Hirwaun Power Project

Outline Lighting Strategy

On behalf of **Hirwaun Power Ltd.**

Project Ref: 28777 | Issue 02 | August 2014

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Glossary of Terms

Bat Conservation Trust (BCT): The leading Non-Governmental Organisation or charity devoted to the conservation of bats and the landscapes on which they rely;

Brecon Beacons National Park Authority: A non-governmental body setup to carry out the statutory purposes and duty of National Parks as set out in the 1995 Environment Act;

Cutoff lighting system: A luminaire having a light distribution in which the candela per 1000 lamp lumens does not numerically exceed 25 (2.5%) at or above an angle of 90 deg above the nadir;

Development Consent Order (DCO) Application: the application for a DCO made to the Secretary of State under section 37 PA 2008 in respect of the Project, required pursuant to section 31 PA 2008 because the Project constitutes a Nationally Significant Infrastructure Project under section 14 (1)(a) and section 15 PA 2008 by virtue of being an onshore generating station in England or Wales of 50 MWe capacity or more;

Department for Communities and Local Government (DCLG): UK Government department responsible for UK policy in building regulations, community cohesion, decentralisation, fire services and community resilience, housing, local government, planning, race equality, the Thames Gateway and urban regeneration

Draft Development Consent Order (DCO): the draft DCO which accompanies the DCO Application (Document Number 3.1);

Electrical Connection: a new underground electrical cable connection to export electricity from the Power Generation Plant into the national electricity transmission system at the Rhigos Substation (Work No. 5 in the Draft DCO);

Full cutoff lighting system: A term used to describe luminaires that have no direct uplight (no light emitted above horizontal);

Gas Connections: a new underground gas pipeline connection to bring natural gas to the Power Generation Plant from the existing high pressure gas network NTS in the vicinity of the proposed Project Site including the Above Ground Installation (AGI) for the gas pipeline at the point of connection to the NTS, as well as a new permanent access to the AGI (Works No. 3 & 4 in the Draft DCO);

High Pressure Sodium Lantern: a gas-discharge lamp that uses sodium in an excited state to produce light at high pressure with other elements such as mercury;

Institution of Lighting Professionals: The UK and Ireland's largest lighting association, dedicated solely to excellence in lighting;

Landscape and Visual Impact Assessment (LVIA) looks at the landscape and visual aspects of a proposed development;

Low Pressure Sodium Lantern: a gas-discharge lamp that uses sodium in an excited state to produce light. These lamps have a borosilicate glass gas discharge tube containing solid sodium, a small amount of neon, and argon gas in a Penning mixture to start the gas discharge;

Post-curfew: After the time when stricter requirements (for the control of obtrusive light) will apply. If not otherwise stated, 23.00 hours is suggested.

Power Generation Plant Site: the site of the Power Generation Plant (Work No. 2 in the Works Plan);

Power Generation Plant: a Simple Combined Gas Turbine gas fired 'peaking' power generating plant capable of providing up to 299 MWe (Work No. 2 in the Draft DCO);

Pre-Curfew: Before the time when stricter requirements (for the control of obtrusive light) will apply. If not otherwise stated, 23.00 hours is suggested.

Project Site: the site of the Project corresponding to the Order Limits of the Draft DCO;

Project: the Power Generation Plant, the Electrical Connection and the Gas Connection together;

Rhondda Cynon Taf County Borough Council (RCT): The governing body for the borough of Rhondda Cynon Taf;

Semi cutoff lighting system: A luminaire having a light distribution in which the candela per 1000 lamp lumens does not numerically exceed 50 (5%) at or above an angle of 90 deg above the nadir;

Simple cycle gas turbine (SCGT): The generating technology used for the Power Generation Plant. A gas plant technology system comprising Gas Turbine(s) fuelled by natural gas. The hot exhaust gases are routed directly to the stack without passing through a secondary steam turbine;

Site of Importance for Nature Conservation (SINC): An area of local importance for nature conservation protected by planning policy;

Site of Special Scientific Interest (SSSI): A geological or biological conservation designation denoting a protected area in the United Kingdom;

SOX: Low Pressure Sodium Lantern.

SON: High Pressure Sodium Lantern,

Special Area of Conservation (SAC): Areas of protected habitats and species as defined in the European Union's Habitats Directive (92/43/EEC);

The Developer: means Hirwaun Power Limited;

Executive Summary

Peter Brett Associates LLP (PBA) has been commissioned by Hirwaun Power Ltd. (HPL) to develop an Outline Lighting Strategy for a new Power Generation Plant, Electrical Connection and Gas Connection on land at the Hirwaun Industrial Estate, Hirwaun, Rhondda Cynon Taf, south Wales (hereafter referred to as the proposed Project).

The proposed Project is entirely within the administrative boundary of Rhondda Cynon Taf County Borough Council and lies 250 m south of the Brecon Beacons, an area that is administered by the Brecon Beacons National Park Authority.

The Power Generation Plant Site is currently occupied by industrial units which are owned and operated by International Greetings UK Ltd. Land over which the Electrical Connection is situated is characterised by minor roads and hardstanding within Hirwaun Industrial Estate. Land over which the Gas Connection route corridor would cross is hardstanding, agricultural land, improved grassland and semi-natural habitats.

A qualitative assessment of the existing levels of lighting in the area has been established through a Site survey undertaken on 14th August 2014, desk based review of daytime photographs and aerial photography.

The site is currently not used to its full capacity. The current occupier's main operation is undertaken from Building 1. Buildings 3, 4 and 6 are currently not in use. No operational external lighting was identified on Building 4 and 6.

The main sources of external artificial lighting include metal halide security lighting, and fluorescent tubes in the service yard. Most external lighting is currently not in use and considered sub-standard for existing operations and would result in obtrusive lighting (sky glow and light spill) typical for lights of their age.

A viewpoint in the National Park was specifically examined during the night-time to assess the visual effects of existing artificial lighting within the Site on the Brecon Beacons National Park. Street lighting and security lighting within the settlement of Hirwaun and Hirwaun Industrial Estate were visible at night-time. However, no glare or sky-glow was perceived at this distance.

The three main elements of the proposed Project comprise:

(a) simple cycle gas turbine power generation plant capable of providing 50 - 299 MWe (the Power Generation Plant);
(b) an integral underground electrical cable connection line to export electricity from the power generation plant into the National Grid at Rhigos Substation; and
(c) an integral underground gas connection to bring natural gas to the power generation plant from the existing high pressure gas network (including an above ground installation and new access).

The proposed Project Site and surrounding areas are considered to be located in a rural area of low district brightness and therefore falls within **ILP Environmental Zone E2**. This is with the exception of a Special Area of Conservation (SAC), Site of Special Scientific Interest (SSSI), two Sites of Importance for Nature Conservation (SINC) and the Brecon Beacons National Park. All of these designated sites are considered to be natural areas that are intrinsically dark and lie within **ILP Environmental Zone E1**.

The Outline Lighting Strategy for the proposed Project Site is based on a number of design objectives that consider national, regional and local planning policies, and light sensitive receptors identified by guidance documents.

