15 Lighting

15.1 INTRODUCTION

15.1.1 This Chapter presents an assessment of the likely significant environmental effects on sensitive receptors arising as a result of the installation of artificial lighting associated with the Proposed Development.

15.1.2 The assessment considers the potential effects of artificial lighting during the site preparation, demolition, earthworks and construction phase, and the operational phase of the Proposed Development in relation to surrounding sensitive receptors, including existing local residents and road users. The likely potential effect on ecological receptors sensitive to light is also discussed in **Chapter 12 Ecology and Nature Conservation**.

15.1.3 Where likely significant effects have been identified in relation to potential light spill, glare and changes to night-time setting, specific mitigation measures are proposed and the residual effects are identified.

15.1.4 This Chapter (and its associated figures and appendices) is not intended to be read as a stand alone assessment and reference should be made to the Front End of this ES (**Chapters 1 – 4**), as well **as Chapter 16 Cumulative Effects.**

15.2 LEGISLATION, POLICY AND GUIDANCE

Legislative Framework

Statutory Requirements for the Provision of Lighting

15.2.1 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.

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

Empowerment to Light Roads

15.2.3 In England and Wales, the *Highways Act 1980* (**Ref. 15.1**), 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. 15.2**), or the *Parish Councils Act 1957* (**Ref. 15.3**). 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. 15.4**).

Traffic Signs

15.2.4 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. 15.5**) are relevant.

Speed Limits

15.2.5 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. 15.6**) deals with the link between speed limits and a "system of street lighting".

Road Humps

15.2.6 The provision of any new road humps might require particular lighting arrangements. In England and Wales, the *Highways (Road Hump) Regulations 1999* (**Ref. 15.7**) are relevant.

Public Lights on Private Buildings or Land

15.2.7 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

15.2.8 The *Clean Neighbourhoods and Environment Act (CNEA) 2005* (**Ref.15.8**) 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.

11.1.1 The CNEA 2005 amends section 79(1) of the *Environmental Protection Act 1990* (**Ref.15.9**) 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'.*

15.2.9 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

National Planning Policy Framework (March, 2012) (**Ref 15.10**)

15.2.10 The National Planning Policy Framework (NPPF) (**Ref. 15.10**) was published on 27th March 2012 and is a key part of the reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. There is an overarching presumption in favour of sustainable development that should be the basis of every plan and every decision.

15.2.11 The NPPF consolidates all of the previous Planning Policy Statements (PPSs) and Planning Policy Guidance Notes (PPGs) into one document. Paragraph 125 of the NPPF is relevant to lighting and it states:

> *'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.'*

Local Planning Policy

Barnsley Local Development Framework: Adopted Core Strategy (September 2011) (**Ref. 15.12**)

15.2.12 Following public consultation and examination by an Independent Planning Inspector, Barnsley's Core Strategy was adopted by Barnsley Metropolitan Borough Council (BMBC) on 8th September 2011. The Adopted Core Strategy is a fundamental element of Barnsley's Local Development Framework. It considers the key elements of the planning and transportation framework for Barnsley, and the approach to its long term physical development to achieve the BMBC's vision of what sort of place Barnsley wants to become.

15.2.13 The Core Strategy now forms part of the Development Plan for the Borough alongside the remaining saved policies of the Unitary Development Plan, the Education Sites Development Plan Document and the Regional Spatial Strategy (RSS). Whilst Central Government revoked the RSS in 2010, a subsequent successful legal challenge to the revocation means that the RSS is, at the present time, part of the development plan.

15.2.14 Policy CSP 40 '*Pollution Control and Protection*' specifically outlines that development will be '*expected to demonstrate that it is not likely to result, directly or indirectly , in an increase, surface water and ground water, noise, smell, dust, vibration, light or other pollution which would unacceptably affect or cause a nuisance to the natural and built environment or to people.*'

15.2.15 Policy CSP 29 *'Design'* outlines the design principles of new development encouraging high quality development that '*respects, takes advantage of and enhances the distinct features of Barnsley*'. Policy CSP 29 sets the overarching design principles for the area ensuring that development is appropriate for its context. This policy supersedes the policies in Barnsley Unitary Development Plan that are relevant to lighting including Policy BE6A '*Design to Avoid Crime*' and Policy BE6F '*Light Pollution*'.

Barnsley Unitary Development Plan (December 2000) (Ref. 15.13)

15.2.16 From September 2007 some of the policies in the Barnsley Unitary Development Plan 2000 ceased to exist following a direction by the Secretary of State under Paragraph 1(3) of Schedule 8 to the Planning and Compulsory Purchase Act 2004. Following the adoption of Barnsley's Core Strategy on the 8th September 2011, a number of saved policies remain valid alongside the Local Development Framework. The saved policy relevant to lighting is discussed below.

- Policy ED4 *Economic Development and Residential Amenity'* highlights that proposals for economic development adjoining or close to housing will be assessed with particular regard to visually intrusive buildings, plant, fencing, lighting or outside storage.

Guidance

International Guidance

Commission Internationale De L'Eclairage (CIE 150 (2003) - International Commission on Illumination) (2003) (Ref. 15.14)

15.2.17 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 (1997) (Ref. 15.15)

15.2.18 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) (2005) Guidance Notes for the Reduction of Obtrusive Light (Ref. 15.16)

15.2.19 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) set out in **Table 15.3**. The ILE Guidance Notes 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 15.1**.

DEFRA (2001) Lighting in the Countryside: Towards Good Practice (Ref. 15.17)

15.2.20 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 (2003) Code of Practice for the Design of Road Lighting – Part 1: Lighting of Roads and Public Amenity Areas (Ref. 15.18)

15.2.21 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 (2003) Road Lighting – Part 2: Performance Requirements (**Ref. 15.19**)

15.2.22 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.

15.3 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

Scope of the Assessment

15.3.1 Potentially significant effects have been assessed for both the site preparation, demolition, earthworks and construction phase, and the operational phase of the Proposed Development.

Site Preparation, Demolition, Earthworks and Construction Phase

15.3.2 Consideration will be given to the following effects during the site preparation, demolition, earthworks and construction phase of the Proposed Development:

- Increase in light spill and glare (associated with lighting installations) to existing local residential receptors; and
- Increase in glare to existing and future road users including pedestrians, cyclists and motorists.

Operational Phase

15.3.3 Consideration will be given to the following effects during the operational phase of the Proposed Development:

- Increase in light spill and glare (associated with lighting installations) to existing local residential receptors;
- Increase in glare to existing and future road users including pedestrians, cyclists and motorists; and
- Change in night-time scene as viewed by local residential receptors.

15.3.4 Sky glow was considered at the outset of the assessment of lighting conditions. Following the lighting survey, it was noted that the site is largely surrounded by an existing brightly lit environment and is within an urban 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.

15.3.5 The assessment of lighting on ecological species (in particular sensitive bat species) has been 'scoped out' of this Chapter and is assessed within **Chapter 12 – Ecology and Nature Conservation**. Results from the lighting survey have been used within **Chapter 12 – Ecology and Nature Conservation** to demonstrate the existing lighting conditions at sensitive ecological receptors.

15.3.6 The assessment of lighting has not considered the effects of lighting on users of the Local Nature Reserve (LNR) and Country Park adjacent to the eastern boundary of the Site. This is because, it has been assumed that the LNR and Country Park are not a primary recreational resource during the hours of darkness and thus receptors (users) are either non-existent or extremely limited.

15.3.7 The 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 lighting 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.

15.3.8 The change in night time scene to local residential receptors has not been assessed for the site preparation, demolition, earthworks and construction phase. It is predicted that there is unlikely to be a noticeable change from the baseline conditions during this phase, primarily because of the existing sources of construction lighting associated with current construction of the A61 Quality Bus Corridor road/junction improvements (A61 Link Road) in the northern half of the Site and the existing lighting levels and screening in the southern half of the Site. However, the change in night time views has been assessed for the operational phase of the Proposed Development and the output of this assessment can be interpreted as a worst-case scenario assessment for any temporary changes in night time scene associated with the site preparation, demolition, earthworks and construction works.

15.3.9 It is anticipated that recommendations contained in this Chapter will be used to inform the future detailed lighting specification for the Proposed Development.

Extent of the Study Area

15.3.10 The extent of the study area includes the Site and its immediate surroundings (and associated sources of lighting) and the key sensitive receptors which may be subject to a change in existing lighting conditions. The sensitive receptors 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 towards identified receptors are effectively mitigated. Longer distance views are discussed within **Chapter 14 – Landscape & Visual Assessment.**

Consultation

15.3.11 As part of the consultation process, BMBC was informally contacted to provide their opinion and feedback on any potential lighting issues that would need to be considered during the assessment of the site preparation, demolition, earthworks and construction phase and operational phase of the proposed Development (**Appendix 15.2**). The lighting methodology and assessment were discussed and were accepted by BMBC.

Method of Baseline Data Collation

15.3.12 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

15.3.13 A desk study has been undertaken to identify relevant legislation, planning policy, good practice guidance, local designations and relevant planning policy in relation to lighting following the standard methodology outlined in *Lighting in the Countryside: Towards Good Practice, DEFRA, 2001* (**Ref. 15.17**). The desk study also identified other sensitive receptors to be considered in the assessment which were confirmed through the baseline lighting survey.

Baseline Lighting Survey

15.3.14 Day-time and night-time site visits were undertaken on 31st August 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 overcast with approximately 90-100% cloud cover throughout. The moon was hidden behind cloud cover for the duration of the survey and it is considered the levels of moonlight observed during the survey did not influence the survey results.

15.3.15 Readings of illuminance (light spill) and luminance (glare) were taken in the vicinity of the Site and in the surrounding area at predetermined viewpoints and monitoring locations determined prior to the lighting survey. The viewpoint and monitoring locations were determined from map resources and confirmed during the day-time and night-time walkover of the Site and surrounding area. These walkovers aimed to any identify and confirm sensitive receptors on Site and in close proximity to the Site, and to ascertain the existing lighting installations and conditions. The illuminance and luminance readings were taken from 21:15 to 23:30hrs to establish the existing ambient lighting conditions on which to base the lighting assessment upon.

15.3.16 At the viewpoints and monitoring locations, the readings of illuminance and luminance were taken from floodlighting, street lighting, highways lighting and externally lit buildings and installations, using the following equipment:

- Illuminance was recorded using a Minolta T10 hand held meter;
- Luminance was recorded using a Minolta LS1000; and
- Photographs were taken using a Canon A710IS with a night-time landscape exposure setting.

15.3.17 In order to benchmark existing levels of lighting on and in the immediate vicinity of the Site, readings of illuminance were recorded at 14 monitoring locations (A to N) during the baseline lighting survey. Additionally, readings of illuminance and luminance were taken along with illustrative photographed viewpoints (NV1 and NV2). The monitoring locations both on and surrounding the Site and the night-time viewpoint locations are shown in **Figure 15.1**.

15.3.18 These readings have allowed the baseline lighting conditions on the Site and in the immediate area to be benchmarked. In order to determine the baseline levels of lighting on and surrounding the Site, reference has been made to the Environmental Zone Criteria for light nuisance into windows (measured in lux) as outlined in the ILE *'Guidance Notes for the Reduction of Obtrusive Light'* (ILE, 2005) (**Ref. 15.14**), provided as **Appendix 15.1**. 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.

Table 15.1: Description of Monitoring Locations

Location	Description
NV1	Located on raised ground in the A61 Link Road construction site, north-west of the Site
NV2	Located on the junction of Twibell Street and Harborough Hill Road on the south-western boundary of the Site
A	Located 15m from culvert adjacent to the northern bank of the River Dearne, on Site
B	Located in scrub adjacent to the northern bank of the River Dearne, opposite National Grid's Gas Holder in the centre of the Site
C	Located in scrub adjacent to the northern bank of the River Dearne, opposite Booker's Cash and Carry in the centre of the Site
D	Located in light scrub adjacent to the River Dearne, along the eastern boundary of the Site
E	Located in the car park of the construction compound situated on the northern half of the Site
F	Located outside residential property at 6 Burton Road, north of the Site
G	Located in the car park of Flats along Burton Road, north of the Site
H	Located outside residential property 86 Burton Road, north of the Site
I	Located on Old Mill Lane (adjacent to the bat roost), west of the Site
J	Located in the car park of retail units (Plumb Center) in the southern half of the Site
K	Located outside residential property at 39 Twibell Street, south of the Site
L	Located outside of two retail units on Twibell Street, south of the Site
M	Located in the centre of Asda's Car Park, west of the Site
N	Located outside residential property at 7 Twibell Street, south of the Site

15.3.19 In accordance with ILE *'Guidance Notes for the Reduction of Obtrusive Light'* (ILE, 2005), 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 receptors and ecological sites.

- **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.
- **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.

Significance Criteria

15.3.20 The significance level attributed to each effect has been assessed based on the magnitude of change as a result of the Proposed Development and the sensitivity of the affected receptor/receiving environment to change. Magnitude of change and the sensitivity of the affected receptor/receiving environment are both assessed on a scale of high, medium, low and negligible.

