

**Northstowe**

Phase 1 Planning Application

Environmental Statement

Technical Appendix J: Lighting

February 2012







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Northstowe Phase 1  
Lighting Technical Report  
Gallagher  
February 2012

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# 1 INTRODUCTION

## 1.1 Background

1.1.1 WSP Environmental Limited (WSPE) were instructed by Gallagher to undertake a Lighting Technical Report to support the **Environmental Statement (ES)**, February 2012. Following receipt of South Cambridgeshire District Councils (SCDC)'s Scoping Opinion (September 2011), it was considered necessary to include a Lighting Technical Report to ensure that artificial lighting is adequately assessed in relation to residential properties. The scope of the report is outlined in detail in the methodology section below.

1.1.2 A lighting assessment was undertaken to support the preparation of the 2007 planning application for Northstowe, with the day and night time lighting surveys undertaken in December 2006. As part of the 2012 planning application, it has been considered necessary to complete new lighting surveys; re-appraise the scope of potentially significant effects and undertake a new assessment in line with latest guidance and legislation. Therefore, this report, which has been prepared by WSPE assesses the effects of construction and operational sources of artificial light associated with the proposed development on residential properties in close proximity or/and with direct/intermittent views towards the site.

1.1.3 This report (and its associated figure and technical appendices) should be read in conjunction with the Chapters 1 to 3 and 14 of the ES (i.e. the introductory sections and the cumulative effects assessment).

1.1.4 This report (and associated ES) will support an outline planning application for phase 1 of Northstowe comprising up to 1,500 dwellings; a primary school; a mixed-use local centre (including a community building, and provision for non-residential institutions, financial and professional services, shops, cafes and restaurants, drinking establishments, and hot food take-aways); leisure, community, residential institutions, cultural, health, and employment provision (business, general industry and storage & distribution) including a household recycling centre; formal and informal recreational space and landscaped areas; and infrastructure works including site re-profiling and associated drainage works, foul and surface water pumping stations, two flood attenuation ponds on land east of Hattons Road; and associated works including the demolition of existing buildings.

1.1.5 A description of the site and the proposed development, upon which this report is based is outlined within the ES and supporting parameter plans and has not been duplicated within this report. Where additional information has been required to inform this report, this has been clearly outlined in the relevant sections below.

## 1.2 Legislation, policy and guidance

### Legislation

#### *Statutory requirements for the provision of lighting*

1.2.1 There is no statutory requirement to provide road lighting. Neither are there any statutory requirements to install a particular class of lighting if a decision is made to light a particular road. However, the statutes summarised below empower authorities to light roads.

1.2.2 The provision of road lighting on a previously unlit road might involve statutory requirements.

#### *Empowerment to light roads*

1.2.3 In England and Wales, the Highways Act 1980 (**Ref. 1**), 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. This power is given by the Public Health Act 1985 (**Ref. 2**), or the Parish Councils Act 1957 (**Ref. 3**). Where such councils wish to provide lighting on a highway, the consent of the Highway Authority is required, under the Local Government Act 1996, Section 29 (**Ref. 4**).

#### *Traffic signs*

1.2.4 When lighting is provided on a previously unlit road or access entrance, it is likely that certain traffic signs will have to be illuminated. In England, Wales and Scotland, the Traffic Signs Regulations and General Directions 2002 (**Ref. 5**) are relevant.

### *Speed limits*

1.2.5 The provision of road lighting on a previously unlit road or access entrance can cause the imposition of speed limits. In England, Wales and Scotland, the Road Traffic Regulation Act 1984 (**Ref. 6**) deals with the link between speed limits and a 'system of street lighting'.

### *Road humps*

1.2.6 The provision of any new road humps might require particular lighting arrangements. In England and Wales, the Highways (Road Hump) Regulations 1999 (**Ref. 7**) are relevant.

### *Public lights on private buildings or land*

1.2.7 In some circumstances, public lights and associated equipment can be fixed to private buildings or sited on private land. In England and Wales, the Public Health Act 1985 deals with the fixing of public lights to buildings.

### *Clean Neighbourhoods and Environment Act (CNEA) 2005*

1.2.8 The Clean Neighbourhoods and Environment Act (CNEA) 2005 (**Ref. 8**) gives local authorities and the Environment Agency additional powers to deal with a wide range of issues by classifying artificial light emitted from defined premises as a statutory nuisance. This nuisance is defined as an unreasonable interference with someone's enjoyment of their property and/or injurious to health.

1.2.9 The CNEA 2005 amends section 79(1) of the Environmental Protection Act 1990 (**Ref. 9**) to extend the statutory nuisance regime to include light nuisance stating the following:

*'(fb) artificial light emitted from premises so as to be prejudicial to health or a nuisance'.*

1.2.10 Guidance produced on sections 101 to 103 of the CNEA 2005 by the Department of Environment, Food and Rural Affairs (DEFRA) in April 2006 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. Once satisfied that a statutory nuisance exists or may occur or recur, local authorities must issue an abatement notice (in accordance with section 80[2] of the Environmental Protection Act 1990), requiring that the nuisance cease or be abated within a set timescale.

## **Planning policy**

### *National planning policy*

#### [Planning Policy Statement \(PPS\) 1: Delivering Sustainable Development](#)

1.2.11 PPS 1 (**Ref. 10**) states the following in relation to light pollution:

1.2.12 *'The following matters ... may [also] be material in the consideration of individual planning applications where pollution considerations arise: ...the need to limit and, where possible, reduce the adverse impact of obtrusive light, e.g. on local amenity, rural tranquillity and nature conservation'.*

#### [Draft National Planning Policy Framework \(NPPF\)](#)

1.2.13 Paragraph 175 of the draft NPPF (July 2011) sets out emerging policy on lighting, stating that *'by encouraging good design, planning policies and decisions should limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation'.*

#### [Planning Policy Statement \(PPS\) 23](#)

1.2.14 At a national level, the relevant planning policy for lighting is outlined in PPS 23: Planning and Pollution Control (**Ref. 11**).

1.2.15 PPS 23 requires local authorities to take account of the possible polluting effect of lighting in preparing local development plan documents.

### *Local planning policy*

#### [South Cambridgeshire District Council's Core Strategy and Development Control Policies DPD](#)

1.2.16 South Cambridgeshire District Council's (SCDC) Core Strategy and Development Control Policies DPD (**Ref. 12**) outline a number of objectives relating to lighting. DP/3.2 states that:

*'planning permission will not be granted where the proposed development would have an unacceptable adverse impact... from undue environmental disturbance such as noise, lighting, vibration, odour, noxious emissions or dust.*

1.2.17 Objective NE/f is 'to minimise light pollution', whilst NE/14 outlines that:

*'development proposals which include external lighting should ensure that:*

- a. The proposed lighting scheme is the minimum required for reasons of public safety and security;*
- b. There is no light spillage above the horizontal;*
- c. There is no unacceptable adverse impact on neighbouring or nearby properties or on the surrounding countryside;*
- d. There is no dazzling or distraction to road users including cyclists, equestrians and pedestrians; and*
- e. Road and footway lighting meets the District and County Councils' adopted standards'.*

## Guidance

### *International guidance*

#### [Commission Internationale De L'Eclairage \(CIE 150\) \(Ref. 13\)](#)

1.2.18 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.

#### [Guidelines for Minimising Sky Glow \(CIE 126\) \(Ref. 14\)](#)

1.2.19 These guidelines prepared by Commission Internationale De L'Eclairage provide general guidance for lighting designers and policy makers on the reduction of sky glow. The report gives recommendations about maximum permissible values for lighting installations. These values must be regarded as limiting values. Lighting designers should seek to meet the lowest specifications for the design. Other uses of the open air areas at night will usually result in less stringent sky-glow requirements. Practical implementation of the general guidance is left to National Regulations.

### *National guidance*

#### [Institute of Lighting Engineers \(ILE\) Guidance Notes for the Reduction of Obtrusive Light \(Ref. 15\)](#)

1.2.20 The ILE has proposed lighting guidance and criteria for local authorities with a recommendation that they are incorporated at the local plan level. The guidance defines various forms of light pollution and describes a series of environmental zones (similar to the CIE 150 (2003) Environmental zones). The ILE guidance provide suitable criteria against which the effects of artificial lighting can be assessed and is used in this assessment. The ILE Guidance Notes are provided in **Appendix 1**.

#### [DEFRA's Lighting in the Countryside: Towards Good Practice \(Ref. 16\)](#)

1.2.21 The Office of the Deputy Prime Minister (ODPM – now Department for Communities and Local Government) in conjunction with the Countryside Commission published '*Lighting in the Countryside: Towards Good Practice*' in July 1997, and a revised issue in 2001. The guidance was developed to '*provide practical advice on the prevention and control of lighting effects through appropriate action by all those involved with lighting in the countryside*'. Its objective is '*to identify good practice in the planning and design of lighting in rural areas; and advise on how it can be achieved, using case study examples*'. The guide aims to provide an overview and common understanding of all aspects of good lighting practice stating that close co-operation and participation is required for all those involved in planning, designing and installing lighting schemes. The guidance provides valuable information on lighting best practice and the standard methodology outlined in this guidance document has been followed as part of this assessment. Whilst, the guidance relates to '*lighting in the countryside*', it is considered best practice to adopt many of the principles contained within the guidance to sites of a more urban nature.

#### [BS 5489: Code of Practice for the Design of Road Lighting – Part 1: Lighting of Roads and Public Amenity Areas \(Ref. 17\)](#)



1.2.22 BS 5489 Part 1, 2003 provides recommendations on the general principles, aesthetic and technical aspects of road lighting and advises on statutory provisions, operation and maintenance of lighting. The standard provides recommendations for the design of lighting for all types of highways and public thoroughfares, including those specifically for pedestrians and cyclists, and for pedestrian subways and bridges. It also provides recommendations for the design of lighting in urban centres and public amenity areas.