A key design objective of the Outline Lighting Strategy is that lighting levels should not normally exceed levels above the ILP classification that has been defined for that area.

Additional design objectives of this Outline Lighting Strategy relate to good practice measures during demolition, construction and decommissioning.

Overall, the lighting design should result in less light trespass and light spill from the existing sources of lighting on the proposed Project Site. The potential for obtrusive light to arise from the proposed Project is negligible if the design objectives identified in this report are adopted and the limits in the recommended ILP environmental zones can be achieved.

Specific design objectives to minimise the adverse effects of lighting through operation will be controlled by terms of the DCO and during demolition, construction and decommissioning through the Environmental Management Plan.

On the basis of this assessment and subject to the incorporation of the recommendations set out in this report, it is considered that external lighting should not pose a material constraint to the Proposed Development.

This Executive Summary contains an overview of the key findings and conclusions. However, no reliance should be placed on any part of the executive summary until the whole of the report has been read.

1 Introduction

1.1 Background

1.1.1 Peter Brett Associates LLP (PBA) has been commissioned by Hirwaun Power Ltd. (HPL) to develop an Outline Lighting Strategy for a new Power Generation Plant, Electrical Connection and Gas Connection (hereafter referred to as the proposed Project) on land at the Hirwaun Industrial Estate, Hirwaun, Rhondda Cynon Taf, South Wales.

1.1.2 The proposed Project constitutes a Nationally Significant Infrastructure Project (NSIP) and therefore the Outline Lighting Strategy will support the development consent order (DCO) for submission to the Secretary of State (the DCO Application).

1.1.3 A Lighting Design will be prepared during the Detailed Design stage of the proposed Project when further information is available. The Lighting Design will follow the recommendations that have been set-out in this Outline Lighting Strategy. This is likely to form part of the requirements of the DCO.

1.2 Site Location

1.2.1 Hirwaun Industrial Estate is located adjacent to the A465 Heads of the Valley dual carriageway and is approximately 29 miles north-west of Cardiff and 5 miles west of Merthyr Tydfil. The industrial estate lies entirely in the county borough of Rhondda Cynon Taf.

1.2.2 The proposed Power Generation Plant site is in a central location within Hirwaun Industrial Estate. It occupies an area of approximately 9.4 hectares and is centred on Grid Reference (NGR) SN 938 061. The Gas Connection route corridor is approximately 900 m in length between the Power Generation Plant Site and its connection to the National Transmission System to the south. The Electrical Connection route is approximately 680 m in length between the Power Generation Plant Site and the new Rhigos Substation to the west. A Location Plan of the proposed Project Site is provided in **Appendix A** of this document (outline strategy environmental zone plan).

1.3 Proposed Project

1.3.1 The proposed Project consists of a Power Generation Plant, Gas Connection and Electrical Connection. These three elements are all integral to the generation of electricity and the subsequent export of that electricity to the National Grid. The DCO Application includes the whole of the proposed Project.

1.3.2 The three main elements of the proposed Project are shown in **Appendix A** of this document (outline strategy environmental zone plan) and comprise:

- A simple cycle gas turbine power generation plant capable of providing 50 - 299 MWe (the Power Generation Plant);

- an integral underground electrical cable connection line to export electricity from the power generation plant into the National Grid at Rhigos Substation; and

- an integral underground gas connection to bring natural gas to the power generation plant from the existing high pressure gas network (including an above ground installation and new access).

1.3.3 A more detailed description of the lighting infrastructure associated with the development is provided in **Section 5**.

1.4 Scope of Work

1.4.1 This report describes a qualitative assessment of the existing levels of external lighting in and surrounding the proposed Project Site and establishes ambient night-time Environmental Zone classifications set out in the Institution of Lighting Professionals (ILP) guidelines (ILP, 2011).

1.4.2 The potential requirement for external lighting arising from the operational phases of the proposed Project is also considered, with obtrusive light control measures recommended where appropriate.

1.4.3 The temporary effect of external lighting during the demolition, construction and decommissioning stages of the proposed Project is only considered in outline. This is because the location of this lighting by its nature is uncertain, depending on the detailed programming of works. Nevertheless, obtrusive light control measures are recommended, where relevant, for both temporary activities and during operation of the proposed Project.

1.4.4 The recommendations set out in this report will be used to prepare a detailed Lighting Design for the proposed Project Site during the Detailed Design stage.

2 Policy and Guidance

2.1 National Policy

2.1.1 Section 104 of the Planning Act (2008) provides that in making decisions on DCO applications, the Secretary of State must have regard to any relevant National Planning Statements (NPS) and must decide applications in accordance with it unless the adverse impacts of the proposal would outweigh its benefits (or in certain other limited circumstances).

2.1.2 The NPS that is most relevant to the consideration of the DCO Application for the proposed Project in terms of the lighting strategy is EN-1.

NPS EN-1 (Dust, odour, artificial light, smoke, steam and insect infestation)

2.1.3 Paragraph 5.6.5: "*Assessment in the ES should describe:*

- *the type, quantity and timing of emissions;*
- *aspects of the development which may give rise to emissions;*
- *premises or locations that may be affected by the emissions;*
- *effects of the emission on identified premises or locations;*
- *and measures to be employed* in preventing or mitigating the emissions"

2.1.4 Paragraph 5.6.7: "*The IPC* [Secretary of State] *should satisfy itself that:*

- *an assessment of the potential for artificial light, dust, odour, smoke, steam and insect infestation to have a detrimental impact on amenity has been carried out; and*
- *that all reasonable steps have been taken, and will be taken, to minimise any such detrimental impacts.*"

Landscape and visual (NPS EN-1)

2.1.5 In relation to developments outside nationally designated areas which might affect them the following paragraphs apply.

2.1.6 Paragraph 5.9.12: "*The duty to have regard to the purposes of nationally designated areas also applies when considering applications for projects outside the boundaries of these areas which may have impacts within them. The aim should be to avoid compromising the purposes of designation and such projects should be designed sensitively given the various siting, operational, and other relevant constraints"*

2.1.7 Paragraph 5.9.11 continues: *"The fact that a proposed project will be visible from within a designated area should not in itself be a reason for refusing consent"*

2.2 Wales Policy

2.2.1 Planning Policy Wales (Edition 5, November 2012) (PPW) and Associated Technical Advice Notes (TAN) sets out the land use planning policies of the Welsh Government (WG) and is supplemented by 21 topic based Technical Advice Notes (TANs).

