

Exmoor National Park

Lighting Management Plan

Version 3 July 2011



Exmoor National Park – Dark Sky Reserve

External Lighting Management Plan

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1 Preamble

1.1 Introduction to Lighting Management Plans

The purpose of this Lighting Management Plan (LMP) is to provide a base document of advice and recommendations to mitigate the effects of stray and obtrusive light, often generally referred to as "light pollution", from all exterior lighting whether it is intended for domestic, public, agricultural or commercial use. To this end the document is not regulatory but will outline strategies of best working practice to follow in both :-

- Planning for lighting with appropriate choice of lighting fixtures and
- Correct lighting installation practice

This plan's principal aim is to provide practical advice on mitigating stray light, which astronomers may find obtrusive, within the boundaries of Exmoor National Park, which is situated in the south west peninsula of England. The Exmoor National Park boundary is included within the Local Authorities of Devon County Council and Somerset County Council. Although the advice given is relative to the National Park it can be equally followed in the other parts of the adjacent counties to protect, maintain or even, hopefully, improve the existing dark sky attributes and the rural environmental setting of intrinsic darkness, which is enjoyed by Exmoor residents.

The provision of and also the continued working to an external Lighting Management Plan is an essential element, required by the International Dark Sky Association (IDA), when considering the initial merits of their Dark Sky Award process and also their continued monitoring of the night sky brightness. The IDA have the option of withdrawing their support of any award if future sky measurements show a marked decrease in darkness.

All National Parks are administered by the National Park Authority which exists:-

- **To conserve and enhance the natural beauty, wildlife and cultural heritage of the National Park.**
- and
- **To promote opportunities for the understanding and enjoyment of the special qualities of the National Park by the public.**

1.2 Introduction to Exmoor National Park

There are 14 National Parks in Britain with Exmoor being one of the smaller, some 692 square kilometres (267 Square Miles) in size. However, it is celebrated for its diverse and beautiful landscapes. It is expressed by many as an unspoilt corner of England and provides access for young and old to appreciate its romantic and tranquil beauty. Many children will have read, or heard about, the romantic novel “Lorna Doone” by R.D. Blackmore (1825-1900, author, fruit farmer and also an environment protectionist), without realising that its story location, the parish of Oare and the “Doone Valley”, exists centrally within the Exmoor National Park although it was not a National Park in R.D Blackmore’s time. The Exmoor National Park was designated in 1954 some 85 years after “Lorna Doone” was first published.

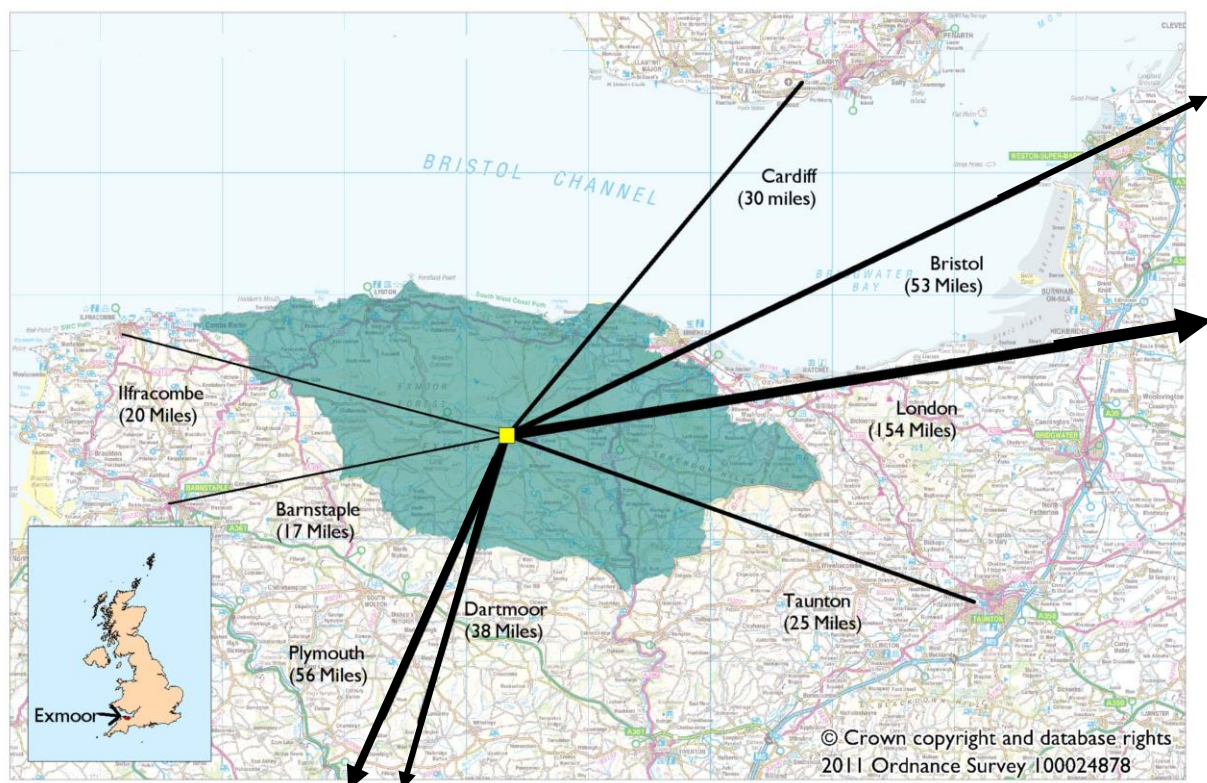


Figure 1.1 – General location of Exmoor National Park

Figure 1.1 shows the location of Exmoor on the north coast of the South West peninsula of England. The peninsula, often referred to as the “West Country” also contains another National Park called Dartmoor National Park.

All National Parks are managed by one authority, however, the land ownership, within each park, is split between several owners. Exmoor land ownership is divided between the following:-

- Exmoor National Park Authority
- Crown Estate
- National Trust
- Forestry Commission
- Farmers (majority holding)
- Other private owners which include conservation and wildlife organisations.

In landscape classification terms a National Park is of greater significance than an Area of Outstanding Natural Beauty (AONB) and the conservation of landscape and environment heritage is uppermost in the Exmoor National Park. Within the National Park boundary there are 18 Sites of Special Scientific Interest (SSSI), where the very best examples of wildlife and geology can be found. There are habitats such as heath, blanket bog and western oak woods which are internationally rare. There is an abundance of wildlife such as the well known Exmoor Ponies and Red Deer but it also includes 16 species of British bats including the recently discovered Barbastelle and Bechstein's bats. **The continued protection of a dark sky will help to protect this biodiversity.**

The collection of churches, some dating back to just after the Norman Conquest, are the earliest surviving community centres, and the conservation of "newer" farms, hamlets and villages form the central core of Exmoor's historic environment. There are 16 Conservation areas where repairs and reconstruction works on many buildings are carefully controlled. There are 3 conservation areas close to the proposed core zone and the **conservation of intrinsic darkness is therefore uppermost in this document.**

In addition to the public highways, which pass through the National Park, there are 620 miles (about 1000km) of public right of way footpaths accessible by cycle, horse or simply walking to appreciate the National Park's tranquil settings. There are more than 1.7 million residents living within easy reach (30 miles) and more than 5 million living within a 60 mile radius. Tranquillity is a special feature of National Parks and the Authority are encouraged to provide recreation that involves "quiet enjoyment". **The introduction of astronomy facilities fits into this tranquillity outreach. Amateur astronomers also form part of the tourism outreach to attract more visitors, as is now recorded in other Dark Sky award areas.**



Figure 1.2 - Extract from the Times newspaper 29 May 2011

As part of the education outreach programme the Exmoor National Park Authority (ENPA) have a residential Centre for Outdoor Education at Pinkery where primary, secondary or further education groups can meet to learn more about conservation in the outdoor environment. The centre is located at over 400 metres above sea level and enjoys splendid isolation with easy access to a wide variety of habitats and dark landscapes.

The protection of the existing dark night sky over Exmoor is crucial in this tourist outreach objective.

This Lighting Master Plan (LMP) only uses the uniqueness relating to the exterior lighting issues and does not intend to diminish the importance of the many other unique issues in the National Park area.

1.3 The Astronomers' Point of View

More than 20 years ago the British Astronomical Association (BAA) forged links with the Institution of Lighting Engineers (ILE) (renamed in 2010 as the Institution of Lighting Professionals (ILP)) to open discussions on the plight of amateur astronomers. The problem was that views of the stars at night were being diminished by stray upward artificial light from outdoor lighting. This included elements such as old style street lighting and poorly installed floodlighting installations, as well as other commercial, advertising and domestic lighting.

There are many reasons why obtrusive light should be prevented but there are two prime objectives for adequate control and they are:-

- **To minimise the problems it creates for human beings, plants and animals thereby improving amenity and biodiversity.**
- **Reduce unnecessary consumption of electricity and demands on fossil fuels thereby minimising carbon footprint and global pollution.**

Addressing poor light control for astronomers assists in achieving these prime objectives, however this is only part of an international obtrusive light control issue.

This document has been commissioned with the prime objective of promoting the use of the intrinsic darkness of Exmoor to view the stars in the night sky. The document concentrates on mitigating any obtrusive light elements which could cause a nuisance, from both the astronomers' and residents' viewpoint, by:-

- Maintaining or improving the night sky darkness as a background to view the star constellations.
- Promoting a good practice working document for Exmoor commercial and agricultural use, and to be accessible by residents, hoteliers and any other tourist related promotion.
- Promoting the use of quality domestic lighting equipment with good light control.
- Encouraging improvement, adaptation or changing of existing lighting equipment.
- Creating a benchmark to achieve the dark sky award for Exmoor.

Unlike some other countries the UK has no regulatory governing body which provides exterior lighting. Professional Institutions such as the ILP, the Society of Light and Lighting (SLL), the Commission Internationale de l'Eclairage (CIE) and British Standards all provide illuminating engineering background advice and recommendations for engineers to follow and adapt to suit different geographic locations.

Likewise it is important to understand that apart from Exmoor National Park Authority (the Authority) owned property it has no statutory powers to change or alter conditions or standards on existing private or commercial property. This role lies in the hands of Exmoor residents, farmers, commerce and local authority managers to work in partnership and adopt the good practice principles outlined. Future new development designs will be encouraged to do likewise.

1.3 Night Sky Darkness Evaluation

The night sky 'brightness' can be measured by a specially adapted meter called a **Sky Quality Meter (model SQM-L)** which is calibrated in **visual magnitudes per square arc second**. The following table contains the complete record of all the readings undertaken by Mr David Badham and other members of the local astronomy groups.

Table 1.1 Sky Quality Measurements

Site No.	Measurement Location	Easting Ref.	Northing Ref.	SQM Value		Site No.	Measurement Location	Easting Ref.	Northing Ref.	SQM Value
1	Barna Barrow	275450	149570	21.55		24	crossroads ENP B'dary	271460	134490	21.78
2	bend above Exford	284620	139120	21.52		25	Dry Bridge	275940	145460	21.32
3	Bessoms bridge	297260	131860	21.49		26	Dulverton (car park)	291260	127950	21.60
4*	Blackpitts Gate	276360	141780	21.76		27	Dulverton (visit. centre)	291270	127880	18.31
5*	Blagdon Cross	291500	139391	21.64		28*	Dunkery Beacon	289160	141590	21.50
6	Blue Gate	275770	137670	21.85		29*	Dunkery Bridge	289540	140630	21.54
7*	Breakneck Hole	271540	141000	21.75		30	Dunster	299240	143860	20.25
8*	Brendon Two Gates	276500	143240	21.78		31	Dunster (car park)	299280	143860	16.65
9*	Bridge	275960	145430	21.75		32	Elworthy Cross	308650	134690	21.39
10*	Bridge nr. SH 406	284530	144550	21.42		33	Exford	285300	138410	21.05
11*	bridge on bend	284800	141960	21.45		34	Field gate top of hill	282880	146430	21.46
12	Brompton Regis	295090	131500	21.15		35	Five Barrows Cross	273100	136100	21.83
13	Car Park (Kennisham)	296400	135860	21.65		36	Five Burrows Hill	273220	136790	21.45
14	Car Park Robber's B	282130	146450	21.50		37	Five Cross Ways	287910	128500	21.46
15	Cattle Grid	285850	128780	21.45		38	footpath	282560	134350	21.41
16	Cattle Grid	278590	147370	21.36		39	footpath	282690	130140	21.44
17*	Challacombe	269320	141070	21.54		40	footpaths	272540	137580	21.24
18*	Chapman Barrows	270000	143480	21.74		41	footpaths	293600	134850	21.34
19*	Clovenrocks Bridge	278670	139630	21.75		42	footpaths	282440	136750	21.39
20	Comer's cross	286030	135510	21.42		43	Friendship Farm	265940	141590	21.65
21	Comer's Gate	286030	135350	21.63		44	Gate - Emmett's Grange	274850	137310	21.83
22	Cross Gate	277140	147130	21.31		45	Goat Hill Bridge	272340	140510	21.75
23	Crossroads	298730	135420	21.63		46	'Green Barrow'	281910	134430	21.38



Site No.	Measurement Location	Easting Ref.	Northing Ref.	SQM Value		Site No.	Measurement Location	Easting Ref.	Northing Ref.	SQM Value
47	Haddon Hill	296120	128610	21.66		79	Lynmouth	272360	149410	20.33
48	Haddon Hill car park	296900	128500	21.49		80	Machine Cross	293680	127610	21.48
49	Halse Farm	289310	134400	21.67		81	Memorial Stone	283940	129640	21.41
50	Hare path	293030	317600	21.66		82	near .333	284950	129210	21.20
51	Hartrow Gate Cross	309120	134690	21.42		83	North Molton Ridge	277940	132460	21.33
52	Heath Poult Cross	294050	136830	21.63		84	north of Simonsbath	276960	140280	21.81
53	High point	285380	128370	21.46		85	Nr kennels WCourtenay	295330	142970	21.17
54	Higher Riscombe Farm	282680	139130	21.68		86	Nr quarries	287050	141850	21.47
55	Holdstone Hill	261930	147690	21.60		87*	Pinkery Outdoor Centre	272190	141170	21.48
56	Horner car park	289750	145450	21.28		88	Pittcombe Head	284140	146220	21.46
57	Junct L	284370	137420	21.69		89	Poltimore Arms	272530	135550	21.80
58	Junct L (Corham Farm)	274740	139530	21.67		90	Pool Cross	287190	144220	21.38
59	Junct L (Pickedstones)	280450	139260	21.68		91	Porlock	288390	146870	20.00
60	Junct R	268360	141320	21.69		92	Porlock Common	284930	146040	21.50
61	Junction	289140	128520	21.42		93	Porlock Post	286060	141110	21.35
62	Junction	276900	135010	21.35		94*	Prayway (north/S'bath)	276740	141020	21.80
63	junction	285190	140650	21.46		95	Quarry (south/ S'bath)	276070	138500	21.85
64	Junction	274560	147180	21.36		96	Raleighs Cross (-)	303950	134410	21.50
65	Junction L	307550	133840	21.43		97	Ridgway cross	280930	130480	21.48
66	Junction L	302900	134260	21.57		98	Road (B3223)	276070	144140	21.78
67	Junction L	297070	135510	21.61		99	road at .395	286580	142900	21.37
68	Junction L (.402)	300170	135020	21.60		100	road fork	280100	134000	21.35
69	Junction Malmshead	278130	147700	21.44		101	Sandyway cross	279120	133070	21.46
70	Junction R	308150	134460	21.44		102	Scobhill Road	274500	146860	21.60
71	Junction R	305150	134240	21.49		103	Scorhill Gate	275280	146360	21.73
72	junction	288490	138000	21.41		104	Selworthy Beacon	291860	147940	21.50
73	Kinsford gate	273950	136620	21.40		105	Shilstone Hill	275960	145930	21.50
74	Lanacre bridge	281640	136090	21.43		106	Sloley stone	271660	139390	21.41
75	Langdon Way	287820	139050	21.69		107	Sminhays Corner	301700	134550	21.55
76*	Larkbarrow Corner	282220	141440	21.45		108	Spire Cross	288770	133410	21.60
77	Luckwell Bridge	290580	138700	21.70		109	Sportsmans Inn	279360	133260	20.30
78*	Lucott Cross	284560	143180	21.46		110	Stolford Hill cross	294060	133420	21.49



Site No.	Measurement Location	Easting Ref.	Northing Ref.	SQM Value		Site No.	Measurement Location	Easting Ref.	Northing Ref.	SQM Value
111	Stone Cross	286690	138690	21.70						
112	Stowey Farm	295240	139430	21.15						
113	Timberscombe	295530	142170	20.05						
114	Track L	273150	140020	21.71		Measurement Control sites shown in Figure 1.3				
115	Track R (wireless stn)	295250	136490	21.65		94	Prayway (north/S'bath	276740	141020	21.80
116	Track to ford	280870	146350	21.50		4	Blackpitts Gate	276360	141780	21.76
117	Track to Kemp farm	280490	146160	21.48		8	Brendon Two Gates	276500	143240	21.78
118	Track to Oaremead	279620	147630	21.46		9	Bridge nr Dry Bridge	275960	145430	21.75
119	Track to Shilstone Fm	276030	147230	21.26		88	Pittcombe Head	284140	146220	21.46
120	Twitchen Farm	269850	141060	21.74		10	Bridge nr. spot ht. 406	284530	144550	21.42
121	Wheddon Cross	292390	138850	21.54		78	Lucott Cross	284560	143180	21.46
122	White Cross	283600	138740	21.74		28	Dunkery Beacon	289160	141590	21.50
123	White Cross	283600	138740	21.67		29	Dunkery Bridge	289540	140630	21.54
124	White post	281170	130460	21.48		5	Blagdon Cross	291500	139391	21.64
125	White Post	294120	131130	21.49		11	bridge on bend	284800	141960	21.45
126	Wimbleball tea rooms	296570	130760	21.49		76	Larkbarrow Corner	282220	141440	21.45
127	Winsford	290590	135000	21.16		19	Clovenrocks Bridge	278670	139630	21.75
128	Winsford Hill	287660	134260	21.62		4	Blackpitts Gate	276360	141780	21.76
129	Withycombe Common	298630	139440	21.22		87	Pinkery Centre	272190	141170	21.48
130	Withypool	284550	135480	21.32		17	Challacombe	269320	141070	21.54
131	Woody Bay	267400	148470	21.68		18	Chapman Barrows	270000	143480	21.74
132	Yelland Cross	267520	141540	21.63						Core Average = 21.60
			Area Average = 21.42							

Table 1.1 and Figure 1.3 (on following page) contains an abbreviated selection from the main list (shown in Table 1.1 with bold *) as those readings taken within, or close to, the proposed Core Zone boundary. These readings will form the monitoring points for future assessment of changing night sky conditions. The values in Figure 1.3 are shown on a map base together with their associated measurement site number. The complete measurement methodology carried out by Tiverton and Mid Devon Astronomical Society together with North Devon Astronomical Society is included in the Data Compendium. **The average for 132 readings is 21.42 with an average reading of 21.60 in the prospective Core Zone**

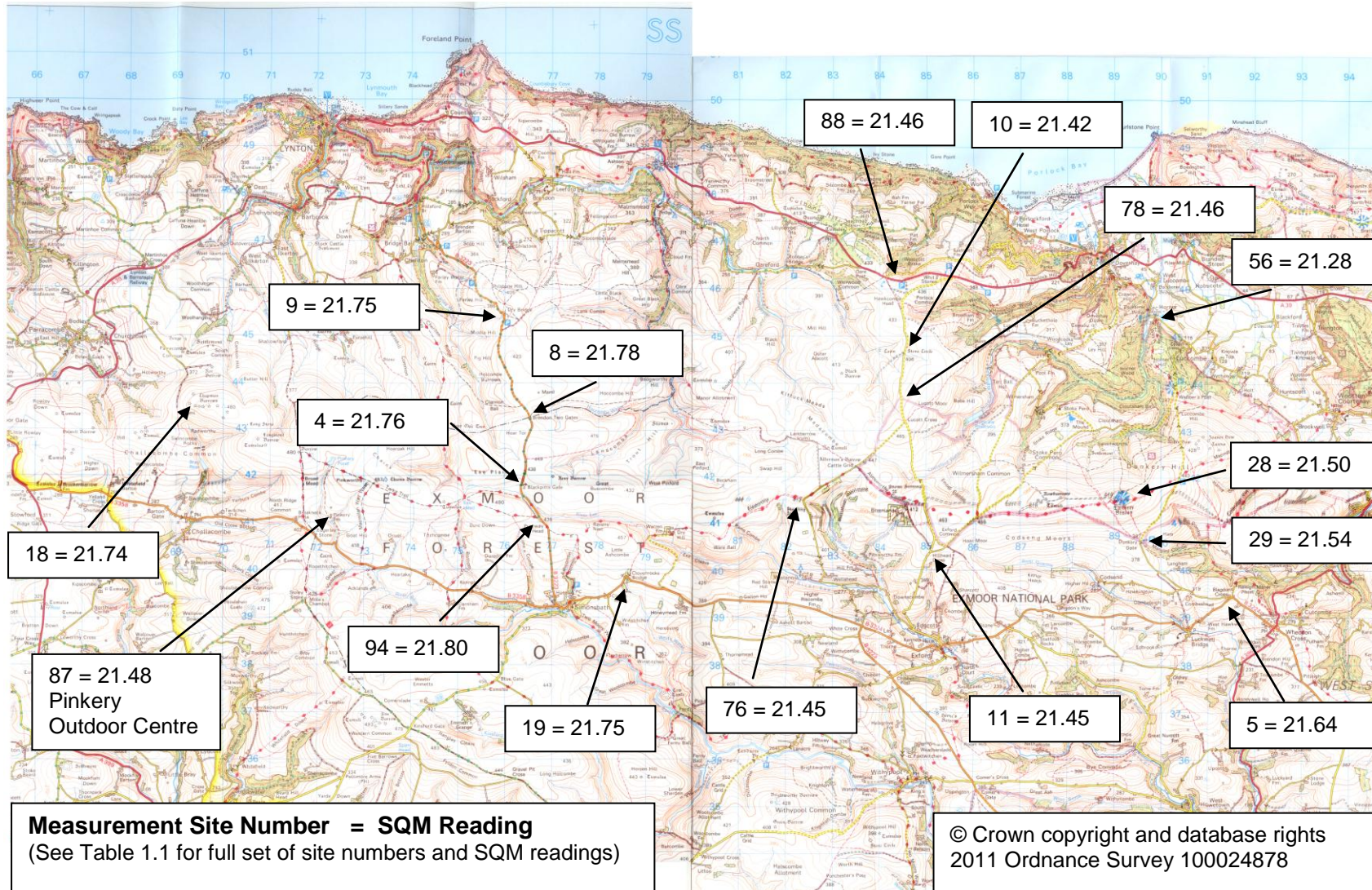


Figure 1.3 Sky Quality measurements within and near proposed Core Zone boundary

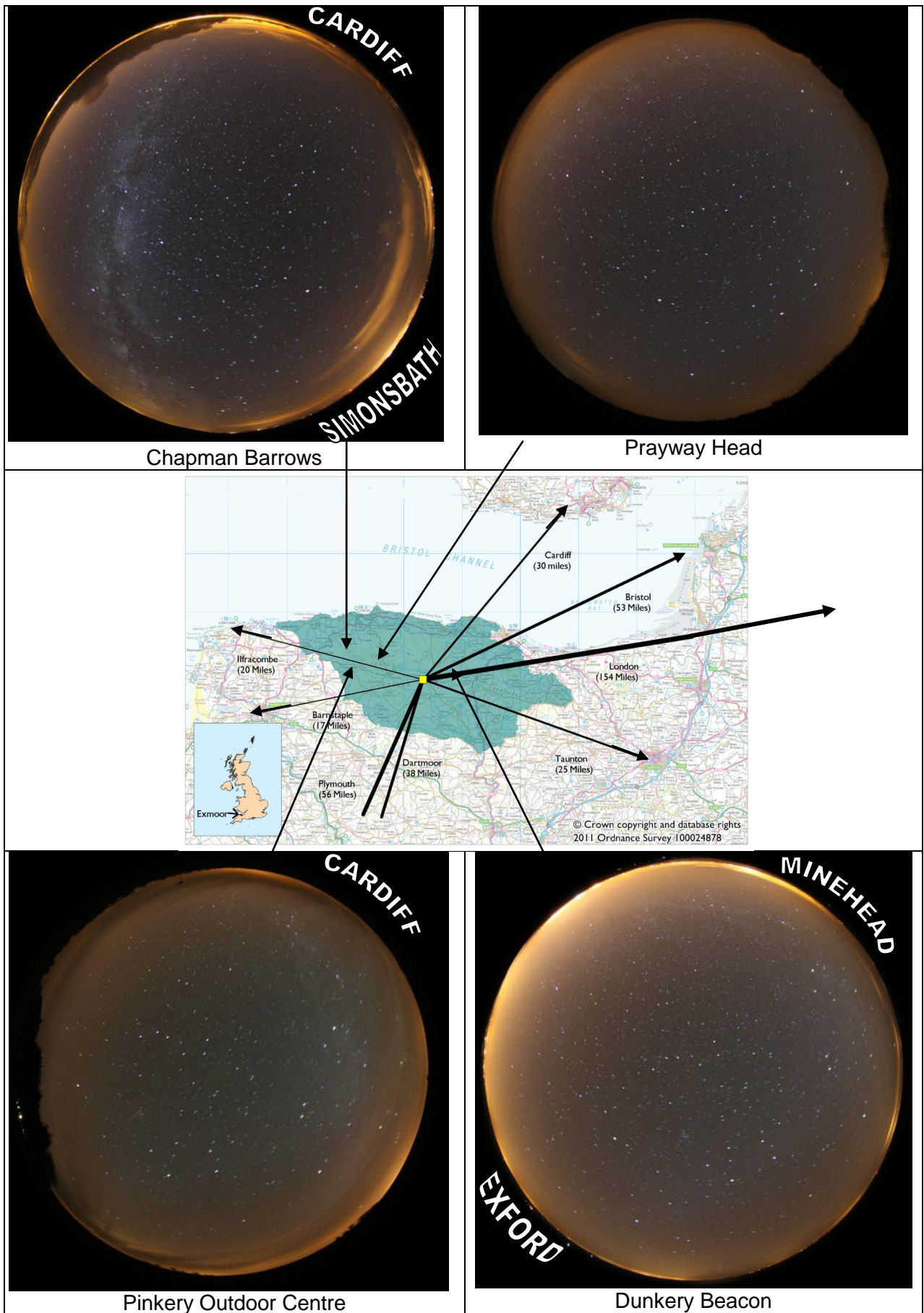


Figure 1.4 Sky Quality photographs within and near proposed Core Zone boundary

Astronomers also describe the sky darkness in terms of a Bortle Scale* of 1 to 9, this time the lower the number the darker the sky. Reference to the nomogram in Appendix B shows the comparison of the various methods the astronomers use to describe the night sky quality.

