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S38 LAND OFF FIELDHEAD LANE, BIRSTALL

DESIGN SUMMARY REPORT

DFL-UK
17 City Business Centre, Hyde Street, Winchester, SO23 7TA
+44(0)1962 855080 | info@dfl-uk.com | www.dfl-uk.com

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

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1. INTRODUCTION

1.1. Scope of Works

1.1.1. Street lighting design for the S38 works on drawing 13002, this will be the newly proposed residential area coming off of Fieldhead Lane.

1.2. Site Description and Context

1.2.1. DFL have been commissioned to carry out the lighting design for the S38 scheme of Fieldhead Lane. Please refer to **Figure 1** for an overview of the site.

Figure 1: Site Plan

2. LOCAL POLICIES

2.1. Introduction

2.1.1. The relevant Local Highway Authority (LHA) for the Application Site is Kirklees Council, we did not manage to obtain any specification from the Local Authority but received an email from the street lighting team with some information regarding the equipment, switching arrangements, colour temperatures.

3. BRITISH STANDARDS

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

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

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

3.2.1. 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.

4. GUIDANCE

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

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

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

Table 1: Environmental Zone Descriptions

Environmental Zones	Sky Glow ULR[1] (Max %)	Light Trespass (Into Windows) E_v (lux)		Building Luminance Average, Pre-curfew
		Pre-Curfew	Post-Curfew[2]	Average L (cd/m²)
E0	0	0	0	0
E1	0	2	0 (1*)	0
E2	2.5	5	1	5
E3	5	10	2	10
E4	15	25	5	25

Table 2: Obtrusive Light Criteria

[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

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

4.2.1. 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 2**).*

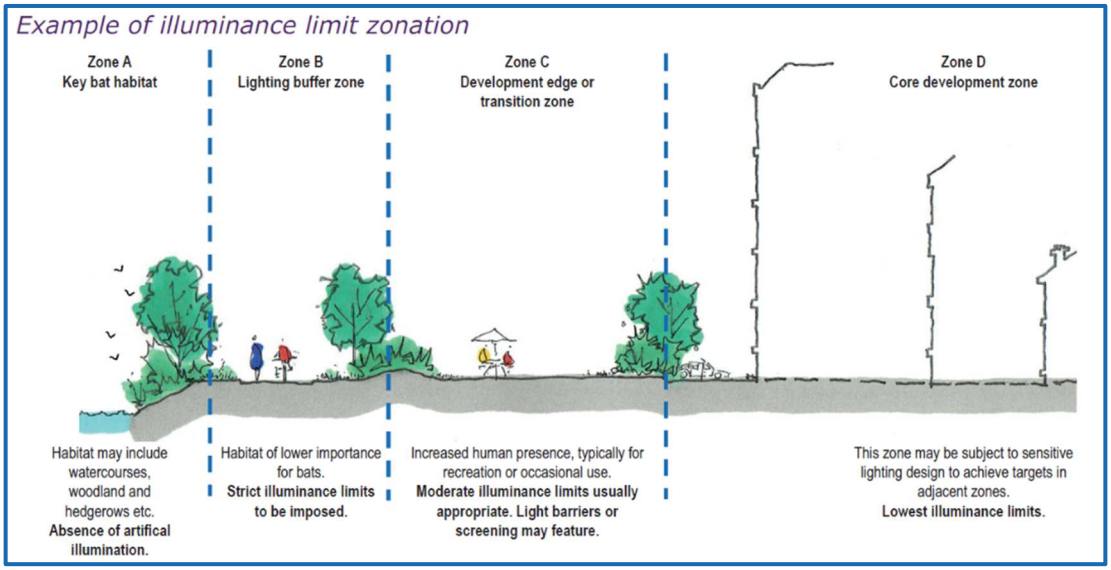

Figure 2: Example of Lighting Zonation near Sensitive Boundaries and Known Ecological Habitat

5. DESKTOP ASSESSMENT

5.1. Site Description and Context

5.1.1. The Application Site is a field just off of Fieldhead Lane, this will be for residential area and public footpaths.

5.1.2. The existing lighting on Fieldhead Lane is using 4000 kelvin luminaires and installed at a heigh of 6m. The same type of luminaires have been used in the Proposed site for consistency.

5.2. Environmental Zone Classification

5.2.1. The Environmental Zone criteria detailed within **Table 1** and **Table 2** informs the basis of the Lighting Impact Assessment.

5.2.2. The Application Site is considered to be located within an E3 environmental zone. This is because of the Application Sites location within a well inhabited rural and urban area with small town centres or suburban location.

5.2.3. The lighting classes used within the Proposed Development, and the limitation placed on the lighting in terms of its environmental effect, is informed by the requirements for an E3 environmental zone (**Table 3**).

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 lux	2 lux	5%

Table 3: Limitations of the Environmental Zone

6. LIGHTING STRATEGY

6.1. Summary

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

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

6.1.3. Lighting in Private but to adoptable standard areas will be required in the following application areas:

- Access Road and side roads

6.2. Consultation

6.2.1. Consultation has been carried out with Kirklees Street Lighting team prior to designing to agree the general specification of equipment to use and design guidance. There was no specific guidance to use or any specification documentation but had information within the email to progress with the design.

6.3. Residential Road(s)

6.3.1. The lighting class can be seen within **Table 4** below. This is derived from BS5489-1:2020 Table A.5, the performance requirements for which are based on BS EN 13201-2:2015.