2.2.2 Chapter 13 (Minimising and Managing Environmental Risks and Pollution), Section 13.13 (Reducing noise and light pollution) states:

"*13.13.2: There is a need to balance the provision of lighting to enhance safety and security to help in the prevention of crime and to allow activities like sport and recreation to take place with the need to:*

- *protect the natural and historic environment including wildlife;*
- *retain dark skies where appropriate;*
- *prevent glare and respect the amenity of neighbouring land uses; and*
- *reduce the carbon emissions associated with lighting.*

Lighting to provide security can be particularly important in rural areas"

"*13.15.3 Local authorities can attach conditions to planning permissions for new developments that include the design and operation of lighting systems (for example, requiring energy-efficient design) and prevent light pollution.*"

2.3 Local Policy

Rhondda Cynon Taf Local Development Plan up to 2021 (2011)

2.3.1 The Rhondda Cynon Taf Local Development Plan up to 2021 was adopted by the Council in March 2011 and sets out *".....the framework for decisions to be made up until 2021 on how land is used in the County Borough, for example what type of development is appropriate or desirable and how best to protect our environment*".

2.3.2 Policy AW10 (Environmental Protection and Public Health) "*Development proposals will not be permitted where they would cause or result in a risk of unacceptable harm to health and / or local amenity because of…(3) Light Pollution …or any other identified risk to the environment, local amenity and public health or safety unless it can be demonstrated that measures can be taken to overcome any significant adverse risk to public health, the environment and/or impact upon local amenity.*"

Brecon Beacons National Park International Dark Sky Reserve - Lighting Management Plan

2.3.3 The Brecon Beacons National Park has duties under the Environment Act to protect the special qualities of the National Park and also is designated as an International Dark Sky Reserve. The management plan for the Dark Sky Reserve forms a base document of advice and recommendations for the Brecon Beacons National Park Authority.

2.3.4 The Brecon Beacons National Park Authority has set guidance for lighting levels within 5 miles of the park boundary called an External Zone.

2.3.5 Typical Obtrusive Light recommendations for the External Zone include:

- ILP Environmental Zone E1 (ILP, 2011) – for lamp lumens > 20,000 (includes the use of full cut-off installations).
- ILP Environmental Zone E2 (ILP, 2011) - For 5 miles beyond park boundary limit with rural setting (includes the use of semi-Cut-off installations).

2.4 Other Guidance

2.4.1 The Institution of Lighting Professionals (ILP) Guidance Notes for the Reduction of Obtrusive Light (2011) provides advice on lighting including the recommendation to local planning authorities to specify Environmental Zones for exterior lighting based on the existing external lighting levels in the area. These documents also provide design guidance including maximum lighting level limits for each ambient night-time Environmental Zone – focusing on sky glow light intrusion (into windows) and glare (intensity) in particular.

2.4.2 The Department for Communities and Local Government (DCLG) *Guidance on Lighting in the Countryside: Towards Good Practice* (1997) provides advice on the assessment of lighting schemes in the countryside and recommends good practice measures for England and Wales. The document provides advice on the principles of lighting and the effects on people and the environment; gives guidance on how to prepare, design and assess lighting schemes and suggests how local authorities can implement the recommendations within their policies.

2.4.3 The document *Assessment of the Problem of Light Pollution from Security and Decorative Light* produced by Temple and NEP Lighting Consultancy on behalf of Defra is a summary of current legislation and guidance relating to external artificial lighting. The document is aimed at providing advice to English and Welsh local authority officers on assessing whether lighting is causing a statutory nuisance, and providing advice on how to mitigate such impacts.

2.4.4 The Bat Conservation Trust document *Bats and Lighting in the UK* (May, 2009) is designed to provide guidance on general principles of lighting to

mitigate adverse effects on areas where bats are known to be present and / or commuting to feeding areas. The document sets out advice for bat workers and lighting designers to ensure that both parties work together to achieve the most effective solution in delivering an appropriate lighting solution whilst minimising the adverse effects on bats.

2.4.5 The Bat Conservation Trust (BCT) – *Statement on the Impact and Design of Artificial Light on Bats*. A supplemental to the May 2009 document cited above, this statement summarises the key issues associated with bats and artificial lighting, as well as summarising the main mitigation methods to reduce the adverse effects of lighting.

2.5 Legislation

2.5.1 The Clean Neighbourhoods and Environment Act 2005 (CNEA) amended the Environmental Protection Act 1990 to include within section 79 (statutory nuisance) "…artificial light emitted from premises so as to be prejudicial to health or a nuisance…" Therefore since 6 April 2006, artificial light can be considered to be a statutory nuisance. If a light nuisance is considered by a local authority to exist, the local authority must serve a notice on the person responsible requiring the abatement of the nuisance, and/or restricting or prohibiting its recurrence. Public street lighting is not considered as a statutory nuisance.

2.5.2 Section 62(2) of the Environment Act 1995 imposes a duty on all public bodies (including The Rhondda Cynon Taf County Borough Council) to have regard to National Park purposes when making their decisions or carrying out activities in relation to or so as to affect land within a National Park.

3 Methodology

3.1 Establishment of Baseline

3.1.1 The lighting baseline at the proposed Project Site has been established from a site survey, consultation with the current site owner and a desk based study of daytime photographs and aerial photography of the existing industrial/distribution complex.

3.1.2 The current site owner was consulted and a site walkover undertaken on 12th August 2014. During the daytime (16:20-19.00hrs) the weather conditions were variable with some sunny spells and cloud with intermittent rain showers.

3.1.3 Sunset was at 20:34 and the night-time survey was undertaken between 21:40 and 00:20hrs. The weather conditions at night-time were also variable. The survey was undertaken during a dry period and a bright waning gibbous moon and stars were clearly visible.

3.1.4 Establishing the existing external lighting baseline allows the impacts of the proposed Project to be compared and/or combined with the existing quality of the ambient night-time lighting environment. This will ensure an informed qualitative assessment of the potential impacts and allow the identification of the most appropriate mitigation which could be employed to minimise any adverse impacts.

3.1.5 Viewpoint 8 from the Landscape and Visual Impact Assessment (LVIA) [Document reference 6.1.0 Section 11] within the Brecon Beacons National Park to the north of the Site was also examined during the night-time survey on 12th August 2014 to assess the visual effects of existing artificial lighting from the existing Site.

3.1.6 The lighting baseline of the proposed Project Site has also been related to the definitions of various ambient night-time 'Environmental Zones' for lighting which are set out in the ILP guidance note on the reduction of obtrusive light (2011).

3.1.7 The ILP guidance classifies various environments into five ambient night-time Environmental Zones (E0 to E4), based on the nature and extent of artificial lighting that is present in an area. The definition of each classification is set out in **Table 3.1** below and, in the absence of quantitative measurement the descriptors provide the best tool for classifying a given locality in terms of the existing lighting environment.

3.2 Outline Lighting Strategy

3.2.1 The Outline Lighting Strategy for the proposed Project Site is based on a number of design objectives (see Section 6) designed to limit obtrusive light to light sensitive receptors (see Section 4.3) while considering national, regional and local planning policies (see Section 2).

Table 3.1 Lighting classifications described in the ILP Guidance

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty etc.
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night- time activity

3.2.2 The following three components of artificial light in open spaces contribute to the potential for obtrusive light:

- Sky glow – this is the general illumination of the night sky above conurbations and any areas where there are large amounts of artificial light. It comprises aspects of reflected light from illuminated surfaces, direct upward light from lighting installations and spill light, which is light which falls outside the specific area to be lit.

