



· LIGHTING DESIGN · ELECTRICAL · SMART CITIES ·
ENERGY REDUCTION · LIGHTING IMPACT

4182 COOPER ESTATES

LIGHTING STRATEGY

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EXECUTIVE SUMMARY

This Technical Report proposes a suitable approach for the proposed car park along Bath Road, with electric car charging facilities. This strategy is in accordance with BS 5489-1.2020 – 7.4.8.3 Outdoor Car Parks. The strategy proposes to minimise obtrusive lighting impacts on human, and ecological receptors, in line with GN01.2021 & GN08.2023 guidance, as well as Wiltshire councils local planning policies.

It has been identified that the site is located in an E3 zone. This is because the site is situated within a well inhabited urban area, consisting of large residential developments, shopping facilities as well as a small industrial estate.

The Application Site has a nursery to the west of the scheme. To ensure that the nursery is not affected by any light spill, GN01 grids have been added to the eastern and southern walls of the nursery, ensuring that no more than 2.00 Lux of light spill is hitting the nursery, in line with the area being identified as an E3 zone. No other GN01 concerns have been identified.

To the northern and eastern edges of the Application Site, ecology concerns have been raised. We have assured that there is no light spill above 0.4 Lux hitting any of the boundary vegetation, as per the ecologist's report. We have also added GN08 grids onto all boundary vegetation to ensure compliance with GN08.

In response to the ecologist's report, we have specified all "A" type luminaires to have rear louvres and specified that all luminaires are 2700K colour temperature. All luminaires are to be mounted onto a 6M column, enabling the design to have good uniformity as per BS5489-1.2020, whilst minimising unnecessary light spill.

The carpark has been lit according to BS 5489-1.2020, achieving a minimum average illuminance of 5 Lux, as well as a minimum uniformity of 0.25 Lux.

Overall, the technical report has considered all lighting proposed within the scheme and calculated a worst-case scenario for light spill onto surrounding areas.

1. INTRODUCTION

1.1. General

- 1.1.1. This Lighting Strategy has been written by DFL (Designs for Lighting Ltd¹), a lighting design consultancy specialising in Lighting Impact Assessments, obtrusive light mitigation, and detailed lighting design.
- 1.1.2. The Lighting Strategy is intended to set out a minimally obtrusive approach to the lighting, whilst ensuring it is necessary and considers the sensitivity of nearby human, environmental and ecological receptors.
- 1.1.3. Lighting associated with the Proposed Development will comply with relevant British Standards and Institution of Lighting Professionals (ILP) guidance to ensure obtrusive light is minimised in accordance with best practice.
- 1.1.4. This report outlines the following:
 - Relevant obtrusive light policies in direct relation to the Proposed Development;
 - Relevant National and Local Policies;
 - Why the Proposed Development requires artificial lighting; and
 - Details as to how lighting will be implemented for the Proposed Development.
- 1.1.5. Through careful design and mitigation, this Lighting Strategy ensures the lighting installation at the Proposed Development will be in accordance with British Standards, Guidance and Local Policy.

1.2. Ecologist's Report

- 1.2.1. The ecology report ECIA and BMA has informed the lighting strategy for the Proposed Development, and care has been taken to achieve the GN08:2023 recommended illuminance levels in the locations specified by this report.

¹ <https://www.dfl-uk.com/about/>

2. LEGISLATIVE FRAMEWORKS AND NATIONAL POLICIES

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

- 2.1.1. Since 2005, artificial light has been incorporated as a potential statutory nuisance. An amendment to section 79 of the Environmental Protection Act 1990, contained within the Clean Neighbourhoods and Environment Act 2005 states: ²

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

[...] artificial ³light emitted from premises so as to be prejudicial to health or a nuisance;

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

2.2. National Planning Policy Framework 2024 (Amended 2025)

- 2.2.1. The National Planning Policy Framework (NPPF) sets out the government's planning policies for England and how they are expected to be applied and provides a framework for local plans. With regard to light pollution, the NPPF was updated in February 2025 and states that the following elements are to be considered⁴:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

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

² <https://www.legislation.gov.uk/ukpga/1990/43/part/III/crossheading/statutory-nuisances-england-and-wales> Section 79, paragraph 1,

³ 2005 Section 102 relating to section 79, Indent reference (fb)

⁴ Paragraph 198 NPPF 2024 page 57

2.3. Planning Practice Guidance

2.3.1. Guidance for assessing the effects of proposed artificial lighting is outlined in the planning practice guidance (PPG). The guidance states:⁵

“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.)”*

⁵ <https://www.gov.uk/guidance/light-pollution>, Paragraph 002 Ref ID: 31-002-20191101 revision 01 11 2019

3. LOCAL POLICIES

3.1. WILTSHIRE COUNCIL POLICIES.

- 3.1.1. The relevant Local Planning Authority (LPA) for the Proposed Development is Wiltshire Council, with policies detailed within Wiltshire Council dated January 2015, applying to the lighting associated with the Proposed Development.

The applicable policies are: [Wiltshire Core Strategy.pdf](#).

- 3.1.2. The following policies from this local plan apply to the proposed lighting

Bat roost sites, foraging habitat and flight lines within, and in the vicinity of the site must be identified, retained and protected in the long-term, including sensitive lighting

Habitat corridors across the site should be retained, buffered and restored with sensitive lighting close to hedgerows, mature trees and the riparian corridor.

Street lighting designed to minimise light pollution and sky glow.

Ensure lighting does not exceed the height of the development and designed to minimise light pollution and sky glow.

Lighting is low level and does not intrude above the height of the tree screen and is designed to minimise sky glow.

3.2. UNADOPTED ROADS

- 3.2.1. Whilst the roads and paths within the Application Site will be privately maintained, where applicable, they will be designed to an adoptable class and compliant with the relevant British Standards.

4. BRITISH STANDARDS

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

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

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

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

5. GUIDANCE

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

5.1.1. The Lighting Strategy has been developed in accordance with industry guidance aimed at minimising the risk of obtrusive light, which often results from poorly designed or installed external lighting. It draws specifically on the most relevant sections of GN01:2021, which provides best practice recommendations for reducing obtrusive light across a wide range of outdoor lighting applications.

