Elan Valley Estate

Dark Sky Park

Application to the International Dark Sky Association

Protecting and Promoting the Beauty of our Dark Skies.

And senseless were my heart, could I look back
Upon the varied way my feet have trod,
Without a silent prayer that health and joy,
And love and happiness, may long abide
In the romantic vale where Ellen winds.

Coombe Ellen – William Lisle Bowles

This document was initiated by Sorcha Lewis BSc Hons, on behalf of Dwr Cymru Welsh Water and The Elan Valley Trust, living on the Estate as a Farmers wife and working as the Head Countryside Ranger. In January 2014 Alan Samuel took over as Head Ranger for the Elan Valley, and with the assistance of local amateur astronomers Les & Kris Fry, and Ed Parsons (Area Lands Manager) of Dwr Cymru Welsh Water, carried this to completion.

CONTENTS.

Elan Valley International Dark Skies Park Summary

This application is submitted to the International Dark Skies Association's Dark sky places programme with our aim to be recognised as an "International Dark Sky Park"

The Elan Valley Estate promotes the recognition of our night skies importance for protecting the night time environment and heritage of our Dark skies. We hope to encourage our Visitors to see first hand how amazing and beautiful our night skies are and with further education, enable them to protect their environment from light pollution by taking action in their own communities. Many of our visitors come to mid-Wales from cities around the UK and many are awed by the sky above.
We promote the enjoyment, conservation, enhancement and access to our dark skies and this runs in hand with the other special qualities the Elan Valley has (biodiversity/water quality/history/recreation). We believe having a dark sky designation will help with the promotion and conservation of our dark skies. We have on site an Education Ranger who will be able to promote Dark skies to the Visitors and public who arrive on site.

Dŵr Cymru
Welsh Water

ELAN
valley

Executive Summary

The Elan Valley is a unique area of 180 sq km in the heart of Wales which was compulsory purchased by the Birmingham Corporation in 1892 by an Act of Parliament to provide a water source to the city of Birmingham 72 miles away, where the people were dying due to poor water and sanitation. It was an amazing feat of Victorian Dam Construction and is now a very popular tourist destination. The Elan Valley is located within the Cambrian Mountains which is the "mountainous spine" of Wales which connects the two national parks of Snowdonia to the North and the Brecon Beacons to the South.

Since its compulsory purchase, the Elan Estate has been managed to protect the quality and quantity of the water supplies and partly as a consequence its moorlands, bogs, woodlands, rivers and reservoirs are of national importance for plants and wildlife. Birmingham Corporation Water Department existed until 1974 when, under the Water Act 1973, its responsibilities were transferred to **to Dwr Cymru Welsh Water; a not for profit Water Company** to manage.

Then in 1989, the Elan Valley Trust was established by Dwr Cymru Welsh Water to protect the flora and fauna of the Elan Estate and to encourage public access and environmental education, and to safeguard against inappropriate developments which may affect the Estate.

Ownership.

Elan Valley Trust

YMDDIRIEDOLAETH CWM ELAN
ELAN VALLEY TRUST

The Elan Valley Trust was established by Dwr Cymru Welsh Water in 1989 to protect the flora and fauna of the Elan Estate and to encourage public access and environmental education, and to safeguard against inappropriate developments affecting the Estate. The Elan Valley Trust is responsible for the open hill land, Elan Village and the self-catering properties and farms. The trust has a lease of 999 years of the 180sq.km.estate from Welsh Water and an area of adjoining common has been acquired. Most of the estate is scheduled for conservation by national and international designation. Additional conservation measures are carried out in partnership with Natural Resources Wales, Wildlife Trust and Royal Society for the Protection of Birds.

Charitable objects.

1.

THE PRESERVATION MAINTENANCE AND ENHANCEMENT FOR THE BENEFIT OF THE PUBLIC OF THE AREA OF GREAT NATURAL BEAUTY COMPRISING THE ELAN VALLEY AND ITS NATURAL ASPECT AND FEATURES (AND ITS ANIMAL AND PLANT LIFE).

2.

THE FACILITATION AND ENCOURAGEMENT OF ACCESS TO AND THE STUDY OF THE ELAN VALLEY (AND ITS ANIMAL AND PLANT LIFE) BY THE GENERAL PUBLIC.

3.

THE PROVISION AT THE ELAN VALLEY OR SUCH PART OF IT AS SHALL BE APPROPRIATE IN THE INTERESTS OF SOCIAL WELFARE AND FOR THE PURPOSE OF IMPROVING THE CONDITIONS OF LIFE FOR THE PERSONS FOR WHOM THE SAME ARE INTENDED OF FACILITIES FOR PHYSICAL RECREATION WHICH SHALL BE AVAILABLE TO MEMBERS OF THE PUBLIC AT LARGE.

4.

THE FACILITATION AND ENCOURAGEMENT OF THE USE OF THE WHOLE OR PART OF THE ELAN VALLEY FOR CHARITABLE PURPOSES.

Dŵr Cymru
Welsh Water

DWR CYMRU WELSH WATER IS THE SIXTH LARGEST OF THE TEN REGULATED WATER AND SEWERAGE COMPANIES IN ENGLAND AND WALES. RESPONSIBLE FOR PROVIDING OVER THREE MILLION PEOPLE WITH A CONTINUOUS, HIGH QUALITY SUPPLY OF DRINKING WATER AND FOR TAKING AWAY, TREATING AND PROPERLY DISPOSING OF THE WASTEWATER THAT IS PRODUCED. SINCE 2001, WE HAVE BEEN OWNED, FINANCED AND MANAGED BY GLAS CYMRU. UNIQUE IN THE WATER AND SEWERAGE SECTOR, GLAS CYMRU IS A COMPANY LIMITED BY GUARANTEE AND AS SUCH HAS NO SHAREHOLDERS.

As a large landowner and a water company with processes and activities that can have a direct influence on the environment, Welsh Water is committed to enhancing biodiversity within its landholdings and also to ensuring that operations do not adversely affect biodiversity value in our rivers and seas.

DCWW has developed a clear policy that describes our commitments and approach to biodiversity and produced a Biodiversity Overview Document which describes our work and approach in much more detail. Welsh Water has directly contributed to biodiversity through the improved quality of its discharges to the marine and freshwater environments.

As a member of the IDA, it gives me great personal pleasure to nominate,

The Elan Valley,

for consideration as an International Dark Sky Park.

After deciding to move to Wales some 4 odd years ago in our "escape from the rat race", my Wife and I setteled some 7 miles inland from Aberystwyth in Mid Wales. One of our prime new home requisites was for dark skies to continue and grow our love of astronomy, and our growing family of telescopes can testify to fulfilling that requirement! A year or so after the move, we made contact with the then Head Ranger of the Elan Valley, Sorcha Lewis, on a totally non astronomical related topic. During the course of our discussion, she mentioned her desire to get the Elan recognised as a dark sky site, but that she had little idea as to how to proceed further. Prior to our move, I had been the Secretary for the Wessex Astronomical Society for some 14 years, based in Wimborne, Dorset, and one of our members – Bob Mizon - had become the BAA Co ordinator for the Campaign for Dark Skies. Bob's details and further information was soon in Sorcha's hands and so she started the application process going. By a further twist of fate some 18 months later, I took over the task of completing this Application on behalf of the Elan Valley Trust and Dwr Cymru, Welsh Water.

Being only some 30 minutes drive from our new home, The Elan Valley is really my "backyard". It's natural, unspoilt wilderness is already protected by the dedicated Ranger teams at ground level, and now, as a Volunteer Ranger, I take pride in representing the Elan on the astronomical stage, to do all that I can to help protect the other, sometimes forgotten beauty, that lies in the skies above. There clearly exists an interest in astronomy here in Mid Wales, and the protection of the Elan's skies for humans and wildlife to benefit from is a logical and worthy goal. IDA status would demonstrate to all, our commitment to preserve all aspects of the Elan's landscape and could lead to greater things.

The Brecon Beacons to the South of us already has protected IDA status, and I am aware that other bodies are following our progress with interest. Should the Elan Valley be sucessful in this application for Dark Sky Park status, it is eminently possible that we would act as a springboard for further areas of Wales to follow suit. Were the Llyn Peninsula, Snowdonia National Park, Shropshire Hills ANOB, and the Cambrian Mountains to follow our lead, there could soon become a great "Arc of Dark" across a major swathe of the Welsh Countryside..... Now that's a GOAL!!!

I humbly submit my nomination and this application for your consideration.

Leslie Fry
Volunteer Ranger – Elan Valley.

Elan Valley Trust

Ymddiriedolaeth Cwm Elan

Elan Estate Office
Elan Village
RHAYADER
Powys
LD6 5HP

Swyddfa Ystâd Elan
Pentre Elan
RHAEADR GWY
Powys
LD6 5HP

Tel :01597 810449
Fax :01597 811276

Ffôn :01597 810449
Ffacs :01597 811276

E Mail : info@elanvalleytrust.org
Website : www.elanvalley.org.uk

Dear Sirs

Letter of Nomination Support

As the Estates Manager for the Elan Valley Trust, I, on behalf of the Trust support the nomination of the Elan Valley in its aspiration to be awarded International DarkSky Park status.

The Elan Valley is a wonderful "hidden gem", nestling in the heart of Mid Wales. With our commitment to protecting the wildlife and natural landscape that is so much a feature of the outstanding beauty of this area, it seems only a logical and natural extension to our work to protect our dark skies to a similar degree.

The astronomical events held here in the Estate over the past year have reached out into the local communities, raising both profiles of the Elan Valley and that of astronomy in general. Our pre existing commitment to outreach and public education are enhanced by Welsh Waters Education Ranger and volunteer "Astro" Rangers to further assist our efforts in enlightening visitors of all ages to this enchanting landscape, be they looking at ground level or in the dark skies above.

The Trust is fully supportive of the efforts required to achieve and maintain an International DarkSky status for the Elan Valley, and requests that the IDA consider this application to achieve such.

Yours faithfully

J A BAKER
ESTATES MANAGER

2nd January 2015

Re: International Dark Sky Park status

Dwr Cymru Welsh Water own the spectacular 72 square mile Elan Valley Estate, and manage Access, Conservation, Recreation and Education in partnership with Elan Valley Trust.

We fully support the application for International Dark Sky Park status as we recognise the importance of conserving and preserving the unique quality of the estate and the dark sky we benefit from. Our team of Rangers deliver a wide range of events from our Visitor Centre which currently attracts c. 200,000 visitors, with c. 400,000 visiting the estate each year.

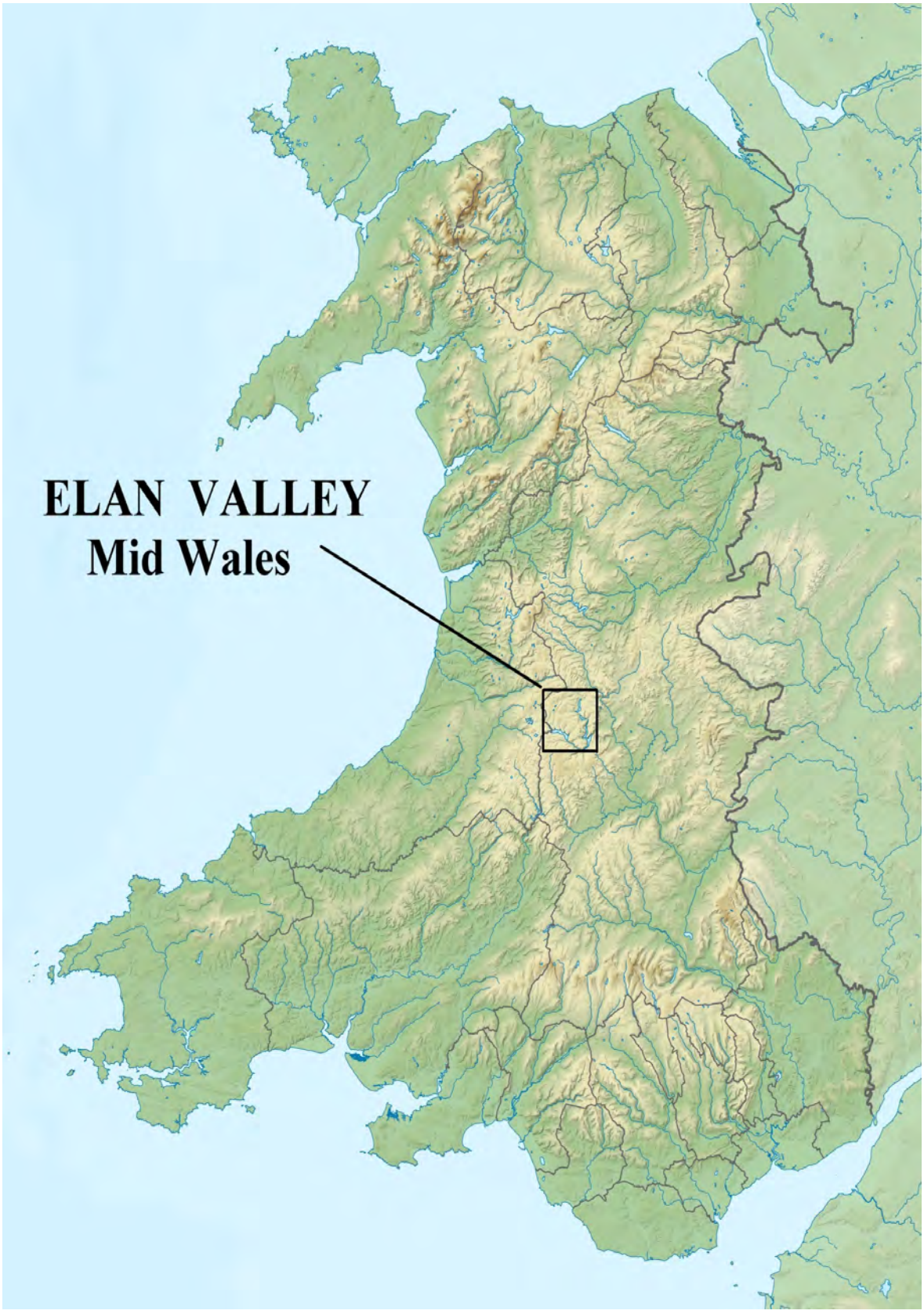
With support from our dedicated and enthusiastic volunteer 'Astro Rangers' we have included specific dark sky events for the last two years. These have proven very popular and we will continue to develop this programme of activity, engaging with both the local community and visitors, which also benefits local businesses such as accommodation providers. Tourism is a key component of the local economy and we recognise that preserving the dark skies is fundamental to attracting new visitors and increasing their length of stay in the area.

The lighting audit which has recently been completed has highlighted some areas where we need to reduce light pollution, we are committed to completing these actions promptly and we are also developing plans for dark sky viewing areas and potentially a bespoke observatory on site.

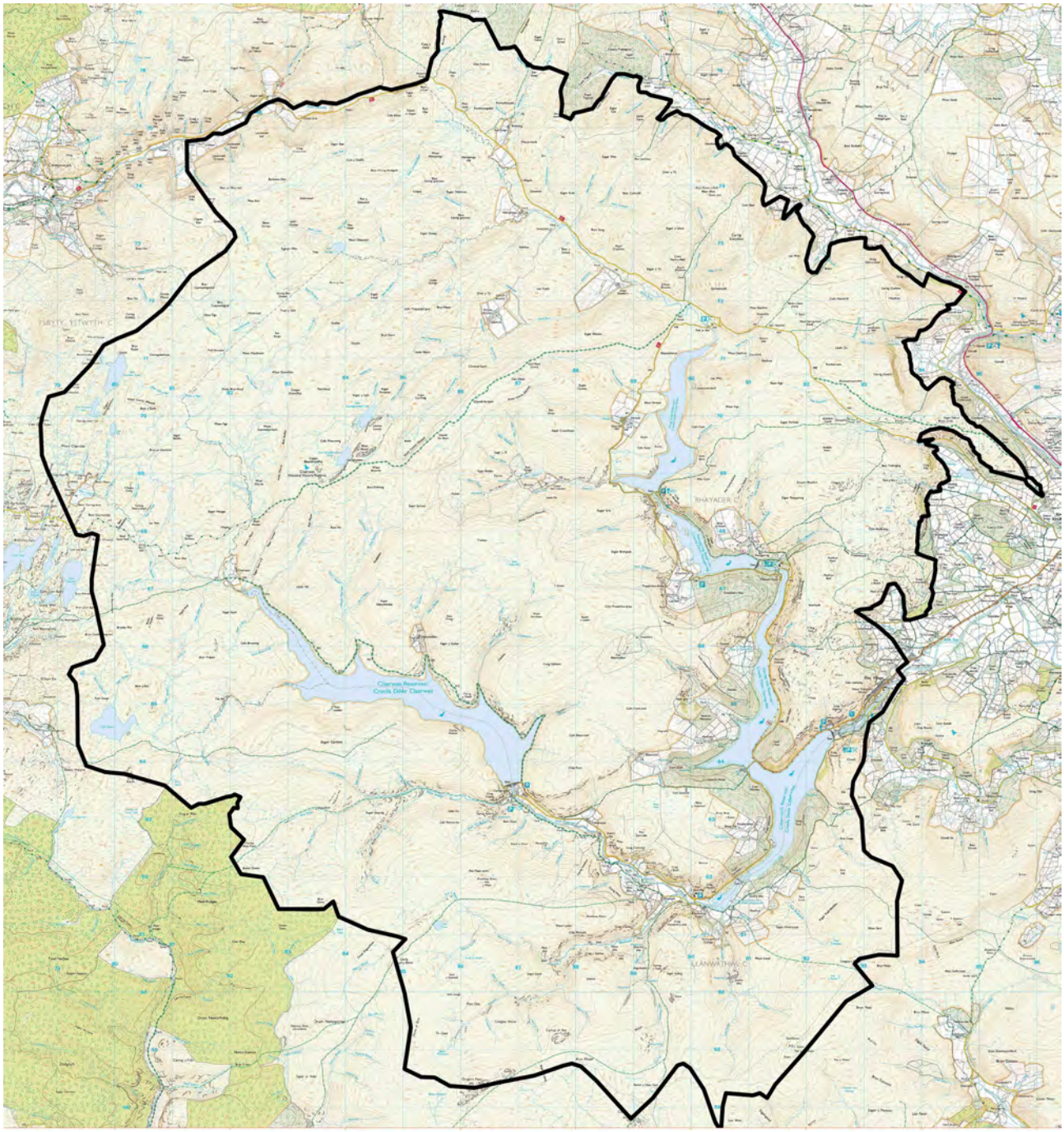
Ed Parsons

Area Lands Manager

LOCATION MAP



Boundary outline of proposed Elan Valley Dark Sky Park.



BIODIVERSITY

The Estate falls within the Cambrian Mountains Environmentally Sensitive Area. Nearly all of the farms on the Estate have signed up to the scheme which aims to conserve the natural beauty of the area and its flora and fauna.

The Estate also forms the major part of the 30,000 hectare Elenydd-Mallaen Special Protection Area under the European Wild Birds Directive. It also has three Special Areas of Conservation under the European Habitats and Species Directive. One is for the woodlands and two are for the upland bogs, which together total over 6,000 hectares.

Most of the Estate is vested in the Elan Valley Trust whose charitable objectives include the preservation, maintenance and enhancement of the Elan Valley including its animal and plant life as well as encouraging access to, and study of it, by the general public.

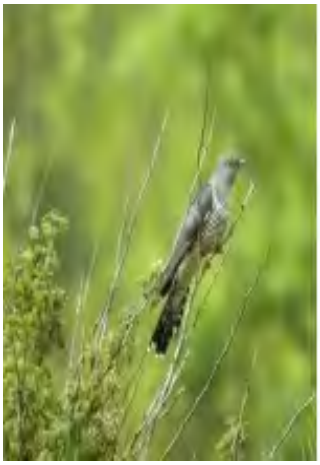
On the Elan Estate there are 350 hectares of coniferous woodland and 100 hectares of broadleaved woodland. The coniferous woods have been planted over the past 200 years whilst the broadleaved woods, mostly sessile oak, are known as "semi-natural ancient woodlands" and have been present for about 8,000 years. The broadleaved woods have a much greater variety of wildlife associated with them but the conifers are also essential for some species of bird. All the Estate's broadleaved woods are Sites of Special Scientific Interest and even one coniferous wood is included. Some of both types are also included in a Special Protection Area under the European Wild Birds Directive.

The Elan Estate Woodland Biodiversity Project is being undertaken to enhance the biodiversity of our deciduous woodlands. The aim of the Project is to improve the biodiversity of our woodlands, to increase the variety and numbers of all groups of animals and plants wherever possible in line with the UK Biodiversity Action Plan. Also to improve facilities for access and education as well as enjoyment of the woodland environment.

The main task ahead over the next twenty years is to replace at least 70 hectares of what is now coniferous woods with broadleaved species. Large areas of conifers will need to be clear-felled and then replanted with thousands of small oak, birch, rowan, hazel and ash which are being grown for us from seed gathered on the Estate. Some areas will be replanted with mostly conifers so as to create a much wider age range of trees in the permanently coniferous areas. This will greatly increase the populations of a number of bird, insect and wild flower species.

Throughout the Project the changes in the wildlife of all the wooded areas will be closely monitored by the Elan Estate's Countryside Ranger Service both by a detailed photographic record and by scientific wildlife surveying. An important part of the work has been to improve access to the woodlands partly via two new car-parks and 40 kilometres of woodland walks.

Dwr Cymru Welsh Water are committed to improving nature conservation, access and recreation on their lands whenever possible. They have been financially helped in this Project by the Forestry Commission via its Woodland Grant Scheme.



ELAN VALLEY RANGERS

The team of Countryside Rangers carries out practical nature conservation work and wildlife surveying as well as writing management plans, leaflets and other wildlife information and also helping the many visitors to the Elan Estate to enjoy and appreciate the countryside and its wildlife. The Environmental Education Ranger guides schools in their field studies. There are more than twenty wildlife information panels around the Estate. All of the different habitats are covered through 180 km of leafleted and way-marked walks as well as the Cnwch Wood Nature Trail and the Elan Valley Trail. Rangers have put up more than 300 nest-boxes for Pied Flycatchers, Redstarts, Tits and Tawny Owls as well as 50 bat-boxes.

The area of the Elan Estate is 180 square kilometres; it has 12 Sites of Special Scientific Interest, a National Nature Reserve and many rare species of animal and plant. It attracts more than **400,000 visitors** per year.

The work of an Elan Valley Countryside Ranger is therefore very varied and generally comes under four headings:

Practical Estate Management

Looking after and repairing existing footpaths and recreation areas.
Opening up and creating new paths and trails.
Practical wildlife conservation management.
Keeping picnic areas, rivers, reservoir shores and roadsides free from litter.

Survey And Monitoring Work

Carrying out a programme of ecological surveys of individual species and complete habitats. Information gathered through this work is used not only by us but by a number of other organisations including the Countryside Council for Wales, the British Trust for Ornithology and the Mammal Society.

Interpretation

Leading and assisting schools and colleges with their environmental work and visits to the Estate.
Leading guided walks, wildlife and family events, giving talks and lectures.
Research and production of interpretive materials such as leaflets, displays and interpretative panels.
Looking after the Visitor Centre exhibition and audio visual programmes.
Replying to enquiries about the Elan Valley. Providing advice, suggestions and information to the public and institutions.

Policing

Looking after all of the wildlife, the 12 SSSIs and the 800 hectare Claerwen National Nature Reserve.
Patrolling of the Estate so as to protect the water supply and prevent illegal and damaging activities.

ELAN VALLEY ESTATE, MID-WALES – A BACKGROUND.

THE ELAN VALLEY ESTATE IS THE LARGEST SINGLE AREA OF LAND OWNED BY ANY OF THE NATIONAL WATER COMPANIES WITHIN THE UK. THERE ARE 70 SQUARE MILES OF WOODLAND, MOORLAND, BOG, MEADOW, RIVER AND RESERVOIR AND THE ESTATE LIES TO THE WEST OF RHAYADER IN MID-POWYS. IT IS AN AREA OF SPECTACULAR BEAUTY AND ABUNDANT WILDLIFE RIGHT IN THE HEART OF MID WALES AND IS OF NATIONAL IMPORTANCE FOR ITS BIODIVERSITY.

HISTORY:

Glaciation has played an important role in shaping the landscape and there are several important exposures and distinctive landforms on the Estate resulting from glacial and periglacial conditions. The typical peat and brown earth soils have developed since the last ice age. Thick birch and pine forests clothed the areas summits until some 6,000 years ago, as can be seen from the well preserved plant material in a few high peat exposures.

The remote upland areas which surround the reservoirs are liberally scattered with spectacular Bronze Age burial cairns and standing stones, while there is a Roman marching camp at Esgair Perfedd. In the medieval period, the area was part of the extensive Cwmteuddwr grange of common pasture and isolated holdings belonging to the Cistercian Abbey at Strata Florida, Ceredigion. By the late 12th century practically the entire area formed part of the lands granted to the Cistercian abbey of Strata Florida by The Lord Rhys. So Rhys ap Gruffedd can probably be considered the first owner of the Estate.

Most of the historic landscape area falls within the Cwmteuddwr grange, the western part of the area falling within the Cwmystwyth grange to the north-west and the Pennardd grange to the south-east. Although few contemporary records survive there is some evidence which suggests how these monastic granges were managed in the middle Ages. The grange remained in the hands of Strata Florida abbey until its dissolution in 1539 in the reign of Henry VIII, when the crown took possession of all the estates belonging to it. The lands remained in the possession of the crown for a number of years, being leased by various parties until the manor was acquired by Sir James Croft of Croft Castle and Thomas Wigmore of Shobdon, who then proceeded to resell it in lots.

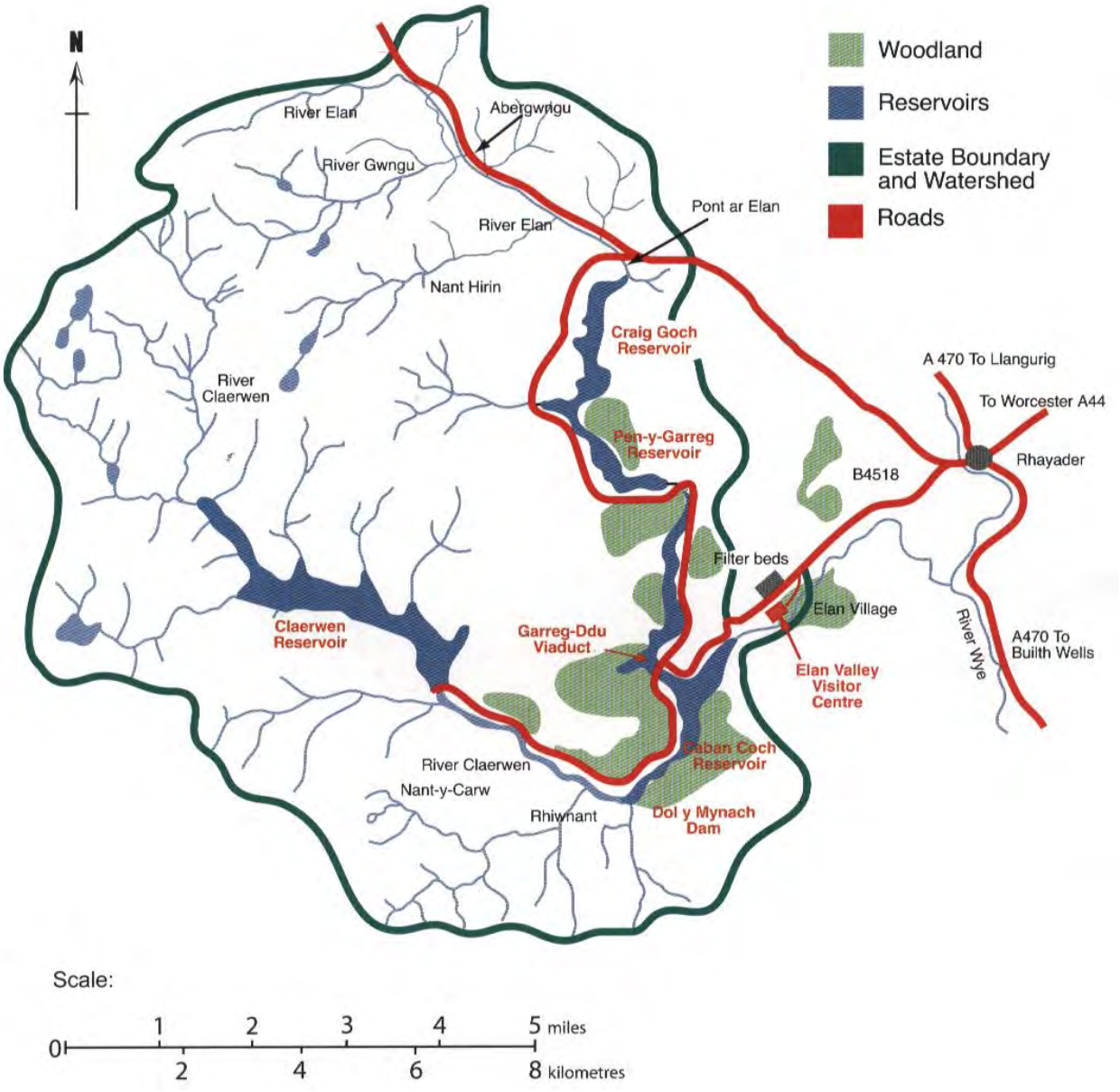
There are also post-medieval farmsteads, and a considerable number of late 18th and early 19th century mining sites and industrial monuments. Although physically dwarfed by, and secondary to, the theme of this landscape, many of these sites have been so well-preserved by the estate that they form a valuable historic adjunct to an otherwise modern landscape.

