

Lighting – Assessment

5367 – LP

Huddersfield Town AFC

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Final Issue



BRENTWOOD
LIGHTING DESIGN

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Executive Summary

It is judged, through on-site survey that the baseline condition for the Site location falls in to an E4 (High district brightness) environment with the relevant sensitive receptors being:

- Ecology – Light Sensitive
- Lighting Landscape – Huddersfield Canal
- Dark Sky

The proposed lighting installations, for the Proposed Developments include for:

- Access Roadway / Pedestrian / Cycle Path Lighting
- Car Parking
- Football Pitch 12 (Standard Arrangement)

Where, the notable inclusion is for the pitch lighting to achieve 500 Lux mounted to 16m columns. These have been assessed on a 'precautionary principal'.

In terms of pre-mitigation impact, due to the close vicinity of the badger sets and Huddersfield Canal it is likely that illumination levels (at these locations) will exceed the current baseline scenario.

However, this is limited to the timing and frequency of operation (during the hours of darkness) and from the retention of existing natural screening and dense treelines (mitigation) the residual impact is likely to be minimised.

1 Introduction

The intent for this Lighting Assessment is to provide a quantified assessment of potential obtrusive light impact to confirmed sensitive receptor locations in relation to published guidance limiting thresholds, policy and specialist discipline recommendation.

Where applicable, this will outline the requirements of mitigation measures (over standard embedded measures) to be implemented at design and operational stages in order to reduce or remove this potential impact.

The potential impacts of obtrusive light are categorised as follows:

- Light Trespass: The spilling of light beyond the boundary of a property which may cause nuisance to others - Horizontal (ground level) and Vertical (residential windows and ecology zones);
- Glare: The uncomfortable brightness of the light source against a dark background which results in dazzling the observer, which may cause nuisance to residents and a hazard to road users;
- Direct Sky Glow: The direct upwards spill of light into the sky which can cause a glowing effect and is often seen above cities when viewed from a dark area.

It is intended that this Lighting Assessment supports the forthcoming planning application.

2 Relevant Policy and Guidance

Legislation

Clean Neighbourhoods and Environment Act (CNEA) 2005 ¹

The Clean Neighbourhoods and Environment Act (CNEA) 2005 gives Local Authorities additional powers to deal with artificial lighting by classifying artificial light emitted from defined premises as a statutory nuisance (from April 2006). Guidance produced on Sections 101 to 103 of the CNEA extends the duty on local authorities to ensure their areas are checked periodically for existing and potential sources of statutory nuisances including nuisances arising from artificial lighting. Local authorities must take reasonable steps to investigate complaints of such nuisances from artificial light.

Empowerment to Light Roads - The Highways Act 1980 ²

Section 97 empowers a Highway Authority to provide lighting for any highway or proposed highway for which they are or will be the Highway Authority. District Councils and many Parish or Town Councils also have the power to provide lighting as local lighting authorities.

National Planning Policy

The National Planning Policy Framework 2012 and 2018 ³

The National Planning Policy Framework (NPPF) encourages good design with planning policies and decisions limiting the effect of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

National Planning Practice Guidance – Light pollution ⁴

The National Planning Practice Guidance (NPPG) advises on how to consider light within the planning system, specifically focusing on:

- When light pollution is relevant to planning;
- What factors should be considered when assessing whether a development proposal might have implications for light pollution;
- What factors are relevant when considering where, when and how much light shines;
- What factors are relevant when considering possible ecological effect.

Regional Planning Policy

Validation Checklist – Revised guidance notes to accompany the local list Published July 2013 – Kirklees Council - Policy driver – PPS 10 / A7 ⁵

Lighting assessment Glare and stray light from external lighting associated with development may be held to affect local amenity, dark landscapes and nature conservation to an unacceptable degree and/or to adversely impact on the character of a Conservation Area or listed building.

Depending on location applications that include proposals for external lighting can raise issues relating to glare and light pollution. Such applications need to be supported by detailed information to include:

- The proposed level of maintained average horizontal illuminance for the site,
- The predicted vertical illuminance that will be caused by lighting when measured at the windows of any properties in the vicinity
- The specification of the luminaries, including the number and location of the luminaries, the type and rating of the lamps, the design of lamp housing and proposals to minimise or eliminate glare from the use of the lighting installation
- The proposed hours of operation of the lighting.

- For issues specifically relating to the effect of lighting on bats see the Bat Conservation Trust guidelines Bats and Lighting in the UK ⁵. An overview of issues relating to light pollution can be found in the Institution of Lighting Professionals's (I.L.P.) Guidance Notes for the reduction of obtrusive light (GN01:2011)

For larger schemes applicants are encouraged to seek advice/ guidance direct from The Institution of Lighting Professionals ILP web site. Further guidance, with a particular emphasis on floodlighting relating to sports development can be found in Sport England's briefing note on Outdoor Sports Lighting and Artificial Sports Lighting: Design Guide (Nov 2012).

Two sources available are the Society of Light and Lighting document LG4 Lighting Guide: Sports and British Standard BS EN 12193: 2007 —Light and Lighting – Sports Lighting.

Obtrusive Light and Design Guidance

Institute of Lighting Professionals – Guidance Notes for the Reduction of Obtrusive Light GN01:2011 ⁶

This Guidance provides measurable design guidance limits and recommendations to ascertain acceptability of obtrusive light levels at night.

CIE – 150:2003 - Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations ⁷

The purpose of this Guide is to help formulate guidelines for assessing the environmental effects of outdoor lighting and to give recommended limits for relevant lighting parameters to contain the obtrusive effects of outdoor lighting within tolerable levels. As the obtrusive effects of outdoor lighting are best controlled initially by appropriate design, the guidance given is primarily applicable to new installations; however, some advice is also provided on remedial measures which may be taken for existing installations. This Guide refers to the potentially adverse effects of outdoor lighting on both natural and man-made environments for people in most aspects of daily life, from residents, sightseers, transport users to environmentalists and astronomers.

CIE 126 (1997) Guidelines for Minimising Sky Glow ⁸

This Guide gives general guidance for lighting designers and also policy makers about the ways the interference by light of astronomical observations can be reduced or even avoided. The report gives guidance for the design of lighting installations and lighting equipment. Practical implementation of the general guidance is left to National Regulations.

CIE Technical Report Document 129 - 1998 Guide for lighting exterior work areas ⁹

The purpose of this Guide is to provide guidance for the design of lighting for exterior work areas. The objectives of lighting for exterior work areas are to ensure:

- Efficient working conditions;
- Safe movement and traffic; and

- Safety and security of people and property.

*BS5489-1: 2013 – Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas*¹⁰

This part of BS 5489 gives recommendations on the general principles of road lighting, and its aesthetic and technical aspects, and advises on operation and maintenance.