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

Table 1: Environmental Zone Descriptions

Environmental Zones	Sky Glow ULR ⁶ (Max %)	Light Trespass (Into Windows) E _v (lux)		Building Luminance Average, Pre-curfew
		Pre- Curfew	Post-Curfew ⁷	Average L (cd/m ²)
E0	0	0	0	0
E1	0	2	0 (1 ⁸)	0
E2	2.5	5	1	5
E3	5	10	2	10
E4	15	25	5	25

Table 2: Obtrusive Light Criteria

⁶ ULR (Upward Light Ratio) is the maximum permitted percentage of luminaire flux that goes directly into the sky.

⁷ 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

⁸ If the installation is for public (road) lighting, then this may be up to 1 lx

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

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

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

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

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

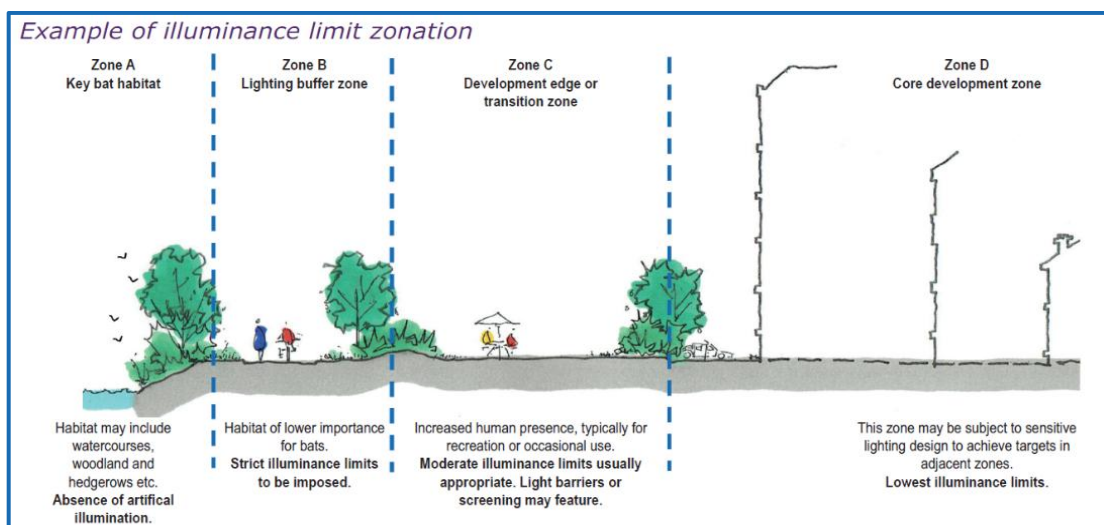


Figure 1: Example of lighting zonation near sensitive boundaries and known ecological habitat

6. DESKTOP STUDY

6.1. Site Description and Context

- 6.1.1. A desktop assessment was completed to understand the Application Sites position within the current lit environment.
- 6.1.2. The Application Site is land lying North of Bath Road, Chippenham, SN14 0BJ. The site is located next to Busy Bees Nursery, just off an existing dead-end road. The site itself is mostly grassland, with some trees and shrubbery surrounding the site, some of which is proposed to be removed. To the North of the site, there is a small residential development that has a pathway running from the residential development and towards the local supermarket. The supermarket is located to the east of the Application Site.
- 6.1.3. The Proposed Development consists of a car park incorporating 16 electric vehicle charging stations. As well as charging facilities, the carpark has a proposed 20ft storage BESS Container.
- 6.1.4. The Application Site including the redline boundary can be seen in **Figure 2**.



Figure 2: The Application Site location and boundary

6.2. Environmental Zone Classification

6.2.1. The Environmental Zone criteria detailed within **Table 1** and **Table 2** informs the basis of the Lighting Strategy. The Application Site is assessed to be located within an E3 Environmental Zone.

Zone	Surrounding	Examples	Limitations		Sky Glow ULR (Max)
			Pre-curfew	Post-curfew	
E3	Suburban	Well inhabited rural and urban settlements, small town centres or suburban locations.	10	2	5%

Table 3: Limitations of identified environmental zone.

7. IDENTIFIED RECEPTORS

7.1. Ecological

- 7.1.1. The North & Eastern boundaries of the Application Site have been identified in the ecology report ECIA and BMA as areas where potentially sensitive ecological receptors maybe present, as shown in **Appendix 3 – Sensitive Receptors**. Therefore, this Lighting Strategy is informed by GN08:2023 with respect to these locations.
- 7.1.2. A description of the potential ecological receptors can be seen in **Table 4**.

Receptor Type	Receptor No. (Appendix 3)	Description
Ecology	PSER 001	Boundary vegetation identified by the ecology report that is not to have any more than 0.4 lux of light spill.
Ecology	PSER 002	Boundary vegetation identified by the ecology report that is not to have any more than 0.4lux of light spill.
Ecology	PSER 003	Boundary vegetation identified by the ecology report that is not to have any more than 0.4lux of light spill.

Table 4: Potentially Sensitive Ecological Receptors (PSER)

7.2. Human Amenity

- 7.2.1. To the West of the site, Potential Human Amenity Receptors (PHAR) have been identified as shown in **Appendix 3 – Sensitive Receptors**. Therefore, this Lighting Strategy has been written in accordance with GN01:2021 (Table 2 - Obtrusive Light Criteria).
- 7.2.2. A description of the potential human receptors can be seen in **Table 5**.

Receptor Type	Receptor No. (Appendix 3)	Description
Human Amenity	PHAR 001	Eastern wall of the Nursery that is potentially susceptible to light spill.
Human Amenity	PHAR 002	Southern wall of the Nursery that is potentially susceptible to light spill.