[BS 13201: Road Lighting – Part 2: Performance Requirements \(Ref. 18\)](#)

1.2.23 This standard defines lighting classes for road lighting according to photometric requirements and aiming at the visual needs of road users. It also considers environmental aspects of road lighting. Roads designated within BS EN 13201-2, S class are lit to a level required by pedestrians and pedal cyclists on footways, cycleways, emergency lanes and other road areas lying separately or along the carriageway of a traffic route, and for residential roads, pedestrian streets, parking places and school yards.

[BS EN 12464-2: Lighting of Work Places. Outdoor Work \(Ref. 19\)](#)

BS EN 12464-2 is the standard that focuses on the recommendations for outdoor work places that are used at night. BS EN 12464-2 includes important recommendations on how obtrusive light can be limited, to keep night skies free of light pollution.

## 2 METHODOLOGY

### 2.1 Scope of the assessment

2.1.1 An EIA Scoping Report for the preliminary phase of Northstowe was submitted to SCDC in July 2011 (**Ref. 20**). Within this report, 'Chapter 10 – Landscape and Visual Effects' outlined the following likely significant effect in relation to lighting:

- 'Changes to sensitive views into the site, including from designated areas such as Longstanton conservation area, and including changes to night time views as a result of increased lighting.

*The night time visual assessment will be informed by a lighting study, which will include a night time survey of baseline lighting levels and consideration of new sources of light associated with the proposed development, such as roads, buildings and sports pitches. Given that this issue will be addressed in the landscape and visual effects assessment, it is not considered appropriate to include a separate lighting assessment within the ES'.*

2.1.2 The above likely significant effect is assessed within **Chapter 4 - Landscape and Visual Effects of the ES**, February 2012.

2.1.3 SCDC's Scoping Opinion, September 2011 (**Ref. 21**) provided the following comments on 'Landscape and Visual Effects':

*2.1.4 'Lighting impact can be wide and there can be significant adverse effects on ecology and possible statutory nuisance to the amenity of residential premises both during the construction and operational phases. The effects/impacts of construction and operational artificial lighting on existing and proposed sensitive residential premises should be considered within the ES. The 2007 ES had a separate chapter 6 on Lighting, which was robust and comprehensive with adequate mitigation measures. It is likely that the assessment in the main remains valid subject to some validation of baseline levels. It is recommended that the potential impact associated with any artificial lighting should be considered as a separate topic or at the very least the ES should make it clear in the contents that artificial lighting impact has been assessed to include the impact on existing and proposed residential premises'.*

2.1.5 Following the receipt of SCDC's Scoping Opinion, it was considered necessary to ensure that **the ES** was supported by a Lighting Technical Report which would include new day and night time surveys. This has been taken into account in the landscape and visual, natural heritage and community, economic and social chapters of the ES (chapters 4, 6 and 12 respectively).

2.1.6 The following potentially significant effects are examined in this report:

#### Effects during construction

- Increase in light spill and glare (associated with lighting installations) to existing local residential receptors.

#### Effects post-construction

- Increase in light spill and glare (associated with lighting installations) to existing local residential receptors.

#### Insignificant effects

2.1.7 The only existing road for which users may experience an increase in glare, is Station Road (B1050), primarily associated with the section between Striplands Farm and Hattons Farm to Longstanton Park and Ride. This section of road is currently inconsistently lit, as exemplified by the range in illuminance readings recorded during the survey in November 2011 (see below). Readings ranged from 1.15 to 12.87 lux. This wide range is largely as a result of the significant lighting installations associated with Longstanton Park and Ride. Assuming that British Standard 5489, 13201 and EN 12464 (**Ref. 17, 18 and 19**) are adhered to, there is likely to be more consistent and controlled lighting levels along this section of road. A significant increase in glare to road users of Station Road is considered unlikely and therefore this is not considered further in this report.

2.1.8 Sky glow was considered at the outset of the assessment of lighting conditions. Following the lighting surveys in November 2011 (see below), it was noted that the site is partially surrounded by an existing brightly lit environment and is adjacent to an established semi-urban/village location. The increase in sky glow associated with the proposed development is considered to be negligible based on the likelihood of a noticeable change from the baseline conditions when viewed from

the surrounding area. This is applicable to both phases of the proposed development. Given the subjective nature of sky glow it is difficult to quantify the potential effects due to a number of variables including the fact that sky glow is measured as a percentage change. Furthermore, the assumed lighting design specification for the proposed development will adopt best practice lighting which includes the requirement to minimise upwards light emitted and contributions towards sky glow. Therefore this is not considered further in this report.

2.1.9 The potentially significant lighting effects of light spill and glare that are generated by the proposed development on future residential receptors have not been considered in the scope of this assessment. It is considered that new lighting installations will be designed in accordance with best practice guidelines and criteria in order to prevent/minimise any nuisance or disturbance. New lighting installations will be operational prior to the arrival of any future residential receptors and thereby they will not experience a change in the baseline conditions. Therefore this is not considered further in this report.

### Effects considered elsewhere in the ES

2.1.10 The assessments of potentially significant lighting effects on ecological species (in particular sensitive bat species) has been 'scoped out' of this report and are assessed within **Chapter 6 – Natural Heritage of the ES**, February 2012. Results from the lighting surveys have been used within this chapter to demonstrate the existing lighting conditions at sensitive ecological receptors. Therefore this is not considered further in this report.

2.1.11 As outlined above, the potentially significant lighting effects to night time views (as viewed by residents and all other users of the surrounding area) including those from designated areas such as Longstanton Conservation Area has been assessed within **Chapter 4 - Landscape and Visual Effects of the ES**, February 2012. This includes appropriate consideration of potentially significant lighting effects to the setting of valuable landscape or historical assets/designations. A range of views including medium and long distance views have been considered within **Chapter 4 - Landscape and Visual Effects of the ES**, February 2012 as have any changes in lighting levels on public rights of way and other informal paths. Therefore these potential effects are not considered further in this report.

2.1.12 It is anticipated that recommendations contained in this report will be used to inform the future detailed lighting specification for the proposed development.

## 2.2 Extent of the study area

2.2.1 The extent of the study area includes the site, its immediate surroundings and key sensitive residential properties which may be subject to a change in existing lighting conditions. The residential properties identified during the desk-based study and lighting surveys are discussed below. The study area does not take into account medium or long distance views into the site, as the focus of this assessment is to ensure that statutory nuisance issues from lighting associated with the proposed development are effectively mitigated. Medium and longer distance views are discussed within **Chapter 4 - Landscape and Visual Effects of the ES**, February 2012.

## 2.3 Method of baseline data collection

2.3.1 The approach and methodology used to assess the baseline lighting conditions on and in the immediate vicinity of the site involved a desk study, and a baseline lighting survey on-site and in the immediate vicinity, as discussed below.

### Desk study

2.3.2 A desk study has been undertaken to identify relevant legislation, planning policy, good practice guidance in relation to lighting following the standard methodology outlined in '*Lighting in the Countryside: Towards Good Practice*' (Ref. 16). The desk study was also informed by WSPE's in-house IGIS database.

### Baseline lighting surveys

2.3.3 Day-time and night-time surveys were undertaken on 22nd November, 2011 to ascertain the current baseline lighting conditions and the types of lighting installations present on-site and in the immediate vicinity. The weather conditions for the duration of both the day-time and night-time surveys were dry and fog-free but with cloudy skies clearing towards the end of the night-time survey.

2.3.4 Readings of illuminance (light spill) were taken from within the site (in order to benchmark existing on-site lighting conditions) and at predetermined lighting monitoring locations considered representative of sensitive residential properties. These were determined during the desk study and confirmed during the day-time survey. In particular, properties in close proximity to the site were evaluated in terms of their direct and intermittent views towards the site and whether existing screening prevented any existing views. The baseline lighting monitoring locations (outlined in **Table 3.1**) are illustrated on

**Figure 1.** The illuminance readings were taken from 17:24 to 20:15hrs and establish the existing ambient lighting conditions on which to base the lighting assessment upon.

2.3.5 At the lighting monitoring locations, the readings of illuminance were taken from floodlighting, street lighting, highways lighting and externally lit buildings and installations using a Minolta T10 hand held meter (Serial Number 41021018/60031036). The hand held meter is maintained and calibrated in accordance with the manufacturers' instructions. Readings of illuminance were recorded at 10 monitoring locations (1 to 10), the locations of which are described in **Table 3.1**. At each of the monitoring locations, vertical illuminance was recorded from northerly, southerly, easterly and westerly directions. A reading of horizontal illuminance was also made at each location to benchmark the lit surface.

2.3.6 Reference has been made to the Environmental Zone Criteria for light nuisance into windows (measured in lux) as outlined in the *Guidance Notes for the Reduction of Obtrusive Light (Ref. 15)*, provided as **Appendix 1**. Both pre-curfew (referred to where light sources are switched off before the recommended 2300hrs curfew time) and post curfew (referred to if light sources remain on throughout the night time period such as highways and street lighting) standards have been referred to in the assessment.

## 2.4 Key definitions

2.4.1 In accordance with the *Guidance Notes for the Reduction of Obtrusive Light (Ref. 15)*, provided as **Appendix 1**, the following definitions are used to describe lighting effects in this assessment:

- Sky glow: the upward spill of light into the sky which can cause a glowing effect and is often seen above cities when viewed from a dark area;
- Light spill: the unwanted spillage of light onto adjacent areas and may affect sensitive receptors, particularly residential properties;
- 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; and
- Light trespass (into windows): the spilling of light beyond the boundary of a property which may cause nuisance to others. It should be noted that the term 'trespass' is no longer used by practitioners and 'light nuisance' is now the preferred term.