Darkest reading within Exmoor boundary = 21.85 magnitudes per sq. arc second
Darkest reading within proposed Core Zone = 21.80 magnitudes per sq. arc second
Average reading around proposed Core Zone = 21.60 magnitudes per sq. arc second

The following readings are only included as a general comparison with other external areas **and should not be used as an absolute measurement value** since the SQM meters used may not have been calibrated at the same time, the measurement methodology may have been different and the weather conditions will certainly have been different.

Darkest reading in Galloway Forest = 22.7 magnitudes per sq. arc second
Darkest reading on the Isle of Sark = 21.5 magnitudes per sq. arc second
Darkest reading in Exmoor = 21.8 magnitudes per sq. arc second

With an estimated conversion of 21.60 magnitudes per square arc second, in Exmoor, to Bortle's scale, the area in and around the proposed Core Zone can be described as Bortle Class 2 and an asset in need of preserving.

* See <http://skyandtelescope.com/resources/darksky/article811.asp> for further information on the Bortle Scale.

1.5 Technical Lighting Data

It is not possible to produce a document on light control without introducing some light technical parameters and when used they will be defined as required with an appendix summary of technical definitions.

Basic Lighting Terms

Detailed explanations of basic lighting terms can be found in Appendix A but in this document the three lighting terms most commonly used for expressing values of light are:

lumen	Describes the total amount of light given off by a bare lamp. (abbreviation: lm (sometimes klm for 1000lm))
candela	Describes the intensity (I) of light in a particular direction. (abbreviation: cd)
illuminance	Describes the amount of light falling on a surface area in lumens / square metre. (abbreviation: lux)
luminaire	The total package of lantern, lamp operational components.

This LMP has been devised, principally, to control different forms of stray light. First, and foremost, is upward light which can obscure night-time astronomical observations when it reflects off air-borne particles of water or dust. The effect is commonly known as **sky glow**. Direct light sources close to any field of observation are also problematic and are discussed later.

In addition to sky glow, astronomers do not like to see a visible source of light either and luminaires with a light source larger than 1000 lumens should be what the IDA call "**fully shielded**" from view, ie a completely flat glass window mounted horizontally, as shown in Figure 1.5 (right).

Non-technical terms like this will be explained and mixed with technical descriptions later.

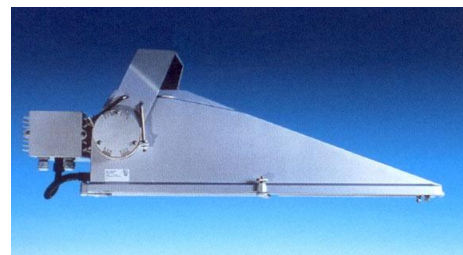


Figure 1.5 "Fully Shielded" luminaire

The IDA term of "fully shielded" and other non-technical terms like high beam, semi cut-off, cut-off, fully cut-off and aero-screened were formerly used in the UK to categorise a luminaire's light distribution. These luminaire category terms disappeared from the lighting industry usage in Europe and the UK some 30-40 years ago but sometimes still appear in UK planning publications. These old, non technical, terms have therefore been reinstated, in this LMP, but with more accurate technical descriptions with recommended limitations on intensity values in Section 2.

The IDA term "**Fully Shielded**" is synonymous with the old UK term "**Fully Cut-off**" and is the preferred term used in this LMP.

Upward light and source intensity limitation are only two of four aspects of stray light control explained in two complementary technical publications on the limitation of obtrusive light namely:-

- The Institution of Lighting Professionals (**ILP**) (formerly **ILE**) 'Guidelines for the Control of Obtrusive Light' (Undergoing continued revision)
- and
- The Commission Internationale de l'Eclairage (**CIE**) Technical Report 150:2003 'Guide on the limitation of the effects of obtrusive light from outdoor lighting installations'.

Both documents support the concept of setting out environmental zones based on the night time ambient light in the area. They then go on to recommend differing degrees of stray light control for each of 4 environmental zones. In previous years the most onerous limitations were in the zone of darkest ambience namely Environmental Zone E1 but the next edition of the ILP guidelines will include an even more severe restriction in a new zone numbered “E0” where no new artificial lighting will be permitted.

Exmoor National Park has a total population of about 11,000, with the majority of this population residing in the northern regions of the National Park. The area is predominantly rural but there are no very large areas free of human habitation. Where this does apply a cohesive area of about 64 square km may be just large enough to warrant the application of this strict E0 regime. The remainder of the National Park does, however, fall into Environmental Zone E1 as outlined below in Table 1.2. Strict light control status in all UK National Parks has been recognised since the ILP first introduced the night time ambience zone classification in 1993 and a full description of light limiting factors for this and other adjacent environments will follow in Section 2.

Table 1.2 Environmental Zones in the UK

Zone Number	Surrounding	Night Environment	Typical examples
E0	Protected	Dark	Starlight Reserves, Dark Sky Parks or Islands, Typical of Core Zones
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty or Dark Sky Core Buffer Zones
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Suburban residential / commercial or small town centre locations
E4	Urban	High district brightness	Large town, commercial area or city centre with high levels of night time activity

In addition to direct upward light limitations Dr Christopher Baddiley has shown in ‘Towards Understanding Skyglow’ (ILE:2007) that obtrusive glare from street lighting units, at or near the luminaire horizontal axis, can also diminish the astronomers’ observations. Accordingly the source horizontal intensity is also used in this LMP as a further means of providing both public nuisance reduction and better astronomical observations.

Reference is therefore made to limiting intensity values emanating from lighting units. The traditional simplistic means of displaying intensity distribution information is by means of a polar diagram with angular intensity values.

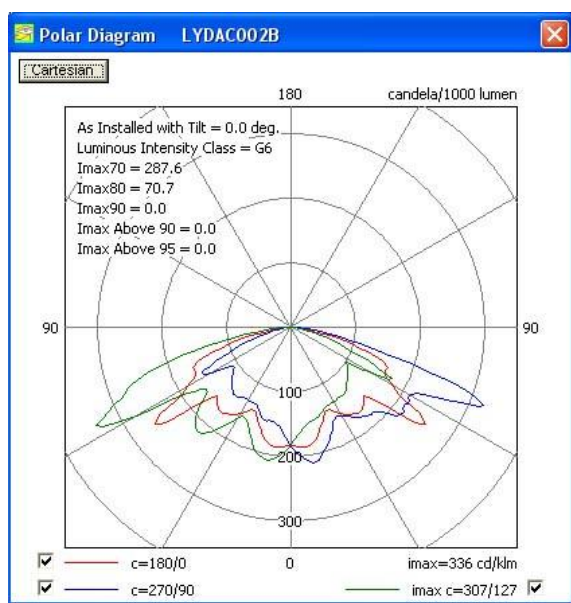
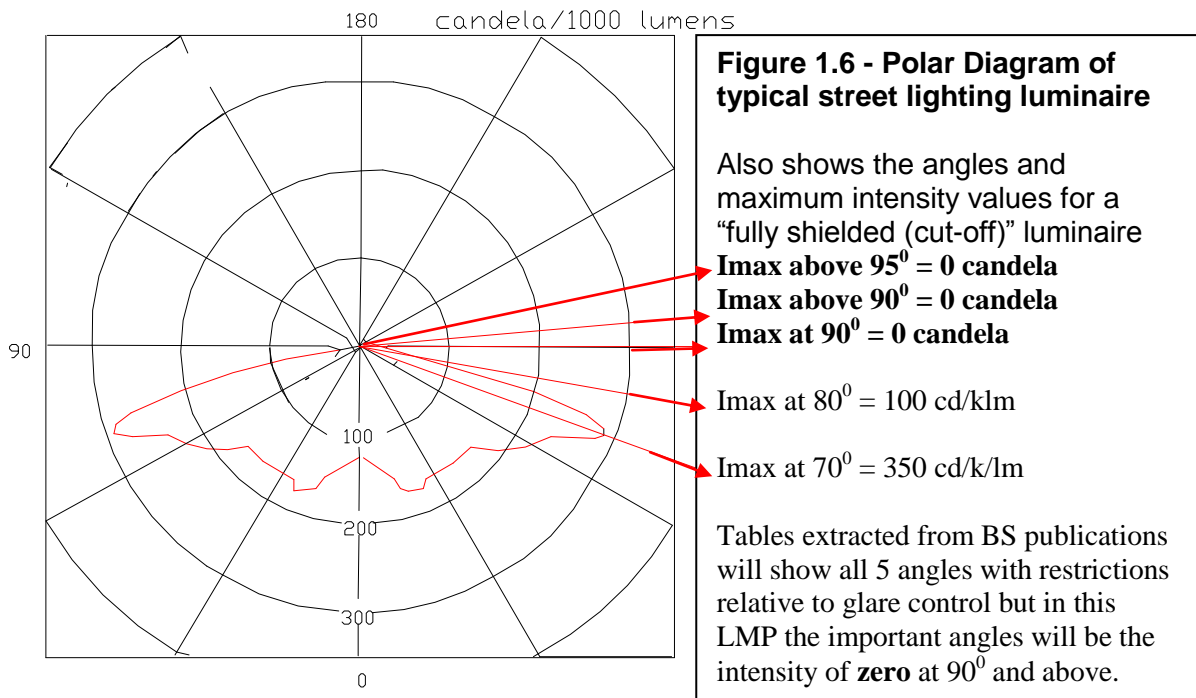
The polar diagram in Figure 1.6 (following) is a traditional way of illustrating a line of maximum intensity through the major and minor axis of a street lighting luminaire. For clarity Figure 1.6 shows only the major axis distribution for a street lighting luminaire ie the intensity of light emitted out of each side of the luminaire together with three angles where intensity limitations will be later applied to control horizontal and upward light, and a further two downward angles which are used in BS 13201 to control disability glare on the public road network. However, recent research has shown that downward intensity values at an angle of 70 degrees has an effect on the amount of light reflected upwards, off hard surfaces.

Therefore the lower the values at 70° and 80°, the lower the reflected upward light.

Regardless of luminaire light distribution characteristics recent research has also, more importantly, shown that off highway light absorbing landscape such as natural grass can reduce, by half, the upward reflected light of the installation and the use of asphalt surface lowers by half the upward light reflected off concrete.

(Landscape note:- Many rural commercial / industrial estates and car parks could be constructed, where appropriate, with asphalt surfaces rather than bare concrete if illumination is required or intended in the future.)

Throughout this LMP Upward light control limitations are stated for the luminaire in its designed or as-installed condition on site and is not a factory measured intensity.



Industry standard design software like “Lighting Reality” can be used to check luminaire “as installed” intensity values in a dynamic format as shown in Figure 1.7 at the design stage.

Another technical way of describing the limitation of upward light from luminaires is called the Upward Light Output Ratio and the ILP are currently considering the values, in percentage terms, of the zonal flux in 2 upward zones, namely between 90° and 100° and between 100° and 180°.

Figure 1.7 Dynamic output from Lighting Reality showing results at tilt angle

Task Illuminance

Over a period of time most working tasks, and sports activities, have been analysed and researched. Recommendations have been relative to the quantity and quality of light required to carry out the task in comfort and safety. It is important to:-

- Provide the correct lighting levels for the task or sport game and grade playing level.
- Provide the lighting only when needed.
- Recognise that providing light in excess of the recommendations not only increases an unnecessary addition to sky glow but it also wastes energy and increases the carbon footprint.

Some recommended lighting levels relative to rural situations are included in this LMP for reference information and to assist in providing initial benchmarks for defining appropriate light levels.

The Roadmap shown in later sections of this LMP has been compiled from information in BSEN13201-2:2003 - 'Code of practice for the design of road lighting' (parts 1 and 2) and the European CEN Standards. It has been designed to provide a simple selection process for light levels and quality criteria, including obtrusive light controls. The road lighting solution is derived from assessment of environmental zones, user types, user volume and crime volume via a flowchart.

It is hoped to extend this, or develop a similar process, for lighting management within the National Park.

For task lighting on other outdoor work places reference should be made to BSEN 12464-2:2007 – 'Light and Lighting – Lighting of work places' (Part 2: Outdoor work places) but a few of the typical National Park area tasks are contained in Section 3.2.

Within the boundary of the National Park it is important to note here that if there is "NO TASK" in operation there should be "NO LIGHT" and that the recommended values given could be reduced if "white" light sources are used (see technical reason later).

2 Dark Sky Reserve Boundaries and Light Limitation Policy

2.1 Dark Sky Reserve - Core Zone

The International Dark Sky Association promotes the concept of creating three zones to the dark sky area with a central area of zero light sources known as the Core Zone. However, the central core area of Exmoor, although sparsely populated, does not have a significantly large area of zero human habitation to declare one particular area as a totally light free area. However, an area of 32.1 square miles has been identified containing 2 inhabited buildings and one old farm, now in ruins with no plans to re-establish. Although it is not therefore habitation or light free this LMP proposes to maintain this area as the Core Zone of the Dark Sky Reserve.



Figure 2.1 – Core Zone moorland looking East from B3223 near Brendon Two Gates

The shape of the Core Zone approximates to an oval with a major axis of 15 miles running East to West along hilltop ridges. The North / South minor axis is approximately 3 miles wide and several public roads provide access across the core North and South boundaries. There is no street lighting on any of the roads within the Core Zone and this un-illuminated condition will be maintained. The land in the Core Zone is generally free of dense tree planting and consists of open moorland and rolling hill tops as shown in Figure 2.1. The photo was taken looking East along the major axis near Brendon Two Gates on the B3223. The hill tops contained within the Core Zone are noted in Table 2.1 (following page) and the topography provides the water source for many streams and secluded river valleys which provide the habitat for Red Deer and wild Exmoor ponies.

Table 2.1 Hilltops in the Core Zone

The Chains	Mill Hill	The Mound (317m)
Hoar oak Hill (475m)	Black Hill	Luccombe Hill
Butter Hill	Outer Alscott (413m)	Robin How (428m)
Winaway (480m)	Dunkery Beacon (519m)	Dunkery Hill (443m)

The Core Zone boundary has been devised to minimise human habitation and maximise on open land access by encompassing the following natural attributes of Exmoor:-

- A collection of hill top Bronze Age burial mounds (eg. Chapman Barrows, Row Barrows and Kit Barrows)
- An extensive area of Blanket Bog containing:- cotton grasses, deer sedge, sundew and heath spotted orchid.
- Hoccombe Combe:- a deserted medieval settlement and legendary home of the 17th century outlaws called “The Doones”. An ancient woodland of crooked oaks is also close to this area.
- A Site of Special Scientific Interest (SSSI) at Dunkery and Horner Wood National Nature Reserve.
- Dunkery Hill at 1,705 feet and Dunkery Beacon. The fire beacon is still occasionally used for celebratory events.

In addition to the natural attributes shown above the Authority own two properties included within the Core Zone boundary and they are:-

- **Pinkery Residential Outdoor Education Centre**
- **Blackpitts Gate**



Figure 2.2 Pinkery Outdoor Centre

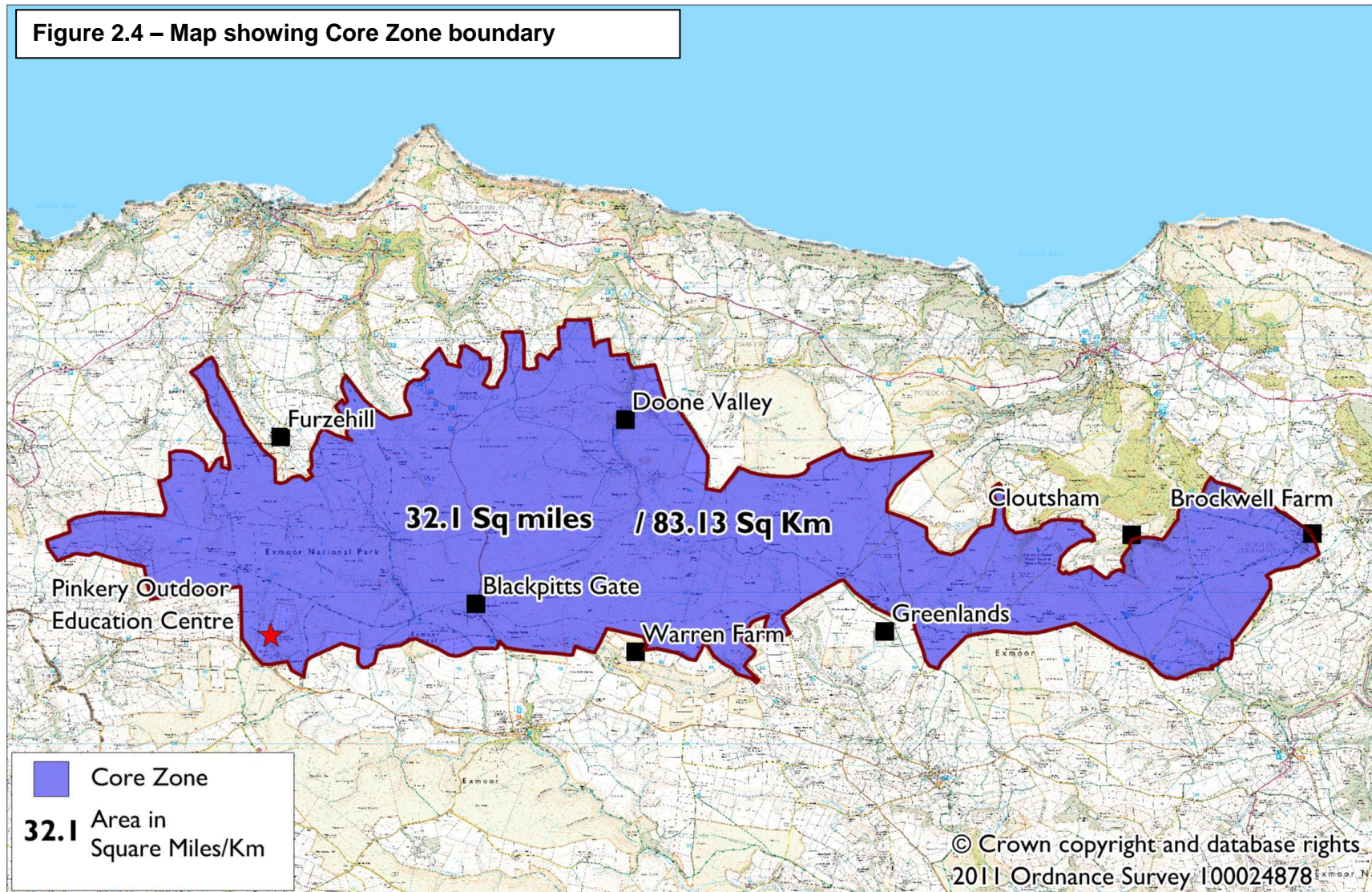
A former Victorian farmstead recently converted to provide residential accommodation for groups of all ages. It is located in the south of the Core Zone and its immediate environment provides isolation suitable for astronomy workshops. As in Blackpitts Gate the shelterbelt also acts as partial screening from emanating light.



Figure 2.3 Blackpitts Gate

Blackpitts takes its name from the peat cutting that was carried out here for centuries. The habitation is a small detached bungalow constructed in 1954, and a corrugated tin barn/outbuilding. A small conifer plantation to the east of the dwelling was planted as a shelterbelt like most of the remote habitations in Exmoor.

Figure 2.4 – Map showing Core Zone boundary



Land ownership within the Core Zone is split as follows:-

- National Trust 23%
- National Park Authority 32%
- Badgworthy Land Company 28%
- 17% in private ownership

The following properties are close to the Core Zone boundary

- **Stoke Pero Church** Ownership: National Trust
- **Cloutsham Farm** Ownership: National Trust
 - A working farm on the Holnicote Estate
- **Brockwell** - Private Ownership
- **Fairgarden Farm** - Private Ownership
- **Greenlands** - Private Ownership
- **Warren Farm** - Authority land ownership with Tenant farmer
- **Furzehill North & South** - Private Ownership

An inventory of the limited amount of external lighting within the Core Zone has been undertaken and assessed whether compliant with the International Dark Sky Association (IDA) initial recommendations. The results are shown in Section 5.2 and all owners / tenants have given an assurance that all non-compliant units will be replaced by “fully cut-off” units within 12 months of the publication of this LMP. External lighting round the Pinkery Outdoor Education Centre is required in emergency evacuation conditions and Appendix C contains a “fully cut-off” example which could be used to replace the existing non-compliant lighting units.

Policy Statement Number 1

Within the Core Zone boundary (shown in Figure 2.4) it is proposed to maintain a policy of no additional permanent illumination and all existing lighting units should be replaced by “fully cut-off” examples regardless of the lumen output.

Policy Statement Number 2

Residents in the Core Zone are to be encouraged to limit the overspill light at their property boundary, or within 10 meters of the main residence, to no more than 0.05 lux.

Policy Statement Number 3

The Authority will endeavour to ensure that no lighting will be allowed to be projected from the adjacent light permitted zones into the Core Zone and any overspill lighting from lights in the Critical Buffer Zone to be no greater than 0.05 lux (horizontal) at ground level or 0.05 lux vertical at 1 metre (or higher) above ground on the Core Zone side of the property boundary.

2.2 “Fully Shielded” Concept Visualisation

The upward light limitations of a “fully shielded” / fully cut-off luminaire is outlined in technical detail in section 1.5, however, to display the effects, in a non technical format, an electronic model village was constructed and illuminated firstly with traditional low pressure sodium street lights, as found in Exford. The luminaire positions were then replaced by luminaires with flat glass and mounted horizontally with an equivalent wattage consumption using LED light sources. The software used for the ensuing “before and after” visualisation used ray tracing techniques to calculate the effects of the light reflected off all surfaces from both types of luminaire.



