East Midlands Airport and the existing commercial facilities between the receptor location and the proposed works. As such, the magnitude of change is assessed as Negligible.	Negligible Adverse	Long Term
PHAR 006	As shown in **Table 11.20** and **Appendix 11d**, the illuminance levels reaching PHAR 006 from the proposed lighting reaches a maximum of 0.00 Lux. This is significantly lower than the post-curfew E2 environment zone limit, and will not result in a change in the lighting baseline at this location. This receptor will not have direct views of the **Scheme**. The proposed lighting may be partially visible through existing woodland between this receptor location and the **Scheme**, but compared to the	Negligible Adverse	Long Term

	existing views of lighting this receptor has this will be a negligible change. Therefore, the magnitude of change is assessed as Negligible.		
PHAR 007	As shown in **Table 11.20** and **Appendix 11d**, the illuminance levels reaching PHAR 007 from the proposed lighting reaches a maximum of 0.01 Lux. This is significantly lower than the post-curfew E2 environment zone limit, and will not result in a change in the lighting baseline at this location. Several dwellings within this receptor location will have views of the proposed lighting for the **EMG1 Works** and some areas of **Highway Works**. This receptor will not have views of the **EMG2 Main Site**. This receptor location benefits from existing screening that is outside of the **Scheme** in the form of woodland. This will partially reduce views of any proposed lighting. The proposed lighting is also only visible in the context of a significant volume of existing lighting, which the proposed lighting will only result in a minor change against. Therefore, the magnitude of change is assessed as Minor.	Minor Adverse	Long Term
PHAR 008	As shown in **Table 11.20** and **Appendix 11d**, the illuminance levels reaching PHAR 008 from the proposed lighting reaches a maximum of 0.00 Lux. This is significantly lower than the post-curfew E2 environment zone limit, and will not result in a change in the lighting baseline at this location. Several dwellings within this receptor location will have views of the proposed lighting for the **EMG1 Works** and some areas of **Highway Works**. This receptor will also have very limited views of the **EMG2 Main Site**. All views of the proposed lighting will be through areas of existing lighting, and this will reduce the contrast with the proposed lighting, thus reducing its noticeability in the landscape. However, there will be an increase in the height of the installed lighting due to the proposed terminal gantry crane, which means lighting will become more visible from this receptor.	Minor Adverse	Long Term

	As the lighting baseline at this receptor will not change as a result of the proposed lighting, but there will be a minor increase in the visibility of the lighting, the magnitude of change is assessed as Minor.		
PHAR 009	The proposed lighting for the **Scheme** will use luminaires with a 0% upward light output ratio, and the tilt of all luminaires will be limited to a maximum of 5° and only where this can be demonstrated not to result in significant effects. This will prevent all direct upward light. There will be some effects of reflected lighting, but this will be limited by ensuring that no area is over lit by only achieving the minimum safe and acceptable light levels detailed in British Standards. The baseline sky quality in the area surrounding the **Scheme** is low, with the existing sky brightness being very high. The **Scheme** is likely to result in some minor increase in sky brightness compared to the baseline, so this change is assessed as Minor.	Minor Adverse	Long Term
PSR 001	Lighting for the operational phase of the **Scheme** will be typical of commercial uses and highways lighting. This lighting is not similar to that of an airport or runway. Additionally, the lighting for the operational phase will not use the same colours in the same arrangement as that for the East Midlands Airport Runway. These two things will prevent pilots being distracted by the operational lighting, and it will remain clear where the runway for the East Midlands Airport is. No lighting during the operational phase will be aimed into the sky, and no luminaires will have the lumen output required to cause glare to pilots.	Negligible Adverse	Long Term
PSR 002	This receptor location will not have direct views of the proposed lighting for the **EMG2 Main Site** or the **EMG1 Works**, and therefore safety in this location cannot be impacted by the proposed lighting in these locations. This receptor is an existing part of the highway network and the proposed changes to the highway will be integrated into this network.	No Change	Long Term