- Glare – this is the brightness of a light source when viewed against a dark background. Glare is most often experienced when the light source itself (i.e. the bulb or tube) is directly visible and is not covered by a shield, cowl or directed by a suitable lens / reflector arrangement.

- Light Intrusion (or 'trespass') is light which affects areas beyond those which are supposed to be lit by a particular source and which, depending on the nature of the receptor affected, has the potential to cause nuisance and disturbance.

3.2.3 General principles considered to prevent obtrusive light and protect the sensitive receptors surrounding the proposed Project Site have been provided in this Outline Lighting Strategy. A Lighting Design for the proposed Project will subsequently be prepared.

4 Existing Conditions

4.1 The Site

Summary Site Description

4.1.1 The proposed Project is entirely within the administrative boundary of Rhondda Cynon Taf County Borough Council (RCTCBC), although it is also lies 250 m south of the Brecon Beacons, an area that is administered by the Brecon Beacons National Park Authority (BBNPA).

4.1.2 The Power Generation Plant Site would be situated entirely within the Hirwaun Industrial Estate. The Industrial Estate currently accommodates several industrial units including a metal recycling facility and an industrial plant hire business. The Power Generation Plant Site is currently occupied by industrial units which are owned and operated by International Greetings UK Ltd. The largest unit being 300 m in length and 10 m high.

4.1.3 The Power Generation Plant Site is accessed via Main Avenue and Fourth Avenue, which both run through the Hirwaun Industrial Estate. These roads connect to Thirteenth Avenue and Fifth Avenue respectively, which in turn connect to Rhigos Road (to the south of the Power Generation Plant Site).

4.1.4 Land over which the Electrical Connection is situated is characterised by minor roads (Main Avenue and Fourteenth Avenue) and hardstanding within Hirwaun Industrial Estate.

4.1.5 Land over which the Gas Connection route corridor would cross is initially similar to the Power Generation Plant Site (i.e. industrial in nature) although the final two thirds of the route run through agricultural land, improved grassland and semi-natural habitats. The route includes one major road crossing, two minor road crossings, no major water crossings (i.e., Main Rivers) and four minor water crossings (e.g. field drains).

4.1.6 Existing development in the area that is of relevance to the assessment include the National Grid 400kV Rhigos substation extension (ref. 10/0113/10) to the north-west of the proposed Project Site which at the time of writing this report is in the process of being built.

Visual Amenity

4.1.7 A LVIA [Document reference 6.1.0 Section 11] has been undertaken for the proposed Project Site and has identified potential for effects on visual amenity at night-time from publically accessible viewpoints to the north of the proposed Project Site in the Brecon Beacons National Park. It should be noted however that many views from public road and footpaths are partially screened by vegetation.

4.1.8 Viewpoint 8 of the LVIA was specifically examined during the night-time to assess the visual effects of existing artificial lighting within the Site on the Brecon Beacons National Park. The view was widely screened by seasonal vegetation. In order to allow better views towards the site, additional photographs were taken just south of LVIA Viewpoint 8. The photographs undertaken during the survey of viewpoint 8 are included in **Appendix B**. Street lighting and security lighting within the settlement of Hirwaun and Hirwaun Industrial Estate were visible at night-time. However, no glare or sky-glow was perceived at this distance during the night-time survey.

4.1.9 The Brecon Beacons National Park is designated as an International Dark Sky Reserve. Any views from the National Park are not considered to be from the Core Zone of the Dark Sky Reserve. However, the proposed Project Site falls within an 'External Zone' designated as five miles from the National Park boundary.

Ecology

4.1.10 An Ecological Assessment, has been undertaken for the proposed Project Site the findings of which are docemented in the Environmental Statement [Document reference 6.1.0 Section 8]. The assessment confirms that the habitat provided by the existing buildings on the Power Generation Plant site is of local importance for bats. The identified bats are sensitive to external lighting.

4.1.11 The proposed Gas Connection crosses agricultural land, improved grassland and some semi-natural habitats, part of which is designated as Hirwaun Common Site of Importance for Nature Conservation (SINC). Bats have also been recorded foraging and commuting within these areas. Streams and ponds within this area are also used by foraging otters.

4.1.12 To the north-east of the proposed Project Site is Blaen Cynon, an area of wet grassland, wet heath, bog pools and swamp that is designated as a Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI). The SAC is designated for supporting a substantial population of marsh fritillary butterfly.

4.1.13 To the north-west of the proposed Project Site, close to the Rhigos substation, the Industrial Estate gives way to marshy, waterlogged grassland comprising some rushes and reeds. This area is outside of the proposed Project Site but is designated as a Site of Importance for Nature Conservation (SINC). The habitats support breeding birds and bats that are potentially sensitive to lighting impacts.

4.2 Existing Lighting

Proposed Power Generation Plant Site

4.2.1 The site is currently not used to its full capacity. The current occupier's main operation is undertaken from Building 1. Buildings 3, 4 and 6 are currently not in use. No operational external lighting was identified on Building 4 and 6.

4.2.2 The main sources of external artificial lighting include metal halide security lighting, fluorescent tubes in the service yard to the north and low level emergency exit lighting over doorways. Most external lighting is currently not in use and considered sub-standard for existing operations and would result in obtrusive lighting (sky glow and light spill) typical for lights of their age.

4.2.3 According to the current site owner there are 26 metal halide security lights on site only eight of which are currently operational. The lights identified during the survey are illustrated in figure 4.1. A further eight lights are being repaired and will soon return into service, before winter when the seasonal business undertaken is more intensive, and days are shorter.

4.2.4 **Table 4.1** shows the type of lighting recorded during the site walkover:

Table 4.1 Existing Operational Lighting on Site

Type Identifier	Type	Location	Height (approx.)	Directionality	Power*
A	White, Double-Asymmetrical Metal Halide,	North and East Side of Building 1	5.5 m	Down facing (<70°)	150 Watt
B1	Black Asymmetrical Metal Halide, (tube)	South and East Side of Building 1	5.5 m	Down facing (<70°)	Data not available
B2	Black Asymmetrical Metal Halide, (bulb)	Building 1 Near reception	5.5 m	Down facing (<70°)	150 Watt
C	Black Asymmetrical Metal Halide with aged cover	Security Building Gate 1	2.5 m	Down facing (>70°)	Data not available
D	Fluorescent tubes	Building 1 Service Yard to the North, underneath roof	5.5 m	Down facing, shielded by roof	125 Watts
E	Emergency Exit light tube	North Site of Building 1	2.5 m	Horizontal, 180°	Data not available

Type Identifier	Type	Location	Height (approx.)	Directionality	Power*
F	Emergency Exit light bulb	South Side	2.5 m	Horizontal, 180°	Data not available
G	Amenity Lighting at Entrance Doors	Building 3	2.5 m	Horizontal, 360°	Data not available

* Information provided by current owner

4.2.5 The car park to the south of Main Road is not illuminated except for existing Street Light on Main Avenue (see further information below).