Figure 2.5 Traditional Low Pressure Sodium distribution - shows house details up to chimney pots

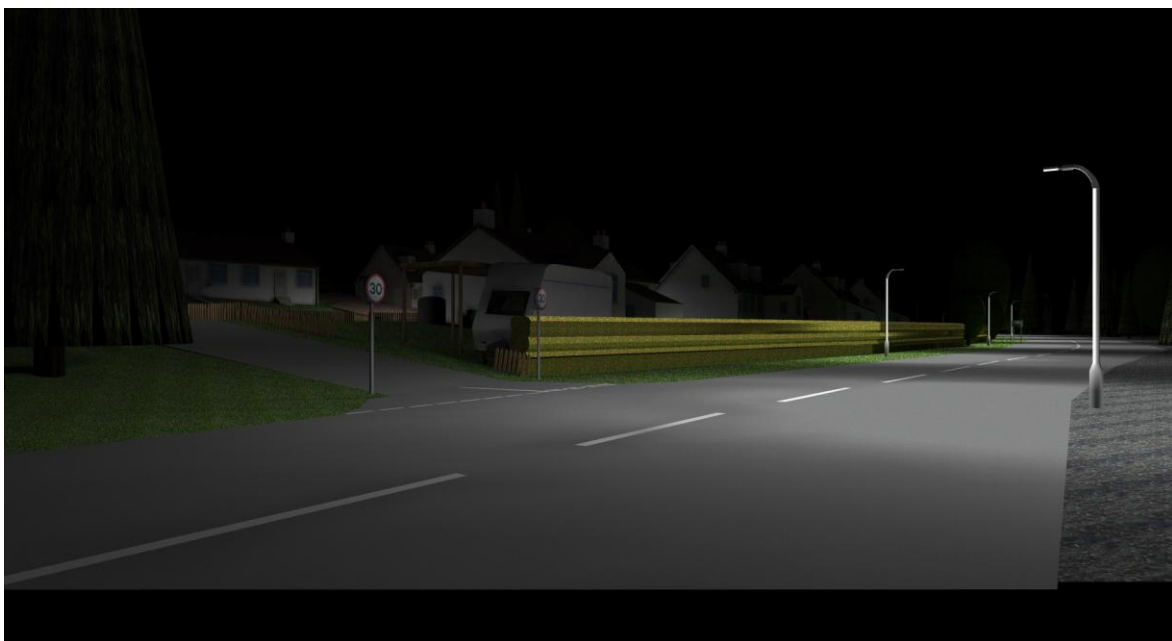


Figure 2.6 Luminaires with Fully Cut-Off distribution showing distinct lack of upward spill light detail and distinct reduction in distant visual glare from luminaires.

2.3 Dark Sky Reserve – Buffer Zone

It is a general recommendation that all Core Zones require an area of protection surrounding the very strict limit of no artificial light with one of less severe recommendations. As outlined in Section 1.5 the status of light control within any National Park has been recognised since 1993 as that of a night time environmental zone E1 and as such provides a general Buffer Zone limit of many miles distant round the core zone. This LMP encourages continuance of this classification but proposes a two step approach within the National Park boundary. The IDA recommend that an external lighting audit is carried out on all lighting within the Buffer Zone but the quantity of lighting, within the Exmoor boundary, would take too long to collect. It is therefore proposed that a Critical Buffer Zone is established with a generalised edge (not a boundary limit) of about 1½ miles (about 2Km) as a representative fraction of lighting typical of Exmoor area in general.

2.3.1 Critical Buffer Zone

The generalised edge of the Critical Buffer Zone is shown in Figure 2.8 and, in addition to many remote houses and farm steadings, contains four villages, two of which have Conservation Area status namely Wootton Courtenay and Luccombe to the North East of the Core Zone. The village of Exford is the only village with a few street lighting units which currently burn all night (see both County Council implementation of part night lighting later). Unlike the residential status of the conservation villages, north of the Core Zone, both Exford and Simonsbath, which are south of the Core Zone, have several hotels and Inns, all with their own forms of exterior lighting and associated light pollution.

A full set of the lighting audit survey results is given in section 5, however, in summary form of the 694 lighting units found in this zone there are currently about 78% dark sky compliant based on the limit of 1000 lamp lumens or less being deemed compliant. Many of the non-compliant relate to the installation of security style floodlights although in general terms several have natural tree leaf shielding in the summer months.

Although there are many variations on a theme to be found in the Critical Buffer Zone there are principally 3 different luminaire styles: Heritage (Figure 2.7.1), Bulkheads (Figure 2.7.2), and Floodlights (Figure 2.7.3).



Figure 2.7.1

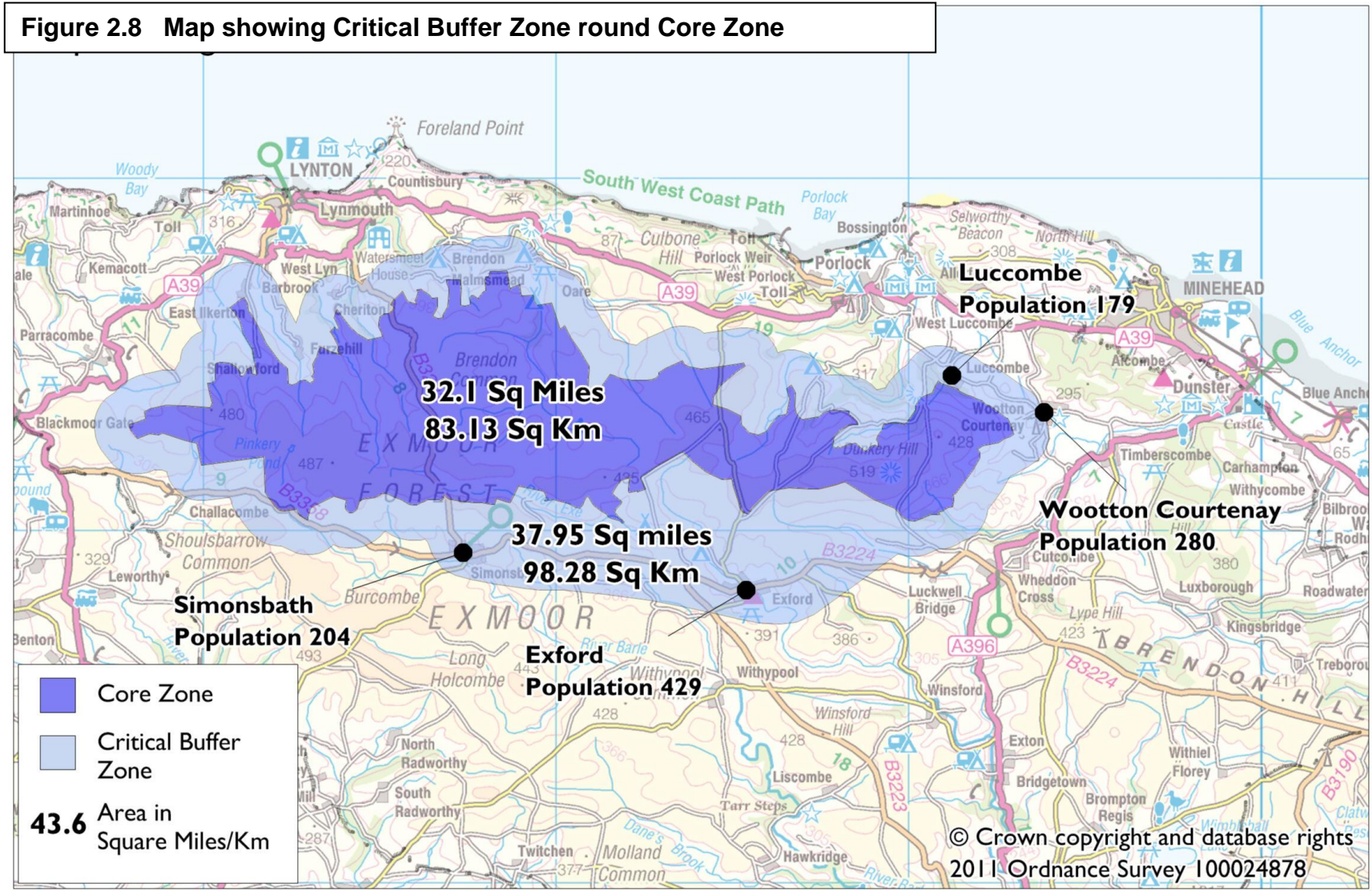


Figure 2.7.2



Figure 2.7.3

A few other styles were also found but the important element is not the style of the luminaire but its associated lamp output and more importantly the distribution of light being emitted. Most of the tungsten halogen floodlights use lamps which have an output greater than 1000 lumens. At least 113 were found with an elevated angle as illustrated in Figure 2.7.3. To be fully compliant with the IDA recommendations, the glass window should be totally horizontal as shown previously in Section 1.5 (Figure 1.5). (See Appendix F for a future improvement process)



Policy Statement Number 4

Luminaires using lamps greater than 1000 lumens should be installed as a Fully Cut-Off (IDA “fully shielded”) example.

Bulkhead style luminaires should be fitted with lamps less than 1000 lumens even although they may have an upper hood purportedly limiting upward light. A luminaire such as shown in Figure 2.7.2 with an 18watt compact fluorescent lamp (“energy saving light bulb”) can provide a vertical illuminance value of 0.1 lux at least 22 metres from the source and also provide visual perception of light on tree tops some 150 meters distant. Although it may not be possible to measure the quantity of illumination at this distance it is the visual perception of the light reflecting effects, which causes concern for both astronomers and neighbours alike.

The IDA recommend that the spill light at a property boundary is not greater than 0.1 lux, which is about 1/3 of the light from a full moon. Illuminance can be measured with a light meter but a rule of thumb guide which links the lamp lumen usage to property footprint size is included in section 3.1 guide.

As well as providing careful control of spill light it is equally important to avoid over-lighting an area as that found, during the lighting audit survey, in an industrial/commercial estate immediately adjacent to, but outside, the Exmoor boundary. Where possible this LMP provides task illuminance recommendations and some alternative solutions to address in the future.

Policy Statement Number 5

Residents of Exmoor National Park are to be encouraged to limit the overspill light at their property boundary to no more than 0.1 lux. (Residents within the Core Zone have stricter recommendations see Policy statement no. 2)

With the exception of the large pole mounted heritage style luminaires as shown in Figure 2.9 most domestic heritage style luminaires are designed and labelled with a maximum tungsten filament lamp wattage of 60 watts (11watts Compact fluorescent), both producing less than 1000 lumens, and although they have very little light control can generally be classified as IDA compliant for the moment. The lower the wattage the better the compliance. In some residences the heritage style luminaire was found to be located in a door porch area. This approach provides a good method of limiting stray upward light. Additionally some residents have installed 8 watt, or less, compact fluorescent lamps, which are often all that is necessary to provide some light round a doorway in the intrinsic darkness of Exmoor.



Figure 2.9 Good example of Heritage Luminaire with rear light limiter, lamp recessed in canopy hood and light distribution using pot-optic. (St Lukes Church, Simonsbath)

A lamp wattage and lumen output chart for domestic style lamps is given in Appendix E and guidelines for an individual property self-assessment style audit with recommendations on what to do to better the existing conditions is given in Appendix F.

2.3.2 Remainder of Buffer Zone

Like Luccombe and Wootton Courtenay nearly all the villages in Exmoor have no street lighting system and the same intrinsic darkness can be attributed to the remaining majority of the National Park. Even though Exford, in the Critical Core Zone has street lights, there are only 8 in number and they serve a population of some 400 residents, alternatively 1 light for 50 residents or about 20 households. Like Exford many of the other villages with street lighting units have had the units located at strategic locations rather than providing a cohesive street lighting system. Both local authorities have this policy already contained in their own lighting policy plans. In larger towns like Dulverton the ratio of street lights per head of population is about 1 to 8. (see both County Council implementation plans for part night lighting later)

As outlined in Section 2.3 no audit was undertaken for domestic lighting units in the remainder of the National Park due to the quantities involved, however, as shown in Table 2.2 the surveyed quantity, within the Critical Buffer Zone, and the resulting compliance percentage is greater than other UK Dark Sky applications. It is reasonable to assume that this percentage will be replicated throughout Exmoor. From the population numbers within the Critical Buffer Zone, shown in Figure 2.8, the domestic and commercial lighting ratio per head is in the order of 0.7 domestic lights per head of population.

Table 2.2 Comparison of Percentage Compliant

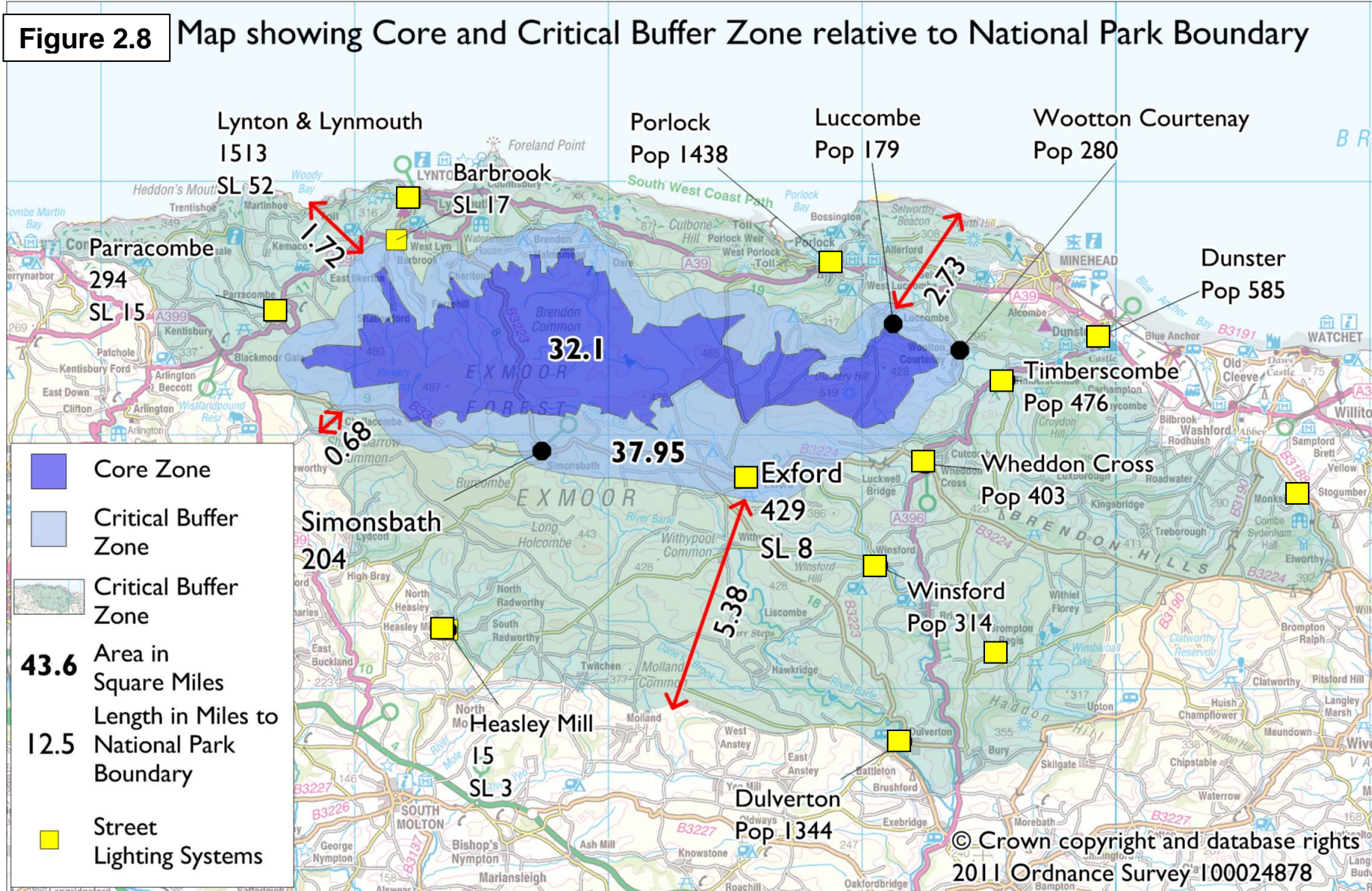
Dark Sky Application	Quantity Surveyed	Quantity Compliant	Percentage Compliant
Exmoor National Park Reserve	693	539	77.8%
Isle of Sark Dark Sky Island	582	436	75%
Galloway Forest Park	374	263	70%

Accordingly Exmoor should be maintained in this pristine condition. Where new or replacement external lighting is required the most onerous light control conditions should be applied to maintain this condition. To assist in this objective Section 2.3.3 contains recommendations on luminous intensity limits for new luminaires, with a lamp output greater than 1000 lumens. For domestic style luminaires with no intensity data Section 3.1 contains a lumen limit evaluation process.

Although the domestic lighting audit was limited to the Critical Buffer Zone a Public Lighting Audit was also collected and is displayed, together with typical luminaire profiles in Section 5.3. Figure 2.10 shows a map of the town or village locations which contain street lights.

Policy Statement Number 6

In Environmental Zone terms the residents round the Core Zone live with and enjoy intrinsic darkness and as shown in Table 1.1, equivalent to Zone E1. Towns within the Exmoor National Park boundary with a population greater than 900 may relax the Environmental Zone in the town centre where buildings provide natural screening but not in exposed locations.



2.3.3 Light Limitation Parameters

Luminous intensity from a luminaire is derived from photometric information, which has been measured under laboratory conditions. These measured values describe the luminaire's light distribution in numeric electronic format (commonly known as I-tables in IES, TM14 or ELUMDAT format).

As commented in Section 1.5 the ILP originally classified upward light as one segment above 90° but are now considering upward light ratios in two upward segments but the recommendations are not yet formulated sufficiently to include in this document and a modified derivative of the glare restriction table in BS13201 will be used in this LMP.

From the I-table for a particular luminaire and its installed angle of elevation the intensity of light at different elevation angles can be computed and classified in glare classes, namely G1 to G6. G1 is the most relaxed and G6 is the most restrictive and this is the recommended restriction, with selective relaxation, which should be applied throughout Exmoor as shown in table 2.3. An example of some luminaires with light sources greater than 1000 lumens and complying with the upper intensity limits of table 2.3 are shown in Appendix C.

Table 2.3 - Intensity limitation in Exmoor (excluding Core Zone)

ENP Zone Dark Sky Requirements	Glare Class	Maximum luminous intensity in cd/klm				Non technical description of luminaire light control in installed condition
		at 70° az	at 80° az	at 90° az	above 95° az	
Between Core Zone and nearest population cluster > 900	G6*	350	100	0	0	Fully cut-off installation in environmental zone E1
Residential buffer between town centre and rural remainder (or centre of town with < 900)	G5- derivative	350	100	5	0	Cut-off installation
Town Centre with population > 900 (excluding heritage style streets)	G4	500	100	10	0	Part Cut-off installation
Heritage bowl style	G4	500	100	10	0	
Heritage gas style	G4+	500	100	20	0	
External to ENP for 5 miles beyond Park boundary (lamps < 20,000 lumens)	G3	.	100	20	2.5%	Semi-Cut-off installation in environmental zone E2
All luminaires with lamps greater than 20,000 lumens between Core Zone boundary and 20 miles distant	G6**	350	100	0	0	Fully cut-off installation regardless of night time environmental zone

(see next page for notes on * items)

Note ^{az} Table 2.3 restrictions apply to the luminaire's installed angle of inclination (azimuth) which can be tested in UK industry standard design calculation software.

Note * Intensity relaxation may be appropriate at 70° and 80° depending on luminaire availability but the **values of zero intensity at 90°, 95° and above are crucial.**

Note ** Requires discussions with adjacent land owners and local authorities to adopt similar controls in their individual environmental policy plan.

In addition to the intensity controls presented in table 2.3 further light limitation recommendations are contained in table 2.4, below, to mitigate any obtrusive light in an E1 Environmental Zone and the two tables should be considered in tandem at the design stage for all new exterior lighting in Exmoor.

The ILP and CIE describe 'curfew' as the time after which stricter requirements (for the control of obtrusive light) will apply. After 'curfew', most lighting should be extinguished or reduced as activity levels decline.

Although very few residents leave external lighting on longer than presence detection there are a few situations where lights are left on all night, sometimes by accident. The time of 22.00 hours is suggested as 'exterior light curfew' time for Exmoor at which point users will be encouraged to extinguish or reduce the quantity of lighting.

Table 2.4 - Obtrusive Light Marker Points

Light Limitations for Exterior Lighting Installations within Exmoor boundary						
Night Time Environmental Zone	Sky Glow Upward Light Ratio %	Light Intrusion (into windows) E _{vertical} (lux)		Source Intensity I (cd)		Maximum Luminance L (cd/m ²)
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Pre-curfew
E1	0	2	0	2,500	0	0
E 1.05	1%	2	0	3,000	0	1
E 1.10	1%	2	0.5	4,000	100	2.5
Illuminated advertising signs	0	0	0	100	0	50

Refer to Section 3 for information on time switches and other switching regimes and also for Devon and Somerset County Councils' commitment to converting most of the street lighting units to part night usage.

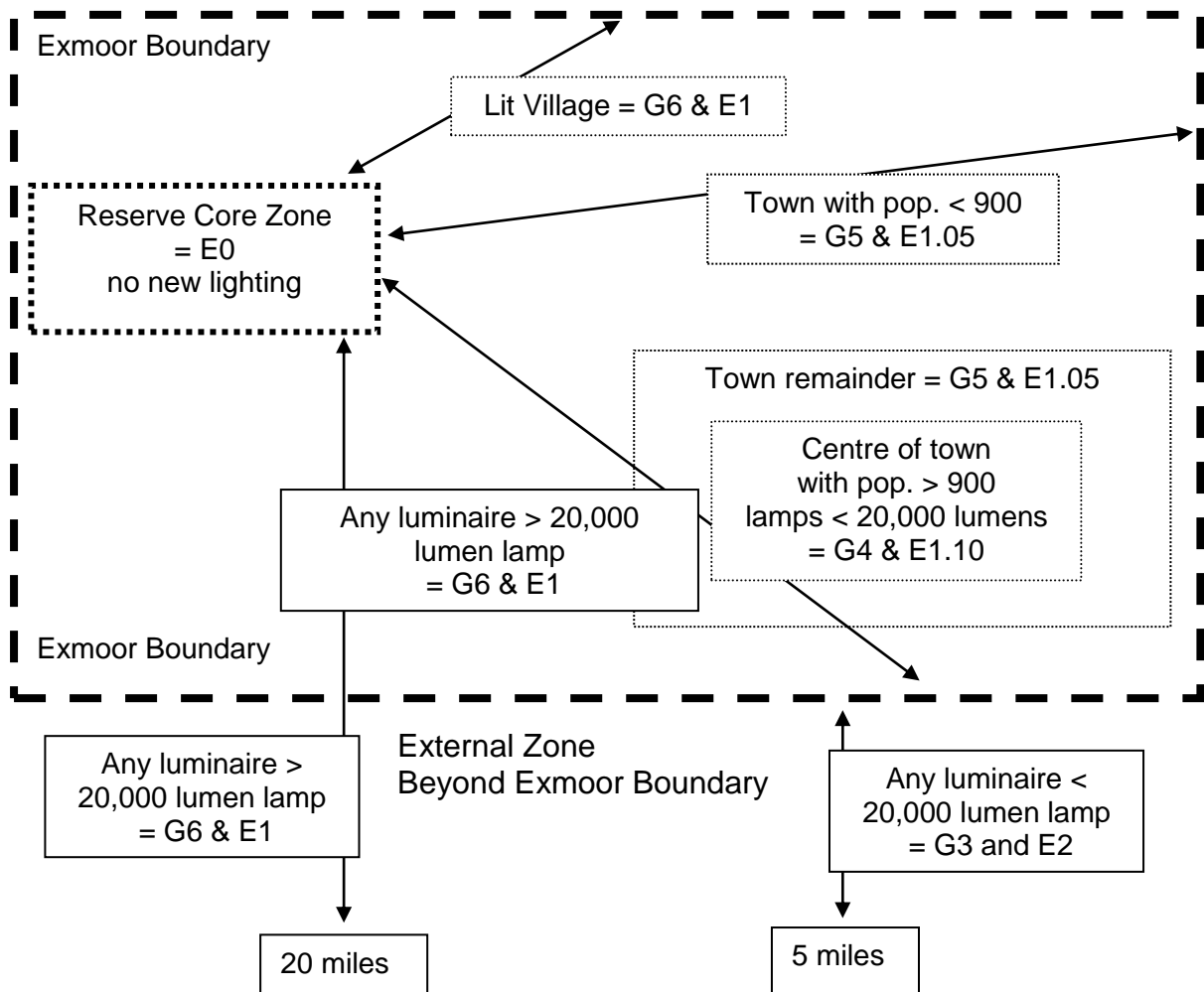
Policy Statement Number 7

Where possible all new lighting within Exmoor should be designed and installed to provide lower glare or intensity values, where possible, than that recommended by the ILP for night time Environmental Zones.