Table 5: Potential Human Amenity Receptors (PHAR)

8. LIGHTING STRATEGY

8.1. Summary

- 8.1.1. The following criteria seeks to ensure that the lighting is not outside of the obtrusive light limits for the Environmental Zone in which the Application Site is located, is sensitive to the area, and provides a recognised standard level of lighting for all adoptable areas requiring illumination. Luminaires will distribute light downwards only to reduce the potential for light spill onto the boundaries surrounding the buildings and upwards towards the sky.
- 8.1.2. Lighting will be of an appropriate specification and designed in accordance with British Standards.
- 8.1.3. Amenity lighting for the Proposed Development will be applied sensitively to account for the receptors identified surrounding the Application Site.
- 8.1.4. Luminaires will be used with integral LEDs and only where the luminaire photometry is available from the manufacturer. This is to ensure the photometric footprint of the luminaires can be modelled to ensure the potential effects of light spill are minimised or mitigated.
- 8.1.5. All lighting unless otherwise stated is to emit a warm white colour temperature light (2700 Kelvin or less) to reduce the potential for adverse effects onto potentially sensitive receptors.
- 8.1.6. An additional column has been proposed along the access road south of the scheme. The instillation of this column is recommended for safety and path finding purposes. The carpark will introduce an area of conflict between vehicles and pedestrians at the entrance to the carpark. As this road/path allows access to a nursery, it's likely that the pathway is going to be used by a high volume of pedestrians, particularly at peak times. To help increase the visibility of pedestrians and increase safety for all road users, we recommend the instillation of this additional column and luminaire.
- 8.1.7. Lighting in unadopted areas will be required in the following task areas:
 - > Car Park
 - > Access Road

8.2. Car Park

- 8.2.1. The car park will be illuminated in accordance with BS 5489-1:2020 and BS EN 13201-2:2015 for amenity and safety purposes. The lowest possible lighting levels are proposed within this Lighting Strategy.
- 8.2.2. Performance requirements for the car park are outlined in **Figure 3**.
- 8.2.3. Following a risk assessment, the lighting class will remain as recommended in BS 5489-1:2020.

Table 4 — Maintained lighting levels for outdoor car parks

Type of area and usage	Values in lux	
	$\bar{E}$	U_o
Light traffic, e.g. parking areas of shops, terraced and apartment houses; cycle parks	5	0.25
Medium traffic, e.g. parking areas of department stores, office buildings, plants, sports and multipurpose building complexes	10	0.25
Heavy traffic, e.g. parking areas of major shopping centres, major sports and multipurpose sports and building complexes	20	0.25

Figure 3: Performance requirements

Area	Section	BS 5489 Requirements		MF used	Note
		Eav Lux	U_o		
Car Park		5	0.25	0.75	

Table 6: design parameters BS5489

8.3. Access Road

- 8.3.1. The access road will be lit for safety and path finding purposes only. The access road will not be illuminated in accordance with BS 5489-1:2020.

Equipment Specification	
Application Area	Car Park / Access Road
Correlated Colour Temperature (Kelvin)	≤2700K
Lumen Output	≤1.55 Lux
Height	≤6m
Mounting Arrangement	Post Top
Luminaire Tilt	0 Degrees
Upward Light Output Ratio E3 < 5%	0%
Luminaire Manufacturer	Urbis Schreder
Luminaire family	Axia 3.1 16 OSLO Square Giant LED – 200mA – 2700K – 5293 Lens with rear louvre.
Example Luminaire Image	
Light Spill Diagram reference	Type A
Controls ⁹	Photoelectric Cells

Table 7: Luminaire performance requirements

⁹ Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

Equipment Specification	
Application Area	Car Park
Correlated Colour Temperature (Kelvin)	≤2700K
Lumen Output	≤ 1.47 Lux
Height	≤6m
Mounting Arrangement	Post Top
Luminaire Tilt	0 Degrees
Upward Light Output Ratio E3 < 5%	0%
Luminaire Manufacturer	Urbis Schreder
Luminaire family	Axia 3.1 8 OSLO Square Giant LED – 400mA – 2700K – 5293 Lens.
Example Luminaire Image	
Light Spill Diagram reference	Type B
Controls ¹⁰	Photoelectric Cells

Table 8: Luminaire performance requirements

¹⁰ Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

9. SUMMARY OF RESULTS

9.1. Overview

- 9.1.1. The Light Spill Diagram shown in **Appendix 1 – Light Spill Diagram** and **Appendix 2 – Vertical Light Spill Diagram**, demonstrates that the Light Spill Levels associated with the proposed lighting would comply with the obtrusive light guidance set out in ILP GN01:2021, at sensitive receptors.
- 9.1.2. To ensure the worst-case scenario has been modelled, the highest potential light levels have been modelled / presented in the light spill diagram, with the project maintenance factors set at MF = 1.0¹¹. This demonstrates the light levels at their highest (initial light levels at the start of luminaire life).

9.2. Summary of Results

- 9.2.1. The proposed lighting within the task area(s) is compliant to the relevant policies, standards and guidance.
- 9.2.2. Where ecological receptors are potentially sensitive to vertical light spill, a vertical illumination grid has been modelled, as shown in **Appendix 2 – Vertical Light Spill Diagram**. The light levels based on the modelling do not exceed 0.4 Lux, keeping the light levels within the guidance given within GN08:2023.
- 9.2.3. In line with section 4.56 of GN08:2023, the vertical grids will be mounted at a height of 1.5 metres above the ground level to simulate the likely flight path of a light sensitive bat.

Receptor No	GN08:2023 requirements	Maximum vertical Illuminance (Lux)	Notes
PSER 001	0.40	0.11 Lux	
PSER 002	0.40	0.14 Lux	
PSER 003	0.40	0.06 Lux	

Table 9: PSER results table, maximum illuminance.

¹¹ <https://www.dfl-uk.com/knowledge-hub/faqs/>

- 9.2.4. Where human receptors are potentially sensitive to vertical light spill, a vertical illumination grid has been modelled, as shown in **Appendix 2 – Vertical Light Spill Diagram**. The light levels based on the modelling do not exceed 2 Lux, keeping the light levels within the guidance given within GN01:2021 for an area identified as an E3 environment.

Receptor No	GN01/2021 requirements		Maximum vertical Illuminance (Lux)	Notes
	Pre-curfew	Post Curfew		
PHAR 001	10 Lux	2 Lux	0.25 Lux	
PHAR 002	10 Lux	2 Lux	0.17 Lux	

Table 10: PHAR results table, maximum illuminance

9.3. Mitigation and Enhancements

- 9.3.1. Careful design ensures the lighting has been minimised onto sensitive receptors in accordance with standards and guidance.
- 9.3.2. Where applicable, louvres are proposed in particularly sensitive areas to further minimise spill. As is shown on the Lighting Spill Diagram (**Appendix 1 – Light Spill Diagram**).
- 9.3.3. The detailed design is to be completed by a competent person or persons in accordance with the details within this Lighting strategy.
- 9.3.4. As per **Paragraph 8.1.6**, an additional column is recommended to be installed for safety and wayfinding purposes.