## 2.5 ILE lighting zones

2.5.1 As outlined above, the ILE has proposed lighting guidance and criteria for local authorities with a recommendation that they are incorporated at the local plan level. These are provided within *Guidance Notes for the Reduction of Obtrusive Light (Ref. 15)*, provided as **Appendix 1**, which defines the following zones which are likely to be adopted by local authorities:

- E1: Intrinsically Dark Landscapes - National Parks, Areas of Outstanding Natural Beauty or other dark landscapes;
- E2: Low District Brightness Areas – Rural, small village or relatively dark urban locations;
- E3: Medium District Brightness Areas - Small town centres or urban locations; and
- E4: High District Brightness Areas – Town/city centre with high levels of night-time activity.

2.5.2 This guidance proposes that where a district classification falls between two zones that the more rigorous environmental zone standards are applied in the design of the lighting. The guidelines and threshold values for the environmental zones, as amended in 2005, have been used as part of the assessment and are outlined in **Table 2.1**. In addition, a glossary of lighting terminology used in the assessment is provided in **Appendix 2**.

**Table 2.1: Obtrusive light limitations for exterior lighting installations**

Environmental Zones	Sky glow ULR (Max %)	Light trespass into windows Ev (lux)		Source intensity I (kcd)		Building luminance
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Average, pre-curfew
<b>E1</b>	0	<b>2</b>	<b>1*</b>	2.5	0	0
<b>E2</b>	2.5	<b>5</b>	<b>1</b>	7.5	0.5	5
<b>E3</b>	5	<b>10</b>	<b>2</b>	10	1.0	10
<b>E4</b>	15	<b>25</b>	<b>5</b>	25	2.5	25

Source: ILE Guidance Notes for the Reduction of Obtrusive Light (2005)

Notes to **Table 2.2**:

- ULR (Upward Light Ratio) is the maximum permitted percentage of luminaire flux that goes directly into the sky;
- Ev is Vertical Illuminance in Lux;
- I is Light Intensity in Candelas;
- L is Luminance in Candelas per square metre; and
- Curfew refers to a time when SCDC has agreed that the lighting installation should be switched off; this typically refers to 11pm - 7am.
- \* From public road lighting installations only.

2.5.3 In the absence of statutory guidance, it is proposed that the *Guidance Notes for the Reduction of Obtrusive Light Ref. 15*), provided as **Appendix 1** will be used, in order to provide suitable categorisation of existing lighting conditions and a nationally understood reference upon which to assess changes to the baseline conditions. The guidance levels for light nuisance into windows have been used as the principal criteria, although this should not be seen as definitive but indicative.

## 2.6 Significance criteria

2.6.1 The significance of the effect is based on the magnitude of change as a result of the proposed development and the importance of the affected receptor/receiving environment. Magnitude/scale of change is assessed on a scale of large, medium, small or negligible and further details on the evaluation criteria is provided below. The importance of the affected receptor/receiving environment is assessed on a scale of high, medium, low and negligible.

2.6.2 To determine the magnitude/scale of the change in lighting levels at the sensitive residential property, the following criteria are evaluated using professional judgement:

- Type of lighting installations during construction and post construction;
- The duration of the lighting anticipated;
- The distance between the proposed lighting installations and the sensitive residential property;
- Type of view (e.g. direct, intermittent or restricted);
- Existing and proposed screening;
- Potential change in ILE Environmental Zone; and
- Potential for statutory nuisance.

2.6.3 The degree of the effect is assessed using the matrix outlined in **Table 2.2**. Effects that are moderate or above are considered to be significant.

**Table 2.2: Determination of degree of effect**

Magnitude/scale of change	Importance of receptor			
	High	Medium	Low	Negligible
Large	Very substantial	Substantial	Slight to moderate	Negligible
Medium	Substantial to moderate	Moderate	Slight	Negligible
Small	Moderate to slight	Slight	Slight to negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

2.6.4 The degrees of effects are outlined below:

- Very substantial: a large change in illuminance levels at the windows of residential properties as a result of light spill and glare and for adverse effects, the likelihood of exceedance of ILE criteria and creation of statutory nuisance;
- Substantial: a medium to large change in illuminance levels at the windows of residential properties as a result of light spill and glare. For adverse effects this is likely to be broadly within the ILE criteria and a statutory nuisance is considered unlikely to be determined;
- Moderate: a medium change in illuminance levels at the windows of residential properties as a result of light spill and glare. For adverse effects the change is likely to be within the ILE criteria and a statutory nuisance is considered unlikely to be determined;
- Slight: a small change in illuminance levels at the windows of residential properties as a result of light spill and glare. For adverse effects the change is likely to be within the ILE criteria and a statutory nuisance is considered unlikely to be determined; and
- Negligible: no change in illuminance levels at the windows of residential properties as a result of light spill and glare.

2.6.5 The degree of effects will distinguish between temporary and permanent effects based on the following timescale:

- Short term: the effects from lighting would be of short duration and would not last more than 1 year from the commencement of the works;
- Medium term: the effects from the lighting would last between 1 year and 10 years; and
- Long term: the effects from the lighting would last for a period greater than 10 years and are considered permanent effects.

## 3 BASELINE CONDITIONS

### 3.1 Introduction

3.1.1 The baseline conditions are those surveyed and documented during the surveys in November 2011. The majority of the site is unlit; however there are a number of significant floodlights as part of Cambridge Golf Course and driving range and other lighting from the parking provisions associated with the driving range. Discussions with the management team at Cambridge Golf Club confirmed that the facilities remain unlit during the evening with the exception of the driving range, which is operational seven days a week until approximately 8pm (at the time of the survey). Significant sources of lighting can be viewed from the site, primarily to the north where lighting associated with Station Road (B1050) and Longstanton Park and Ride is prominent.

3.1.2 In the wider area to the south and west, lighting is typical of levels anticipated in rural villages and small town centres, with the lighting levels determined by the age of the installations. Throughout these areas, the residential zones have a range of lighting levels, from well-lit consistent lighting (largely associated with the newer infill development) to inconsistent areas of lighting associated with sporadic installations implemented as part of highway schemes of older developments.

3.1.3 Station Road (B1050), but primarily from Southwell to the north and Longstanton Park and Ride (and associated junctions) are the greatest sources of lighting in the immediate surrounding area.

### 3.2 Surveys results

3.2.1 As outlined above, surveys were undertaken in November 2011. **Table 3.1** outlines the description of each of the lighting monitoring locations alongside the typical sources of existing lighting recorded at each lighting monitoring location. For the residential properties, details on existing screening were also recorded. **Table 3.2** presents the illuminance readings recorded at the lighting monitoring locations.

**Table 3.1: Descriptions of lighting monitoring locations**

Lighting Monitoring Location	Description		
	Location (Figure 1)	Typical sources of existing lighting	Indicative Environmental Zone
On-site			
1	Central section of Cambridge Golf Club	<ul style="list-style-type: none"> <li>Intermittent views of lighting to north and west associated with the highways lighting of Station Road (B1050) and high pressure sodium lighting and floodlighting associated with Longstanton Park and Ride.</li> </ul>	E2
2	Eastern section of Cambridge Golf Club	<ul style="list-style-type: none"> <li>Clear views of lighting to north-west and west associated with the highways lighting of Station Road (B1050) and high pressure sodium lighting (40+ estimated at this lighting monitoring location) and floodlighting associated with Longstanton Park and Ride; and</li> <li>Limited sky glow to the east was noted.</li> </ul>	E2
3	Southern section of Cambridge Golf Club	<ul style="list-style-type: none"> <li>Primarily, intermittent views of lighting to north and west associated with the highways lighting of Station Road (B1050); and</li> <li>Scattered singular high and low pressure sodium lighting installations from north to west and south to east.</li> </ul>	E2
4	Adjacent to northern	<ul style="list-style-type: none"> <li>4 x simple asymmetric beam floodlights directed at the</li> </ul>	E3

	boundary of Cambridge driving range	<p>horizontal and providing a lit surface to 200m;</p> <ul style="list-style-type: none"> <li>■ Internal strip lighting within driving range; and</li> <li>■ Intermittent views of lighting to north and west associated with the highways lighting of Station Road (B1050).</li> </ul>		
Sensitive residential properties				
		Typical sources of existing lighting	Existing screening	
5	41, Station Road (entrance to driveway)	<ul style="list-style-type: none"> <li>■ No lighting installations on section of Station Road (B1050) outside of property;</li> <li>■ Lighting associated with junction lighting scheme to the north (approximately 50m from lighting monitoring location). However, it is considered unlikely that this can be viewed from this property; and</li> <li>■ Lighting from headlamps of passing vehicles.</li> </ul>	<ul style="list-style-type: none"> <li>■ Bungalow windows almost fully screened by hedgerows on both sides of Station Road (B1050). An intermittent glimpse of the lighting associated with Longstanton Park and Ride can be viewed due to a gap in one of the hedges.</li> </ul>	E2
6	Ashby Bed and Breakfast	<ul style="list-style-type: none"> <li>■ Lighting from highways lighting (reflector optic, flat glass, high pressure sodium on alternative sides at an approximate distance of 15m apart); and</li> <li>■ Lighting from headlamps of passing vehicles.</li> </ul>	<ul style="list-style-type: none"> <li>■ Some screening but intermittent and direct views from single story property towards the site and Longstanton Park and Ride.</li> </ul>	E3
7	24, Prentice Close (a typical example of cul-de-sacs in this area)	<ul style="list-style-type: none"> <li>■ Lighting from street lighting (reflector optic, low pressure sodium on alternative sides at sporadic locations).</li> </ul>	<ul style="list-style-type: none"> <li>■ Although not possible to access the rear of the property, it has been assumed that there are direct views towards the site and at least intermittent views.</li> </ul>	E2
8	60, Magdalene Close	<ul style="list-style-type: none"> <li>■ Lighting from street lighting (reflector optic, low pressure sodium at an approximate distance of 40m apart on the opposite side of the road).</li> <li>■ Lighting associated with Longstanton Park and Ride can be viewed to the north-</li> </ul>	<ul style="list-style-type: none"> <li>■ Although there are a range of trees and boundary hedges between this property and the site, there are intermittent and direct views of the site from both storeys.</li> </ul>	E2/E3