In order to prevent medium district brightness from adjacent "non-national park" lighting creeping closer to the intrinsic darkness within Exmoor, Table 2.3 and Section 2.5, later, contains recommendations to reduce the elevation angle of existing or proposed high wattage / high output luminaires in the External Zone. This requires discussions to

encourage adjacent developers or Planning Committees to work towards adopting similar controls in their individual environmental policy plan.

Figure 2.11 Diagram showing combination of intensity and environment recommendations (refer to Table 2.3 and 2.4 for full descriptions)



Most domestic luminaires provide very little light control and very few are measured photometrically in the same manner as commercially available luminaires. Accurate intensity or illuminance values cannot therefore be predicted by computer calculations and a different method of calculation is required. Section 3.3 therefore contains a method recommended by the IDA which provides a guide to the number of lumens based on the footprint size of the property for all new domestic style lighting.

Care for the night time environmental control should be part of the process when selecting all new domestic equipment. Examples of domestic luminaires with good and poor light control can be found in Table 3.6 and Appendix D.

Policy Statement Number 8

All design submissions and planning applications that include external lighting in Exmoor should be encouraged to show evidence of compliance with the zero candela intensity at 90° and above and encourage domestic luminaires to be selected from units having some form of upward light control.

2.4 External Zone - General

Since the Authority has no jurisdiction in the area beyond their park boundary this section explains how planners and engineers need to work in partnership, both internally and externally, to help maintain or enhance the Dark Sky Reserve.

As indicated in the Preamble the guidance given in this document will assist in the defence of the existing dark sky over Exmoor. However, beyond the National Park there is a national problem with obtrusive light. Part of the problem emanates from the random standards of some planning applications containing external lighting proposals and in the UK the Scottish Executive produced a Planning Guidance Note (Controlling Light Pollution and Reducing Energy Consumption) which provides a rationale to all lighting design proposals.

An abbreviated 12 point summary checklist of the design methodology, suitable for adoption by the Authority, is shown in Table 2.5 below but reference to the full document will provide the reasoning behind a 20 bullet point checklist. This LMP should encourage Development Control Committees, both within the Authority and adjacent Local Authorities, to insist on a thorough design process by the developer before submitting proposals. Although only 12 points are included in Table 2.5 these should be treated as an absolute minimum requirement and there are no reasons why the full 20 point plan is not set as a standard requirement.

Table 2.5 Planning Application Checklist

Good External Lighting Design Practice
<ul style="list-style-type: none">• Survey of surrounding area environment• Identification of critical viewpoints or receptors• Analysis of task lighting level recommendations and game level if sports lighting application• Establish environmental light control limits• New lighting design quality objectives• Calculated measurement of Task working area(s) Overspill area(s)• Obtrusive light calculation of Property intrusion Viewed source intensities Direct upward light output ratios• Compare design achievement with baseline values• Schedule of luminaire types, mounting height and aiming angles• Schedule of energy usage and lumens per square metre• Schedule of luminaire profiles• Layout plan with beam orientation indication and site relationship with surrounding residential and commercial properties

Policy Statement Number 9

Through this LMP it will be possible for the Authority to provide a basis for discussion with its neighbours on various options to help reduce upward light transmission.

2.5 External Zone – Immediate Surrounds

No inventory was undertaken in the External Zone.

Table 2.6 - Intensity limitations in External Zone

Dark Sky Requirements	Glare Class	Maximum luminous intensity in cd/klm				Non technical description of luminaire light control in installed location
		at 70 ⁰ az	at 80 ⁰ az	at 90 ⁰ az	above 95 ⁰ az	
External to ENP for 5 miles beyond National Park boundary (lamps < 20,000 lumens)	G3	.	100	20	2.5%	Semi-Cut-off installation in environmental zone E2
All luminaires with lamps greater than 20,000 lumens between Core Zone boundary and 20 miles distant	G6	350	100	0	0	Fully cut-off installation

The mileage limits shown in Table 2.6 assume that no other, more restrictive intensity limitation, external policy is in place.

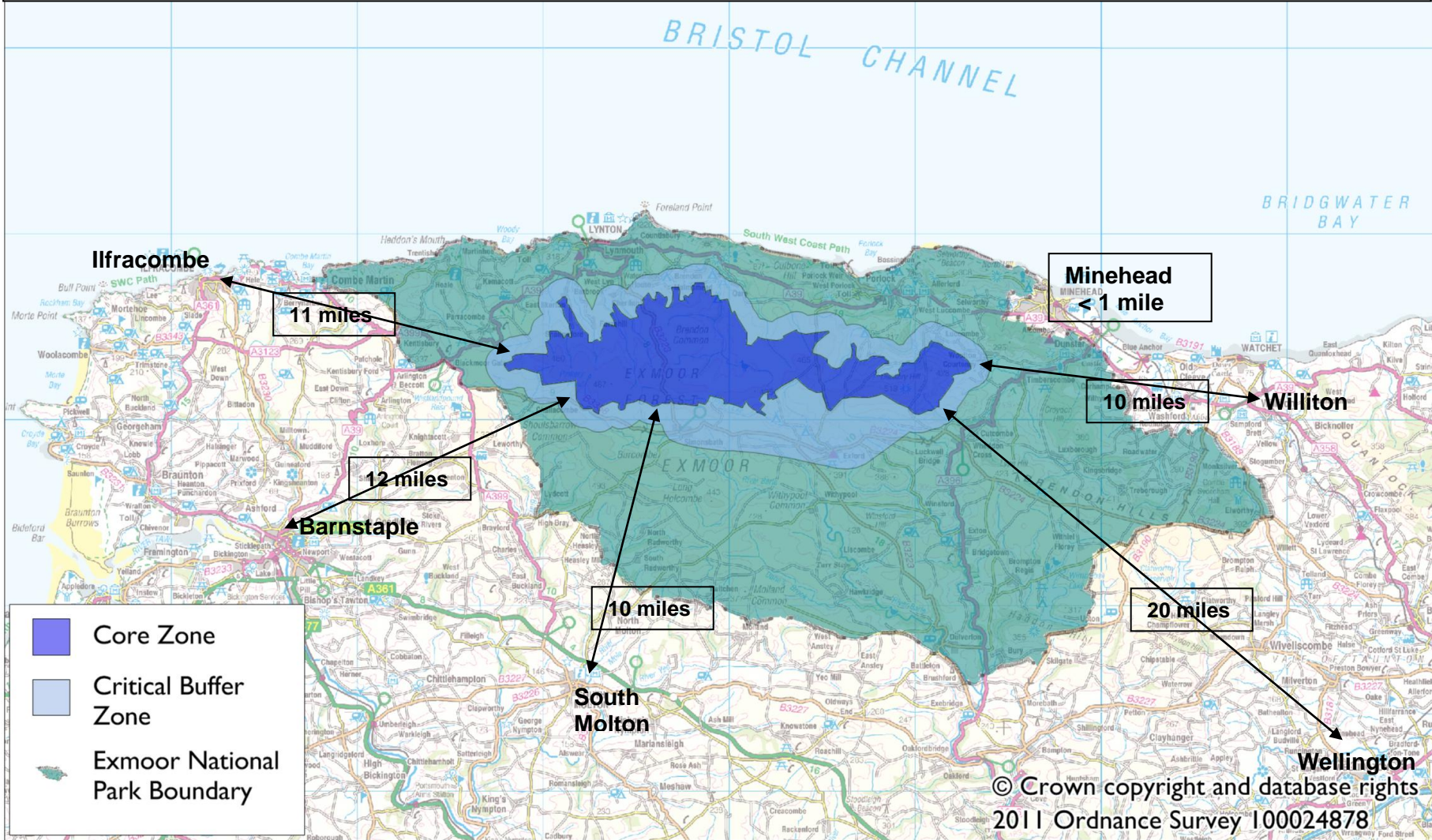
As in section 2.3.3 the following table should be used in tandem with table 2.6 to mitigate any obtrusive elements in the lighting design of new installations.

Table 2.7 - Obtrusive Light Maker Points for External Environmental Zone

ILE and CIE Obtrusive Light Limitations for Exterior Lighting Installations						
Environmental Zone	Sky Glow Upward Light Ratio %	Light Intrusion (into windows) E _{vertical} (lux)		Source Intensity I (cd)		Building Luminance L (cd/m ²)
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Pre-curfew
E1 – for lamp lumens > 20,000	0	2	0	2,500	0	0
E2 - For 5 miles beyond ENP boundary limit with rural setting	2.5**	5	1	7,500	500	5
E3 / E4 for Minehead and Barnstaple	5	10	2	10,000	1,000	10
	15	25	5	25,000	2,500	25

** Upward Light Ratio for luminaires in External Zone using lamps less than 20,000 lumens otherwise 0% for lamps greater, up to a distance of 20 miles beyond ENP Core Zone.

Figure 2.11 – Map showing National Park boundary relative to surrounding External Area



3 Performance Requirements - General

Luminaires are designed to have light distributions which are appropriate for specific applications. Even though a luminaire has a Dark Sky Fixture Award it can produce sky glow, light intrusion or glare if it is installed incorrectly with an upward aiming angle. At lighting design stage, by following the recommendations relating to intensity and vertical illuminance limits should mitigate the obtrusive nature of stray light. Industry standard software, complete with obtrusive light evaluation criteria eg Philips Calculux is downloadable from their web site.

Although described in the External Zone section, all planning applications involving external lighting should follow the 20 point plan outlined in Section 2.3 whether it is in Exmoor or in the External Zone beyond the park boundary to ensure that intensity and obtrusion are mitigated accordingly.

Over-lighting an area is just as obtrusive and wasteful as pushing light into the night sky. Designing for, and providing, the correct task illuminance on the ground is just as important as controlling stray light. The next sections look at task luminance or illuminance to suit the holistic need of the area's environmental night ambience.

Switching Regime

Many commercial premises have labels attached to light switches to say "switch off lights when room is not in use" and some buildings have energy management systems which automatically detect occupation and adjust accordingly. External lighting should be similarly treated, not only to limit energy usage but also to reduce the impact on the night sky.

Section 2.2 introduces a night curfew time after which exterior lighting should be switched off or reduced in quantity.

Devon County Council and Somerset County Council are now implementing part night lighting throughout their respective public road lighting networks. Within the Exmoor boundary Devon have already implemented the changes in Paracombe. Somerset are committed to converting the street lights in Dulverton and Exford within the next 12 months. Additionally, as a direct result of this dark sky application, they are proposing to seek implementation approval in each Parish Council within Exmoor within the next 12 months. The switching off times are slightly different but generally they will be extinguished between about midnight and 5.30am as part of their respective energy and CO² reduction policies.

Some road and motorway lighting in the UK now have energy management built into the luminaire control gear to dim the street lighting depending on the volume of traffic. The same principles could equally apply to new lighting which is installed within Exmoor. Such a system requires electronic control gear to operate the lamp and some road lighting luminaires can be fitted with a presence detection regime. However, the cost to implement this advanced regime may preclude early implementation but the installation of part night photoelectric switches is seen as a viable alternative.

As far as domestic exterior luminaires are concerned many can be purchased with a combined passive infra-red (PIR) presence detector and photoelectric switch unit (PECU) to do the same work as a commercial building management system. A push button time delay switch is just as good and it has the added advantage over PIR detection in that the luminaires will not be turned on by cats, dogs or other wildlife movement.

All residences in the Buffer Zone should be encouraged to adopt some form of light reduction after the 'curfew' time. Even if the luminaire is not fitted with presence or darkness detection some DIY stores supply programmable light switches which are designed to replace existing internal manually operated switches.

Policy Statement Number 10

All residential and business occupiers in Exmoor will be encouraged to switch off or reduce their exterior lighting quantity at 22.00 hours.

3.1 Requirements for non residential outdoor lighting

3.1.1 Work Task Lighting

The preferred method of designing lighting is by following the performance method of task illuminance selection process from either BS EN12464-2:2007 "Light and Lighting – Lighting of work places – Part 2 Outdoor work places", and a few examples have been extracted and shown in Table 3.1 for easy reference, or from BS EN 12193:2007 "Light and Lighting. Sports Lighting" (see also the CIBSE Sports Lighting Guide).

Table 3.1 – Illuminance for typical tasks within Exmoor

Ref No.	Type of area, task or activity	Eav lux	U _o	GR _L	R _a	Remarks
	Farms					
5.5.1	Farm Yard	20	0.10	55	20	
5.5.1	Equipment Shed (Open)	50	0.20	55	20	
5.5.3	Animals sorting pen	50	0.20	50	40	
	Farmland Sport					
	Equestrian (outdoor event)	100	0.50	55	20	
	Industrial sites and Storage					
5.7.1	Short term handling of large units and raw material, loading and unloading of solid bulk goods	20	0.25	55	20	
5.7.2	Continuous handling of large units and raw material, loading and unloading of freight, lifting and descending location for cranes	50	0.40	50	20	Probably no sites like this in Exmoor
5.9.1	Parking Areas – See Roadmap in section 3.2 following				20	
	Simple Summary for safety and security					
	Very low risk	5	0.25	55	20	
	Low Risk	10	0.40	50	20	
	Medium Risk	20	0.40	50	20	
	High Risk	50	0.4	45	20	

Key to table abbreviations

Eav = Maintained average illuminance

U_o = Overall uniformity

GR_L = Glare Rating limit (for internal work visibility benefit and not a visibility measure from outside the site)

R_a = minimum colour rendering index

Most of the recommended values shown in Table 3.1 have been based on the premise that a lamp with a low colour rendering index will be used as shown in the column headed 'R_a'.

The colour rendering index of a standard high pressure sodium lamp (SON) (yellow coloured light) is about 20 but the colour rendering index of ceramic metal discharge lamp (CMD) (true white light) is in the order of 65.

Various research projects, carried out over several years, have proved that human vision works better with high order colour rendering and in some tasks the illuminance value can be reduced if 'white' light is used instead of 'yellow' light.

Although monochromatic low pressure sodium light is simple to filter out of astronomical observations a well controlled, zero upward light, white light source should be a more acceptable compromise with some energy saving advantages. Filtering out certain wavelengths of artificial light, however, has the effect of reducing the visibility of low magnitude stars by a factor of at least 4 (equivalent to 2 F-stops in a camera aperture).

Illuminance recommendations are based on a numeric system to replicate visually perceptible increasing steps as shown in Table 3.2. This table also shows the illuminance step difference between low colour rendering lamps and high colour rendering lamps.

Table 3.2 – Illuminance comparisons based on colour rendering index (R_a)

Colour Rendering Index	Task Maintained Average Illuminance Steps (lux)													
	2	3	5	7.5	10	15	20	30	50	75	100	200	300	
R _a < 60														
R _a > 60		2	3	5	7.5	10	15	20	30	50	75	100	200	300

The roadmap in Section 3.2 shows this technique in operation on public highways and amenities, however, BS 13201 recommends that the lowest value of 2 lux should not be reduced to the anticipated value of 1 lux.

There is no visual reason why 1 lux cannot be used on private paths or roads within Exmoor where appropriate and only if lighting is found to be necessary.

Although ocular vision research has proved a case of improved visual acuity with "white light" current health research in the UK and the USA is studying the effect of "blue rich" white light on the mental well being of humans and animals. The IDA are considering limiting the use of some lamps which radiate light at or below 500 nanometers. (See Appendix A for Colour Temperature and coloured spectrum distribution of commonly used external light sources). **This is not a practical proposition in the UK since it will eliminate the use of all except low pressure sodium light sources.** However, as an interim measure this LMP suggests that light sources which have a colour temperature of 3,200 °K or 4,500°K should be used in preference to 6000°K, especially in residential areas.

3.1.2 Sports Lighting

With a growth in leisure pursuit comes a growth in the need to extend the hours that play areas can be used and there are several game areas in Exmoor with floodlighting facilities but some have poor light control. Nationally some sports areas contain some of the worst cases of over-lighting and it is essential that this does not happen in or around Exmoor.

BS EN 12193:2007 “Light and Lighting. Sports Lighting” contains both indoor and exterior lighting recommendations for not just the players but also the audience, the referees, the cameras and last but not least the neighbours. It also contains recommendations for lighting designers in the form of typical calculation areas and the number of calculation points to include in any assessment.

The illuminance recommendations are based on the quality of the game. There are 5 levels of competition from National to Recreational, all with different illuminance requirements. Table 3.3 shows some of these extremes.

Some manufacturers provide free design outlines as shown in Figure 3.1 but that is only a very small part of sports lighting design considerations. It is also essential to consider light overspill and intrusion, especially when the sports field is close to residential property.

In order to protect the existing dark sky over Exmoor any new sports facilities requiring floodlights it is essential to ensure the playing surface is not over lit.

Double asymmetric flat glass luminaires should be used with the luminaire window completely horizontal as shown in Figure 1.5 and 3.2.

It may also be necessary to limit the average illuminance to that of recreational level depending on the distance the sports facility is from the Core Zone. (see Appendix A for the definition of ‘average’).

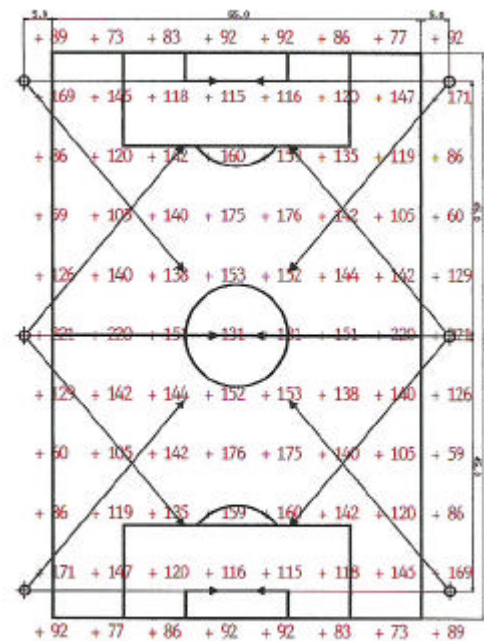


Figure 3.1 – Typical Football Area - Free Design

Note:- Free Design like this never includes the impact on the surrounding landscape.

Table 3.3 - Game maintained average illuminance extremes

Game	Class I	Class III
Football, Rugby, Basketball, Netball, Volleyball	500 lux	75 lux
Equestrian and Cycle Racing	500 lux	100 lux
Hockey and Tennis	500 lux	200 lux



Figure 3.2 – Tennis Court lighting good example

This is a pictorial example of a fully cut-off luminaire installation.

The IDA term for this installation is “fully shielded” without applying additional external screens, hoods or louvers on the luminaire.



3.2 Requirements for Traffic and Residential Area Lighting

Selection Matrix Starter

Main User Type	Typical Speed of Main User	Excluded User Type	Situation Set
Pedestrian & Cyclist	Walking Speed	Motors, Slow Vehicles & Motor Cycles	Remote Path - Set 8 "Shops" - Set 7
Vehicle conflict and shop users	10-30 MPH		"Streets" - Set 7 Car Parks - Set 3
Residential vehicles, Cycles & Pedestrians	10-30 MPH	Heavy goods vehicles	Set 5
Motorised traffic & Slow vehicles	20-40 MPH		Minor / Rural - Set 4 Secondary - Set 3
Motorised Traffic	30-70 MPH	None	Set 2
Motorway Regulations	70+	Slow vehicles, cycles & pedestrians	Set 1

Set 1 - Luminance Design Objectives

Typical Network:- Motorway & Motorway Link Roads

Traffic Flow ADT	<40,000					>40,000						
	Lav	Uo	UI	TI	SR	Lav	Uo	UI	TI	SR		
Complex Interchange	2.0	0.4	0.7	10%	0.5	2.0	0.4	0.7	10%	0.5		
Junction	<=3Km		1.5	0.4	0.7	10%	0.5	2.0	0.4	0.7	10%	0.5
Spacing	>3Km		1.5	0.4	0.7	10%	0.5	1.5	0.4	0.7	10%	0.5
Hard Shoulder	0.75	0.4	0.6	10%	0.5	0.75	0.4	0.7	10%	0.5		

Set 2 - Luminance Design Objectives

Typical Network:- Strategic Routes, Trunk and some Principal "A" roads
Main Distributor Routes or
Routes between Strategic routes with peak time parking restrictions

Traffic Flow ADT	<15,000					>15,000					>25,000					
	Lav	Uo	UI	TI	SR	Lav	Uo	UI	TI	SR	Lav	Uo	UI	TI	SR	
Single Carriage-way	Normally	1.0	0.4	0.7	15%	0.5	1.5	0.4	0.7	10%	0.5	<i>2.0</i>	<i>0.4</i>	<i>0.7</i>	<i>10%</i>	<i>0.5</i>
	>10,000 & E3 or E4	1.5	0.4	0.7	10%	0.5						<i>Above only with on street parking, otherwise as below</i>				
Dual Carriageway	1.0	0.4	0.7	15%	0.5	1.5	0.4	0.7	10%	0.5	<i>1.5</i>	<i>0.4</i>	<i>0.7</i>	<i>10%</i>	<i>0.5</i>	

Set 3 - Luminance Design Objectives

Typical Network:- Secondary Distributor ("A,B & C" Classified)
Unclassified Urban Bus Routes
Urban Collector Road

Traffic Flow ADT	Low District Brightness					Medium District (E3)					High District Bright. E4				
	Lav	Uo	UI	TI	SR	Lav	Uo	UI	TI	SR	Lav	Uo	UI	TI	SR
< 7,000	0.75	0.4	0.6	10%	0.5	1.0	0.4	0.5	15%	0.5	1.0	0.4	0.7	15%	0.5
7,000 - 15,000	1.0	0.4	0.6	10%	0.5	1.0	0.4	0.6	15%	0.5	1.5	0.4	0.7	10%	0.5
> 15,000	1.0	0.4	0.7	10%	0.5	1.5	0.4	0.7	10%	0.5	1.5	0.4	0.7	10%	0.5
> 25,000	<i>1.5</i>	<i>0.4</i>	<i>0.7</i>	<i>10%</i>	<i>0.5</i>	<i>1.5</i>	<i>0.4</i>	<i>0.7</i>	<i>10%</i>	<i>0.5</i>	<i>2.0</i>	<i>0.4</i>	<i>0.7</i>	<i>10%</i>	<i>0.5</i>

Set 4 - Luminance Design Objectives

Typical Network:- Local Rural Roads & Rural Bus Routes = 40MPH or less
Residential or Industrial Interconnecting Roads
Minor single carriageway & Link Roads between Secondary Distributors

	Traffic Flow ADT	Low District Brightness					Medium District (E3)				
		Lav	Uo	UI	TI	SR	Lav	Uo	UI	TI	SR
No Parking	< 7,000	0.5	0.4	0.4	10%	0.5	0.75	0.4	0.5	15%	0.5
Parking	<7,000 + high cycle	0.75	0.4	0.5	10%	0.5	0.75	0.4	0.6	15%	0.5
	< 7,000	0.75	0.4	0.5	10%	0.5	0.75	0.4	0.6	15%	0.5
	7,000 to 9,000	0.75	0.4	0.5	10%	0.5	<i>1.0</i>	<i>0.4</i>	<i>0.5</i>	<i>15%</i>	<i>0.5</i>
	> 9,000 use Set 3										

Set 8 - Illuminance Design Objectives

Typical Network:- Footpath, cycle way and non-town centre pedestrian area

Pedestrian Flow Environmental Zone		Normal			High			Pedestrian Flow Measurement from IESNA in 1st hour of darkness Low = 10 or less Medium = 11 to 100 High = over 100
		E1/2	E3	E4	E1/2	E3	E4	
Normal Crime	Eav	2	3	5	3	5	7.5	
	Emin	0.6	0.6	1	0.6	1	1.5	
High Crime	Eav	7.5	10	15	10	15	20	
	Emin	1.5	3	5	3	5	8	

Where a light source with Ra>60 is used, the lighting level can be reduced by 1 class except 2 lux should not be reduced further.