*BS EN 13201-2: 2015 – Road lighting – Part 2: Performance requirements*¹¹

This part of this European Standard defines, according to photometric requirements, lighting classes for road lighting aiming at the visual needs of road users, and it considers environmental aspects of road lighting.

*BS EN 12193:2007 – Light and Lighting – Sports Lighting*¹²

This European standard deals with sports lighting to ensure good visual conditions for players, athletes, referees, spectators and CTV transmission. The objective of this document is to provide recommendations and specify requirements for good quality sports lighting by:

- Optimising the perception of visual information used during sports events;
- Maintaining the level of visual performance;
- Providing acceptable visual comfort;
- Restricting obtrusive light.

*BS EN 12464-2: 2014 – Lighting of Work Places – Part 2: Outdoor Work Places*¹³

This European standard specifies lighting requirements for outdoor work places, which meet the needs for visual comfort and performance. All usual visual tasks are considered.

3 Baseline Conditions

The proposed Site is known as the Canalside Sports Complex, which serves as a training facility for Huddersfield Town A.F.C and as community venue. The complex is located on The Leeds Road (A62) and located within the county boundaries of the West Riding of Yorkshire. The landscape setting of the Site is characterised by urban development to the East, West and Southern aspects, with a more natural setting towards the North.

A study has been undertaken to identify relevant legislation, good practice guidance, local designations and relevant planning policy in relation to lighting following the CIE 126 (1997), Institute of Lighting Professionals – Guidance Notes for the Reduction of Obtrusive Light GN01: 2011 and CIE 150 (2003) guidance.

Appendix 1.0 provides an overview of the measured survey undertaken.

The study area includes sensitive receptors within and outside the boundaries of the Site which are likely to have a direct line of sight towards the Proposed Development and which may therefore be affected during the operational phase. Due to the distance from and the likelihood of obtrusive light impact being confined to a maximum 50m distance (zone of influence). The following provides an overview of the sensitivities included / not included within this assessment.

Sensitive Receptors included within this Assessment:

- **Ecology – Light Sensitive**

In terms of ecology, the applicant ecologist has confirmed that there are no existing bat populations within the vicinity of the Proposed Site location. However, relating to other nocturnal species it has been confirmed that there are localised badger sets which are considered as Ecology receptors.

- **Landscape**

With the exception of the Huddersfield Canal to the north of the Proposed Development (considered as a sensitive receptor), there are no other notable landscape features or designations within a close vicinity of the Site location.

- **Dark Sky**

When considering sky glow, as a result of direct upwards light, there is the possibility of a site wide impact being visible from darker environments.

Taken on a regional scale, existing saturated sky glow is notable from bordering major urban development associated with nearby locations (e.g. Huddersfield).

On a local scale, sky glow is visible and is comparable to that received on the regional scale.

Sensitive Receptors excluded from this Assessment:

- **Residential**

Due to distance and screening of the Proposed Development, it is unlikely that obtrusive light will be the cause of any significance and it therefore excluded from this assessment.

- **Heritage**

Due to the Site location heritage sensitivities are not applicable and are therefore not included within this assessment.

- **Highway**

In terms of the surrounding roadways, it is likely that significant obtrusive light effects can be mitigated (glare) to minimise potential adverse effects to the existing highways and are therefore excluded from this assessment.

- **Rail**

In terms of the surrounding rail, the TransPennine rail track runs approximately 200m to the North of the Proposed Development. Due to distance, it is unlikely that obtrusive light will be the cause of any significance and it therefore excluded from this assessment

- **Other Locations**

Due to the expected type and nature of light effect, in relation to the likely activities and periods of occupation existing commercial, industrial and employment developments are considered to have a nil sensitivity and are therefore excluded from this assessment.

Environmental Zone Classification

Assessment of the designation, use, habitat and external lighting condition dictates the classification of Environmental Zones across the Site and surrounding areas. The Environmental Zones relate to limiting guidance published by the Institute of Lighting Professionals ILP for obtrusive light (residential and highway) - ILP Guidance Notes for the Reduction of Obtrusive Light (2011).

Due to the limited type of sensitive receptors, although not wholly applicable, the Environmental Zone classification provides context to the assessment.

Due to the presence of existing artificial highway lighting to the highways and existing development, it is considered that this area (during normal operation) is the equivalent of an E3 Zone classification (Medium district brightness). However, once existing floodlighting is in operation, due to the significant increase in illumination, the profile adjusts to that of an E4 environment ((High district brightness)).

The ILP guideline values for the Environmental Zones are outlined in **Table 3.1**.

Table 3.1: ILP Guidance Notes for the Reduction of Obtrusive Light (2011)

Environmental Zone	Sky Glow ULR (Max %) (1)	Light into Windows EV (2)		Source Intensity I (cd) (3)		Building Luminance (4) L (cd/m ²) Ave. Before Curfew
		Pre Curfew	Post Curfew	Pre Curfew	Post Curfew	
E0	0	0	0	0	0	0
E1	0	2	0 (1*)	2500	0	0
E2	2.5	5	1	7500	500	5
E3	5	10	2	10000	1000	10
E4	15	25	5	25000	2500	25

Where:

ULR (Upward Waste Light Ratio) = Maximum permitted percentage of luminaire flux that goes directly into the sky.

EV = Vertical Illuminance in Lux - measured flat on the glazing at the centre of the window.

I = Light intensity in Candelas

L = Luminance cd/m²

Curfew = The time after which stricter requirements (for the control of obtrusive light) will apply.

* Permitted only from Public road lighting installations

1 - Upward Light Ratio – Some lighting schemes will require the deliberate and careful use of upward light, e.g. ground recessed luminaires, ground mounted floodlights, festive lighting, to which these limits cannot apply. However, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires and light controlling attachments.

2 - Light Intrusion (into Windows) – These values are suggested maxima and need to take account of existing light intrusion at the point of measurement. In the case of road lighting on public highways where building facades are adjacent to the lit highway, these levels may not be obtainable. In such cases where a specific complaint has been received, the Highway Authority should endeavour to reduce the light intrusion into the window down to the post curfew value by fitting a shield, replacing the luminaire, or by varying the lighting level.

3 - Luminaire Intensity – This applies to each luminaire in the potentially obtrusive direction, outside the area being lit. The figures given are for general guidance only and for some sports lighting applications with limited mounting heights, may be difficult to achieve.

4 - Building Luminance – This should be limited to avoid over lighting and related to the general district brightness. In this reference building luminance is applicable to buildings directly illuminated as a night-time feature as against the illumination of a building caused by spill light from adjacent luminaires or luminaires fixed to the building but used to light an adjacent area.

4 External Lighting Parameters and Mitigation

Appendix 2.0 provides an overview of the lighting parameters that have been used within this assessment.