15.3.21 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 contained within the '*Guidance Notes for the Reduction of Obtrusive Light*' (ILE, 2005), 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.

15.3.22 The ILE '*Guidance Notes for the Reduction of Obtrusive Light*' (ILE, 2005) propose 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 15.2**. In addition, a glossary of lighting terminology used in the assessment is provided in **Appendix 15.3**.

Table 15.2: Obtrusive Light Limitations for Exterior Lighting Installations (ILE, 2005)

Environmental Zones	Sky Glow ULR (Max %)	Light Trespass into Windows Ev (lux)		Source Intensity I (kcd)		Building Luminance Average, Pre-curfew
		Pre-Curfew	Post-Curfew	Pre- Curfew	Post-Curfew	Average (cd/m2)
E1	0	2	1*	2.5	0	0
E2	2.5	5	1	7.5	0.5	5
E3	5	10	2	10	1.0	10
E4	15	25	5	25	2.5	25

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

Notes to Table 15.2:

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 the LPA has agreed that the lighting installation should be switched off; this typically refers to 11pm - 7am.

* From public road lighting installations only

15.3.23 In the absence of statutory guidance, it is proposed that the ILE '*Guidance Notes for the Reduction of Obtrusive Light*' (2005) will be used, in order to provide suitable assessment criteria against which to assess the effects of artificial lighting. The guidance levels for light nuisance into windows have been used as the principal criteria for assessing the effects associated with the Proposed Development. However, this cannot be wholly relied upon, particularly when assessing non-residential receptors; therefore, consideration has also been given to the presence of lighting within the foreground and distance and whether sky glow can be viewed. This is especially important when

assigning Environmental Zones. Also, given the subjective nature of glare, it is difficult to quantify the potential effects due to glare from a light source being dependent on the type and distance from the light source.

15.3.24 The overall significance of an effect will be determined by measuring the magnitude of the effect against:

- The number of receptors affected, which will consider the scale of an effect, whether it is local, regional or national;
- The reversibility and duration of the effect;
- The type and sensitivity of the receptor affected; and
- The type of effect.

15.3.25 **Table 15.3** presents the significance criteria used to assess the significance of effects where they are predicted to occur:

Table 15.3 Significance Criteria used in the Lighting Assessment

Significance	Definition
Major Positive	Major decrease in the level of light spill and glare on to surrounding areas and illuminance levels at the windows of residential receptors, resulting in a noticeable or major improvement in baseline conditions and is well within the recommended ILE guidance levels.
Moderate Positive	Moderate decrease in the level of light spill and glare on to surrounding areas and illuminance levels at the windows of residential receptors, resulting in a moderate improvement in the current baseline conditions and recommended ILE guidance levels.
Minor Positive	Minor decrease in the level of light spill and glare on to surrounding areas and illuminance levels at the windows of residential receptors, resulting in a perceptible improvement in baseline conditions and is within the recommended ILE guidance levels.
Negligible	No increase or decrease in the level of light spill and glare onto surrounding areas and illuminance levels at the windows of residential receptors and would cause no discernible effect to current baseline conditions.
Minor Negative	Minor increase in the level of light spill and glare on to surrounding areas and illuminance levels at the windows of residential receptors, would cause a minor perceptible change in baseline conditions which are slightly above recommended ILE guidance levels but where current uses could still be maintained.
Moderate Negative	Moderate increase in the level of light spill and glare on to surrounding areas and illuminance levels at the windows of residential receptors, and would result in a noticeable effect on baseline conditions moderately in excess of the recommended ILE guidance levels.
Major Negative	Major increase in the level of light spill and glare on to surrounding areas and illuminance levels at the windows of residential receptors, and would result in a major effect on baseline conditions significantly in excess of the recommended ILE guidance levels.

15.3.26 The overall significance of an effect 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 take 1 year to 10 years to be mitigated; and
- Long Term – the effects from the lighting would be reasonably mitigated over a long period of time (10 years or more) and includes permanent effects.

15.4 BASELINE CONDITIONS

15.4.1 The Site is located close to Barnsley Town Centre adjacent to Old Mill Lane. The Site is bordered by Twibell Street to the south, Dearne Valley Park Local Nature Reserve (LNR) and Country Park to the east, Old Mill Lane to the west and a Wickes DIY Store, Burton Road and residential housing located to the north of the Site. The River Dearne

travels from east to west directly through the centre of the Site providing a natural division between the northern and southern sections of the Site.

Sensitive Receptors

15.4.2 For the purposes of this lighting assessment the following sensitive receptors have been identified within the Site and surrounding area:

- Local residents with views towards the Site from their residential dwellings located along Twibell Street immediately adjacent to the south of the Site, and residential receptors located along Burton Road ranging from approximately 55m to 200m north to north-east of the Site; and
- Existing and future local road users including pedestrians, cyclists and motorists of surrounding roads adjacent to the Site such as Twibell Street, Old Mill Lane and Burton Road.
- The existing night-time scene and amenity value.

Baseline Lighting Conditions on the Site and in the Surrounding Area

15.4.3 This section provides the results of the baseline lighting survey undertaken at the Site and surrounding area on 31st August 2011. This includes information relating to the existing lighting on and surrounding the Site and provides data on both levels of illumination (including light spill) and the luminance (glare) from externally lit sources in the area including buildings, signage, security lighting and highways/street lighting together with levels of fugitive light loss from the windows of residential and commercial receptors. The position of the monitoring locations identified during the day and night-time surveys are illustrated in **Figure 15.1** and described in **Table 15.1**.

15.4.4 The night-time viewpoints are shown in **Figures 15.2** and **15.3** and the illuminance levels in the immediate area are provided in **Table 15.4** below. In addition, a description of the lighting recorded at each of the night-time viewpoints and monitoring locations is provided in **Appendix 15.4**.

Table 15.4: Baseline Lighting Conditions Recorded on the Site and in the Surrounding Area, and Details of the ILE 2005 Environmental Zone Criteria

Location	Vertical Illuminance (Lux)				Horizontal Illuminance (Lux)	ILE Zone Criteria
	Facing North	Facing East	Facing South	Facing West		
Within the Main Site						
A	0.41	0.05	0.02	0.13	0.12	E2 (post-curfew)
B	0.03	0.00	0.01	0.02	0.02	E2 (post-curfew)
C	0.11	0.07	0.16	0.03	0.06	E2 (post-curfew)
D	0.23	0.20	0.05	0.08	0.15	E2 (post-curfew)
E	9.27	6.49	0.37	1.63	1.14	E3[1] (post-curfew)
Outside of the Site						
F	9.26	1.73 (into window)	3.79	8.69	5.48	E3[2] (post-curfew)
G	1.49	0.30	0.12	0.32	0.42	E3 (post-curfew)
H	1.83 (into window)	13.14	9.48	4.95	8.81	E3[3] (post-curfew)
I	7.57	1.48	19.41	6.74	12.29	E4 (post-curfew)
J	1.58	0.25	6.76	9.99	1.44	E3[4] (post-curfew)
K	0.49	8.89	4.92 (into window)	0.87	12.19	E3[5] (post-curfew)
L	2.40	0.76	0.48	3.27	1.86	E3 (post-curfew)
M	7.88	16.78	7.49	8.68	6.99	E4 (post-curfew)
N	3.39	28.85	12.46 (into window)	14.16	10.8	E3[6] (post-curfew)
NV1	1.58	4.23	0.31	1.58	0.97	E3 (post-curfew)
NV2	21.34	8.05	26.45	23.88	25.47	E4 (post-curfew)

Notes to Table 15.4:

Baseline conditions refer to the conditions recorded on Site and in the surrounding area during the lighting survey undertaken in August 2011. These classifications have been applied indicatively based on the baseline lighting conditions recorded at the Site and available information and guidance levels contained in the ILE Guidance Notes for the Reduction of Obtrusive Light (ILE, 2005). Detailed baseline lighting conditions are outlined in **Appendix 15.4**.

15.4.5 The lighting in the area surrounding the Site is operational post-curfew and therefore the values have been compared against the post-curfew values contained in the ILE '*Guidance Notes for the Reduction of Obtrusive Light*' (ILE, 2005) to ascertain the indicative Environmental Zone for each monitoring location. The lighting in the local area mainly consists of highways lighting, floodlighting associated with retail units in the locality and fugitive lighting originating from residential dwellings.

[1] Monitoring location E has been factored down from an E4 to an E3 Environmental Zone because readings were taken directly under a lighting source.
[2] Monitoring location F has been factored down to an E3 Environmental Zone because readings exceed the E4 post-curfew threshold but the level of light varied considerably at this location.
[3] Monitoring location H has been factored down to an E3/E4 Environmental Zone because readings exceed the E4 post-curfew threshold but the level of light varied considerably at this location with inconsistent levels of lighting along Burton Road.
[4] Monitoring location J has been factored down to an E3 Environmental Zone because readings were elevated as a result of bulkhead security lighting associated with warehouse and car park lighting.
[5] Monitoring location K has been factored down to an E3 Environmental Zone because readings exceed the E4 post-curfew threshold but the level of light varied considerably at this location with inconsistent levels of lighting and screening along Twibell Street.
[6] Monitoring location N has been factored down to an E3 Environmental Zone because readings exceed the E4 post-curfew threshold but these illuminance readings were taken underneath a direct source of illumination and are not representative of the varied lighting conditions at this monitoring location.

15.4.6 The results and descriptions in **Table 15.4** and **Appendix 15.4** predominantly indicate that the northern section of the Site is indicative of an E2 Environmental Zone which represents an area of '*low district brightness*' as outlined by the ILE *'Guidance Notes for the Reduction of Obtrusive Light'* (ILE, 2005). Monitoring location E in the northern section of the Site shows an E3 Environmental Zone situated next to existing construction compound. The southern section of the Site to the south of the River Dearne is indicative of an E3 Environmental Zone representing an area of 'medium district brightness'. The survey highlighted the contrast between the Site which varies from an E2 Environmental Zone to an E3 Environmental Zone, and the surrounding area which is representative of Environmental Zones E3/E4 (locations F-N, NV1 and NV2) which are described as areas of '*high district brightness*' and '*medium district brightness*'. The most elevated illuminance readings were at locations along Twibell Street, Harborough Hill Road, Old Mill Lane and Burton Road, in the immediate vicinity of the Site, whilst significantly lower readings were identified within the Site itself.

15.4.7 The existing lighting conditions are discussed below under the following areas which are characterised by similar lighting installations and levels. These areas are shown in **Figure 15.1** and are as follows:

- Twibell Street (to the south);
- Old Mill Lane (to the west);
- Burton Road (to the north);
- Along the River Dearne on Site; and
- Asda Supermarket Car Park.

Twibell Street

15.4.8 The street lighting in Twibell Street comprises 6m high columns located approximately 20m apart on alternative sides of the road, fitted with modern highways lighting including a mixture of low pressure sodium and high pressure sodium lamps. The luminaires are generally reflector optics with flat glass and generate minimal upwards light pollution as a result of horizontal cut-off. Light spill on the façades of residential properties on Twibell Street was noted at monitoring locations K and N which is attributable to the close proximity of the street lighting installations to the respective residential properties.

15.4.9 Twibell Street has a number of sensitive residential receptors with a mixture of direct and intermittent views of the southern section of the Site. This is a result of existing partial screening in the form of a 2.5m high wall situated along the eastern part of Twibell Street. Therefore, residential receptors located at the eastern end of Twibell Street have restricted views of the southern section of the Site from ground floor windows and direct views from first floor windows. Residential receptors located at the western end of Twibell Street are subject to direct views of the southern section of the Site due to the sloping topography into Site and a lack of screening. NV2 (**Figure X.3**) shows the view from where the western extent of Twibell Street meets Harborough Hill Road looking directly into the southern section of the Site. There are no views into the northern section of Site for the residential receptors along Twibell Street, as a result of a thick layer of trees and vegetation acting as screening running along the River Dearne in the centre of the Site.

15.4.10 Monitoring location K (**Figure 15.1**) was selected as representative of a sensitive residential receptor and it was adjacent to streets lighting indicative of Twibell Street (description above). This monitoring location experienced elevated figures of vertical and horizontal illuminance of 8.89 lux and 12.19 lux respectively, which are initially representative of an E4 Environmental Zone. The vertical illuminance that was experienced directly into windows was 4.92 lux which is indicative of an E3 Environmental Zone. The varying levels of light at this location have resulted in an overall factoring down of the Environmental Zone from E4 to E3 which is more representative of the indicative lighting conditions along Twibell Street. These recordings and other recordings taken along Twibell Street (monitoring locations K, L & N) were based on the presence of street lighting in close proximity and light from windows, which overall characterise Twibell Street as an E3 Environmental Zone. It is considered that such levels are generally representative of the obtrusive light limitations for an area of '*medium district brightness*'.