The series of reservoirs, known collectively as the Elan Valley, was started by the Birmingham Corporation in 1893. Work to build the Elan Valley reservoirs was undertaken because the rapid growth of the industrial city of Birmingham in the late 19th century had led to a lack of available clean water. Numerous outbreaks of disease prompted Birmingham City Council to petition the British Government which passed the Birmingham Corporation Water Act in 1892. It allowed the Corporation to compulsory purchase all the land within the water catchment area of the Elan Valleys. By the time they were completed in 1904, the Corporation had not only built the expected range of straining and valve towers, settling tanks, filter beds and other machine and generator houses necessary to control the water level and maintain its steady flow, but also enclosed most the land immediately surrounding the reservoirs with a succession of massive stone walls and elaborate boundaries to protect the water from contamination. The height difference at which the reservoirs were built enabled water to reach the outskirts of Birmingham to Frankley Resservoir by gravity alone along a remarkable system of buried aqueducts, 126km long. A gradient of 1:2300 maintains a flow of less than 2 miles per hour (3.2km/h); water takes one-and-a-half days to reach Birmingham.

The five lakes are known as the Claerwen, Craig Goch, Pen-y-Garreg, Garreg Ddu, and Caban Coch.

SPECIAL FEATURES OF THE ESTATE

DAMS & RESERVOIRS



CRAIG GOCH

Craig Goch, the highest upstream of the series of dams in the Elan Valley, is often referred to as the 'top dam'. It is located at a height of 1040 feet (317m) above sea level. As with all the dams, work started with the arrival of the railway line at the site. In the case of the top dam the line had farthest to go and a rocky outcrop had to be blasted and dug through on the route to the site. Work on excavating the foundations for a secure base for the structure started in July 1897, some three years after the start of work on the lowest dam at Caban Coch.

Craig Goch is seen by many as the most attractive of the dams, with an elegantly curved retaining wall and a series of arches carrying a narrow roadway across the top of the dam. It has a domed valve tower and the structure is typical of the 'Birmingham Baroque' style of much of the waterworks scheme.

GARREG DDU

The Gareg Ddu dam in the lower Elan Valley serves a dual role. It is a low, completely submerged dam which plays a vitial role in maintaining a constant supply of water to Birmingham. It also supports masonry pillars carrying the access roadway to the neighbouring valley of the River Claerwen. Garreg Ddu holds water back on the upstream side so that water can always be extracted at the Foel Tower. The bottom of Caban Coch Reservoir is too low to allow water to be gravity fed to Birmingham. Extraction from here would require pumps.
The submerged dam played its intended role of maintaining the flow to Birmingham in September 1937, when after a period of

exceptional drought, the water levels in the Elan Valley dropped alarmingly.
The original road leading to this valley was to be lost, along with many original buildings, with the completion of the Caban Coch dam and the subsequent flooding of the two valleys.

CABAN COCH

The lowest of the dams in the sequence of four built in the valley of the River Elan is Caban Coch dam. It is the simplest and most functional in appearance of all the dams, resembling a natural waterfall when the reservoir is full and the dam is in full spate with water pouring over the dam wall.

Eustace Tickell, one of the senior engineers on the waterworks scheme, wrote of this dam before it was completed "... in time of flood, when the storm water rushes over the crest and falls to a depth of over 120 feet, the dam at Caban Coch will present the appearance of a magnificent waterfall".

The Caban Coch dam contributes to the supply of water to Birmingham when water levels are normal, but it also provides compensation water to ensure that adequate flow is maintained in the Elan and the Wye downstream from the dams.
There are identical stone buildings on either side of the river just below the dam wall which house electricity generating turbines and valves and sluices to adjust the amount of compensation water released downstream.

PEN-Y-GARREG

Pen-y-garreg is often regarded as the 'middle dam'. The viaduct at Careg-Ddu lies further downstream, but it does not resemble the other dams since the dam part of the structure is not visible above the surface in normal conditions. This dam is unusual in that it houses an access tunnel to the central tower which is lit by apertures in the downstream side of the dam.

DOL-Y-MYNACH

Dol-y-Mynach is the unfinished dam! The original 1890's scheme for the sequence of dams and reservoirs in the Elan and Claerwen valleys included provision for three dams on the River Claerwen, which were intended to be constructed later when additional water supplies were needed for Birmingham.The Caban Coch dam was to create a reservoir with a top water level which would be above the level of the foundations of the dam at Dol-y-Mynach, the lowest of the planned three on the River Claerwen. It was therefore necessary to build the base of the Dol-y-Mynach dam at the same time as the other dams in the adjacent valley the River Elan. When exposed above the waters of Caban Coch reservoir, it reveals huge blocks of stone weighing anything up to ten tons, set in concrete which form the solid core of the huge structure, between the outer faces of dressed masonry. The “unfinished dam” is submerged when the reservoir is full.

CLAERWEN

The severe drought of 1937 served to give warning of the increasing need for much greater water storage capacity. The three dams proposed for the Claerwen valley as part of the original Elan Valley Waterworks scheme of 1892 had not been built, apart from the base of the dam at Dol-y-Mynach which had to be constructed early because of its location below the top water level of the Craig Goch reservoir. Proposals for a large new dam in the Upper Claerwen valley were at an advanced stage by early 1939, but the second world war meant that the demands of wartime production itself put even greater strains on the existing water supplies. The increasingly urgent calls for a new dam and reservoir on the Claerwen were to be reactivated soon after the end of the war. Progress in civil engineering techniques and in mechanisation however, meant that much larger dams could be built by this date.

It is a measure of its size that the Claerwen dam was to create a reservoir which holds almost as much water as the combined total of the three earlier dams built in the neighbouring Elan Valley. The new dam is 184 ft (56 m) high and 1167 ft (355 m) long. The Claerwen dam was designed to be in keeping with the appearance of the much older structures nearby. Although built in concrete, the huge dam was faced with dressed stone at considerable extra cost in materials and labour.

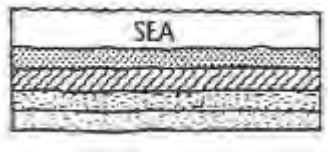
The construction of the Claerwen dam, the last of the dams in the district, took six years, using a workforce of 470. The improved techniques and mechanisation of large-scale civil engineering projects meant that large numbers of manual workers were no longer needed.

The Claerwen dam was ceremonially declared open by the newly crowned Queen Elizabeth in October 1952, in one of the first official engagements of her reign.

Geology

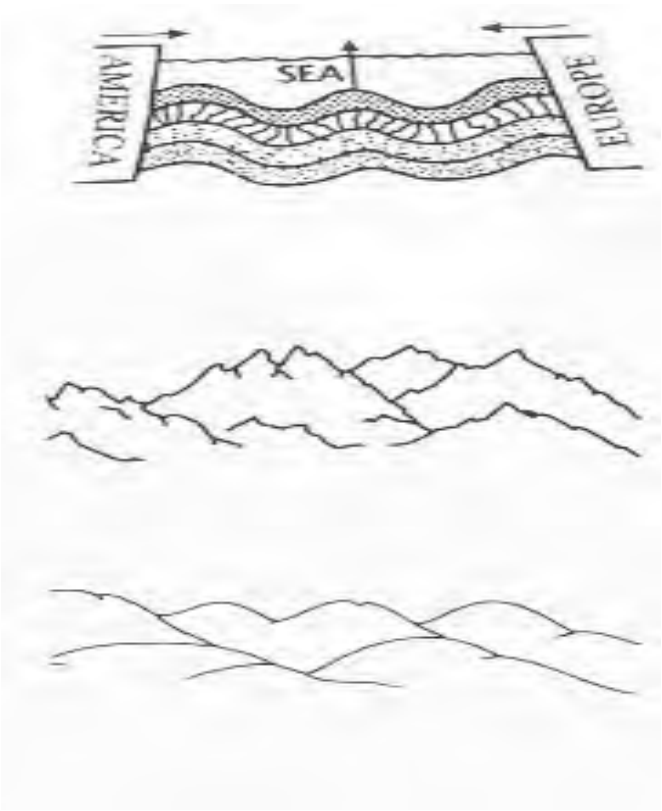
Most of the rock of the Elan Valley was formed 745 - 450 million years ago (the Ordovician and Silurian periods). This took place under the Atlantic Ocean.

Throughout this time-period fine-grained silts and muds settled on the ocean floor in layers. Marine organisms (Trilobites, Brachiopods and Graptolites) became entrapped in the layers of mud.



The layers of mud and silt became compacted together under the weight of the sea to make the sedimentary rocks, mudstones and siltstones and the commonest rocks in the Elan Valley, slates and shales.
Another type of rock found in the Elan Valley is **conglomerate**. This was formed by pebbles and fragments of rock which were deposited on the sea bed during submarine avalanches and became fused together under the pressure of the sea.

All of these rock types can be seen clearly in Caban Coch Quarry (Grid ref. SN 924646)



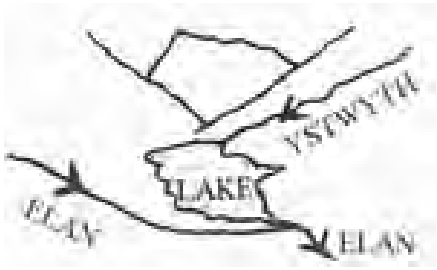
Around 400 million years ago the land masses of N.America and Europe moved towards each other squashing the bed of the Atlantic Ocean, this is called Continental Drift.

The movement of the continents slowly buckle the rock layers under the sea into huge fold mountains. As this occurs faulting takes place (the rocks crack and slide against each other) resulting in a range of jagged mountains like the Alps and the Himalayas.

The jagged new mountains became exposed to weathering by rain and ice-ages. This has occurred over the last 400 million years and is still taking place today.

The last ice-age (70,000 to 12,000 years ago) engulfed the Elan and surrounding area with a glacial ice-sheet. The movement of ice smoothed the mountains to give a plateau (an upland with a near level summit).

One major effect of the ice-age was the glacial drainage diversion of the River Ystwyth (Grid ref. SN 854759).



The River Ystwyth once flowed into a pre-glacial lake which had its outflow into the River Elan.

During the ice-age the lake froze. As snow filled the valley it compressed and turned into ice, forming a glacier. This ice cut a channel to the west which the Ystwyth took as it’s new route to the Sea through Cwm Ystwyth.

METAL MINES OF THE ELAN ESTATE

Lead has been mined in Wales since around 1,000BC. During the Roman occupation of AD43 – 407 lead was used in large quantities for water pipes, ornaments and coffins. Demand was high again in the eleventh and twelfth centuries to cover roofs of castles, churches and other great buildings. The scale of workings remained small until the sixteenth century when the industry saw steady growth promoted by Queen Elizabeth 1st. Technical advances from Germany greatly improved methods of production and by the eighteenth century Britain was the most important producer of lead in Europe. Lead mining continued into the nineteenth century and most of the mines found on the Elan Estate date from this period. During the eighteenth century however, there was a massive increase in foreign produce and the industry declined, no longer able to compete.

NANT Y CAR North. Grid ref: SN891618.
Dates worked: 18th century. - 1854

NANT Y CAR South. Grid ref: SN886609.
Dates worked: 18th century. - 1883

Produced copper/lead/zinc.

At Nant y Car south the main shaft, now flooded, was lined with masonry resting on timber lintels. There are also the foundations of a stonework winding arrangement on the western side of the shaft and 'bob-pit'. The shaft was pumped by a flat-rod system powered by the main wheelpit, the narrow stone-lined culvert to the east of the wheelpit housed these rods.

A tramway connects the shaft structures with the two or three stone built ore bins with picking floors in front. Considerable amounts of 'jigtailings' by the bins indicate that there were jiggers in use at the site, probably located on the platform remains on the north-east of the crusher house, which still contains the remains of four beam ends, indicating that there were two crusher rolls in operation. A ramp connects the ore bins to the crusher house. To the east lie two circular 'buddles' with stone revetment walls surrounding them. Water would flow from the crusher house via a culvert to the buddle area.

The main leat is largely stone lined and is fed from the Rhiwnant stream. The site has remains of three drainage 'adits'. A series of three-sided shelters, located amongst some natural stone fall, is presumed to have been used for some form of shelter for people employed to dress the stone for building use.

DALRHIW. Grid ref: SN885607.
Dates worked: 1850 – 1867

Produced copper/lead.

The mine was originally accessed by a footbridge from Nant y Car south mine. The main shaft is located on the southern hill slopes at the top of the site, with a drainage adit on the south bank of the stream. A horse whim would have raised the ore from the shaft. A bob-pit and a wheel pit are associated with the shaft, and the track beds from this system can still be traced. The water channel from the wheel pit runs into Rhiwnant stream.

There are the remains of three ore bins and a small building beside them, probably where the ore was hand sorted before going to the crusher house. The remains of the crusher house and its wheelpit are located down slope from the ore bins. There is a slab floor beside the building which is possibly the washing area. Jigs were powered by another small wheelpit and the stone-slabbed floor on which they stood remains along with jig-waste by the wheelpit wall. No evidence remains of buddles. The mine office/mine managers house has collapsed, attached to it was probably the smithy.

NANTYGARW. Grid ref: SN874606.
Dates worked:1877 – 1899

Produced lead.

Although there a few signs of the earliest workings, most of the remains visible today date from1886 onwards. The main shaft is stone lined with a timber frame surrounding the top, some timber pump-rods remain in place. Along the south side is the bob-pit and to the east side is a single roomed building of unknown usage. A roughly circular area in the vicinity is probably all that remains of a whim circle. There is a substantial wheelpit to the east with water probably being drawn directly from the stream.

A track leads up to the remains of a processing mill. No wheelpit remains, however, power was presumably provided by water. Three adjoining buildings would once have provided processing machinery. There are also piles of jig waste and the remains of a buddle near to the mill site. Two buildings to the east of the mill

consist of stone walls with a concrete cap, which would suggest a timber structure above this point. One of the buildings is divided up internally and may have been a barracks, the other building only contains a single room partition and the presence of a slot in one of the walls suggests the housing of some form of machinery. Jig platforms remain to the east of the shaft.

The remains of a leat exist which probably took 'slimes' from the mill to a settling pit. The remains of the mine office are of stone base with a concrete cap, which is divided into two rooms internally. There is also some evidence of a possible garden which appears as a grassy area now. The mine magazine is located at some distance to the east.

CWM ELAN MINE. Grid ref:SN901651.
Dates worked: 1796 – 1877

Produced Lead/zinc.



The early workings remain a series of open-cuts, some small tips and the earthwork remains of a few buildings. Other workings from the 18th century are now lost beneath the spoil tips of the larger 19th century operations. The majority of the structural remains at Cwm Elan date from the 1870's.

The pumping wheelpit for the main shaft would have housed a 36x4ft wheel, water from this wheel would then pass through the archway to be re-used at the crusher wheelpit. Some of the pumping rods and other supporting iron work can still be found around the site.

Ore from the main shaft would be stored in three ore bins, of which only one remains fairly intact. From here the ore would be taken to

the crusher house by tramways. The walls of the crusher house still stand almost at full height, and the crushing rolls supporting beams lie close to the building. The associated wheelpit is of similar size to that of the pumping pit, powering a crusher, jiggers and a circular buddle.

Water from the crusher house wheelpit again flowed out of an arch to feed a third smaller wheelpit which powered a buddle below. Water passed along wooden 'launders' and the supports remain in situ.

The site shows evidence of three parallel rows of ten settling pits to launder the lead waste, and these all had interconnecting leats. Situated away from the main areas of activity is the magazine, a small roomed stone building used to store explosives.

Farming.

It was not until 800 years ago that the Cistercian monks began sheep farming in the Elan Valley. The shepherds and sheep moved with the seasons. During the winter they would graze the sheep in the mild lowlands (referred to as hendre). During the summer months the shepherd would move up to a temporary dwelling in the mountains (the hafod).

About 250 years ago land became divided up and privately owned although there were no fences erected to divide the upland. This saw the start of the settled flock system of hill farming that still takes place today. The Elan Estate is divided into 43 holdings covering some 17,402 hectares. Five of these are in-hand farms while the others are all tenants of the Elan Valley Trust.

Sheep rarely wander far from their place of birth but to enable the farmers to identify their sheep they mark the ears. Different tags may be used for different years. The gathering of sheep still takes place largely on horseback with the help of several Collie dogs and, in recent years, quad-bikes.

There are approximately 40,000 sheep in the Elan Valley today. They are a Welsh Mountain breed which are small, very hardy and can tolerate harsh mountain conditions. The sheep do not have docked tails, the naturally long tails protect their udders from chilling winds. Very few twins are born, these are not encouraged as the grazing is too poor. 15,000 hogs (first year females) are wintered off the Estate to protect the sensitive vegetation.

Cattle grazing is limited on the Estate as their waste is thought to foul the water course. They also churn-up the ground causing soil erosion and run-off into the reservoirs.

There are still a handful of semi-wild Welsh Mountain Ponies on the hills of the Elan Valley. This breed of pony were often taken to be pit ponies in the South Wales coal mines.

Woodlands.

The Elan Valley's Woodlands are one of several sites representing **old sessile oak wood** in central Wales. The site is extensive, and comprises a series of woodland blocks with varying topography and underlying geology, and a wide range of structural types from dense closed canopy to open wood pasture with ancient trees, which support a rich invertebrate fauna. Sessile oak *Quercus petraea* predominates, with a typical upland acidic flora and rich lower plant assemblages including bryophytes such as *Bazzania trilobata*, *Plagiochila spinulosa* and *Saccogyna viticulosa*, and the lichens *Arthonia vinosa*,*Catillera sphaeroides* and *Thelotrema lepadinum*. The woods are also notable for their bird-life. They are all Special Protection Areas, and support breeding red kites *Milvus milvus.*

Why are Dark Skies important?

The effect on Mammals

Lights attract and disorientate animals, for example British Bats and endangered Beach Mice in the US. Even the milk production in dairy animals can be detrimentally effected by lighting. For many more examples, take a look at the LiteLynx-mammals page.

The effect on Birds

In a light polluted site, birds are continuously chirping throughout the night, in anticipation of a dawn that will not arrive for many hours. This seriously disrupts their sleep patterns, preventing them from resting. The dawn chorus from a dark site begins much earlier than the dawn chorus under light polluted skies. Under dark skies, birds begin singing the dawn chorus as soon as dawn begins. However, under light polluted skies, birds do not begin singing until the dawn Sun has finally overpowered the light pollution. This restricts the birds ability to be the early bird that catches the worm. For more details, please see the RSPB website.
In the UK, Owl numbers are falling. Light pollution reduces the suitable area of feeding habitat for owls and other night-hunting birds.
Light pollution may be the reason for the large decline in UK Sparrow and Thrush numbers. This decline of both species may also be due to light pollution assisting birds of prey or reducing insect numbers. Sea-birds are also affected by light pollution.

Most songbirds evolved to migrate at night, when predators retire and winds subside. Lighting increases the mortality rate of wild birds, via fatal collisions with illuminated buildings. In the USA and Canada there is growing concern over the increasing number of

migrant birds dying as a result of hitting illuminated buildings at night. The dead and wounded birds are often scavenged by rats, raccoons, cats and seagulls, etc. Net result: Songbirds diminish while scavengers thrive!
Needless to say, birdwatchers would like buildings to extinguish all interior building lights and non-essential outdoor lights (especially all floodlighting) during migration time, and to shield essential lights.

Since 1990, Chicago's Hancock Centre has doused its ornamental night-time lighting during spring and autumn to save the nearly 1,500 birds that - nightly - met with an abrupt death when they crashed into the tower during migration season, mistaking its illumination for stars or the moon. In 2000, volunteers gathered over 3,000 dead and wounded birds of 138 different species in Toronto. In 2006, a further 2,000 dead birds from 89 different species were put on display at the Royal Ontario Museum to encourage people to turn off unnecessary lights.

The effect of lighting on birds has been graphically demonstrated on the anniversaries of the September 11th terrorists attacks on New-York's World Trade Centre. The New York authorities commemorate the murder of thousands of innocent people in that attack by, oddly enough, murdering thousands of innocent birds, by shining two high powered beams of light into the sky.

As a witness explains: "The beams were visibly filled with birds for their entire height, looking like clouds of bugs. Their twittering was audible. There were so many birds, it was impossible to track any one individual for any length of time. I did see one bird that circled in and out of the uptown beam six times before I lost track. Each time, the bird stayed in the light for from 3 to 9 seconds. I found all this extremely disturbing."

It takes a song-bird about a week to lay down a gram of fat, fuel for about 120 miles of its long-distance migration - which can all be lost due to bad lighting.

The effect on Insects

Insects are also detrimentally affected by bad lighting. Lights attract insects which are destined to be either killed instantly with the heat of the bulb, or to circle the light until they are too exhausted either to feed or procreate.

To quote from a BBC News article: "It is only a humble beetle but the ability to use moonlight as a compass may be widespread in the animal kingdom. Many birds use the Sun, Moon or stars as a marker in the sky. But the African dung beetle seems to have even more remarkable skills. It uses the pattern created when moonlight strikes tiny particles in the atmosphere (polarisation) to orient itself and travel in a straight line. When nights are cloudy, its progress across the ground is more random and it tends to go around in circles."

Lights attract a wide variety of insects, which can cause problems around your home, especially in the summer months. If your lights are frequently on, insects will get into the habit of nesting and feeding around your lights even when they are turned off. So if you have problems with insects, make sure you minimise the use of your lights!

Glowworms and fireflies are severely affected by ambient light and glare caused by light pollution ,which scientific researchers in entomology believe seriously precludes their ability to seek and find mates using their own much dimmer bio-luminescence. That threatens species' survival at the very core. Moths are also effected.

The effect on Trees

Trees provide entire ecosystems to many animal and insect species, and are detrimentally affected by light pollution. Trees need to adjust to seasonal variations, and artificial light prevents them from doing so - many trees are prevented from loosing their leaves by bad lighting. This has an effect on the wildlife that depend on the trees as their natural habitat. For example, many birds are unable to nest in trees due to the surrounding light pollution.

The effect on Humans

We might not wander the wrong way on the beach or crash head first into the upper stories of high rise buildings, but that doesn't mean that light pollution -- and an overexposure to light in general -- isn't just as damaging to our bodily functions and overall health.

Regular people also suffer when there's too much light floating around. There are many complex components, but one factor that pops up repeatedly is melatonin: Too much night time light equals too little melatonin production. One little hormone might not seem like too big of a loss, but research has consistently proven that low melatonin levels are incredibly detrimental, with sweeping health effects across the body. Light during the night time, even at low levels, can seriously impede melatonin production. Less than 40 minutes basking under an incandescent light bulb can reduce melatonin levels up to 50 percent [source: Navara].

Melatonin affects a whole host of bodily processes including metabolism, immune function, and, through the endocrine system, helps balance reproductive, thyroid and adrenal hormones. When you throw into the mix closely related factors such as disrupted circadian rhythms and sleep deprivation, there's a laundry list of the health concerns that have been linked in some degree to an artificially lit world. Among them are obesity, type II diabetes, coronary heart disease, hypertension, insulin resistance, poor metabolism and heart attacks.

Breast cancer and other cancers are another major concern. Melatonin acts as an antioxidant, so combined with all its other key roles, increased cancer risk should come as no surprise -- although the actual figures might. In the developed nations, women are five times more likely to get breast cancer than women in underdeveloped nations [source: Navara].
Shift workers who spend their nights under artificial lights are another group that's highly susceptible to these effects.

It's even been suggested that we've basically been running a massive global experiment, seeing how much we can handle before our addiction to light leads us to a very dark place. Luckily, light pollution is a pretty easy fix with benefits even larger in scope than the improved health of pretty much everything on the planet.

Cygnus setting over “Troedrhiwdrain” - Sorcha Lewis.

THE CAMPAIGN FOR DARK SKIES (CFDS)

Location, location...
The best place for astronomy in the UK

The map below indicates the best places in UK from where to see the rest of our Universe.

The best places are colour coded white, with the worst places colour coded dark yellow. The dark grey areas have little light pollution but few clear nights per year. The bright yellow areas indicate areas with many clear skies, but suffer greatly from light pollution. In addition, air traffic routes are also highlighted.

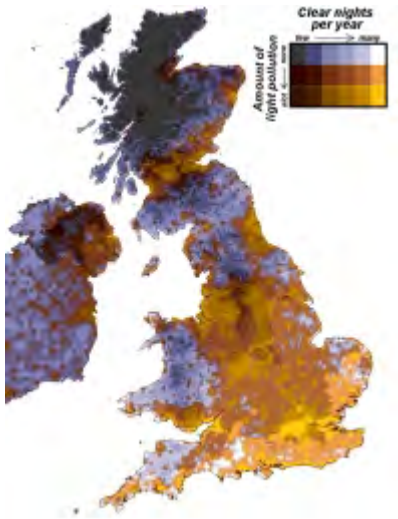
The details...

Light pollution

Light pollution is artificial light that needlessly shines up into the sky. This wasted light reflects off the atmosphere, and back towards the ground, which in many cases drowns out all but the brightest of stars. The map of light pollution, here colour coded yellow for severe light pollution and brown for medium light pollution, has been adapted from the CPRE Night Blight campaign.

The weather!

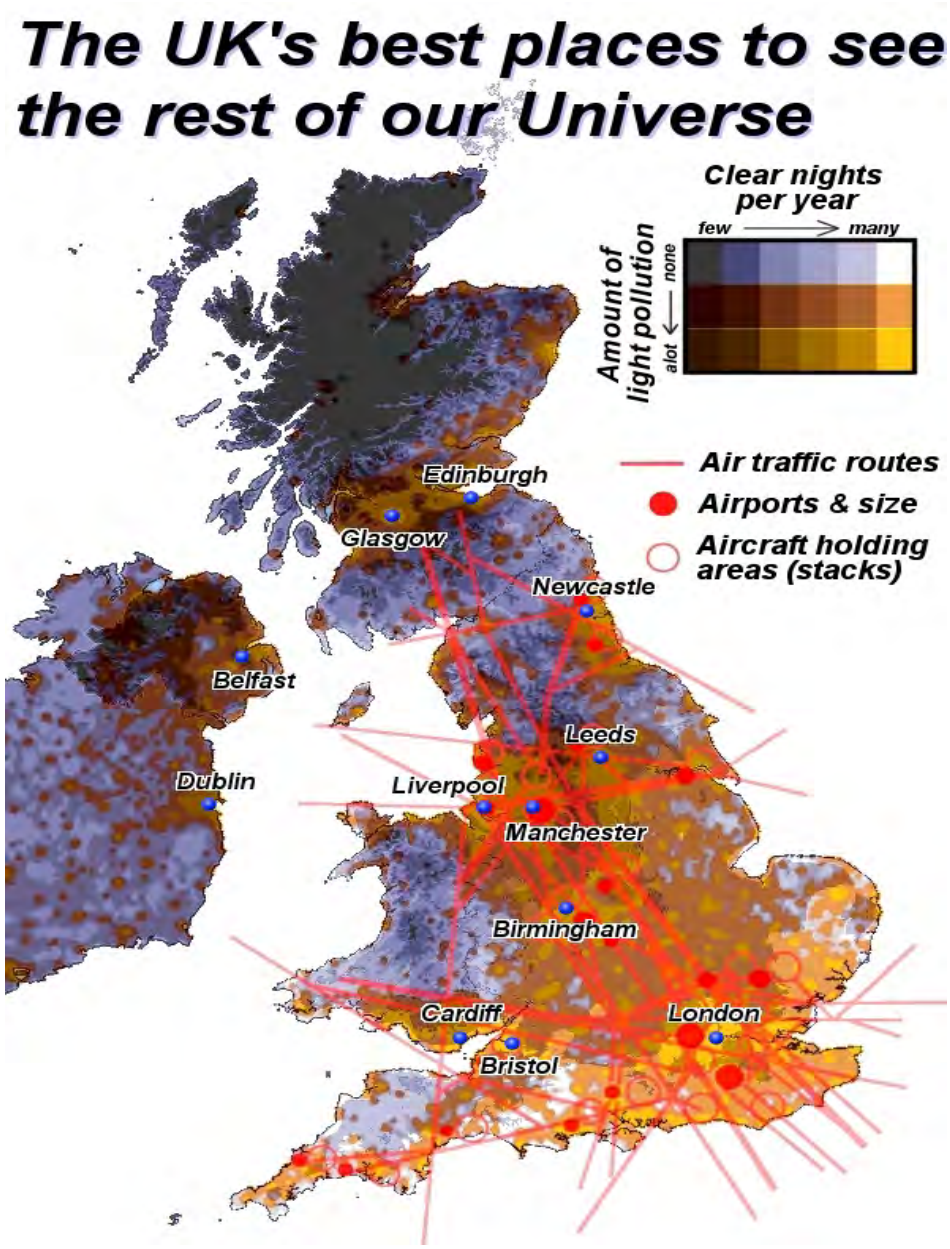
Of course, the more clear nights per year the better for astronomy. The average number of clear nights can be estimated from the average number of sunshine hours (clear days) per year, maps of which are available from the UK MET office. This can vary by a factor of two, depending on where you live in the UK. The highlands of Scotland have the fewest clear nights, with less than 1200 hours of sunshine per year (colour coded black), and the entire southern and south eastern coastlines have the most, with over 1600 hours of sunshine per year (colour coded white; mid-ranges are colour coded blue). *Note that the UK MET Office only provides weather data for England, Wales, Scotland and Northern Ireland; there is no weather data for the rest of Ireland.*



Weather and light pollution:

Aircraft

High altitude aircraft leave behind turbulent contrails. These contrails, which spread out to cover huge areas over time, dissipate only slowly. It is very difficult to get a sharp view of the heavens through aircraft contrails, and so for this reason, details of air traffic over the UK has also been added to the map. The maps of aircraft traffic are taken from the CPRE's Plane Crazy campaign.