4.2.6 The figures shown in **Appendix C** illustrate the main types of lighting found on Site as well as the eight external lights that were operational on the date of the survey.

4.2.7 **Figure 4.1** shows the locations of the existing security lighting within the site.

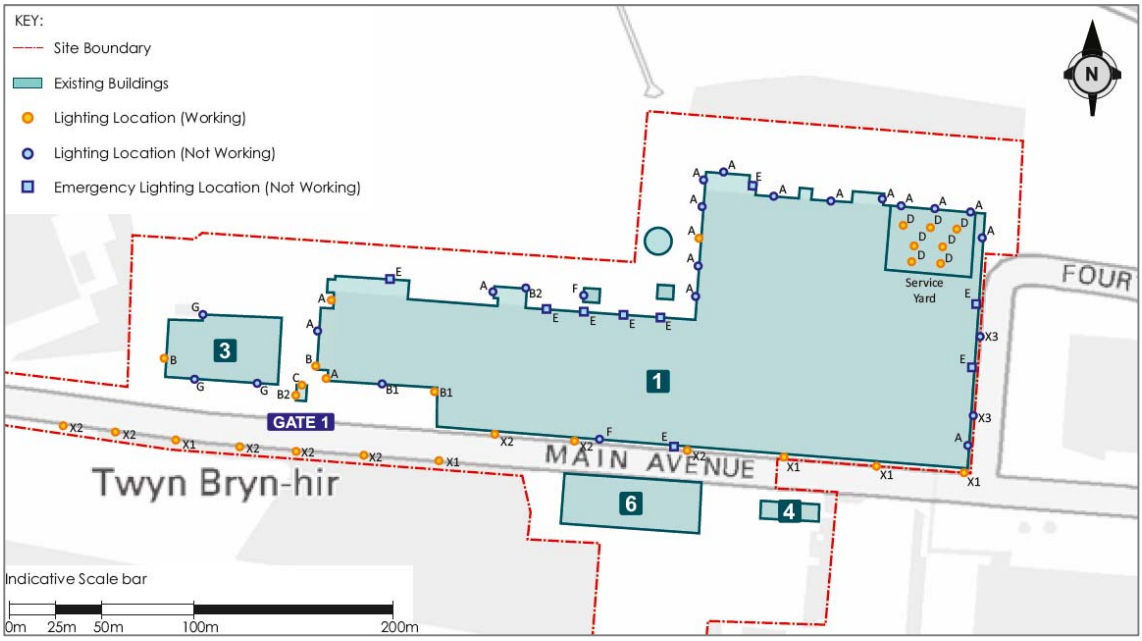


Figure 4.1: Location of External Lighting on Site

4.2.8 The current site owner stated that the external security lights are computer operated and programmed to switch on at 10pm, which is outside of the operating hours of the Site.

Electrical Connection (Street Lighting on Main Avenue/ Fourteenth Avenue)

4.2.9 The Street Lighting on Fourteenth and Fourth Avenue adjacent to the site boundary was not operational on the day of the survey.

4.2.10 A description of public Street Lighting on roads surrounding the Site is shown in Table 4.2 and Figures 4.2 to 4.3.

Table 4.2 Street Lighting Surrounding the Site

Type Identifier	Type (A/B/C)	Location	Height (approx. m)	Directionality
X1	High-Pressure Sodium	Main Avenue	8 m	Down facing <70°
X2	Low-Pressure Sodium	Fourteenth Avenue, Main Avenue	8 m	Down facing <70°
X3	Heritage Style	Fourth Avenue	4.5 m	Horizontal, 360° shielded towards sky

Figure 4.2: Type X1 (left) and X2 (right) Street Lighting on Main Avenue

Figure 4.3 Type X3 Street Lighting (left) on Fourth Ave and Type X2 Street Lighting (right) on Fourteenth Ave Gas Connection

4.2.11 The proposed route of the Gas Connection crosses Rhigos Road south of the Power Generation Plant Site. Rhigos Road is not illuminated with street lighting and so it is thought that it will remain a relatively dark corridor as it is enclosed by trees that screen the corridor from light from the industrial site to the north. This is with the exception of a small gap in the trees to be created level where new bus stop will be located, corresponding to the route of the proposed gas pipeline and its root protection requirements.

4.2.12 The Gas Connection crosses arable fields, improved grassland and semi-natural habitats further south where there is no external lighting and it is assumed that the area would naturally be dark. It is thought that any light sources would be screened by vegetation but sky glow would be visible on the horizon to the north from the industrial estate.

4.2.13 The Above Ground Installation is located adjacent to the A4061 (Rhigos Road) that is not illuminated by street lighting and so it is assumed that the area is relatively dark, although lighting will be visible and sky glow possible from the industrial estate to the north.

4.3 Sensitive Receptors

4.3.1 Receptors and locations with the potential to be sensitive to lighting associated with the proposed Project and existing sources of obtrusive lighting on the proposed Project Site are listed in **Table 4.3**. The locations have been identified in accordance with the frameworks set out in the guidance documents reviewed as part of this assessment (see **Section 2.3**).

Table 4.3 Existing Sensitive Receptors

Receptor	Information
Existing local residents (off-Site)	Existing residents at Rhigos (1.3km south west); Hirwaun (1.4km east); Penderyn (1.8km north); Pen Y Waun (3.5km east); and Aberdare (5km east).
Motorist, cyclists & pedestrians	Using the Main Avenue, Fourteenth Avenue, Rhigos Road and the A4061 (Rhigos Road).
Visual amenity	View from the Brecon Beacons National Park International Dark Sky Reserve.
Ecology	Habitats for nesting birds, otters and bats. Bats are particularly sensitive to light and therefore, any new lighting can affect social flying; and change feeding behaviour (some are attracted to lighting but others are not)..

4.4 Lighting Designation – ILP Guidance

4.4.1 The ILP guidance classifies various environments into five environmental zones (E0 to E4), based on the nature and extent of artificial lighting that is present. The definition of each classification is set out in **Table 3.1** and, in the absence of quantitative measurement the descriptors provide the best tool for classifying a given locality in terms of the existing lighting environment.

4.4.2 Referring to **Section 4.2** and in the context of the Site and the surroundings, which is located in a relatively rural area of low district brightness and the 'external zone' of the Brecon Beacons National Park Dark Sky Reserve, it is reasonable to conclude that the proposed Project Site lies within the following zone:

- Lighting Zone E2 (Rural) Low district brightness

4.4.3 This is with the exception of a SAC/SSSI to the north-east, two Sites of Importance for Nature Conservation (SINC), one of which is immediately to the north of the proposed Project Site and the other to the south which is crossed by the proposed Gas Connection. These are considered to be natural areas that are intrinsically dark and so it is reasonable to conclude that they lie within the following zone:

- Lighting Zone E1 (Natural) of Intrinsically Dark Lighting Environment

4.4.4 The land at the boundary of the Brecon Beacons National Park is not within the core zone of the Dark Sky Reserve. However, it is considered to be a natural area that is intrinsically dark and so it is reasonable to conclude that it lies within the following zone:

- Lighting Zone E1 (Natural) of Intrinsically Dark Lighting Environment

4.4.5 An Environmental Zone Plan showing the location of the ambient night-time Environmental Zones is shown in **Appendix A**.