The following provides good practice embedded measures included within the assessment, which are intended as being the base principals for the future light developments of the Site:

- Wherever possible, ensuring the use of controlled light distribution, optimised optics (flat glass - controlled light distribution below the horizontal) minimal inclination and considered luminaire positioning / minimal heights are employed;
- All luminaires used around the perimeter of the site should be mounted within the Site, so that the main photometric distribution of the luminaire will be towards the task area, keeping all light within the boundary of the development and preventing artificial light spilling outside of this;
- Wherever possible, adopting a light quality that minimises disruption to existing ecological systems in the form of warm light sources (<4200K) which emit minimal UV and blue light.

The following mitigation measures will be considered and, where appropriate, shall be incorporated into the detailed lighting design / installation:

- Adopting an appropriate control strategy for the operational lighting so that, when not required and subject to Health and Safety assessment, non-essential lighting is switched off (occupancy sensing) at a pre-determined curfew time (suggested as 23:00 in accordance with ILP Guidance Notes) in order to further reduce the effect.
- All luminaires used around the perimeter of the site should be mounted within the Site, so that the main photometric distribution of the luminaire will be towards the task area, keeping all light within the boundary of the development and preventing artificial light spilling outside of this;
- Wherever possible consideration should be given to the need for lighting in areas where ecology habitat crosses or is situated directly adjacent to. Should H&S require artificial lighting to these areas all luminaires should be directed away from the habitat area;
- Wherever possible and subject to landscape design, the retention of trees to the Site perimeter.
- Where applicable, and not integral to the luminaire type, additional glare controlling louvres and light shields to be applied post installation;
- The implementation of new / supplementary dense natural screening (treelines, foliage etc.) where applicable to minimise light spill and luminaire visibility;

5 Scope and Methodology of Assessment

Impact Assessment

It is assumed that pitch lighting will not be operational in a post curfew condition (23:00) and amenity lighting elements will not create additional impact over the current baseline condition. Hence, assessment only relates to a pre curfew condition where pitch floodlighting will be operation.

The calculated impact from the new lighting proposals (all operational) is modelled quantitatively and, where applicable to existing baseline measurements, a cumulative impact is provided.

With respect to relative sensitivities the following methodology applies:

- **Ecology – Light Sensitive**

The applicant ecologist has advised there are no existing bat populations. However, relating to other nocturnal species it has been confirmed that there are localised badger sets which are considered as Ecology receptors.

Assessment is provided on the peak horizontal and vertical effect condition for representative ecology zones. Where a potential significant effect is possible, tabulated baseline, effect and resultant values are provided for assessment locations on the location of the respective ecology zone.

Currently there is a lack of evidence regarding the light levels below which there are no/reduced effects on badgers. Therefore, light levels at the site shall be considered in the context of the lux data recorded during pre-development lighting. Where, possible post-development light levels should be as close to the light levels recorded at key areas of ecology use on the site pre-development.

- **Landscape – Huddersfield Canal**

The stretch of canal adjacent to the north of the Proposed Development is not considered as being of ecological importance. However, in terms of maintaining natural conditions to water bodies assessment is provided on the peak horizontal and vertical effect condition to representative locations. Where a potential significant effect is possible, tabulated baseline, effect and resultant values are provided.

Currently there is a lack of evidence regarding the light limiting thresholds for water bodies (in the absence of ecology). Therefore, light levels at the site shall be considered in the context of the lux data recorded during pre-development lighting. Where, possible post-development light levels should be as close to the light levels recorded at key areas on the site pre-development.

- **Dark Sky**

When considering direct sky glow, as a result of direct upwards light, there is the possibility of a site wide effect being visible from darker environments. Direct Sky Glow cannot be measured. The baseline is professionally judged relative to visual baseline survey conditions.

The ILP Guidance Notes for the Reduction of Obtrusive Light (2011) provides limiting sky glow percentages relative to the Environmental Zone. This is assessed on a Site wide basis relative to the overarching Environmental Zone classification for intended and existing artificially lit areas.

Assumptions / Limitations

External Operational Lighting Parameters shall be prepared for the purposes of this assessment.

For the purposes of demonstrating a robust assessment, the following standard industry precautionary measures are applied to the assessment calculation:

- A unity maintenance factor of 1.0 is applied to represent the maximum adverse condition from initial installation (maximum light output not including for light losses through light source degradation and dirt accumulation);
- As per standard industry practice and for the demonstration of maximum effects existing and proposed landscape bunding and planting / trees are not been included within the assessment calculations.

Reflective Properties of Illuminated Surfaces

Guidance is expressed in terms of the direct illuminance component. However, where the surface is relatively light in colour and typically >30% the reflected light component should be taken into account. In the case of this assessment it is assumed that the typical landscape reflectance value is <30% and will not provide significant contribution, by reflection, to the illuminance at the measured point.

6 Assessment

The following provides an obtrusive light assessment, in tandem with the Planning Application, which gives assessment of the exterior operational lighting parameter impact on the surrounding environment.

The intention of the assessment is to convey how the Proposed Development will fit into the existing Illumination profile of the area and how that will comply with relevant legislation requirements and best practise Design Guidance.