	Lighting for the proposed **Highway Works** will be to the National Highway standard and will not result in any change to the safety of drivers in this location. Therefore, the magnitude of change is assessed as No Change.		
PSR 003	These receptor locations are near the **EMG2 Main Site**, but will have no direct views of the **EMG1 Works**. This section of highway is adjacent to a section of highway that will be changed as part of the access arrangement for the **EMG2 Main Site**, and the proposed lighting for these proposals will be integrated into this section of highway. This will not result in a change in the safety of drivers in this location.	No Change	Long Term
PSR 004	These receptor also benefits from the proposed landscape screening, which will assist in protecting this area from effects of lighting. Therefore, the magnitude of change is assessed as No Change.	No Change	Long Term
PSR 005	This receptor will not have direct views of the **EMG2 Main Site** or the proposed works at **Plot 16**. It does, however, pass the EMG1 rail yard, and will have partial views of the proposed terminal gantry crane. This proposed lighting for the Terminal Gantry Crane is likely to be minimally visible through existing boundary planting from this receptor. However, the luminaire will not directly face drivers on this road, and will only be visible through the existing lighting. This will reduce contrast with the proposed lighting, which will reduce the likelihood of glare to be perceived by drivers. As this proposed lighting will only be minimal visible through boundary planting and contrast with this proposed lighting will be reduced by existing lighting, there will not be a change in driver safety resulting from the proposed lighting.	No Change	Long Term

	As such, the magnitude of change is assessed as No Change.		
PSER 001	The effects on this receptor are assessed using the light spill diagram shown in **Appendix 11d** for the **EMG2 Main Site**. This shows that there are locations within this receptor locations where light spill from the proposed lighting will reach above 1 Lux. This only happens in isolated locations and directly adjacent to areas that will be lit for the purpose of health and safety. This light spill diagram also shows that the majority of this receptor location will be maintained in darkness. This is shown by the areas outside of the red 0.2 Lux contour line. As only isolated locations will experience illuminance levels above 1 Lux and there will be a consistent dark corridor maintained in this location, the magnitude of change is assessed as Minor.	Minor Adverse	Long Term
PSER 002	As shown in **Table 11.22** and **Appendix 11d**, the illuminance levels reaching PSER 002 from the proposed lighting reaches a maximum of 0.17 Lux. This is significantly lower than the recommended limits detailed in GN08:2023. This shows that this location will remain dark and therefore any light sensitive species within this location will not be significantly affected by lighting.	Negligible Adverse.	Long Term
PSER 003	As shown in **Table 11.22** and **Appendix 11d**, the illuminance levels reaching PSER 003 from the proposed lighting reaches a maximum of 0.00 Lux. This is significantly lower than the recommended limits detailed in GN08:2023. This shows that this location will remain dark and therefore any light sensitive species within this location will not be significantly affected by lighting.	No Change	Long Term
PSER 004	As shown in **Table 11.22** and **Appendix 11d**, the illuminance levels reaching PSER 002 from the proposed lighting reaches a maximum of 0.79 Lux. The maximum level is calculated on the northeast boundary of this receptor location, and all other locations along this boundary contain lower illuminance levels.	Minor Adverse.	Long Term

	Viewing the light spill diagram for this area in **Appendix 11d**, it is clear that the vast majority of this area is retained as a dark space. Therefore, this location is maintained as dark but there will be a minor change to this location resulting from the proposed lighting. Therefore, the magnitude of change is assessed as Negligible.		
PSER 005	As shown in **Table 11.22** and **Appendix 11d**, the illuminance levels reaching PSER 005 from the proposed lighting reaches a maximum of 0.01 Lux. This is significantly lower than the recommended limits detailed in GN08:2023. This shows that this location will remain dark and therefore any light sensitive species within this location will not be significantly affected by lighting.	No Change	Long Term

Significance of Effect

11.5.11. The significant of effect is calculated using the matrix in **Table 11.24** by comparing the sensitivity of a receptor with the magnitude of change.

Table 11.24: Operational Phase Assessment of Significance of Effect

Receptor No.	Sensitivity	Magnitude of Change	Significance of Effect
PHAR 001	Medium	Minor Adverse	Slight
PHAR 002	Medium	Minor Adverse	Slight
PHAR 003	Medium	Negligible Adverse	Neutral
PHAR 004	Medium	Negligible Adverse	Neutral
PHAR 005	Medium	Negligible Adverse	Neutral
PHAR 006	Medium	Negligible Adverse	Neutral
PHAR 007	Medium	Minor Adverse	Slight
PHAR 008	Medium	Minor Adverse	Slight
PHAR 009	Low	Minor Adverse	Slight
PSR 001	High	Negligible Adverse	Slight
PSR 002	Low	No Change	Neutral
PSR 003	Low	No Change	Neutral
PSR 004	Low	No Change	Neutral
PSR 005	Low	No Change	Neutral
PSER 001	High	Minor Adverse	Slight
PSER 002	High	Negligible Adverse.	Slight
PSER 003	High	No Change	Neutral

PSER 004	High	Minor Adverse.	Slight
PSER 005	High	No Change	Neutral

11.6. Mitigation Measures

11.6.1. This section details the mitigation measures that will be applied to the lighting design for the **Scheme**.

Embedded Mitigation

11.6.2. Embedded mitigation is all the mitigation measures that are embedded into the lighting strategy for the **Scheme** as is detailed in **Appendix 11a,** which also contains example images of this mitigation and proposed luminaires.