5 Lighting Requirements

5.1 Introduction

5.1.1 Lighting during demolition, construction, decommissioning of the proposed Project Site may have different effects on sensitive receptors than lighting required during operation of the proposed Project Site. Therefore, the lighting requirements of these phases of the proposed Project are described separately in Sections 5.2 and 5.3.

5.2 Demolition, Construction and Decommissioning Lighting Requirements

5.2.1 Lighting during demolition, construction and decommissioning is likely to be focused around either end of the pipelines, the secured entrance, site offices, compounds, welfare facilities, parking, laydown area (south of Main Avenue), fuel and plant storage areas.

5.2.2 However, task specific lighting to aid working in the dark (or more likely evening and morning working during the winter months) will be more variable and will vary according to the phase of the demolition, construction or decommissioning programme, weather conditions and the particular tasks being undertaken. This is particularly true during installation of the underground Electrical Connection and the underground Gas Connection, where temporary activities take place, (This can include topsoil stripping, pipe stringing and welding, trench excavation, pipe laying, back filling and re-instatement of the land) depending on the progress of the open-cut pipeline. It is assumed that watercourses around the Gas Connection will not be lit during the evening, overnight or early morning (i.e. outside approximately one hour before dusk and one hour after dawn).

5.2.3 Generally speaking, the demolition, construction and decommissioning of lighting facilities tends to lead to more obtrusive lighting (glare, light trespass and sky glow) than operational lighting because of its temporary nature, and the type of lighting equipment used. For ease of deployment and use, lighting tends to be mobile, and focus on providing the widest coverage of light from the fewest possible units – in order to minimise time spent maintaining and installing the equipment. This, along with the fact that it is often inadequately directed or installed, can result in problems with obtrusive light unless appropriately controlled.

5.2.4 Lighting associated with vehicles or cranes can similarly result in adverse effects for similar reasons. In addition, vehicles often deploy flashing lights and strobes when operating which can cause additional adverse effects, and this is particularly relevant here, because of its urban location and the proximity of parts of the Site to sensitive receptors.

5.3 Operational Lighting Requirements

5.3.1 Operational lighting is required throughout the Site for operational activities; to prevent crime and meet set safety standards. During operation, it is likely that the following distinct requirements for lighting associated with the development will emerge, although this will be confirmed during the Detailed Design process.

Power Generation Plant

5.3.2 The Power Generation Plant would include between one and five simple cycle gas turbines (SCGT) and these items of plant are likely to require external lighting as maintenance activities could be undertaken during the day and night-time.

5.3.3 The exhaust gasses and waste heat from the power generation plant would be discharged to the atmosphere by a 30-35 m stack for each of the SCGTs. The stacks are under the threshold requiring safety lighting to prevent contact with aircraft and so will not be illuminated.

5.3.4 Additional plant required to support the Power Generation Plant include a demineralised process water tank, a raw/fire water tank and a blackstart diesel generator. It is not expected that these items of plant will require external lighting.

5.3.5 An administration building, control building; workshop and store building will be required to support the workforce who will operate and maintain the Power Generation Plant. It is likely that lighting columns will be required to illuminate access tracks and walkways, ‘courtesy’ lights to illuminate building entrances and external security lighting to improve safety and security around the buildings.

5.3.6 A Switchyard/Banking Compound containing up to eight transformers and other equipment to connect the electrical infrastructure from the Power Generation Plant to transformers before export to the National Grid will require column mounted lighting positioned outside of the security fencing.

5.3.7 A Natural Gas Receiving Station and Compound will feed the Site of the proposed Power Generation Plant and will include a control and instrumentation kiosk. It is likely the instrumentation kiosk will require internal lighting to complete maintenance activities. The Natural Gas Compound will require column mounted lighting positioned outside of the security fencing.

5.3.8 Security infrastructure will be required including security cameras, perimeter fencing and a gatehouse at the main entrance to provide safety and security and restrict and log site attendance, deliveries etc. It is likely that the access road in front of the gatehouse will need to be illuminated to maintain the safety of staff and allow the secure recognition of vehicles and visitors. Other site accesses will also require similar security lighting. It should be noted that this

lighting already exists on the proposed Project Site but will be upgraded during construction.

5.3.9 Lighting infrastructure will be required around internal roadways and parking areas to maintain the safety of site operatives during operational hours only, and to reduce the risk of accidents throughout the night.

5.3.10 It is proposed that the permissive path between the Power Generation Plant and the bus stop on Rhigos Road will be retained for operatives of the Power Generation Plant to use. Lighting on along the route of the path may need to be provided to reduce the fear of crime. The lighting will also consider the sensitivity of the area for bats.

Electrical Connection

5.3.11 The underground electrical connection will have no operational lighting requirements.

Gas Connection

5.3.12 The underground gas pipeline that forms part of the Gas Connection will have no operational lighting requirements.

5.3.13 The proposed Above Ground Installation will require lighting to illuminate the access track, internal footways, instrumentation and electrical kiosks to provide safe access during operation (pre-curfew) in the hours of darkness. Security lighting and cameras will also be required (post-curfew) as the facility is in a remote location. The Ecological Management Plan as detailed in Requirement 10 and the Lighting Strategy required by Requirement 16 of Schedule 2 of the Development Consent Order would ordinarily need to have regard to the ecological sensitivity of the area.

6 Design Objectives

6.1 Demolition, Construction and Decommissioning

General Design Objectives

6.1.1 The general design objectives that will be used to ensure that adverse effects of lighting associated with demolition, construction and decommissioning of the proposed Project are minimised are listed below:

- Design luminaires for the task at hand. Use louvres and shields to prevent undesirable light break-out.
- Demolition and Construction lighting will be directed away from all the sensitive receptors identified in **Table 4.3**.
- Preference will be given to several lower lighting units rather than tall, wide beam lighting units to illuminate large areas as it will limit light trespass, glare and sky glow from the plant.
- Vehicle lights will be properly directed (conforming to MOT requirements) and lenses must be intact to prevent unnecessary glare and light intrusion.
- Lighting will be reduced or switched off when not required for safety purposes. Security lighting will be kept at the minimum level needed for visual and security protection.
- If appropriate, the use of infra-red floodlighting and CCTV systems will be considered for security to reduce the need for visible lighting outside working hours. These technologies reduce potential adverse effects of artificial lighting.

6.1.2 These measures to minimise the adverse effects of demolition, construction and decommissioning of lighting will be included within the Environmental Management Plan so they can be controlled during demolition, construction and decommissioning activities.

6.1.3 The above design objectives will be considered when developing the phased demolition, construction and decommissioning programmes to prevent obtrusive light affecting the adjoining areas beyond the proposed Project Site.