Set 7 - Illuminance Design Objective

Typically:- City & Town Centre Shopping Streets

Pedestrian / traffic flow Environmental Zone		Medium		High	
		E3	E4	E3	E4
Pedestrian Only	Eav	15	20	20	30
	Uo	0.4	0.4	0.4	0.4
Mixed on separate surface	Eav	20	30	30	30
	Uo	0.4	0.4	0.4	0.4
Mixed on shared surface	Eav	20	30	30	30
	Uo	0.4	0.4	0.4	0.4

Set 6 - Illuminance Design Objectives

Typical Network:- Car Parks & Motorway Rest Area

	Zone	Eav	Uo	GRL
Major shopping centre, sports & major multi purpose building complex		20	0.25	50
Small town shops, Department store office building, small sports complex		10	0.25	50
Village shops, schools, churches, terraced and apartment houses		5	0.25	50

See BSEN12464-2:2007 for other external work task illuminance

Set 5 - Illuminance Design Objectives

Typical Network:- Local Access Roads & roads serving limited number of properties
Urban Residential Loop Roads

Residential Traffic	Env. Zone	Ra value	Low traffic flow with pedestrians and cyclists		Normal traffic flow with pedestrians and cyclists		Normal traffic flow with pedestrians and cyclists					
			E1/E2	E3/E4	E1/E2	E3/E4	E1/E2	E3/E4				
Low	<60	3	0.6	5	1	5	1	7.5	1.5	10	3	
		2	0.6	3	0.6	3	0.6	5	1	5	1.5	
Med	<60	5	1	7.5	1.5	7.5	1.5	10	3		15	5
		3	0.6	5	1	5	1	7.5	1.5		10	3
High	<60	10	3	10	3	10	3	15	5		15	5
		7.5	1.5	7.5	1.5	7.5	1.5	10	3		10	3

LIGHTING DESIGN ROADMAP - Devised and Designed by

LCADS Ltd, Moffat : Tel 01683 220 299

Values in RED Italics are additional CEN values to BSEN 5489 Recommendations



Some luminaire manufacturers / suppliers, especially budget range DIY equipment, cannot provide photometric intensity tables. This precludes the use of computer algorithms to check either the essential information about fundamental illuminance values or check for obtrusive light situations.

There are therefore no substitute recipe methods in this LMP acceptable for public highway or local authority adopted areas.

At design and planning application stages the answer is simple, do not propose the use of such equipment and at installation stage do not substitute a non-photometrically measured equivalent look-a-like.

Domestic residential exterior lighting does, however, require a non-photometrical method better than a global 1000 lumen limit as indicated in earlier sections.

3.3 Non-photometric Recipe method for domestic exterior lighting

Budget range DIY equipment usually takes the form of a simple area floodlight with a high wattage tungsten halogen lamp. They are popular because they are cheap, easy to install, and are often combined with photo-electric (PECU) switches to prevent daytime operation and with passive infra red (PIR) detectors to switch on and off automatically during the hours of darkness.



In the majority of cases these fittings, or luminaires, are installed typically on garage or porch fascias at about 2-3 metres above ground level, and arranged to direct their main beams towards the property boundary to operate as vehicles or people enter. This high beam arrangement can result in glare to road users and light intrusion into adjacent property.

This type of installation is not in keeping with the light control required in a rural setting and as from the effective date of implementation of this LMP no new floodlights of this type will meet the Dark Sky Reserve requirements.

As described previously a lamp output limit of 1000 lumens in luminaires with poor light control is considered to be a generalised rule of thumb marker. However Table 3.3 provides a more accurate lumen and wattage prescription, which is based on the overall area of the building structures on each residential plot of land.

Appendix D contains simple advice on installation techniques and Appendix E contains examples of exterior lighting equipment which should be considered when purchasing new exterior lighting. The Authority intend to make these available to all the residents within the park boundary.

Lamp lumens is a consistent value and although difficult to find on some packaging may in the future supersede the lamp wattage. Lamp watts can vary with the efficacy of the lamp. Table 3.3 (following) has therefore been constructed using the lamp lumens as the base from which to start followed by tables which show the equivalent lamp wattages for different lamp types.

Table 3.3 - Total Lumen Limit for each residence


	Environmental Zone				
	E0 Core	E1 Buffer	E2	E3***	E4***
Total Lumens for domestic Exterior Lighting	0	750 lm plus 4.5 lm / m ² of site structures*	2250 lm plus 4.5 lm / m ² of site structures*	4500 lm plus 4.5 lm / m ² of site structures*	6000 lm plus 4.5 lm / m ² of site structures*
Fully cut-off luminaires each lamp lumen maximum		1200 lm	1650 lm	2400 lm	3200 lm
Part cut-off luminaires each lamp lumen maximum		750 lm	1200 lm	1650 lm	2400 lm
No light control luminaires each lamp lumen maximum		480 lm**	750 lm	750 lm	750 lm

*** Environmental zones E3 and E4 do not relate to any conditions in or near Exmoor and should be excluded from any considerations for domestic lighting. They are shown here as an example for others to follow if appropriate.

* Site structures is the sum of the land area of residential buildings, habitable structures, garages, recreational buildings and storage structures on each property plot.

From table 3.3 a total site structure in the Buffer Zone (E1) with say 255 m² would provide for a total of 1,897 lumens which can be distributed as 1 or more luminaires up to the total allowance. (see Appendix E for list of lower lumen and wattage lamps)

Table 3.4 - Lamp watts for each luminaire with Compact Fluorescent

	Environmental Zone				
	E0 Core	E1 Buffer	E2	E3***	E4***
Fully cut-off luminaires each lamp watts maximum	0	20 watts	24 watts	32 watts	42 watts
Part cut off luminaires each lamp watts maximum	0	11 watts	20 watts	24 watts	32 watts
No light control luminaires each lamp watts maximum	0	9 watts**	12 watts**	12 watts	12 watts

** The maximum watts or lumens for each lamp in this section relates to replacing lamps in existing lighting units only. No new luminaires with little or no light control should be considered, especially in environmental zones E1 and E2.

Table 3.4 - Lamp watts for each luminaire with Tungsten Halogen


	Environmental Zone				
	E0 Core	E1 Buffer	E2	E3***	E4***
Fully cut-off luminaires each lamp watts maximum		60 watts	100 watts	150 watts	200 watts
Part cut off luminaires each lamp watts maximum		N/A	60 watts	100 watts	150 watts
No light control luminaires each lamp watts maximum		N/A	N/A	N/A	N/A

Table 3.5 - Lamp watts for each luminaire with Incandescent / Candle / Capsule Lamp


	Environmental Zone				
	E0 Core	E1 Buffer	E2	E3***	E4***
Fully cut-off luminaires each lamp watts maximum		2x35 watt halostar	2x60 watt Capsule	See 3.4	See 3.4
Part cut off luminaires each lamp watts maximum		60 watts	See 3.4	See 3.4	See 3.4
No light control luminaires each lamp watts maximum		40w candle	40w candle	40w candle	40w candle

Table 3.6 - Lumen and Watts exception for Ceramic / Metal Halide discharge lamps




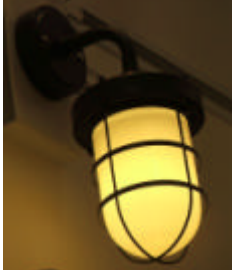



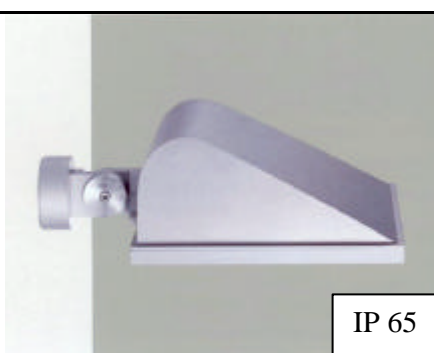





	Environmental Zone				
	E0 Core	E1 Buffer	E2	E3***	E4***
Fully cut-off luminaires each lamp lumen maximum each lamp watts maximum		1500 lm 20w	2400 lm 35w	5500 lm 70w	5500 lm 70w
Part or No light control luminaires are not allowed with this light source					

Table 3.7 – Light Control Examples

Fully Cut-off Examples	Partly Cut-off Examples	No light Control Examples
 <p>Konst Smide Torino range 7326-750 black or 7325-000 silver</p>	 <p>IP 44 100w halogen = 1650 lm 150w halogen = 2200 lm 300w halogen = 5000 lm</p>	 <p>no new units</p>
 <p>Zumtobel Bega 2489 18w PLC</p>	 <p>Solar power LED</p>	 <p>no new units</p>
 <p>IP 65 ERCO Parscoop 42w fluorescent = 3200 lm 70w metal halide = 5000 lm Acceptable substitute for 300 or 500 watt tungsten halogen replacement</p>		 <p>limit to 40 watt candle or 9 watt compact fluorescent</p>
		 <p>18 watts = 1200 lm and too large for Dark Sky application</p>

4 Excluded Lighting Applications and Special Permit Exemptions

4.1 DSR on the Authority Land Holding

The Authority has no statutory powers to change or alter existing or future conditions or standards, however, they can act in an advisory role for all existing and new buildings within the Core & Buffer Zones. It is planned to have access to good light control equipment examples, as part of this advisory role. The Authority will continue to advocate the reduction in light emissions and the use of 'good' lighting fixtures until such time that they no longer are in the lead role as landowners.

Local Authority planning control will normally request a fully detailed application when lighting units are proposed on columns with a height of 12 metres and above. However, it should be noted that some external lighting proposals escape the attention of local authority planning or lighting engineer's overview. The Authority will advise the appropriate department if it discovers any such activity within the buffer zone and seek for controls to be implemented where possible.

4.2 DSR Extending beyond the Authority Land Holding

This section describes how it would be proposed that the local authority would take over as lead organisation should the Dark Sky Reserve buffer zone be extended to include land out with the holding of the Authority. In this scenario the local authority would have the powers to control and implement lighting conditions. It would be hoped that the Authority would be used in an advisory capacity in and around the original core and buffer zones within their land holding.

The **Special Permit Zone** will be deemed to include the Dark Sky Reserve Buffer Zone only.

To obtain a lighting permit, planning applicants shall demonstrate that the proposed lighting installation:-

- ?? (a) Contains an analysis of the 20 point Good Design Practice Checklist produced by the Scottish Executive (see also Section 2.3)
- ?? (b) A statement that shows every reasonable effort to mitigate Sky Glow and Light Intrusion has been addressed and accompanied by a computer calculation indicating average task illuminance, uniformity, horizontal values of overspill beyond the property line and vertical illuminance values of light intrusion on adjacent properties.
- ?? (c) Employs lighting controls to reduce the quantity of lighting at the project specific 'Curfew' time which has been established in the Planning Permission.
- ?? (d) Complies with all light limitation factors outlined in this LMP.

Typical lighting applications requiring Special Permit but not limited to the following applications:

-
- ?? Sports facilities with column mounted luminaires less than 15 metres in height.
 - ?? Construction site lighting.
 - ?? Club Car Parks.
 - ?? Bridges, churches, public monuments or buildings and urban parks.
 - ?? Theme and amusement parks.

The following applications will be prohibited from any part of the Core Zone and Buffer Zone falling inside the boundary of the Exmoor and Special Use Permits will not be issued for:

- ?? Aerial Laser Shows
- ?? Sky Tracking Searchlights
- ?? High intensity light sources greater than 200,000 lumens
- ?? Sports complexes requiring an average playing surface greater than 75 lux.

5 Existing Lighting

5.1 General

All existing lighting units within the Buffer Zone, which utilise lamps greater than 1000 lumens, should be brought into line with the light limitation recommendations in this LMP within the timescale indicated in Appendix D.

All existing street lighting in the External Zone shall remain as installed until the luminaires require to be replaced. As local authority improvement budgets permit, each street will be equipped with new luminaires and bracket arms, where necessary, to meet the light intensity limitation at 90° and above as recommended in this LMP.

Change of property size

If a major addition occurs on a property, or street, lighting for the entire property, or street, shall comply with the recommendations in this LMP. The following are considered major additions:

- ?? An addition of 50% or more in terms of residential houses, gross floor area, seating capacity, parking space or street length.
- ?? Single or cumulative additions, modifications or replacement of 50% or more of installed exterior lighting luminaires.

Change of Property Ownership

If a property, with non-conforming lighting, changes ownership or usage a new external lighting application must be made. The application must include a complete lighting inventory and site plan detailing all existing and proposed new exterior lighting. If the existing exterior lighting is no longer required all non-conforming lighting shall be disconnected and removed.

Guide to Table 5.1 “Compliant” column

In Table 5.1 the last column contains 2 grades of non-compliant luminaires namely:-

- (1) those with lamps less than 1000 lumens (shown as 0 in clear cells) equating to just less than 1% of the total inventory but are not causing concern
and
- (2) those with lamps greater than 1000 lumens (shown as 0 in red cells) in the table.

As previously indicated priority should be given to modifying the over 1000 lumen units, in the red cells, since they equate to just over 22% of the total inventory.

Cells with 1 or greater mean that these luminaires are fully compliant and are not at issue.



5.1 Domestic / Commercial Exterior Lighting Audit

Total Number of lighting units = **693** Total Compliant = **539** = **77.78%**

Ref No.	Type of fitting	Qty.	Building Type	Elevation Angle	Adaptable	Wattage	Duty Cycle	Application	Fully Shielded	Qty. Compliant
1.00										
1.01	floodlight	1	house	50	yes	500	pir	access	no	0
1.02	not surveyed - too distant from gate									
1.03	not surveyed - poor visibility									
1.04		0								
1.05	heritage	3	house	90	no	60	pir	access	no	3
1.06	floodlight	1	house	50	yes	300	switch	access	no	0
1.07	none seen from road									
1.08	none seen from road									
1.09	floodlight	1	stables	45	yes	300	switch	yard	no	0
1.09	bulkhead	2	stables	90	no	60	switch	yard	no	2
1.10	floodlight	1	house	60	yes	300	switch	security	no	0
1.10	heritage	3	house	90	no	60	switch	access	no	3
1.11	heritage	1	house	90	no	60	switch	access	no	1
1.12	heritage	1	house	90	no	60	switch	access	no	1
1.13	bulkhead	1	house	90	no	60	switch	door	no	1
1.14	bulkhead	1	house	90	no	60	switch	door	no	1
1.15	wellglass	1	wall	90	no	60	switch	access	no	1
1.16	not surveyed - too distant from gate									
1.17	floodlight	1	house	45	yes	150	pir	access	no	0
1.18										



1.30 bulkhead	1	outhouse	90	no	60	switch	access	no	1
1.31 bulkhead	1	outhouse	damaged and no lamp						1
2.00									
2.01 floodlight	1	house	80	yes	300	switch	security	no	0
2.02 large heritage	1	house	90	no	11	switch	garden	no	1
2.03 not surveyed -									
2.04 heritage	1	house	90	no	11	switch	door	no	1
2.04 wellglass	1	garage	90	no	60	switch	door	no	1
2.05 bulkhead	1	house	0	no	60	switch	door	part	1
2.05 floodlight	1	house	0	no	300	switch	access	yes	1
2.06 floodlight	1	house	90	yes	300	pir	garden	no	0
2.06 bulkhead	1	garage	90	no	11	switch	access	no	1
2.07 floodlight	1	stables	80	yes	300	switch	security	no	0
2.08 floodlight	1	house	45	yes	300	switch	security	no	0
2.08 heritage	1	house	90	no	11	switch	access	no	1
2.09 none seen from road									
2.09 none seen from road									
2.10									
2.10 floodlight	2	house	45	yes	300	switch	seating	no	0
2.10 bulkhead	1	garden shed	90	no	60	switch	garden	no	1
2.10 floodlight	1	yard office	5	yes	300	switch	yard	part	1
2.10 heritage	2	garage	90	no	60	switch	door	no	2
2.10 bulkhead	4	yard	90	no	60	switch	access	no	4
2.11 floodlight	1	garage	45	yes	300	switch	car park	no	0
2.11 bulkhead	1	garage	90	no	60	switch	access	no	1
2.12 bulkhead	2	house	90	no	60	switch	access	no	2
2.13 floodlight	1	open barn	45	yes	300	switch	yard	no	0
2.13 floodlight	1	house	10	yes	300	switch	courtyard	part	1
2.13 bulkhead	3	house	90	no	60	switch	courtyard	part	3
2.14 clear sphere	1	garage	90	no	60	pir	access	no	1



2.14										
3.00										
3.01 floodlight	1	stables	45	yes	300	switch	security	no	0	
3.02 not surveyed	too distant from gate									
3.03										
3.04										
3.05 wellglass	1	Cottage	90	no	60	switch	Drive	no	1	
3.06 not surveyed	beyond critical buffer zone									
41.00										
41.01 none visible										
41.02 heritage	2	shop	90	no	60	switch	footpath	no	2	
41.03 wellglass	1	house	90	no	60	switch	lane	no	1	
41.04 car headlight feature		Morris Engine Block					flowers			
41.05 heritage	1	house	90	no	60	switch	access	no	1	
41.06 none visible										
41.07 floodlight	1	garage	0	no	150	switch	door	yes	1	
41.08 bulkhead	1	house	0	no	60	switch	porch	part	1	
41.10 floodlight	1	house	80	yes	300	switch	yard	no	0	
41.10 heritage	2	house	90	no	60	switch	porch	part	2	
41.11 floodlight	1	garage	45	yes	300	pir	drive	no	0	
41.12 heritage	1	house	90	no	13	switch	porch	part	1	
41.13 heritage	1	porch	90	no	60	switch	door	no	1	
41.14 heritage	1	house	90	no	60	switch	path	no	1	
41.14 bulkhead	1	house	90	no	60	switch	path	no	1	
41.14 floodlight	2	house	0 / 45	yes	300	switch	access	part	1	
41.15 wellglass	4	house	90	no	60	switch	access	no	4	
41.16 floodlight	3	canopy	10	yes	150	switch	path/parking	part	3	
41.16 bulkhead	7	railings	90	no	8	switch	emergency	no	7	
41.17 MBFU floodlight	1	pole	0	no	80	switch	road	part	1	



41.18 MBFU floodlight	2	pole	0	yes	80	switch	access	part	2
41.19 none visible									
41.20 none visible									
41.21 heritage	4	house	90	no	60	switch	access	no	4
41.22 not surveyed -									
41.23 not surveyed -									
42.00									
42.01 large heritage	1	house	90	no	?	switch	access	no	0
42.01 floodlight	1	house	10	yes	150	switch	access	no	0
42.01 heritage	1	house	90	no	60	switch	access	no	1
42.02 floodlight	1	house	10	yes	300	switch	garden	no	0
42.03 floodlight	2	outhouse	10	yes	300	pir	Drive	no	0
42.03 bulkhead	1	house	0	no	60	pir	door	no	1
42.04 poor view									
42.05 floodlight	1	garage	45	yes	300	pir	Drive	no	0
42.06 heritage	2	house	90	no	60	switch	door	no	2
42.07 heritage	2	house	90	no	60	switch	door	no	2
42.08 heritage	1	house	90	no	11	switch	door	no	1
42.09 heritage	1	house	90	no	60	switch	door	no	1
42.09 bulkhead	1	house	90	no	60	switch	garden	no	1
42.10 heritage	2	canopy	90	no	13	switch	door	no	2
42.11 heritage	1	house	90	no	60	switch	door	no	1
42.12 heritage	1	canopy	90	no	8	switch	door	no	1
42.12 bulkhead	1	workshop	0	no	60	switch	door	no	1
42.12 heritage	2	house	90	no	60	switch	door	no	2
42.13 bulkhead	1	house	90	no	60	switch	door	no	1
42.13 floodlight	1	garage	0	no	150	pir	drive	yes	1
42.14 wellglass	1	house	90	no	60	switch	access	no	1
42.14 heritage	1	house	90	no	60	switch	door	no	1
42.15 bulkhead	1	house	90	no	60	switch	door	no	1



42.16 wellglass	1	house	90	no	60	switch	door	no	1
42.17 bulkhead	1	house	90	no	60	pir	Drive	no	1
42.18 heritage	2	house	90	no	60	pir	Drive	no	2
42.19 not surveyed -	poor visibility								
42.20 wellglass	1	house	90	no	60	pir	access	no	1
42.21 not surveyed -	too distant from gate								
43.00									
43.01 heritage	1	house	90	no	60	switch	access	no	1
43.02 floodlight	2	outhouse	45	yes	500	pir	yard	no	0
43.02 bulkhead	1	outhouse	90	no	8	pir	access	no	1
43.02 heritage	4	house	90	no	60	switch	access	no	4
43.03 heritage	1	house	90	no	60	switch	canopy	part	1
43.04									
5.00									
5.01 not surveyed -									
5.02 not surveyed -									
5.03 not surveyed -									
5.04 not surveyed -									
5.05 surveyed but survey sheet missing									
5.06 wellglass	1	house	90	no	60	switch	access	no	1
5.07 floodlight	2	house	45	yes	300	pir	security	no	0
5.08 not surveyed -	no right of access sign								
6.00									
6.01 not surveyed -									
6.02 not surveyed -									
6.03 not surveyed -	Large wood fence obscures view								
6.04 not surveyed -	Security gates closed								
6.05 Wellglass	1	Bungalow	90	no	13	switch	Security	no	1



6.05 Security	1			no	150	PIR	Security	no	0
6.06 Security TH	1			no	300	PIR	Garage	no	0
6.06 Security	1			no	150	PIR		no	0
6.07 Heritage	2	Cottage	90	no	25	switch	Door	no	2
6.08 Heritage	5	Bungalow	90	no	13	switch	Security	no	5
6.09 not surveyed -	too distant from gate								
6.10 Heritage	2	Bungalow	90	no	60	switch	Security	no	2
6.11 Security TH	1	Cottage	45	no	150	PIR	Security	no	0
6.11									
6.12									
6.12 Heritage	1	House	90	no	13	switch	Door	no	1
6.13	2	Bungalows	90	no	11	PIR	Doors	no	2
6.14 Security TH	1	Stables	60	no	300	PIR	Yard	no	0
6.15 Bulkhead	1	Cottage	90	no	60	PIR	Door	no	1
6.16 Bulkhead 2D	1	House	90	no	18	switch	Security	no	0
6.16 Security TH	1	Outbuilding	90	yes	300	PIR?	Security	no	0
6.17 NO ACCESS		Outbuilding							
6.18 HeritagePost-top	1	Church	90	no	60	switch	Gate	no	1
6.18 Wellglass	1	Church	90	no	60	switch	Door	no	1
6.19 Bulkhead	1	Cottage	90	no	13	switch	Door	no	1
6.20 Security TH	2	House	85	Y	300?	PIR?	Security	no	0
6.21 Security TH	1		80	yes	300?	PIR	Security	no	0
6.21 Wellglass	1	Bungalow	90	no	13	PIR?	Security	no	1
6.22		House							
6.23 Heritage wall	2	House	90	no	13	switch	Security	no	2
6.24 Security TH	1		80	?	300	PIR	Garage	Part	0
6.25 Heritage wall	1	House	90	no		switch	Porch	no	1
6.26 Lamp post globe	2	Bungalow	90	no	?	switch	Security	no	0
6.26 Wall globe	1		90	no	?	switch	Door	no	0
6.27 Bulkhead	1	House	90	no	13	switch	Porch	no	1



6.27	Heritage wall	1	House	90	no	13	switch	Rear	no	1
6.28	Wellglass	1		90	no	13	switch	Security	no	1
6.28	Heritage wall	2	Bungalow	90	no	13	switch	Porch/Sec	no	2
6.29	3head lamp post	1	Bungalow	90	no	39	PIR	Path	no	0
6.29	Heritage wall	1		90	no	13	switch	Security	no	1
6.29	Wellglass	3		90	no	13	switch	Security	no	3
6.30	Wellglass	1		90	no	13	switch	Security	no	1
6.30	Heritage wall	2	Bungalow	90	no	13	switch	Porch/Sec	no	2
6.31	Bollard	1	Tel. Exch.	90	no	60	switch	Steps	no	1
6.32	Wellglass T	1	Cottage	90	no	60	switch	Porch	no	0
6.32	Wellglass T	1		90	no	60	PIR	Garage	no	0
6.33	Heritage wall	1	House	90	no	13	switch	Rear	Part	1
6.34	Wellglass	1	House	90	no	13	switch	Security	no	1
6.34	Heritage wall	1		90	no	13	switch	Porch	no	1
6.35	Security TH	1	Bungalow	45	no	150	PIR	Security	no	0
6.35	Security TH	1		50	no	300	PIR	Security	no	0
6.36	Bulkhead T	1		90	no	60	PIR?	Door	no	1
6.36	Wellglass	1	Hall	90	no	13	switch	Door	no	1
6.36	Bulkhead	3		90	no	13	switch	Doors	no	3
6.38	not surveyed -	no access								
6.39	Bulkhead	1	Bungalow	90	no	13	PIR?	Garage	no	1
6.40	Heritage wall	2	Bungalow	90	no	13	switch	Door	no	2
6.41	Bulkhead 2D	2	School	90	no	42	switch	Door	no	0
7.00										
7.01	SON floodlight	2	Wall wash	135	yes	70	switch	feature	no	0
7.01	Floodlight	1	car park	90	yes	150	switch	car park	no	0
7.01	Floodlight	1	car park	0	yes	150	switch	car park	yes	1
7.01	Sign Light	2	Sign	135	yes	8	switch	sign light	no	2
7.01	clear sphere	2	out house	90	no	8	switch	circulation	part	2
7.01	Pan light	5	signage	0	no	8	switch	feature	yes	5