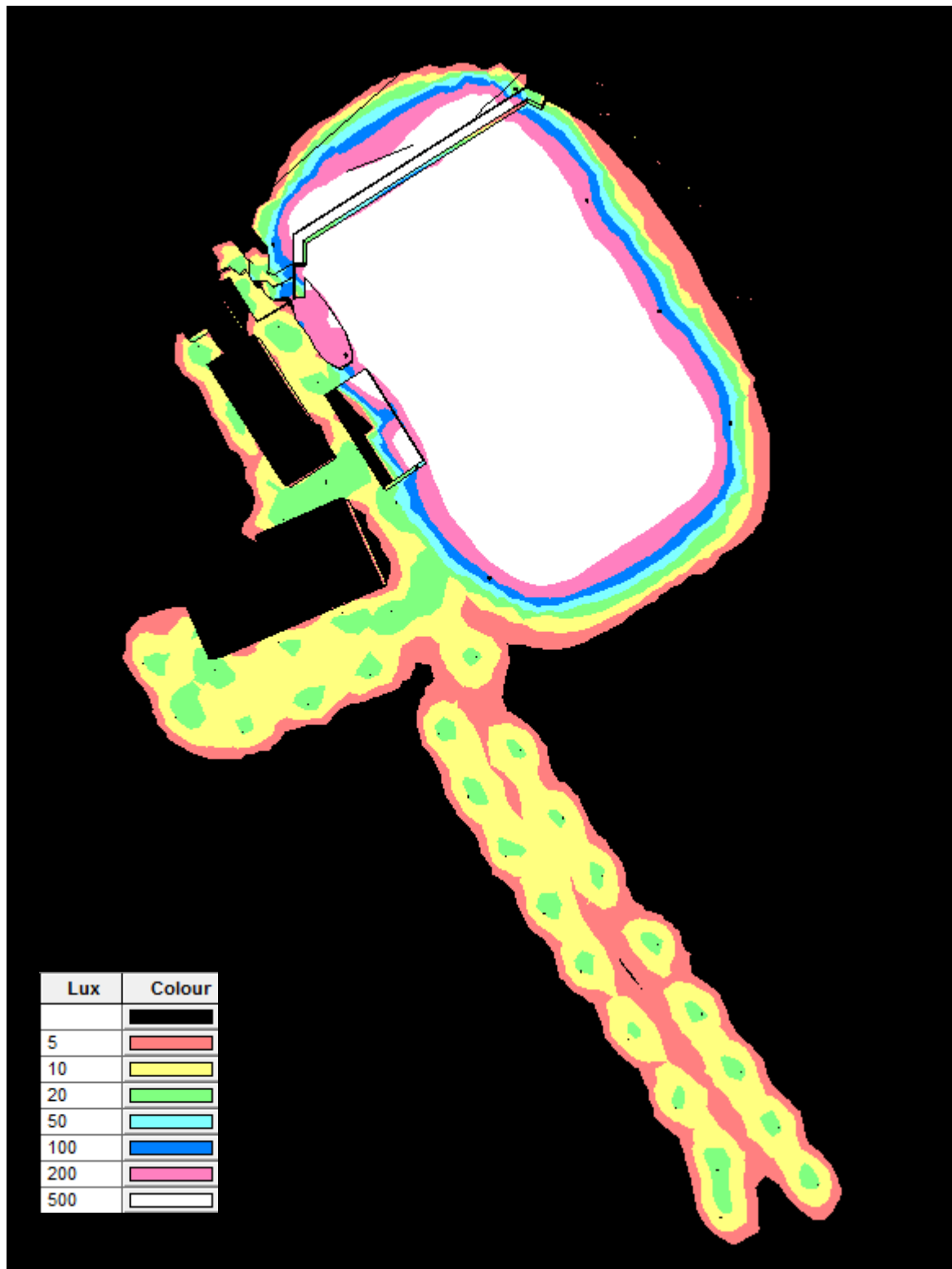
Overview

Alongside baseline data provided within **Appendix 1.0**, the following effect contours (proposed development only) are provided to inform the application.

Figure 6.1 provides graphical representation of pre-curfew horizontal illuminance (from the Proposed Development)

- Maintenance Factor = 1.0
- New and proposed lighting only
- Excludes trees and natural foliage

Figure 6.1: Graphical representation of pre-curfew horizontal illuminance (from the Proposed Development)



Ecology – Light Sensitive (Figure 6.2 – Badger Set Location)

- Tabulated within **Table 6.1** data provides the measured baseline conditions, peak / resultant horizontal and vertical light effects (0.5m above ground) on the location of the ecology zone.

Table 6.1: Impact to Ecology – Light Sensitive

Sensitive Receptor	Baseline Existing Horizontal Illuminance (Lux @ Ground)	Baseline Existing Vertical Illuminance (Lux @ 0.5m AFL)	Effect Max. Horizontal Illuminance (Lux @ Ground)	Effect Max. Vertical Illuminance (Lux @ 0.5m AFL)	Resultant Max. Horizontal Illuminance (Lux @ Ground)	Resultant Max. Vertical Illuminance (Lux @ 0.5m AFL)
Badger Sets	0.15	0.08	407 (*)	86.5 (*)	407.15 (*)	86.58 (*)

Figure 6.2: Badger Set Location



Landscape – Huddersfield Canal

- Tabulated within **Table 6.2** data provides the measured baseline conditions, peak / resultant horizontal and vertical light effects (1.5m above ground) on the location stretch of Canal adjacent to the proposed development.

Table 6.2: Impact to Landscape – Huddersfield Canal

Sensitive Receptor		Baseline	Baseline	Effect	Effect	Resultant	Resultant
		Existing Horizontal Illuminance (Lux @ Ground)	Existing Vertical Illuminance (Lux @ 1.5m AFL)	Max. Horizontal Illuminance (Lux @ Ground)	Max. Vertical Illuminance (Lux @ 1.5m AFL)	Max. Horizontal Illuminance (Lux @ Ground)	Max. Vertical Illuminance (Lux @ 1.5m AFL)
Treeline	Adjacent to Existing Lit Pitch	-	3.6	-	0.56	-	4.16
	Adjacent to Proposed Pitch Location	-	0.02	-	23.4	-	23.42
Towpath	Adjacent to Existing Lit Pitch	1.1	1.6	0.25 (*)	0.57 (*)	1.35 (*)	2.17 (*)
	Adjacent to Proposed Pitch Location	0.09	0.02	10.9 (*)	14 (*)	10.99 (*)	14.02 (*)
Wet Edge of Towpath	Adjacent to Existing Lit Pitch	0.31	1.6	0.25 (*)	0.55 (*)	0.56 (*)	2.15 (*)
	Adjacent to Proposed Pitch Location	0.09	0.02	3 (*)	7.04 (*)	3.09 (*)	7.06 (*)

Note: (*) Calculated values do not take account of light screening effects that will be provided by retained treelines. Regarding the existing pitch location, the dense treeline creates a considerable reduction in light trespass towards the Canal.

Dark Sky

- Direct Sky glow is assessed as a Site Wide effect and is based on a scenario where the most onerous of lighting impact is applied relative to the potential uses within each area. In accordance with CIE 150 Section 5.5.2 the Upward Direct Light Ratio is calculated and referenced against ILP sky glow guidance.
- The Direct ULR for the installation is calculated from the following equation:

$$ULR = Eup / (Edown + Eup)$$

Eup – Resultant average illuminance taken from a grid 1.0m above the highest luminaire

Edown – Resultant average illuminance taken from a grid 1.0m below the highest luminaire

- For the purposes of direct skyglow assessment the the Site is currently considered to be representative Environmental Zone classification of an E4: High district brightness (floodlights in operation). In the interest of maintaining a no change / improved environment the ILP Guidance Notes for the Reduction of Obtrusive Light (2011) provides a limiting sky glow percentage of 15%.
- **Figure 6.3** illustrates the pre-curfew horizontal illuminance levels (Edown) at 1.0m below the lowest luminaire within the Application Site. **Figure 6.4** illustrates the pre-curfew horizontal illuminance levels (Eup) at 1.0m above the highest luminaire.
- The data represented in **Table 6.3** is relevant to identified **Direct Sky Glow** where pre-curfew calculated direct sky glow is assessed as the key indicator.