10. CONCLUSION

10.1. General

- 10.1.1. Lighting associated with the Proposed Development shall be designed in accordance with the Lighting Strategy for the Application Site outlined in **Section 8**.
- 10.1.2. This Technical Report has been written in accordance with the relevant British Standards, industry guidance and local policies to ensure it is unlikely to give rise to obtrusive light with the potential to affect human, environmental and ecological receptors.
- 10.1.3. Through the application of this Lighting Strategy sensitive receptors will not be adversely affected by obtrusive light, as shown in **Appendix 1 – Light Spill Diagram** and **Appendix 2 – Vertical Light Spill Diagram**.

10.2. Relevant Planning Conditions

- 10.2.1. The following planning conditions have been met. Please defer to ECIA and BMA Document: [draft ECIA and BMA.pdf](#)
- 10.2.2. A sensitive lighting plan is required. We have modelled the lighting and created a light spill calculation. This calculation models the lighting to show the worst-case scenario light spill. It shows that there is no light spill above 0.4 Lux upon the boundary vegetation and surrounding habitats. It also shows that lighting levels meet Guidance Note 08/23: Bats and Artificial Lighting at Night.
- 10.2.3. To ensure minimal light spill, we have chosen a column height of 6m. This will enable us to design the carpark with good uniformity to reach BS5489-1_2020 Outdoor Car Parks standard, whilst also ensuring that sensitive receptors are protected from the light spill.
- 10.2.4. Lighting that has been proposed adjacent to charging points. Lighting adjacent to charging points has been specified to have rear louvres to minimise light spill onto sensitive receptors. In addition to this the columns & luminaires have been positioned in such a way to minimise light spill onto sensitive receptors.
- 10.2.5. 2700K LED Luminaires have been specified. The use of 2700K luminaires reduces the amount of blue light being emitted, minimising the disruption to bats. LED Luminaires also benefit from having better optic systems available, so we can better direct the light to where it is needed, to minimise light spill and create a more efficient lighting design.

Through careful design and mitigation, this Lighting Strategy ensures the lighting installation at the Proposed Development will be in accordance with British Standards, Guidance and Local Policy [North Wiltshire Local Plan \(2011\) Natural environment.pdf](#).

APPENDIX 1 – LIGHT SPILL DIAGRAM

See accompanying document 4182-DFL-ELG-XX-LD-EO-13002-S3-P01

APPENDIX 2 – VERTICAL LIGHT SPILL DIAGRAM

See accompanying document 4182-DFL-ELG-XX-CA-EO-13002-S3-P01

APPENDIX 3 – SENSITIVE RECEPTORS

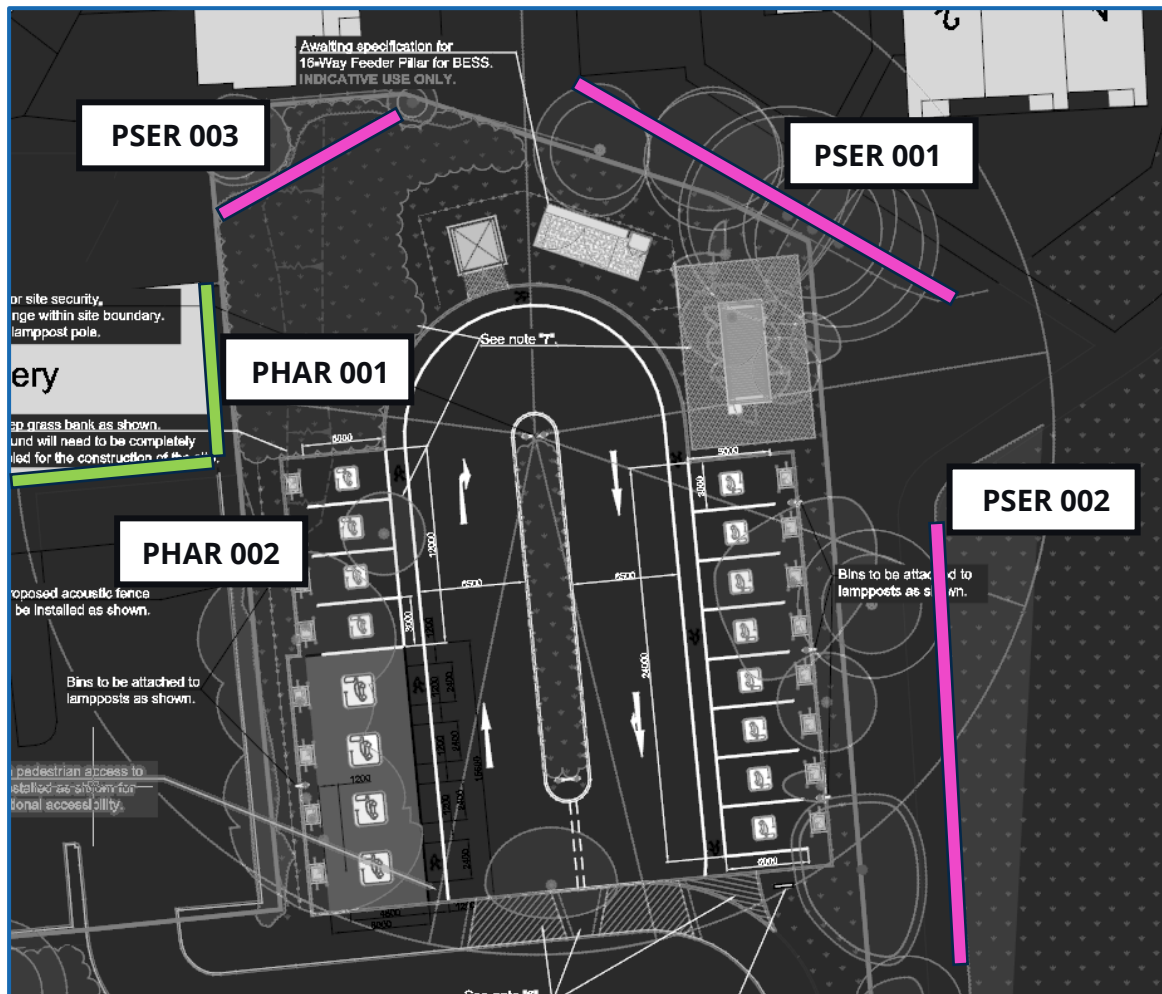


Figure 4: Sensitive receptors

Receptor Colour	Receptor Type
Pink	GN08 Receptor
Green	GN01 Receptor

TECHNICAL DESCRIPTIONS, DEFINITIONS AND ABBREVIATIONS

PHAR: is an abbreviation for a potential human amenity receptor, a location where an observer could have the potential to be affected by the proposed lighting to be installed [Abbreviation used by DFL LI and P.](#)