Old Mill Lane

15.4.11 The street lighting on Old Mill Lane predominantly comprises 12-14m columns located at approximately 30m intervals on both sides of the road, fitted with modern high pressure sodium lamps. The luminaires are generally reflector optics with clear bowls which are used for both orange and white lamps. Monitoring Location I (**Figure 15.1**)

is characteristic of the lighting conditions along Old Mill Lane with vertical and horizontal illuminance levels being elevated to a maximum of 19.41 lux. The readings are mainly indicative of an E4 Environmental Zone and an area of '*high district brightness*' whilst one vertical illuminance reading (facing east) was significantly lower at 1.48 lux which was facing directly towards the Site. The area is indicative of an E4 Environmental Zone and an area of '*high district brightness*' due to the number of lighting installations associated with the road network and car parking facilities associated with the retail outlets to the west, however, this is in contrast to the Site, adjacent to the east..

Burton Road

15.4.12 The street lighting on Burton Road comprises 10-12m columns located at approximately 12m intervals on alternative sides of the road, fitted with low pressure sodium lamps. The luminaires are generally refractor optic with bowls which are predominantly for low pressure sodium lamps. Monitoring locations F and H, and Night-Time Viewpoint (NV) 1 are characteristic of the lighting conditions along Burton Road, and have been selected as representative of sensitive residential receptors north of the Site. The maximum vertical and horizontal illuminance levels were recorded at monitoring location H as 13.14 lux (facing east) and 9.48 lux (facing south). These readings were taken adjacent to a luminaire indicative of Burton Road (as described above), and it was considered that because of uneven lighting levels and the unlit area to the south of Burton Road, the area is characteristic of an E3 Environmental Zone. The lighting conditions on Burton Road are principally affected by the street lighting and this is illustrated by **Figure 15.2.**

15.4.13 NV1 (**Figure 15.2**) shows the lighting conditions along Burton Road and the maximum levels of glare as viewed from this location were recorded at 7816cd/m^2, 3369cd/m^2, and 2158cd/m^2 from highways lighting. These readings were taken from a distance ranging from 20-50m along Burton Road and are considered to be a significant source of glare.

15.4.14 The views of the northern section of the Site vary along Burton Road due to fluctuating levels of screening along the Site boundary. Residential receptors located adjacent to monitoring location H further east on Burton Road have direct, unobstructed views into the northern section of the Site due to the sloping topography into Site and a lack of screening. This is illustrated by NV1 (**Figure 15.2**). Moving further west along Burton Road a block of flats at monitoring location G act as screening to receptors on Burton Road, however the monitoring location itself has partial screening in the form of trees and vegetation with intermittent views into the northern section of the Site. Residential receptors located at monitoring location F, at the western extent of Burton Road at the junction of Old Mill Lane, are screened from the Site by a warehouse retail unit and intermittent vegetation.

River Dearne

15.4.15 The River Dearne runs through the centre of the Site and illuminance readings at monitoring locations A-D illustrate the lighting conditions on Site adjacent to the River. There are no immediate sources of lighting within this area, the largest contributions are from simple asymmetric beams associated with the construction compound located in the northern section of the Site and highways lighting along Burton Road and Old Mill Lane (see above for description of lighting at these locations).The maximum vertical and horizontal illuminance levels recorded at monitoring locations A-D were 0.41 lux (A – facing north) and 0.23 lux (D – facing north), which are far below the ILE 2005 criteria for either an E1 or E2 Environmental Zone (when considering light from highways lighting). Based on the presence of street lighting in the distance and fugitive light from the construction compound located in the northern section of the Site, it is broadly considered that the area on Site is not representative of an E1 Environmental Zone '*intrinsically dark landscape*' but of E2 Environmental Zone representing an area of '*low district brightness*'.

15.4.16 The banks of the River Dearne consist of broad-leaved woodland, containing primarily alder, willow and sycamore species. The river Dearne itself also flows through the Site in a west to east direction, contained within tall retaining walls to the western end of the Site (where it is located adjacent to Old Mill Lane) after which it flows in a more natural curvilinear profile with vegetated banks (which include some invasive species such as Japanese Knotweed). The River Dearne is therefore enclosed by vegetation on both the north and south banks effectively providing screening of the northern part of the Site from the south and vice versa.

Asda Supermarket Car Park

15.4.17 The lighting in Asda Supermarket's car park comprises 6x 40m high columns located across the car park, fitted with high pressure sodium lamps. The luminaires are modern reflector optics with flat glass and full horizontal cut-off which are extremely effective at controlling the upward light and light spill. Vertical illuminance levels directly

facing one of the described lighting sources represented an illuminance level of 16.78 lux (facing east), and all of the other illuminance readings were significantly over the threshold for an E4 Environmental Zone representing an area of '*high district brightness*'.

Future Baseline

15.4.18 The Site is currently split into two sections with the River Dearne running from west to east through the centre of the Site. The Site is therefore divided into the southern section which consists of four retail warehouses and associated car park, and the northern section which is currently under construction for the development of the A61 Link Road. The future baseline on Site is therefore subject to changes resulting from the continuing construction and the eventual operation of the road through the northern section of the Site. It is expected that there will be highways lighting associated with the road improvements and once operational this installation of additional lighting on Site will significantly change the lighting conditions on Site. Once operational, this highways lighting will have implications on the northern section of the Site, which at present is currently unlit (apart from the construction compound), becoming part of the brightly lit urban environment. It is assumed that the southern section of the Site will experience a limited change to the future baseline because of the dense vegetation and trees providing screening from the northern section of the Site. The southern section of the Site will be largely unaffected by the A61 Link Road in the northern section of the Site and is likely to remain as retails units being indicative of an Environmental Zone E3 which is described as an area of '*medium district brightness*'.

15.4.19 The area surrounding the Site will remain well lit should the Proposed Development not proceed and will stay broadly indicative of Environmental Zones E3 and E4, representing areas of '*medium district brightness*' and '*high district brightness*'.

15.5 ASSESSMENT OF EFFECTS, MITIGATION AND RESIDUAL EFFECTS

Site Preparation, Demolition, Earthworks and Construction Phase

15.5.1 Sources of light during the site preparation, demolition, earthworks and construction phase of the Proposed Development are likely to include security lighting associated with the construction compound and site perimeter (similar to the construction compound currently located in the northern section of the Site), and lighting associated with vehicles and machinery particularly along the access route which is assumed will be from Twibell Street to the south of the Site. An assumption has been made that the working hours during the site preparation, demolition, earthworks and construction phase will be restricted to Monday – Friday: 08:00 – 18:30, Saturday: 08:00 – 13:00 and no workings on Sundays or Bank Holidays. Consequently, it is likely that sources of light will be predominant in winter months when working hours fall within the hours of darkness. However, it assumed that some level of security lighting will be required at all times (during the hours of darkness).

15.5.2 As it stands, the northern section of the Site has undergone demolition of existing structures and relevant remediation works, and is currently undergoing construction activities associated with the development of the A61 Link Road. Therefore, works in the northern section of the Site are limited to the works associated with the construction of the new retail units and petrol station forecourt (and the associated assessment follows this principal).

15.5.3 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.com/complianceplus/) **(Ref. 15.20)** 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.

15.5.4 It is anticipated that the key potential areas to be illuminated temporarily during the site preparation, demolition, earthworks and construction phase (i.e. the sources of light) will include the following:

- Floodlighting and security lighting associated with temporary car parking areas and within the construction compounds, which will be typically required for health and safety purposes;
- Security and health and safety lighting associated with ongoing working areas, where equipment is stored and safety hazards may be present;
- The potential for fugitive light spill and glare from internal lighting associated with any temporary office units in the construction compounds; and

- Lighting required for operational purposes associated with the demolition, earthworks and construction activities when working during the late afternoon in the winter period.

15.5.5 An installation of artificial lighting may result in light spill and glare if lighting is poorly controlled. However, lighting provided during the site preparation demolition, earthworks and construction phase will be limited to certain areas of the Proposed Development at any one time being short /medium-term and temporary in nature.

15.5.6 Potential disturbance from artificial lighting associated with plant and construction vehicles is considered unlikely and minimal (as working hours should be limited to construction industry standard hours). However, should any night-time works be required, particularly during the winter months, lighting associated with such works would be temporary and intermittent in nature.

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

Residential Receptors located on Twibell Street

15.5.7 There are a number of residents along Twibell Street that are considered to be sensitive receptors to lighting associated with this phase of the Proposed Development. The majority of the residential receptors located along Twibell Street are currently subject to a brightly lit environment and lie within an E3 Environmental Zone (monitoring locations K and N). There are a number of direct views from residential receptors located along Twibell Street with all first floor rooms having direct views on to the southern section of Site. Ground floor windows at residential receptors located at monitoring location K are currently screened from the Site as the result of an existing 2.5m wall. It is therefore deemed that the majority of residential receptors located on Twibell Street have direct views into the southern section of the Site.

15.5.8 The residential receptors are currently exposed to inconsistent levels of lighting, varying from 12.19 lux (facing east) to 0.49 lux (facing north) at monitoring location K and from 28.85 lux (facing east) to 3.39 lux (facing north) at monitoring location N. These existing inconsistent levels of lighting are less than 5m from the boundary of the Site. These residential receptors with direct views of the Site have the potential to be subjected to temporary sources of light spill and glare, largely associated with perimeter and access security lighting. The majority of residential receptors along Twibell Street currently experience a brightly lit environment and some have direct views across the southern section of the Site. It is for this reason that they are considered to be of medium sensitivity. The sensitivity of the most sensitive residential receptor is considered to be medium and the magnitude of change, prior to the implementation of mitigation measures, is considered to be medium. Therefore, there is likely to be a direct, temporary, medium-term effect on such residential receptors of **moderate negative** significance, prior to the implementation of mitigation measures.

Residential Receptors located on Burton Road

15.5.9 There are a number of residential receptors located along Burton Road which have direct views into the northern section of the Site. The majority of residential receptors along Burton Road currently experience an E3 Environmental Zone (monitoring locations F, H and G). At present, there are limited areas of screening for these residential receptors with screening limited in places to sporadic trees and vegetation. There are also direct views from first floor windows and above into the northern section of the Site due to the topography sloping down towards the River Dearne in the centre of the Site.

15.5.10 The residential receptors along Burton Road are subject to varying levels of lighting with monitoring location G, in close proximity to the northern boundary of the Site, experiencing lighting typical of an E3 Environmental Zone likely to be due to the existing lighting associated with the construction works on the northern section of Site. These residential receptors in close proximity to the Site, in particular monitoring location G approximately 50m north of the Site boundary, have the potential to be affected by temporary sources of light spill and glare associated with the lighting of temporary construction compound during the site preparation, demolition, earthworks and construction phase. It is anticipated that the works will be medium-term in duration and lighting will be similar to that currently experienced on the northern section of the Site from the existing construction compound. The majority of residential receptors along Burton Road (including the block of flats on the south side) currently experience a brightly lit environment and lighting associated with an existing construction site. They also have long range and direct views across the Site, but are set back from the Site's perimeter. It is for this reason that they are considered to be of low to medium sensitivity. The sensitivity of the most sensitive residential receptor is considered to be low to medium and the magnitude of change, prior to the implementation of mitigation measures, is considered to be low. Therefore, there is

likely to be a direct, temporary, medium-term effect on such residential receptors of **minor negative** significance, prior to the implementation of mitigation measures.

Mitigation

15.5.11 It is anticipated that a Construction Environmental Management Plan (CEMP) will be prepared and agreed with BMBC in advance of commencement of the construction activities. The CEMP will be implemented to specify the locations of the contractor's compound, material storage areas, highway improvement works and temporary security/health and safety lighting required throughout the construction programme. This will ensure that the siting of such features considers the surrounding sensitive receptors and that any disturbance effect from lighting is reduced to a minimum. This will ensure that the lighting effects will be controlled and minimised wherever possible.

15.5.12 In order to reduce the effects of lighting during the site preparation, demolition, earthworks and construction phase on the sensitive residential and road user receptors, the following best practice measures as recommended in guidance prepared by the ILE, CIRIA and Health and Safety Executive (HSE) should be implemented as part of the CEMP:

- Specified uses of lighting, the location of temporary floodlights, construction compounds, material storage areas and potential road diversions/ highway improvement works will be agreed in advance with BMBC. This will ensure the siting of such features considers the surrounding sensitive receptors and that any disturbance is minimal. This will ensure that the effects of lighting associated with the site preparation, demolition, earthworks and construction activities on the neighbouring residential receptors of Twibell Street and Burton Road are minimised wherever possible. The CEMP will outline the proposed location of construction compounds and material storage areas which will be sited taking into consideration the location of sensitive receptors and will respect the proximity of nearby sensitive receptors;
- Lighting to be switched off when not required unless specifically needed for construction activities or for security and/or health and safety requirements;
- Glare caused by poorly directed security and floodlighting will be minimised by ensuring that light fittings are horizontally mounted and directed inwards on Site. The location of sensitive receptors in close proximity requires that 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
- Light spill will be minimised by avoiding poorly sited lights on the boundary of the Site where possible. In particular, lighting should be located and directed so that it does not cause unnecessary intrusion to the adjacent residential receptors.