WHAT YOU CAN DO!

Remember, the simple rules for preventing light pollution are...

- No light should be allowed to shine into the sky. As well as causing so many problems, it is also wasteful and pointless.
- Ensure that lighting shines where you want it to shine and, more importantly, it does NOT shine where you do not need it to shine
- 'Over-lighting' must be avoided. Using only the correct amount of light for the task in hand.
- Unnecessary night-time lighting, particularly flood-lighting, advertising lighting and sports flood-lighting, should be switched off at 11pm or midnight to reduce over-night pollution.
- We are not asking for people to turn off light - just to use the right amount and only where it is needed. Such intelligent lighting design will make an area safer and more secure.

You can help ensure these simple guidelines are followed by...

- ***Campaigning! Lots!*** Write to your MP! Politicians will only consider the problems of light pollution if enough people voice their concerns. If a politician gets one letter, it's and oddity. If a politician gets a dozen letters, it will be at the back of their mind. If more than a dozen people voice their concern, it becomes of vote winning importance.
- Press for planning policies to reduce light pollution. Ensure that planning permission is only granted to non-light-polluting lighting.
- Ensure all your lighting is non-polluting. Advise your neighbours to follow suit, and show them why you enjoy the night sky at a telescope if possible.
- Inform local media. They often welcome "green" issues. But insist on some editorial control to avoid headlines such as "Star-gazers Call for Big Switch-Off".
- Offer to speak to schools and groups. Any discussion of the Earth in Space and the stars can include light pollution.
- Approach those with obtrusive lights. Many individuals and organisations will not even know that there is a problem.
- Write to local councillors, council lighting/highway engineers, MPs, MEPs, sports clubs etc. to ask about their views and lighting policies. Use CfDS literature.

- Write to Central Government environment officials, asking why the UK has subscribed to international energy initiatives (Agenda 21, Kyoto protocols etc.) yet continues to waste millions of pounds on light-energy waste every year.
- If you or any group you belong to has a website, please link it to the Campaign for Dark Skies.
- Investigate the views of your local police and Watch organisations on "security" lighting. Dazzling, "over-the-top" lamps can be the burglars' friend
- Try to forestall poor lighting schemes by studying planning applications and making sure your council has lighting clauses in its planning and environmental strategies.
- Help the CfDS directly by subscribing to its newsletter, donating to its fighting fund, becoming a local officer or distributing its literature.
- Ask your MEP why the European Environment Commissioners continue to insist that light pollution is not a problem which the European Union should address.

ELAN VALLEY – WHAT CAN WE DO HERE?

The Elan Valley is as fantastic and diverse at night as it is in the day. Taking a nightly stroll in some areas you may come across the delightful luminosity of the glow worms which can be found here. But look up and you will behold the amazing lights in our night sky. The nearest town to the Elan Valley is Rhayader which is 4 miles from the Visitor Centre and slightly further as you climb up into the catchment area. Living on a remote farm in the heart of the Elan Valley gives me ample opportunity to enjoy the night sky. A good proportion of time is spent outside at night when lambing, putting in hens, surveying for bats and moths and counting glow worms. Frequently I have been halted in my tracks to gaze up at the marvel of the heavens. Living in the Valley I have had the good fortune of seeing a moon bow and have watched the amazing showers of meteors propel across the nights canopy. Last night I went out to put away the hens, got startled by a badger and then took the time to look into this lovely sky in which I appreciated beauty of the Milky Way, and used the Google sky App on my phone to locate the constellation Draco. I promised myself I would start as soon as possible on my promise to complete this report illustrating the reasons I feel we should have a dark sky status and thus looking to build upon the momentum which seems to be stirred up recently between interested parties/organisations within the area keen to move closer in that direction. This rather flowery start to my report is to evoke not just the science of the night sky but also the relationship between mankind and the stars. This report aims to explore the need to "share the beauty and understanding of the night sky" for here at the Elan Valley, locally in Rhayader and extended throughout Powys.

There is a positive approach to our street lighting within Rhayader, and with the local community becoming involved it could really enhance how we feel about our local lighting and dark skies landscape. Light pollution locally I would imagine must be quite limited within the area – but this would need to be recorded from various points in the Landscape surrounding to confirm this idea. As you go into the heart of the Elan Valley the remote farm holdings are all run on generator

and lighting is pretty limited and holdings are greatly spaced.

The Elan Valley Estate is an area of spectacular beauty and abundant wildlife right in the heart of mid Wales. As a Wildlife Ranger I am well aware of how recent research has proven that light pollution has an adverse impact on our wildlife and their life cycles. Much of the Elan Valley and Rhayader area is designated for its rare and specialist wildlife; it then seems a simple and logical step that this should be extended to protect the wildlife of the night and that to so we should add protection to the wonderful skies above.

Having a Visitor Centre here lends itself to promoting the Dark Skies of the area, parking is good, and there are facilities available such as toilets, cafe and rooms for events. The Visitor Centre will be open all year around which again times with much of the astronomical interest. Having a shop here also could tie into providing books, star charts and other items useful for budding astronomy enthusiasts. It is estimated In the UK there are 250,000 amateur astronomers. This is figure increasing all the time due to programmes such as the BBC Stargazing live show which attracted 4 million viewers per episode. (Judy Dennison)

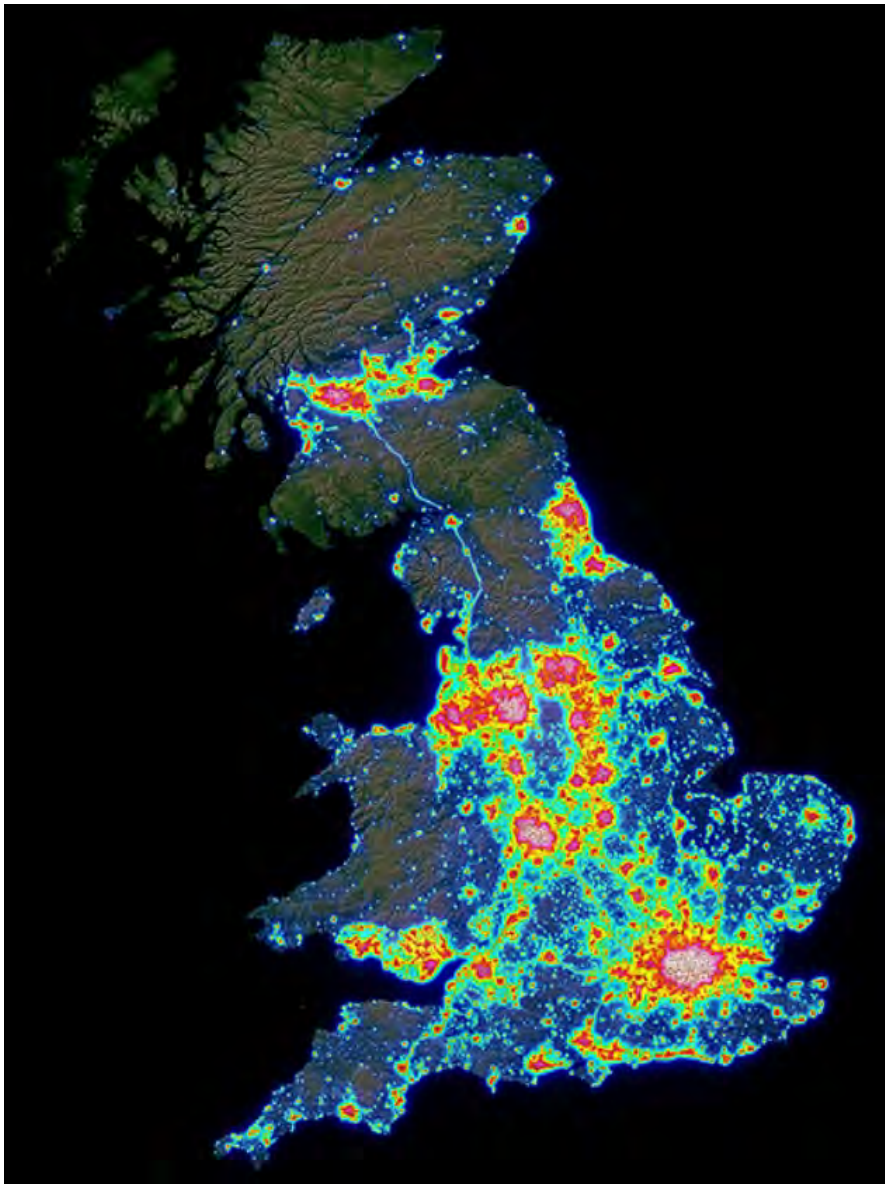
There have been 13 locations to date within the UK which have secured various levels of dark sky status. The BBNP has recently been successful in being recognised for its dark skies and received an International Dark Sky Reserve. Powys is landlocked and much of the economy strength is from tourism and farming. But we do have a Dark Sky provision and there is potential to improve its quality in ample measures. We need to take steps in preserving and enhancing peoples/visitors/locals experiences, understanding and pride in what is a very simple relationship of the wonders of the night. We should strive to preserve this for our children and the generations to come.

Sorcha Lewis – Head Ranger – March 2013

The AVEX file maps of Light Pollution in the UK show one of the primary reasons behind the Elan Valley Trust's application.

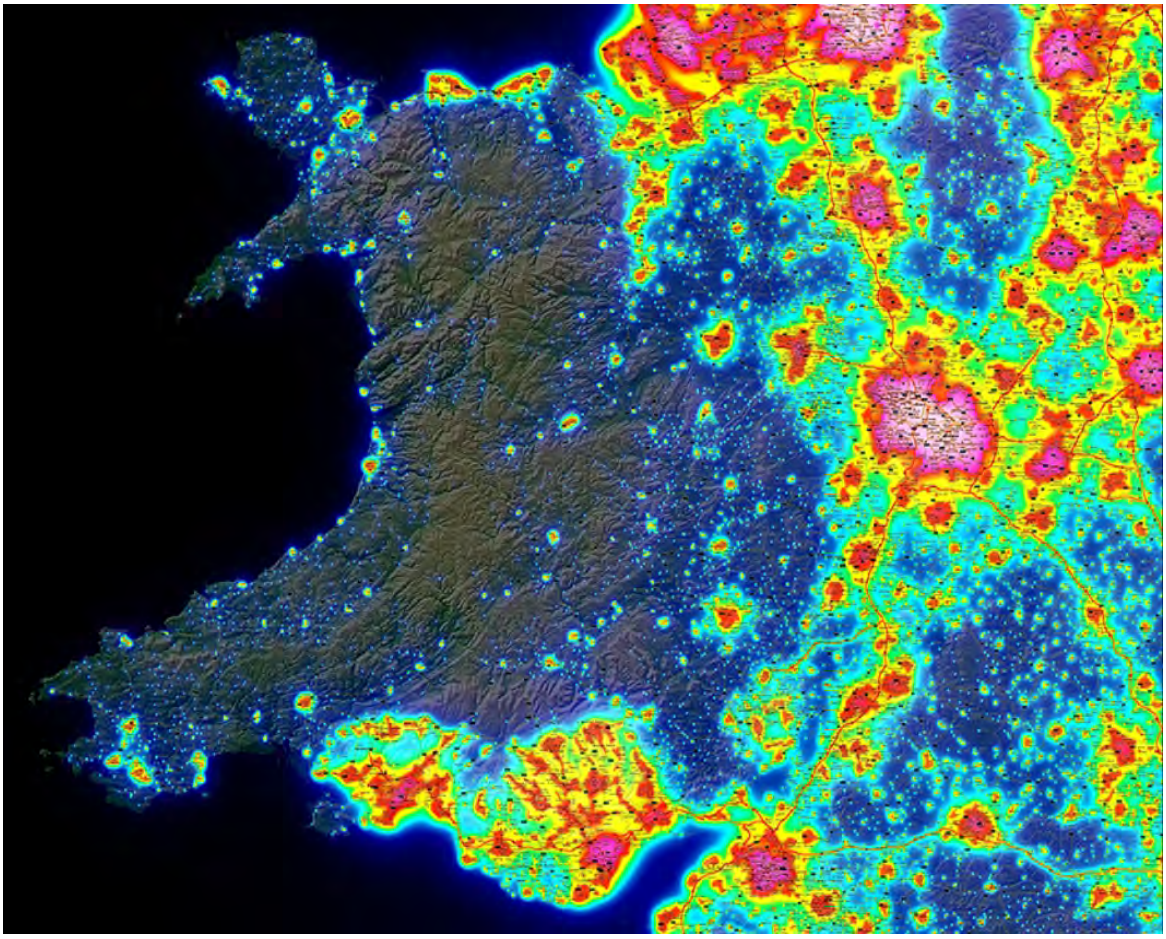
90% of the UK's population live under polluted skies.
We are in the fortunate 10%.

With cities like Manchester and Birmingham just some two hours travel time distant, we *should* protect what *we've* got for the continued and future enjoyment of ourselves and for those less fortunate than us.

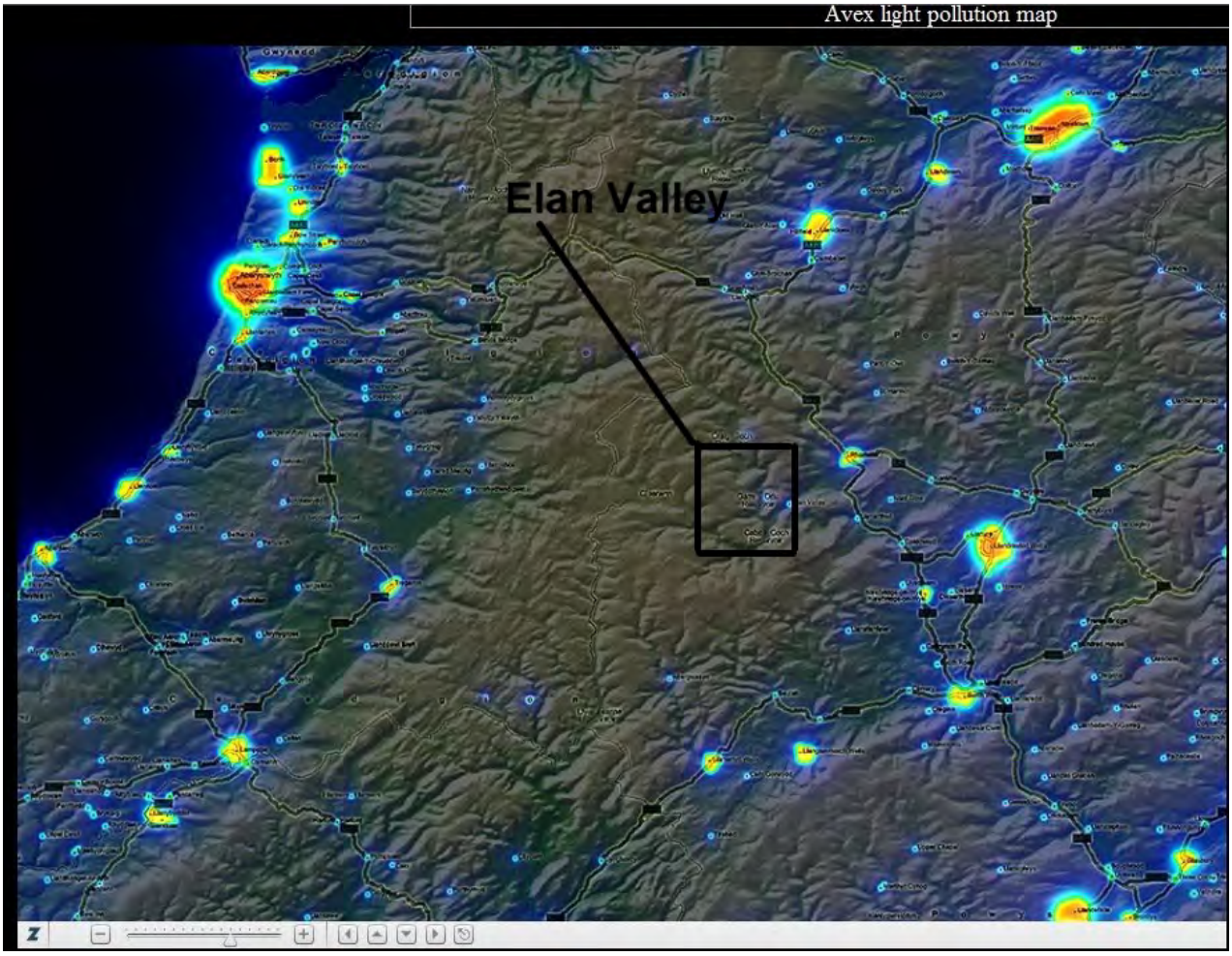


A MAP SHOWING THE RELATIVE DARKNESS OF WALES.

Brighter colours represent more nightime light pollution from artificial sources. The Cambrian Mountains wilderness is one of the few dark places left in the UK where you can enjoy the stars without obscuring light pollution.

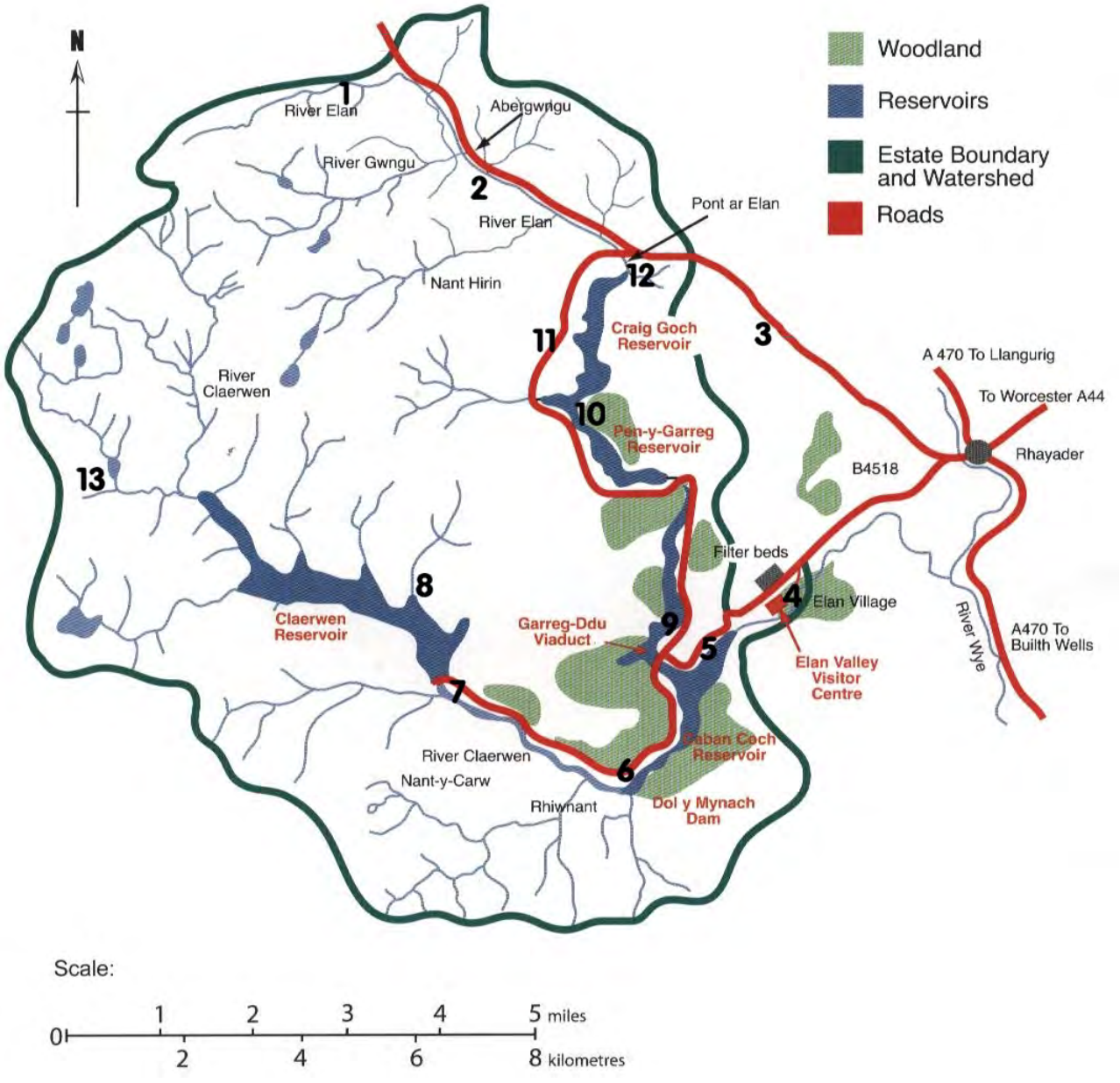


CLOSE-UP OF THE MID WALES REGION.



Light readings from the Elan Valley Estate.

With reference to the map below, thirteen sites were selected for light meter readings with a total of 209 readings being taken between March 2013 and January 2015.



Data collection.

A Unihedron Sky Quality Meter was purchased for the purpose of collecting light readings. The unit selected was a SQM-L, model 2.17, serial number 7170. The data was collected following the guidelines at this link -

http://www.darksky.org/night-sky-conservation/269

Quote – *It* ..(The SQM-L).. *is simple to use and effective at measuring sky brightness at zenith. Simply hold the device above your head, pointing the photometer at zenith, and click the button. The screen will then display the magnitude of the sky brightness at that point; the higher the number, the darker the sky. Take three to five measurements per location and average the results. Never take a measurement directly underneath a light source or anything that might block the clear sky. Always take measurements with clear open sky, cloudless, to prevent any sky glow measurements that will deter the accuracy of the device. Also, always take measurements on clear, moonless (New Moon) nights. Measurements taken during Full Moon and while the Moon is visible will not reflect the natural darkness of your location.*

In general, five readings were taken on each visit to the individual sites, the only exception being at site 5, when only four were made before cloud intervened on 19th April 2014.

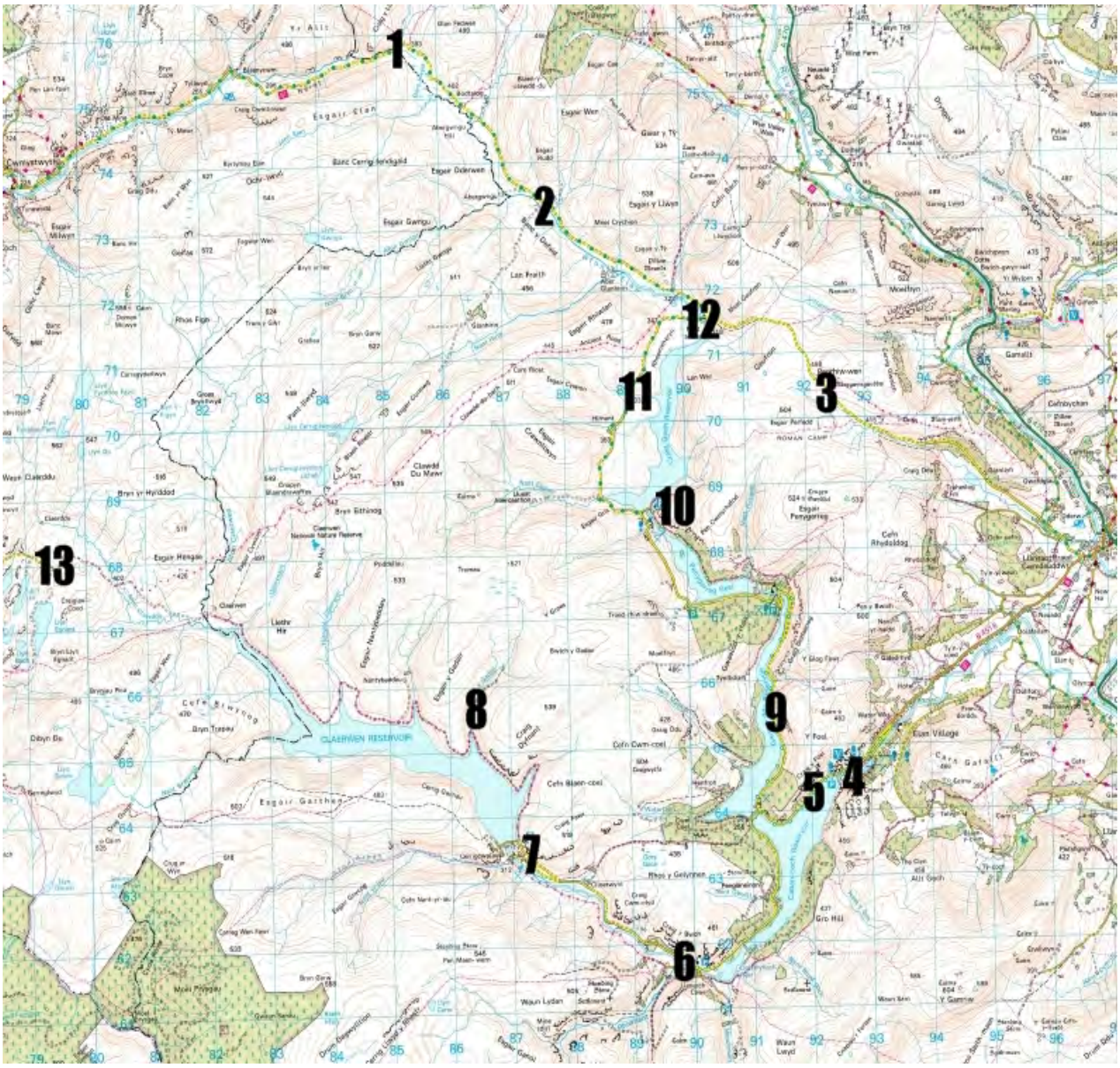
Site Selection.

It will be noted that all the sites, with the exception of Site 8, are situated alongside or just adjacent to the road network within the Elan Valley. There are numerous "pull-ins" and "official" car-parks along these roads, and since we strongly doubt that potential observers would consider dragging their equipment across inhospitable terrain,- indeed we would actively **discourage this practice** for their own safety!!,- the sites identified provide easy access to the night skies. With due consideration to the geography of the region, observers are strongly advised to visit sites before nightfall, to ensure that their chosen site offers views in the right sky regions they wish to study, since some of the sites suffer from restricted views due to the hilly environment.

Site 4 – the Visitors Centre - was deliberately selected on the assumption that it would be the worst case scenario for the meter readings, being situated in the only area with nearby lighting.

Site 8 was reached only by 4x4 along a rough private drive, and was accessed with owners permission, so as to obtain a reading from a more central location to see if a "dark core" to the Elan Valley existed.

Sites 1 and 13 are accessed from roads/trackways not shown on earlier map, but are shown on the OS version displayed on the following page.



It should be noted that the **only** mains supplied street lighting in the whole Elan Valley Estate, is from Rhayader to the Visitors Centre along the B4518, within the Elan Village and at the Severn Trent water treatment works above the Visitor Centre. All other lighting on the Elan is generated by the farm/property owners. This will be fully dealt with later on.