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

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

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

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

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

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

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

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

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

Luminous intensity: is light brightness or how intense the light source is. Light intensity is how intense a light source is emitted or received in a particular direction, this is measured in candelas and is termed as luminous intensity I_v <of a source, in a given direction> quotient of the luminous flux, $d\Phi_v$, leaving the source and propagated in the element of solid angle $d\Omega$ containing the given direction, by the element of solid angle (unit: $cd = lm \cdot sr^{-1}$). BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.2.

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

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

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

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

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

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

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

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

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

This isn't the end...

We don't just have the solution for what you need today. We also have the solutions you might need for the future. We have dedicated teams that deliver.

- **Lighting Impact and Planning** teams that focus on delivering the most effective and sensitive lighting solutions to support planning.
- **Residential** teams that cover all aspects of new development and redevelopment spanning private, section 38 and section 278 design packages.
- **Public Realm** teams that are experts in enhancing night-time public spaces to create inviting spaces and opportunity for local economies to thrive during the hours of darkness.
- **Electrical** teams – we don't just put a light in the ground, we can help you get power to it as well! Additionally, we also offer design services for EV charging. As this market rapidly expands, make sure you have the experts managing the load, otherwise your EV charging solutions might not live up to expectations.
- **Strategic Infrastructure** teams that offer Lighting and Electrical expertise for complex transport networks and interchanges.
- **Consultancy Services** teams that help when you know what you want but you need someone to help you turn the idea into a project.

Finally, as innovators, you might be facing something bespoke or niche. Don't worry – we might have the answer you need. Feel free to get in touch!

THE POWER TO MAKE LIGHT WORK



Aaron Cockram
Lighting Technician



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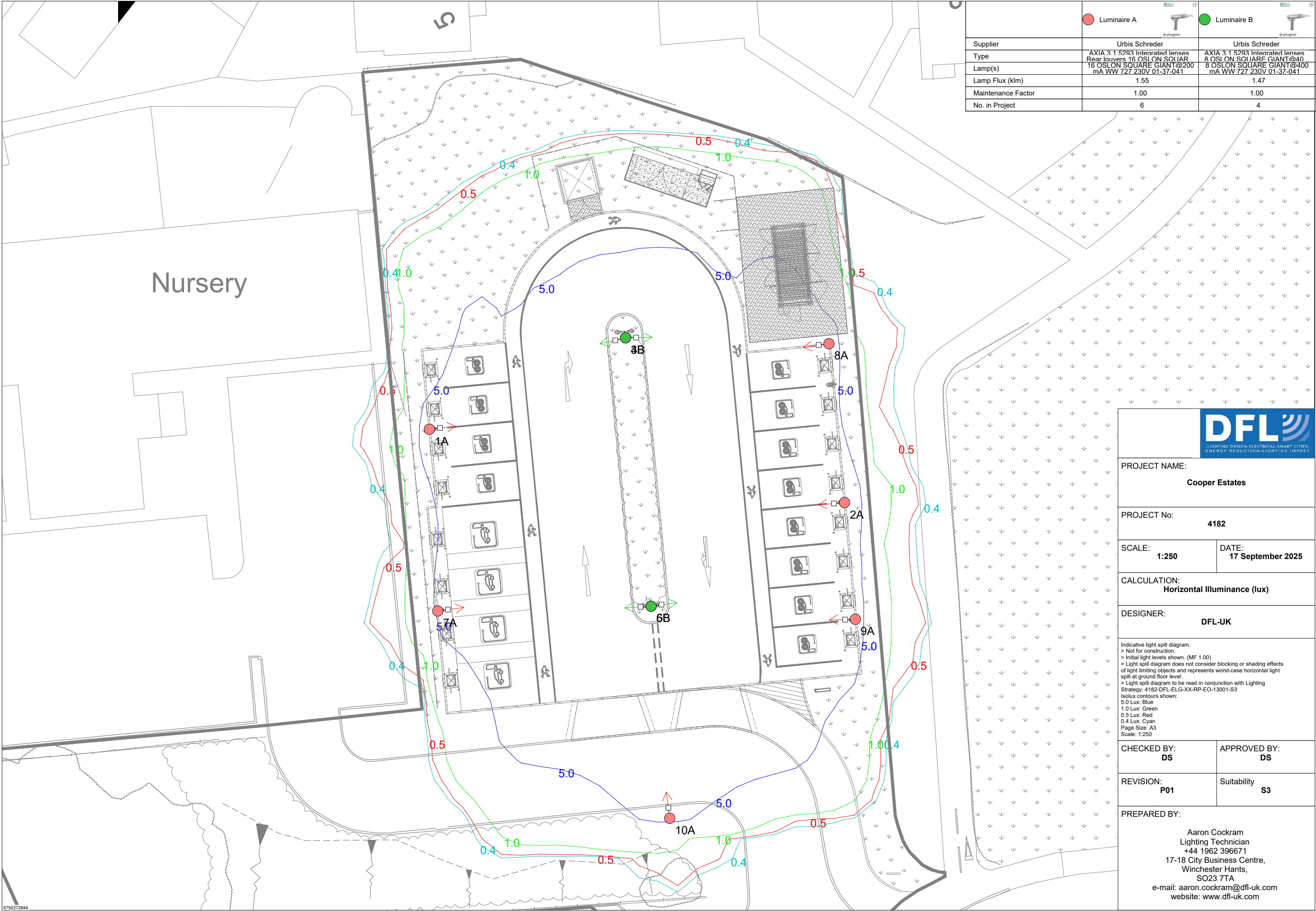
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Street, Winchester, Hampshire,
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	Luminaire A	Luminaire B
Supplier	Urbis Schreder	
Type	AXIA 3.1 5293 Integrated lenses Rear louvers 16 OSLO SQUARE 16 OSLO SQUARE GIANT @200 mA WW 727 230V 01-37-041	
Lamp(s)	AXIA 3.1 5293 Integrated lenses 8 OSLO SQUARE GIANT @400 mA WW 727 230V 01-37-041	
Lamp Flux (klm)	1.55	1.47
Maintenance Factor	1.00	1.00
No. in Project	6	4