Road	Environmental Zone	Traffic Flow	Speed Limit / Pedestrianised	Standard Lighting Class	Risk Assessment	Design Class
Fieldhead Lane – onsite lighting	E3	Quiet	≤30 mph	P4	No Change	P4

Table 4: Lighting Class for Residential Roads

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

7. SUMMARY OF RESULTS

7.1. Design

7.1.1. As demonstrated in lighting calculation **4428-DFL-HLG-XX-CA-EO-13003**, the following results have been achieved (**Table 4**). Where grids are non-compliant, the reason for non-compliance/departure from standard has been given.

Calculation Grid Ref	Compliant?	Non-compliance / Departures from Standards
Grid 1 – Class P4	✓	
Grid 1 – Class P4	✗	For the side roads, due to parking spaces and site layout, column locations are limited. As such, the minimum requirement for the specified class could not be achieved. This has been assessed and deemed acceptable by the designer as the roads are only leading to a few properties.
Grid 1 – Class P4	✗	
Grid 1 – Class P4	✗	

Table 4: Lighting Class Compliance

7.2. Obtrusive Light

7.2.1. Where human receptors are potentially sensitive to vertical light spill, a vertical illumination grid has been modelled, as shown in 4428-DFL-ELG-XX-CA-EO-13001. The light levels based on the modelling in some cases do exceed the 2 Lux maximum stated in the guidance given within GN01/2021 for an area identified as an E3 environmental zone.

Receptor No	Compliant?	Notes
PHAR 001	✓	
PHAR 002	✗	The amount that the 2 lux has been exceeded is low and deemed acceptable and only by 0.35 lux
PHAR 003	✗	The amount that the 2 lux has been exceeded is low and deemed acceptable and only by 0.37 lux
PHAR 004	✗	The amount that the 2 lux has been exceeded is low and deemed acceptable and only by 0.07 lux

Table 5: PHAR Results Table, Maximum Illuminance

8. LIGHTING DESIGN

8.1. Overview

8.1.1. The equipment to be used has been chosen in accordance with (Local Authority) specification received in an email when contacting Kirklees County Council.

8.2. Passive Safety

8.2.1. No passive safe equipment has been proposed; this is due to slow road speeds and in some cases the presence of buildings. It should be noted however that there are two column locations, LC02 and LC06 that are positioned between parking bays and in narrow areas. No other alternative places could be fond to site a column. It may be necessary to install some form of static bollard or other form by means to protect the column from parking vehicles.

8.3. Colour Temperature

8.3.1. 4000k neutral white colour temperature has been used throughout as per Kirklees Councils Specification.

8.4. Column Locations (setbacks, clearances and clear zones)

8.4.1. Where possible, proposed columns have been designed at the rear of the footway at a minimum of 800mm from the face of the kerb to the leading edge of the column. In areas where columns cannot be placed at the rear of footways, they have been placed in other suitable locations.

8.4.2. It should be noted that LC06 is positioned in a path access due to no other suitable location being available.

8.5. Supply

8.5.1. All proposed columns will be connected via .

8.6. Maintenance Factors

8.6.1. Maintenance factors have been based on LM80/TM21 depreciation curves, in line with BS5489-1:2020 and ILP GN11 – Determination of Maintenance Factors (**Table 6**). The maintenance factors are calculated as follows:

$$OMF = LLMF * LSF * LMF$$

Where:

LLMF is lamp or LED lumen maintenance factor, representing the proportion of initial light output remaining at the median useful life,

LSF is lamp or LED survival factor representing the proportion of LEDs in a luminaire that are expected to remain working at the median useful life,

LMF is luminaire maintenance factor representing the dirt build-up and other deterioration of the optic surfaces/materials as per BS5489-1:2020 Annex C, Table C.1,

OMF is the overall maintenance factor.

Type	LLMF	LSF	LMF	OMF
A	0.90	1	0.84	0.76

Table 6: Maintenance Factor Calculations

8.7. Dimming Regime

8.7.1. As per Kirklees request the luminaires will be controlled by a 20/20 lux photocell, the luminaire outputs will need to be dimmed between 2200 and 0500 as per the following pre-programmed regime:

- 100% - Dusk to 2200
- 75% - 2200 to 0000
- 50% - 0000 to 0500
- 100% - 0500 to Dawn

8.8. Mitigation and Enhancements

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

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

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

9. RISK ASSESSMENT

9.1. Overview

9.1.1. Refer to **4428-DFL-HLG-XX-RA-EO-13001** for the full risk assessment.

APPENDIX 1 – LIGHTING CLASS MAP

Figure 3: Lighting Class Map

Lighting Colours	Colour Coding
P4	

Table 8: Lighting Class Colour Coding

TECHNICAL DESCRIPTION, DEFINITIONS & 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&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&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&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 candelas and is termed as luminous intensity *Iv <of a source, in a given direction> quotient of the luminous flux, dΦv, leaving the source and propagated in the element of solid angle dΩ containing the given direction, by the element of solid angle (unit: cd =lm · sr -1.* BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.2.

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

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

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

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

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

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

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

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

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

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- **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.

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Connor Gardner
Lighting and Electrical Technician

+44 (0)1962 855080
Connor.gardner@dfl-uk.com
www.dfl-uk.com/
17/18 City Business Centre, Hyde Street, Winchester, Hampshire, SO23 7TA