11.6.3. Due to this mitigation being embedded into the lighting strategy, the obtrusive lighting calculations that have been conducted thus far include this mitigation where possible at this stage.

[this section is to be completed]

Table 11.28: Embedded Mitigation Measures

Embedded Mitigation Name	Description of Mitigation	Installation Location
Restricting the Upward Light Output Ratio	All luminaires will have an Upward Light Output Ratio of 0%.	Whole **Scheme**
Restricting Luminaire Tilt	All luminaires will be installed with a 0° as standard. An allowance to tilt luminaires to 5° may be made, where it is demonstrated that: This is required to achieve a standard lighting level on the task or area, and This will not result in any significant effects on the surrounding receptors.	Whole **Scheme**
Installation of Back Light Shielding	Manufactures often provide “back light optics” where back light mitigation is integrated on the lenses of the luminaires. This is the preferred option as it provides the greatest degree of control. Where this is not available, traditional back light shields can be used.	Whole **Scheme**: Where luminaires are installed on the boundary of an area facing into the site.
Using the lowest possible Correlated Colour Temperature	Throughout the **Scheme** the standard Correlated Colour Temperature used will be ≤ 3000K. Where there are areas of specific ecological sensitivity the lighting near this area will be dropped to ≤ 2700K. In locations where there are specific safety concerns, for example in substations, the Correlated Colour Temperature may be increased to ≤ 4000K. However, a risk assessment needs to be undertaken to justify	Whole **Scheme**

	this increase if this does not form part of a local authority adoptable specification.	
Using the lowest applicable lighting levels for tasks and areas	All areas and task will be lit using the lowest applicable lighting levels are defined in the relevant British Standard. This will ensure a standard and recognised levels of light is provided for all areas of the **Scheme**, while ensuring no area is over lit. During the detailed lighting design, a risk assessment must be undertaken to help defined the specific lighting class for any area.	Whole **Scheme**
Centralised Lighting Controls	Throughout the **Scheme** centralised lighting control system/s will be used. This will ensure lighting is only active as required during the hours of darkness, will allow dimming based on traffic flow, and switching to take place based on the hours of use. For example: When a car park is experiencing low use over night the lighting can be dimmed, If a unit is closed overnight, then all associated lighting can be switched off. This will not only reduce the effects of lighting, but will save money and energy for the owner of the lighting system.	Whole **Scheme**
Using the minimum practical mounting height	All luminaires will be mounted at the minimum practical mounting height for the area or task. This will reduce the visibility of the luminaires in the landscape, by allowing surrounding trees, buildings and landscape screening to act as blocking features to direct views of luminaires. This will also help ensure there is minimum need to tilt luminaires, by providing enough height for the light to travel forward into the task area.	Whole **Scheme**
Using appropriate optics for the areas being illuminated	The luminaire optic used will be specific to the area being lit. This will ensure the task and area is lit to a standard level of light, while also allowing the lux contours to be shaped to the specific areas. This will help reduce light spill out of areas and the either over lighting or under lighting of areas.	Whole **Scheme**
Only using Luminaires where Photometry is Available from the Manufacturer	Luminaires will be used with integral LEDs and only where the luminaire photometry is available from the manufacturer. This is to ensure the photometric footprint of the luminaires can be modelled to ensure the potential effects of light spill are reported and minimised or mitigated.	Whole **Scheme**
The creation of mitigation mounding	The **EMG 2 Main Site** proposes mitigation mounding around the perimeter of the site including a significant buffer to the west and the **EMG1 Works** benefit from existing mitigation mounding . This will reduce the visibility of luminaires and lighting within the landscape and from the identified receptors.	**EMG2 Main Site** As shown on the Parameters Plan.
The creation of green buffer zone	The **EMG2 Main Site** has a green buffer zone proposed.	**EMG2 Main Site.** As shown on the Parameters Plan.