		<p>west; and</p> <ul style="list-style-type: none"> <li>■ Lighting associated with the driving range floodlights at Cambridge Golf Course can be viewed clearly with significant sky glow from this source noted at this location.</li> </ul>		
9	Brookfield Farm	<ul style="list-style-type: none"> <li>■ Inconsistent lighting from street lighting (a range of low pressure sodium installations at various distances, however, these were not adjacent to or in close proximity to the farm)<sup>1</sup>;</li> <li>■ External lighting associated with Brookfield Farm; and</li> <li>■ Intermittent distant views of lighting associated with Longstanton Park and Ride.</li> </ul>	<ul style="list-style-type: none"> <li>■ Screening varied considerably but there were direct views from the farm towards the site, which is located immediately to the west of the southern boundary.</li> </ul>	E2
10	New Close Farm Cottage (Hazelwell Court, entrance to office)	<ul style="list-style-type: none"> <li>■ External lighting associated with Brookfield Farm; and</li> <li>■ Lighting from headlamps of passing vehicles and moving vehicles on the A14 (prominent in the mid-view).</li> </ul>	<ul style="list-style-type: none"> <li>■ Windows almost fully screened by 2-3m high hedgerows on all sides. There are possible intermittent views to the north-east.</li> </ul>	E2

**Table 3.2: Illuminance readings recorded at the lighting monitoring locations**

Lighting Monitoring Location (Figure 1)	Vertical Illuminance (Lux)				Horizontal Illuminance (Lux)
	Facing North	Facing East	Facing South	Facing West	
On-site					
1	0.05	0.02	0.01	0.03	0.04
2	0.06	0.02	0.02	0.07	0.04
3	0.02	0.02	0.02	0.02	0.03
4	1.15	0.03	0.04	2.04	0.34
Sensitive residential properties					
5	1.10	0.18	2.56	0.39	0.07
6	6.30	10.97	12.87	0.39	9.70

<sup>1</sup> A lighting replacement scheme was currently underway at this time of the survey.

7	0.26	0.04	0.09	4.68	1.07
8	7.02	0.22	0.16	0.53	3.27
9	0.02	0.02	0.08	0.06	0.04
10	0.02	0.04	0.05	0.02	0.04

### 3.3 Discussion of surveys results and confirmation of indicative Environmental Zones

3.3.1 All of the above results relate to operational lighting pre-curfew. The only significant changes to existing lighting post-curfew is likely to be the reduction in lighting levels at lighting monitoring location 4 associated with the turning off of the simple asymmetric beam floodlights associated with the driving range at approximately 8pm. The remainder of the primary sources of lighting (street lighting, highways lighting, security lighting and lighting from Longstanton Park and Ride are assumed to be operational throughout the hours of darkness. Therefore, with the exception of location 4 the indicative Environmental Zones as identified in **Table 3.2** are considered to be representative of both pre and post curfew Environmental Zones. Based on professional judgement, the post curfew lighting levels at location 4 are likely to be representative of Environmental Zone 2.

3.3.2 Illuminance readings at lighting monitoring location 5 are predominately below 1 lux and are from mixed sources. The exceptions are facing north and south, where readings of 1.10 and 2.56 lux were recorded respectively. An Environmental Zone 2 is considered representative at this lighting monitoring location.

3.3.3 Illuminance readings at lighting monitoring location 6 are varied and range from 0.39 to 12.87 lux, primarily associated with illuminance recording in close proximity to the high pressure sodium installations and lighting associated with Longstanton Park and Ride (facing east and south). Light into windows was recorded at 6.30 lux, considered attributable to an Environmental Zone 4, post curfew. However, this monitoring location cannot be justified as a high district brightness area and therefore an Environmental Zone 3 is considered to represent the lighting monitoring location.

3.3.4 Illuminance readings at lighting monitoring locations 7 and 8 range from 0.04 to 7.02 lux with light into windows recorded at 0.04 (anticipated) and 7.02 respectively. Whilst for similar reasons to those above, an Environmental Zone 2 is considered representative of lighting monitoring locations 7, monitoring location 8 is considered to be more represented by an Environmental Zone 3, due to the location being in close proximity to the reflector optic, low pressure sodium installation and potential contributions from the lighting associated with the driving range.

3.3.5 Illuminance readings at lighting monitoring locations 9 and 10 are below 1 lux and are from mixed sources and therefore an Environmental Zone 2 is considered representative at these lighting monitoring locations.

### 3.4 Sensitive Receptors

3.4.1 As outlined above, the sensitive receptors considered in this report are limited to residential properties with intermittent or direct views of the Site. The following are considered representative of the most sensitive residential properties and will be those upon which the assessment will be based. The receptor number also relates to the lighting monitoring location, which is illustrated on **Figure 1**.

- 41, Station Road (lighting monitoring location 5): **Receptor 5**;
- Ashby Bed and Breakfast (lighting monitoring location 6) **Receptor 6**;
- 24, Prentice Close (lighting monitoring location 7) **Receptor 7**;
- 60, Magdelene Close (lighting monitoring location 8) **Receptor 8**;
- Brookfield Farm (lighting monitoring location 9) **Receptor 9**; and
- New Close Farm Cottage (lighting monitoring location 10) **Receptor 10**.

3.4.2 Whilst there were other sensitive residential properties in close proximity to the site, such as Striplands Farm and properties to the west of the High Street, these were screened by vegetation and existing buildings. Whilst the eastern frontage of the properties on Ladywalk were not accessible, receptors 7 and 8 are considered representative.

### 3.5 Future baseline

3.5.1 Should the site remain undeveloped, the baseline lighting conditions would result in the area remaining categorised as the indicative Environmental Zones outlined above, which range from a low to medium district brightness area. However, at the time of the survey, a lighting replacement scheme was currently underway at lighting monitoring location 9, which indicates a wider replacement scheme in the area. Low pressure sodium lighting is being phased out and replaced with alternatives such as high pressure sodium lamps which provide a better overall performance. This may well improve the consistency of lighting in the area and has the potential to change the indicative Environmental Zones outlined above.

3.5.2 Some authorities and private firms are increasingly leaving some lighting turned off as a result of the cost of energy and the climate change agenda, which also has the possibility of reducing lighting levels.

# 4 LIGHTING ASSESSMENT

## 4.1 Effects during construction

4.1.1 Good practice guidance documents prepared by The Construction Industry Research and Information Association (CIRIA) note that lighting on construction sites is typically required as part of on-site security and health and safety requirements. However, the online CIRIA Guidance (<http://www.ciria.org/complianceplus/>) also notes that potential effects towards surrounding receptors need to be minimised through the controlled application of lighting in accordance with current best practice standards.

4.1.2 It is anticipated that the key potential sources of lighting during the construction phase will include the following:

- Floodlighting and security lighting associated with temporary car parking areas for workers, the secure compound adjacent to the northern boundary (sufficient to accommodate at least 55 HGVs) and any perimeter fencing/hoarding;
- Security and health and safety lighting associated with working areas, (e.g. where equipment is stored and safety hazards may be present), temporary haul routes and emergency escape routes;
- The potential for fugitive light spill and glare from internal lighting associated with site offices and welfare facilities; and
- Lighting required for operational purposes associated with construction when working during the late afternoon in the winter period (including light from headlamps of vehicles). This may be particularly applicable when material is transferred from the Hatton's Road attenuation ponds area to the primary development site.

4.1.3 The intended working hours will be from 0730 to 1800 Monday to Friday and from 0800 to 1300 Saturdays and at no time on Sunday or bank holidays. However, certain operations are seasonal and weather dependent and in these instances it may be necessary to extend working hours to take advantage of daylight hours, subject to the prior agreement of SCDC. An example of this is the movement of large items of construction plant to and from the site, which although infrequent and short term may normally fall between 1900 and 0700.

4.1.4 Consequently, it is likely that sources of light will be predominant in winter months when the above working hours fall within the hours of darkness. However, it is assumed that some level of security lighting (mainly associated with the secure compound and perimeter fencing/hoarding) will be required at all times (during the hours of darkness).

4.1.5 Measures already included in the pre-mitigation scenario include:

- Procedures will be implemented to ensure effective liaison with the neighbouring properties, adjacent residents and local community through newsletters, letter drops (when construction activities are likely to affect the local residents), and information boards;
- The site will be registered to the Considerate Constructor's Scheme to ensure the construction process is audited and monitored with the aim of maintaining the highest possible standards; and
- Specifically in relation to temporary lighting, lighting will be kept to the minimum required for that activity (meeting health and safety requirements) and lighting will be located and directed away from residential properties where possible.

4.1.6 The practical and aesthetic functions of lighting can become a source of intrusiveness, friction and even adverse health effects for others. Health related effects that are thought to be associated with exposure to artificial light include: headaches; fatigue; stress and circulating and circadian rhythm effects (**Ref. 22**).

### **Increase in light spill and glare (associated with lighting installations) to existing local residential receptors**

4.1.7 As outlined above, there will be a number of sources of lighting during the construction phase, the majority of which will be far more prominent during winter months. The duration of the construction phase is likely to be up to six years. The key sources of lighting are those associated with the secure compound and perimeter fencing/hoarding. For the purposes of the assessment, it has been assumed that these sources of lighting will be at the perimeter (which provides a worst case for assessment of light spill and glare at surrounding properties).