15.5.13 The location of compounds will give due regard to *'sensitive neighbourhood issues'*. It has been assumed that all security lighting will be located to minimise light spill to all sensitive receptors. Therefore, the location of the construction compound is likely to be sited fairly central on Site north of the River Dearne, wherever possible, away from sensitive residential receptors located on Twibell Street.

Residual Effects

Residential Receptors located on Twibell Street

15.5.14 The sensitivity of the most sensitive residential receptor is considered to be medium and the magnitude of change, following mitigation is medium. Therefore, there is likely to be a direct, temporary, medium-term effect on sensitive residential receptors of **moderate negative** significance following the implementation of mitigation measures.

Residential Receptors located on Burton Road

15.5.15 The sensitivity of the most sensitive residential receptor is considered to be low to medium and the magnitude of change, following mitigation to remain low. Therefore, there is likely to be a direct, temporary, medium-term effect on sensitive residential receptors of **minor negative** significance following the implementation of mitigation measures.

Increase in glare to existing and future road users including pedestrians, cyclists and motorists.

15.5.16 Existing and future road users utilising the surrounding road network, include motorists, pedestrians and cyclists and all of these users may be sensitive to changes in ambient lighting levels (in particular glare). The levels of glare currently experienced by road users located on Twibell Street and Burton Road are typical of a residential area on the periphery of retail parks and major road infrastructure, i.e. varying and inconsistent lighting but in general considered an area of *'medium district brightness'*. Road users along Old Mill Lane (monitoring location I) currently experience consistent lighting attributable to an area of *'high district brightness'*. The predominant lighting at Twibell Street, Burton Road and Old Mill Lane are street and car park lighting that is in operation post-curfew. It has been considered that the additional sources of lighting associated with the site preparation, demolition, earthworks and construction works are unlikely to be perceptible by these sensitive road users at any of the locations (especially when considering the intermittent nature and duration).

15.5.17 The sensitivity of road users including motorists, pedestrians and cyclists is considered to be low due to the limited number of users that will be subject to any perceptible change when compared against the baseline conditions. The existing brightly lit environment currently experienced by road users on Twibell Street, Burton Road and Old Mill Lane will result in a low magnitude of change, prior to mitigation. Therefore, there is likely to be a direct, temporary, medium-term effect on road users including motorists, pedestrians and cyclists of **negligible to minor negative** significance, prior to the implementation of mitigation measures.

Mitigation

15.5.18 To reduce any likely effects of glare during the site preparation, demolition, earthworks and construction phase on road users including motorists, pedestrians and cyclists utilising the surrounding road network, the following best practice measures as recommended by the ILE, CIRIA and the Health and Safety Executive will be implemented as part of the CEMP:

- Mitigation measures outlined in paragraph: 15.5.12 above;
- The construction areas adjacent to walkways or roadways should be lit in an appropriate way and clearly defined at all times to ensure the safety of motorists, pedestrians and cyclists;
- Construction area fences located near existing roadways or paths should be well lit to assist in defining the limits of the construction area for motorists and pedestrians;
- Any temporary walkways, roads or parking areas should be illuminated in accordance with current guidance stipulated in the ILE *'Guidance Notes of the Reduction of Obtrusive Light'* (ILE, 2005); and
- Should hoarding be required during the construction phase, care should be taken to avoid casting shadows on the surrounding and adjacent footpaths and roads.

Residual Effects

15.5.19 The sensitivity of road users including motorists, pedestrians and cyclists is considered to be low and the magnitude of change, following mitigation, is considered to be negligible. Therefore, there is likely to be a direct, temporary, medium-term effect on road users including motorists, pedestrians and cyclists of **negligible** significance following the implementation of mitigation measures.

Operational Phase

15.5.20 Due to the nature of the Proposed Development, street lighting will be required within the built development areas (including along internal streets and main access points). This will result in an increase in artificial lighting installations on Site compared to the baseline conditions.

15.5.21 A comprehensive detailed lighting design and specification for the Proposed Development will be prepared by a specialist lighting contractors at the detailed design stage and agreed with BMBC. 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, glare and sky glow 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 used.

15.5.22 It is expected that the lighting to be installed on the Site will be predominantly street lighting consisting of high pressure sodium lamps mounted on 10-12m columns along access roads and car parking areas. Other lighting installations are likely to include lighting of pedestrian areas/ walkways, any illuminated advertisements and decorative lighting on building façades. It is also possible that some floodlighting will be utilised in service yard areas associated with the Proposed Development especially the proposed supermarket retail unit (Class A1) in the southern section of Site. Any lighting will be designed to comply with guidance contained within BS EN13201-3 (Road Lighting – Part 3: *Calculation of Performance*) which is likely to be similar to those recommended in BS 5489-1: *Part 9 Codes of Practice for Lighting of Urban Centre and Other Public Amenity Areas*, 1996. This recommends that for outdoor car parks in urban environments the average illuminance provided should be 30 lux.

15.5.23 Street lighting on Site should be designed to comply with guidance contained within BS 5489-1: 2003 and BS EN 13201-2: 2003 with the appropriate level for the proposed use of each road taken into account. The requirement for a town centre location with high flows and moderate to high crime level should be that for S1 class illumination to provide a maintained average illuminance of 15 lux.

15.5.24 In order to assess, it has been assumed that the lighting design will accord with the above BS guidelines and minimum specification. Professional judgement is then used to assess the significance of the lighting effect in accordance with methodology outlined above.

15.5.25 It has been assumed for the purposes of this lighting assessment that the proposed supermarket retail unit (Class A1) will be open 24hrs a day and that delivery of goods will occur throughout the night-time period. Therefore, it expected that the sources of light associated with the proposed supermarket retail unit (Class A1) and the associated service yard will be largely constant and operational post-curfew. The service yard of the proposed supermarket retail unit (Class A1) will be located south east corner of the Proposed Development south of the River Dearne adjacent to Twibell Street. It is anticipated that access to the service yard area will be from the northern section of the Site crossing the proposed bridge over the River Dearne.

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

15.5.26 As outlined above, the likely sources of light during the operational phase of the Proposed Development include street lighting along access roads and surface car parking areas, lighting of pedestrian areas, any illuminated advertisements and proposed service yard operations associated with the predicted 24hr a day delivery schedule.

15.5.27 Any lighting installed should provide levels of illuminance suitable for the proposed use of the Proposed Development. These installations have the potential to result in light spill to sensitive residential receptors causing nuisance and disturbance to residents within. These lighting installations also have the potential of glare effects which can result in dazzling and discomfort to road users.

<u>Residential Receptors located on Twibell Street</u>

15.5.28 The majority of residential receptors along Twibell Street (monitoring locations K and N) lie within an E3 Environmental Zone and are currently subject to an inconsistent but generally brightly lit environment. Residential receptors at monitoring location K located at the eastern extent of Twibell Street experience a maximum of 12.19 lux (facing horizontal) and a minimum of 0.49 lux (facing north). These recordings show the existing inconsistent lighting conditions and are considered alongside the limited views directly into the Site from this location, with obstructed views at ground floor level and direct views from first floor windows and above. Residential receptors at monitoring location N close to the junction of Twibell Street and Harborough Hill Road also experience inconsistent levels of lighting (28.85 lux facing east to 3.39 lux facing north), however they have direct views into the southern section of the Site with no screening present, as illustrated by NV2 (**Figure 15.3**). The Proposed Development will be more prominent along the southern boundary with residential receptors on Twibell Street having unobstructed views of the proposed supermarket retail unit (Class A1) in the southern section of the Site. The distance of the proposed supermarket retail unit (Class A1) to the nearest sensitive residential receptor is anticipated to be approximately 20m from the nearest residential receptor.

15.5.29 The most representative sensitive residential receptor located on Twibell Street is likely to be located at monitoring location K which will be adjacent to the proposed service yard of the Proposed Development. The Proposed Development is not anticipated to have lighting located on the southern boundary of the Site and the service yard is expected to be screened from the residential receptors on Twibell Street. Whilst it is anticipated the above

measures will aim to control excess lighting along Twibell Street, fugitive light spill and glare are still likely to occur from the proposed service yard.

15.5.30 The residential receptors are currently exposed to inconsistent levels of lighting, varying from 12.19 lux (facing east) to 0.49 lux (facing north) at monitoring location K and from 28.85 lux (facing east) to 3.39 lux (facing north) at monitoring location N. These existing inconsistent levels of lighting are less than 5m from the boundary of the Site. These residential receptors with direct views of the Site have the potential to be subjected to permanent sources of light spill and glare, largely associated with service yard operations and proposed supermarket retail unit (Class A1) itself. The majority of residential receptors along Twibell Street currently experience a brightly lit environment and some have direct views across the southern section of the Site. It is for this reason that they are considered to be of medium sensitivity. The sensitivity of the most sensitive residential receptor along Twibell Street is considered to be medium and the magnitude of change, prior to the implementation of mitigation measures, is considered to be medium, following the assumption that effective screening will be included. Therefore, it is considered that there is likely to be direct, permanent, long-term effects on residential receptors on Twibell Street of **moderate negative** significance, prior to the implementation of mitigation measures.

Residential Receptors located on Burton Road

15.5.31 As previously stated, residential receptors along Burton Road (monitoring locations F, G and H) lie within an E3 Environmental Zone (monitoring locations F, H and G). Due to the increased distances, in which residential receptors vary from 55m to 200m away from the Proposed Development, in combination with intermittent screening and also the implementation of a best practice uniform lighting scheme (outlined above), sensitive residential receptors along Burton Road are unlikely to experience significant levels of light spill from the Proposed Development. Light spill associated with best practice lighting is unlikely to have a noticeable effect on properties greater than 10m away and therefore light spill is unlikely to affect residential receptors beyond 10m from the proposed light source. Receptors at monitoring location G are considered to be the most sensitive residential receptor on Burton Road being in closer proximity of the Site but within an E3 Environmental Zone and with direct views of the Site.

15.5.32 The majority of residential receptors along Burton Road (including the block of flats on the south side) currently experience a brightly lit environment and lighting associated with an existing construction site. They also have long range and direct views across the Site, but are set back from the Site's perimeter. It is for this reason that they are considered to be of low to medium sensitivity. The sensitivity of the most sensitive residential receptor along Burton Road is considered to be to be low to medium and the magnitude of change, prior to the implementation of mitigation measures, is considered to be low. Therefore, it is considered that there is likely to be direct, permanent, long-term effects on residential receptors on Burton Road ranging from **negligible to minor negative** significance, prior to the implementation of mitigation measures.

Mitigation

15.5.33 The proposed lighting specification or/and strategy should be designed to use current best practice and best available technology, conform to Policy CSP40 of the BMBC's Local Development Framework: Adopted Core Strategy (**Ref. 15.12**) and should be agreed with BMBC.

15.5.34 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'* (ILE, 2005).

- 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;
- 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 experience. This is particularly relevant for light spill on residential receptors along Twibell Street;
- 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;
- Road lighting should be designed in accordance with assumed specification as outlined above i.e. to meet the minimum requirements of BS 5489-1:2003 and BS EN 13201-2:2003. This creates an even luminance on the road surface;
- '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.

15.5.35 As stipulated in the guidance on the CNEA 2005, 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.

15.5.36 In addition to the measures outlined above, all lamps used for external lighting should be high pressure sodium lamps (or similar performance lamps). At present, low pressure sodium lamps are being phased out nationwide. The whiter light emitted by high pressure sodium lamps provide superior colour rendering compared to the more orange low pressure sodium lamps.

15.5.37 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 '*Brightness of Illuminated Advertisements*' (2001) **(Ref. 15.21)**.

Residual Effects

Residential Receptors on Twibell Street

15.5.38 The sensitivity of the most sensitive residential receptor is considered to be medium and the magnitude of change, following mitigation is medium to low. Therefore, there is likely to be direct, permanent, long-term effects on sensitive residential receptors of **minor to moderate negative** significance following the implementation of mitigation measures.

Residential Receptors on Burton Road

15.5.39 The sensitivity of the most sensitive residential receptor is considered to be low to medium and the magnitude of change, following mitigation is negligible. Therefore, there is likely to be direct, permanent, long-term effects on sensitive residential receptors of **negligible** significance following the implementation of mitigation measures.

Increase in glare to existing and future road users including pedestrians, cyclists and motorists.

15.5.40 Poorly controlled and designed lighting installations have the potential to cause unnecessary distraction and glare towards both existing and future road users, together with uncomfortable brightness towards cyclists and pedestrians. New lighting associated with the Proposed Development may result in increased glare towards existing and future road users (compared to existing baseline levels).

15.5.41 The indicative masterplan (**Appendix 3.1**) shows a full consideration of pedestrian, cyclist and road access within, and leading to, the Proposed Development. Following guidance outlined above, there will be modern lighting installed which adheres to best practice criteria and modern lighting specification. This lighting should provide a consistently lit environment across Site.