Figure 6.3: Pre-curfew horizontal illuminance levels (E_{down}) at 1.0m below the lowest luminaire.

Edown – 272 Lux average

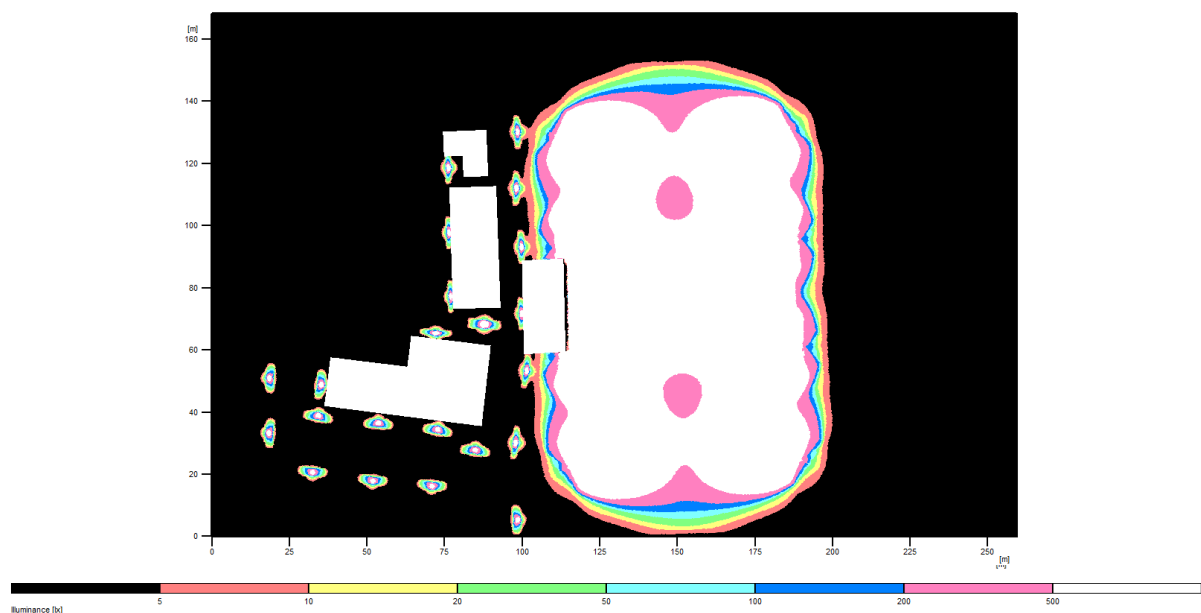


Figure 6.4: Pre-curfew horizontal illuminance levels (E_{up}) at 1.0m above the highest luminaire.

E_{up} – 0.1 Lux average

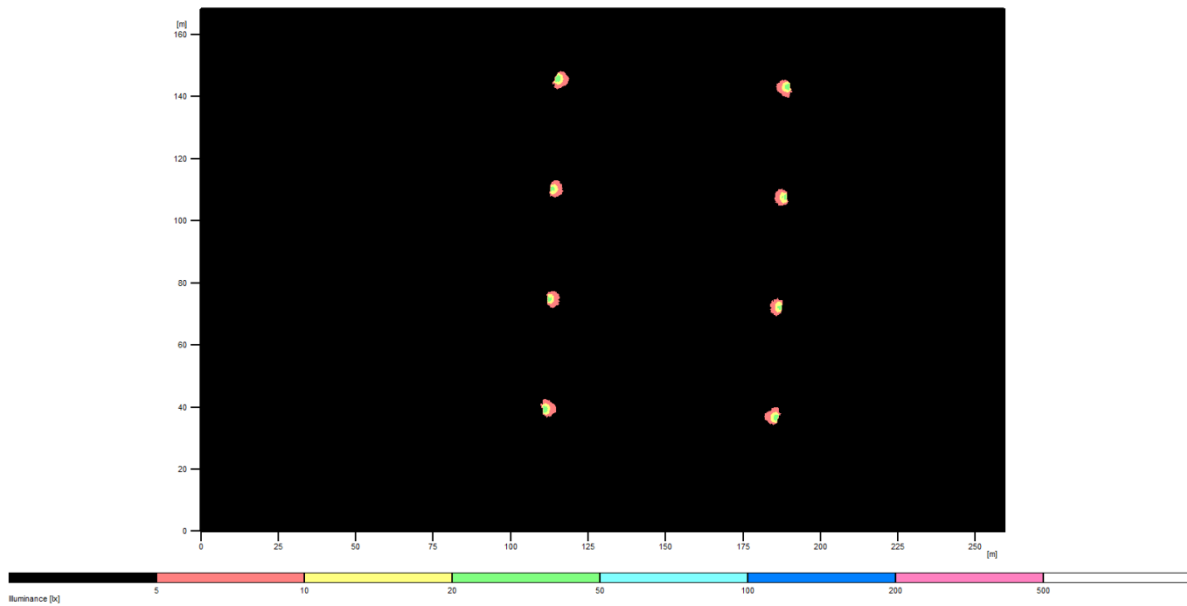


Table 6.3: Impact to Dark Sky – Direct Sky Glow

Sensitive Receptor	Direct Sky Glow		
	Existing Condition (floodlights on)	Sky Glow ULR (Max. %) (ILP Guidance Notes 2011) (cd)	Calculated Direct Sky Glow % ULR = $E_{up} / (E_{down} + E_{up})$ ULR = $0.1 / (272 + 0.00)$ Pre-Curfew
Dark Sky	Representative of an E4 site wide night sky classification	15 %	0.04 %

7 Conclusion

The following conclusion provides an overview of the obtrusive light impact calculated in respect of the Proposed Developments, as follows:

- **Access Roadway / Pedestrian / Cycle Path Lighting**
- **Car Parking**
- **Football Pitch 12**

Assessment is provided for the following sensitivities:

- **Ecology – Light Sensitive**
- **Lighting Landscape – Huddersfield Canal**
- **Dark Sky**

Ecology – Light Sensitive

The applicant ecologist has advised there are no existing bat populations. However, relating to other nocturnal species it has been confirmed that there are localised badger sets which are considered as the Ecology receptors.

These are located within a close proximity to the proposed pitch location and during the operation of floodlighting it can be expected that illumination levels will exceed the current baseline scenario. However, this is during limited periods and only applicable when the pitch is in operation during the hours of darkness.

Landscape – Huddersfield Canal

Although not considered as being of ecological importance the mitigation in place to the current illuminated pitch provides a degree of light spill control which is also assisted by the dense screening provided by the existing treeline.

From the assessment of impact from the proposed illuminated pitch location, it is notable that an unscreened impact will exceed the current baseline scenario. However, when considering the retention of dense and existing treelines, it is professionally judged, that the majority of light trespass will be screened, consequently minimising the potential impact.