LIGHT METER READINGS FOR THE ELAN VALLEY ESTATE

SITE 1 : CEREDIGION/POWYS BOUNDARY

CO-ORDS: N52 22.104 W003 41.083 SN 85393 75820

ELEVATION: 1238ft

Date	02/03/13	04/11/13	04/12/13	08/01/14	19/04/14
	21.48	22.10	22.64	22.10	21.52
	21.33	22.50	21.84	22.50	21.31
	21.44	22.05	21.31	22.05	21.42
	21.28	22.24	22.58	22.24	21.32
	21.17	22.36	22.72	22.36	21.14
AVERAGE	21.34	22.25	22.22	22.25	21.34

SITE 1: Total of 25 SQM readings = 547.00: Average = 21.88: NELM = 6.57

SITE 2 : BRIDGE CROSSING

CO-ORDS: N52 20.801 W003 38.954 SN 87754 73349

ELEVATION: 1162ft

Date				19/04/14	16/01/15
				21.85	22.35
				21.54	22.31
				21.53	22.31
				21.55	22.07
				21.50	22.11
AVERAGE				21.59	22.23

SITE 2: Total of 10 SQM readings = 219.12: Average = 21.912: NELM = 6.58

SITE 3 : ROAD SUMMIT - PENRHIW WEN

CO-ORDS: N52 19.470 W003 35.103 SN 92071 70784

ELEVATION: 1614ft

Date	02/03/13	04/11/13	04/12/13	08/01/14	19/04/14
	21.44	22.33	22.32	22.33	21.79
	21.31	22.45	21.88	22.45	21.49
	21.30	22.42	22.35	22.42	21.56
	21.19	22.24	21.43	22.24	21.53
	21.18	22.77	22.72	22.77	21.45
AVERAGE	21.28	22.44	22.14	22.44	21.56

SITE 3: Total of 25 SQM readings = 549.36: Average = 21.974: NELM = 6.61

SITE 4 : VISITOR CENTRE

CO-ORDS: N52 16.152 W003 34.292 SN 92859 64613

ELEVATION: 744ft

Date	02/03/13		04/12/13		19/04/14
	21.73		21.53		21.77
	21.61		21.85		21.66
	21.48		22.36		21.60
	21.48		21.57		21.64
	21.29		22.20		21.71
AVERAGE	21.52		21.90		21.67

SITE 4: Total of 15 SQM readings = 325.48: Average = 21.699: NELM = 6.48

SITE 5 : CABAN COCH LAYBY

CO-ORDS: N52 16.072 W003 34.875 SN 92193 64479

ELEVATION: 805ft

Date				19/04/14	16/01/15
				21.72	21.98
				21.69	22.01
				21.61	21.99
				21.67	22.02
					22.04
AVERAGE				21.67	22.01

SITE 5: Total of 9 SQM readings = 196.73: Average = 21.858: NELM = 6.56

SITE 6 : OLD BARN

CO-ORDS: N52 14.581 W003 36.839 SN 89897 61765

ELEVATION: 853ft

Date					19/04/14
					21.83
					21.76
					21.76
					21.71
					21.67
AVERAGE					21.75

SITE 6: Total of 5 SQM readings = 108.73: Average = 21.746: NELM = 6.51

SITE 7 : CLAERWEN PICNIC AREA

CO-ORDS: N52 15.380 W003 39.285 SN 87148 63308

ELEVATION: 1024ft

Date	02/03/13	04/11/13	04/12/13	08/01/14	19/04/14
	21.69	21.90	21.49	21.39	21.84
	21.71	21.50	21.60	21.50	21.78
	21.57	21.45	21.52	21.45	21.79
	21.37	21.34	21.56	21.34	21.75
	20.95	21.63	21.15	21.63	21.69
AVERAGE	21.46	21.56	21.46	21.46	21.77

SITE 7: Total of 25 SQM readings = 538.59: Average = 21.54: NELM = 6.41

SITE 8 : CLAERWEN FARM ROAD BEND

CO-ORDS: N52 16.195 W003 39.020 SN 87484 64812

ELEVATION: 1246ft

Date				19/04/14	16/01/15
				21.83	22.08
				21.75	22.11
				21.75	22.09
				21.71	22.14
				21.71	22.08
AVERAGE				21.75	22.10

SITE 8: Total of 10 SQM readings = 219.25: Average = 21.925: NELM = 6.59

SITE 9 : CYCLE TRACK PULL IN

CO-ORDS: N52 16.520 W003 35.581 SN 91408 65327

ELEVATION: 836ft

Date				19/04/14	16/01/15
				21.81	21.99
				21.69	21.96
				21.70	22.02
				21.64	21.98
				21.71	22.03
AVERAGE				21.71	22.00

SITE 9: Total of 10 SQM readings = 218.53: Average = 21.853: NELM = 6.56

SITE 10 : CRAIG GOCH DAM CAR PARK

CO-ORDS: N52 18.309 W003 37.367 SN 89452 68688

ELEVATION: 1049ft

Date	02/03/13	04/11/13	04/12/13	08/01/14	19/04/14
	21.73	21.31	21.63	21.31	21.74
	21.63	21.29	21.99	21.29	21.68
	21.68	21.32	21.93	21.32	21.72
	21.17	21.43	22.29	21.43	21.66
	21.28	21.35	21.98	21.35	21.68
AVERAGE	21.50	21.34	21.96	21.34	21.70

SITE 10: Total of 25 SQM readings = 539.19: Average = 21.568: NELM = 6.42

SITE 11 : HERNANT

CO-ORDS: N52 19.310 W003 37.683 SN 89134 70552

ELEVATION: 1147ft

Date				19/04/14	16/01/15
				21.81	22.07
				21.73	22.04
				21.67	22.01
				21.61	22.04
				21.62	22.04
AVERAGE				21.71	22.04

SITE 11: Total of 10 SQM readings = 218.74: Average = 21.874: NELM = 6.57

SITE 12 : PONT AR ELAN

CO-ORDS: N52 19.849 W003 36.669 SN 90308 71525

ELEVATION: 1057ft

Date	02/03/13	04/11/13	04/12/13	08/01/14	19/04/14
	21.58	21.36	21.73	21.36	21.68
	21.45	21.43	22.19	21.43	21.66
	21.52	21.25	21.88	21.25	21.61
	21.36	21.43	22.15	21.43	21.63
	21.21	21.40	21.83	21.40	21.60
AVERAGE	21.42	21.37	21.96	21.37	21.64

SITE 12: Total of 25 SQM readings = 538.82: Average = 21.553: NELM = 6.41

SITE 13 : TEIFI POOLS ROAD - END

CO-ORDS: N52 17.825 W003 46.164 SN 79434 68025

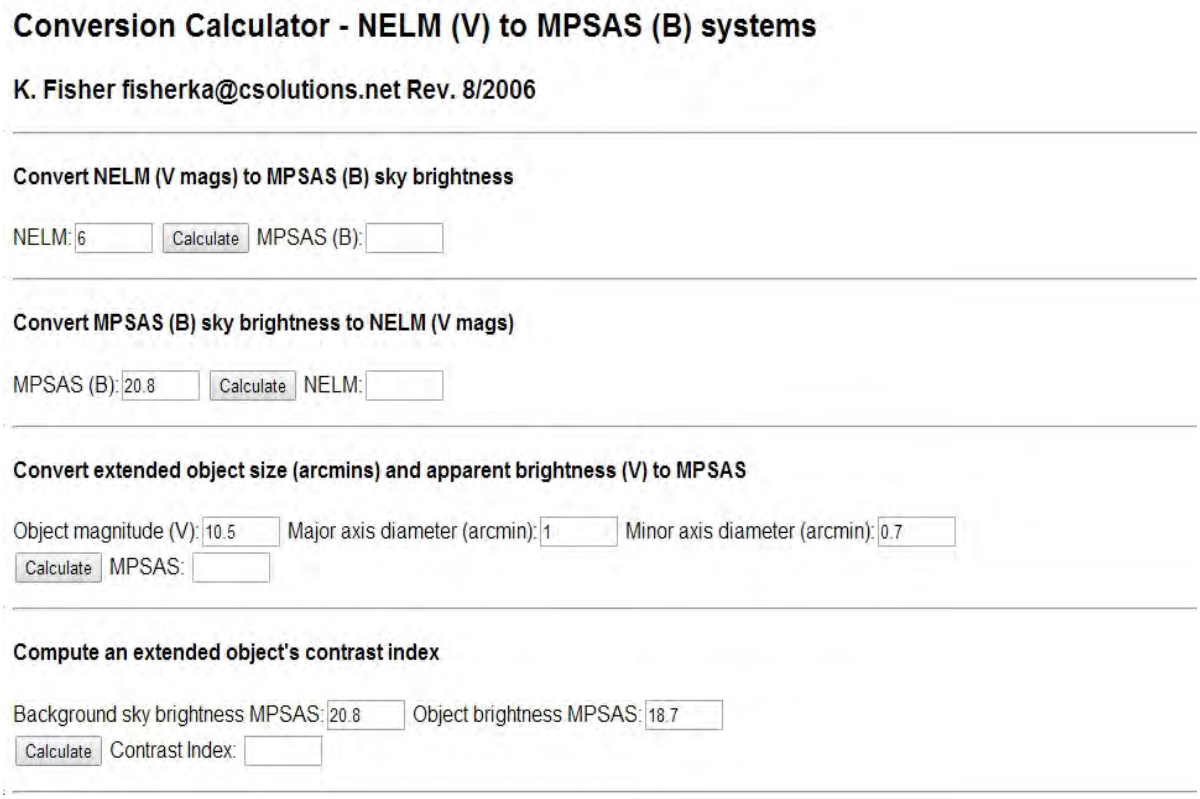
ELEVATION:1397ft

Date			08/01/14	19/04/14	18/01/15
			21.48	21.48	22.02
			21.52	21.53	22.06
			21.46	21.48	22.01
			21.48	21.47	22.08
			21.46	21.46	22.11
AVERAGE			21.48	21.48	22.06

SITE 13: Total of 15 SQM readings = 325.1: Average = 21.673: NELM = 6.47

NELM's were obtained by using the following link, entering the SQM figures into the conversion boxes.

http://unihedron.com/projects/darksky/NELM2BCalc.html



GRAND TOTALS

of 209 individual SQM readings = 4544.64

Average individual SQM reading = 21.745
(4544.64 / 209)

Average individual NELM = 6.506

The average nightly SQM reading at each site,

(42 readings in RED figures),

vary from 21.28 to 22.44,

equating to Nightly NELM's of 6.27 to 6.81

Overall total of these 42 SQM readings = 913.24

Average Nightly SQM reading = 21.744
(913.24 / 42)

Average Nightly NELM = 6.505

Orion from Penrhiw Wen (site 3)

March 2013

15 sec exposure.

3200 ISO

50mm lens.

Canon 1100d – Les Fry

Proposed Elan Valley Dark Sky Park
"to buffer ...or not to buffer?"

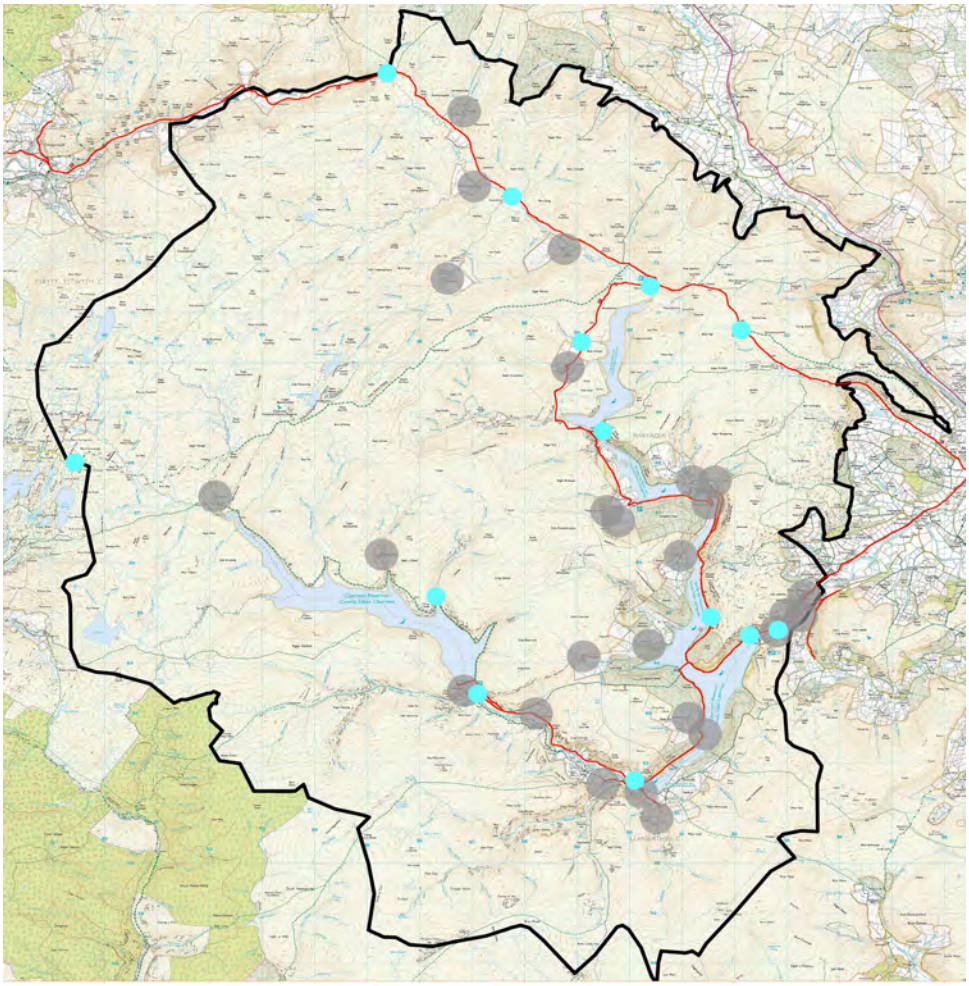
The SQM readings obtained across the Elan, taken in conjunction with the Light Inventory and access on the Elan itself, have come to raise the interesting question highlighted by the title above. Do we need a "buffer zone" to the proposed DS Park? We offer a choice of options for your consideration and reference should be made to the map below, displaying the proposed DS Park boundary.

Legend

Road access across Elan Estate

SQM reading sites

Inventoried Buildings on Elan Estate, Circle diameter approx 0.6km.



OPTION 1

A single core zone Dark Sky Park.

With regards to the SQM readings, the site averages range from Mv 6.38 to Mv 6.61 with the overall site average figure of 6.50. This gives only a differential of +/- Mv 0.12 across the whole of the proposed Elan Dark Sky Park. From this alone, there is no evidence of a dark "core" to the Estate. All of our SQM reading sites were deliberately located at easily accessible points from the road network, and as previously mentioned, we would advise against hauling expensive astronomical equipment any distance "off road" on the basis of safety alone. A SQM measurement point was also deliberately set up at the Visitors Centre in the middle of what we assumed – falsely as it turned out -would be the "brightest" region of the Estate. The site average from here turned out to be only Mv 0.02 lower than the Estate overall average, a result acheived because of the already controlled lighting in the village. We really do not believe that a magnitude differential of only Mv 0.23 across the park sites justifies the need for a "buffer zone".

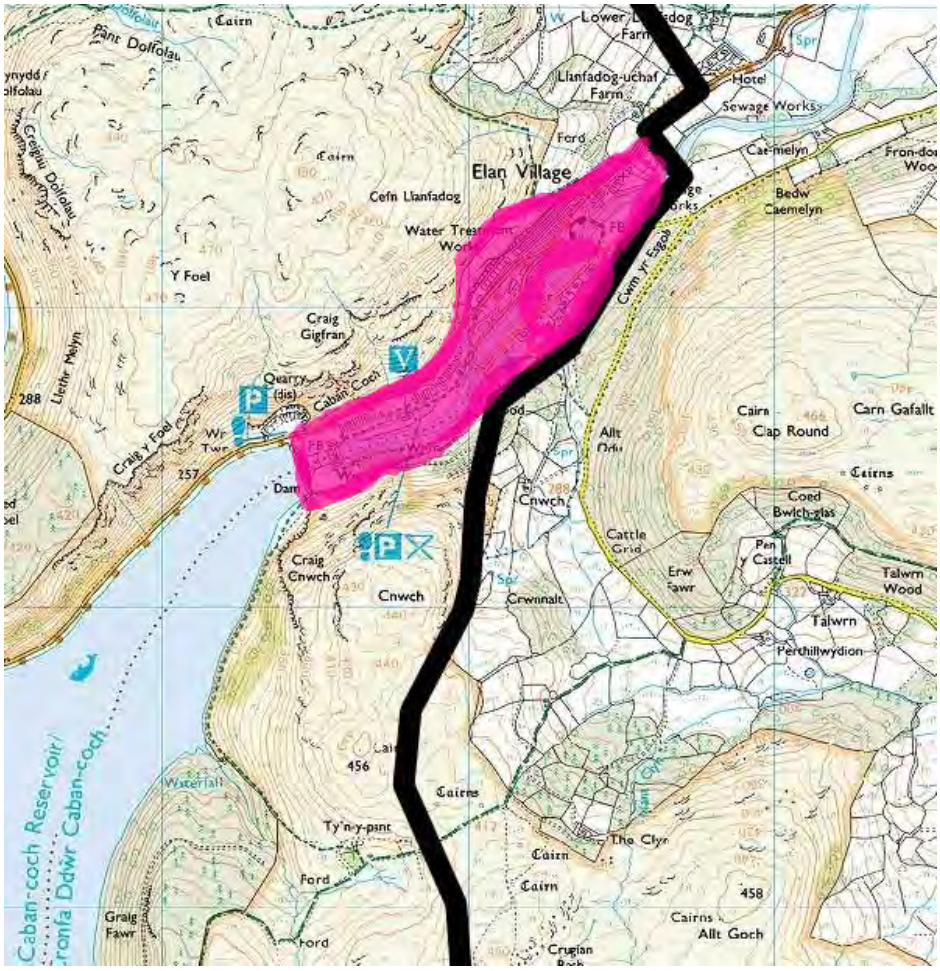
A single core zone Park would be our preferred choice.

OPTION 2

A core zone and buffer zone DS Park.

The only area of the Estate with an significant number of lighting units is from the Severn Trent Complex across to the Elan Village,

enclosing the Visitors Centre. This area, indicated below, could be considered a “buffer zone” with the remainder of the Estate the dark “core” to the DS Park.

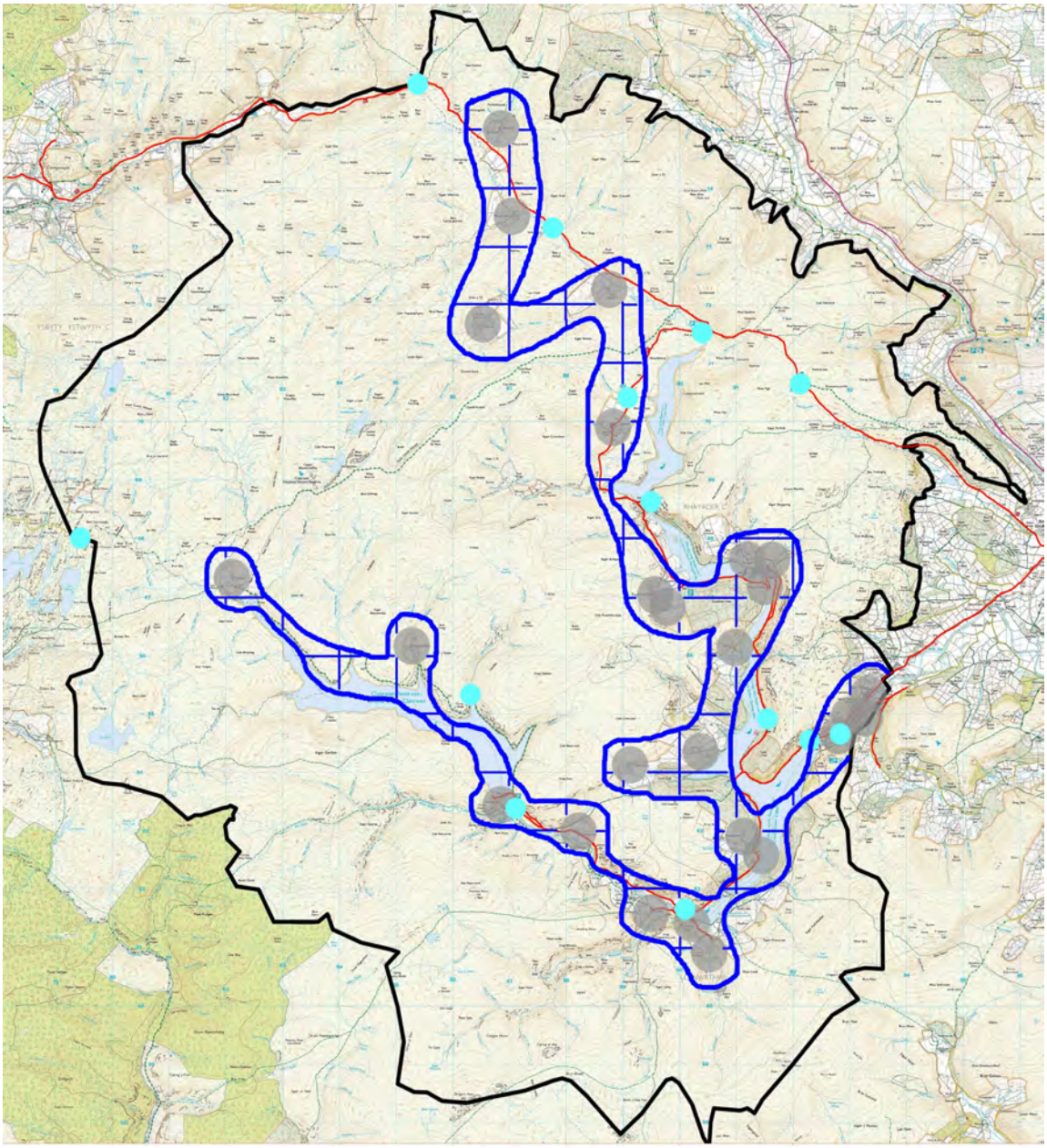


It must again be pointed out that this “buffer zone” does not in any way represent the “brightest” area of the Estate, it being only very marginally below the Estate average, although it could be considered as a “buffer” to the rest of the Elan valley.

OPTION 3

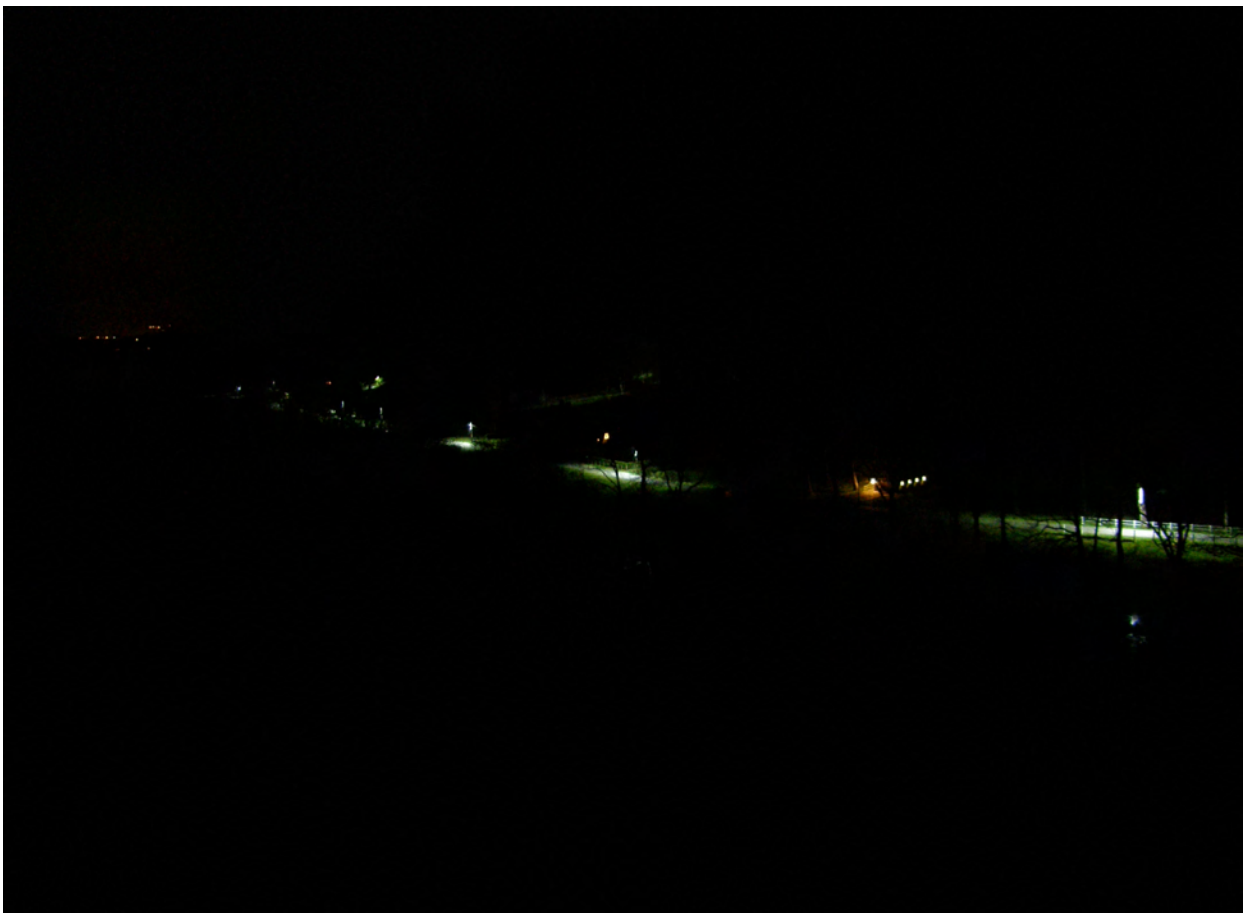
A core zone and buffer zone DS Park.

By dint of simply not having any habitation within, the majority of the Elan Estate becomes the “core” zone to the DS Park, with the remaining region within the blue hatched area becoming “buffer zone” status. We then have the situation of a “buffer zone” being almost surrounded by the “core”.



We accept that the concept of a zero “buffer zone” Park may be somewhat radical, but we believe that our SQM readings back up our standing that the ***whole*** of the Elan Estate has similar quality skies, and thus **Option 1** deserves due consideration.

For the record, our Lighting Management Policy will be **no different** from that listed, **whatever** option is selected.



Looking down on the Elan Village from the Severn Trent works

5sec exposure, 200 ISO, Canon 1100D, 55mm lens
19-04-2014 22.45UT Kris Fry.

Bowl of Ursa Major from Claerwen Dam (site 7)
April 2014, 15 second exposure,
3200 ISO, 50mm lens, Canon 1100d – Les Fry

Elan Valley Trust

Ymddiriedolaeth Cwm Elan

Elan Estate Office
Elan Village
RHAYADER
Powys
LD6 5HP

Swyddfa Ystâd Elan
Pentre Elan
RHAEADR GWY
Powys
LD6 5HP

Tel :01597 810449
Fax :01597 811276

Ffôn :01597 810449
Ffacs :01597 811276

E Mail : info@elanvalleytrust.org
Website : www.elanvalley.org.uk

Dear Sirs,

Elan Valley - Park Lighting Inventory

As the Estates Manager of the Elan Valley Trust, I hereby confirm that, to the best of my knowledge, the following "Lighting Inventory" is an accurate reflection of the exterior lighting within the Elan Valley Estate at the time of the inventory, and confirm our commitment to attain a 90% lighting compliance figure within a five year period, and a 100% future compliance by following the guidelines set out within our enclosed Lighting Management Plan policy statements.

Yours faithfully

J A BAKER
ESTATES MANAGER

Lighting inventory within proposed Elan Valley Dark Sky Park.

The inventory was compiled over four separate days in the period from October to November 2014. All properties within the Elan Valley's, the whole of the Elan Village and the Severn Trent Water Treatment Complex were surveyed and inventoried. The individual lighting wattage was determined as a result of either a visual inspection, or from information supplied by the property owners. Wattage information was sourced via the web from several freely available locations or lighting manufacturers own web sites.

For the purpose of the Data Protection Act, the listed properties below are simply identified by number and broad useage description. A master inventory copy, held by the Elan Valley trust, contains a full property identification listing.

All lighting units within Grey boxes have been inventoried, but NOT included in either the total light units or the percentage compliant figures. These are either units installed but having NO light in the unit at time of inventory, or are Emergency useage only. The latter useage is primarily at the Elan Valley Visitor Centre and at the Severn Trent Complex.