15.5.42 In the area surrounding the Site, road users currently experience a brightly lit environment varying from E3/E4 to E4 Environmental Zones. This is illustrated by the examples of monitoring location I on Old Mill Lane experiencing Environmental Zone 4 levels of lighting including 19.41 lux (facing south) and 12.29 (facing horizontal), and monitoring location L on Twibell Street experiencing Environmental Zone 3 levels of lighting including 3.27 lux (facing west) and 2.40 lux (facing north). It is expected that the lighting installations associated with the Proposed Development will not result in any perceptible changes to the existing levels of glare and there should be a consistent

levels of light for road users as they pass through and within the wider area. This should minimise the impact of glare as the user travels between areas which are lit to a different level of brightness.

15.5.43 The sensitivity of road users including motorists, pedestrians and cyclists is considered to be low due to the limited number of users that will be subject to any perceptible change when compared against the baseline conditions. The existing brightly lit environment currently experienced by road users on Twibell Street, Burton Road and Old Mill Lane will result in a negligible magnitude of change, prior to mitigation. Therefore, there is likely to be direct, permanent, long-term effects on road users including motorists, pedestrians and cyclists of **negligible** significance, prior to the implementation of mitigation measures.

Mitigation

15.5.44 Best practice would see the inclusion of the mitigation measures outlined above in paragraph 15.5.33 to 15.5.37. Providing best practice guidance and standards are incorporated into the detailed lighting strategy than no mitigation measures are required.

Residual Effects

15.5.45 The sensitivity of the road users including motorists, pedestrians and cyclists is low and the magnitude of change, following mitigation, is negligible. Therefore, there is likely to be direct, permanent, long-term effects on road users including motorists, pedestrians and cyclists of **negligible** significance, following the implementation of mitigation measures.

Change in night-time scene as viewed by local residential receptors.

15.5.46 There is the potential for installed lighting as part of the Proposed Development to affect the current night-time scene, landscape character and visual amenity of the surrounding area. The presence of existing artificial light sources exist to the south of the Site associated with Twibell Street; to the west of the Site associated with Old Mill Lane and Harborough Hill Road and the associated retail outlets; and to the north of the Site associated with Burton Road. This lighting is currently operational post-curfew throughout the night time period, resulting in existing brightly lit night time landscape of equivalent to an E3/E4 Environmental Zone.

15.5.47 However, with the exception of the existing construction compound area, the northern section of the existing Site and river corridor in general is currently considered to be lit to levels typical of an E2 Environmental Zone ('*low district brightness*' area) with an area of E3 Environmental Zone close to the construction compound ('*medium district brightness*') . The southern section of the Site, south of the River Dearne, is lit to levels typical of an E3 Environmental Zone ('medium district brightness' area). The majority of the northern section of the Site is unlit with the only dominant source of lighting being from floodlighting associated with the construction compound related to the construction of the A61 Link Road. The lighting in the southern section of Site is dominated by an asymmetric floodlight lighting the car park of the retail warehouses situated in the south of the Site and is representative of an E3 Environmental Zone.

15.5.48 The overall context of the Site in the wider surroundings is that it is an area which is irregularly and inconsistently lit at the bottom of the valley surrounded by a well-lit urban environment to the north, west and south. The Site is intermittently lit by security lighting associated with construction compound in the northern section, and asymmetric floodlighting associated with the retail units in the southern section of the Site. Residential receptors with direct views of the Site which are sensitive to changes in night-time scene are limited. Those situated to the north of the Site along Burton Road, will experience a change in night-time scene in the mid to foreground as a result of the Proposed Development. However, it is expected that although changes to the night-time setting will occur, the Proposed Development's location in a surrounding well-lit urban environment will result in a significant reduction in overall sensitivity, and therefore a reduced effect on the change in total night-time setting.

15.5.49 The most sensitive residential receptors with direct views of the night-time scene are limited to those situated on Burton Road due to the sloping topography and views across the valley. The existing construction lighting on the northern section of Site is prevalent in the mid to foreground and the as a result of the Proposed Development the river corridor is likely to remain unlit. Therefore, there are likely to be greater changes to levels of light in the southern section of Site associated with the proposed supermarket retail unit (Class A1). However, this will be within the longer distance views and therefore less significant against the brightly lit background and thus less significant when viewed from sensitive residential receptors on Burton Road. The sensitivity of the most sensitive residential receptors to a change in the night-time scene is considered to be low to medium and the magnitude of change, prior to mitigation, is

low to medium. Therefore, there is likely to be a direct, permanent, long-term effect on the night-time scene of **negligible to minor negative** significance, prior to the implementation of mitigation measures.

Mitigation

15.5.50 Mitigation measures should follow mitigation outlined above in paragraph 15.5.33 to 15.5.37.

Residual Effects

15.5.51 The sensitivity of the most sensitive residential receptors to a change in the night-time scene is considered to be low to medium and the magnitude of change, following mitigation, is low. Therefore, there is likely to be a direct, permanent, long-term effect on the night-time scene of **negligible to minor negative** significance, following the implementation of mitigation measures.

Monitoring and Follow Up

15.5.52 As part of best practice, it is recommended that monitoring of the temporary lighting installations is undertaken during each significant stage of the site preparation, demolition, earthworks and construction phase of the Proposed Development to ensure that correct tilting angles and appropriate direction of lighting are being achieved via the CEMP. This monitoring may result in any appropriate modifications being made, where necessary, should undue light spill or glare be identified. This should be considered in accordance with the general principles of the *Considerate Constructors Scheme*, particularly given the sensitivities surrounding the Site. This monitoring should be focused on Twibell Street close to the proximity of the proposed access to the Site and will also ensure that during the site preparation, demolition, earthworks and construction phase levels of lighting are maintained in accordance with best practice standards and requirements stipulated in the CEMP. This will ensure that potential effects associated with the introduction of temporary artificial light sources will be minimised through the illumination of only required areas of the Site during the night-time period for on-site safety and security purposes.

Limitations and Assumptions

15.5.53 It has been assumed that in order to minimise the potential effects from temporary lighting during the site preparation, demolition, earthworks and construction phase, the mitigation measures proposed in this Chapter will be incorporated into a CEMP for the Proposed Development in accordance with the *Considerate Constructors Scheme*. The implementation of such best practice measures for on-site lighting during construction would ensure that the temporary effects of such lighting would be controlled and minimised.

15.5.54 It has been assumed that the mitigation measures in this Chapter would be incorporated into the future lighting design specification and strategy and that the implementation of this approach would ensure that lighting proposals for the Proposed Development comply with BMBC policies (specifically CSP40) together with the *CNEA 2005*, ILE *'Guidance Notes for the Reduction of Obtrusive Light'* (ILE, 2005) and relevant British Standards.

15.5.55 In the absence of statutory guidance, the ILE *'Guidance Notes for the Reduction of Obtrusive Light'* (ILE, 2005) (included as **Appendix 15.1**), have been used as criteria against which to assess the effects of artificial lighting, which is considered best practice. The guidance levels for light nuisance into windows have been used as the principal criteria for assessing the likely effects of artificial lighting associated with the Proposed Development. However, given the subjective nature of sky glow and glare, it is difficult to quantify the likely effects due to a number of variables including the fact that sky glow is measured as a percentage change and glare from a light source is dependent on the type and distance from the light source, and the angle from which it is viewed. The position will be further clarified at the detailed design stage.

Cumulative Effects

Effect Interactions

15.5.56 The interaction of light spill, glare and visual amenity is dealt with in **Chapter 14 Landscape and Visual Assessment**

15.5.57 The interaction of light spill on ecological receptors has been assessed in **Chapter 12 – Ecology and Nature Conservation**. The lighting and ecology surveys were completed in tandem to provide lux measurements in which to assess the interaction of light spill on ecological receptors and in particular the effect on bats.

In-combination Effects

15.5.58 Few of the identified committed developments have the potential to further contribute towards upward light in combination with the Proposed Development, thereby increasing sky glow as viewed from the limited receptors that are anticipated to experience changes to the night-time views. However, it is difficult to comprehensively measure and effectively quantify the sources of light that contribute to sky glow. In addition to this there is no widely accepted methodology or guidance on the assessment of sky glow. Therefore the in-combination effect of sky glow cannot be comprehensively outlined.

15.5.59 The very nature of light spill is that it is only significant within approximately 25m of the Proposed Development and therefore any in-combination effect is limited to committed developments within 25m of the Proposed Development. There have been no committed developments located within 25m of the Proposed Development and therefore it is anticipated that there will be an in-combination effect of a negligible significance.

Summary

15.5.60 An assessment of the external lighting environment was undertaken to ascertain the baseline lighting conditions on Site and in the immediate surrounding area. A daytime and night time lighting survey was carried out which included readings of illuminance (light spill) and luminance (glare) at key monitoring locations, supported by night time viewpoint images to illustrate the current night time scene.

15.5.61 During the survey, measurements recorded within the Site indicated that the northern section of the Site is characteristic of an E2 Environmental Zone (*'low district brightness'*), whilst the southern section of Site has variable lighting conditions which are indicative of an E3 Environmental Zone (*'medium district brightness'*). The immediate surrounding areas were indicative of E3/E4 Environmental Zone classifications, especially along Twibell Street, Burton Road and Old Mill Lane. The Site is an area of varying levels of lighting with predominant sources of light coming from existing construction compound in the northern section of Site and floodlighting associated with retail units in the southern section of Site. The Site is located in a well-lit urban environment with high levels of lighting to the north, west and south. There is a Local Nature Reserve to the east which is currently unlit.

15.5.62 During the site preparation, demolition, earthworks and construction phase, the principal lighting effects arising from the Proposed Development are likely to be from the temporary lighting associated with the illumination of temporary car parks on Site, constructor's activities and compound and for safety and security reasons. In order to mitigate the temporary effects on surrounding sensitive receptors, it is assumed that the lighting requirements at Site will be managed as part of a Construction Environmental Management Plan. Lighting installed will be appropriately located, with modern light fittings which are directionally controlled and will be in accordance with current best practice standards. The installation of lighting featuring in the Construction Environmental Management Plan will be agreed with BMBC. Overall, the residual effect on local sensitive residential receptors is medium-term and temporary in nature, and of moderate negative significance at limited locations along Twibell Street, and minor negative significance for other sensitive residential receptors, following the implementation of suggested mitigation measures. It has been predicted that there will be a negligible effect on motorists, pedestrians and cyclists from temporary lighting associated with site preparation, demolition, earthworks and construction works.

15.5.63 During the operational phase, the introduction of artificial lighting sources as a result of the Proposed Development have the potential to affect sensitive receptors and there will be changes to the current baseline conditions for some sensitive receptors. The main sources of artificial light to be installed as part of the Proposed Development are likely to include street lighting associated with the access roads and surface car parking areas, lighting associated with pedestrian and public realm areas, service yard areas, illuminated signage and service yard operations associated with the proposed supermarket retail unit (Class A1). Identified effects will be mitigated through the implementation of an appropriate lighting design which will aim to minimise the effects of light spill and glare on existing sensitive residential receptors in the local vicinity of the Proposed Development. Overall, the residual effect of light spill and glare from the Proposed Development on local sensitive residential receptors is considered to be negligible for residents on Burton Road and of minor to moderate negative significance for residents on Twibell Street, following the implementation of suggested mitigation measures. It has been predicted that there will be a negligible effect on motorists, pedestrians and cyclists from lighting sources associated with the operational phase of the Proposed Development.

15.5.64 The operational phase of the Proposed Development will also see changes to the night-time scene as viewed by sensitive residential receptors in the local vicinity. The Site is an inconsistently lit area at the bottom of the valley surrounded by a well-lit urban environment to the north, west and south. The lighting of the proposed supermarket

retail unit (Class A1) on Site will cause changes to the night-time setting of the Site within the longer distance views, however it will be less significant against the brightly lit background when viewed from sensitive residential receptors. Therefore, there is predicted to be a permanent, direct, long-term residual effect on the night-time scene of negligible to minor negative significance following the implementation of mitigation measures.