4.1.8 The key sensitive receptors are those with direct views towards the site that are within a 25m radius of the sources of construction lighting. It has been assumed that sensitive receptors located greater than 25m from the sources of construction lighting are unlikely to experience a noticeable change in light spill and/or glare. These include receptors 7, 8 and 10. Receptors 7 and 8 may even notice a decrease in glare associated with the closure of the driving range.

4.1.9 Receptors 5, 6 and 9 are within 25m of the sources of construction lighting. Receptor 5 will be largely screened from the sources of lighting as there are only intermittent glimpses of the site from this location. However, there are direct and intermittent views from receptors 6 and 9. Receptors 5 and 9 currently experience low levels of lighting (maximum vertical illuminance of 2.56 and 0.08 lux), indicative of an Environmental Zone 2 and therefore will be more susceptible to an increase in light spill and glare in contrast to the baseline conditions. Receptor 6 is already brightly lit, with maximum vertical illuminance levels of upto 12.87 lux, indicative of an Environmental Zone 3 and therefore will be less susceptible to an increase in light spill and glare.

4.1.10 In all cases, the likely sources of construction lighting are unlikely to cause a statutory nuisance and any temporary issues that local residents may have can be quickly and effectively resolved during the public liaison activities.

4.1.11 The importance of receptors 5, 6 and 9 (i.e. those within 25m of the sources of construction lighting) is considered as high due to the potential for statutory nuisance and adverse effects to health (as outlined above). Based on the significance criteria outlined in section 2.6 and the evaluation above, the magnitude/scale of change is predicted to be small to negligible for receptor 6 and small to medium for receptors 5 and 9, assuming the measures included in the pre-mitigation scenario outlined above are strictly adhered to. Based on the determination of degree of effects (**Table 2.2**), there is likely to be a slight, insignificant, adverse, direct, temporary, medium term effect at receptor 6 and moderate significant, adverse, direct, temporary, medium term effects at receptors 5 and 9.

## 4.2 Effects post construction

4.2.1 As outlined in chapter 2 of the **ES**, February 2012, the proposed development will be developed within the spatial parameters defined in a series of parameter plans. In particular, the land use and access and movement parameter plans (figures 2.2 and 2.5 in chapter 2 of the **ES**) have been used to inform this assessment.

4.2.2 A comprehensive detailed lighting design and specification for the proposed development will be prepared by a specialist lighting contractor at the detailed design stage and agreed with SCDC. The external lighting specification and design for the proposed development will be prepared with due regard to the sensitivities of surrounding receptors. The lighting specification will 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 the effects of light spill and glare are minimised. In order to undertake an assessment of likely lighting effects it has been necessary to make assumptions in terms of lighting specification to be adopted.

4.2.3 It is assumed that the operational lighting will be associated with the following elements:

- Primary and secondary streets (and residential streets);
- Principal cycle/pedestrian routes (on and off road); dedicated cycleway along primary street and existing byway and public rights of way;
- Key public amenity areas;
- Car parking areas and service yards associated with the employment and mixed use areas to the north and the primary school/community centre; and
- Sports pitches (including mini; bowling; junior; synthetic turf; cricket and rugby).

4.2.4 In addition, decorative lighting associated with some of the key buildings and illuminated advertisements is anticipated.

4.2.5 It is assumed that unlike the existing CGB route, the new section within the proposed development will be lit as a result of the adjacent roads and cycle routes.

4.2.6 In terms of the Hatton's Road attenuation ponds area, it is assumed that this area will remain unlit post construction and there will be no changes to the lighting of Hatton's Road.

4.2.7 For the purposes of the assessment it has been necessary to understand the minimum distance between the closest residential receptor and potential floodlighting associated with the sports pitches. Receptor 8 is the closest residential property to a potentially lit sports pitch (in this case the rugby pitch) at approximately 65-70m.

4.2.8 It is assumed that the majority of lighting will consist of high pressure sodium lamps which provide a better overall performance. Any lighting will be designed to comply with guidance contained within BS 5489-1 (**Ref.17**); BS 13201 (**Ref.18**) and BS EN 12464 (**Ref.19**). Again for the purposes of the assessment, the light sources outlined above are assumed to be operational 24 hours day.

4.2.9 As part of the proposed development, a number of tree groups will be retained and structural planting will increase the screening between the proposed development and the residential receptors of Longstanton to the west.

#### **Increase in light spill and glare (associated with lighting installations) to existing local residential receptors**

4.2.10 As outlined above, there will be a number of sources of lighting during the operational phase, the majority of which will be far more prominent during winter months. The key sources of lighting closest to the residential receptors outlined above include lighting from the primary street (at receptor 9); lighting associated with the adjacent highway and service yards and car parking areas within the employment area (at receptors 5 and 6) and lighting associated with sports pitches (as outlined above, this is best represented by receptor 8, which also provides a worst case scenario for receptor 7). This is considered to best represent the sources of lighting closest to the identified receptors. As there is no operational lighting proposed within the potential area for excavation and fill, no change to the baseline lighting conditions at receptor 10 is anticipated.

4.2.11 As outlined above, receptor 5 will be largely screened from the sources of lighting associated with highways and the service yards and car parking areas within the employment area, as there are only intermittent glimpses of the site from this location. It has been assumed that this screening and associated tree group will be retained. However, receptor 5 currently experience low levels of lighting (maximum vertical illuminance of 2.56), indicative of an Environmental Zone 2 and therefore will be more susceptible to an increase in light spill and glare in contrast to the baseline conditions.

4.2.12 Whilst receptor 6 will have direct and intermittent views of the service yards and car parking areas within the employment area, they are already within a brightly lit environment due to its location in relation to Longstanton Park and Ride (and associated lighting). At receptor 6 there are current maximum vertical illuminance levels of upto 12.87 lux, indicative of an Environmental Zone 3. It is for this reason that this receptor will be less susceptible to an increase in light spill and glare.

4.2.13 Receptor 8 has intermittent and direct views of the site and currently experiences lighting levels indicative of an Environmental Zone 3 due to the location being in close proximity to the reflector optic, low pressure sodium installation and potential contributions from the lighting associated with the driving range. The existing screening will be retained. The lighting associated with the sports pitches are likely to be asymmetric beam horizontal cut-off (HCO) floodlights or simple asymmetric beam floodlights. Either of these options will ensure that light spill is unlikely to be greater than 10m from source. Potential glare from these installations may cause nuisance at upto 50m but will be greatly reduced by the retention of existing screening. As outlined above, receptor 8 is located between approximately 65 to 70m from the source and therefore an increase in light spill and glare is considered unlikely, especially when considered against the baseline conditions which are indicative of an Environmental Zone 3.

4.2.14 Receptor 9 has intermittent and direct views of the site and currently experiences low levels of lighting (maximum vertical illuminance of 0.08 lux) indicative of an Environmental Zone 2. Therefore, this receptor will be more susceptible to an increase in light spill and glare from the adjacent lighting of the primary street when considered against the baseline conditions, particularly in the absence of screening.

4.2.15 In all cases, the likely sources of operational lighting are unlikely to cause a statutory nuisance if controlled within the guidance contained within BS 5489-1 (**Ref.17**); BS 13201 (**Ref.18**) and BS EN 12464 (**Ref.19**).

4.2.16 The importance of receptors 5, 6, 8 and 9 is considered as high due to the potential for nuisance and adverse effects to health (as outlined above). Based on the significance criteria outlined in section 2.6 and the evaluation above, the magnitude/scale of change is predicted to be small to negligible for receptors 5, 6 and 8 and small to medium for receptor 9. Based on the determination of degree of effects (**Table 2.2**), there is likely to be slight, insignificant, adverse, direct, permanent, long term effects at receptors 5, 6 and 8 and a moderate significant, adverse, direct, permanent, long term effect at receptor 9.

### **4.3 Mitigation**

#### **Effects during construction**

##### *Increase in light spill and glare (associated with lighting installations) to existing local residential receptors*

4.3.1 In addition to the pre mitigation scenario measures outlined above which are included as part of the Construction Management Strategy, the following will be undertaken:

- Adherence to best practice measures as recommended by the ILE, CIRIA and Health and Safety Executive (HSE), over and above those outlined in the pre-mitigation scenario;

- Regular consultation with SCDC and feedback from any nuisance issues arising from the public liaison activities;
- Glare caused by poorly directed security and floodlighting will be minimised by ensuring that light fittings are mounted close to the horizontal and directed into the centre of site. Temporary lighting fixtures should be installed and designed to provide full cut-off or should be directionally shielded to ensure that artificial light is controlled and substantially confined to the defined area intended to be illuminated; and
- The location of residents with intermittent and/or direct views within a 25m radius of the Site should be evaluated prior to the installation of lighting.

### Effects post construction

#### *Increase in light spill and glare (associated with lighting installations) to existing local residential receptors*

4.3.2 The proposed lighting specification or/and strategy should be designed to use current best practice and best available technology, conform to policies and objectives DP/3.2, NE/f and NE/14 (see above) and should be agreed with SCDC.

4.3.3 Additional care should be taken to minimise light spill and glare from any lighting installed by ensuring the correct luminaire is selected and installed correctly in line with the following recommendations within ILE *Guidance Notes for the Reduction of Obtrusive Light* (**Ref. 15, Appendix 1**).