DFL
LIGHTING DESIGN • ELECTRICAL • SMART CITIES •
ENERGY REDUCTION • LIGHTING IMPACT

PROJECT NAME:
Cooper Estates

PROJECT No:
4182

SCALE:
1:250

DATE:
17 September 2025

CALCULATION:
Horizontal Illuminance (lux)

DESIGNER:
DFL-UK

Indicative light spill diagram.
> Not for construction.
> Initial light levels shown. (MF 1.00)
> Light spill diagram does not consider blocking or shading effects of light limiting objects and represents worst-case horizontal light spill at ground floor level.
> Light spill diagram to be read in conjunction with Lighting Strategy: 4182-DFL-ELG-XX-RP-EO-13001-S3

Isolux contours shown:
5.0 Lux: Blue
1.0 Lux: Green
0.5 Lux: Red
0.4 Lux: Cyan
Page Size: A3
Scale: 1:250

CHECKED BY:
DS

APPROVED BY:
DS

REVISION:
P01

Suitability
S3

PREPARED BY:

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DATE: 17 September 2025

DESIGNER: DFL-UK

PROJECT No: 4182

PROJECT NAME: Cooper Estates



Location: Cooper Estates

Environmental Zone: E3

GN01: 2.0lx Maximum

GN08: 0.4 Lux Maximum

Lighting parameters taken from ILP Guidance documents

GN01.2021 - The reduction of Obtrusive Light & The reduction of Obtrusive Light and GN08.2023 - Bats and Artificial Lighting at Night.

4182-DFL-ELG-XX-CA-EO-13002-S3-P01

PREPARED BY:

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Illuminance (lux)

Grid 1 - PSER 001

[illegible]

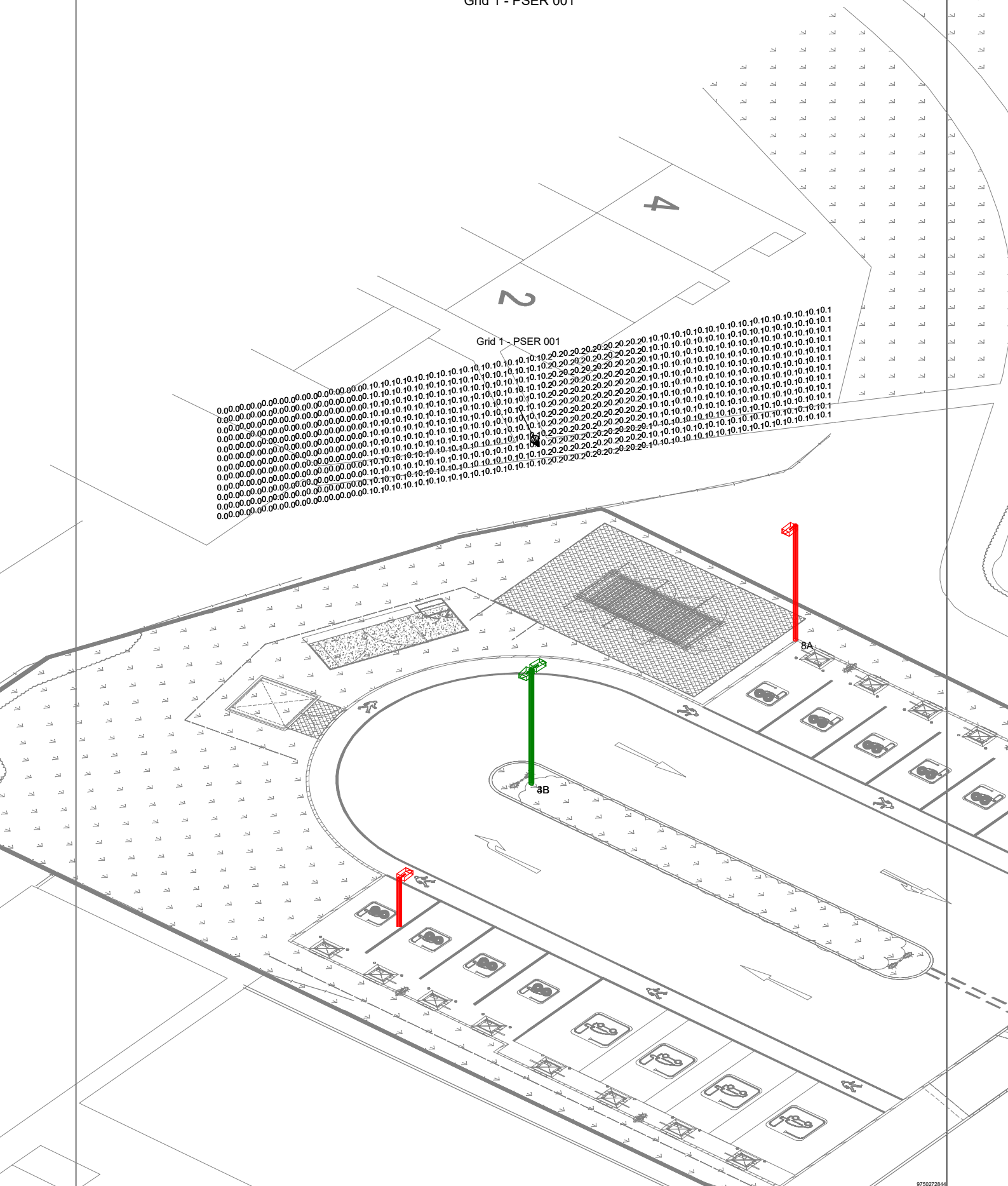
Results

Eav	0.02
Emin	0.00
Emax	0.11
Emin/Emax	0.00
Emin/Eav	0.00

Vertical Illuminance (lux)