7.01 bulkhead	7	rear wing	90	no	8	switch	escape stairs	part	7
7.01 Heritage	13	rear wing	90	no	60	switch	circulation	part	13
7.01 Contemporary	16	face/side	90	no	7	switch	feature	no	16
7.01 AA Sign	1								
7.02	0								
7.03 bulkhead	1	house	90	no	60	switch	door	no	1
7.04 Heritage	1	house	90	no	25	switch	door	no	1
7.05	0								
7.06 Heritage	1	house	90	no	8	switch	door	no	1
7.07 Heritage	1	house	90	no	8	switch	door	no	1
7.08 Heritage	1	house	90	no	8	switch	door	no	1
7.09 Heritage	1	house	90	no	60	switch	door	no	1
7.10 bulkhead	2	house	90	no	60	switch	door	no	2
8.01 floodlight	1	house	45	yes	150	pir	parking	no	0
8.01 floodlight	1	house	0	yes	150	switch	security	yes	1
8.01 bulkhead	1	garage	90	no	60	pir	door	no	1
8.02 Floodlight	1	house	90	yes	150	switch	access	no	0
8.02 wellglass	1	house	0	no	60	switch	access	no	1
8.03 wellglass	1	house	0	no	60	switch	door	no	1
8.04 opal sphere	2	house	90	no	60	switch	footpath	no	2
8.05 bulkhead	1	house	90	no	60	switch	access	no	1
8.06 bulkhead	2	garage	90	no	60	switch	door	no	2
8.07 bulkhead	1	porch	0	no	60	d/dawn	door	no	1
8.08	0								
8.09 Floodlight	1	house	45	yes	150	switch	access	no	0
8.10	0								
8.11	0								
8.12 wellglass	1	house	0	no	60	switch	access	no	1
8.12 bulkhead	1	shed	90	no	60	switch	garden	no	1
8.13 Floodlight	2	house	90	yes	150	pir	security	no	0



8.14	0									
8.15	0									
8.16	0									
8.17 bulkhead	1	workshop	90	no	60	switch	access	no		1
8.17 Heritage	9	drive+paths	90	no	60	pir	access	no		9
8.17 Floodlight	0	workshop	90	yes	150	pir	security	no		
8.17 PAR 38	0	greenhouse	90	yes	150	pir	access	no		
8.18 Heritage	1	house	90	no	60	switch	door	no		1
8.19 Heritage	3	house	90	no	60	switch	parking	no		3
8.20 Heritage	2	house	90	no	60	switch	access	no		2
8.22	0									
8.23 garland string		house	90	no	20x60	dead	decoration	no		0
8.24	0									
8.25 wellglass	1	house	0	no	60	switch	access	no		1
8.26 bulkhead	1	bungalow	0	no	60	switch	access	no		1
8.26 wellglass	1	pole	0	no	60	switch	garden	no		1
8.27	0									
8.28 not surveyed -		no right of access								
8.29	0									
8.30 bulkhead	1	house	90	no	60	switch	courtyard	no		1
8.31 not surveyed -										
9.00										
9.01 Heritage	1	house	90	no	60	pir	door	part		1
9.02 bulkhead	1	house	0	no	60	switch	door	no		1
9.02 wellglass	2	house	90	no	60	pir	path	no		2
9.03 Heritage	1	house	90	no	60	switch	door	no		1
9.03 bulkhead	2	house	90	no	60	pir	door	no		2
9.04 Floodlight	1	garage	45	no	150	pir	access	no		0
9.04 Heritage	5	drive+paths	90	no	60	pir	access	no		5



9.05 Heritage	1	garage	90	no	60	pir	door	no	1
9.05 bulkhead	2	house	90	no	60	switch	path	no	2
9.06 Heritage	1	house	90	no	60	pir	stair	no	1
9.06 front not surveyed - gate closed									
9.07 Floodlight	1	yard	45	yes	150	switch	access	no	0
9.07 Heritage	1	house	90	no	60	switch	door	no	1
9.07 wellglass	1	house	90	no	60	switch	access	no	1
9.08 Floodlight	1	garage	45	no	150	pir	parking	no	0
9.08 Heritage	2	house	90	no	60	switch	footpath	no	1
9.08 wellglass	1	workshop	90	no	60	switch	access	no	1
9.09 Heritage wall	1	House	90	no	60	PIR	Door	Part	1
9.09 Bulkhead	1		90	no	60	switch	Door	no	1
9.09 Wellglass	2		90	no	60	PIR	Path	no	2
9.10 Heritage wall	1	Bungalow	90	no	60	switch	Door	no	1
9.10 Bulkhead	2		90	no	60	PIR	Door	no	1
9.11 Security TH	1		45	no	150	PIR	Garage	no	0
9.11 Heritage	5	House	90	no	60	PIR	Drive	no	1
9.12 Security TH	1		90	no	500	PIR	Yard	no	0
9.12 Heritage PT	1	House	90	no	60	switch	Garden	no	1
9.12 Heritage wall	1		90	no	60	switch	Door	no	1
9.12 Wellglass	1		90	no	60	switch	Yard	no	1
9.12 Heritage wellglass	2		90	no	60	PIR	Barns	no	1
9.12 Bulkhead	1		90	no	13	switch	Yard	no	1
9.13 Wellglass	1	Cottage	90	no	Broken	?	Path	no	0
9.14 Security TH	1	Tree	45	no	150	switch	Garden	no	0
9.14 Heritage	2	Cottage	90	no	60	switch	Frontage	no	2
9.15 NONE IDENTIFIED									
10.00									
10.01 Bulkhead	1	House	90	no	8	switch	Door	no	1
10.02 Heritage large	1	Cottage	90	no	60	switch	Door	no	1



10.02 Bulkhead	1		90	no	8	switch	Door	no	1
10.03 Heritage wall	3	Stables	90	no	60	switch	Security	no	3
10.04 Bulkhead	1	Cottage	90	no	60	switch	Porch	Part	1
10.04 Wellglass	1	Garage	90	no	60	switch	Door	no	1
10.05 Bulkhead	1	House	90	no	60	switch		no	1
10.05 Wellglass	2		90	no	60	switch		no	1
10.06 Bulkhead	2		90	no	60	switch	Barn	no	1
10.06 Wellglass	2		90	no	60	switch	Shed	no	1
10.07									
10.08 not surveyed -									
10.08									
10.09									
10.09 Bulkhead	1	Farm		no	60	switch	Shed	no	1
10.10 wellglass	1	house		no	60	switch		no	1
10.10 heritage	1	house		no	13	switch	door	no	1
10.11 Security TH	1	Cottage	45	no	150	switch	Yard	no	0
10.11 twin spot	1	garage	0	yes	2x50	switch	Garage	part	1
10.11 Solar LED	1		90	no	1	switch	Gatepost		1
10.12 Security TH	1	Cottage	45	no	150	PIR	Yard	no	1
10.12 Security T - twin	2		0	yes	60	PIR	Yard	yes	1
10.13 Floodlight	1	shed	80	yes	300	switch	Garden	no	0
10.13 Bulkhead	1		90	no	60	switch	Yard	no	1
10.13 Bulkhead	2	House	90	no	60	PIR	Frontage	no	1
10.13 Heritage wall	1		90	no	60	PIR	Door	no	1
10.13 Wellglass	1		90	no	60	switch	Garage	no	1
10.14 NO VISIBILITY									
10.14 not surveyed -	too distant from gate								
10.15 Floodlight	2	Mill	60	no	500	PIR	Pens	no	0
10.15 Floodlight	2	house&garage	45	yes	150	switch	Stables	no	0



10.15 wellglass	1	Mill	90	no	60	switch	access	no	1
10.15 bulkhead	1	garage	90	no	8	switch	access	no	1
10.15 bulkhead	2	house	90	no	11	switch	access	no	2
10.15 heritage	4	house&garage	90	no	60	switch	access	no	4
10.15 hooded spots	4	tack room	90	no	25	switch	horses	yes	4
10.15 not surveyed -	may be part of Wellshead Farm (access further up hill)								
10.16 not surveyed -	private road over ford								
10.16 not surveyed -									
10.17 wellglass	1	house	90	no	8	switch	door	no	1
10.17 Wellglass	2	stables	90/45	no	60	switch	access	no	2
10.17 floodlight	2	stone sheds	0	yes	500	switch	farmyard	yes	2
10.17 wellglass	2	toilet block	90	no	60	switch	access	no	2
10.17 bulkhead	3	reception area	90	no	8	switch	door	no	3
10.18 Wellglass	2	House	90	no	60	switch	access	no	2
10.18 not surveyed -									
10.19 Security TH	1		90	no	300	PIR		no	0
10.19 Wellglass	1	Farm	90	no	60	switch		no	1
10.19 not surveyed -	private road								
10.20 Heritage wall	1	House	90	no	60	switch		no	1
10.20 not surveyed -	private road								
10.21 Bulkhead	1	Farm	90	no	60	switch		no	1
10.21 none to view									
10.22 not surveyed -	private road								
10.22 None									
10.22									
10.23									
10.23 bulkhead	2	house	90	no	60	switch	access	no	1
10.24 bulkhead	1	House	90	no	60	switch	door	no	1
10.25 none viewed									



10.26	floodlight	2	Farm	60	yes	300	switch	Yard	no	0
10.27	heritage	1	House	60	no	60	switch	access	no	1
10.28	none viewed									
10.29	not surveyed -		too distant from gate							
11.00										
11.01	Security TH	1	Workshop	30	no	150	switch	Security	no	0
11.01	Security TH	1		80	no	300	PIR	Security	no	0
11.01	Security TH	1		90	no	300	PIR	Security	no	0
11.02	Bulkhead	2	Clubhouse	90	no	26	switch	Doors	no	0
11.02	Bulkhead	2	Clubhouse	90	no	13	switch	Doors	no	2
11.03	Heritage wall	1	House	90	no	13	switch	Door	Part	1
11.03	Wellglass	2	house	90	no	13	switch	Security	no	2
11.04	Security TH	1		90	no	300	pir	Yard	no	0
11.04	Bi-sym MH	2		90	yes	150	switch	Yard	no	0
11.04	Bulkhead	5	Workshops etc.	90	no	13	switch	Doors	no	5
11.05	Heritage wall	1	Door	90	no	13	switch	Security	no	1
11.06	Heritage wall	2	Door	90	no	13	switch	Door	Part	2
11.07	NONE		Cottage							
11.08	NONE		Cottage							
11.09	NONE		Cottage							
11.10	Heritage wall	1	Cottage	90	no	13	switch	Porch	Part	1
11.11	NONE		Shop							
11.12	Wellglass	1	Garage	90	no	100?	switch	Garage	no	0
11.12	Eyelid	2		0	no	13	switch	Canopy	no	2
11.12	fireproof pendant	2	old canopy	0	no	80	switch	Canopy	yes	2
11.13	Floodlight	1		10	no	300?	PIR	Sign/access	Part	1
11.13	Heritage wall	2	Hotel	90	no	13	switch	Security	no	2
11.13	Heritage wall	2		90	no	60?	switch	Security	no	2
11.14	Heritage wall	1	Cottage	90	no	13	switch	Porch	no	1
11.15	Heritage wall	2	Chapel	90	no	13	switch	Door	no	2



11.15 Bulkhead	2		90	no	13	switch	Security	no	2
11.16 Area TH	2		0	no	300	switch	Sign/Area	no	2
11.16 Wellglass	2		90	no	13	switch	Security	no	2
11.16 Bulkhead	3		90	no	13	switch	Security	no	2
11.17 Heritage Column	2	Hotel	90	no	80	switch	Seating	no	0
11.17 Bi-sym flood MBF	1	Hotel	90	no	400	switch	Front FL	no	0
11.17 SON floodlight	2	Hotel	100	no	70	switch	wall uplight	no	0
11.17 Security TH	1	Hotel	85	no	300	switch	Rear parking	no	0
11.17 Heritage wellglass	1	Hotel	90	no	13	switch	Security	no	1
11.17 Heritage wall	2	Hotel	90	no	13	switch	Door	no	2
11.17 Bulkhead	2	Hotel	90	no	13	switch	Security	no	2
11.17 Bulkhead	2	Hotel	90	no	13	switch	Steps/balcony	no	2
11.17 Heritage wall	4	Hotel	90	no	13	switch	Porch	yes	4
11.17 Heritage PT	4	Hotel	90	no	13	switch	River wall	no	4
11.18 Bi-sym flood MBI	1	Annex Bldg.	120	no	70	switch	Rear FL	no	0
11.18 Bulkhead	1	Annex Bldg.	90	no	13	switch	Gatepost	no	1
11.18 Heritage wall	3	Annex Bldg.	90	no	13	switch	Doors	no	3
11.18 Heritage PT	4	Annex Bldg.	90	no	13	switch	River wall	no	4
11.19 Bulkheads	3	Hostel	90	no	13	switch	Doors	no	3
11.19 Bollard globes	4	Hostel	90	no	60	switch	Yard	no	4
11.20 Bulkheads	2	House	90	no	13	switch	Door	no	2
11.21 Security TH	1	garage	45	no	150	switch	Yard	yes	1
11.22 floodlight	1	shed	60	yes	300	pir	security	no	0
11.22 bulkhead	2	s/c accom.	90	no	60	switch	access	no	2
11.22 floodlight	2	stables	canopy	yes	300	switch	security	yes	2
11.22 wellglass	4	s/c accom.	90	no	11	switch	footways	no	4
11.22 heritage	6	house	90	no	60	switch	access	no	6
11.23 floodlight	1	house	50	yes	300	pir	security	no	0
11.23 bulkhead	1	house	90	no	8	pir	access	no	1



11.23 heritage	3	house	90	no	60	switch	access	no	3
11.24 not surveyed -	poor visibility		white house on ridge overlooking Exford						
11.25 not surveyed -	poor visibility		grey house on ridge overlooking Exford						
11.26 Floodlight	1	barn	45	yes	300	switch	cow pen	no	0
11.26 floodlight	1	house	0	yes	300	pir	security	yes	1
11.26 wellglass	1	barn	90	no	60	switch	Yard	no	1
11.26 bulkhead	1	under canop	90	no	60	switch	Yard	part	1
11.27 Floodlight	1	house	45	yes	300	switch	Yard	no	0
11.27 heritage	1	house	90	no	60	switch	access	no	1
12.01 NONE		House							
12.02 Wellglass	1	House	90	N	13	switch	Door	N	1
12.02 Heritage wall	1		90	N	13	switch	Porch	Part	1
12.03 NONE									
12.04 Bollard	3	SD Bungalow	0	no	13	switch	Path	yes	3
12.05 bulkhead	2	Bungalow	90	no	13	switch	access	no	2
12.05 Bollard	1	SD Bungalow							
12.06 small eyelid	2	Ter-House	90	N	13	switch	Path	no	2
12.07 NONE		Ter-House							
12.08 NONE		Ter-House							
12.09 NONE		SD House							
12.10 NONE		SD House							
12.11 NONE		SD House							
12.13 NONE		SD House							
12.14 Bulkhead	1	SD House	90	N	13	switch	Door	N	1
12.15 NONE		SD House							
12.16 NONE		SD House							
12.17 NONE		SD House							



13.01 floodlight	1	house	90	no	300	pir	yard	no	0
13.01 wellglass	1	house	90	no	13	switch	stairs	no	1
13.01 bulkhead	3	cottage	90	no	13	switch	door	no	3
13.02 heritage	2	side door	90	no	13	switch	door	no	2
13.02 wellglass	2	cottage	90	no	60	switch	door	no	2
13.03 wellglass	1	workshop	90	no	11	switch	access	no	1
13.04	0								
13.05 floodlight	1	stables	15	yes	300	switch	security	part	0
13.05 bulkhead	4	stables	90	no	11	switch	security	no	4
13.06 heritage	1	front	90	no	60	switch	door	no	1
13.06 wellglass	1	rear	90	no	60	switch	security	no	1
13.07 floodlight	1	house	70	yes	150	pir	security	no	0
13.07 wellglass	1	house	90	no	60	switch	door	no	1
13.07 heritage	1	porch	90	no	60	switch	door	part	1
13.07 floodlight	1	house	0	yes	150	pir	security	yes	1
13.08 wellglass	1	house	90	no	11	switch	door	no	1
13.09 floodlight	3	at least							0
						Cone of white upward light at night			
13.10 SON floodlight	1	to rear	90		250?	d/dawn	horses	no	0
13.10 wellglass	1	lodge	90	no	11	switch	door	no	1
13.10 bulkhead	4	stables	0	no	60	switch	horses	part	4
13.11 not surveyed -		out of sight in south valley							
13.12 not surveyed -		gated -top of ridge and possible SON floodlight							
13.13 opal sphere	2	house	90	no	60	pir	door	no	2
13.14 floodlight	4	barn	80	yes	300	pir	Yard	no	0
13.14 wellglass	1	house	90	no	60	switch	access	no	1
13.14 wellglass	2	House	90	no	60	switch	door	no	2
13.15 not surveyed -		out of sight in south valley			at least 1x 300w floodlight				
13.16 not surveyed -									
13.17 not surveyed -		out of sight in south valley							



13.18 bulkhead	2	house	90	no	60	switch	door	part	2
13.19 bulkhead	2	house	90	no	60	switch	access	no	2
13.20 not surveyed -	private road								
13.21 floodlight	1	45	50	yes	150	switch	exercise	no	0
13.21 bulkhead	3	farmhouse	90	no	60	switch	yard	part	3
13.21 bulkhead	6	sheep pen	0	no	8	switch	lambing	part	6
13.22 not surveyed -	out of sight in south valley								
13.23 bulkhead	1	bungalow	90	no	60	switch	door	no	1
13.24 floodlight	1	bungalow	0	yes	150	switch	garden	yes	1
13.25 not surveyed -	out of sight in south valley								
13.26 floodlight	1	house	110	yes	300	pir	yard	no	0
13.26 bulkhead	1	house	90	no	60	switch	door	no	1
13.27 large heritage	1	pole	90	no	60	switch	garden	no	0
13.27 floodlight	1	house	0	yes	150	switch	yard	yes	1
13.27 bulkhead	2	shed	60	no	60	switch	yard	part	2
14.00									
14.01 large heritage	1	pole	0	no	70	switch	drive	yes	1
14.01 gas heritage	1	porch	90	no	25	switch	access	yes	1
14.01 bulkhead	1	porch	0	no	60	pir	access	yes	1
14.01 wellglass	2	church	90	no	60	pir	rear path	no	2
14.02 wellglass	2	house	90	no	60	switch	access	no	2
14.03 circular bulkhead	1	toilet	90	no	18	switch	access	no	0
14.04 bulkhead	1	shed	90	no	60	pir	work	no	1
14.05 floodlight	1	house	90	yes	150	pir	garden	no	0
14.05 heritage	1	house	90	no	60	pir	access	no	1
14.05 heritage	2	house	90	no	60	pir	access	no	2
14.05 not surveyed -	poor visibility of front								
14.06 clear sphere	1	house	90	no	60	pir	door	no	1
14.06 bulkhead	3	house	90	no	60	pir	door	no	3







14.07	ice drop garland	house					decoration		
14.08	MBFU floodlight	3 tin shed	45	yes	80	switch	car park	no	0
14.08	floodlight	2 roof/pole	45	yes	300	pir	car park	no	0
14.08	pan light	2 pole	45	no	8	switch	sign	part	2
14.09	heritage	3 house	90	no	60	switch	access	no	3
14.10	MBFU floodlight	5 inn	45	yes	80	switch	courtyard	no	0
14.10	pan light	1 inn	45	no	60	switch	sign	part	1
14.10	bulkhead	2 inn	90	no	60	switch	rear path	part	2
14.10	heritage	3 inn	90	no	11	switch	courtyard	no	3
14.10	opal sphere	4 outhouse	90	no	60	switch	courtyard	no	4
14.11	opal sphere	3 wall	90	no	60	switch	access	no	3
14.12	floodlight	1 house	45	no	150	pir	car park	no	0
14.12	heritage	1 house	90	no	11	switch	door	no	1
14.13	floodlight	3 wall	45	yes	150	switch	courtyard	part	0
14.13	large heritage	1 doorway	90	no					0
14.14	wellglass	3 wall	90	no	60	switch	access	no	3
14.15	heritage	7 tea room	90	no	11	switch	decking	no	5
14.16	bulkhead	1 house	90	no	60	switch	garage	no	1
14.16	wellglass	1 house	90	no	60	switch	access	no	1
14.17	floodlight	1 cottage	90	no	150	pir	car park	no	0
14.17	bulkhead	1 cottage	90	no	11	pir	stairs	no	1
14.17	heritage	1 cottage	90	no	11	d/dawn	stairs	no	1
14.17	heritage	3 cottage	90	no	11	switch	stairs	part	3
14.17	not surveyed	private drive							
14.18	heritage	1 house	90	no	60	switch	door	no	1
14.18	wellglass	2 house	90	no	60	switch	access	no	2
14.18	bulkhead	2 shed	90	no	60	switch	access	no	2
14.18	not surveyed	private drive							
14.19	floodlight	1 house	45	yes	300	pir	garden	no	0




14.19 wellglass	1	house	90	no	60	pir	access	no	1
14.19 bulkhead	2	stables	0	no	60	switch	access	part	2
14.20 not surveyed -									
14.21 floodlight	1	house	80	yes	150	pir	access	no	0
15.00									
15.01 Under renovation work - no lights yet									
15.02 bulkhead	1	canopy	0	no	60	switch	access	yes	1
15.03 clear sphere	1	house	180	yes	150	switch	access	no	0
15.04 PAR 38	1	house	0	yes	150	switch	access	part	1
15.05 floodlight	1	house	80	yes	100	switch	security	no	0
15.05 bulkhead	2	house	90	no	60	switch	access	no	2
15.06 bulkhead	1	house	90	no	60	switch	access	no	1
15.06 wellglass	2	house	90	no	60	switch	access	no	2
15.07 not surveyed -									
15.08 circular bulkhead	6	house	90	no	28/38	pir	emergency	no	0
15.08 bulkhead	2	house	90	no	16	switch		no	0
15.08 wellglass		disconnected ?							
16.00									
16.01 not surveyed -									
16.02 none seen									
16.03 bulkhead	1	house	90	no	60	switch	access	no	1
16.04 circular bulkhead	1	house	90	no	60	switch	access	no	1
16.05 not surveyed -									
16.06 bulkhead	1	house	90	no	60	switch	access	no	1

5.2 Public Lighting Audit





Luminaire Profiles
Common to Devon County Council and Somerset County Council
with typical intensity distribution of light emerging near the horizontal axis