	This assists in increase the distance of lit areas from the boundaries of the **Scheme** and provide the distance require of the other mitigation to work effectively.	

Additional Mitigation

[this section is to be completed]

Table 11.29: Additional Mitigation Measures

Additional Mitigation Name	Description of Mitigation	Installation Location
CEMP	As detailed within the CEMP construction work within the development site will be confined to the following: • 07:00-19:00 hours Monday to Friday • 07:00-16:00 hours Saturday No works will be undertaken on Sundays or public holidays, save in exceptional circumstances only and with prior notification to the LPA, and any changes to the above working hours will also be agreed with the LPA. No works within the **EMG2 Main Site** and Plot 16 are planned to be undertaken in periods of darkness and therefore it is unlikely that task lighting will be required. However, unplanned events can occur for which task lighting may be required for short periods; in this event each P-CEMP, which will be submitted shall set out the maximum height of lighting lanterns and the average lux levels. The P-CEMP for any component of the **Highway Works** shall provide details of requirements for night working and any associated proposals for lighting.	Whole **Scheme**
The use of solid hoarding during the construction phase	The installation of solid hoarding surrounding construction compounds would reduce the visibility of any construction lighting, and would contain any light spill produced by this lighting.	The boundaries of construction compounds and other suitable areas of work

Phasing construction so the proposed landscape screen bunding is in place during construction	Phasing construction in this way would ensure this mitigation, which is embedded into the operational phase, would also provide mitigation from the visibility of lighting and from light spill during construction.	The locations of the bunding as shown on the parameters plans.

11.7. Residual Effects

[this section is to be completed]

11.7.1. This section details the final residual effects of the proposed lighting after all mitigation is applied to the **Scheme**.

Table 11.30: Residual Effects Assessment

Receptor No.	Sensitivity	Magnitude of Change after all Mitigation is Applied	Residual of Effect
Construction			
PHAR 001	Medium	Minor Adverse	Slight
PHAR 002	Medium	Minor Adverse	Slight
PHAR 003	Medium	Negligible Adverse	Neutral
PHAR 004	Medium	Minor Adverse	Slight
PHAR 005	Medium	Negligible Adverse	Neutral
PHAR 006	Medium	Negligible Adverse	Neutral
PHAR 007	Medium	Minor Adverse	Slight
PHAR 008	Medium	Negligible Adverse	Neutral
PHAR 009	Low	Minor Adverse	Neutral
PSR 001	High	Negligible Adverse	Neutral
PSR 002	Low	No Change	Neutral
PSR 003	Low	No Change	Neutral
PSR 004	Low	No Change	Neutral
PSR 005	Low	No Change	Neutral
PSER 001	High	Minor Adverse	Slight
PSER 002	High	Minor Adverse	Slight
PSER 003	High	No Change	Neutral
PSER 004	High	Minor Adverse	Slight
PSER 005	High	No Change	Neutral
Operation			
PHAR 001	Medium	Minor Adverse	Slight
PHAR 002	Medium	Minor Adverse	Slight
PHAR 003	Medium	Negligible Adverse	Neutral
PHAR 004	Medium	Negligible Adverse	Neutral
PHAR 005	Medium	Negligible Adverse	Neutral

PHAR 006	Medium	Negligible Adverse	Neutral
PHAR 007	Medium	Minor Adverse	Slight
PHAR 008	Medium	Minor Adverse	Slight
PHAR 009	Low	Minor Adverse	Slight
PSR 001	High	Negligible Adverse	Slight
PSR 002	Low	No Change	Neutral
PSR 003	Low	No Change	Neutral
PSR 004	Low	No Change	Neutral
PSR 005	Low	No Change	Neutral
PSER 001	High	Minor Adverse	Slight
PSER 002	High	Negligible Adverse.	Slight
PSER 003	High	No Change	Neutral
PSER 004	High	Minor Adverse.	Slight
PSER 005	High	No Change	Neutral
Cumulative [to be completed on receipt of cumulative impacts data]			

11.7.2. As none of the residual effects are assessed as being Moderate or higher, these effects of lighting are not considered significant on the identified receptors.

11.8. Cumulative Effects

11.8.1. [this section is to be completed]

11.8.2. **Table 11.31** lists the cumulative sites that have been identified surrounding the **Scheme**. These sites have been assessed for the potential of having cumulative effects alongside the **Scheme**, and these effects have been categorized into direct effects (light spill and light intrusion) and indirect effects (upward light and sky glow) on the identified sensitive receptors. This initial assessment is based on the distance of the cumulative sites from the **Scheme** and the lighting baseline between the **Scheme** and the cumulative site.