Dark Sky

The current light scenario demonstrates a sky glow that can be associated with urban development that is typical for an E4 environment. The existing lighting on the Site is relatively controlled, in terms of downwards facing. However, it is noted that lighting to adjacent sites is not so well governed.

With respect to the proposed lighting installations, in view of the embedded mitigation for downwards facing luminaires and cut offs, the calculated direct skyglow (ULR) is judged to comply with ILP guidance for the Environmental Zone and no further mitigation is required.

Appendix 1.0 – Baseline Survey

This survey reviews the artificial lighting currently installed on the Application Site area and adjacent surrounding areas. Comment is made regarding the resulting lighting levels found, with regards to current standards and guidelines, where relevant. Ecological receptors are assessed relative to their present lighting conditions to enable a future assessment to be made of the potential impact the proposed development may have. The Moon was not visible in the sky when lighting measurements were taken. The unscreened moonlight Condition measured as **0.09 Lux** (Horizontal) and **0.02 Lux** (Vertical).

Light Readings (illuminance levels in Lux) were taken using a handheld Minolta T-10A illuminance meter. All horizontal lux readings were taken on the ground, all vertical lux readings were taken at arm's length from a standing position; approximately 1.5m above ground.

X1.1 - Data Sheet – Existing Lighting

Location	A – Illuminated pitch locations
Artificial Lighting	Metal halide and LED floodlighting (15m and 18m columns)
Horizontal Measured Illuminance (Lux @ Ground)	Varies – 150 Lux to >300 Lux
Vertical Measured Illuminance (Lux @ 1.5m)	-
Environmental Zone Characteristic	E4 (High district brightness) reverts to E3 (Medium district brightness) once floodlighting is not operational
Notes:	When floodlighting is in operation the survey provided visual evidence of skyglow and a degree of light spill towards the canal, although being substantially screened by existing natural foliage and the canal embankment.

Photograph of Existing Lighting

Illuminated Sports Pitches



X1.2 - Data Sheet – Existing Lighting

Location	A – Illuminated Club House / Amenity
Artificial Lighting	LED uplights, step lights and downlights
Horizontal Measured Illuminance (Lux @ Ground)	Varies – 5.6 Lux to 120 Lux
Vertical Measured Illuminance (Lux @ 1.5m)	-
Environmental Zone Characteristic	E4 (High district brightness) reverts to E3 (Medium district brightness) once adjacent floodlighting is not operational
Notes:	When adjacent pitch floodlighting is in operation the survey provided visual evidence of skyglow.

Photograph of Existing Lighting

Club House



X1.3 - Data Sheet – Existing Lighting

Location	A – Complex Access Road / Car Park
Artificial Lighting	LED Lanterns
Horizontal Measured Illuminance (Lux @ Ground)	Access Road – 32 Lux ave. Car Park – 2 Lux ave.
Vertical Measured Illuminance (Lux @ 1.5m)	-
Environmental Zone Characteristic	E4 (High district brightness) reverts to E3 (Medium district brightness) once floodlighting is not operational
Notes:	When adjacent pitch floodlighting is in operation the survey provided visual evidence of skyglow. Glare is notable from adjacent industrial floodlighting. However, this provides 'borrowed light' to the top car park.

Photograph of Existing Lighting

Complex access road and car parking



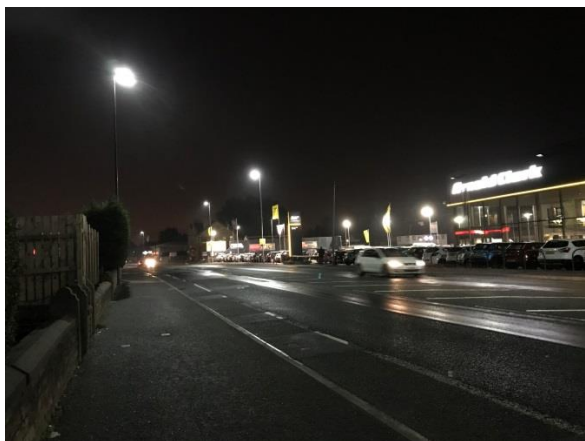
X1.4 - Data Sheet – Existing Lighting

Location	A62 – Leeds Road
Artificial Lighting	LED Lanterns
Horizontal Measured Illuminance (Lux @ Ground)	21.2 Lux ave.
Vertical Measured Illuminance (Lux @ 1.5m)	-
Environmental Zone Characteristic	E3 (Medium district brightness)
Notes:	Cool LED lanterns create a harsh feel and visible light intrusion can be noticed on adjacent premises. Illuminated premises include retail / restaurant outlets, car showrooms.

Photograph of Existing Lighting

Left Image – A62 – Leeds Road – light trespass to residential

Right Image – A62 – Leeds Road – Illuminated premises include retail / restaurant outlets, car showrooms.



X1.5 - Data Sheet – Existing Lighting

Location	Cycle paths and various surrounding residential roads
Artificial Lighting	Various column lanterns
Horizontal Measured Illuminance (Lux @ Ground)	Various residential roads – Typical 17 Lux ave. Cycle paths – Typical 9 Lux ave.
Vertical Measured Illuminance (Lux @ 1.5m)	-
Environmental Zone Characteristic	E3 (Medium district brightness)
Notes:	A number of lanterns were in operational at the time of survey

Photograph of Existing Lighting

Left Image – Cycle / footpath

Right Image – Surrounding residential roads



X1.6 - Data Sheet – Sensitive Receptor

Location	Eastern location of Proposed Site Location
Use	Ecology – Light Sensitive – Badger Sets
External Lighting Condition	Unlit
Horizontal Measured Illuminance (Lux @ Ground)	0.15 Lux
Vertical Measured Illuminance (Lux @ 1.5m)	0.08 Lux
Existing Obtrusive Light Scenario (Receptor Cause)	None
Current Obtrusive Light Impact to Receptor	Minor element of light trespass from the existing pitch / industrial flood lighting
Notes:	

Photograph of Sensitive Receptor

View towards badger set location, from the existing pitch / industrial flood lighting.