Table 15.1: Summary of Effects Table for Lighting

Description of Likely Significant Effects	Significance of Effects					Summary of Mitigation / Enhancement Measures	Significance of Residual Effects					Relevant Policy	Relevant Legislation
	(Major, Moderate, Minor, Negligible)	Positive / Negative	(P/T)	(D/I)	ST/MT/ LT)		(Major, Moderate, Minor, Negligible)	Positive / Negative	(P/T)	(D/I)	ST/MT/LT)		
Site Preparation, Demolition, Earthworks and Construction Phase													
Increase in light spill and glare (associated with lighting installations) to existing local residential receptors located on **Twibell Street**	Moderate	Negative	T	D	MT	▫ Implementation of a CEMP including specified working hours, uses of lighting, the location of temporary floodlights and construction compounds; ▫ Lighting to be switched off when not in use/required; ▫ Best practice measures to be adhered to outlined by ILE, CIRIA and the HSE;	Moderate	Negative	T	D	MT	PPS23 Barnsley Metropolitan Borough Council Core Strategy Policy CSP 40 CSP 29	Section 101 – 103 of CNEA 2005, Section 79 and 80(2) of the EPA 1990
Increase in light spill and glare (associated with lighting installations) to existing local residential receptors located on **Burton Road**	Minor	Negative	T	D	MT	▫ Glare to be controlled by appropriately selected light fittings; and ▫ The minimisation of light spill by the appropriate siting lighting adjacent to sensitive receptors.	Minor	N/A	T	D	MT	PPS23 Barnsley Metropolitan Borough Council Core Strategy Policy CSP 40 CSP 29	Section 101 – 103 of CNEA 2005, Section 79 and 80(2) of the EPA 1990
Increase in glare to existing and future road users	Negligible to Minor	Negative	T	D	MT	▫ As above; ▫ Construction areas adjacent	Negligible	N/A	T	D	MT	PPS23 Barnsley	Section 101 – 103 of

including pedestrians, cyclists and motorists.						to walkways or roadways should be lit in an appropriate way and clearly defined at all times to ensure the safety of motorists, pedestrians and cyclists; ▫ Construction area fences located near existing roadways or paths should be well lit to assist in defining the limits of the construction area for motorists and pedestrians; ▫ Any temporary walkways, roads or parking areas should be illuminated in accordance with current guidance stipulated in the ILE Guidance Notes of the Reduction of Obtrusive Light (2005); and ▫ Should hoarding be required during the construction phase, care should be taken to avoid casting shadows on the surrounding and adjacent footpaths and roads.						Metropolitan Borough Council Core Strategy Policy CSP 40 CSP 29	CNEA 2005, Section 79 and 80(2) of the EPA 1990
Operational Phase													
Increase in light spill and glare (associated with lighting installations) to existing local	Moderate	Negative	P	D	LT	▫ Appropriate lighting specification and strategy to be devised; ▫ Design of all lighting in accordance with best	Minor to Moderate	Negative	P	D	LT	PPS23 Barnsley Metropolitan	Section 101 – 103 of CNEA 2005, Section 79 and 80(2) of

residential receptors located on **Twibell Street**						practice guidance and British Standards; ▫ Direct light downwards to illuminate target wherever possible; ▫ Lighting to be switched off when not in use/required; ▫ Use of floodlighting with asymmetric beams; ▫ Avoidance of 'over lighting' wherever possible; and ▫ Lighting equipment once installed should minimise the spread of light near, to or above the horizontal.						Borough Council Core Strategy Policy CSP 40 CSP 29	the EPA 1990
Increase in light spill and glare (associated with lighting installations) to existing local residential receptors located on **Burton Road**	Negligible to Minor	Negative	P	D	LT		Negligible	N/A	P	D	LT	PPS23 Barnsley Metropoli tan Borough Council Core Strategy Policy CSP 40 CSP 29	
Increase in glare to existing and future road users including pedestrians, cyclists and motorists.	Negligible		P	D	LT	▫ None required. Best practice would use mitigation measures outlined above.	Negligible		P	D	LT	PPS23 Barnsley Metropoli tan Borough Council Core Strategy Policy CSP 40 CSP 29	Section 101 – 103 of CNEA 2005, Section 79 and 80(2) of the EPA 1990
Change in night-time scene as viewed by local residential	Negligible to Minor	Negative	P	D	LT	▫ See mitigation measures for light spill and glare to residential receptors above.	Negligible to Minor	Negative	P	D	LT	PPS23 Barnsley Metropoli	Section 101 – 103 of CNEA 2005,

receptors												tan Borough Council Core Strategy Policy CSP 40 CSP 29	Section 79 and 80(2) of the EPA 1990

Key to table:

P/T = Permanent or Temporary, D/I = Direct or Indirect, ST/MT/LT = Short Term, Medium Term or Long Term

N/A = Not Applicable

15.6 REFERENCES

Documentary sources

15.1 *Highways Act 1980;*

15.2 Public Health Act 1985;

15.3 Parish Councils Act 1957;

15.4 Local Government Act 1996;

15.5 Traffic Signs Regulations and General Directions 2002;

15.6 Road Traffic Regulation Act 1984;

15.7 Highways (Road Hump) Regulations 1999;

15.8 Clean Neighbourhoods and Environment Act 2005;

15.9 Environmental Protection Act 1990;

15.10 Office of the Deputy Prime Minister (ODPM), (2006). *Planning Policy Statement 1: Delivering Sustainable Development.* HMSO;

15.11 ODPM, (October, 2004). *Planning Policy Statement 23: Planning and Pollution Control.* HMSO;

15.12 Barnsley Metropolitan Borough Council, (September, 2011). *Local Development Framework: Adopted Core Strategy*;

15.13 Barnsley Metropolitan Borough Council, (December, 2000). *Barnsley Unitary Development Plan*;

15.14 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*;

15.15 CIE, (1997). CIE 126:1997. *Guidelines for Minimising Sky Glow*;

15.16 Institute of Lighting Engineers (ILE), (2005). *Guidance Notes for the Reduction of Obtrusive Light*;

15.17 Department of Environment, Food and Rural Affairs, (2001). *Lighting in the Countryside: Towards Good Practice*;

15.18 British Standard (BS) 5489, (2003). *Code of Practice for the Design of Road Lighting – Part 1: Lighting of Roads and Public Amenity Areas*;

15.19 BS 13201, (2003). *Road Lighting – Part 2: Performance Requirements*;

Online Sources

15.20 The Construction Industry Research and Information Association (CIRIA) – Compliance Plus – Lighting: http://www.ciria.org/complianceplus/

Institution of Lighting Engineers – www.ile.org.uk

Lighting Industry Federation – www.lif.co.uk

Society of Light and Lighting – www.cibse.org

Monitoring Locations and Night Time Viewpoints

Scale @ A3 : 1:2,500

Figure 1

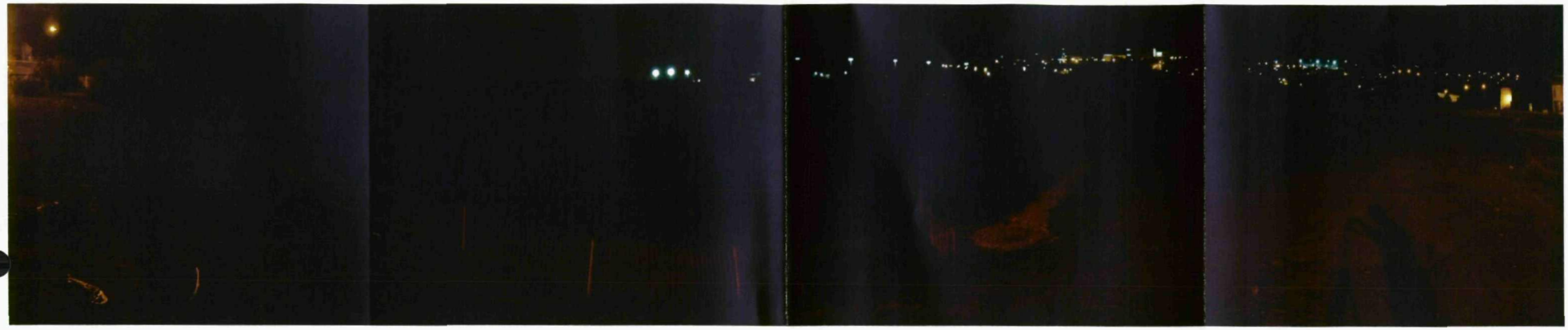


Contains Ordnance Survey data © Crown copyright and database right 2011

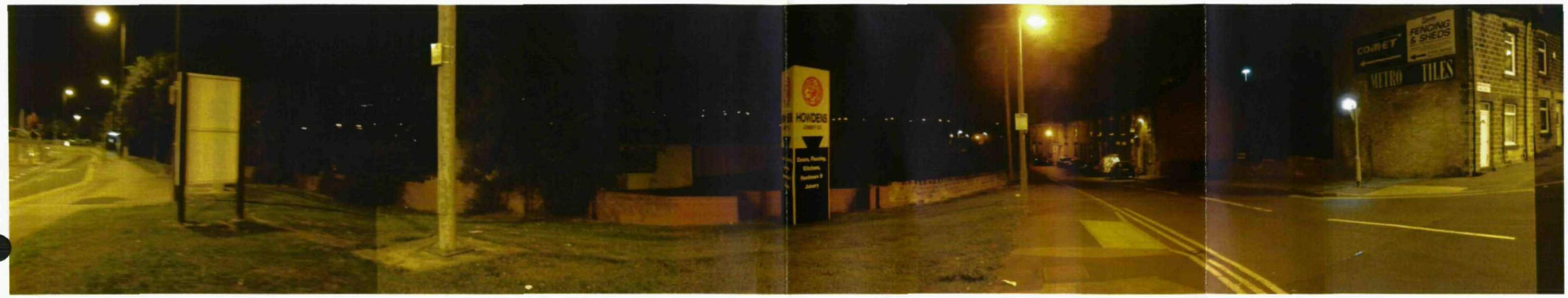
PROJECT: Old Mill Lane, Barnsley
PROJECT No: 20470
Client: Peel Holdings PLC

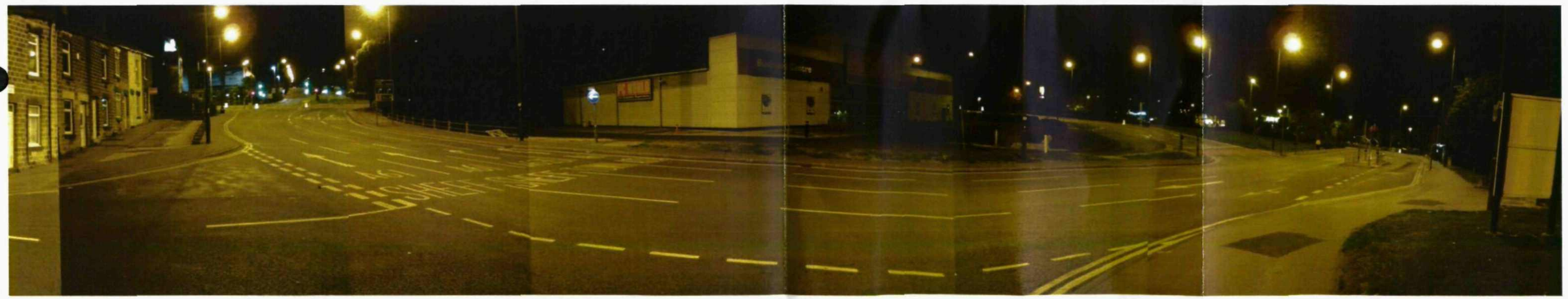
Drawn: GH
Checked: AP
Approved: AP
Revision: A
Date: September 2011

WSP









PROJECT: Old Mill Lane, Barnsley
PROJECT No: 20470
CLIENT: Peel Holdings PLC

DRAWN: GH
CHECKED: AP
APPROVED: AP
REVISION: A
DATE: September 2011

WSP

15 APPENDICES: Lighting

APPENDIX 15.1: ILE GUIDANCE

The Institution of Lighting Engineers

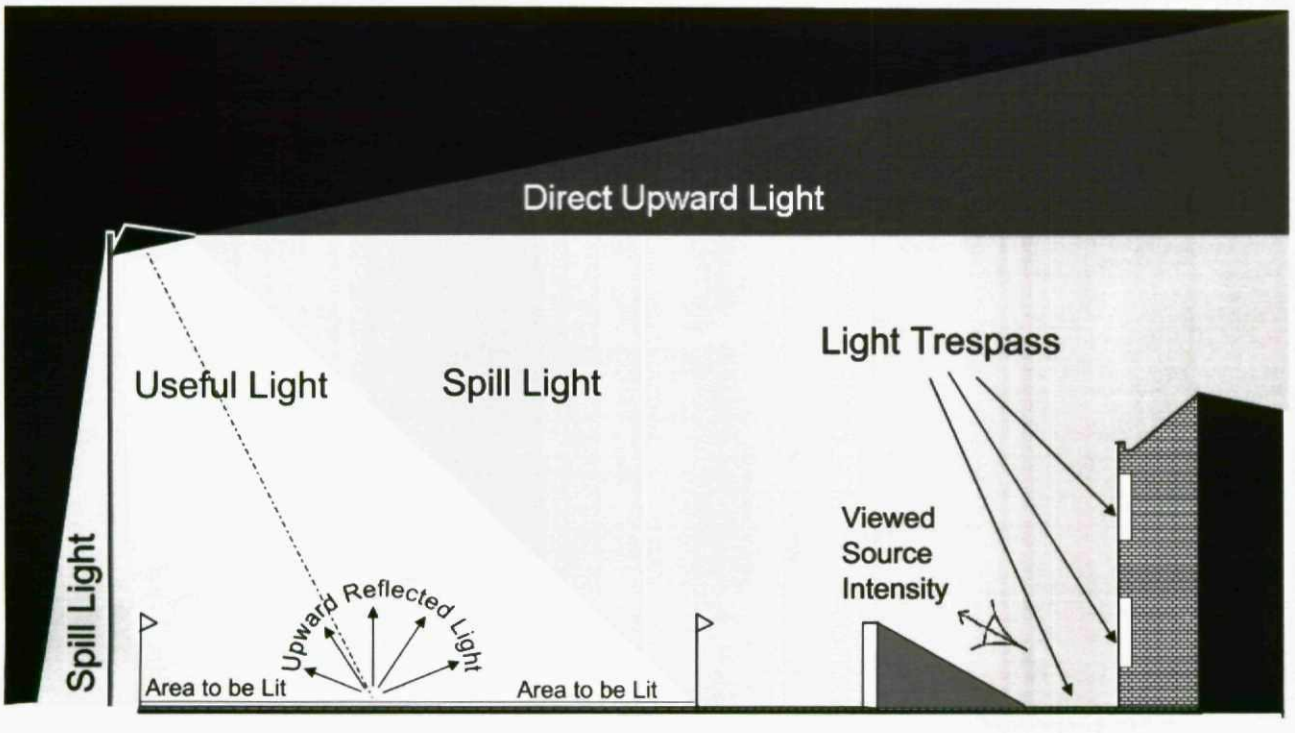
E-mail ile@ile.org.uk Website www.ile.org.uk

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.