4.3.4 The following measures should be strictly adhered to:

- Lights should be switched off when not required for safety, security or enhancement of the night-time scene. In this respect, the introduction of the concept of a curfew with further limitations in lighting levels between agreed hours should be investigated;
- Lights should direct light downwards wherever possible to illuminate the target not upwards. If there is no alternative to the installation of upward lighting then use of shields and baffles will help reduce light spill to a minimum. Shields and baffles should also be considered adjacent to sensitive areas where darker environments are currently experienced. This is particularly relevant for receptor 9;
- Lighting equipment once installed should minimise the spread of light near, to or above the horizontal;
- Glare should be kept to a minimum, ensuring that the main beam angle of all lights directed towards a potential observer is kept below 70 degrees. It should be noted that the higher the mounting height, the lower the main beam angle can be (although columns in excess of 10m in height should be avoided);
- Wherever possible, flood lights with asymmetric beams should be adopted. These permit the front glazing to be kept at or near parallel to the surfaces being lit;
- 'Over lighting' should be minimised, it is a cause of light pollution and a waste of money and energy. It is recommended that reference is made to lighting standards (as outlined above), for individual work tasks; and
- Any architectural or decorative lighting within the proposed development should comply with best practice.

4.3.5 As stipulated in the guidance on the CNEA 2005 (**Ref. 8**), if lighting used on commercial premises is required for on-site safety and security purposes this can result in a material change to the external façade of the building. Therefore, through applying the above measures in accordance with CNEA 2005, lighting installations are considered to be adequate for purpose so that effects are minimal whilst remaining compatible with the use and function of the proposed facilities.

4.3.6 Should any illuminated advertisement be installed on any element of the proposed development, to advertise their presence during the night time period, then the signage will be designed to minimise glare and follow best practice guidance in ILE Technical Report 5 (**Ref. 23**).

4.3.7 Following a review of the detailed sports lighting specification, consideration will be given to the potential for light spill and glare and floodlight modelling will be undertaken if a nuisance at receptors is considered a possibility.

#### 4.4 Residual effects

##### Effects during construction

###### *Increase in light spill and glare (associated with lighting installations) to existing local residential receptors*

4.4.1 The importance of receptors 5, 6 and 9 is considered as high for the same reasons as outlined above. Based on the significance criteria outlined in section 2.6 and the evaluation above, the magnitude/scale of change is predicted to remain small to negligible for receptor 6 and small to medium for receptors 5 and 9, assuming the measures included in the pre-mitigation scenario and section 4.2 are strictly adhered to. Based on the determination of degree of effects (**Table 2.2**), there is likely to be a slight, insignificant, adverse, direct, temporary, medium term residual effect at receptor 6 and moderate significant, adverse, direct, temporary, medium term residual effects at receptors 5 and 9.

##### Effects post construction

###### *Increase in light spill and glare (associated with lighting installations) to existing local residential receptors*

4.4.2 The importance of receptors 5, 6, 8 and 9 is considered as high for the same reasons outlined above. Based on the significance criteria outlined in section 2.6 and the evaluation above, the magnitude/scale of change is predicted to remain small to negligible for receptors 5, 6 and 8 and small to medium for receptor 9. Based on the determination of degree of effects (**Table 2.2**), there is likely to be a slight, insignificant, adverse, direct, permanent, long term residual effects at receptors 5, 6 and 8 and a moderate significant, adverse, direct, permanent, long term residual effect at receptor 9.



## 5 SUMMARY

5.1.1 Following receipt of SCDC's Scoping Opinion (**Ref. 21**), it was considered necessary to include a Lighting Technical Report to ensure that artificial lighting is adequately assessed in relation to residential properties. The following potentially significant effect is examined in this report for both the construction and operational phases:

- Increase in light spill and glare (associated with lighting installations) to existing local residential receptors.

5.1.2 A desk study was undertaken to identify relevant legislation, planning policy and good practice guidance in relation to lighting following the standard methodology. Day-time and night-time surveys were undertaken on 22nd November, 2011 to ascertain the current baseline lighting conditions and the types of lighting installations present on-site and in the immediate vicinity.

5.1.3 The majority of the site is unlit; however there are a number of significant floodlights associated with Cambridge Golf Course and driving range. Significant sources of lighting can be viewed from the site, primarily to the north where lighting associated with Station Road (B1050) and Longstanton Park and Ride is prominent. In the wider area to the south and west, lighting is typical of levels anticipated in rural villages and small town centres, with the lighting levels determined by the age of the installations. Throughout these areas, the residential areas have a range of lighting levels, from well-lit consistent lighting (largely associated with the newer infill development) to inconsistent areas of lighting associated with older development. The results of the survey (including illuminance readings) enabled indicative Environmental Zones to be defined which ranged from Environmental Zones 2 to 3.

5.1.4 A lighting assessment has been undertaken to determine the significance of potential light spill and glare at the following sensitive and representative residential receptors: 41, Station Road; Ashby Bed and Breakfast; 24, Prentice Close; 60, Magdelene Close; Brookfield Farm; and New Close Farm Cottage. **Table 5.1** provides a summary of the residual significant effects remaining after mitigation.

**Table 5.1: Significant residual effects**

Significant residual effect	Sensitivity of receptor	Magnitude/scale of change	Duration	Nature	Degree of effect	Level of certainty
Effects during construction						
<i>Increase in light spill and glare (associated with lighting installations) to receptors 5 and 9</i>	High	Small to medium	Medium	Adverse	Moderate	Reasonable
Effects post construction						
<i>Increase in light spill and glare (associated with lighting installations) to receptor 9</i>	High	Small to medium	Long	Adverse	Moderate	Reasonable

## 6 REFERENCES

### Documentary Sources

- Ref. 1** *Highways Act 1980*;
- Ref. 2** *Public Health Act 1985*;
- Ref. 3** *Parish Councils Act 1957*;
- Ref. 4** *Local Government Act 1996*;
- Ref. 5** *Traffic Signs Regulations and General Directions 2002*;
- Ref. 6** *Road Traffic Regulation Act 1984*;
- Ref. 7** *Highways (Road Hump) Regulations 1999*;
- Ref. 8** *Clean Neighbourhoods and Environment Act 2005*;
- Ref. 9** *Environmental Protection Act 1990*;
- Ref. 10** Office of the Deputy Prime Minister (ODPM), (2006), *Planning Policy Statement 1: Delivering Sustainable Development*, HMSO;
- Ref. 11** ODPM, (October, 2004), *Planning Policy Statement 23: Planning and Pollution Control*, HMSO;
- Ref. 12** South Cambridgeshire District Council, (July, 2007), *Core Strategy and Development Control Policies DPD*;
- Ref. 13** Commission Internationale De L'Eclairage (CIE – International Commission on Illumination), (2003), CIE 150:2003, *Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations*;
- Ref. 14** CIE, (1997), CIE 126:1997, *Guidelines for Minimising Sky Glow*;
- Ref. 15** Institute of Lighting Engineers (ILE), (2005), *Guidance Notes for the Reduction of Obtrusive Light*, **Appendix 1**;
- Ref. 16** Department of Environment, Food and Rural Affairs, (2001), *Lighting in the Countryside: Towards Good Practice*;
- Ref. 17** British Standard (BS) 5489, (2003), *Code of Practice for the Design of Road Lighting – Part 1: Lighting of Roads and Public Amenity Areas*;
- Ref. 18** BS 13201, (2003), *Road Lighting – Part 2: Performance Requirements*;
- Ref. 19** BS 1264-2, (August, 2007), *Lighting of Work Places. Outdoor Work*;
- Ref. 20** Terence O' Rourke Ltd, (July, 2011), *Northstowe Phase 1 EIA Scoping Report*;
- Ref. 21** South Cambridgeshire District Council, (September, 2011), *Scoping Opinion*;
- Ref. 22** DEFRA, (November 2010), *An Investigation into Artificial Light Nuisance Complaints and Associated Guidance*;
- Ref. 23** ILE, (2001), Technical Report 5, *Brightness of Illuminated Advertisements*;

### Online Sources

- Ref. 24** The Construction Industry Research and Information Association (CIRIA), *Compliance Plus – Lighting*, <http://www.ciria.org/complianceplus>;
- Ref. 25** Institution of Lighting Engineers – [www.ile.org.uk](http://www.ile.org.uk);
- Ref. 26** Lighting Industry Federation – [www.lif.co.uk](http://www.lif.co.uk); and
- Ref. 27** Society of Light and Lighting – [www.cibse.org](http://www.cibse.org).

# 7 FIGURES

**Figure 1**      **Baseline Lighting Monitoring Locations**

Key

- Planning Application Boundary
- Baseline Lighting Monitoring Locations



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## 8 APPENDICES

- Appendix 1**     **ILE Guidance Notes for the Reduction of Obtrusive Light, 2005**
- Appendix 2**     **Glossary of Lighting Terminology**