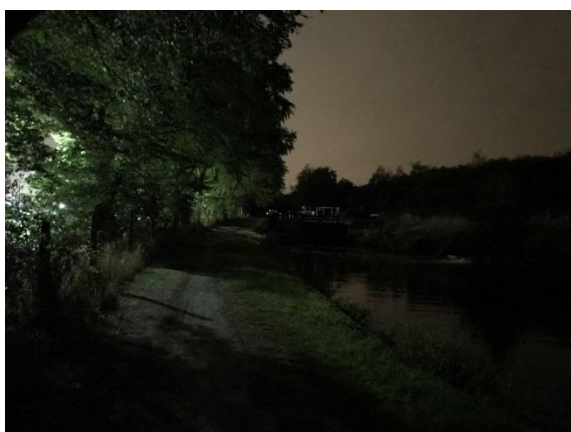
X1.7 - Data Sheet – Sensitive Receptor

Location	Northern edge of Proposed Site Location
Use	Landscape (confirmed no bat population)
External Lighting Condition	Unlit
Horizontal Measured Illuminance (Lux @ Ground)	Towpath - 1.1 Lux (adjacent to lit pitch) Towpath - 0.09 Lux (adjacent to proposed new pitch location) Towpath wet edge - 0.31 Lux (adjacent to lit pitch)
Vertical Measured Illuminance (Lux @ 1.5m)	Treeline - 3.6 Lux (adjacent to lit pitch) Treeline - 0.02 Lux (adjacent to proposed new pitch location) Towpath - 1.6 Lux (adjacent to lit pitch) Towpath wet edge - 0.02 Lux (adjacent to proposed new pitch location)
Existing Obtrusive Light Scenario (Receptor Cause)	None
Current Obtrusive Light Impact to Receptor	Minor element of light trespass from the existing pitch, but is significantly screened by dense existing trees and the canal bunding.
Notes:	

Photograph of Sensitive Receptor

Left Image – Minor element of light trespass from the existing pitch, but is significantly screen by existing trees and the canal bunding

Right Image – Unlit Towpath and Canal adjacent to the Proposed Pitch Location



X1.8 - Data Sheet – Sensitive Receptor

Location	Site wide
Use	Natural – Direct Sky Glow
External Lighting Condition	NA
Horizontal Measured Illuminance (Lux @ Ground)	NA
Vertical Measured Illuminance (Lux @ 1.5m)	NA
Existing Obtrusive Light Scenario (Receptor Cause)	NA
Current Obtrusive Light Impact to Receptor	The current light scenario demonstrates a sky glow that can be associated with urban development that is typical for an E4 environment. The current lighting on the Site is relatively controlled, in terms of downwards facing. However, it is noted that lighting to adjacent sites is not so well governed.
Notes:	

Photograph of Sensitive Receptor

Left Image – Existing floodlighting the Site, which are relatively controlled in terms of being downwards facing.

Right Image – Sky glow contribution from other surrounding locations.



Appendix 2.0 – External Lighting Parameters

Lighting Design Development – Design and Associated Mitigation Measures

The detailed lighting design should consider best practice standards and technology, as appropriate. The external lighting specification(s) and design(s) for the proposed development of the Application Site should be prepared by a specialist lighting engineer with due regard to the sensitivities of surrounding receptors. The lighting specification should include the appropriate selection of column heights, light fittings and luminaire design to ensure that the intensity and direction of the lighting is controlled through retaining tilting angles close to the horizontal to ensure that the effects of light spill, glare and sky glow are minimised. Consideration should be given, where applicable, to the measures in appropriate best practice guidance and standards.

Where applicable all lighting should be designed to comply with relevant codes and guidance, as follows:

- BS5489-1: 2013 – Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas;
- BS EN 13201-2: 2015 – Road lighting – Part 2: Performance requirements;
- BS EN 12464-2: 2007 – Lighting of Work Places – Part 2: Outdoor work places;
- CIBSE LG6 – 2016 – Lighting Guide - The Exterior Environment;
- BS EN 12193: 2007 – Light and Lighting – Sports Lighting;
- SLL Guide to Limiting Obtrusive Light – 2012; and
- ILP – Guidance Notes for the Reduction of Obtrusive Light GN01: 2011.

As a detailed lighting design is not available at this stage, for the purposes of assessment a 'precautionary' lighting strategy has been developed. The following pages provide the lighting strategy and intent for the types of lighting within the areas identified.

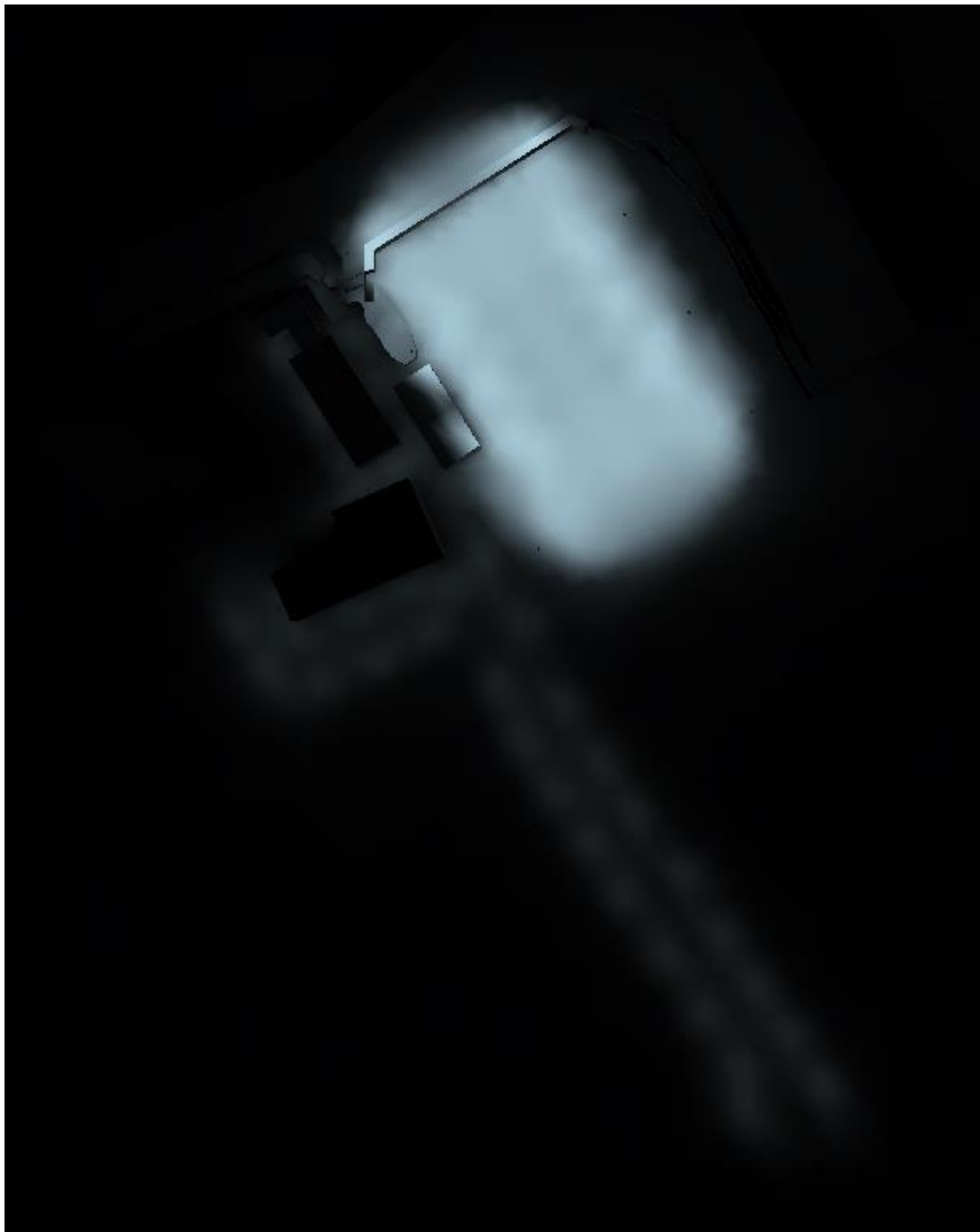
Where applicable the lighting strategy includes for the following design and associated mitigation measures:

- Where feasible, **typical** lighting product types have been used to minimise cost and specification constraints to the future detailed design.
- Column heights are minimised to reduce potential obtrusive light impact.
- Where feasible, lamp specification is based on LED <4200K to minimise UV light distraction to nocturnal ecology.

- Where feasible, all luminaire product uses flat glass technology at minimal inclination.
- Design criteria follows the best practice guidance, as per relevant codes and guidance above.

Lighting Design Development – Rendered Overview

Below illustrates a rendered overview of the operational lighting (pre curfew) for assessment, this is based on the lighting equipment and criteria contained within the following pages.

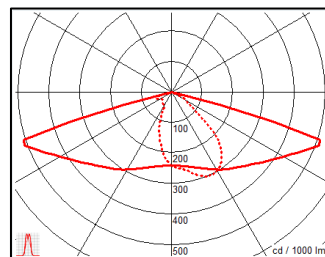


X2.1 – External Lighting Parameters Data Sheet - Amenity

Access Roadway / Pedestrian / Cycle Path Lighting

Typical Equipment

- Philips Luma LED
(One of the advantages of LED lighting is that it can be dimmed. Thus, instead of always lighting an empty street or parking lot at full brightness, LEDs can be turned down, or even off, when they aren't needed and then brought back to full brightness as necessary. This feature both saves on energy and reduces light pollution during the night).
- Flat glass, zero tilt and zero uplight
- 5m mounting height
- Minimum UV / Blue Light
- CCT 3000K
- Dusk till dawn operation



Typical Design Criteria

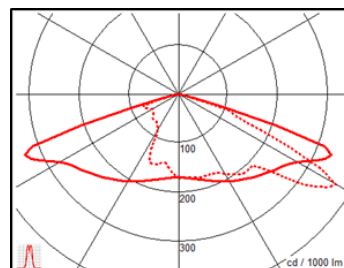
- BS5489-1: 2013 – Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas
- BS EN 13201-2: 2015 – Road lighting – Part 2: Performance requirements
- Assessment based on $R_a > 60$ for an S3 classification at an average 6.3 Lux (minimum maintained) and a minimum of 1.3 Lux (maintained).

X2.2 – External Lighting Parameters Data Sheet - Amenity

Car Parking

Typical Equipment

- Philips Luma LED
- Flat glass, zero tilt and zero uplight
- 6m mounting height
- Minimum UV / Blue Light
- CCT 3000K
- Dusk till dawn operation



Typical Design Criteria

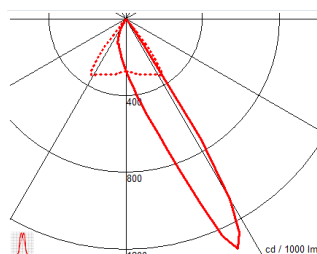
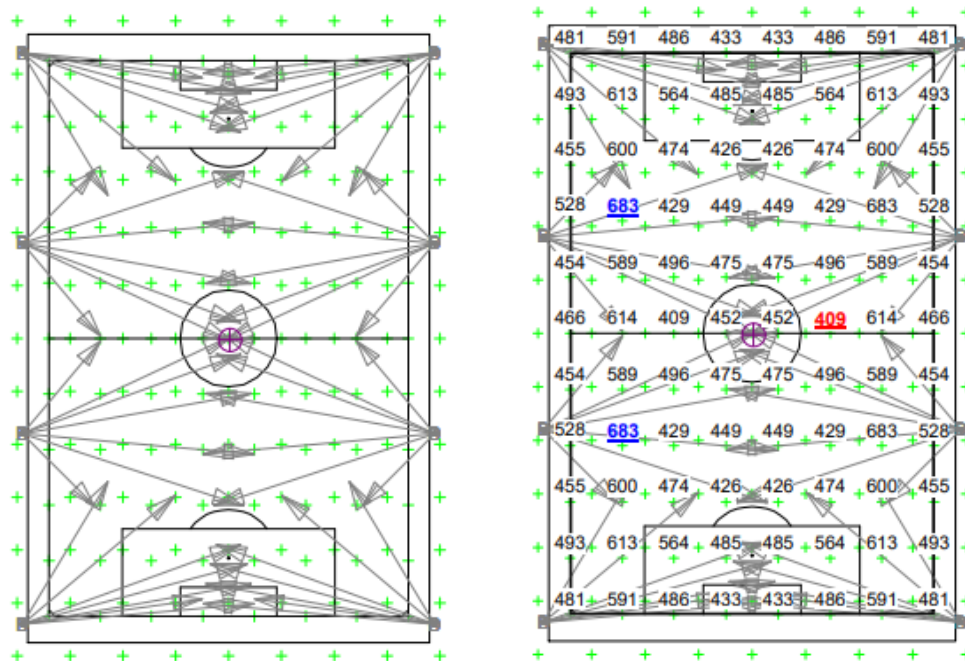
- Medium traffic, e.g. parking areas of department stores, office buildings, plants, sports and multipurpose building complexes
- Table 5: BS 5489-1:2013 – Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas
- Table 5.9 — Parking areas: EN 12464-2:2014
- Assessment based on 10.0 Lux (average), 0.25 Uniformity

X2.3 – External Lighting Parameters Data Sheet - Pitch

Football Pitch 12

Typical Equipment

- Philips OptiVision LEDGEN 2 luminaire + Integral Louvres, 16m columns
- Narrow (NB) distribution
- Impact rating: IK08
- Minimum uplight (when not subject to excessive tilt angles)
- Minimum UV LED
- Switched operation
- Light spill towards the 'warm up area' removes the need for additional lighting to this area



Typical Design Criteria

Designed to achieve 500 Lux for training purposes

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13. The British Standards Institution / CEN (2007) *BS EN 12464-2:2014 – Lighting of Work Places – Part 2: Outdoor work places*, BSI Standards, London