	<p>Typical 35 or 55w SOX Refractor bowl 35w luminaire elevated 5⁰</p> <table border="1" data-bbox="614 555 890 770"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95</td> <td>43</td> </tr> <tr> <td>Above 90</td> <td>62</td> </tr> <tr> <td>90⁰</td> <td>62</td> </tr> <tr> <td>80⁰</td> <td>115</td> </tr> <tr> <td>70⁰</td> <td>163</td> </tr> </tbody> </table>	I max	Cd/klm	Above 95	43	Above 90	62	90 ⁰	62	80 ⁰	115	70 ⁰	163	<p>Refractor Bowl 55w luminaire elevated 5⁰</p> <table border="1" data-bbox="986 555 1262 770"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95</td> <td>30</td> </tr> <tr> <td>Above 90</td> <td>70</td> </tr> <tr> <td>90⁰</td> <td>70</td> </tr> <tr> <td>80⁰</td> <td>294</td> </tr> <tr> <td>70⁰</td> <td>304</td> </tr> </tbody> </table>	I max	Cd/klm	Above 95	30	Above 90	70	90 ⁰	70	80 ⁰	294	70 ⁰	304
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	<p>Typical 50 / 70 / 100w SON – Low profile dish polycarbonate</p> <p>At best G3 @5⁰ and 10⁰ with DP/1200/098/-30/930971 optic</p>	<p>luminaire elevated 10⁰</p> <table border="1" data-bbox="986 1467 1262 1713"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95</td> <td>7</td> </tr> <tr> <td>Above 90</td> <td>7</td> </tr> <tr> <td>90⁰</td> <td>7</td> </tr> <tr> <td>80⁰</td> <td>50</td> </tr> <tr> <td>70⁰</td> <td>313</td> </tr> </tbody> </table>	I max	Cd/klm	Above 95	7	Above 90	7	90 ⁰	7	80 ⁰	50	70 ⁰	313												
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 ZX1	Typical 70w SON flat glass luminaire elevated 5°		Preferred mounting luminaire elevated 0°																								
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**Luminaire Profiles
Special to Somerset County Council**

with typical intensity distribution of light emerging near the horizontal axis

	<p>Typical 80w MBFU</p> <p>No longer available as replacements and now replaced by flat glass or low profile 50w or 70w SON</p>	<p>Pre photometry area but certainly not G3 to G6</p>																								
	<p>Typical 80 /125w MBFU conical post top</p> <p>Similar shape available as replacements but</p>	<p>Pre photometry area but certainly not G3 to G6</p>																								
	<p>Typical 70w / 150w SON Wall pack</p>	<p>luminaire elevated 0°</p> <table border="1"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95</td> <td>high</td> </tr> <tr> <td>Above 90</td> <td>109</td> </tr> <tr> <td>90°</td> <td>109</td> </tr> <tr> <td>80°</td> <td>316</td> </tr> <tr> <td>70°</td> <td>602</td> </tr> </tbody> </table> <p>not even G1</p>	I max	Cd/klm	Above 95	high	Above 90	109	90°	109	80°	316	70°	602												
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	<p>Typical 70w SON Shallow bowl luminaire elevated 5°</p> <table border="1"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95</td> <td>?</td> </tr> <tr> <td>Above 90</td> <td>6</td> </tr> <tr> <td>90°</td> <td>6</td> </tr> <tr> <td>80°</td> <td>107</td> </tr> <tr> <td>70°</td> <td>586</td> </tr> </tbody> </table>	I max	Cd/klm	Above 95	?	Above 90	6	90°	6	80°	107	70°	586	<p>luminaire elevated 10°</p> <table border="1"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95</td> <td>4</td> </tr> <tr> <td>Above 90</td> <td>22</td> </tr> <tr> <td>90°</td> <td>22</td> </tr> <tr> <td>80°</td> <td>215</td> </tr> <tr> <td>70°</td> <td>561</td> </tr> </tbody> </table>	I max	Cd/klm	Above 95	4	Above 90	22	90°	22	80°	215	70°	561
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	<p>Typical 70w SON Deep Bowl</p> <p>Original Acorn with refractor not photometered but replacement units now manufactured by Sugg Lighting</p>	<p>Rochester photometry</p> <table border="1"> <thead> <tr> <th>I max</th> <th>Cd/kl m</th> </tr> </thead> <tbody> <tr> <td>Above 95</td> <td>4</td> </tr> <tr> <td>Above 90</td> <td>86</td> </tr> <tr> <td>90⁰</td> <td>86</td> </tr> <tr> <td>80⁰</td> <td>104</td> </tr> <tr> <td>70⁰</td> <td>105</td> </tr> </tbody> </table>	I max	Cd/kl m	Above 95	4	Above 90	86	90 ⁰	86	80 ⁰	104	70 ⁰	105
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70 ⁰	105													

Somerset Public Lighting Inventory

Town / Village Name : **Porlock**
 Location (relative to Core) : North
 Distance from Core Zone : 2 miles
 Population : 1332

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
SON	70	98	dusk/dawn	Deep bowl	86
MBFU	80	14	dusk/dawn	Conical	High
MBFU	80	5	dusk/dawn	Reflector	High
SON	50/70	16	dusk/dawn	Low profile	9
SON	70	1	dusk/dawn	Wall pack	109

Other Exterior Lighting (eg sports, school, community)

Location : Parson's Street Playing Fields

Fixture	Elevation	Lamp / Watts	Duty Cycle	Application	Compliance
Deltalux Asymmetric floodlight c.1988	8m@15°	8 x1,000wMBI 107,000 lum's	Playing time + 9.30pm curfew	Twin tennis courts 300 lux ave. (TPA?)	No + Planning condition expired 31/08/2006

Town / Village Name : **Dunster**
 Location (relative to Core) : North East
 Distance from Core Zone : 4 ½ miles
 Population : 948

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
SON	50/70	30	Dusk/dawn	Deep bowl	13
MBFU	80	16	Dusk/dawn	Reflector	high
SON	150	15	Dusk/dawn	Deep bowl	56
SON	50/70	9	Dusk/dawn	Low profile	7
SON	70/150	8	Dusk/dawn	Wall pack	109
SOX	35	6	Dusk/dawn	Reflector	70
SON	70	2	Dusk/dawn	Heritage	44
SON	70	2	Dusk/dawn	Conical	high

Other Exterior Lighting (eg sports, school, community)

Location : Town boundary

Fixture	Elevation	Lamp / Watts	Duty Cycle	Application	Compliance
Sonpack	0 - 45	250 SON		Car park	some
Street light	0	70		Car park	yes

Town / Village Name : **Timberscombe**
 Location (relative to Core) : East
 Distance from Core Zone : 2 miles
 Population :

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
MBFU	80	25	Dusk/dawn	Reflector	High
MBFU	125	6	Dusk/dawn	Conical	High
SON	70	2	Dusk/dawn	Deep bowl	44
SON	50	2	Dusk/dawn	Low profile	7
SOX	35	1	Dusk/dawn	Reflector	70

Other Exterior Lighting (eg sports, school, community)

Location : Magna Housing

Fixture	Elevation	Lamp/Watts	Duty Cycle	Application	Compliance
2 units					

Town / Village Name : **Wheedon Cross & Cutcombe**
 Location (relative to Core) : East
 Distance from Core Zone : 2 miles
 Population :

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
SON	70	1	Dusk/dawn	Reflector	44
SON	70	1	Dusk/dawn	Conical	high

Other Exterior Lighting (eg sports, school, community)

Location : Games Area on core zone side of village

Fixture	Elevation	Lamp/Watts	Duty Cycle	Application	Compliance
Shoebox on site but application shows SNF/210/61 ⁰	0 ⁰ ? but not shown on application	SON 250	Play time + 9.15pm curfew	Multi Use Game Area	Yes if horizontal No date limit

Town / Village Name : **Monksilver**
 Location (relative to Core) : East
 Distance from Core Zone : 11 miles
 Population :

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
SON	50	3	Dusk/dawn	Low profile	7

Town / Village Name : **Winsford**
 Location (relative to Core) : South East
 Distance from Core Zone : 4 ½ miles
 Population : 270

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
SON	70	1	Dusk/dawn	Reflector	44
SON	50	1	Dusk/dawn	Conical	high

Town / Village Name : **Bridgeton & Exton**
 Location (relative to Core) : South East
 Distance from Core Zone : 4½ miles
 Population :

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
SOX	35	3	Dusk/dawn	Reflector	70
SON	70	1	Dusk/dawn	Reflector	44

Town / Village Name : **Exford**
 Location (relative to Core) : South
 Distance from Core Zone : 1 mile
 Population : 399

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
SOX	35	7	Dusk/Dawn*	refractor	62
SOX	55	1	Dusk/Dawn*	refractor	70

*Part night conversion imminent

Town / Village Name : **Brompton Regis**
 Location (relative to Core) : South East
 Distance from Core Zone : x mile
 Population : x

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
SOX	18	2	Dusk/Dawn*	refractor	62
SOX	35	4	Dusk/Dawn*	refractor	62
SOX	55	3	Dusk/Dawn*	refractor	70
SON	70	7	Dusk/Dawn*	bowl	13
SON	70	1	Dusk/Dawn*	wallpack	109

Town / Village Name : **Dulverton**
 Location (relative to Core) : South East
 Distance from Core Zone : 9 miles
 Population : 1347

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
SON	50/70	79	Dusk/dawn	Deep bowl	60
SON	50/70	56	Dusk/dawn	Low profile	7
MBFU	80	22	Dusk/dawn	Refractor	high
SON	70/150	4	Dusk/dawn	Wall pack	109
SON	70	7	Dusk/dawn	bollard	7

Part night conversion imminent

Other Exterior Lighting (eg sports, school, community)

Location : Millham Lane Triple court layout





Fixture	Elevation	Lamp / Watts	Duty Cycle	Application	Compliance
Floodlights c. 1978	6m @ 45°	16 x Not stated on application	Playing time	Triple Tennis Courts 250 lux minimum	No + planning consent expired 2005
30° Asymmetric Floodlights	8m @ 40° as per calculation sheet	12x400w	16.00-21.30 Tue-Thur.	Football Training 50 lux average	No + planning consent expires 31/03/2016

Location: Dulverton Middle School

Fixture	Elevation	Lamp / Watts	Duty Cycle	Application	Compliance
Double asymmetric 45° peak @ 0° incline	6x8m @x° incline but shown about 45° on application	12x 1,000 MBI	9.30pm curfew	Multi Use Game Area 175 lux ave. (160 to 379 lux)	? planning consent expired 01/11/2009

Luminaire Profiles Special to Devon County Council

with typical intensity distribution of light emerging near the horizontal axis

		<p>Long Victorian</p> <p>Mix of 100w and 150w SON</p> <p>Diffused Glass</p>	<p>Pre photometry area</p>																							
		<p>Short Victorian</p> <p>Clear Glass</p>	<p>Pre photometry area</p>																							
 <p>P567</p>	<p>Typical 100w SON – Flat Glass luminaire elevated 0°</p> <table border="1" data-bbox="639 1137 927 1346"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95</td> <td>0</td> </tr> <tr> <td>Above 90</td> <td>0.7</td> </tr> <tr> <td>90°</td> <td>0.7</td> </tr> <tr> <td>80°</td> <td>49</td> </tr> <tr> <td>70°</td> <td>323</td> </tr> </tbody> </table> <p style="text-align: center;">?</p>	I max	Cd/klm	Above 95	0	Above 90	0.7	90°	0.7	80°	49	70°	323	<p>Low profile glass luminaire elevated 5°</p> <table border="1" data-bbox="1023 1137 1305 1346"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95</td> <td>11</td> </tr> <tr> <td>Above 90</td> <td>25</td> </tr> <tr> <td>90°</td> <td>25</td> </tr> <tr> <td>80°</td> <td>71</td> </tr> <tr> <td>70°</td> <td>361</td> </tr> </tbody> </table>	I max	Cd/klm	Above 95	11	Above 90	25	90°	25	80°	71	70°	361
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 <p>P567</p>	<p>Typical 42w Compact fluorescent Low profile bowl</p>	<p>luminaire elevated 5°</p> <table border="1" data-bbox="1023 1413 1305 1621"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95</td> <td>4.2</td> </tr> <tr> <td>Above 90</td> <td>14</td> </tr> <tr> <td>90°</td> <td>14</td> </tr> <tr> <td>80°</td> <td>73</td> </tr> <tr> <td>70°</td> <td>152</td> </tr> </tbody> </table> <p>G3 compliant</p>	I max	Cd/klm	Above 95	4.2	Above 90	14	90°	14	80°	73	70°	152												
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70°	152																									

Devon Public Lighting Inventory

Town / Village Name : Heasley Mill
 Location (relative to Core) : South
 Distance from Core Zone : miles
 Population :

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
SON	70	3	Dusk/Dawn	refractor	44

Town / Village Name : Paracombe
 Location (relative to Core) : West
 Distance from Core Zone : 2 ½ miles
 Population : 310

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
HP Sodium	70	12	Part Night	Low Profile	7
HI Discharge	45	3	Dusk/Dawn	Shallow Bowl	7

Town / Village Name : Barbrook
 Location (relative to Core) : North West
 Distance from Core Zone : 1 ½ miles
 Population :

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
SON	70	12	Dusk/Dawn	Low profile	9
SON	70	5	Dusk/Dawn	Flat glass	1

Town / Village Name : Lynton
 Location (relative to Core) : North West
 Distance from Core Zone : 3 miles
 Population : 1658

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
Compact Flu.	42	3	Dusk/Dawn	Flat Glass	6
CDM	35	3	Dusk/Dawn	Cylindrical	
SON	70	79	Dusk/Dawn	Low Profile	9
SON	70/100	59	Dusk/Dawn	Victorian	high
SON	70	10	Dusk/Dawn	Shallow	14
SON	70	12	Dusk/Dawn	Refractor	44
SON	70/100	16	Dusk/Dawn	Cylindrical	High
SON	150	5	Dusk/Dawn	Victorian	high

Other Exterior Lighting (eg sports, school, community)

Location : Rock Lodge Park

Fixture	Elevation	Lamp / Watts	Duty Cycle	Application	Compliance
Shoobox floodlights	6m@5°	150/250	4 evenings play + 9.30pm curfew	Twin Tennis courts	partly

Town / Village Name : Lynmouth
Location (relative to Core) : North West
Distance from Core Zone : 3 miles
Population :

Local Authority Lighting

Lamp Type	Watts	Quantity	Duty Cycle	Bowl Type	I ₉₀
SON	70	37	Dusk/Dawn	Long Victorian	High
SON	70	6	Dusk/Dawn	Short Victorian	high
SON	150	9	Dusk/Dawn	Low profile	14

Duty Cycle Options:- Dusk/Dawn
Half Night = Midnight or 1am Off
Part Night = On for Evening and Morning, Off between
Dimmed = On for Evening and Morning, Dimmed between
Presence Detection

6 Summary of Policy Statements

Policy Statement Number 1

Within the Core Zone boundary shown in Figure 2.4 it is proposed to maintain a policy of no additional permanent illumination and all existing lighting units should be replaced by “fully cut-off” examples regardless of the lumen output. (see Section 2.1)

Policy Statement Number 2

Residents in the Core Zone are to be encouraged to limit the overspill light at their property boundary, or within 10 meters of the main residence, to no more than 0.05 lux. (see Section 2.1)

Policy Statement Number 3

The Authority will endeavour to ensure that no lighting will be allowed to be projected from the adjacent light permitted zones into the Core Zone and any overspill lighting from lights in the Critical Buffer Zone to be no greater than 0.05 lux (horizontal) at ground level or 0.05 lux vertical at 1 metre (or higher) above ground on the Core Zone side of the property boundary. (see Section 2.1)

Policy Statement Number 4

Luminaires using lamps greater than 1000 lumens should be installed as Fully Cut-off (IDA term “Fully Shielded”) example. (see Section 2.3.1)

Policy Statement Number 5

Residents of Exmoor National Park are to be encouraged to limit the overspill light at their property boundary to no more than 0.1 lux. (Residents within the Core Zone have stricter recommendations see Policy statement no. 2) (see Section 2.3.1)

Policy Statement Number 6

In Environmental Zone terms the residents round the Core Zone live with and enjoy intrinsic darkness and as shown in Table 1.1 equivalent to Zone E1. Towns within the Exmoor boundary with a population greater than 900 may relax the Environmental Zone in the town centre where buildings provide natural screening but not in exposed locations. (see Section 2.3.2)

Policy Statement Number 7

Where possible all new lighting within Exmoor should be designed and installed to provide lower glare or intensity values, where possible, than that recommended by the ILP for night time Environmental Zones. (see Section 2.3.3)

Policy Statement Number 8

All design submissions for new lighting in Exmoor should be encouraged to show evidence of compliance with the zero candela intensity at 90° and above and encourage domestic luminaires to be selected from units having some form of upward light control. (see Section 2.3.3)

Policy Statement Number 9

Through this LMP it will be possible for the Authority to provide a basis for discussion with its neighbours on various options to help reduce upward light transmission. (see Section 2.4)

Policy Statement Number 10

All residential and business occupiers in Exmoor will be encouraged to switch off or reduce their exterior lighting quantity at 22.00 hours.

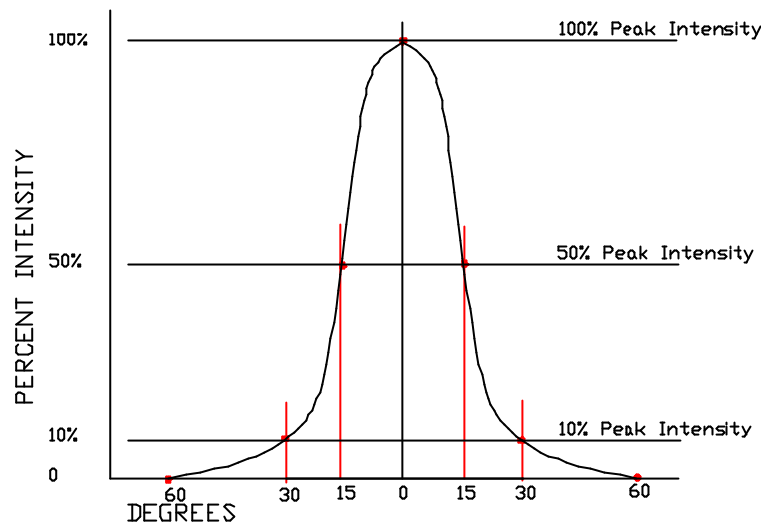
Appendix A – Definitions

Unit/Term

lumen	A unit of light (luminous flux) emitted from a point source of one candela intensity, sometimes expressed in kilolumens - (klm)
candela	A unit of luminous intensity
illuminance	The quantity of luminous flux incident upon a unit area, expressed as lumens per square metre or lux
luminance	The luminous intensity (or brightness) of a surface or source expressed in terms of surface area i.e. candelas per square metre (cd/m²) To convert dark sky 'brightness' to luminance Use the formula: $[\text{value in cd/m}^2] = 10.8 \times 10^4 \times 10^{(-0.4 \times [\text{value in mag/arcsec}^2])}$
reflectance	The reflection factor (or index) of a surface or material
inter-reflection	The result of various reflections
efficacy	In lighting terms - the value of light obtained per unit of electrical energy input i.e. lumens per watt
wattage	The nominal load rating of a lamp (excludes any allowances for associated operating gear losses usually taken as averaging 10% of the nominal wattage value (lower for electronic control gear))
luminaire	The total package of lantern, lamp and all associated integral items of operating control and switch gear
projector	A special luminaire designed to provide a concentrated pattern of light
skylight	The variable brightness value of daytime sky caused by sunlight scattered by particles of dust and vapour in the earth's atmosphere (skylight can reach values in excess of 2,000 candelas per square metre)
moonlight	The luminous flux emitted by the moon received at the earth's surface at an average value of between 0.3 and 0.5 lux (a rural surface under moonlight conditions will have an average brightness of about 0.002 candelas per square metre i.e. 1/500 cd/m ²)
sky glow	The variable brightness value of night-time sky caused by upward components of light from direct and inter-reflected light off the earth's surface (the brightness of sky glow is dependent on the amount of upward light and the presence and density of atmospheric particles and their distance above ground level)
aura	The hemisphere of light rising up from ground level encircling a light source or lighting array caused by low level mist and fog particles

Disability glare This is glare from a lamp or luminaire which prevents a visual task from being carried out by obscuring ones vision. It is sometimes associated with visual pain.

Cartesian diagram



IES, TM14, & Elumdat

Are different electronic formats of luminaire intensity distribution. They are not a meaningful representation in hard copy printed format, like a Cartesian or polar diagram, however, as numeric data input for a computer algorithm they represent a 3-dimensional array. Some computer algorithms recognise all three different formats whilst other algorithms only recognise one format.

Light intrusion Is light entering or illuminating windows beyond the intended area requiring illumination. Sometimes referred to incorrectly as 'light trespass' since the word 'trespass' has different legal implications in the UK.

Average luminance Or average illuminance

Are all based on a maintained average which means the lowest average value to which the installation will fall before lamp replacing and luminaire cleaning takes place as part of a maintenance regime cycle.

Colour appearance

The colour appearance of a light source can be defined objectively in terms of the temperature, in degrees Kelvin, to which a thermal radiator (e.g. a black body) would have to be heated to have the same colour appearance as that of the light source being assessed. A GLS filament lamp (light bulb) has a colour temperature of c.2700° Kelvin (usually written as 2700K).

The "Correlated Colour Temperature" (CCT) provides guidance of the colour appearance of lamps whether or not their chromaticity point (from the x & y values) is on the black body locus.**

The CIE categories of "Warm", "Intermediate" and "Cold" relate to CCTs as follows:

Below 3300K	-	WARM
3300K to 5300K	-	INTERMEDIATE
Above 5300K	-	COLD

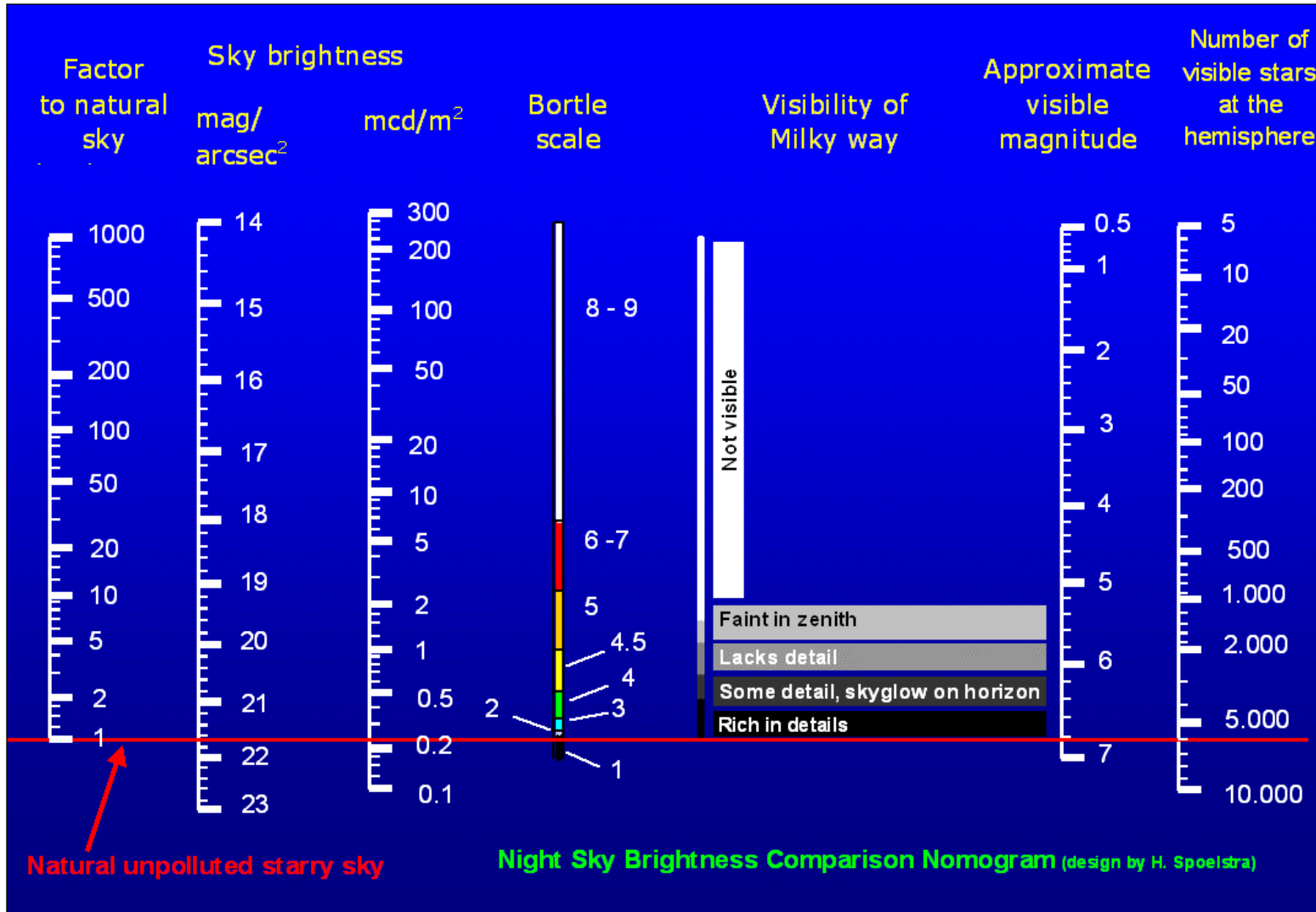
** BS 5489 and BSEN 12665:2002 use the abbreviation of Tcp to replace CCT

Light source Spectral Power and Colour Temperature Analysis

<p>Spectral power distribution</p> <p>SOX E 36W</p>	<p>Low pressure sodium (SOX) Colour Temperature CCT = 1800K Colour rendering index Ra = minus 40</p> <p>No radiation below 500nm</p> <p>nm = wavelength in nanometers</p>
<p>Spectral power distribution</p> <p>HPL Comfort 250W</p>	<p>High pressure mercury with fluorescent coating to convert UV radiation into visible light. (MBF/U) CCT = 3300K, Ra = 52 (Comfort version)</p> <p>More than 50% radiation below 500nm</p> <p>Some MBF/U still exists in some National Parks</p>
<p>Spectral power distribution</p> <p>SON PIA Plus</p>	<p>High pressure sodium (SON/T plus) CCT = 2000⁰ K, Ra = 22 to 25</p> <p>25% radiation below 500nm but no radiation in UV range</p> <p>“White SON” CCT = 2500K, Ra = 83</p>
<p>Spectral power distribution</p> <p>MH-W-TD 150W</p>	<p>Spectral power distribution</p> <p>MH-N-TD 150W</p>
<p>Metal halide warm white CCT= 3300K, Ra = 52</p> <p>Less than 25% radiation below 500nm</p>	<p>Metal halide cool white CCT= 4000K, Ra = 65</p> <p>About 50% radiation below 500nm</p>