Lighting units identified within Orange boxes represent fixtures that are allowing light to either escape above the horizontal plane, thus being primary sources of light pollution or wastage, or are simply “overkill” for the intended purpose with excess light being reflected back off the ground, a secondary source of light pollution. Most wastage sources are caused by badly directed Bulkhead or Security type lights, but therefore represent an easily solvable issue for the proposed DS Park.

Property No & Description	Fitting & Bulb type	Wattage	Qty fitted	Fully shielded	Op cycle	Application	Qty compliant	NOTES
01–Farm & outbuildings	DOWNLIGHT ES SPIRAL	11	1	PARTIAL	ON/OFF	YARD ENTRY	1	
	BULKHEAD ES SPIRAL	11	2	NO	ON/OFF	OVER DOORS	2	
	SECURITY LED	10	1	YES	ON/OFF	BARN ENTRY	1	
02-Farm & outbuildings	BULKHEAD ES BIAX S	9	1	NO	ON/OFF	OVER DOOR	1	
	DOWNLIGHT ES SPIRAL	11	1	PARTIAL	ON/OFF	YARD LIGHT	1	
	BULKHEAD ES BIAX S	9	1	NO	ON/OFF	OVER DOOR	1	
03-Farm & outbuildings	BULKHEAD 2D COMP FL	10	1	NO	ON/OFF	OVER DOOR	0	Shield or replace unit
	DOWNLIGHT ES SPIRAL	11	2	PARTIAL	ON/OFF	YARD LIGHTS	2	
04-Farm & outbuildings	BULKHEAD HALOGEN	60	1	YES	ON/OFF	DOOR/YARD	0	Adjust illumination down
	BULKHEAD STD CLEAR GLS	40	1	NO	ON/OFF	SHED ENTRY	1	
05-Farm & outbuildings	BULKHEAD 2D COMP FL	10	1	NO	ON/OFF	YARD LIGHT	0	Shield or replace unit
	BULKHEAD PEARL GLS	40	1	NO	ON/OFF	YARD LIGHT	1	
	FLOODLIGHT METAL HALIDE	70	1	YES	ON/OFF	YARD LIGHT	1	
06-Residential	FLOODLIGHT ES SPIRAL	11	2	YES	PIR	DOOR ENTRY	0	Adjust illumination down
	COACHLIGHT OPAL CANDLE	40	1	PARTIAL	PIR	PATIO LIGHT	1	
	SOLAR GLOBE SINGLE LED	0.6	18	NO	SOLAR	DECORATIVE?	18	NOT included in total count
07-Farm & outbuildings	NIL EXTERIOR LIGHTING	0	0	0	0	0	0	
08–Residential & outbuildings	BULKHEAD ES BIAX S	7	1	YES	ON/OFF	OVER DOOR	1	
	BULKHEAD HALOGEN	11	1	PARTIAL	ON/OFF	ENTRY/YARD	0	Adjust illumination down
	BULKHEAD ES SPIRAL	11	1	YES	ON/OFF	OVER DOOR	1	
09-Residential (Holiday Let)	DOWNLIGHT ES SPIRAL	11	3	PARTIAL	ON/OFF	OVER DOOR	3	
10-Farm & outbuildings	COACHLIGHT ES BIAX D	10	1	PARTIAL	ON/OFF	DOORLIGHT	1	
	BULKHEAD BIAX S/E	9	2	YES	ON/OFF	YARD LIGHTS	2	
	CORNER D/LIGHT ES SPIRAL	11	1	NO	ON/OFF	YARD LIGHT	1	
11-Outdoor Centre	SECURITY BULKHEAD M/H	250	2	YES	ON/OFF	DOOR ENTRY	0	Adjusted down-reduce wattage
12-Holiday Let & barn	BULKHEAD ES BIAX S	9	3	NO	ON/OFF	DOOR/YARD	3	
	SECURITY BULKHEAD M/H	70	1	YES	ON/OFF	BARN ENTRY	1	
13-Church	NIL EXTERIOR LIGHTING	0	0	0	0	0	0	
14-Water Tower	DOWNLIGHT ES BIAX MINI	11	1	YES	PIR	DOOR ENTRY	1	
15-Farmhouse & Storage	DOWNLIGHT STD CLEAR GLS	40	2	YES	ON/OFF	DOOR ENTRY	2	
16-Residential let	NIL EXTERIOR LIGHTING	0	0	0	0	0	0	
17-Dam	NIL EXTERIOR LIGHTING	0	0	0	0	0	0	
18-Residential let	BULKHEAD STD CLEAR GLS	40	5	NO	ON/OFF	ENTRY/YARD	5	
19-Farm & outbuildings	BULKHEAD ES SPIRAL	11	3	NO	ON/OFF	ENTRY/YARD	3	
20-Holiday let	BULKHEAD STD CLEAR GLS	40	1	NO	ON/OFF	OVER DOOR	1	
	CORNER D/LIGHT ES SPIRAL	11	1	PARTIAL	ON/OFF	DOOR/YARD	1	
21-Business Property	SECURITY HALOLINE LINEAR	60	1	YES	ON/OFF	YARD LIGHT	0	Adjust illumination down
	BULKHEAD STD CLEAR GLS	40	1	NO	ON/OFF	DOOR ENTRY	1	
	BULKHEAD STD CLEAR GLS	40	1	NO	PIR	WALKWAY LIGHT	1	
	SECURITY LED	10	1	YES	PIR	DOOR ENTRY	1	
	SECURITY LED	10	1	YES	ON/OFF	DOOR ENTRY	1	
	BULKHEAD STD CLEAR GLS	40	1	NO	PIR	DOOR ENTRY	1	
22-Farmhouse & outbuildings	BULKHEAD STD CLEAR GLS	40	2	NO	ON/OFF	DOOR/YARD	2	
23-Public convenience	NIL EXTERIOR LIGHTING	0	0	0	0	0	0	
24-Farmhouse & outbuildings	CORNER D/LIGHT STD CL GLS	40	1	NO	ON/OFF	YARD LIGHT	1	
	SECURITY BULKHEAD M/H	150	1	YES	ON/OFF	YARD ENTRY	0	Adjust illumination down
	BULKHEAD ES SPIRAL	11	1	NO	ON/OFF	DOOR ENTRY	1	
25-Farm & outbuildings	SECURITY BULKHEAD M/H					YARD		3 FITTED - NON FUNCTIONAL
	CORNER D/LIGHT STD CL GLS	40	1	NO	ON/OFF	ENTRY/YARD	1	
26-Farm & outbuildings	SECURITY ES SPIRAL	11	1	YES	ON/OFF	ENTRY/YARD	1	
	CORNER D/LIGHT							NO BULB FITTED
27-Farm & outbuildings	BULKHEAD 2D COMP FL	10	1	NO	ON/OFF	ENTRY/YARD	0	Shield or replace unit
28-Farm & outbuildings	BULKHEAD ES SPIRAL	11	1	NO	ON/OFF	ENTRY/YARD	1	
	DOWNLIGHT STD CLEAR GLS	40	1	NO	ON/OFF	DOOR ENTRY	1	
	SECURITY BULKHEAD M/H	150	2	YES	ON/OFF	DOOR ENTRY	2	
	BULKHEAD STD CLEAR GLS	40	1	NO	ON/OFF	YARD ENTRY	1	
29-Residential	COACHLIGHT STD CLEAR GLS	40	1	PARTIAL	ON/OFF	DOOR ENTRY	1	
	SECURITY BULKHEAD M/H	70	1	YES	PIR	ENTRY/YARD	1	
30-Chapel	DOWNLIGHT STD CLEAR GLS	40	1	NO	ON/OFF	DOOR ENTRY	1	
	CORNER D/LIGHT ES SPIRAL	11	1	NO	ON/OFF	SHED ENTRY	1	
31-Residantial	CORNER D/LIGHT ES SPIRAL	11	1	NO	ON/OFF	DOOR ENTRY	1	
32-Residential	CORNER D/LIGHT ES SPIRAL	11	1	NO	ON/OFF	DOOR ENTRY	1	
	SECURITY BULKHEAD M/H	70	1	YES	ON/OFF	DRIVEWAY/DOOR	0	Adjust illumination down
33-Residential	CORNER D/LIGHT STD CL GLS	40	1	NO	ON/OFF	DOOR ENTRY	1	
34-Residential	CORNER D/LIGHT STD CL GLS	40	1	NO	ON/OFF	DOOR ENTRY	1	
35-Residential	CORNER D/LIGHT ES SPIRAL	11	1	NO	ON/OFF	ENTRY/YARD	1	
36-Public convenience	BULKHEAD STD CLEAR GLS	40	2	NO	TIMER	DOOR ENTRY	2	
37-Residential	DOWNLIGHT STD CLEAR GLS	40	1	NO	ON/OFF	DOOR ENTRY	1	
	DOWNLIGHT ES SPIRAL	11	1	YES	ON/OFF	DOOR ENTRY	1	
	CORNER D/LIGHT ES SPIRAL	11	1	NO	ON/OFF	DOOR ENTRY	1	
38-Residential	BULKHEAD ES SPIRAL	11	1	NO	ON/OFF	DOOR ENTRY	1	
	BULKHEAD BIAX S/E	9	2	PARTIAL	PIR	DRIVEWAY/DOOR	2	
	CORNER D/LIGHT BIAX S	9	1	NO	ON/OFF	DOOR ENTRY	1	
39-Office	BULKHEAD STD CLEAR GLS	40	1	NO	ON/OFF	DOOR ENTRY	1	
40-Short stay accomodation	SECURITY BULKHEAD M/H	150	3	YES	PIR	DRIVEWAY/DOOR	1	Adjust illumination down X2
	DOWNLIGHT BIAX S	9	1	YES	ON/OFF	DOOR ENTRY	1	
	CORNER D/LIGHT ES SPIRAL	11	3	NO	ON/OFF	YARD LIGHTS	3	
	BULKHEAD STD CLEAR GLS	40	2	NO	ON/OFF	DOOR ENTRY	2	
41-Residential	BULKHEAD ES SPIRAL	11	2	NO	ON/OFF	ENTRY/YARD	2	
42-Residential	COACHLIGHT STD CLEAR GLS	40	5	PARTIAL	ON/OFF	ENTRY/YARD	5	
	SECURITY LED	20	1	YES	PIR	ENTRY/YARD	1	
43-Residential	DOWNLIGHT ES SPIRAL	11	2	NO	ON/OFF	ENTRY/YARD	2	Renovation in progress
44-Residential	SECURITY BULKHEAD M/H	70	1	YES	PIR	REAR YARD	0	Adjust illumination down
	CORNER D/LIGHT ES SPIRAL	11	1	NO	ON/OFF	DOOR ENTRY	1	
45-Residential	CORNER D/LIGHT STD CL GLS	40	1	NO	ON/OFF	DOOR ENTRY	1	
	SECURITY BULKHEAD M/H	70	1	YES	ON/OFF	REAR YARD	0	Adjust illumination down
46-Residential	SECURITY BULKHEAD M/H	70	3	YES	ON/OFF	ENTRY/YARD	0	Adjust illumination down
47-Residential	CORNER D/LIGHT STD CL GLS	40	2	NO	ON/OFF	ENTRY/YARD	2	
48-Residential	BULKHEAD STD CLEAR GLS	40	1	NO	ON/OFF	REAR YARD	1	
49-Works site	SECURITY BULKHEAD M/H	150	1	YES	ON/OFF	SITE LIGHT	0	Adjust illumination down
50-Residential	BULKHEAD ES SPIRAL	11	2	YES	ON/OFF	DOOR ENTRY	2	
	SECURITY BIAX S	9	1	YES	ON/OFF	DOOR ENTRY	1	
51-Residential	COACHLIGHT STD CLEAR GLS	40	2	NO	ON/OFF	DOOR ENTRY	2	
	SECURITY LED	30	1	YES	PIR	ENTRY/YARD	1	
	DOWNLIGHT STD CLEAR GLS	40	1	PARTIAL	ON/OFF	REAR YARD	1	
52-Residential	DOWNLIGHT STD CLEAR GLS	40	2	NO	ON/OFF	ENTRY/YARD	2	
53-Residential	CORNER D/LIGHT STD CL GLS	40	2	NO	ON/OFF	ENTRY/YARD	2	
54-VC	SECURITY BULKHEAD M/H	70	2	YES	ON/OFF	DOOR ENTRY	2	
	FLUORESCENT LINEARS	8	3	NO	ON/OFF	DOOR ENTRY	3	
	BULKHEAD 2D COMP FL	10	1	NO	ON/OFF	DOOR ENTRY	0	Shield or replace unit
	DOWNLIGHT LED	7	6	YES	ON/OFF	DOOR ENTRY	6	
	DOWNLIGHT HALOGEN ES	28	2	YES	ON/OFF	DOOR ENTRY	2	
	EMERGENCY FLUORESCENTS	8	3	NO	ON/OFF	DOOR ENTRY	3	EMERGENCY USE ONLY
55-Works Complex	HP SODIUM LIGHTS	70	26	YES	ON/OFF	ENTRY/YARD	26	
	DOWNLIGHT M/H	70	1	YES	ON/OFF	DOOR ENTRY	1	EMERGENCY USE ONLY
	HP SODIUM LIGHTS	70	16	YES	ON/OFF	YARD	16	EMERGENCY USE ONLY
Tower/power stn	SECURITY LED	30	2	YES	ON/OFF	DOOR ENTRY	2	
	SECURITY LED	30	1	YES	PIR	DOOR ENTRY	1	
	FLUORESCENT LINEARS	15	6	NO	ON/OFF	ACCESS LIGHTS	6	EMERGENCY USE ONLY
Water recovery site Storage building	BULKHEAD ES SPIRAL	11	2	YES	ON/OFF	ACCESS LIGHTS	2	
	BULKHEAD STD CLEAR GLS	60	1	NO	ON/OFF	ACCESS LIGHTS	1	EMERGENCY USE ONLY
	TOTAL LIGHT UNITS		172				151	COMPLIANT LIGHT UNITS
							87.80%	PERCENTAGE COMPLIANT

NOTES

NOT OWNED BY EV TRUST

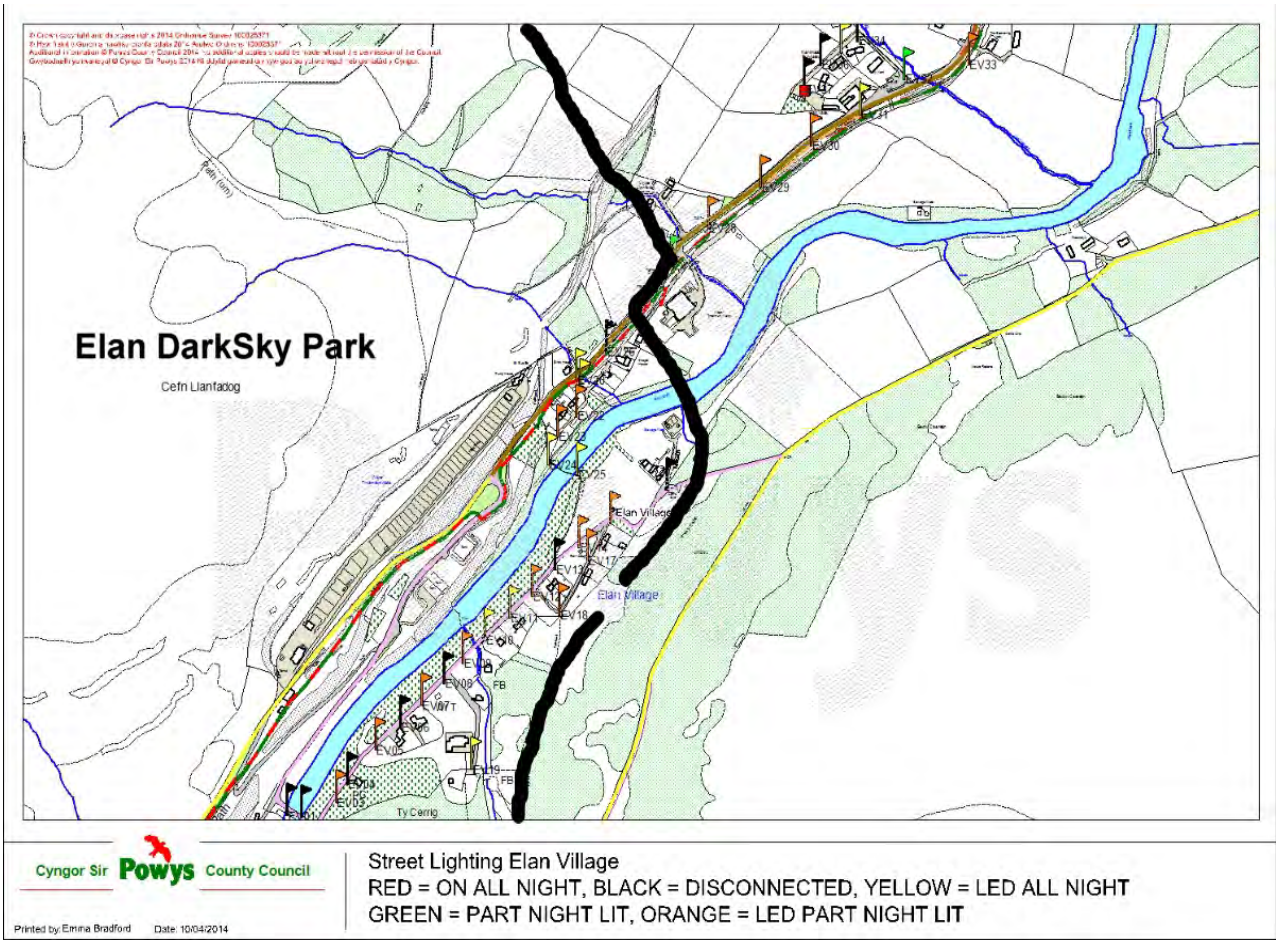
GREYED OUT BOXES NOT INCLUDED IN COUNTS

ORANGE BOXES DISPLAY NON COMPLIANT ISSUES

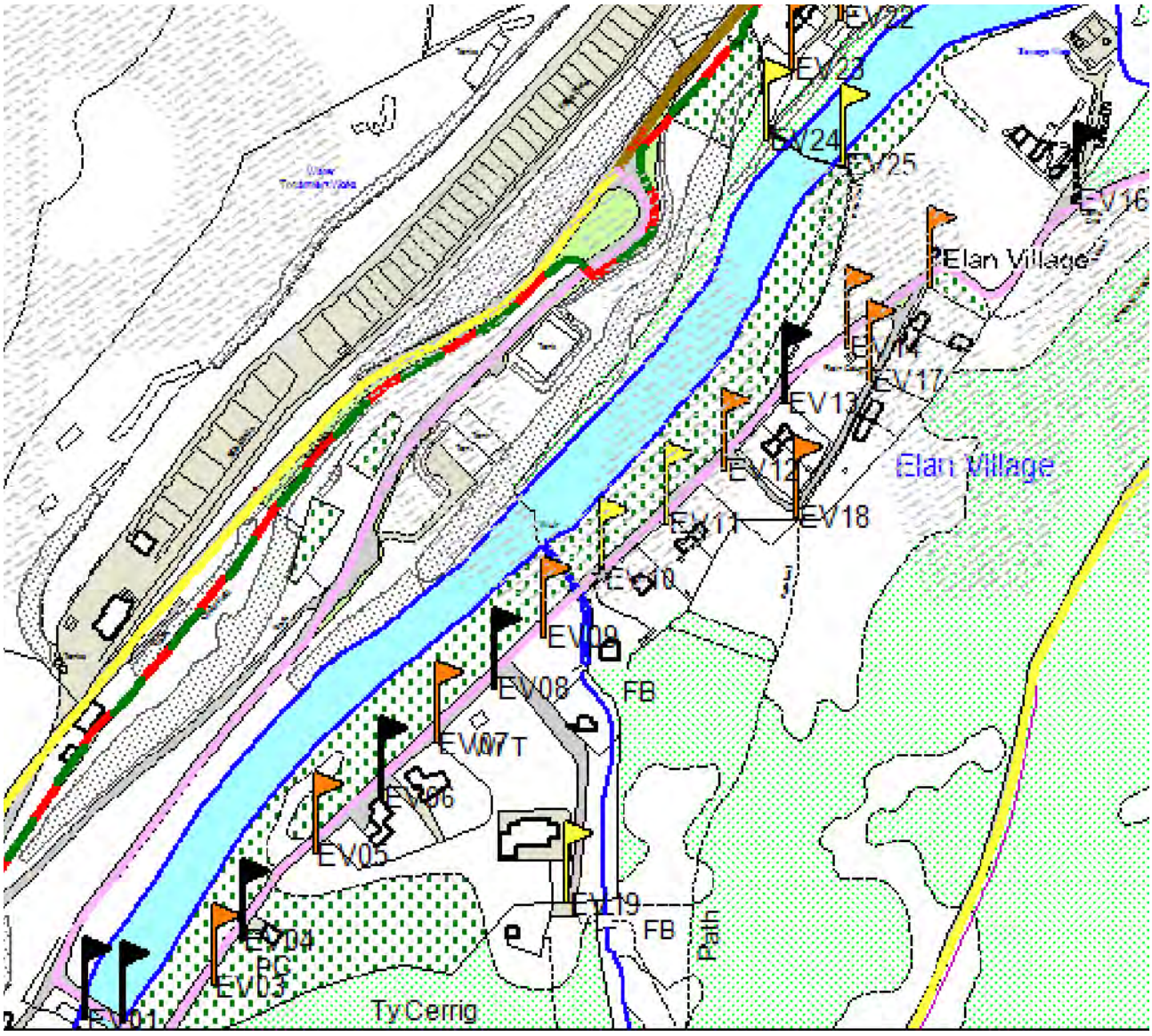
AUDIT COMPILED OCTOBER-NOVEMBER 2014

It should be noted that apart from the Elan Village, the Visitor Centre and the Severn Trent Complex, **all** properties generate their own source of power. These sources range from petrol/diesel generators through to solar and wind generators. This requirement of self generation of power no doubt contributes to the significant number of "energy saving" light bulbs within the estate boundaries and to the minimal numbers of lighting units installed overall.

With regards to street lighting within the proposed DS Park, we are grateful to Powys Lighting engineers for their assistance and reference should be made to the following supplied lighting installation map.



The black line on the previous map indicates our proposed Park boundary, enclosing the Severn Trent Complex and the whole of the Elan village. A close up of the installations within the Elan village is below.



From this it is clear to see that only 5 light units are illuminated all night ,(yellow), and note that unit EV24 has subsequently been altered to orange status, part lit. Photo's on the next pages show the lighing units and literature on illumination times.

Kris Fry

Kris Fry

Lighting wattage for these units has been supplied by Powys Lighting engineers and their email response, which included the earlier maps, is copied to the following page.

With regards to your email received today, please find attached a plan of our street lighting columns at the Elan Village.

They are as follows -

Black - disconnected

Green -Part night lit (55 watt)

Orange - LED partnight (21 watt)

Yellow - LED all night (21 watt)

Red - none in your area

I hope this information is helpful.

Kind regards

Emma Bradford

Street Lighting

01597 829840

Only yellow and orange units, both 21W LED illuminators, are located within the proposed Elan Valley DS Park boundaries.

Below are photographs of the most common exterior lighting installations found in the Elan Valley Estate.

Light units from Severn Trent Complex

Lighting “regulations and guidance”

Planning Permission - Wales

Light itself, and minor domestic light fittings, are not subject to planning controls.
Nevertheless, if you are planning to install external lighting for security or other purposes, you should ensure that the intensity and direction of light does not disturb others. Many people suffer extreme disturbance due to excessive or poorly-designed lighting.
Ensure that beams are NOT pointed directly at windows of other houses. Security lights fitted with passive infra-red detectors (PIRs) and/or timing devices should be adjusted so that they minimise nuisance to neighbours and are set so that they are not triggered by traffic or pedestrians passing outside your property.
A neighbour might take you to court if you are negligent or cause nuisance.
If your property is a listed building you should always consult the Local Planning Authority.
Building Regulations
If you are carrying out electrical work and fixing lighting to the outside of your house in England and Wales, you will have to follow new building regulations rules.
You should either use an installer who is registered with the competent person scheme or make an application to your local authority's building control department or approved inspectors.
It is now a general aim to make our buildings as energy efficient as possible. You are required to install efficient electric lighting to your house in specific circumstances including:

- When your dwelling has been extended
- When your existing lighting system is being replaced as part of re-wiring works.

An example of efficient lighting is where reasonable provision should be made to enable effective control and/or use of efficient lamps such that:

- Either, lamp capacity does not exceed 150 Watts per light fitting and the lighting automatically switches off when there is enough daylight and when it is not required at night;
- or the lighting fittings have sockets that can only be used with lamps having an efficacy greater than 40 lumens per circuit-Watt.

Please see Approved Document L-1B in the main Building Regulations section of this site for further guidance.
External Lights
If you are installing an external light which is supplied from your electrical system and fixed to the exterior surface of your house then you should ensure that reasonable provisions are made to enable effective control and/or use of energy efficient lamps. Two options for achieving this are:

- Installing a lamp with a capacity which does not exceed 150W per light fitting and the lighting automatically switches off both when there is enough daylight and also when it is not required at night
- Ensuring that the lighting fittings you use have sockets that can only be used with lamps having an energy efficacy greater than 40 lumens per circuit-watt.

In general, there is little in the legislation governing lighting in the **workplace**, and what the law does require is mostly qualitative (sufficient and suitable) rather than quantitative. The

basic requirements are set out in BS EN 12464:1 (Lighting of Indoor Workplaces) and BS EN 12464:2 (Lighting of Outdoor Workplaces). European Standards by default are called up for any work carried out under the public procurement directive so EN 12464 et al may have indirect legal status

The other major provisions are found in the Health and Safety at Work etc. Act 1974 and the Health and Safety (Display Screen Equipment) Regulations 1992, but other legislation such as the Disability Discrimination Act 2005 (and subsequently the Equality Act 2010) also has to be complied with.

The Building Regulations, and in particular Part L on conservation of fuel and power, have provisions regarding the energy efficiency and carbon emissions of lighting in new and refurbished premises, but do not prescribe lighting standards. As part of the implementation of the Energy Performance of Buildings Directive and in fulfilment of Government policy to make buildings more efficient, a new edition of Part L came into force in October 2010.

The following documentation does give a number of guidelines towards the Welsh Assembly Policies on lighting and light "nuisance" and is reproduced in part below. Portions of particular interest are highlighted red.

This guidance covers sections 101, 102 and 103 of the
Clean Neighbourhoods and Environment Act 2005,
which amend sections 79, 80 and 82 of the Environmental Protection Act 1990 to extend the statutory nuisance regime to include two new statutory nuisances.

- Statutory nuisance from insects; and
- Statutory nuisance from artificial light

2 This guidance is aimed at local authorities, particularly Environmental Health Practitioners who enforce nuisance legislation. It may also be useful to other agencies.

Central Principles

3 These changes extend the duty on local authorities to check their areas periodically for existing and potential statutory nuisances so as now to include such nuisances arising from insects and from artificial lighting. Local authorities must take reasonable steps to investigate complaints of such nuisances. Once satisfied that a statutory nuisance exists or may occur or recur, local authorities must issue an abatement notice (in accordance with section 80 (1) and 80(2) of the 1990 Act) against either the person responsible for the nuisance, or the owner or occupier of the premises from which it emanates, requiring that the nuisance cease or be abated within a set timescale. Where a nuisance arises from any defect of a structural character, the abatement notice must be served on the owner of the premises.

4 It also becomes possible for persons aggrieved to take private action in respect of these new statutory nuisances through the magistrates' court by way of section 82 of the 1990 Act.

5 The appeals procedure is as for the other statutory nuisances. An appeal against an

abatement notice can be made to the Magistrate's Courts. As grounds for an appeal, the claim of 'best practicable means' can be used against an abatement notice, or subsequently as a defence against liability for conviction for breaching or failing to comply with an abatement notice, for nuisances on industrial, trade or business premises. In the case of artificial light nuisance, this defence of "best practicable means" also applies to all such lighting used for the outdoor illumination of "relevant" sports.

6 The defence of 'reasonable excuse' for breaching or failing to comply with an abatement notice remains available to all.

7 A statutory nuisance may also be capable of being a nuisance at common law (and, where reliance is on the 'nuisance' limb, must also be a nuisance at common law), in which case an operator may be the subject of proceedings in tort by persons aggrieved by a common law nuisance even if the operator can rely on the defence of 'best practicable means' against action for a statutory nuisance.