Table 11.31: Cumulative Sites

Cumulative Site Number	**Planning Reference**	**Approximate Distance from the Scheme**	**Potential for Cumulative Effects of Lighting**	
			Direct	Indirect

11.8.3. Those sites in **Table 11.31** that have been identified as being capable of having either/or direct or indirect effects alongside the **Scheme** will be assessed in more detail in **Table 11.32** and the cumulative significance of the effect is identified in Table 11.33**.**.

Table 11.32: Cumulative Magnitude of Change

Cumulative Site Number	Relevant Receptors	Description of Change	Magnitude of Change

Table 11.33: Cumulative Significant of Effect

Receptor No.	Sensitivity	Magnitude of Change	Significance of Effect

11.9. Summary of Effects and Conclusions

[to be completed]

Introduction

11.9.1. This chapter of the ES has assessed the likely significant impacts of the **Scheme** on the identified receptors from any proposed Lighting. It also described the methods used to assess the impacts; the baseline conditions currently existing within and surrounding the **Scheme**; the mitigation measures required to prevent, reduce or offset any significant adverse effects of lighting; and the likely residual impacts after these measures have been adopted.

Baseline Conditions

11.9.2. Full details of the lighting baseline assessment can be found in **Appendix 11b**.

11.9.3. The area surrounding the **Scheme** is a broad mixture of commercial uses, rural settlement and more suburban settlement interspersed with agricultural land.

11.9.4. There is a large volume of existing artificial lighting in the area, but this is primarily concentrated on the East Midland Airport, its associated infrastructure and the highway network. This existing lighting is visible across the landscape and is affecting the district brightness of the surrounding area.

11.9.5. Due to the above, the area within which the **Scheme** and the surrounding area is within can be classified as either an E2 or E3 environmental zone based on the descriptions from ILP GN01:2021.

11.9.6. Guidance from ILP GN01:2021 recommends that in cases such as this, that the environmental zone with the most rigorous restrictions is used. As such, the **Scheme** has been assessed against E2 (rural) environmental zone limitations.

11.9.7. The **Scheme** has been surveyed for views of existing lighting and the existing lighting levels.

11.9.8. It has been found that the **Scheme** is for the most part dark, but that it contains locations with significant views of lighting and location which are currently lit as set out within **Appendix 11b**..

11.9.9. It has also been found that there are significant views of lighting within the landscape, and that this is a significant quality of the existing baseline.

Likely Significant Effects

[this section to be completed]

11.9.10. During the construction and operation phase no effects of lighting are assessed as moderate or above this level. Therefore, the effects of lighting from the **Scheme** are assessed as being not significant on the identified receptors.

11.9.11. Although the effects on the receptors are assessed as not being significant, it is acknowledged that the lighting baseline within the Order Limits will change as a result of the **Scheme**.

Mitigation and Enhancement

11.9.12. The majority of mitigation for the effects of lighting need to be embedded into the lighting design for them to be effective. This mitigation is embedded into the Lighting Strategy for the **Scheme**.

11.9.13. The embedded mitigation includes the following:

- Using the lowest applicable colour temperature of light for the area being light
- Using luminaire optics that fit the area being lit, and only using luminaires where the photometry is available from the manufacture
- Restricting luminaire tilt to 0°
- Only using luminaires that have a 0% Upward Lighting Output Ratio (full cut off luminaires)
- Installing back light shields or using back lighting optics on luminaires

11.9.14. When applied this embedded mitigation will ensure there are not significant effects of light spill, light intrusion, glare, and direct upward lighting.

11.9.15. Additional mitigation is also proposed – this includes:

- The use of solid hoarding during the construction phase
- Phasing construction so the proposed landscape screen bunding is in place during construction

11.9.16. This additional mitigation can be secured through DCO Requirements and will further reduce the effects of lighting and will ensure that the embedded mitigation that is proposed can be applied affectively to the **Scheme**.

Conclusion

[section to be completed]

11.9.17. Through the implementation of the Lighting Strategy (which includes all the embedded mitigation) and the additional mitigation measures detailed within this Chapter, there will not be significant effects of lighting on the identified receptors.

11.9.18. However, there will be an increase in the lighting baseline and an increase in the visibility of lighting in the landscape.