Observer direction = 0 deg. Height = 0.00

Grid 1 - PSER 001



Illuminance (lux)

Grid 2 - PSER 002

[illegible]

Results

Eav	0.03
Emin	0.00
E _{max}	0.14
Emin/E _{max}	0.00
Emin/Eav	0.00

DATE: 17 September 2025
PROJECT No: 4182

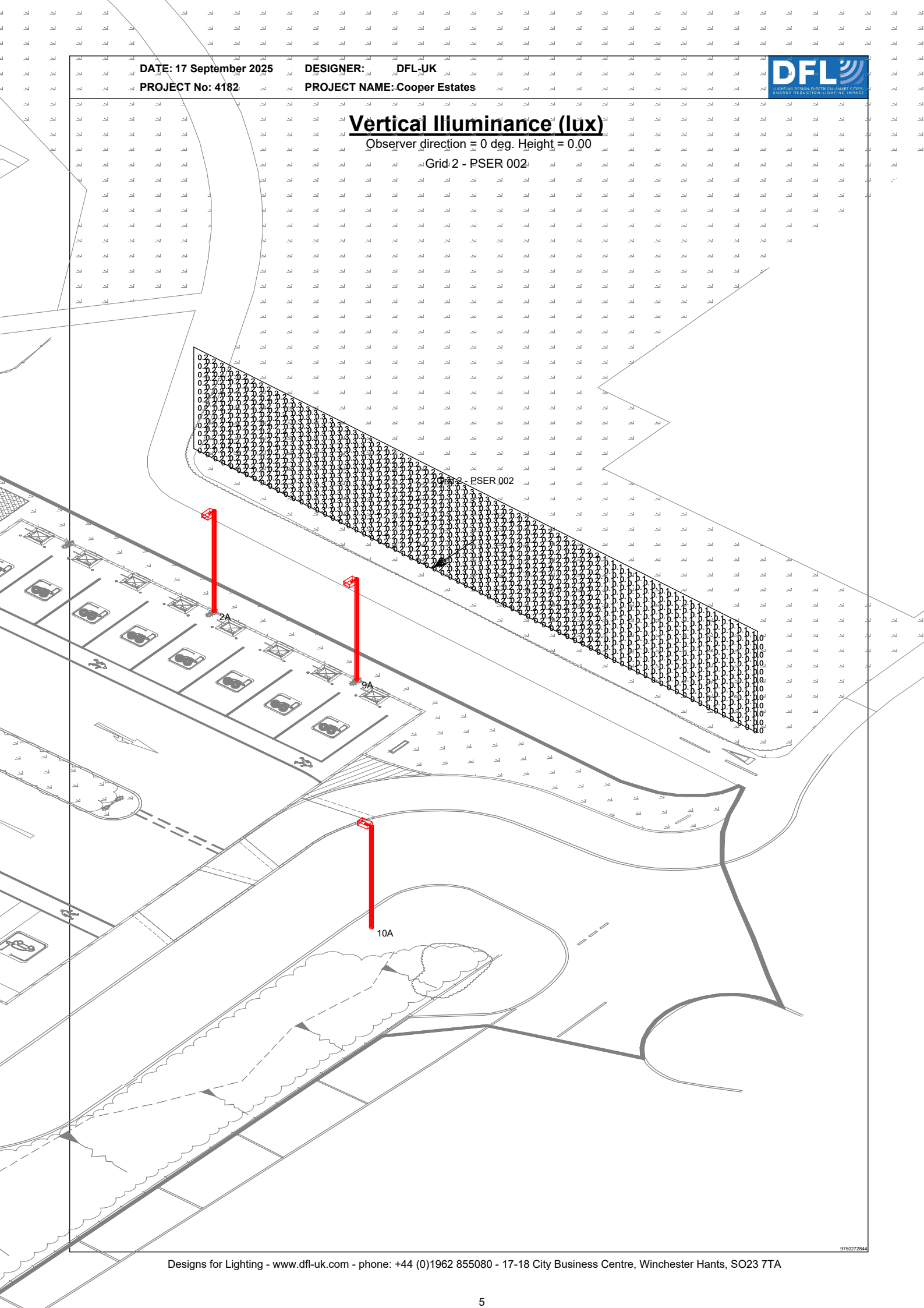
DESIGNER: DFL-UK
PROJECT NAME: Cooper Estates



Vertical Illuminance (lux)

Observer direction = 0 deg. Height = 0.00

Grid 2 - PSER 002



Illuminance (lux)

Grid 3 - PSER 003

[illegible]