Section 102

13 Section 102 adds to the descriptions of statutory nuisances listed in section 79 (1) of the 1990 Act:

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

14 However, this does not include light emitted from the following premises. These are premises used for transport purposes and other premises where high levels of light are required for safety and security reasons, i.e.:

- Airports
- Harbours
- Railway premises
- Tramway premises
- Prisons
- Bus stations and associated facilities
- Public service vehicle operating centres
- Goods vehicle operating centres
- Lighthouses
- Premises occupied for defence purposes

Section 103

16 Section 103 extends the defence of "best practicable means" to these new statutory nuisances where in the case of the insect nuisance, the nuisance arises on industrial, trade or business premises, or in the case of the artificial light nuisance, where either the light is emitted from industrial, trade or business premises, or by lights used for the purpose only of illuminating a relevant outdoor sports facility. Most artificially illuminated sports facilities will be regarded as businesses, and so will benefit from the 'best practicable means' defence; however there may be some that are not (local authority grounds or facilities' run by amateur clubs.

17 The Statutory Nuisance (Miscellaneous Provisions) (Wales) Order 2007 designates the 'relevant sports' which will be played at facilities which will be able to use the defence of 'best practicable means' in appealing against, or as a defence against prosecution for breaching or failing to comply with, an abatement notice for statutory nuisance from artificial light under s.79(1)9fb) of the Environmental protection Act 1990.

Artificial Lighting

Likely sources of artificial light statutory nuisance.

87 In order to understand what may be termed a statutory nuisance in lighting an understanding of lighting terminology is required:

Light (or luminous flux) is a type of radiation and forms part of the electromagnetic spectrum visible to the eye. It is measured in ***lumens (lm)*** (NB not watts, which is only a measure of consumption)

The amount of light falling on a surface is known as ***illuminance*** and is measured in ***lumens per square metre or lux***.

While ***'illuminance'*** is easy to calculate and measure, the eye does not see illuminance, but the light radiated or reflected off a surface, which is know as l***uminance or brightness***. It is measured in ***candelas per square metre*** (cd/m2) and if the surface is glossy can differ with the angle of view.

The term candela (cd) or (Kcd= 1000cd) is by itself a measure of light intensity. Whether this light ***intensity*** is seen as glare or not depends on the surrounding ***'luminance'*** as can be demonstrated when comparing a road lighting luminaire or floodlight lit during the day and again at night.

88 Local authorities have a duty to take reasonable steps, where practicable, to investigate any complaints of artificial light nuisance; it is expected that the following sources will generate most complaints:

- Domestic security lights
- Healthy living and sports facilities
- Domestic decorative lighting
- Exterior lighting of buildings and decorative lighting of landscapes
- Laser shows/sky beams/light art

89 Christmas lights may also be the subject of complaint, and could be covered by statutory light nuisance although this seems unlikely given their duration.

90 We anticipate that much artificial light nuisance will be caused by excessive levels of illuminance and glare, which is inappropriate to its need and which has been poorly designed, directed, operated and maintained. Simple remedies such as re-aiming or screening should be sufficient in many cases and although light nuisance is not a matter of light levels per se, light meters are available for taking measurements in order to quantify the scale of the possible nuisance.

91 Efficient and high quality lighting installations that help people to see where they are going and bring security to both themselves and their property can be designed so as to produce minimal impact on the environment. The management and maintenance of such lighting that limits both glare and dark shadows is essential for people with a visual impairment.

92 We also anticipate a high number of complaints about street lighting. However these are unlikely to qualify as a statutory nuisance as they are unlikely to be located on premises. They can nevertheless cause adverse affects and are discussed in more detail below.

Statutory Nuisance from Artificial Light and Light Pollution

93 Artificial light nuisance may be, but is not necessarily the same as light pollution. Artificial light nuisance is a source of light that in the opinion of a trained public health professional, who makes an assessment on a case by case basis, interferes with someone's use of their property and/ or is or might be prejudicial to someone's health. Light pollution could be defined as any form of artificial light which shines

outside the area it needs to illuminate, including light that is directed above the horizontal into the night sky creating sky glow (which impedes our view of the stars), or which creates a danger by glare. Although light pollution might affect the aesthetic beauty of the night sky and interfere with astronomy, it is not necessarily a statutory nuisance. The statutory nuisance regime is not an appropriate tool with which to address light pollution per se.

Domestic security lights

94 Those aggrieved by a neighbour's lighting should be encouraged to speak to their neighbour first where possible, perhaps with the aid of a mediation service. Mediation UK (http://www.mediationuk.org.uk/) may be able to advise.

95 Inappropriate lighting can cause glare and dark shadows which may adversely affect drivers, cyclists and other road users, including pedestrians, and people with a visual impairment. Bad lighting can also produce shadows for those with criminal intent to hide in or behind. Many cases of artificial light nuisance can be solved through simple engineering techniques and consideration of function and effect. For example:

• Minimum level of illumination necessary to light a property should be used. Relatively high-powered lights are rarely necessary in domestic situations and waste energy and money, can cause glare which can adversely affect road users or passer-bys. Excessive levels of illumination provide dark shadows for people, including those with criminal intent, to hide in or behind. Lighting that is shielded or angled down can actually improve rather than compromise security. There are agreed standards for lighting levels, some of which are listed at the end of this document.

• Special optics or "double asymmetric" luminaires - which are designed to ensure full flow of light over the lit area from each floodlight - can be aimed facing downwards while still spreading light over a wide distance (the lamp is usually fitted close to the back edge of the unit, not in the middle). The reflector becomes less visible to onlookers resulting in low glare to the surrounding locality.

• A separate switching detector can be used on some models to sense the movement of intruders on the property. Luminaires and detectors should be aimed to detect and light people on the property, not people or animals walking down the street. If lights detect everything that moves, they will switch on and off repeatedly and could be a source of statutory nuisance.

• Timers adjusted to the minimum can reduce the operation of the light.

• Bulkhead or porch lights are cheaper than security lights, use less energy, and have reduced glare so there are fewer shadows for criminals to hide in. Movement detectors on these lights are generally mounted lower and so are less susceptible to nuisance switching on and off. However they tend to, because they are lower and aimed more horizontally, to capture movement over a wider range and if not located with care can be interfered with.

• Vegetation may help screen the light at certain times of year provided the movement of vegetation itself does not trigger light and it does not cause a 'high hedges' problem.

96 It is sometimes suggested that a complaint of artificial light nuisance could easily be mitigated by the installation of curtains or blinds, even blackout curtains or blinds, by the complainant. It is for the Environmental Health Practitioner to exercise discretion over what is reasonable and what is not. A judgment might need to be made about whether or not it is actually reasonable to expect a complainant to purchase and install household hangings which might be expensive and/or impair that person's enjoyment of their property to abate a nuisance caused by a third

party. This approach would leave the solution and cost of abatement in the hands of the complainant rather than the perpetrator of the nuisance.
97 Technical parameters on obtrusive lighting, formulated by the International Commission on Illumination (CIE) and Institution of Lighting Engineers (ILE) from research into individual sensitivity to light, may be helpful in considering the level of sensitivity that might be considered that of the “average person”. These parameters vary depending on whether the installation is in town or country and there is a suggested curfew time of 23.00 after which lighting levels should be further restricted. However, there are no objective levels at which artificial light does not constitute a statutory nuisance.
98 It is sensible to word abatement notices to be simple, requiring abatement and non-recurrence within a specified timescale. If the abatement notice is too detailed, it could be that the terms of the notice may be fulfilled whilst the nuisance remains unabated.
99 A list of useful sources of further information and useful practical advice on the positioning of external lighting is listed at the end of this guidance.

Commercial security lights

100 Lighting used on commercial premises will usually be subject to the same controls as apply to domestic premises, i.e. it will be for the local authority to decide whether the lighting amounts to a statutory nuisance.
101 Commercial premises are more likely than domestic premises to use lighting which makes a material change to the external appearance of the building. It may therefore be subject to planning permission. National planning policy contained in planning Policy Wales (March 2002) is that there is a need to balance the provision of lighting to enhance security and safety with the need to protect natural and historic environments, retain dark skies where appropriate and respect the amenity of neighbouring land uses.
102 Premises or apparatus used for the provision of electronic communication services need adequate lighting for operational and security purposes to ensure the safety of their staff, and to protect the integrity of the telecommunications network. Statutory nuisance laws recognise the need for industry to be able to carry out its usual functions without being compromised by inadequate security lighting. That need is addressed by the availability of the best practicable means defence and ground of appeal.

Streetlights

104 Streetlights are not specifically exempt, but because of their location are unlikely to qualify, as generally speaking they are not found on “premises”. It is, however, acknowledged that streetlights can have adverse affects on the local community.
105 Local authorities have a duty under section 17 of the Crime and Disorder Act 1998 to exercise their functions with due regard to the likely effect on crime and disorder in their areas, and to do what they reasonably can to prevent crime and disorder. Local authorities already have the means to deal with nuisance street lighting and are accountable to those within their areas. Local authorities should do their best to ensure that streetlights under their control do not cause problems to the local community. The Government expects local authorities to take reasonable steps to investigate and, where appropriate, resolve problems from streetlights as a matter of good practice and consideration for the local environment and the community to

whom they are accountable.
106 The Government supports good design, installation and maintenance practice to minimise problems where possible.
107 New technologies now allow much finer control of light distribution and reduced light directed towards the sky. Beneficial lighting can be achieved that is fit for purpose, provided roads are appropriately rather than over classified, and which minimises the impact on the environment through using modern light sources in combination with luminaires designed to appropriate, not unnecessarily high, lighting levels. The simple use of front and / or back shields can improve illumination on the road whilst reducing intrusion elsewhere.
108 Guidance has been published by the Department for Transport and also the Institution of Lighting Engineers to help reduce light pollution and sky glow generally and promote good practice for street lighting maintenance. As most street lighting is alight throughout the night, the obtrusive light levels to be adhered to should be those given for all night, i.e. after curfew. In addition, the UK Government's "Lighting in the Countryside: Towards good practice" includes street lighting. The Government will continue to work with the appropriate organisations to promote good practice in design, installation and maintenance to minimise problems where possible.

Lighting in the Countryside

111 The 1998 Transport White Paper A New Deal for Transport - Better for Everyone stated that 'where lighting is essential, it should be designed in such a way that nuisance is reduced and the effect on the night sky in the countryside minimised'.
112 Lighting in the Countryside: Towards Good Practice is accessible free of charge at http://www.odpm.gov.uk/planning//litc/index.htm (under Planning Advice and Guidance). This document continues to be a valuable guide for local authorities, highways planners and engineers and members of the public. It demonstrates what can be done to lessen the adverse effects of external lighting, including street lighting. The advice is applicable in towns as well as the countryside.

The relationship between planning and statutory nuisance

113 It is preferable and a demonstration of good practice to prevent a statutory nuisance from occurring in the first place. One approach is to capture it at the planning stage.
114 Well-designed public lighting increases the opportunity for surveillance at night and sends out positive messages about the management of an area, and can help to reduce crime and disorder. Detailed guidance on types of lighting is available at www.securedbydesign.com. In addition Welsh office Circular 16/94 gives advice to local authorities, developers and designers about planning considerations relating to crime prevention.
115 Lighting installation proposals should be submitted to local authorities to assist them in determining planning permission. Local authorities should carry out professional reviews of developments involving exterior lighting to minimise their impact by day and night. Planning permission for such requirements should ensure that the installation is maintained in an appropriate and approved manner, and that all screens, shield, baffles and aiming requirements are maintained throughout the life of the installation.
116 The existence of a planning permission does not, however, mean that a statutory nuisance cannot exist. Statutory nuisance can exist whether a particular site has planning permission for the artificial light or not. Circumstances and local

environments change, so, for example, artificial light that was not a nuisance before may become one.

Exemptions

117 Whilst the Assembly Government recognises that some premises are of strategic importance owing to their nature and importance to the community, and exterior lighting may be necessary to prevent crime, disorder and safety hazard, it is expected that exempted premises will take seriously their social responsibility to use artificial light responsibly and with consideration to local circumstances.

118 Exempted premises are expected to maintain lighting systems that do not unduly affect the environment and neighbourhood. Lighting systems should be fit for purpose and not in excess of that requirement, so the impact is minimal whilst remaining compatible with the use and function of the facilities. Inappropriately designed installations may cause unnecessary distraction for drivers on adjacent highways and compromise safety for road users, pedestrians and people with a visual impairment.

119 Local authorities may still need to undertake an initial investigation of complaints made about artificial light from exempt premises in order to establish first whether or not that premises really is the source. Even though enforcement action for artificial light statutory nuisance from exempt premises cannot be taken under section 80 of the 1990 Act, efforts should still be made to negotiate an acceptable solution on an informal basis. The exemptions are to protect the public interest and health and safety, not to condone the irresponsible, inconsiderate or unnecessary use of artificial light.

Healthy living and sports facilities

121 It is the Welsh Assembly Government's policy to increase participation in sport and provide better healthy living and sporting opportunities at every level. To help achieve this aim the Government has invested heavily in new and improved sports facilities, including the floodlighting of playing grounds and other facilities.

122 Given the limited hours of daylight in Wales in the winter, floodlighting is essential if communities are to make maximum use of many sports grounds, and the Welsh Assembly Government will continue to promote their use. All new floodlighting schemes are subject to appraisal under the planning system, which aims to balance the interests of those who may object to new sources of bright light against the interest of those who will benefit from the lighting in terms of greater opportunity to participate in sport. Full details of the equipment to be used and estimated lighting levels, not only on the field of play, but also that trespassing onto surrounding properties should be submitted to the local authority to assist with planning permissions. Where planning permission is granted, it is usually accompanied by strict technical specifications designed to ensure that nuisance from the lighting is minimised.

123 Against this background, the Welsh Assembly Government would not normally expect local authorities to have to resort to a statutory nuisance abatement order to address complaints about light from illuminated outdoor sports facilities.

124 Any modern facility which is operating in accordance with approved standards will be able to rely on the statutory defence of 'best practicable means', which is extended by the Clean Neighbourhoods and Environment Act 2005 to cover all illuminated outdoor relevant sports facilities. Most such facilities are likely to be regarded as

businesses, and so benefit from this defence in any event under sections 80(8) and 82(10) of the Environment Protection Act 1990, but to ensure that all are covered by this defence, section 80(8)(aza)(ii) , (8A), (8B) and 8(C) of the Environment Protection Act 1990 (inserted by section 103(2)(b) and (3) of the Clean Neighbourhoods and Environment Act 2005) specifically extends the BPM defence to all outdoor relevant sports facilities.

125 There may be occasions when badly sited or defective floodlighting causes unnecessary hardship to individuals; in such cases a local authority may consider making use of statutory nuisance legislation. However, before concluding that it is satisfied that a statutory nuisance exists a local authority should make every effort to resolve the problem by discussion with those responsible for the lighting. For example, older floodlighting towers can be affected by excess wind which can change slightly the direction of the floodlights; such situations can be resolved by altering the fixings and repositioning the lights in their original position. An abatement notice should only be issued as a measure of last resort.

CPRE production - "Shedding Light" comes up with the following conclusions as a result of local authority surveys.

The following extracts have been taken from the Office of Deputy Prime Minister (ODPM) publication, **Lighting in the Countryside: towards better practice**, modified 2003. It includes recommendations for good practice in lighting issues for various land uses.

• Commercial Developments

1. All lighting should have a clear purpose – avoid use of lights simply to create a ‘presence’ at night;
2. Concentrate lights where they are needed and establish a clear hierarchy, with minimum lighting around the outer, more rural, perimeter of the complex;
3. Reduce the scale of street/road lighting (from usual standards for roads) and consider height and spacing of lights in relation to buildings, if other requirements like visibility, glare, etc. permit it.
4. Position promotional lighting/signs so that they are not visible from open countryside i.e. Concentrate at public entrance to buildings;
5. Direct all floodlights carefully to where they are most needed and design equipment to minimise light pollution;
6. Encourage a `rural' image, with low key lighting in small developments and on the edges of larger sites and design lighting to be in harmony with the building styles;
7. Use a unified lighting scheme, so that the different types of lighting are not intrusive in daytime;
8. Consider timing of lights - avoid any lights being left on during daytime and turn off all lights after working hours; and
9. Consider design of overall site to minimise use of lighting e.g segregate pedestrian and vehicular traffic and introduce traffic calming measures.

• Decorative Building Lighting

1. Keep lighting understated and aim to enhance rather than swamp architectural character.
2. Consider timing of lighting - only on special occasions?
3. Direct light carefully, minimising up lighting where it distorts architectural detailing and design lighting scheme to prevent light pollution.

• Farms and Market Garden Centres

1. Mount lights below the roof height of buildings and direct light downwards, to where it is needed;
2. Avoid use of sensors which can be tripped by animals;
3. As far as possible, position lights so that they are shielded by buildings and are not visible from the surrounding countryside;
4. Use internal blinds to screen glasshouse lighting; and
5. The potential impact of light from glasshouses should be considered at planning application stage.

• Lighting Railway Stations and Road/Rail Interchanges

1. Design the lights for the station as a whole, balancing the need for lighting in different areas and considering the impact of light in views from the surrounding countryside;
2. Concentrate on lighting to enhance the architectural character of the station building (which is often attractive) rather than on creating an `urban' level of light on the platform and in the
station forecourt;
3. Direct car park and security floodlights downwards and to where the light is required;
4. Design floodlights to minimise light pollution; and
5. Consider use of a larger number of lights mounted on lower columns if the station is in a relatively prominent site.

• Mineral Extraction

1. Mount lights below the roof height of buildings and perimeter fencing and direct light downwards, to where it is required;
2. Position lights so that they are shielded by buildings or permanent plant and are not visible from the surrounding countryside;
3. Avoid lights mounted on the side of buildings that shine directly out, dazzling users of the facility.

• Petrol Filling Stations

1. Canopy lights should be positioned to avoid light spill from the sides of the canopy;
2. The use of dish diffusers causes some additional glare and should be avoided in rural areas;
3. Reduce lighting or avoid it during daylight hours;
4. Integrate design for promotional signage with that of the canopy, but ensure signs on canopies do not cause additional light spill;
5. Avoid lighting internal fascia around canopy;
6. Design and position signs so that they are visible only from the carriageway and not from the surrounding landscape;
7. Co-ordinate security lighting to minimise accumulation of daytime structures; and
8. Direct lighting to where it is needed and design apparatus to control levels of light spill and glare.

• Residential Development

1. Consider whether lighting is required at all, and where it will be most effective;
2. Keep lighting in new residential areas in balance with that of the village as a whole and lighting on adjacent road junctions;
3. Consider views from surrounding countryside and avoid a line of lights, defining the edge of a village.

• Road Junctions and Access

1. Keep number of columns to a minimum - a single column may be sufficient on many small roundabouts;
2. Consider colour of lighting columns in relation to surrounding landscape, i.e. use a dark colour if the columns are set against backdrop of vegetation;
3. Give priority to the use of high pressure sodium lights which give some degree of colour rendition, and to the use of luminaires with full horizontal cut-off, wherever a lit junction is necessary;and
4. Carry out a visual appraisal and design lighting scheme to minimise visual intrusion of light at night and of structures by day.

• Rural Car Parks

1. Direct lighting downward and design equipment to control levels of light spill and glare;
2. Car park lighting should fall within the levels recommended in the ILE Guidance for rural zones E1 and E2;
3. Site lighting equipment carefully, making use of the backdrop provided by any existing vegetation and introducing new planting within the car park to help integrate the lighting
structures and minimise the visual impact of both equipment and lighting; and
4. Consider views from the surrounding countryside and give special attention to the car park boundaries, using new hedgerow or tree planting to help minimise the impact of car park lights on the wider landscape.

• Security Lighting

1. Lighting should be controlled by photoelectric switches and should be on the minimum time setting - avoid sensors, which can be tripped by road or footway users.
2. Lighting should be directed down and mounted below the property boundary height.
3. Develop an integrated approach to security lighting, balancing levels of light with other lighting in and around the site to avoid glare and light spill as well as dark spots.
4. Consider the use of alternative security measures, such as an inside light that is on a time switch, or CCTV. •

Sports Facilities

1. Consider potential for temporary floodlighting and for lowering lighting columns in summer, when they are not in use;
2. Design lighting to be as directional as possible, using the minimum number of lights required, and to minimise light pollution;
3. The colour of lighting poles may have significant influence – light colours should be used if lights are generally seen against the sky, or dark if there is a backdrop of vegetation; and
4. Floodlights should only be on when the facility is in use.

LIGHTING MANAGEMENT PLAN

With due consideration to the

"Guidelines for Outdoor Lighting in RASC-DSP-GOL,IDA-DSP-GOL", copied below -

4.8 "Developed" Properties within Park Facilities

These properties include, but are limited to, privately owned and rental properties and towns within Park boundaries.

Owners of private properties within the Park should be informed of the impact of artificial lighting on wildlife. They should be encouraged to remove "dusk to dawn" lights, replace "yard lights" with Full Cut-off (FCO) luminaires and replace MH lamps with either HPS, Low Pressure Sodium (LPS) fixtures or amber LED fixtures. They should be encouraged to turn off all exterior lighting when they are indoors. All municipal lighting should be FCO and illumination levels should be no greater than minimum recommended by Illumination Engineering Society (IESNA) Guidelines.

The outdoor lighting on properties under the control of Park managers should use Full Cutoff (FCO) fixtures. Area lighting fixtures, such as "yard lights" and "dusk to dawn" fixtures or similar luminaires, should not be permitted nor should Metal Halide (MH) or mercury vapour lamps be permitted. These products produce excessive glare and light trespass and emit short wavelength light that affects wildlife.

Use of outdoor lighting on private properties within Parks should be discouraged 2-hours after sunset, and should be turned off when people are indoors. Outdoor lights should not be permitted to remain on throughout the night.

The Elan Valley Trust and Dwr Cymru-Welsh Water

make the following policy statements as part of their Dark Sky Park application, in that they -

1... will actively engage with all the individual tennants and property owners on the Estate, encouraging them to adjust/replace such lighting to enable the proposed Elan Valley Dark Sky Park to conform to the above guidelines, to reach the 90% five year compliance target, and to achieve the final 100% objective. Where appropriate, the Trust may assist with the purchase and or installation of compliant lighting at a future time.

2... will actively engage with Powys County Council and monitor any street lighting changes within the proposed Elan Valley Dark Sky Park boundaries, and where appropriate, request alteration or adaption of any such changes to conform to lighting guidelines or to improve upon them. Such changes would include but not be restricted to - proposed new light placements, timing alterations, changes in light emitters.

3... will actively engage with Severn Trent Water and monitor any lighting changes within the Severn Trent Water Treatment complex and outbuildings, and request alteration/adaption of any new or existing lighting to conform with or to improve upon lighting guidelines.

4... will actively engage with Powys Highways agency in monitoring any additions or changes to any illuminated road/ signage within the proposed Elan Valley Dark Sky Park, and request alteration/adaption of any such illumination change to conform with or to improve upon lighting guidelines.

5... will actively educate patrons of the Elan Valley Visitor Centre, via the medium of permanent display materials and free literature, of the values and benefits of “light friendly” installations for both wildlife and humankind.

6... will request of all property owners and tennants within the proposed Elan Valley Dark Sky Park, to be informed of any alteration and or addition to exterior lighting recorded by the Lighting Inventory of Oct-Nov 2014,to ensure conformance with these LMP Guidelines

7... will continue with it's SQM sky monitoring to ensure sky quality does not diminish the value of the proposed Elan Valley Dark Sky Park.

8... will actively encourage all properties falling under it's control to adopt a policy of zero, or to reduce as *far as practicable*, exterior lighting after 22.00 hours. It should be noted however, of the requirements of the farm tennants to need the understandable use of light to perform their business at certain, and sometimes unforseen, times of the farming calender. The LMP should in *no way* endanger human or farm livestock by restrictive lighting practice.

9... will, in the cases of properties outside of their control, attempt to bring such properties “into the fold” by means of persuasive argument and friendly inducement. (see 11/12/13)

10... will continue to re-audit the Lighting Inventory to ensure the proposed Elan Valley Dark Sky Park attains the required 90% compliance by the 5 year target and an eventual 100% compliant figure.

11... will investigate the bulk purchasing of "light friendly" units, and to make these available to any property owners who wish to alter or add to their exterior lighting, thus ensuring future compliance or improvement in lighting control.

12... will investigate the bulk purchase of LED (Eco lights). These bulbs have a 180° light cone, thus prohibiting illumination above the horizontal plane. Such bulbs could be placed into downlighter units within the proposed DS Park, thus bringing any such unit into compliance for control of light emission.

13... recognise the lighting requirement ideals for energy efficiency, colour and technology. It should be noted that the above mentioned LED bulbs operating at a CCT of 3000K and energy efficiency of A+, would fulfil these requirements, and would be made available to all properties where appropriate.

14... recognise the need for "*light when it is needed,where it is needed, and in the appropriate amount for a specific task".* The Estate have Health & Safety trained personel who would be able to perform such assessment with reference to BS EN 12464:2 Lighting of outdoor workplaces – already mentioned in the Lighting "Regulations and Guidance" section, - and through consultation and direct engagement with appropriate parties.

15... recognise the ideal requirement of fully shielded lighting for units throughout the Park, will encourage this practice, and that of the installation of PIR systems or timers to other light fitments.

16... will adopt a policy of **not** illuminating previously unlit areas of owned land, unless issues of human or animal safety and or welfare require such. Policy 14 would then come into play. For non-owned lands, policies 2,3,4 or 9 would come into service as appropriate.

-------- Letters of Support. --------

The Elan Valley Estate is deeply appreciative of the following

"Letters of Support"

HRH The Prince of Wales -- Please note that at the request of Dr Grahame Davies, the Asst Private Secretary to HRH The Prince of Wales, we are requested only to "....*make factual reference to HRH The Prince of Wales's support....*" . Any enquiries or confirmation as to the letters existence are to be made to Dr Davies c/o Clarence House, London. SW1A 1BA.

The Society for Popular Astronomy,

The Cambrian Mountains Society,

Iolo Williams, - TV Wildlife presenter and naturalist.

Powys Council – Regeneration, property and commissioning Dept.

Elenydd Wilderness Hostels

Rhayader Town Council

Rhayader 2000 ltd

R W Dennison – Director Powys & BBNP Biodiversity Info Service.

Bob Mizon – Coordinator - BAA Campaign for Dark Skies.

Cambrian Safaris – Richard Smith

HIGHGROVE HOUSE

26th July, 2014

Dear Mr. and Mrs. Fry,

Having been told of your application to have the Elan Valley estate

Yours most sincerely,

Charles

Society for Popular Astronomy

Secretary : Guy Fennimore - 36 Fairway - Keyworth - Nottingham - NG12 5DU
E-Mail - secretary@popastro.com

Sorcha Lewis
Elan Valley Visitor Centre
Elan Valley
RHAYADER
LD6 5HP

12 December 2012

Dear Sorcha

ELAN VALLEY ESTATE - CAMBRIAN MOUNTAINS - PROPOSED DARK SKIES STATUS

I am writing on behalf of the President and Council of the Society for Popular Astronomy to express the support of the Society for your bid for Dark Sky status.

Your geographical area is ideally suited to have Dark Sky status, and we admire your efforts to achieve this, including your consideration of allied issues such as tackling the problem of light pollution.

Our Society exists to promote astronomy, and to have access to areas with truly dark skies is very important to us and to our members, especially when considering the legacy that our generation can create for the future. It is sad to see how many young people of today have never had the chance of seeing a really dark sky.

We wish you every success.

Yours sincerely,

Guy Fennimore
SECRETARY

Llywydd: Iolo Williams
Cadeirydd: Ann West annwest@spamarrest.com
Gwefan: www.mynyddoeddcambria.org.uk

President: Iolo Williams
Chairman: Ann West annwest@spamarrest.com
Website: www.cambrianmountains.co.uk

6th November 2013

Ms. S. Lewis,
Head Countryside Ranger,
Elan Valley Visitor Centre,
Rhaedr,
Powys,
LD6 5HP.

Dear Sorcha

Dark Sky Park designation for the Elan Estate

I write on behalf of the membership Cambrian Mountains Society (CMS) who would like to express their support for the joint campaign between Dwr Cymru and the Elan Valley Trust to have the whole of the Elan Estate recognised for the quality of its dark skies. CMS was founded in 2005 with the twin objectives of both conserving the natural beauty of the Cambrians and in raising public awareness of this most iconic hill country. The Society sees designation of the estate as a Dark Sky Park, under the auspices of the International Dark-Sky Association (IDA), as an important initiative in the protection of the night skies over the very heart of Wales.

Whilst concentrating on the outstanding quality of the landscape CMS has not forgotten the beauty of the area's dark skies. The Cambrians are often described as the UK's largest wilderness area south of the Scottish border and it is their remoteness, distant from even small population centres, that helps to create its beautiful night vistas. A number CMS members are quite active in promoting the quality of the dark skies over the Cambrians and I am sure would be very willing to assist in any surveying work needed around the Estate prior to designation. Can I also use this letter as an opportunity to promote the latest edition of our Journal (copy enclosed). In it you will find one of our member's quite stunning photographs of the Milky Way, the Orion Nebula and the Pleiades Cluster, all taken from his home/observatory in the Northern Cambrians.