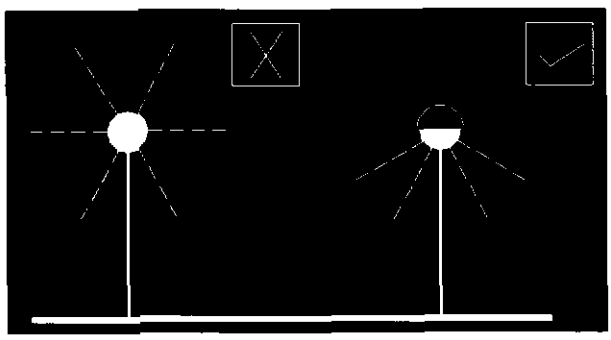
Sky glow, the brightening of the night sky above our towns, cities and countryside, **Glare** the uncomfortable brightness of a light source when viewed against a dark background, and **Light Trespass,** the spilling of light beyond the boundary of the property or area being lit, are all forms of obtrusive 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?

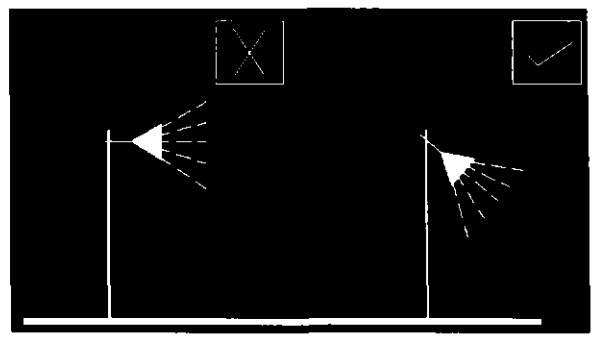


Do not "over" light. This is a major cause of obtrusive light and is a waste of energy. There are published standards for most lighting tasks, adherence to which will help minimise upward reflected light. Organisations from which full details of these standards can be obtained are given on the last page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

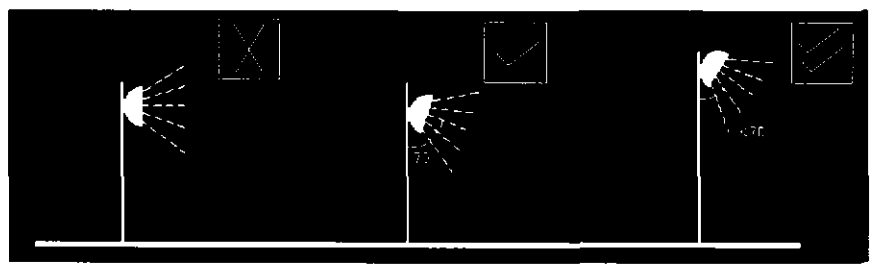
Dim or switch off lights when the task is finished. Generally a lower level of lighting will suffice to enhance the night time scene than that required for safety and security.

ILE Copyright 2005



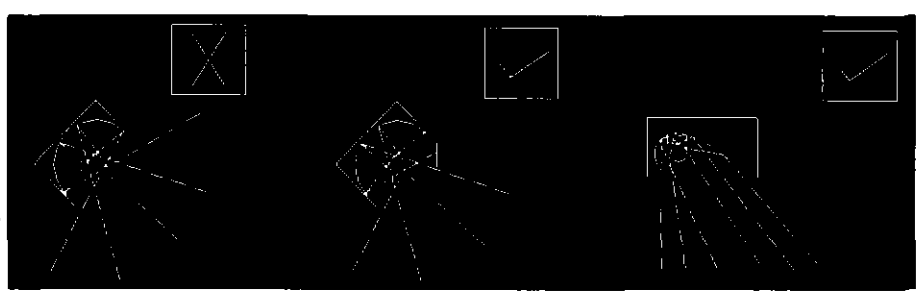


Use specifically designed lighting equipment that minimises the upward spread of light near to and above the horizontal. Care should be taken when selecting luminaires to ensure that appropriate units are chosen and that their location will reduce spill light and glare to a minimum. Remember that lamp 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

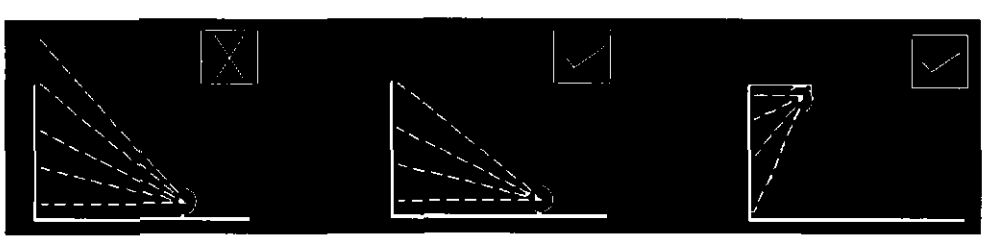


Keep glare to a minimum by ensuring that the main beam angle of all lights directed towards any potential observer is not more than 70°. Higher mounting heights allow lower main beam angles, which can assist in reducing glare. In areas with low ambient lighting levels, glare can be very obtrusive and 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.

ILE Copyright 2005

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.

Table 1 – Obtrusive Light Limitations for Exterior Lighting Installations

Environmental Zone	Sky Glow ULR [Max %] [1]	Light Trespass (into Windows) Ev [Lux] [2]		Source Intensity I [kcd] [3]		Building Luminance Pre-curfew [4]
		Pre- curfew	Post- curfew	Pre- curfew	Post- curfew	Average, L [cd/m2]
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/m2

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.

ILE Copyright 2005

Table 2 – Maximum Values of Threshold Increment from Non-Road Lighting Installations				
Light Technical Parameter TI	Road Classification [5]			
	No road lighting	ME5	ME4/ ME3	ME2 / ME1
	15% based on adaptation luminance of 0.1cd/m^2	15% based on adaptation luminance of 1cd/m^2	15% based on adaptation luminance of 2 cd/m^2	15% based on adaptation luminance of 5 cd/m^2

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) *(Out of Print)*

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) (Out of Print)

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
- Lighting the Environment - A guide to good urban lighting (1995)

ILE/CSS Joint Publications
- 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.

© 2005 The Institution of Lighting Engineers. Permission is granted to reproduce and distribute this document, subject to the restriction that the complete document must be copied, without alteration, addition or deletion.

APPENDIX 15.2: LIGHTING CONSULTATION

Old Mill Lane, Barnsley

Telephone Conversation Record

Lighting Consultation

Consultation with Barnsley Metropolitan Borough Council

BETWEEN:	Alan Pearson	**AND**	Lucy Allen (Regulatory Services)
DATE:	21/09/2011	**Time:**	10.00
JOB NO.	20470	**PROJECT:**	Old Mill Lane
SUBJECT:	Lighting Effects Assessment	Tel	01226 772 455
COPIES TO:			

Details:

AP contacted LA to discuss the scope of the lighting assessment and baseline lighting conditions survey. It was ascertained that the methodology and scope of the assessment were comprehensive and acceptable for this Site. LA confirmed the location of sensitive receptors that need to be assessed along Burton Road and Twibell Street. LA outlined that there were also residential properties along Old Mill Lane but they did not need to be considered in the lighting assessment due to the large distance to the Site and there were no direct views of the Site to these properties.

AP outlined the effect of lighting on sensitive ecological species (in particular bats) would be assessed by WSP ecologist in the ecological chapter of the Environmental Statement.

APPENDIX 15.3: GLOSSARY OF TERMINOLOGY

Appendix 15.3 – 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/m2).
- **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/m2).
- **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^2).
- **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.

APPENDIX 15.4: DETAILED BASELINE LIGHTING RESULTS

Appendix Table 15.4: Detailed Baseline Lighting Survey Results

Location	Vertical Illuminance (Lux)*				Horizontal Illuminance (Lux)	ILE Zone Criteria	Baseline Survey Comments
	North	East	South	West			
NV1	1.58	4.23	0.31	1.58	0.97	E3	The current night-time scene, viewed in all directions (360 degrees) from NV1 Located on raised ground in the A61 Link Rod construction site, north-west of the Site, is illustrated in **Figure X.2.** This is situated approximately 120m from the north-eastern boundary of the Site. The predominant lighting at this location comprises of highways lighting fitted with low pressure sodium (LPS) lamps mounted in shallow bowl lanterns on columns approximately 12m in height. Such installations are typical along Burton Road adjacent to this viewpoint. In an easterly direction of the viewpoint the first highways lighting comprises a refractor optic with bowl fitted with a LPS lamp mounted on a 12m high column. This LPS light source generated high levels of glare with luminance levels of 7816cd/m^2 recorded at a distance of approximately 20m. The highways lighting comprise refractor optics with bowls fitted with LPS lamps and are situated on alternative sides of the road. Moving east along Burton Road values of 3369cd/m^2 and 789.8cd/m^2 were recorded respectively. Moving west along Burton Road the lighting is dominated by highways lighting in the form of LPS lamps mounted on 12m high columns located on alternating sides of the road. The recorded luminance levels are recorded, moving away from NV1 along Burton Road, as 2158cd/m^2, 466cd/m^2, 92.11cd/m^2, 251cd/m^2, 146.5cd/m^2, and 29.83cd/m^2. In a southerly direction, the horizon is dominated by asymmetric floodlighting mounted on 40m columns associated with the Peel Retail Park. The luminance levels were recorded moving from east to west as: 44.28cd/m^2, 57cd/m^2, 23cd/m^2, 3.5cd/m^2, 5.8cd/m^2, 3.64cd/m^2, and 416cd/m^2.Further west, the lighting is dominated by LPS lamps associated with highways lighting with luminance values working from east to west recorded as: 2.12cd/m^2, 9.8cd/m^2, 9.6cd/m^2, 6.22cd/m^2, and 20.68cd/m^2. There are three high pressure sodium (HPS) lamps associated with the Asda retail store which recorded luminance values of 3.3cd/m^2, 2.8cd/m^2 and 1.7cd/m^2. Along Old Mill Lane to the west of the Site, there are a number of LPS lamps mounted on 12-14m columns approximately 30m apart associated with highways lighting and these were recorded as 7.5cd/m^2, 3.3cd/m^2, 9.5cd/m^2, 7.13cd/m^2, 2.23cd/m^2, and 2.84cd/m^2. NV1 shows that the Site is situated in a brightly lit urban environment with lighting to the north, west and south. The post-curfew operation of the lighting at this location, the illuminance levels can be considered representative of the obtrusive light limitations for an **E3 Environmental Zone.** This is considered generally typical of the obtrusive light limitations for an area of "medium district brightness" under current ILE Guidance (2005). The vertical illuminance levels, which are representative of the light spill experienced at this location, are due to the surrounding townscape and are affected predominantly by modern highways lighting adjacent to Burton Road.
NV2	21.34	8.05	26.45	23.88	25.47	E4	The current night-time scene, viewed in all directions (360 degrees) from NV2 located on the junction between Twibell Street and Harborough Hill Road adjacent to the south-western boundary of the Site. This viewpoint has views into the southern section of the Site, along Twibell Street, along Old Mill Lane, and along Harborough Hill Road. The views from NV2 are illustrated in **Figure X.3**. From NV2 looking north along Old Mill Lane, there are highways lighting comprise reflector optics with bowls fitted with HPS lamps mounted on approximately 12-14m columns close to the junction with Harborough Hill Road with the closest moving north along Old Mill Lane recording luminance values of 48,950cd/m^2, 1823cd/m^2, 141.7cd/m^2, and 145.3cd/m^2.