Ecological Design Objectives

6.1.4 Specific ecological design objectives that will be implemented through the Ecological Management Plan submitted pursuant to a requirement on the DCO to ensure that adverse effects of lighting associated with demolition, construction and decommissioning of the proposed Project are minimised are listed below:

- All lighting related to the works will be designed and fitted to minimise light spillage onto any sensitive habitat. The Lighting Design will be reviewed by a suitably qualified Ecologist;

- There should be no light intrusion beyond the boundary of the proposed Project Site and particularly within the SINC to the north of the proposed Project Site.

- Where possible, there will be no night-time working outside of standard working hours within Hirwaun Common SINC while construction and decommissioning of the Gas Connection and Above Ground Installation takes place.

- No task lighting will be used at night-time between the Power Generation Plant to the north and the proposed laydown area (in the existing car park) to the south of the Power Generation Plant to avoid fragmentation of habitats at night-time.

- The use of temporary lighting to illuminate the route along the proposed Gas Connection will be minimized to avoid fragmentation of habitats used by bats (at dusk, dawn and during night-time).

- Dark corridors will be maintained during the evening, overnight or early morning (i.e. outside approximately one hour before dusk and one hour after dawn) along hedgerows, watercourses and any other linear features by avoiding light trespass on these areas. This will avoid the fragmentation of habitat used by species such as bats and otters.

6.2 Operation

ILP Environmental Zone

6.2.1 The key design objective to this Outline Lighting Strategy is that the Lighting Design for the proposed Project Site will specify lighting that is able to achieve the limits set for obtrusive lighting set for the ILP ambient night-time Environmental Zones. These limits are provided in **Appendix D**.

6.2.2 Below is a summary of the ILP Environmental Zones that will be maintained

- The proposed Project Site – ILP Environmental Zone E2; and

- Two Sites of Importance for Nature Conservation (SINC) one of which is within the route of the proposed Gas Connection - ILP Environmental Zone E1

General Design Objectives

6.2.3 General design objectives to ensure the restrictions on obtrusive light (intrusion and glare) associated with the ambient night-time Environmental Zone for that location can be achieved are listed below and will be taken into

consideration in the Design Principals Statement and, prior to construction preparation of the Lighting Design:

- Lighting will be located away from sensitive receptors (identified in Section 4.3) wherever possible.
- Minimising light break-out above the horizontal using 'full cutoff', 'cutoff' and 'semi-cutoff' lighting systems where required. This is achieved through ensuring the lighting units are correctly placed and also by placing them at a height such that they can be directed downwards rather than horizontally.
- Lighting will be designed to avoid reflectance from buildings and plant – so external lighting will be mounted onto buildings or on lighting stands and directed to the area where it is needed rather than facing building facades.
- Building facades will be in matt finishes and use dark colours for those parts of buildings and structures that are close to light sources.
- Where the existing pale concrete slab is retained, it will be surfaced with dark gravel where possible to reduce the reflective nature of the surface.
- Reducing external lighting levels outside working hours (post-curfew) to levels suitable for maintaining safety and security.
- For security lighting, the use of infrared lighting and cameras will be considered where possible to reduce the need for visible lighting outside working hours (post-curfew).
- Use of automated devices to switch lights on and off according to activity/ambient light levels.

6.2.4 A detailed lighting impact assessment, using computational modelling if necessary, will be undertaken during detailed design to evaluate the lighting specifications at the Power Generation Plant to ensure that the correct lighting levels can be achieved where technically possible.

Visual Amenity Design Objectives

6.2.5 As the proposed Project Site is within the Brecon Beacons National Park Dark Sky Reserve, the Lighting Design will include the following recommendations as set in the Dark Sky Reserve Management Plan for facilities within 5 miles of National Park boundary, called the External Zone:

- Lamp lumens > 20,000 - Use ILP Environmental Zone E1 (ILP, 2011) and include the use of full cut-off installations.
- Other lamps – Use ILP Environmental Zone E2 (ILP, 2011) – and include the use of Semi-Cut-off installations.

Ecological Design Objectives

6.2.6 No working in Hirwaun Industrial Estate Site of Importance for Nature Conservation.

6.2.7 Lighting within Hirwaun Common Site of Importance for Nature Conservation (SINC) will remain within the limits set by ILP ambient night-time zone E1 to minimise obtrusive light on habitats likely to be of particular value to breeding birds and foraging or commuting bats. This is particularly relevant to the Above Ground Installation where the Gas Connection connects to the national network.

6.2.8 General principles to ensure that adverse effects of lighting on bats are mitigated are listed below and will be taken into consideration during preparation of the lighting design (Bat Conservation Trust, 2009) for all areas of the proposed Project Site:

- All lighting will be designed and fitted to minimise light spillage onto any suitable habitat. The Lighting Design will be reviewed by a suitably qualified Ecologist;

- Bat roosts – Existing bat roosts and the proposed replacement roost structure to the north-west of the Power Generation Plant will not be directly illuminated (currently none identified on Site).

- Foraging and Commuting –

    - The type of light – the impact on bats can be minimised by the use of low pressure sodium lights or high pressure sodium instead of mercury or metal halide lights.
    - Luminaire - Lighting units will be directed to where the illumination is needed to avoid light spill.
    - Lighting column – The height of columns will be as short as possible as light at a low level reduces ecological impact.
    - Light levels – The light will be as low as is permitted when considering health and safety and security guidelines.
    - Timing of lighting – the times during which the lighting is on will be limited to provide some dark periods.

- Security

    - Sensors – If well installed and aimed, lighting with movement sensors will reduce the amount of time a light is on each night.

6.2.9 Aim – The light will be aimed to illuminate only the immediate area required by using as sharp a downward angle as possible (see guidance above).

7 Conclusions and Recommendations

7.1.1 The baseline study demonstrates that the existing lighting environment of the Power Generation Plant is of older inadequately orientated lighting resulting in obtrusive light (glare and light trespass) to surrounding land uses and sky glow to the night sky.

7.1.2 The Electrical Connection is illuminated with a mixture of older SOX and newer SON street lighting with sky glow and light spill typical of these lanterns. The Gas Connection is in a dark unlit corridor. It is thought that sky glow would be visible on the horizon to the north from Hirwaun Industrial Estate.

7.1.3 However, overall the proposed Project Site and surrounding areas are considered to be located in a rural area of low district brightness and therefore falls within ILP Environmental Zone E2.

7.1.4 This is with the exception of a SAC/SSSI, two Sites of Importance for Nature Conservation (SINC) and the Brecon Beacons National Park. These are considered to be natural areas that are intrinsically dark and lie within ILP Environmental Zone E1.

7.1.5 The development of land at the proposed Project Site will replace the existing older obtrusive lighting with new sources of light during operation. A key design objective of this Outline Lighting Strategy is that the new lighting will be designed to meet the limits for obtrusive light defined by the Environmental Zones.

7.1.6 With this in mind the assessment concludes that the potential for significant obtrusive light to arise from the development is negligible if the design objectives (including ecology and visual amenity) are adopted and the limits in the recommended ILP environmental zones can be achieved.