In our opinion the Elan Estate, at the core of the Cambrians, thoroughly deserves Dark Sky Park status and we will assist in any way we can to help achieve this. Ultimately, of course, part of CMS's vision is to see the whole of the Cambrian Mountains designated by IDA as a Dark Sky Reserve, taking up its rightful place alongside the Brecon Beacons NP which achieved this status quite recently.

Yours sincerely,

Ann

Mrs. Ann West Chairman Cambrian Mountains Society

The Vron,
Cregrina,
Powys, LD1 5SF
LD1 5SF.

Print

Content of the message

From:	"Facebook" [redacted]mail.com>
To:	"Kris Fry" [redacted]
Date:	Apr 23 2014, 07:06 PM
Subject:	New message from Iolo Williams

Show full header

Iolo Williams 23 April 18:36

Dear sir/madam,

I am writing in support of the Elan Valley Trust's application for International Dark Sky Park status. The Elenydd mountain range is Wales' last wilderness and a refuge for rare plants and animals as well as human beings. It is one of the few areas in the whole country where one can walk for a whole day without seeing many signs of human development. Giving the area Dark Sky Park status would help ensure that inappropriate developments are kept at bay and that people can continue to enjoy the area for all its natural qualities.

It is for these reasons that I wholeheartedly support the Elan Valley Trust's application.

Yours sincerely

Iolo Williams

View conversation on Facebook · Reply to this email to message Iolo Williams.
This message was sent to [redacted]. If you don't want to receive these emails from Facebook in the future, please unsubscribe.
Facebook, Inc., Attention: Department 415, PO Box 10005, Palo Alto, CA 94303

Close Window

Sue Bolter
Head of Regeneration, Property & Commissioning
Pennaeth Adfywio, Eiddo a Chomisiynu

Regeneration, Property & Commissioning
Adfywio, Eiddo a Chomisiynu
***Cyngor Sir* Powys County Council**
***Neuadd y Sir* / County Hall**
Llandrindod Wells, Powys, LD1 5LG

Os yn galw gofynnwch am/*If calling please ask for*:
Sue Bolter
Ffôn/*Tel*: **01597 826517**
Ffacs/*Fax*: **01597 826269**
Ebost/*Email*: **sue.bolter@powys.gov.uk**
Eich cyf/*Your Ref*:
Ein cyf/*Our Ref*:
Dyddiad/*Date*: **5th November 2013**

Sorcha Lewis
Head Countryside Ranger
Elan Valley Visitor Centre
Elan Valley
Rhayader
Powys
LD6 5HP

Dear Sorcha,

I am writing with reference to the work you have been doing to achieve 'Dark Skies' recognition for the Elan valley area, and would like to offer the support of Powys County Council for this initiative.

I am aware of the increase in interest in stargazing as a hobby among the 'independent explorer' type of visitors we are trying to attract to Powys, and by raising the profile of the area as a suitable, low light pollution area, I hope to see many new visitors to Powys bringing economic benefits to local businesses and communities, and particularly extending the tourism season into the autumn and winter months.

The Tourism Service of the Council has a programme of online marketing activities based around the key destination of Powys, and this Dark Skies initiative can most certainly be promoted as part of the wider destination offer in the Cambrian Mountains area. I would also suggest developing cross promotional linkages with the Brecon Beacons National Park, who achieved International Dark Sky reserve status in 2012.

I would like to wish you every success with this initiative, and please do not hesitate to contact us if we can be of any further assistance.

Yours sincerely,

Sue Bolter
Pennaeth Adfywio, Eiddo a Chomisiynu /
Head of Regeneration, Property & Commissioning

ARIENNIR GAN Y LOTERI
LOTTERY FUNDED

communities first cymunedau yn gyntaf

Cronfa Amaethyddol Ewrop ar gyfer Datblygu Gwledig: Ewrop yn Buddsoddi mewn Ardaloedd Gwledig
The European Agricultural Fund for Rural Development: Europe Investing in Rural Areas

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Hosteli Unigeddau'r Elenydd | Elenydd Wilderness Hostels

www.elenydd-hostels.co.uk
Rhif Cofrestru Comisiwn Elusennau/Charity Commission Registration number:1115946
Swyddfa Gofrestredig/ Registered Office:7 Azalea Close Cyncoed Cardiff CF23 7HR
Llywydd/ President:Trevor Fishlock

Monday, 25 November 2013

Dear Sorcha.

Re – International Dark Sky Status Application.
Elan Valley Trust

The Elenydd Wilderness Hostels Trust; which is a volunteers charitable organisation owns; and manages two hostels named Dolgoch and Ty'n Cornel.

These hostels lie on the southern edge of the Elan Valley in the Southern Cambrian Mountains.

The Elenydd Trust welcomes the opportunity to support (in any way within the remit of the Elenydd Trust) the application ,which we understand is being put forward by the Elan Valley Trust for 'International Dark Sky Status' for the land and reservoirs comprising the Elan Valley. This status will enhance the visitors experience and protect wildlife .We would be obliged if you could keep the Elenydd Trust informed as to the progress of your application We would be able to place in both Hostels any promotional posters advertising your application Please send any such literature to me.

Yours sincerely

Geoffrey D.V. Williams.
Publicity Secretary the Elenydd Trust

Head Ranger
The Elan Valley Trust
Elan Estate Office. Elan Village
Rhyader Powys LD6 5HP

Geoffrey D. V. Williams
' Maesquarre'
Bethlehem Road

RHAYADER TOWN COUNCIL

Clerk: Carl Baker
Glennydd
South Street
Rhayader
Powys
LD6 5BH

Tel: 01597 810405
carl.baker@homecall.co.uk

15th August 2013

Mrs. S. Lewis,
Head Countryside Ranger,
The Elan Valley Visitors Centre,
Elan Valley,
Rhayader,
Powys.
LD6 5HP

Dear Sorcha,

International Dark Skies Status for the Elan Valley.

Your recent letter was received with great interest by the Town Council.

Councillors appreciate that receiving official recognition of the dark skies which already exist in the Elan Valley by it being designated an International Dark Sky Park will bring the area to the attention of a new section of the public besides those who are attracted to the wonderful scenery and open spaces for which it is renowned.

The recent spectacular sight of meteorites, which could even be view in Rhayader, reinforce your comments that the whole area endures far less light pollution than so many other places.

The Town Council fully supports your aspirations in this venture and wish you every success in achieving Dark Sky Status.

Yours sincerely,

Carl Baker
Clerk to Rhayader Town Council

Rhaeadr Gwy - Rhayader

Rhayader 2000 Ltd

rhayader2000@rhayader.co.uk
www.rhayader.co.uk
01597 810081

The Arches
West Street
Rhayader
Powys LD6 5AB

Y Bwau
Stryd Y Gorllewin
Rhaeadr
Powys LD6 5AB

Sorcha Lewis
Head Ranger
Dwr Cymru Welsh Water
The Elan Valley Visitor Centre
The Elan Valley
Rhayader
LD6 5HP

30 July 2013

International Dark Skies application

Dear Sorcha,

Your application for International Dark Skies status was discussed at our recent board meeting.

Rhayader 2000 fully supports your application. We feel adding the Dark Skies to the visitor experience is important both to our local economy and of course to further boost the conservation of our area.

Please get in touch if you require help in taking this exciting development further.

Yours sincerely,

Alan Samuel
Development Officer

Maes y Geidfa
Crossgates
Llandrindod Wells
Powys LD1 6RP

26th June 2013

To Whom It May Concern:

I should like to add my sincere and firm support for the Elan Valley Trust's initiative to gain International Dark Sky Park status. I write as a long-standing resident of Mid Wales, member of the Radnorshire Wildlife Trust Conservation & Scientific Committee and Director of the Powys and BBNP Biodiversity Information Service.

Like many others in Mid Wales, I have long held the view that our landscape - not just below the horizon, but also above it - is one of our most significant economic and social assets. It is worth noting and often not widely appreciated that Mid Wales - the Elan Valley area included - possesses some of the darkest skies in the UK.

The sky – and more particularly an untarnished, starry night-sky – represents the ultimate "*Area of Outstanding Natural Beauty*" and "*Site of Special Scientific Interest*". On that basis alone, it certainly deserves as much protection as we afford the environment 'below-the-horizon' and I believe the achievement of Dark Sky Park status will play an essential part in that protection.

In addition to the numerous economic opportunities and benefits that such a designation can bring - not least in relation to year-round tourism - there opens up an equally exciting range of educational opportunities for all ages and levels, and across a wide geographical catchment.

Lastly, at a recent meeting between the Brecon Beacons National Park and Powys Biodiversity Information Service, an initiative is now underway in which the Elan Valley Trust is set to play a vital role. The aim is to develop and make available a GIS-based dataset - initially covering the BBNP area, and then subsequently over a wider area of Wales - combining for the first time (we believe) biodiversity data with sky darkness measurements. The combined data would be available for scientific research but may well have other benefits in the longer term.

There is an increasing body of evidence pointing to light pollution as a contributing factor in biodiversity changes – and because human wellbeing is inextricably linked to the rest of biodiversity, we ignore this at our own risk. Moreover, many of our children and grandchildren are growing up never having experienced the full majesty of a starry night sky with its milky-way and mysterious nebulae.

There is a parallel here in terms of the loss of insect-filled, wildlife-rich meadows, which our grandparents might have walked across as children, but which are not part of young people's everyday experience in the early 21st century. There is an argument that with greater appreciation and understanding, comes a greater sense of ownership and responsibility to protect our environment. In the absence of this link, it is easy to lose environmental assets - and the value and opportunities they provide - without fully realising what we have lost. It cannot be right to deny today's and tomorrow's children the joy of these experiences. So I support the Elan Valley Trust's Dark Skies initiative.

R W Dennison

The British Astronomical Association's Campaign for Dark Skies - working towards star-quality lighting

www.britastro.org/dark-skies

Bob Mizon MBE, FRAS
CfDS Co-ordinator
38 The Vineries, Colehill
Wimborne, Dorset BH21 2PX

01202 887084
e-mail: bob.mizon@yahoo.co.uk

Mr Leslie Fry
Maesycoed
Trawscoed
Aberystwyth.
Ceredigion SY23 4LL

May 15 2014

Dear Mr Fry,
The British Astronomical Association, and especially its Campaign for Dark Skies section (CfDS), is particularly interested to hear of the dark-sky initiative in the Elan Valley, with a view to the possibility of securing Dark-Sky status within the IDA scheme for the Elan Valley area.

We have worked with Exmoor, Galloway Forest Park, Brecon Beacons, the South Downs National Park and the island of Sark on similar schemes. We are currently advising the Cranborne Chase

and West Wiltshire Downs Area of Outstanding Natural Beauty on a similar project.

The CfDS believes that, while pursuing its aim to secure the optimum night sky for all Britons, wherever they live, it is also important to foster centres of excellence where astronomers, authorities and local residents work together to preserve existing very dark night skies. We know from experience that the night sky over the Elan Valley must be one of the darkest in the UK.
We therefore wish you and your colleagues all success in your aim to secure dark-sky status for the Elan Valley. Please let us know if we can help in any way.

Yours sincerely,
Bob Mizon Coordinator BAA Campaign for Dark Skies.

Tanfelin
Llanafan
Aberystwyth
Ceredigion
SY23 4BD
01974261425

www.cambriansafaris.co.uk

Dear Sir / Madam,

I write to support the plans to apply 'Dark Skies' status to the Elan Valley Estate, and when possible a greater area of the Cambrian Mountains.

The Cambrian Mountains Tourism network – the tourism branch of the Cambrian Mountains Initiative – is working to gain increased recognition of the Cambrian Mountains as a tourist destination, the dark skies status would be a great boost to 'shoulder season' visitors.

At Cambrian Safaris we work closely with the accommodation sector to promote the areas' natural attractions and encourage people to come again by giving them ideas of places to explore for themselves. We have considered evening / night tours in both the summer and autumn.

Dark Skies Status would be a great help in putting the Cambrian Mountains on the Map!

Regards,

Richard Smith,

Cambrian Safaris.

Astronomical Events at the Elan Valley.

Council for
Learning Outside the Classroom

Learning Outside the Classroom Quality Badge

Awarded to:

Elan Valley Estate

This organisation has therefore pledged to:

- Engage in an ongoing process to sustain high quality learning outside the classroom
- Meet all of the Learning Outside the Classroom Quality Badge indicators

Beth Gardner
Chief Executive, Council for Learning Outside the Classroom

Certificate no. R1QB100039

Date issued: 30/05/2013 Expiry date: 31/05/2015

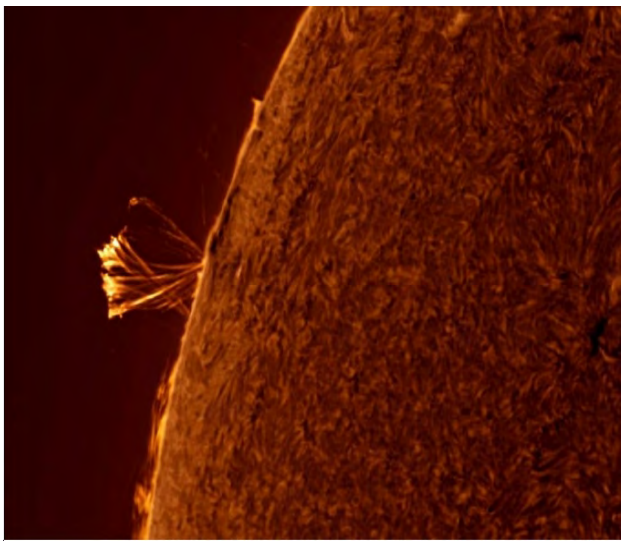
www.lotcqualitybadge.org.uk

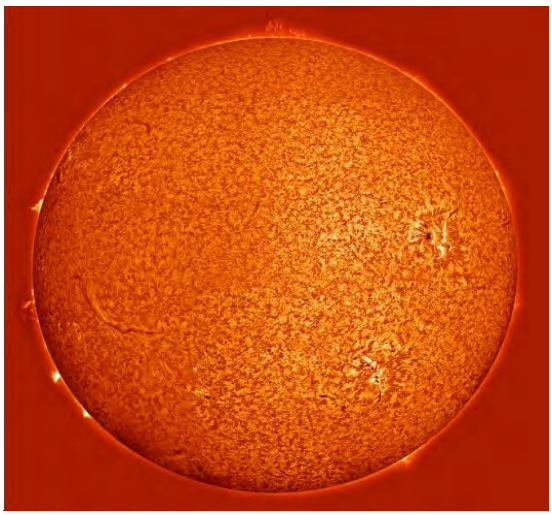
The Council for Learning Outside the Classroom is registered in the United Kingdom no. 06778701.

26-01-2014 … Talk on “Chosing and using a telescope”, by Les Fry. Attended by 50+ people of all ages.

08-03-2014 … Observation Evening at the Visitors Centre. Nine different telescopes were available, for members of the public to look at the Moon, Jupiter and other celestial sights.

16-03-2014 .. Solar Observation Event at the Visitors Centre. The renowned Gary Palmer showed the public, safe Solar observing through full aperture white light scopes, Hydrogen Alpha telescopes and Calcium light telescopes. Live views from some of the telescopes were displayed inside the centre along with feeds from various web sources.

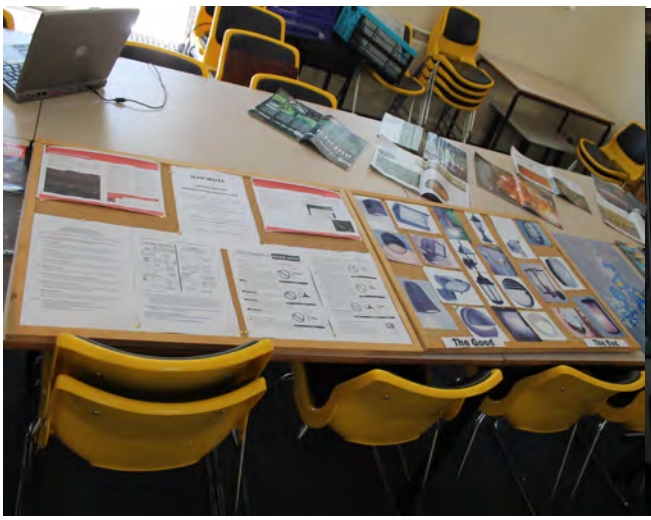




Photo's -Gary Palmer

04-05-2014 .. Planned observation meeting at Caban Coch but clouds had other ideas!

22-06-2014 .. International Solar Sunday. Lead by Gary Palmer and Les Fry, visitors were again treated to different views of the Sun, this time including a couple of simple Solar Radio telescopes. Visitors also saw displays of different lighting types, alongside details and updates of the Elan's Dark Sky Park application.



Les Fry


DELL
Catalogue
The Radio Sky

02-08-2014 .. Basic “kids” rocket design and launch day. Using pop bottles, water and air, youngsters can design, build and launch their very own “space rockets”.

After a 24 hour postponement due to weather, thirteen budding young – and some not so young - rocketeers turned up to build and launch their rockets. The event had an international element with the arrival and launch from “Team Holland” under the guidance of Matthiaus and his Parents. For the purpose of the event, the European Space Agency (ESA), became renamed the *Elan Space Agency*, and can proudly declare that all thirteen launches successfully achieved low atmospheric insertions. The *Elan Valley Astronomy* facebook page received the following from his parents -

After the Saturday launch was cancelled we showed up again on Sunday. Team Holland, on holiday in the best kept secret of Wales, had no idea what to expect. 4-year old team leader Matthias is an enthusiastic dabbler so this event was brilliant. Despite the launch being somewhat affected by the wind it's amazing to see how high you can get fuelled by water. The remaining week the rocket was ever present where-ever we went. Thanks a lot, Elan Space Agency!

"Team Holland" and a proud Matthias ready to launch.

All "rocket day" photographs by Kris Fry.

19-09-2014 .. A chance to do an easy scale walk of our Solar System, talking about the Planets and the Night Sky in general as we wander along in the evening twilight.

25 people turned up to experience our walk and talk through the Solar System. With the Planetary diameters displayed in the same scale as their distances from the Sun, our explorers soon started to get a feel for the distances and proportions involved within our Solar System. After reaching Pluto at a distance of 1.7km from our start point, a discussion of interstellar distances arose and on discovering that to reach the next nearest star system they would have to walk a further 11,607km, they boldly decided to return home! During this return, we discussed the Elan's plans for Dark Sky Park status and lighting needs in general.

As a result of this walk, it was later repeated for the *Powys Dance Group*, who have obtained funding to produce a work based on the Elan and the Dark Skies. The group spent the weekend experiencing the Elan Valley for themselves, with the walk in the twilight followed by a discussion of various astronomical phenomena that they may wish to consider incorporating into their dance production.

I further note that we have been contacted by two schools who wish us to either “bring the walk to them”, or to visit the Elan and to experience the walk here. At this moment in time, we are just waiting for confirmation of dates to schedule these in.

25-10-2014 .. A testing observation session on the occultation of Saturn by the Moon. - Unfortunately clouded / rained off.

13-12-2014 .. An observation session, lying down!! A night of Geminid Meteor observations from 21.00UT until Moonrise.

"Penciled in" plans for the 2015 programme of astronomical events at the Elan Valley include -

Observation evening Feb 21st, taking in the conjunction of Venus and Mars.

Observation of the 90% Solar Eclipse on 20th March, working in visual, Hydrogen Alpha and with Radio telescopes. Link up via web sources to view if cloudy here.

Observation evening 30th April, taking in Mercury and Venus. Mercury being in conjunction with the Pleiades cluster.

Observation evening 30th June, conjunction of Venus and Jupiter in twilight skies.

July/Aug ESA (Elan Space Agency), taking to the skies again with kids fun rocket construction and launch day.

Aug 13th Perseid meteor watch.

Sept Evening "astronomical" walk on Estate

Oct 29th Occultation of members of the Hyades Cluster.

Dec 13-14th Geminid meteor watch.

Possible "talk and show" meetings include,

"Newbie night" - Basic telescope set up and use.

"Solar imaging workshop"

FUTURE ASPIRATIONS – A "WISH LIST"

The following comments represent possible directions and or objectives for the Elan Valley Estate in the future, but should not be taken as "cast in stone", and as such, are subject to adaptation or cancellation without notice due to unforseen circumstances or changes in conditions.

A higher profile astronomical presence located at the Visitor Centre, be it in the form of updatable information and display boards or a permanently allocated display area in the Centre.

Designation of specific observing sites within the Estate and proposed Park boundary. These would deliver all sky – or as near as practicable – viewing sites, with hard standing for telescopes and ancillary equipment. These sites should be accessible by car but adequate screening should be in place to prevent light intrusion to the observers and night sky. A possibility to include some form of power delivery system to the site, solar chargers for example, could be considered.

Mid Wales seems currently without an astronomical society. There is a "Facebook" association under "Elan Valley Astronomy", but there exists the potential for developing the Visitor Centre at the Elan as the base for a new society.

We have already held two “solar system” walks, one at special request. It seems that it would be worth investigating the possibility of making this a permanent feature on the Estate. We have been further approached by a teacher, who having attended our walk on the 19th Sept, wishes to bring her class along at a future time to experience it for themselves. This date has yet to be finalised.

Should significant funding become available, there may also exist an opportunity to create a planetarium facility at the visitor center. This would generate further visitor footfall and finance to the center's facilities, also enabling outreach potential to educational establishments in the Mid Wales region.

Installation of a Park “all sky camera”. Linked to the Elan's web page, any potential astronomers who were planning to make a trip to the Elan Dark Sky Park to make observations could instantly obtain a “live” update of current sky conditions.

MISCELLANEOUS LITERATURE. LIGHTING GUIDANCE, LIGHT SURVEY AND PRESS CUTTINGS.

GUIDANCE NOTES FOR THE REDUCTION OF OBTRUSIVE LIGHT

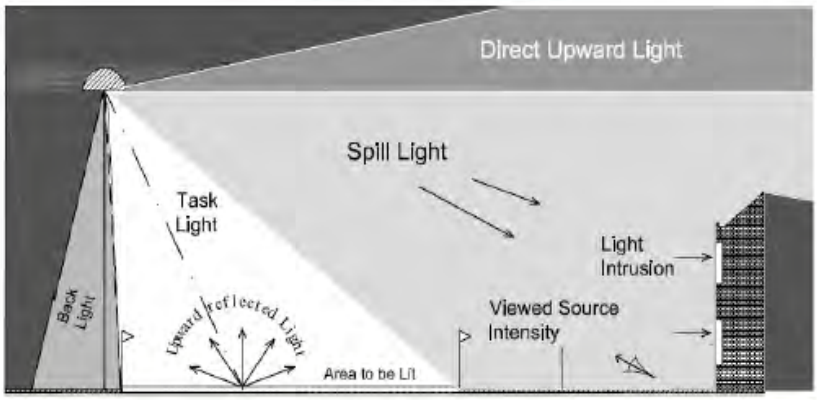
"Think before you light - The right amount of light, where wanted, when wanted."

Man's invention of artificial light has done much to safeguard and enhance our night-time environment but, if not properly controlled, **obtrusive light** (sometimes referred to as light pollution) can present serious physiological and ecological problems.

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

Sky glow, the brightening of the night sky, **Glare** the uncomfortable brightness of a light source when viewed against a darker background, and **Light Intrusion ("Trespass")**, the spilling of light beyond the boundary of the property or area being lit, are all forms of obtrusive light which may cause nuisance to others and waste money and energy. Think before you light. Is it necessary? What effect will it have on others? Will it cause a nuisance? How can you minimise the problem?

Figure 1 – Types of obtrusive light



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

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

"Good Design equals Good Lighting"

Any lighting scheme will consist of three basic elements: a light source, a luminaire and a method of installation.

Light sources (Lamps)

Remember that the light source output in LUMENS is not the same as the wattage and that it is the former that is important in combating the problems of obtrusive light.

Most nightime visual tasks are only dependant on light radiated within the visual spectrum. It is therefore NOT necessary for light sources to emit either ultra-violet or infra-red radiation unless specifically designed to do so. It is also understood that light from the shorter wavelengths of the spectrum has important effects on both flora and fauna that should be considered.

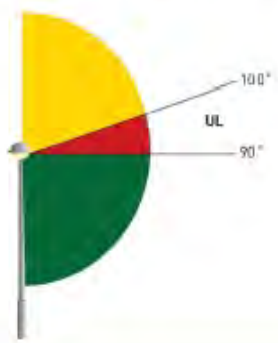
Research indicates that light from the blue end of the spectrum has important non-visual effects on the health of the human body, in particular in our sleep/wake patterns. It is therefore important to appreciate that while in obtrusive light terms the use of blue light should be minimised, there are many night-time tasks such as driving and sports where to be fully awake is an important aid to safety.

Luminaires

Care should always be taken when selecting luminaires to ensure that appropriate products are chosen and that their location will reduce spill light and glare to a minimum.

Use specifically designed lighting equipment that minimises the upward spread of light near to and above the horizontal. The most sensitive/critical zones for minimising sky glow are those between 90° and 100° as shown in Figure 2 and referred to as the lower, upward light output zone (UL).

Figure 2 – Critical luminaire angles For minimising sky glow



For most sports and area lighting installations the use of luminaires with double-asymmetric beams designed so that the front glazing is kept at or near parallel to the surface being lit should, if correctly aimed, ensures minimum obtrusive light.

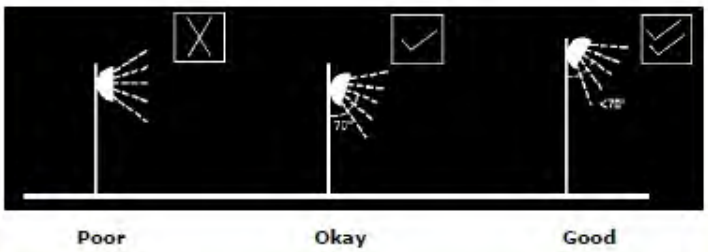
Appendices 1 and 2 to these notes gives more details of how to choose and if necessary modify luminaires.

Installation

In most cases it will be beneficial to use as high a mounting height as possible, giving due regard to the daytime appearance of the installation. The requirements to control glare for the safety of road users are given in Table 3.

Keep glare to a minimum by ensuring that the main beam angle of all lights directed towards any potential observer is not more than 70°. Higher mounting heights allow lower main beam angles, which can assist in reducing glare. In areas with low ambient lighting levels, glare can be very obtrusive and extra care should be taken when positioning and aiming lighting equipment. With regard to domestic security lighting the ILP produces an information leaflet GN02:2009 that is freely available from its website.

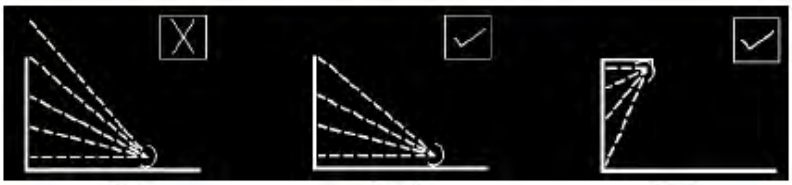
Figure 3 – Luminare aiming angles



When lighting vertical structures such as advertising signs, direct light downwards wherever possible. If there is no alternative to up-lighting, as with much decorative lighting of buildings, then the use of shields, baffles and louvres will help reduce spill light around and over the structure to a minimum.

For road and amenity lighting installations, (see also design standards listed on Page 5) light near to and above the horizontal should normally be minimised to reduce glare and sky glow (Note ULR's in Table 2). In rural areas the use of full horizontal cut off luminaires installed at 0° uplift will, in addition to reducing sky glow, also help to minimise visual intrusion within the open landscape. However in some urban locations, luminaires fitted with a more decorative bowl and good optical control of light should be acceptable and may be more appropriate.

Figure 4 – Façade Illumination



Since 2006 "Artificial Light" has been added to the list of possible Statutory Nuisances in England, Wales and Scotland. The monitoring of such nuisances will be the responsibility of Environmental Health Officers (EHOs) for which separate guidance is being produced.

With regard to the planning aspect, many Local Planning Authorities (LPAs) have already produced, or are producing, policies that within the planning system will become part of their local development framework. For new developments there is an opportunity for LPAs to impose planning conditions related to external lighting, including curfew hours.

The Scottish Executive has published a design methodology document (March 2007) entitled "Controlling Light Pollution and Reducing Energy Consumption" to further assist in mitigating obtrusive light elements at the design stage.

ENVIRONMENTAL ZONES

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

Table 1 – Environmental Zones

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

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

NB: Zone E0 must always be surrounded by an E1 Zone.