# APPENDIX 1 – ILE GUIDANCE NOTES FOR THE REDUCTION OF OBTRUSIVE LIGHT, 2005



# The Institution of Lighting Engineers

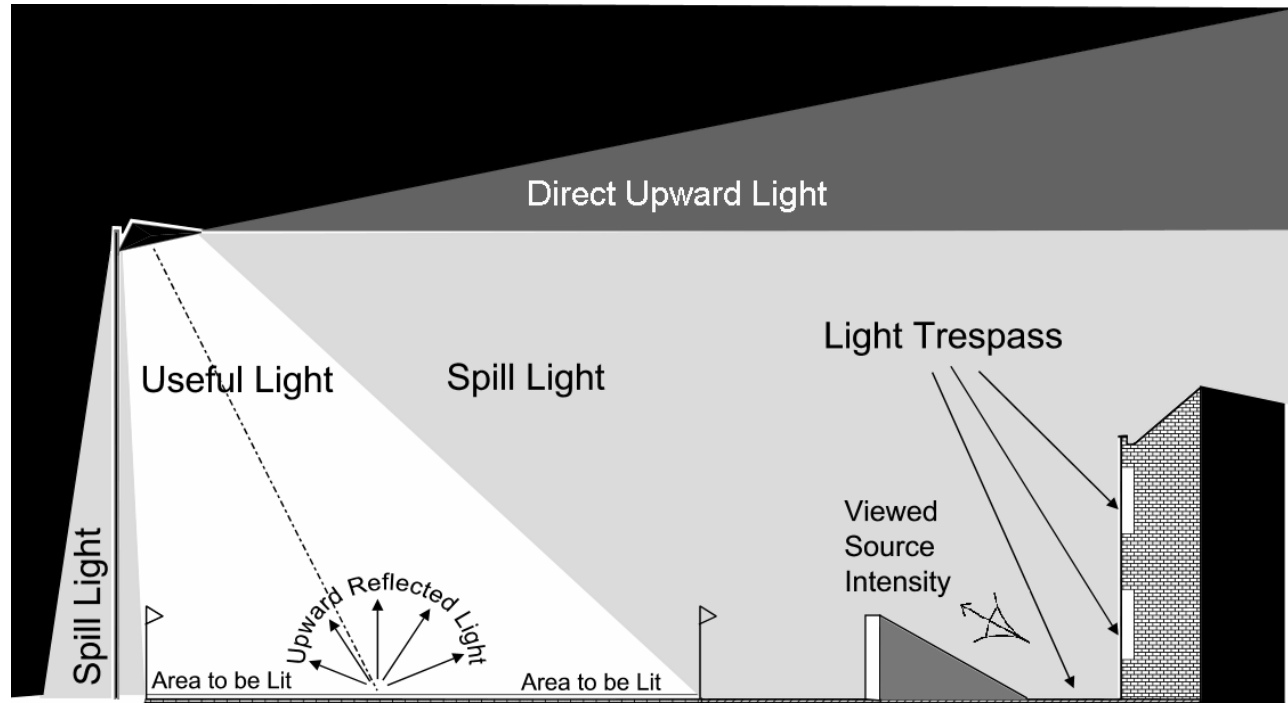
E-mail [ile@ile.org.uk](mailto:ile@ile.org.uk) Website [www.ile.org.uk](http://www.ile.org.uk)

## GUIDANCE NOTES FOR THE REDUCTION OF OBTRUSIVE LIGHT

ALL LIVING THINGS adjust their behaviour according to natural light. Man's invention of artificial light has done much to enhance our night-time environment but, if not properly controlled, **obtrusive light** (commonly referred to as light pollution) can present serious physiological and ecological problems.

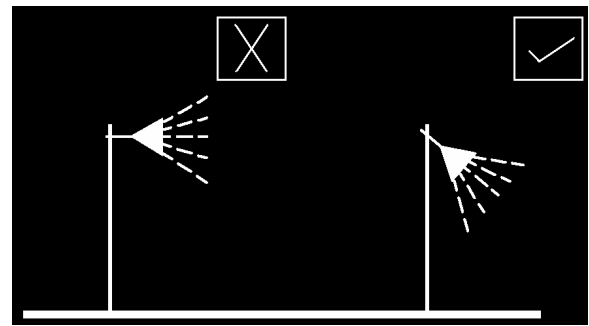
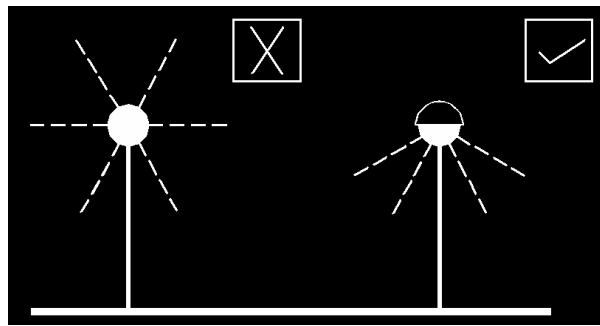
**Obtrusive Light**, whether it keeps you awake through a bedroom window or impedes your view of the night sky, is a form of pollution and can be substantially reduced without detriment to the lighting task.

**Sky glow**, the brightening of the night sky above our towns, cities and countryside, **Glare** the uncomfortable brightness of a light source when viewed against a dark background, and **Light Trespass**, the spilling of light beyond the boundary of the property or area being lit, are all forms of obtrusive light which may cause nuisance to others, waste money and electricity and result in the unnecessary emissions of greenhouse gases. Think before you light. Is it necessary? What effect will it have on others? Will it cause a nuisance? How can I minimise the problem?



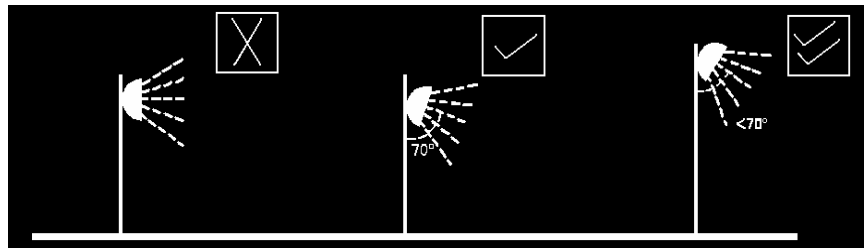
Do not "over" light. This is a major cause of obtrusive light and is a waste of energy. There are published standards for most lighting tasks, adherence to which will help minimise upward reflected light. Organisations from which full details of these standards can be obtained are given on the last page of this leaflet.

Dim or switch off lights when the task is finished. Generally a lower level of lighting will suffice to enhance the night time scene than that required for safety and security.



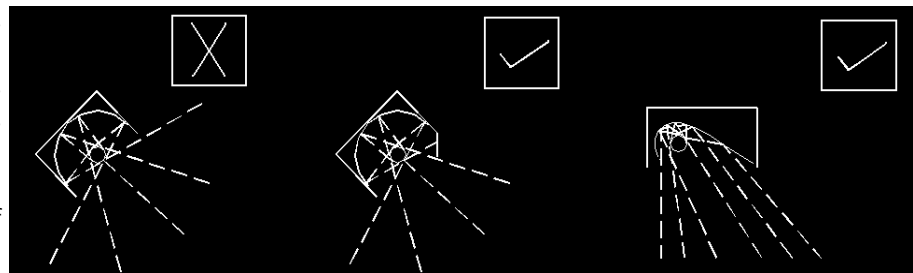
Use specifically designed lighting equipment that minimises the upward spread of light near to and above the horizontal. Care should be taken when selecting luminaires to ensure that appropriate units are chosen and that their location will reduce spill light and glare to a minimum. Remember that lamp light output in LUMENS is not the same as lamp wattage and that it is the former that is important in combating the problems of obtrusive light

Keep glare to a minimum by ensuring that the main beam angle of all lights directed towards any potential observer is not more than 70°. Higher mounting heights allow lower main beam angles, which can assist in reducing glare. In areas with low ambient lighting levels, glare can be very obtrusive and extra care should be taken when positioning and aiming lighting equipment. With regard to domestic security lighting the ILE produces an information leaflet GN02 that is freely available from its web site.

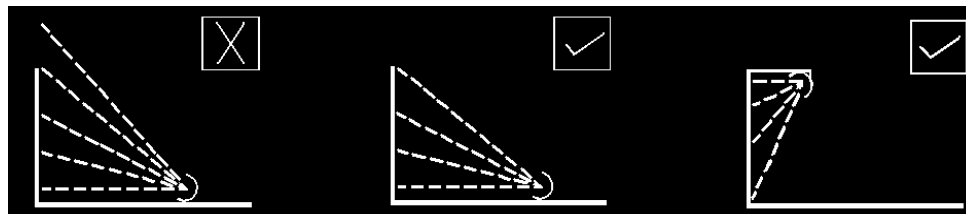


The UK Government will be providing an annex to PPS23 Planning and Pollution Control, specifically on obtrusive light. However many Local Planning Authorities (LPA's) have already produced, or are producing, policies that within the new planning system will become part of the local development framework. For new developments there is an opportunity for LPA's to impose planning conditions related to external lighting, including curfew hours.

For sports lighting installations (see also design standards listed on Page 4) the use of luminaires with double-asymmetric beams designed so that the front glazing is kept at or near parallel to the surface being lit should, if correctly aimed, ensure minimum obtrusive light. In most cases it



will also be beneficial to use as high a mounting height as possible, giving due regard to the daytime appearance of the installation. The requirements to control glare for the safety of road users are given in Table 2.



When lighting vertical structures such as advertising signs direct light downwards, wherever possible. If there is no alternative to up-lighting, as with much decorative

lighting of buildings, then the use of shields, baffles and louvres will help reduce spill light around and over the structure to a minimum.

For road and amenity lighting installations, (see also design standards listed on Page 4) light near to and above the horizontal should normally be minimised to reduce glare and sky glow (Note ULRs in Table 1). In sensitive rural areas the use of full horizontal cut off luminaires installed at 0° uplift will, in addition to reducing sky glow, also help to minimise visual intrusion within the open landscape. However in many urban locations, luminaires fitted with a more decorative bowl and good optical control of light should be acceptable and may be more appropriate.



**ENVIRONMENTAL ZONES:**

It is recommended that Local Planning Authorities specify the following environmental zones for exterior lighting control within their Development Plans.

Category	Examples	
E1:	Intrinsically dark landscapes	National Parks, Areas of Outstanding Natural Beauty, etc
E2:	Low district brightness areas	Rural, small village, or relatively dark urban locations
E3:	Medium district brightness areas	Small town centres or urban locations
E4:	High district brightness areas	Town/city centres with high levels of night-time activity

Where an area to be lit lies on the boundary of two zones the obtrusive light limitation values used should be those applicable to the most rigorous zone.