Location	Vertical Illuminance (Lux)*				Horizontal Illuminance (Lux)	ILE Zone Criteria	Baseline Survey Comments
	North	East	South	West			
							The illuminance reading associated with the Asda signage is 63.44cd/m2, and the highways lighting fitted with HPS lamps mounted on 12-14m columns located between Asda and the Site were recorded as 7717cd/m^2 (approximately 10m), 223.4cd/m^2 and 84.22 cd/m^2 (approximately 100m). Looking south, moving away from the Site along Harborough Hill Road, there are highways lighting fitted with HPS lamps mounted on 12-14m columns moving uphill with the closest approximately 100m away and the furthest extending to 300m. The luminance readings 100m to 300m are 168.4cd/m^2, 91.61cd/m^2, 297.4cd/m^2 and 16.11cd/m^2. Looking east along Twibell Street, there are highways lighting fitted with LPS lamps mounted on 6m columns with the closest LPS located next to NV2. The luminance readings moving further east along Twibell Street were 14,946cd/m^2, 372.3cd/m^2 and 32.64cd/m^2. The post-curfew operation of the lighting at this location, the illuminance levels can be considered representative of the obtrusive light limitations for an **E4 Environmental Zone**. This is considered generally typical of the obtrusive light limitations for an area of "high district brightness" under current ILE Guidance (2005). The vertical illuminance levels, which are representative of the light spill experienced at this location, are due to the surrounding townscape and are affected predominantly by modern highways lighting adjacent to Burton Road.
A	0.41	0.05	0.02	0.13	0.12	E2	Monitoring location A is situated on Site next to the culvert located on the River Dearne approximately 10-15m western perimeter. The ambient lighting conditions at this location are primarily influenced by highways lighting comprising reflector optics with bowls fitted with LPS and HPS lamps mounted on columns approximately 12-14m in height along Old Mill Lane. Other lighting sources are the floodlighting associated with the construction compound located on the northern section of the Site and highways LPS lamps located along Burton Road. There is a large amount of screening associated with the trees and vegetation along the banks of the River Dearne, which effectively screen the south section of the Site from the north. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) such illuminance levels are considered representative of an **E2 Environmental Zone**. This is considered generally representative of the obtrusive light limitations for an area of 'low distinct brightness'.
B	0.03	0.00	0.01	0.02	0.02	E2	Monitoring location B is situated in the centre of the Site on the northern bank of the River Dearne and is representative of the ambient lighting conditions within the northern section of the Site. The ambient lighting conditions at this location are influenced by highways lighting fitted with LPS lamps along Burton Road. Otherwise there are no other apparent sources of lighting in the immediate vicinity. This monitoring location is in the northern section of the Site adjacent to the River Dearne which runs west to east through the centre of the Site. The Site's topography slopes on either side of the River down towards the River Dearne in the centre of Site. There is a large amount of screening associated with the trees and vegetation along the banks of the River Dearne, which effectively screen the south section of the Site from the north. The illuminance levels are low in the centre of the Site and in accordance with post-curfew values stipulated under current ILE Guidance (2005) are considered representative of an **E2 Environmental Zone**. This is considered generally representative of the obtrusive light limitations for an area of 'low distinct brightness'.

Location	Vertical Illuminance (Lux)*				Horizontal Illuminance (Lux)	ILE Zone Criteria	Baseline Survey Comments
	North	East	South	West			
C	0.11	0.07	0.16	0.03	0.06	E2	Monitoring location C is situated on the northern bank of the River Dearne approximately 40m from the eastern boundary of the Site. The ambient lighting levels are representative of the River Dearne corridor. The ambient lighting conditions at this location are influenced by highways lighting fitted with LPS lamps along Burton Road, and the asymmetric floodlighting associated with Booker's Cash and Carry Warehouse located on the southern bank of the River Dearne. The warehouse has a number of floodlightings attached to the building which provide security lighting at night. There are intermittent views of the warehouse on the southern bank of the River Dearne resulting from trees and vegetation acting as screening on the banks of the River. Otherwise there are no other apparent sources of lighting in the immediate vicinity. The topography slopes down to this monitoring location due to its location at the bottom of the valley next to the river. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) such illuminance values are considered representative of an **E2 Environmental Zone**. This is considered generally representative obtrusive light limitations for an area of 'low district brightness'.
D	0.23	0.20	0.05	0.08	0.15	E2	Monitoring location C is situated on the northern bank of the River Dearne adjacent to the eastern boundary of the Site. The ambient lighting at this location is primarily influenced by highways lighting comprising refractor optics with bowls fitted with LPS lamps situated on Burton Road to the north. The land to the east of the Site boundary is occupied by the Dearne Valley Country Park and Local Nature Reserve which is an unlit and undeveloped environment. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) such illuminance values are considered generally representative of an **E2 Environmental Zone**. This is considered representative obtrusive light limitations for an area of 'low distinct brightness'.
E	9.27	6.49	0.37	1.63	1.14	E3	Monitoring location E is situated in the car park of the construction compound located in the northern section of the Site. The ambient lighting conditions are dominated by three asymmetric beam floodlights raised to a height of 10m which are associated with the security of the construction compound. Other influences on the ambient lighting levels are modern highways lighting fitted with HPS and LPS lamps mounted on 12-14m columns located on Old Mill Lane to the west, and highways lighting fitted with LPS lamps located on Burton Road to the north. This location is screened from the southern section of the Site by trees and vegetation along the banks of the River Dearne. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) such illuminance levels are considered representative of an E4 Environmental Zone however because this reading was taken directly underneath adirect light source in a dark area this has been factored down to an **E3 Environmental Zone**. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'medium distinct brightness' under current ILE 2005 Guidance.
F	9.26	1.73	3.79	8.69	5.48	E3/E4	Monitoring location F is situated outside residential properties at 6 Burton Road approximately 120m north of the Site. The ambient lighting is dominated by highways lighting comprising refractor optics with bowls fitted with LPS lamps mounted on 12m columns along Burton Road and Old Mill Lane. The lighting conditions are also subject to fugitive

Location	Vertical Illuminance (Lux)*				Horizontal Illuminance (Lux)	ILE Zone Criteria	Baseline Survey Comments
	North	East	South	West			
							lighting from residential properties along Burton Road. At this monitoring location there are a number of 2 storey houses with direct and intermittent views into the Site. The Wickes retail store provides a level of screening for a number of houses along Burton Road, and along with trees planted along Burton Road provides intermittent views of the Site. The southern section of the Site is screened from view by the trees and vegetation associated with the River Dearne. This monitoring location is representative of a sensitive residential receptor with direct/intermittent views of the Site. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) is considered representative of an **E3/E4 Environmental Zone** because whilst readings exceeded the E4 threshold the level of light varied considerably due to inconsistent lighting along Burton Road. It is considered such values are generally representative of the obtrusive light limitations for an area of 'medium distinct brightness'.
G	1.49	0.30	0.12	0.32	0.42	E3	Monitoring location G is situated in the car park of flats located between Burton Road and the Site. This location is approximately 50m from the northern Site boundary. The ambient lighting conditions at this location is predominantly influenced by security floodlighting along the 3 storey flats and fugitive lighting from residential flats. The longer distance views are influenced by light from highways lighting fitted with LPS lamps and asymmetric floodlighting on the horizon. From this monitoring location there are direct views into the north-western section of the Site, and restricted/intermittent views into the north-eastern section of the site due to sparse trees and vegetation acting as screening. From higher windows none of the views are restricted resulting in direct views into the entire northern section of the Site. The southern section of the Site is screened by the trees and vegetation running adjacent to the River Dearne. In accordance with the pre and post-curfew values stipulated under current ILE Guidance (2005) such illuminance levels are considered representative of an **E3 Environmental Zone**. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'medium distinct brightness' under current guidance.
H	1.83	13.14	9.48	4.95	8.81	E3/E4	Monitoring location H is situated further to the east along Burton road outside residents located at 86 Burton Road. This monitoring location is approximately 140m north-east of the Site and is representative of a sensitive residential receptor with direct views into the Site. The ambient lighting conditions are dominated by highways lighting comprising refractor optics with bowls fitted with LPS lamps mounted on 12m columns on alternative sides of Burton Road. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) such illuminance levels are considered representative of an **E3/E4 Environmental Zone** because whilst readings exceeded the E4 threshold, the levels of light varied considerably with inconsistent levels of lighting along Burton Road. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'medium district brightness' and 'high distinct brightness'.
I	7.57	1.48	19.41	6.74	12.29	E4	Monitoring location I is situated on Old Mill Lane adjacent to the western boundary of the Site. The ambient lighting is predominantly influenced by a mixture of highways lighting comprising reflector optics with bowls fitted with HPS lamps mounted on 12-14m columns situated at 30m intervals on both sides of Old Mill Lane. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) such illuminance levels are

Location	Vertical Illuminance (Lux)*				Horizontal Illuminance (Lux)	ILE Zone Criteria	Baseline Survey Comments
	North	East	South	West			
							considered representative of an **E4 Environmental Zone**. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'high distinct brightness'.
J	1.58	0.25	6.76	9.99	1.44	E3/E4	Monitoring location J is located in the car park of Howdens and Plumb Center retail warehouses situated in the southern section of the Site. The ambient lighting conditions are predominantly affected by one asymmetric beam floodlight mounted upon the Plumb Center warehouse building, and also the highways lighting fitted with HPS lamps mounted on 12-14m columns along Old Mill Lane. The northern section of Site is screened by trees and vegetation associated with the River Dearne in the centre of the Site. In accordance with the post-curfew values stipulated under current ILE Guidance (2005) such illuminance levels are considered representative of an **E3/E4 Environmental Zone** because although certain readings exceed the E4 threshold, these were over-elevated as a result of bulkhead security floodlighting associated with the adjacent warehouses. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'medium district brightness' and 'high distinct brightness'.
K	0.49	8.89	4.92	0.87	12.19	E3/E4	Monitoring location K is located outside of a block of residential properties situated at 39 Twibell Street. This location is approximately 12m from the southern boundary of the Site. Twibell Street is predominantly lit by modern highways lighting comprising reflector optics with bowls fitted with of a mixture of LPS and HPS lamps mounted on approximately 6m tall columns positioned 20m intervals. Ambient lighting conditions are also influenced by minimal levels of fugitive lighting associated with residential properties. The southern section of the Site is screened by a 2m wall for the ground floor of the 2 storey houses with views on the second floor being unobstructed into the Site. This monitoring location was selected as a representative of a sensitive residential receptor located to the south of the Site. In accordance with the post-curfew values under current ILE Guidance (2005) such illuminance levels are considered representative of an **E3/E4 Environmental Zone** because readings exceed the E4 threshold; however the light varied considerably with inconsistent levels of lighting along Twibell Street. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'medium district brightness' and 'high district brightness'.
L	2.40	0.76	0.48	3.27	1.86	E3	Monitoring location L is situated outside of the existing entrance to the retail units on the southern section of Site on Twibell Street. The lighting conditions at this monitoring location are the same sources of lighting visible in monitoring location K. In addition, the ambient lighting is influenced by highways lighting comprising reflector optics with bowls fitted with HPS lamps associated with Harborough Hill Road. In accordance with the post-curfew values under current ILE Guidance (2005) such illuminance levels are considered representative of an **E3 Environmental Zone**. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'medium district brightness'.

Location	Vertical Illuminance (Lux)*				Horizontal Illuminance (Lux)	ILE Zone Criteria	Baseline Survey Comments
	North	East	South	West			
M	7.88	16.78	7.49	8.68	6.99	E4	Monitoring location M is situated in the centre of the Asda retail store's car park approximately 100m west of the Site. The ambient lighting conditions are predominantly affected by the 6 HPS asymmetric beam floodlights located across the car park, which are indicative of modern car park lighting for supermarket developments. The HPS lamps are mounted on columns of approximately 40m with full horizontal cut off. In accordance with the post-curfew values under current ILE Guidance (2005) such illuminance levels are considered representative of an **E4 Environmental Zone**. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'high district brightness'.
N	3.39	28.85	12.46	14.16	10.8	E3/E4	Monitoring location N is situated outside residential properties located at 7 Twibell Street approximately 12m from the southern boundary of Site. The lighting conditions at this monitoring location are similar to monitoring location L with the predominant sources of lighting coming from modern highways lighting consisting of reflector optics with bowls fitted with a mixture of LPS and HPS lamps mounted on approximately 6m tall columns positioned 20m intervals and levels of lighting associated with residential properties. In addition ambient lighting is influenced by modern highways lighting fitted with HPS located along Harborough Hill Road and Old Mill Lane. This monitoring location is representative of a sensitive residential receptor with direct views into the southern section of the Site. The topography at Twibell Street slopes down towards the River Dearne in the centre of the Site; therefore Twibell Street is raised with direct and unobstructed views into the southern section of the Site. The vegetation running along the River Dearne screens the north of the Site. In accordance with the post-curfew values under current ILE Guidance (2005) such illuminance levels are considered representative of an **E3/E4 Environmental Zone** because although readings exceed the E4 threshold, these readings were taken directly beneath a light source and not representative of the lighting conditions. It is considered that such levels are generally representative of the obtrusive light limitations for an area of 'medium district brightness' and 'high district brightness'.