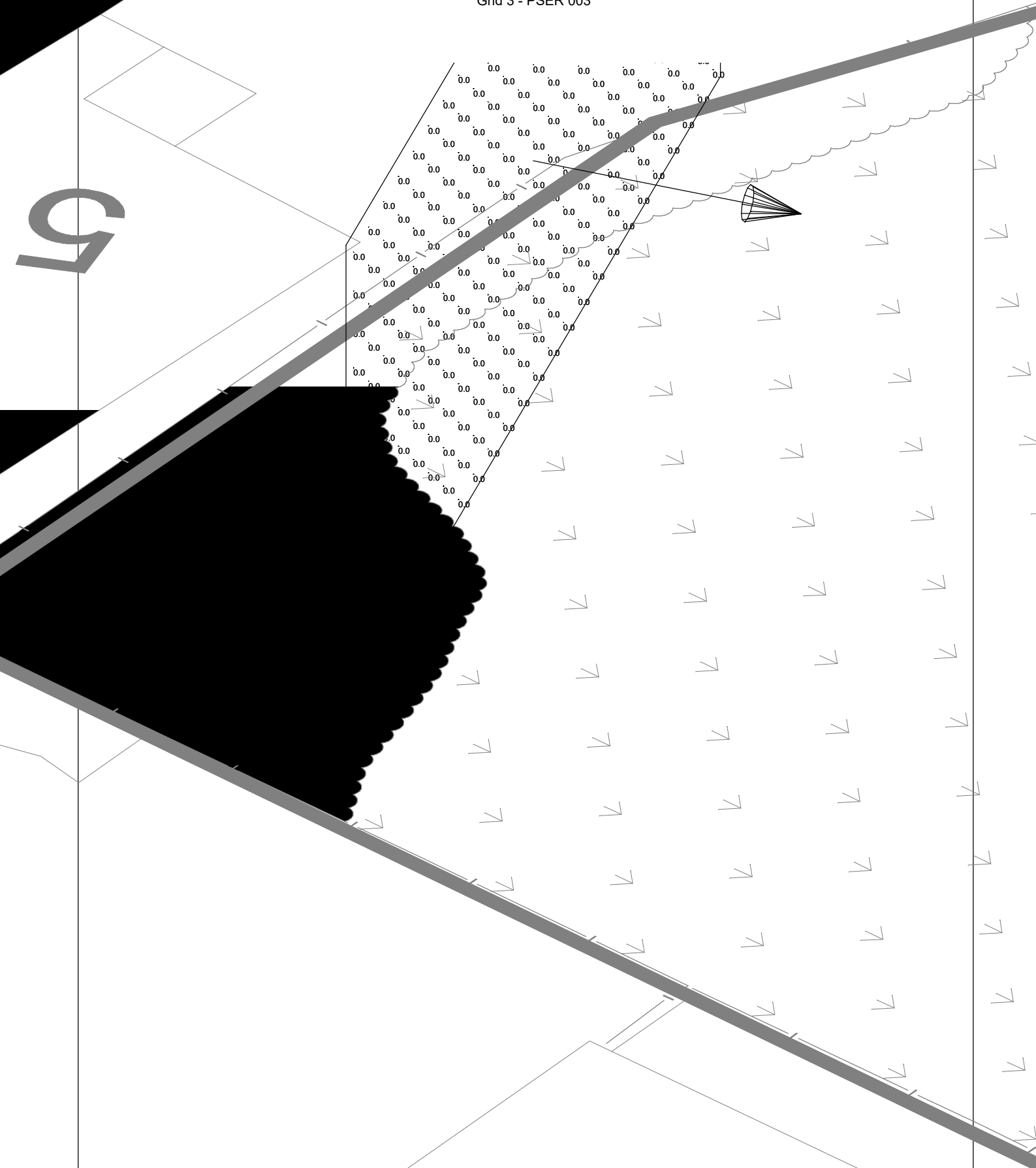
Results

Eav	0.02
Emin	0.00
E _{max}	0.06
Emin/E _{max}	0.00
Emin/Eav	0.00

Vertical Illuminance (lux)

Observer direction = 0 deg. Height = 0.00

Grid 3 - PSER 003



Illuminance (lux)

Grid 4 - PHAR 001

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
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0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Results

Eav	0.05
Emin	0.00
Emax	0.25
Emin/Emax	0.00
Emin/Eav	0.00

DATE: 17 September 2025
PROJECT No: 4182

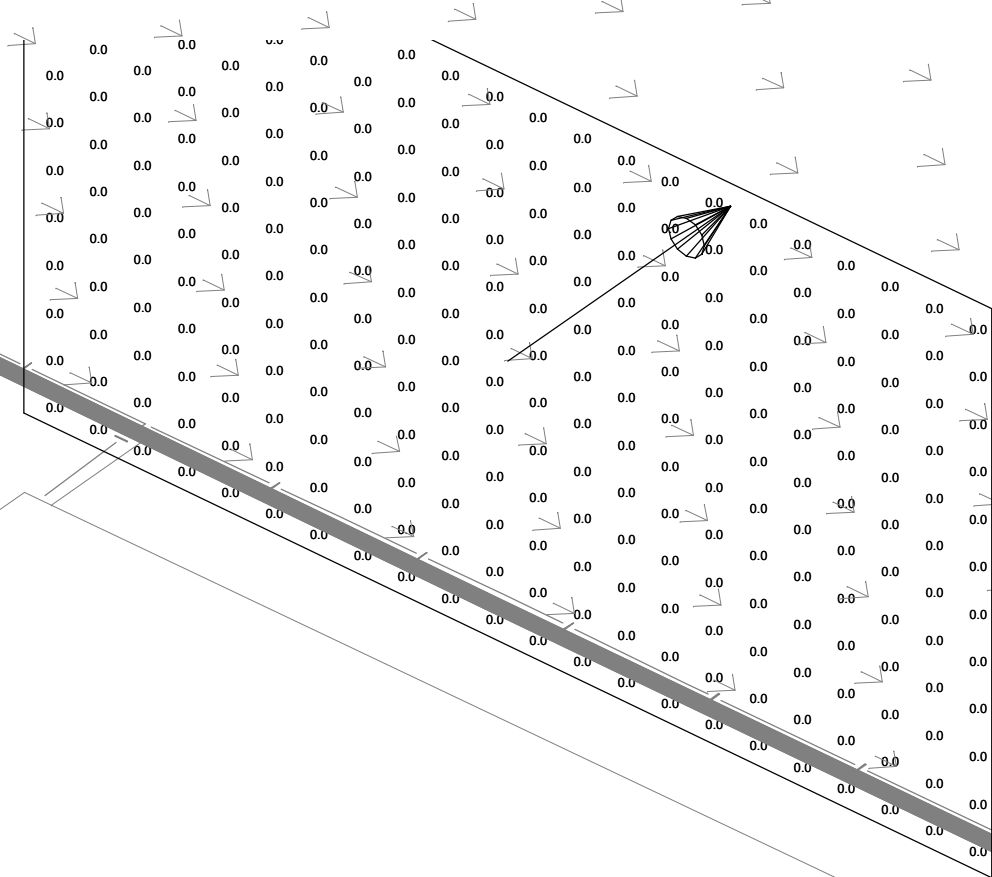
DESIGNER: DFL-UK
PROJECT NAME: Cooper Estates



Vertical Illuminance (lux)

Observer direction = 0 deg. Height = 0.00

Grid 4 - PHAR 001



Illuminance (lux)

Grid 5 - PHAR 002

[illegible]

Results

Eav	0.02
Emin	0.00
Emax	0.17
Emin/Emax	0.00
Emin/Eav	0.00

Vertical Illuminance (lux)

Observer direction = 0 deg. Height = 0.00

Grid 5 - PHAR 002