**DESIGN GUIDANCE**

The following limitations may be supplemented or replaced by a LPA's own planning guidance for exterior lighting installations. As lighting design is not as simple as it may seem, you are advised to consult and/or work with a professional lighting designer before installing any exterior lighting.

Environmental Zone	Sky Glow ULR [Max %] <sup>(1)</sup>	Light Trespass (into Windows) Ev [Lux] <sup>(2)</sup>		Source Intensity I [kcd] <sup>(3)</sup>		Building Luminance Pre-curfew <sup>(4)</sup> L [cd/m <sup>2</sup> ]
		Pre- curfew	Post- curfew	Pre- curfew	Post- curfew	
E1	0	2	1*	2.5	0	0
E2	2.5	5	1	7.5	0.5	5
E3	5.0	10	2	10	1.0	10
E4	15.0	25	5	25	2.5	25

ULR = Upward Light Ratio of the Installation is the maximum permitted percentage of luminaire flux for the total installation that goes directly into the sky.

Ev = Vertical Illuminance in Lux and is measured flat on the glazing at the centre of the window

I = Light Intensity in Cd

L = Luminance in Cd/m<sup>2</sup>

Curfew = The time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by the local planning authority. If not otherwise stated – 23.00hrs is suggested.

\* = From Public road lighting installations only

- (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 Trespass (into Windows) – These values are suggested maxima and need to take account of existing light trespass 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 trespass into the window down to the after curfew value by fitting a shield, replacing the luminaire, or by varying the lighting level.
- (3) Source Intensity – This applies to each source in the potentially obtrusive direction, outside of 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.

Light Technical Parameter TI	Road Classification <sup>(5)</sup>			
	No road lighting	ME5	ME4/ ME3	ME2 / ME1
	15% based on adaptation luminance of 0.1 cd/m <sup>2</sup>	15% based on adaptation luminance of 1 cd/m <sup>2</sup>	15% based on adaptation luminance of 2 cd/m <sup>2</sup>	15% based on adaptation luminance of 5 cd/m <sup>2</sup>

TI = Threshold Increment is a measure of the loss of visibility caused by the disability glare from the obtrusive light installation

- (5) Road Classifications as given in BS EN 13201 - 2: 2003 Road lighting Performance requirements  
Limits apply where users of transport systems are subject to a reduction in the ability to see essential information. Values given are for relevant positions and for viewing directions in path of travel. See CIE Publication 150:2003, Section 5.4 for methods of determination. For a more detailed description and methods for calculating and measuring the above parameters see CIE Publication 150:2003.

#### RELEVANT PUBLICATIONS AND STANDARDS:

British Standards: www.bsi.org.uk	BS 5489-1: 2003 Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas BS EN 13201-2:2003 Road lighting – Part 2: Performance requirements BS EN 13201-3:2003 Road lighting – Part 3: Calculation of performance BS EN 13201-4:2003 Road lighting – Part 4: Methods of measuring lighting performance. BS EN 12193: 2003 Light and lighting – Sports lighting
Countryside Commission/DOE www.odpm.gov.uk	Lighting in the Countryside: Towards good practice (1997) <i>(Out of Print)</i>
CIBSE/SLL Publications: www.cibse.org	CoL Code for Lighting (2002) LG1 The Industrial Environment (1989) LG4 Sports (1990+Addendum 2000) LG6 The Exterior Environment (1992) FF7 Environmental Considerations for Exterior Lighting (2003)
CIE Publications: www.cie.co.at	01 Guide lines for minimizing Urban Sky Glow near Astronomical Observatories (1980) 83 Guide for the lighting of sports events for colour television and film systems (1989) 92 Guide for floodlighting (1992) 115 Recommendations for the lighting of roads for motor and pedestrian traffic (1995) 126 Guidelines for minimizing Sky glow (1997) 129 Guide for lighting exterior work areas (1998) 136 Guide to the lighting of urban areas (2000) 150 Guide on the limitations of the effect of obtrusive light from outdoor lighting installations (2003) 154 The Maintenance of outdoor lighting systems (2003)
Department of Transport www.defra.gov.uk	Road Lighting and the Environment (1993) <i>(Out of Print)</i>
ILE Publications: www.ile.org	TR 5 Brightness of Illuminated Advertisements (2001) TR24 A Practical Guide to the Development of a Public Lighting Policy for Local Authorities (1999) GN02 Domestic Security Lighting, Friend or Foe
ILE/CIBSE Joint Publications ILE/CSS Joint Publications	Lighting the Environment – A guide to good urban lighting (1995) Seasonal Decorations – Code of Practice (2005)
Campaign for Dark Skies (CfDS) www.dark-skies.org	

**NB:** These notes are intended as guidance only and the application of the values given in Tables 1 & 2 should be given due consideration along with all other factors in the lighting design. Lighting is a complex subject with both objective and subjective criteria to be considered. The notes are therefore no substitute for professionally assessed and designed lighting, where the various and maybe conflicting visual requirements need to be balanced.

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# APPENDIX 2 – GLOSSARY OF LIGHTING TERMINOLOGY

## Appendix 2 Glossary of Lighting Terminology

- **BALLAST** – A device used to operate discharge lamps by regulating the lamp current during operation.
- **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.
- **CANDELA** – The intensity of a light source in a specific direction. Unit of luminous intensity.
- **COLOUR RENDERING INDEX (CRI)** – A scale of the colour appearance of an object under a particular light source compared to its colour appearance under a reference light source. Expressed on a scale of 1 to 100 where 100 represents the colour rendering of daylight.
- **COLOUR TEMPERATURE** – A specification of the colour appearance of a light source, relating the colour to a reference source heated to a particular temperature, measured in Kelvin.
- **CONTRAST** – The relationship between the luminance of an object and its background. The higher the contrast, the more likely it is an object can be seen.
- **CONVENTIONAL CONTROL GEAR** – Control gear used to run a lamp, typically consisting of a ballast, ignitor and capacitor.
- **DIFFUSE** – Term describing dispersed light distribution referring to the scattering of light.
- **DISABILITY GLARE** – Glare which impairs the vision of objects but may not cause discomfort.
- **DISCOMFORT GLARE** – Glare causing discomfort which may not impair the ability to see objects.
- **EFFICACY** – A measure of light output against energy consumption measured in lumens per watt.
- **ELECTRONIC CONTROL GEAR** – A device that uses semi-conductor components to operate a discharge lamp.
- **FLUORESCENT LAMP** – A lamp consisting of a tube filled with argon, along with krypton or other inert gas.
- **HIGH INTENSITY DISCHARGE (HID)** – Describes mercury vapour, metal halide and high pressure sodium lamps.
- **HIGH PRESSURE SODIUM LAMP** – A HID lamp whose light is produced by radiation from high pressure sodium vapour (and usually a small amount of mercury).
- **ILLUMINANCE** – Illuminance is the quantity of light, or luminous flux, falling on a unit area of a surface. It is designated by the symbol E. The unit is the lux (lx). One lux equals one lumen per square metre (lm/m<sup>2</sup>).
- **LED** – Light emitting diode.
- **LIGHT POLLUTION** – The spillage of light into areas where it is not required.
- **LIGHT SPILL** – This is the unwanted spillage of light onto adjacent areas and may affect sensitive receptors particularly residential properties and ecological sites.
- **LIGHT TRESPASS** – Light that impacts on a surface outside of the area designed to be lit by a lighting installation.

- **LONGITUDINAL UNIFORMITY** – Ratio of the lowest to highest road surface luminance on a set of grid points in a line along the centre of a driving lane.
- **LOUVRE** – Assembly used to control light distribution from a luminaire.
- **LOW-PRESSURE SODIUM** – A discharge lamp in which light is produced by radiation from low-pressure sodium vapour.
- **LUMEN** – Calculations have shown that one watt of radiant power with a wavelength of 555 nm equals 683 lumens. (This is an arbitrary value which has been selected for definition purposes.) This figure is known as the "maximum spectral luminous efficacy"
- **LUMINAIRE** – A lighting unit designed to distribute the light from a lamp or lamps.
- **LUMINANCE** – Luminance is the concept for the luminous intensity emitted per unit of area of a surface in a specific direction. The unit is the candela per square metre (cd/m<sup>2</sup>).
- **LUX (LX)** – Illuminance is the quantity of light, or luminous flux, falling on a unit area of a surface. It is designated by the symbol E. The unit is the lux (lx). One lux equals one lumen per square metre (lm/m<sup>2</sup>).
- **METAL HALIDE** – A type of HID lamp in which most of the light is produced by radiation of metal halide and mercury vapours in the arc tube. Metal halide lamps generally produce high colour rendering.
- **MERCURY VAPOUR LAMP** – ultraviolet lamp that emits a strong bluish light (rich in ultraviolet radiation) as electric current passes through mercury vapour
- **OPTIC** – The components of a luminaire such as reflectors, refractors, protectors which make up the light emitting section.
- **OVERALL UNIFORMITY** – Ratio of the lowest to highest road surface luminance on a set of grid points.
- **PHOTOCELL** – A unit which senses light to control luminaires.
- **PHOTOPERIOD** – Response of plants and animals to the period of daylight
- **REFLECTANCE** – The ratio of light reflected from a surface to the light incident on the surface.
- **REFLECTOR** – A device used to reflect light onto a surface.
- **REFRACTOR** – A device used to redirect the light output from a lamp when the light passes through it.
- **SKY GLOW** – The brightening of the night sky caused by artificial lighting.
- **SOURCE INTENSITY** – This applies to each source in the potentially obtrusive direction, outside of the area being lit.
- **ULTRA VIOLET (UV)** – Radiation that is shorter in wavelength and higher in frequency than visible violet light.
- **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.
- **VOLTAGE** – The difference in electrical potential between two points of an electrical circuit.
- **WATT (W)** – The unit for measuring electrical power.