7.1.7 Overall, by setting an ILP lighting zone for the proposed Project Site, there will be an improvement on the existing baseline. **Appendix D** presents the ILP guidance on ambient night-time lighting levels.

7.1.8 A Lighting Design will be prepared during the Detailed Design stage to take into consideration the receptors and design objectives that have been identified within this report.

7.1.9 Specific design objectives to minimise the adverse effects of lighting through operation will be controlled by terms of the Design Principals Statement and during demolition, construction and decommissioning through the Environmental Management Plan and Ecological Management Plan.

References

Bat Conservation Trust (2009) *Bats and Lighting in the UK*. Bats and the Built Environment Series.

Document reference 6.1.0 Section 8- Parsons Brinkerhoff - Hirwaun Power Project Environmental Statement – Ecological Assessment. Bristol.

Document reference 6.1.0 Section 11- Parsons Brinkerhoff, Hirwaun Power Project Environmental Statement – Landscape and Visual Impact Assessment. Bristol.

Appendix A Plans

- Outline Lighting Strategy – Environmental Zone Plan

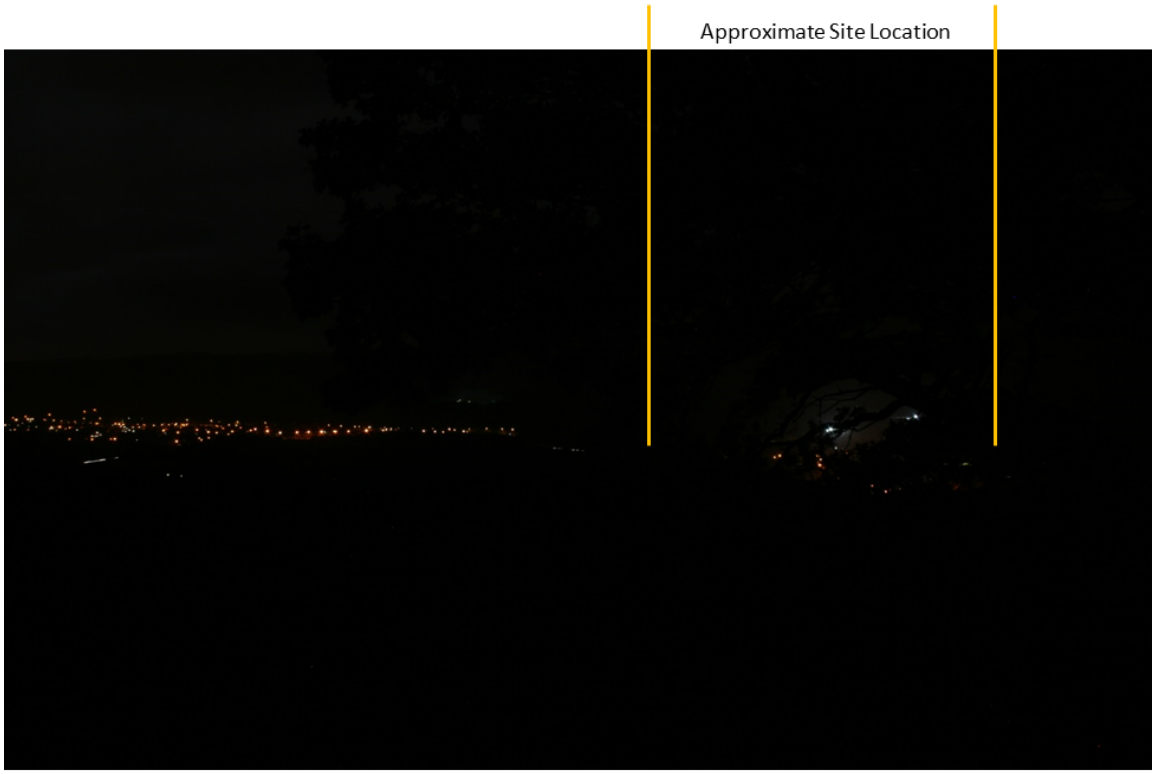
Appendix B LVIA Viewpoint 8 – Night-time Photographs

Dawn, Viewpoint 8, View partially screened by vegetation

No Night-time photograph available

View towards Hirwaun Industrial Estate, approx. 15 m down the road south of LVIA Viewpoint 8 (Dawn)

View towards Hirwaun Industrial Estate, approx. 15 m down the road south of LVIA Viewpoint 8 (Night-time)



Existing Lighting on Site

Figure 0.1: Type A, located on south east corner of Bldg. 1

Figure 0.2: Type B1, near reception, south side of Bldg. 1

Figure 0.3: Type B2, located on West side of Bldg. 3

Figure 0.4: Type C, located on north side of Security Building (Gate 1)

Figure 0.5: Type D, located in Service Yard (north side of Bldg. 1)

Figure 0.6: Type E located on north and east side of Bldg. 1

Figure 0.7: Type F located on south site of Bldg. 1

Figure 0.8: Type G Amenity lighting at access doors on Bldg. 3

Figure 0.9: North-east corner of Security Bldg

Figure 0.10: Security Light type B1 on South side of Bldg 1, near reception

Figure 0.11: Type A and B light on south west corner of building 1

Figure 0.12: Type A light on north west corner of Bldg. 1

Figure 0.13: Type A lighting at south-west corner of Bldg 1

Figure 0.14: Type A light on North-side of Building (near tank)

Figure 0.15: Type D lights on north side of Building (Service Yard).

Figure 0.16: Lighting as seen from Gate 1

Figure 0.17: View down Main Avenue, facing east-bound from Gate 1

Appendix C ILP Lighting Specifications for Zones E0 to E4

Environmental Zone	Sky Glow ULR [Max%]	Light intrusion (into Windows) Ev [Lux]		Luminaire Intensity I [candelas]		Building Luminance pre-curfew
		Pre Curfew	Post Curfew	Pre Curfew	Post Curfew	Average L [cd/m^2]
E0	0	0	0	0	0	0
E1	0	2	0(1*)	2500	0	0
E2	2.5	5	1	7500	500	5
E3	5.0	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,500	

Definitions
ULR = **Upward Light Ratio of the Installation** is the maximum permitted percentage of luminaire flux for 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 Candelas per Square Metre Cd/m^2**
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.
(1) Upward Light Ratio – Some lighting schemes will require the deliberate and careful use of upward light – e.g. ground recessed luminaires, ground mounted floodlights, festive lighting – to which these limits cannot apply. However, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires and light controlling attachments.
(2) Light Intrusion (into Windows) – These values are suggested maxima and need to take account of existing light intrusion at the point of measurement. In the case of road lighting on public highways where building facades are adjacent to the lit highway, these levels may not be obtainable. In such cases where a specific complaint has been received, the Highway Authority should endeavour to reduce the light intrusion into the window down to the post curfew value by fitting a shield, replacing the luminaire, or by varying the lighting level.
(3) Luminaire Intensity – This applies to each 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.

Reproduced from the ILP Publication: Guidance Notes for the Reduction of Obtrusive Light – ILP, GN01:2011