<p>Spectral power distribution</p>		<p>Spectral power distribution</p>	
<p>CDM-T warm white CCT = 3000K, Ra = 85</p> <p>About 30% radiation below 500nm</p>		<p>CDM-T cool white CCT = 4200K, Ra = 96</p> <p>About 50% radiation below 500nm</p>	
<p>Spectral power distribution</p>		<p>Spectral power distribution</p>	
<p>Spectral power distribution</p>		<p>Low pressure mercury (compact fluorescent) (CFL)</p> <p>Wide range of colour effects in tri-phosphor - Warm white, cool white, north light and many others</p>	
		<p>LED</p> <p>Provisional display of early spectral power measurements</p> <p>About 25% radiation below 500nm.</p> <p>3 colour temperatures available 3200K, 4500K and 6000K (avoid using 6,000K in residential area)</p>	






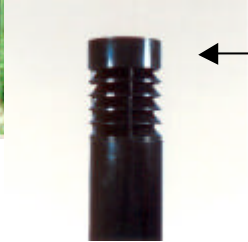
Appendix B – Sky Brightness Nomogram (by kind permission of Heck Spoelstra)




APPENDIX C





Luminaire Profile Examples for Environmental Zone E1
with typical intensity distribution of light emerging near the horizontal axis

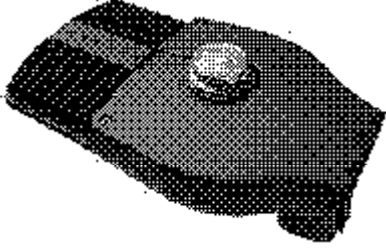


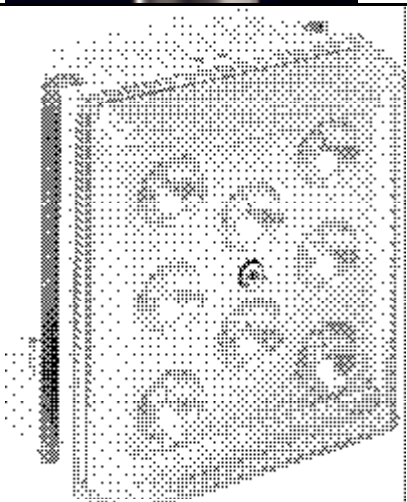
 <p>post top (as illustration) is elevated 10° and non-compliant for E1 @ 90° and above Requires side entry bracket with horizontal spigot for 0° elevation</p>	<p>Flat Glass Philips - Mini Iridium</p> <p>45w Cosmopolis also 16 x Light Emitting Diodes W/White Narrow Beam</p> <p>At 5° tilt output = G5 At 10° tilt output = G4</p>	<p>luminaire elevated 0°</p> <table border="1" data-bbox="965 461 1240 707"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95°</td> <td>0</td> </tr> <tr> <td>Above 90°</td> <td>0</td> </tr> <tr> <td>90°</td> <td>0</td> </tr> <tr> <td>80°</td> <td>10</td> </tr> <tr> <td>70°</td> <td>246</td> </tr> </tbody> </table> <p>45w = G6 compliant 16 LED's = G6 except I₉₀</p>	I max	Cd/klm	Above 95°	0	Above 90°	0	90°	0	80°	10	70°	246
I max	Cd/klm													
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 	<p>Light Emitting Diodes Flat Glass</p> <p>Ruud / CU Phosco Ledway Road</p> <p>30 x LED's @ 3000°K or 50 x LED's @ 4000°K Caution 6000°K also available</p>	<p>luminaire elevated 0°</p> <table border="1" data-bbox="965 943 1240 1189"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95°</td> <td>0</td> </tr> <tr> <td>Above 90°</td> <td>0</td> </tr> <tr> <td>90°</td> <td>0</td> </tr> <tr> <td>80°</td> <td>71</td> </tr> <tr> <td>70°</td> <td>287</td> </tr> </tbody> </table>	I max	Cd/klm	Above 95°	0	Above 90°	0	90°	0	80°	71	70°	287
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 <p>G4 optic (warning also G2 version)</p>	<p>Light Emitting Diodes Flat Glass</p> <p>Urbis Remus</p> <p>16, 24, 32 or 48 LED's</p> <p>3500°K or 4250° K Caution 6000°K also available</p>	<p>luminaire elevated 0°</p> <table border="1" data-bbox="965 1312 1240 1559"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95°</td> <td>0</td> </tr> <tr> <td>Above 90°</td> <td>0</td> </tr> <tr> <td>90°</td> <td>0</td> </tr> <tr> <td>80°</td> <td>89</td> </tr> <tr> <td>70°</td> <td>447</td> </tr> </tbody> </table>	I max	Cd/klm	Above 95°	0	Above 90°	0	90°	0	80°	89	70°	447
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 	<p>SILL Lighting</p> <p>453 CityLiter</p> <p>26w Pll and 35w CDM</p>	<p>luminaire elevated 0°</p> <table border="1"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95°</td> <td>0</td> </tr> <tr> <td>Above 90°</td> <td>0</td> </tr> <tr> <td>90°</td> <td>0</td> </tr> <tr> <td>80°</td> <td>8</td> </tr> <tr> <td>70°</td> <td>84</td> </tr> </tbody> </table> <p>?</p>	I max	Cd/klm	Above 95°	0	Above 90°	0	90°	0	80°	8	70°	84												
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	<p>Thorn Lighting</p> <p>Plazora Wall Light</p> <p>26w TC-D fluorescent</p>	<table border="1"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95°</td> <td>0</td> </tr> <tr> <td>Above 90°</td> <td>0</td> </tr> <tr> <td>90°</td> <td>0</td> </tr> <tr> <td>80°</td> <td>8</td> </tr> <tr> <td>70°</td> <td>50</td> </tr> </tbody> </table> <p>?</p>	I max	Cd/klm	Above 95°	0	Above 90°	0	90°	0	80°	8	70°	50												
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	<p>Zumtobel Bega 2489</p> <p>Triangular Bulkhead</p> <p>18w PLC 3000°K</p>																									
 	<p>Sugg Lighting</p> <p>Probe Louvered Bollard</p> <p>70w SON(E)</p> <p>(white paint on louvers reflects upward light)</p> <p>CU Phosco Lighting</p> <p>P436 Black Louvered Bollard</p> <p>42w Compact Fluorescent</p>	<table border="1"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95°</td> <td>1</td> </tr> <tr> <td>Above 90°</td> <td>7</td> </tr> <tr> <td>90°</td> <td>7</td> </tr> <tr> <td>80°</td> <td>22</td> </tr> <tr> <td>70°</td> <td>35</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95°</td> <td>0</td> </tr> <tr> <td>Above 90°</td> <td>0</td> </tr> <tr> <td>90°</td> <td>0</td> </tr> <tr> <td>80°</td> <td>7</td> </tr> <tr> <td>70°</td> <td>20</td> </tr> </tbody> </table> <p>?</p>	I max	Cd/klm	Above 95°	1	Above 90°	7	90°	7	80°	22	70°	35	I max	Cd/klm	Above 95°	0	Above 90°	0	90°	0	80°	7	70°	20
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	<p>Urbis Isla</p> <p>35watt CDM or 42watt CFL</p> <p>G6 optic (warning G2 optic also available)</p>	<table border="1"> <thead> <tr> <th>I max</th> <th>Cd/ klm</th> </tr> </thead> <tbody> <tr> <td>Above 95⁰</td> <td>0</td> </tr> <tr> <td>Above 90⁰</td> <td>0</td> </tr> <tr> <td>90⁰</td> <td>0</td> </tr> <tr> <td>80⁰</td> <td>31</td> </tr> <tr> <td>70⁰</td> <td>274</td> </tr> </tbody> </table>	I max	Cd/ klm	Above 95 ⁰	0	Above 90 ⁰	0	90 ⁰	0	80 ⁰	31	70 ⁰	274	<p>?</p>
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70 ⁰	274														

The following examples do not fully comply with zero intensity at and above the horizontal but have been selected from many others as being the closest to “Fully Shielded” conditions and need to be located near other natural shields like buildings or trees.

	<p>JW Ltd Gloucester G1/96 Philips Fortino optic</p> <p>45w LED unit</p> <p>Vertical lamps and refractors are not compliant with G6 or E1 objectives.</p>	<table border="1"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95°</td> <td>0</td> </tr> <tr> <td>Above 90°</td> <td>0.3</td> </tr> <tr> <td>90°</td> <td>0.3</td> </tr> <tr> <td>80°</td> <td>33</td> </tr> <tr> <td>70°</td> <td>93</td> </tr> </tbody> </table>	I max	Cd/klm	Above 95°	0	Above 90°	0.3	90°	0.3	80°	33	70°	93
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	<p>Sugg Rochester and Tunbridge</p> <p>50watt SON/T = G4 compliant with cgp stb optic</p> <p>80w MBF/U = G5 compliant with cgp stb optic</p>	<table border="1"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95°</td> <td>0</td> </tr> <tr> <td>Above 90°</td> <td>8</td> </tr> <tr> <td>90°</td> <td>8</td> </tr> <tr> <td>80°</td> <td>78</td> </tr> <tr> <td>70°</td> <td>480</td> </tr> </tbody> </table> <p>$U_h = 0.0$ $U_l = 0.2$ total ULOR = 2%</p>	I max	Cd/klm	Above 95°	0	Above 90°	8	90°	8	80°	78	70°	480
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	<p>Sugg Lighting</p> <p>Large Grosvenor</p> <p>50w SON/T</p> <p>Optic and lamp located in lantern top section to act as “fully shielded” but as in all heritage equipment the glass refracts some light upwards</p>	<table border="1"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95°</td> <td>0</td> </tr> <tr> <td>Above 90°</td> <td>17</td> </tr> <tr> <td>90°</td> <td>17</td> </tr> <tr> <td>80°</td> <td>83</td> </tr> <tr> <td>70°</td> <td>206</td> </tr> </tbody> </table>	I max	Cd/klm	Above 95°	0	Above 90°	17	90°	17	80°	83	70°	206
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	<p>Urbis St. Giles</p> <p>50watt SON/T</p> <p>G3 compliant with SGS Clear P/1200/095/-38.5/911381</p>	<table border="1"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95°</td> <td>10</td> </tr> <tr> <td>Above 90°</td> <td>7.7</td> </tr> <tr> <td>90°</td> <td>7.7</td> </tr> <tr> <td>80°</td> <td>23</td> </tr> <tr> <td>70°</td> <td>148</td> </tr> </tbody> </table>	I max	Cd/klm	Above 95°	10	Above 90°	7.7	90°	7.7	80°	23	70°	148
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	<p>OrangeTEC</p> <p>TerraLED</p> <p>24, 36, 40 and 60 LED units</p>	<table border="1"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95°</td> <td>0</td> </tr> <tr> <td>Above 90°</td> <td>2</td> </tr> <tr> <td>90°</td> <td>17</td> </tr> <tr> <td>80°</td> <td>83</td> </tr> <tr> <td>70°</td> <td>206</td> </tr> </tbody> </table>	I max	Cd/klm	Above 95°	0	Above 90°	2	90°	17	80°	83	70°	206
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	<p>Light Emitting Diodes Concave Glass</p> <p>Urbis Carlo 1</p> <p>28 or 42 LED's</p> <p>35000K</p>	<p>luminaire elevated 0°</p> <table border="1"> <thead> <tr> <th>I max</th> <th>Cd/klm</th> </tr> </thead> <tbody> <tr> <td>Above 95°</td> <td>1.3</td> </tr> <tr> <td>Above 90°</td> <td>1.5</td> </tr> <tr> <td>90°</td> <td>1.5</td> </tr> <tr> <td>80°</td> <td>200</td> </tr> <tr> <td>70°</td> <td>573</td> </tr> </tbody> </table>	I max	Cd/klm	Above 95°	1.3	Above 90°	1.5	90°	1.5	80°	200	70°	573
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	<p>Emergency Exit Lighting Unit</p> <p>Raylux 25</p> <p>8 x LED's and complete with wall mounting bracket</p> <p>Unit to be mounted pointing down for G6 compliance</p>	<p>Currently undergoing photometric tests to prove zero intensity at and above horizontal</p>												

rayLUX 25

DIRECTIONAL WHITE-LIGHT

High Performance White-Light LED illuminators provide class leading performance, long life, energy efficiency and zero maintenance. They incorporate the very latest surface mount LED's to deliver excellent optical output and outstanding reliability, providing even illumination and excellent night time images for surveillance cameras and general area lighting.

The RAYLUX 25 provides a world class 'White-Light' output of 110lm/W at the LED source, and an independently tested luminaire output of 800 lm at 15lm/w.

Each unit is fitted with Active LED Life Control to carefully control LED output, delivering consistent illumination power and a projected working life of 10 years.

RAYLUX illuminators are supplied with bracket and power supply. Control features on the power supply include adjustable power output, photocell and telemetry control. RAYLUX 25 is designed for low light installations up to 20m (66ft).

RAYLUX 25 is also available with low voltage PSU.



POWERFUL

- Quick Start
- **PLATINUM** LED technology
- High Power - Low Running Costs

FLEXIBLE

- Various Angles (30, 50 or 120°)
- Fully Controllable Power Supply
- Optional Low Voltage PSU

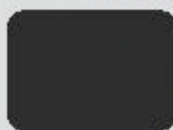
RELIABLE

- 10 year life
- Active LED Life Control
- Vandal resistant

CONTROLLED

- Excellent Colour Rendition
- Even Output Illumination
- Low Running Costs

WHITE-LIGHT IN USE:



White-Light off



White-Light on

Version 3.2

APPLICATIONS



rayTEC[®]

Domestic Lighting Equipment Profiles

Through this leaflet we hope to provide you with examples of well designed equipment which you may wish to consider when purchasing new lighting units. The leaflet also contains examples of poor design relative to the exacting demands of light control within Dark Sky Reserve of National Park.

Unless otherwise noted the equipment illustrated is available from local DIY Stores.



Good – Reflector shaped to direct light down. Boxed as dark sky friendly and has PIR sensor separate from the lamp unit pointing. For rural setting look for unit with a 150 watt lamp or less. Also provides reduced illumination dusk to dawn for courtesy and full power on presence detection.



Poor – Lamp reflector and PIR detector point in same elevation and rotational direction. 300 / 500 watts Tungsten Halogen lamps provide too much light for use in rural settings.



Good – Can direct light in 2 directions and lamps are less than 100 watts. Limit elevation angle to less than 45 degrees. Various other similar styles with integral PIR detector on mounting. 60w capsule with dimming for courtesy or LED lamps



Good – (above and below) 70w or 150w metal halide lamp. Must be installed with glass window **horizontal** – and not as illustrated. When the lamp is located at the bottom of the reflector the main beam will emerge from the glass window at about 45 degrees. Known technically as a double asymmetric light distribution.





Very Good – (SILL 453 CityLiter) Designed to be mounted horizontally and available in a range of low wattage lamps. Luminaire has IDA Dark Sky Friendly Fixture Award. Fluorescent range + 35/70w metal halide



Poor – Low wattage light source but projects light upwards when mounted as shown and needs to be near horizontal to limit sky glow. **(Bracket does not allow horizontal fixing)**
18 watt PL-C = 1200 lm



Poor – No light control



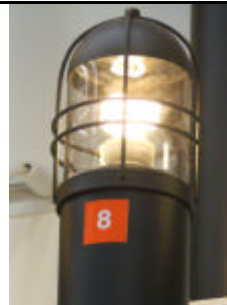
Fair – Upward light limited but lamp must be less than 480 lm.



Poor – No light control



Good – Porch light with downward light



Poor – Bollard with no light control and produces glare










Good – External louvers limit upward light and reduces glare. Lamp must be less than 1000 lm








The output of lamps will shortly be valued in lumens rather than watts as at present. The table below provides interim user guidance when comparing lamp watts and lumens.


Lamp type & Watts	Lamp Lumens (lm)
Clear Bulb GLS 75w	940
Candle Lamp clear 60w	660
Candle Lamp opal 60w	640
Superlux Krypton 75w	1,000
Halogen energy saver 52w	840
Halogen linear 60w	840
12v Tungsten Halogen 50w	925
T2 linear fluorescent 13w	940
T8 linear fluorescent 15w	950
Compact Fluorescent	
Elegance globe 15w	799
Elegance candle 9w	405
Elegance spiral 11w	580
2D compact fluorescent 10w	650
3 loop compact fluor't 13w	900
1 loop compact fluor't 11w	900
LED Opal globe 7w	230






In order to protect the dark night sky over the National Park it is proposed to limit the lamp output on existing poor or no light-controlled luminaires to 480 lumens.

See Lighting Management Plan Section 2 for other restrictions.

<i>Illustration</i>	<i>Lamp Name</i>	<i>Lamp Type</i>	<i>Nominal Watts</i>	<i>Output Lumens</i>
	Standard, clear bulb	Incandescent GLS	15W 25W 40W 60W 100W	90 220 420 710 1,100
	Standard, pearl frosted bulb	Incandescent GLS	15W 25W 40W 60W 75W	90 220 415 700 935
	Candle, clear bulb	Incandescent Tungsten	25W 40W 60W	200 400 660
	Candle, opal bulb	Incandescent Tungsten	25W 40W 60W	190 390 640
	Twisted Candle, clear bulb	Incandescent Tungsten	15W 25W 40W 60W	90 200 400 660
	Twisted Candle, opal bulb	Incandescent Tungsten	15W 25W 40W 60W	90 200 400 660
	GE Candle Lamp (B&Q)	Incandescent Tungsten	18W 30W 45W	170 415 710

	Round, clear bulb	Incandescent Tungsten	25W 40W 60W	200 400 660
	Round, opal bulb	Incandescent Tungsten	25W 40W 60W	200 400 660
	Superlux Krypton mushroom, opal Standard	Incandescent Tungsten	25W 40W 60W 75W	240 455 760 1,000
	Superlux Krypton mushroom, opal Any burning position	Incandescent Tungsten	25W 40W 60W	160 300 530
	Halolux halogen energy saver	Incandescent Tungsten Halogen	18W 30W 42W 45W 52W	170 415 630 710 840
	Haloline linear	Incandescent Tungsten Halogen	60W 100W 120W 130W 230W	840 1,900 2,400 4,650
	Halostar 12V	Incandescent Tungsten Halogen	10W 20W 35W 50W	140 320 600 925

	LED Parathom clear globe	Solid State Light Emitting Diode	1.6W 2W 3W	70 117 165
	Master LED opal globe	Solid State Light Emitting Diode	7W	230
	Master LED reflector	Solid State Light Emitting Diode	4W 7W	110 230
	Lumilux T2 tubular	Discharge Linear Fluorescent	6W 8W 11W 13W	330 540 750 940
	Energy Saver - short T5 tubular	Discharge Linear Fluorescent	4W 6W 8W 13W	130 270 385 830
	Lumilux T8 tubular	Discharge Linear Fluorescent	10W 15W	650 950
	Biax Extra Mini	Discharge Compact Fluorescent	9W 11W 15W	480 600 900
	Elegance Globe	Discharge Compact Fluorescent	7W 9W 11W	286 405 580

			15W	799
	Elegance Candle	Discharge Compact Fluorescent	5W 7W 9W	177 286 405
	Elegance Spiral	Discharge Compact Fluorescent	8W 12W 15W 20W 23W	460 700 950 1152 1380
	2D	Discharge Compact Fluorescent	10W 16/14 21/19	650 1100 1350
	Biax S	Discharge Compact Fluorescent	5W 7W 9W 11W	250 400 600 900
	Biax S/E	Discharge Compact Fluorescent	5W 7W 9W 11W	265 425 600 900
	Biax D	Discharge Compact Fluorescent	10W 13W	600 900
	Biax T	Discharge Compact Fluorescent	13W 18W 32W 42W	900 1,200 3,200

APPENDIX F

Property Self-Audit Guidelines – The Next Step for Improvement

Of particular interest in the lighting audit was the high percentage of security style floodlights, many of them with the glass almost vertical. The application for a dark sky status over Exmoor would benefit greatly if more “security” style floodlights were tilted down, preferably horizontal.

Are you ready to help improve the excellent dark night time conditions in the National Park? If so survey your property externally (all buildings and any free-standing lighting eg. on poles in exercise yards or ménage areas)

Tungsten Halogen Floodlights



Preferred Step

Replace with new fitting having good light control & meeting the Lighting Management Plan requirements

or **Option 1**

Tilt down until glass is horizontal and thereby meeting the requirements of a “fully shielded” luminaire.

Reduce lamp size if possible (500watts – 300watts or 150watts – 100watts).

or **Option 2**

Tilt down as far as fitting allows (integral sensor units sometimes limits the downward angle).

Fabricate shielding from aluminium or similar material and fix securely in place.

Ensure that shielding as fixed, allows no light at or above the horizontal axis.

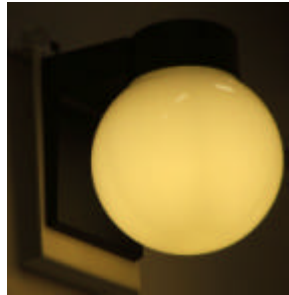
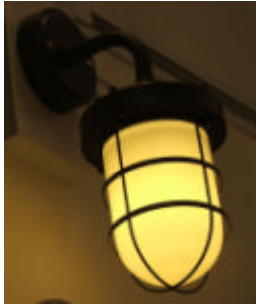
Reduce lamp size if possible.

Remember:-

**SWITCH OFF - AFTER YOUR WORK IS FINISHED
NO TASK – NO LIGHTING**

For all other fittings which are **not “fully shielded” or “fully cut-off”**, implement changes or upgrades as follows:-

1) No or very minimal Light Control



Preferred

Measure the building footprint and replace with new fitting(s) having good light control, preferably “fully cut-off” like the examples on the following page and thereby meeting the Lighting Management Plan (LMP) requirements.
Do not exceed the total lumen limit in the table below for your size of property.







	Environmental Zone				
	Core	E1 Buffer	E2 Lit streets	E3***	E4***
Total Lumens for domestic Exterior Lighting	0	750 lm plus 4.5 lm / m ² of site structures*	2250 lm plus 4.5 lm / m ² of site structures*		
Fully cut-off luminaires each lamp lumen maximum		1200 lm	1650 lm		
Part cut off luminaires each lamp lumen maximum		750 lm	1200 lm		
No light control luminaires each lamp lumen maximum		480 lm**	750 lm		

Table - Total lumen limit and individual lamp lumen limit per property

* Site structures is the sum of the land area of residential buildings, habitable structures, garages, recreational buildings and storage structures on each property plot.

***** Environmental zones E3 and E4 exist but do not relate to any conditions in Exmoor National Park.**

A full list of domestic lamp types, their wattage and their lumen outputs are shown on the following pages as reference data. However, lamp manufacturers are continually improving lamp efficiency and some lamp lumen outputs may change through time.

 <p>Fully cut-off example</p>	 <p>Fully cut-off example</p>	 <p>Fully cut-off example</p>
 <p>Only part shielded so limit lamp size as per table 3.1</p>	 <p>Only part shielded so limit lamp size as per table 3.1</p>	 <p>Only part shielded so limit lamp size as per table 3.1</p>

or **Option 1**

Shield to fully comply with LMP requirements.

Fabricate shielding from aluminium or similar material and fix securely in place.

Ensure shielding as fixed, allows no light at or above the horizontal axis.

or **Option 2**

If high power lamp, replace lamp with one having less than 1000 lumen output (see tables in Appendix).

Consider shielding as well.

2) Partly Cut-off Fittings



Preferred

Adjust tilt angle down to meet LMP requirements.

or **Option 1**

Tilt down if adjustable and

Provide additional shielding to comply with LMP requirements.

Fabricate shielding or cowl from aluminium or similar material and fix securely in place.

Ensure that shielding / cowl as fixed, allows no light at or above the horizontal axis.

or **Option 2**

Replace with new fitting having improved light control & meeting LMP requirements

or **Option 3**

If high power lamp, replace lamp with one having less than 1000 lumen output (see tables in Appendix)

Consider tilt reduction as well, if possible.

Consider shielding as well.

For all external lighting:-

?? Check switching times are sensible / comply with curfew as appropriate.

?? PIR detectors are properly aimed to avoid nuisance switching.

?? Consider installing a push button switch with short time delay facility.