DESIGN GUIDANCE

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

Table 2 – Obtrusive Light Limitations for Exterior Lighting Installations – General Observers

Environmental Zone	Sky Glow ULR [Max %][1]	Light Intrusion (into Windows) E_v [lux] [2]		Luminaire Intensity I [candelas] [3]		Building Luminance Pre-curfew [4]
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Average, L [cd/m²]
E0	0	0	0	0	0	0
E1	0	2	0 (1*)	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5.0	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,500	25

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

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

I = **Light Intensity in Candelas (cd)**

L = **Luminance in Candelas per Square Metre (cd/m²)**

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

* = **Permitted only from** Public road lighting installations

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

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

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

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

Table 3 – Obtrusive Light Limitations for Exterior Lighting Installations – Road Users

Road Classification (1)	Threshold Increment (TI)	Veiling Luminance (Lv)
No road lighting	15% based on adaptation luminance of 0.1cd/m^2	0.04
ME6/ ME5	15% based on adaptation luminance of 1cd/m^2	0.25
ME4/ ME3	15% based on adaptation luminance of 2cd/m	0.40
ME2 / ME1	15% based on adaptation luminance of 5cd/m^2	0.84

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

Lv = **Veiling Luminance** is a measure of the adaptation luminance caused by the disability glare from the obtrusive light installation

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

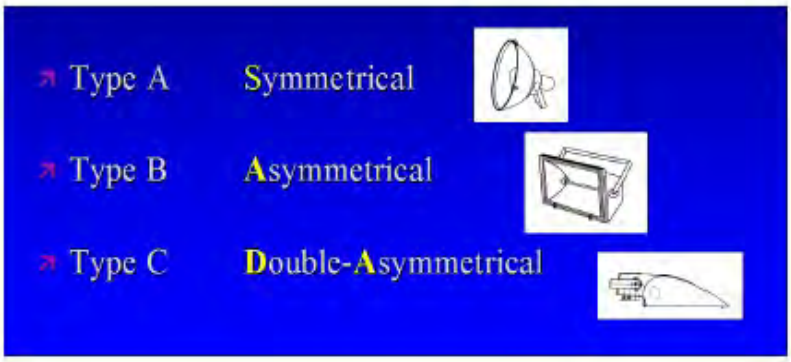
RELEVANT PUBLICATIONS AND STANDARDS:

British Standards: www.bsi.org.uk	BS 5489-1: 2003 Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas BS EN 13201-2:2003 Road lighting – Part 2: Performance requirements BS EN 13201-3:2003 Road lighting – Part 3: Calculation of performance BS EN 13201-4:2003 Road lighting – Part 4: Methods of measuring lighting performance. BS EN 12193: 1999 Light and lighting – Sports lighting BS EN 12464-2: 2007 Lighting of work places – Outdoor work places	
Countryside Commission/ DOE	Lighting in the Countryside: Towards good practice (1997) *(Out of Print but available on www.communities.gov.uk/index.asp?id=1144823)*	
UK Government / Defra www.defra.gov.uk	Statutory Nuisance from Insects and Artificial Light – Guidance on Sections 101 to 103 of the Clean Neighbourhoods and Environment Act 2005	
	Road Lighting and the Environment (1993) (Out of Print)	
CIBSE/SLL Publications: www.cibse.org	CoL	Code for Lighting (2002)
	LG1	The Industrial Environment (1989)
	LG4	Sports (1990+Addendum 2000)
	LG6	The Exterior Environment (1992)
	FF7	Environmental Considerations for Exterior Lighting (2003)
CIE Publications: www.cie.co.at	01	Guidelines for minimizing Urban Sky Glow near Astronomical Observatories (1980)
	83	Guide for the lighting of sports events for colour television and film systems (1989)
	92	Guide for floodlighting (1992)
	115	Recommendations for the lighting of roads for motor and pedestrian traffic – Second Edition (2010)
	126	Guidelines for minimizing Sky glow (1997)
	129	Guide for lighting exterior work areas (1998)
	136	Guide to the lighting of urban areas (2000)
	150	Guide on the limitations of the effect of obtrusive light from outdoor lighting installations (2003)
	154	The Maintenance of outdoor lighting systems (2003)
ILP Publications: www.theilp.org.uk	TR 5	Brightness of Illuminated Advertisements (2001)
	TR24	A Practical Guide to the Development of a Public Lighting Policy for Local Authorities (1999)
	GN02	Domestic Security Lighting, Friend or Foe
ILP/CIBSE Joint Publications	Lighting the Environment - A guide to good urban lighting (1995)	
ILP/CSS Publications	Joint Code of Practice for the installation, maintenance and removal of seasonal decorations. (2005)	
ILP/CfDS Joint Publication www.dark-skies.org	Towards Understanding Sky glow. 2007	
IESNA www.iesna.org	TM-15-07 (R) Luminaire Classification System for Outdoor luminaires	

NB: These notes are intended as guidance only and the application of the values given in Tables 2 & 3 should be given due consideration along with all other factors in the lighting design. Lighting is a complex subject with both objective and subjective criteria to be considered. The notes are therefore no substitute for professionally assessed and designed lighting, where the various and maybe conflicting visual requirements need to be balanced.

APPENDIX 1 - PROPOSED OUTDOOR LUMINAIRE CLASSIFICATION SYSTEM

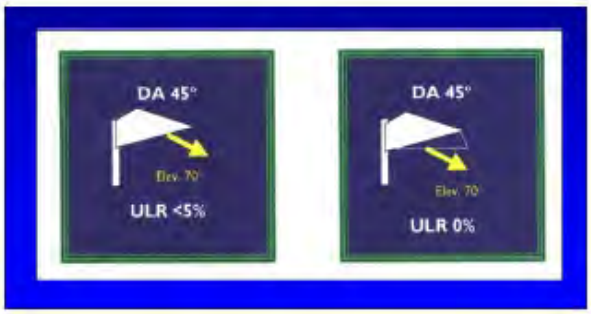
Variable Aim Luminaires – General Classifications:



Proposed labelling System:

Fixed Position luminaires

Variable Aim Luminaires
(Shown here for a 45° Double-Asymmetric luminaire aimed at 70° – with and without a cowl).



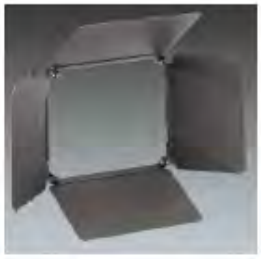
APPENDIX 2 - ILLUSTRATIONS OF LUMINAIRE ACCESSORIES FOR LIMITING OBTRUSIVE LIGHT (images provided by Philips and Thorn)

Cowl (or Hood)

External Louvre

SHIELD

SHEILD "Barn Doors"



Double Asymmetric Luminaire

Simple Hood

Circular Louvre

Cowl & Louvre

Internal Louvre (horizontal)

Internal Louvre (vertical)

CPRE and CfDS Lighting Nuisance survey 2009/10: results

Question 1: Where does the light pollution come from? (multi choice)

Source	#1	#2	#3
Transport facility	Road (88.9%)	Other (8.8%)	Railway (8.5%)
Public service facility	Sports ground (52.9%)	School or educational establishment (35.4%)	Other (26%)
Business	Other (56.3%)	Supermarket (40.8%)	Offices (29.5%)
Private residence	Security lights (79.3%)	Other form (20.7%)	
Street lighting	Lights that are more than five years old (77%)	Lights that are under five years old (23%	

Question 2: Does the lighting come from a:

Type	Response
New development	14.8%
Established source with a new lighting scheme	20.1%
Established source with an established lighting scheme	65.1%

Question 3: Are the lights:

Location	Response
Along a road	47.2%
On a building perimeter	28.6%
Other	12.7%

Question 4: When are the lights on?

When	Response
All night	81.8%
Intermittent	11.2%
Switched off at a certain time	7.1%

Question 5: What problems is the light causing you? (multi choice)

Problem	Response
1:Affecting the view of the night sky from your property	83.4%
2: Shining in to a bedroom window, hindering sleep	49.5%
3: Affecting the view of the night sky from a public area	46.2%
4: Shining across your drive or garden	36.7%
5: Detracting from the view of the countryside from your property	29.7%
6: Shining in to another window in your property	29.6%

Question 6: What measures have you taken to deal with the light pollution? (multi choice)

Measure	Response
1: Thicker curtains	67.9%
2: Confronted person responsible for the light pollution	23.6%
3: Created a screen using fencing or planting trees	15.3%
3: Other measure	15.3%
4: Sleeping in a different room	14.3%
5: Moved house	2.6%

Question 7: Have you complained to your:

Who	Response
1: I have not complained	71%
2: Directly to the lighting owner	15.6%
3: Council planning department	12.6%
4: Council environmental health department	11.5%
5: MP	3.8%

Question 8: If you have complained to your council have they been supportive?

Yes	27.2%
No	72.8%

Question 9: Do you think that wasted light should be addressed to help cut energy waste and carbon emissions?

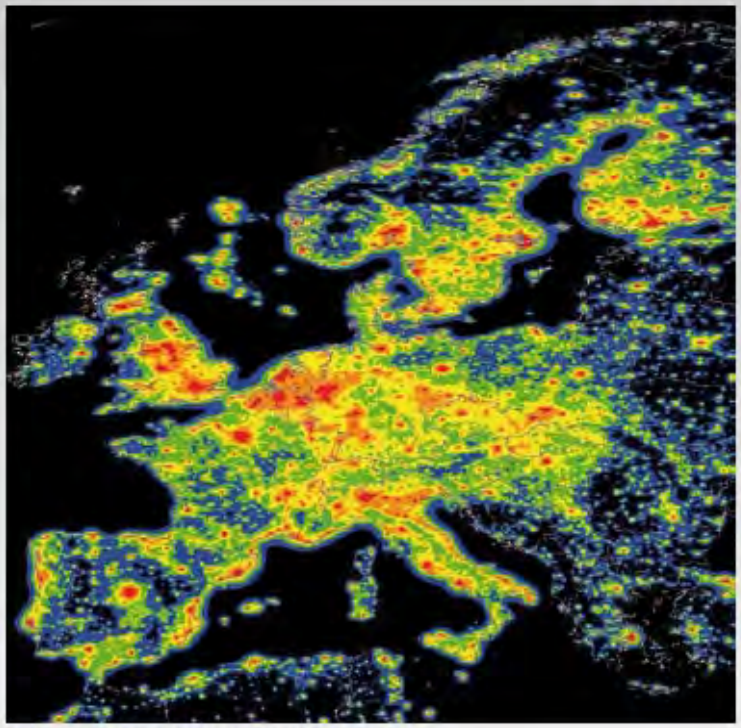
Yes	99.1%
No	0.9%

Starry starry night ??

Bob Dennison

As a lover of the landscape, I am often dismayed by people's tendency to forget that bit above the horizon! The sky – and more particularly an untarnished, starry night-sky – represents the ultimate *"Area of Outstanding Natural Beauty"* and *"Site of Special Scientific Interest"*. On that basis alone, it surely deserves as much protection as we afford the environment 'below-the-horizon'.

I have been concerned for some years about the relentless degradation of our night skies from light pollution; and when I searched the internet in preparation for this article, I was staggered to see how widespread a concern it has become – both geographically and in terms of the interest groups affected. I was also horrified to learn that, despite a growing interest and concern over light pollution, the problem is set to get worse before it gets better.



Artificial night sky brightness across Europe
http://www.inquinamentoluminoso.it/download/euromini.jpg

So what is light pollution and what are the causes?

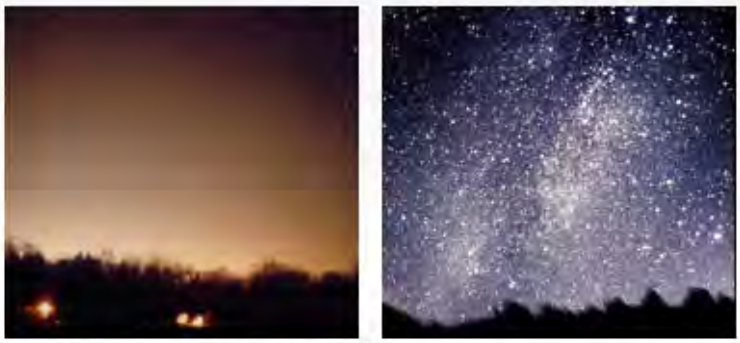
Light pollution has been defined by various "dark-skies" organisations as *"any unwanted or adverse effect of artificial light"*. If we need to artificially illuminate an external area, then 'useful light' is that which falls only on the area to be lit. Any light experienced outside this is 'spill light' or 'obtrusive light' and is where the problem of light pollution begins. The Institution of Lighting Engineers have described different aspects of the problem as;-

– **sky glow** (the brightening of the night sky above towns and villages, caused mainly by light being allowed to shine above the horizontal plane)

– **light trespass** (the spilling of light beyond the boundary of the property on which the light source is located) and

– **glare** (the uncomfortable brightness of a light source when viewed against a dark background)

Most sources of external artificial lighting which I see are guilty of producing unwanted **obtrusive light**. Omni-directional luminaires (still favoured by some architects, planners and home-owners) inevitably contribute to light pollution; but even luminaires which can be directed are often badly directed. Moreover, there is a tendency for lighting to be over-powered and simply left on when it is not actually needed.



The night sky with and without artificial light.
Photo: Todd Carlson- International Dark Skies Association
http://www.darksky.org/resources/protecting-our-night-environment#(24)

What are the effects?

Part of the problem is the imperceptibly gradual nature of the degradation of our night sky. As with many gradual social changes, undesired effects are somehow able to slip under our collective radar. Photographic techniques and satellite imaging, however, allow us to see the dramatic changes over the last few decades and to predict how light pollution may develop in the future.

It is worth noting and often not appreciated that Powys possesses some of the darkest skies in the UK. Nevertheless, the very prevalence of dark skies in mid Wales means that even a small increase in light pollution can have a significant adverse effect on the night-time landscape.

The effects of light pollution are not, however, restricted to human wellbeing. Alan Outen, a notable UK ecologist, has long argued that there are numerous subtle, but significant, effects on the natural world. Changes have been noted in behaviour across many taxonomic groups, affecting resting, foraging and feeding, breeding, hatching, territorial and migratory patterns.

Many of us will be familiar with robins singing under street lights late into the night.

It has also been shown that even the dim light of a child's night light is enough to blind nocturnal frogs, impairing their ability to hunt crickets. Many biologists argue that light at night has an effect similar to habitat loss. As surely as development alters habitat, light can also render an area unsuitable for wildlife. Analogous to the presence of toxic compounds, light has the ability to cause physiological stress or impairment in vulnerable species, or to change the balance between predator and prey in a food chain.

Why the effect is so dramatic is not fully known, and may be different depending on the species. But Alan Outen is quoted with an intuitive, evolutionary explanation: *"Life on Earth evolved in the presence of alternating darkness and light . . . and has adapted to it."*

Why does it matter?

There seems to be an increasing body of evidence pointing to light pollution as a contributing factor in biodiversity changes – and because human well-being is inextricably linked to the rest of biodiversity, we ignore this at our own risk. Moreover, many of our children and grandchildren are growing up never having experienced the full majesty of a starry night sky with its milky-way and mysterious nebulae. There is a corollary here with the loss of insect-filled, wildlife-rich meadows, which our grandparents might have walked across as children, but which are not part of young people's everyday experience in the early 21st century.

There is an argument that with greater appreciation and understanding comes a greater sense of ownership and responsibility to protect our environment. In the absence of this link, it is easy to lose environmental assets (and the value and opportunities they provide) without fully realising what we have lost. It cannot be right to deny today's and tomorrow's children the joy of these experiences.

An example of good street lighting

Colli'r nos

Yn raddol bach, heb i ni sylwi, mae tywyllwch y nos wedi cael ei ddinistrio gan olau artiffisial ac mae hi'n broblem eang. Bellach, mae lluniau lloeren yn gallu dangos pa mor ddrwg.

Y broblem yw golau ymwthiol, sy'n mynd y tu hwnt i'r lle sydd wir angen ei oleuo, a hynny'n oherwydd goleuadau sy'n llewyrchu i bob man neu sydd wedi eu cyfeirio'n wael. Mae llawer o oleuadau hefyd yn rhy gryf.

Nid pobl yw'r unig rai sy'n dioddef o lygredd golau. Mae'n cael effaith ar arferion gorffwys, bwydo, magu a mudo nifer fawr o rywogaethau; yn ôl rhai bywydegwyr mae'n debyg i'r broblem o golli cynefinoedd.

Yn yr un modd â gwenwyn, mae hefyd yn rhoi pwysau ar rywogaethau bregus neu newid y cydbwysedd rhwng heliwr a sglyfaeth yn y gadwyn fwyd.

Mae llygredd golau felly'n ychwanegu at newid mewn bioamrywiaeth a, gan ein bod ni wedi ein cysylltu'n annatod â gweddill bioamrywiaeth, mae'n beryglus i ni anwybyddu hyn.

Lighting on A487 extending into the open countryside

From CPRE publication - "Shedding Light"

Planning, lighting and the law

National planning

In March 2012, the Government introduced the first ever policy to control light pollution in the NPPF. CPRE welcomed this as a significant step forward. Paragraph 125 of the NPPF states: 'By encouraging good design, planning policies and decisions should limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.' CPRE had campaigned for many years for planning guidance to control light pollution, so we welcomed this important move.

National Planning Practice Guidance has also been published (in March 2014) on how local authorities should address light pollution[10]. This Guidance sets out how the Government defines the link between lighting and planning:

'Artificial light provides valuable benefits to society, including through extending opportunities for sport and recreation, and can be essential to a new development. Equally, artificial light is not always necessary, has the potential to become what is termed 'light pollution' or 'obtrusive light' and not all modern lighting is suitable in all locations. It can be a source of annoyance to people, harmful to wildlife, undermine enjoyment of the countryside or detract from enjoyment of the night sky. For maximum benefit, the best use of artificial light is about getting the right light, in the right place and providing light at the right time.

Lighting schemes can be costly and difficult to change, so getting the design right and setting appropriate conditions at the planning stage is important. In particular, some types of premises (including prisons, airports and transport depots where high levels of light may be required for safety and security reasons) are exempt from the statutory nuisance regime for artificial light, so it is even more important to get the lighting design for these premises right at the outset'.

The Guidance goes on to explore which factors should be considered when assessing whether a development proposal might have implications for light pollution and which factors are relevant when considering where, when and how much the light shines and possible ecological impacts. CPRE applauds the Department for Environment, Food and Rural Affairs for its proactive work on this issue and its willingness to take on board the views of CPRE in creating this Guidance. We hope that it will encourage more local authorities to address light pollution by adopting effective local planning policies in their Local Plans and associated local guidance.

IF SOMEONE'S LIFE IS BEING NEGATIVELY AFFECTED BY EXCESSIVE LIGHT THIS COULD BE DEEMED AS A LIGHTING NUISANCE

One of the aims of our survey was to find out whether the NPPF policy to control light pollution has made a difference to how lighting is dealt with by local authorities.

Lighting and the law

CPRE welcomed the first UK law tackling light pollution which came into force in 2006 under Section 102 of the Clean Neighbourhoods and Environment Act (2005)[11]. Exterior lighting joins noise and smells on the list of things that can be treated as a statutory nuisance; things against which local council Environmental Health Departments can take legal action. The law makes 'exterior light emitted from premises so as to be prejudicial to health or a nuisance' a criminal offence.[12]

This law does not tackle all forms of light pollution, only incidents of particularly bad lighting from some types of premises which cause people real nuisance. But CPRE would like to see it used, to raise awareness of the issue and to help people who are suffering from severe light pollution. If someone's life is being negatively affected by excessive light this could be deemed as a lighting nuisance, although it may not fall under the official criteria for a statutory nuisance. For example, if a street light is shining into a bedroom window it can affect quality of sleep but it is exempt from the statutory nuisance criteria.[13]

[11] Planning Practice Guidance: Light pollution http://planningguidance.planningportal.gov.uk/blog/guidance/light-pollution/

[12] *Clean Neighbourhoods and Environment Act (2005)* http://www.legislation.gov.uk/ukpga/2005/16/part/V/crossheading/statutory-nuisances

[13] Morgan-Taylor, M. (2012) *The Legal Methods of Controlling Light Pollution in the UK*, in Conference proceedings, pp 257- 276, 19 September 2012, Seoul, Korea. http://www.sustainablehealthybuildings.org/PDF/8th/martinbtaylor.pdf

[14] *CPRE Light pollution as a statutory nuisance: a how to guide* (2014) http://www.cpre.org.uk/resources/countryside/dark-skies/item/3545-light-pollution-as-a-statutory-nuisance-a-how-to-guide

Country Times

Elan Valley in bid for dark sky park status

A RADNORSHIRE beauty spot's night sky could gain special protection if it can secure international dark sky park status.

by NAOMI PENROSE
naomi.penrose@countytimes.co.uk

With some of the darkest skies in the UK, the Elan Valley estate, near Rhayader, which includes 18,000 hectares of land across Mid Wales and the Cambrian Mountains, will submit its bid to the US-based International Dark-Sky Association this month.

The estate, which has some of the lowest levels of light pollution in the UK, aims to attract more tourists by being certified as an ideal site for star gazing.

The only current dark sky designation in Wales is the Brecon Beacons, which was awarded the status in February.

International dark sky parks are areas where the night sky is protected and lighting controls are in place to prevent light pollution.

Sorcha Lewis, head ranger at Welsh Water's Elan Valley estate, said: "Having a dark sky status at the Elan Valley would have a positive impact on the local economy here in Mid Wales.

"Tourists interested in the night sky would be more likely to come and visit during the autumn and winter months, when tourism tends to be slightly quieter, which would be a huge benefit to local businesses.

"Aside from promoting tourism, we would also educate visitors of all ages about our night sky and show them how they can help to conserve it in their own homes.

"By simply reducing the wattage of light bulbs, we can all do our own bit to reverse light pollution, and therefore reduce our carbon footprint."

Sorcha also added that dark skies also helped to protect wildlife and the natural environment.

"Many birds and animals are affected by stray light intruding into their night world, confusing their natural patterns of activity and affecting their breeding cycles causing premature breeding

"As the Elan Valley is an area of spectacular beauty and abundant wildlife, it is crucial that we protect the wildlife of the night by ensuring we look after the dark skies here in Mid Wales," she said.

Astronomer, Allan Trow, manager at Dark Sky Wales, said: "We fully support the Elan Valley's application for dark sky status. The area provides an unusually dark area for night time observing providing amateur astronomers, the general public and tourism providers a unique environment in which to treasure the night sky and prosper from its economic potential."

The estate has held a number of events during the past year to promote dark skies.

The next of these will be a Star Meeting held on Sunday, January 26, 2014, from 7.30pm until 9pm, where visitors will have the chance to use scopes to learn all about the stars in the night sky.

For further information, contact the Elan Valley Visitor Centre on 01597 810 880.

'Dark sky park' bid for the Elan Valley estate

by Mary Queally

WITH some of the darkest skies in the UK, Dŵr Cymru Welsh Water's Elan Valley estate wants to become the first International Dark Sky Park in Wales.

The estate – approximately 18,000 hectares in Mid Wales and the Cambrian Mountains – has some of the lowest levels of light pollution in the whole of the UK, providing an ideal location to boost tourism.

International Dark Sky Parks are areas where the night sky is protected and lighting controls are in place to prevent light pollution. Currently, the only International Dark Sky designation in Wales is the Brecon Beacons, which was awarded the status in February this year.

Over 90 per cent of the UK population lives under a severely light polluted sky *(British Astronomical Association survey, 2012)*. Therefore, protecting skies that are free of light pollution is very important and should encourage more people to enjoy their true beauty.

Sorcha Lewis, head ranger at the Elan Valley, said: "Having a Dark Sky Status at the Elan Valley would have a positive impact on the local economy here in Mid Wales. Tourists interested in the night sky would be more likely to come and visit during the autumn and winter months when tourism tends to be slightly quieter, which would be a huge benefit to local businesses."

Unique

Local astronomer Allan Trow, manager at Dark Sky Wales, said: "We fully support the Elan Valley's application for dark sky status. The area provides an unusually dark area for night-time observing, giving amateur astronomers, the general public and tourism providers a unique environment in which to treasure the night sky and prosper from its economic potential.

"The benefit to businesses from a successful application via astro tourism is enormous, with companies like ours being able to provide astronomy-based activities and educational programmes."

The Elan Valley estate has been holding a number of events to promote its dark skies. The next one will be a Star Meeting on January 26.

Tourists interested in the night sky would be more likely to come and visit during the autumn and winter months

Elan Valley aspires to become Wales' first International Dark Sky Park

With some of the darkest skies in the UK, the Elan Valley estate wants to become the first International Dark Sky Park in Wales. The estate – which includes approximately 18,000 hectares of land across mid Wales and the Cambrian Mountains - has some of the lowest levels of light pollution in the whole of the UK, and this provides an ideal location to promote the enjoyment of night skies and boost tourism.

International Dark Sky Parks are areas where the night sky is protected and lighting controls are in place to prevent light pollution. Currently, the only International Dark Sky designation in Wales is the Brecon Beacons, which was awarded this status in February this year.

Sorcha Lewis, Head Ranger at the Elan Valley, said: "Having a Dark Sky Status at the Elan Valley would have a positive impact on the local economy here in mid Wales. Tourists interested in the night sky would be more likely to come and visit during the autumn and winter months, when tourism tends to be slightly quieter, which would be a huge benefit to local businesses.

"Dark skies are hugely important in protecting wildlife and the natural environment. Many birds and animals are affected by stray light intruding into their night world, confusing their natural patterns of activity and affecting their breeding cycles causing premature breeding. As the Elan Valley is an area of spectacular beauty and abundant in wildlife, it is crucial that we protect the wildlife of the night by ensuring we look after the dark skies here in mid Wales."

The Elan Valley estate has held a number of events during the past year to promote the dark skies. The next of these will be a Star Meeting held on Sunday, January 26 from 7.30pm until 9pm where visitors will have the opportunity to use scopes to learn all about the stars in the night sky.

For further information, please contact the visitor centre on 01597 810 880.

Comet C/2014 Q2 Lovejoy – 22 Jan 2015 - 21.18UT
Canon 1100d 300mm lens f/5.6 6400 ISO 2.5 sec.
Les Fry.

ACKNOWLEDGEMENTS.

As final "author" of this document, I'd like to thank everyone who has assisted in its completion, these being,

Alec Baker – Elan Estates Manager; *Ed Parsons* – Area Lands Manager Dwr Cymru; *Sorcha Lewis* and *Alan Samuel* – Previous and Current Head Rangers at the Elan Valley; The *Ranger* and *Volunteer Ranger* staff at the Elan Valley; *Managers* and *Staff* at Severn Trent water; *Gary Palmer* – Solar Guru; All the *residents* and *tenants* of the Elan village and Estate; *Staff* at the Elan Estate Office; and finally my Wife *Kris*, for understanding that "just another 5 minutes," could be quite a bit longer!!

A very special and heartfelt thank you is given to *John Barentine* of the IDA, without whose generous guidance and assistance, this application would not have come to fruition.

Les Fry - Jan 2015

ADDENDUM – March 2015

Since initial dispatch of this application to John Barentine of the IDA back in Feb 2015, it has become apparent that two of the application requirements require a little "reworking" and "clarification" along with some further correspondance which further aids our case. Rather than trying to adjust the original application to that end, and possibly introducing further errors in doing so, I choose to add such in the form of this addendum.

In relation to …. "**Minimum Requirements For All Parks**," item (B)(i) reads "*The Park's commitment to dark skies and lightscape management, as shown by: (i) The Park recognizes dark skies as an important natural, cultural, and/or scientific resource value as demonstrated by inclusion in approved management documents (e.g. General Management Plan, Resource Management Plan, Facility Development Plan)"*

It should be noted that there are no "*approved Management documents*" from either The Elan Estate Trust or Dwr Cymru/Welsh Water that currently contain such specific commitments as required in (B)(i), having been written well before any inkling of Dark Sky preservation had ever been considered. I therefore make the case to the IDA Committiee that the following should be considered as an alternative.

Page 4. Joint statement from EV Trust/ Dwr Cymru.

Page 6. Elan Trust's "Charitable objects". These were deliberately written to be as "all encompassing" as possible at the time and the preservation of the Dark Skies should be considered to be within their scope.

Page 9. Elan Valley Trust support letter.

Page 10. Dwr Cymru/Welsh Water support letter – Ed Parsons being the Area Lands Manager for that body.

I would also press the case that the policies contained within the LMP section of this application show clear commitment from both bodies, especially for a *charitable trust*, during what are still, harsh and austere economic times and that the ***LMP principles*** will ***guide Trust lands management*** for the future.

and under "**Minimum Requirements For All Parks**," item (B)(v) reads:

"*The Park has set a leadership example in the restoration of dark skies by implementing at least one of the following:*
(1) Producing at least one "night sky friendly" lighting project that is publicly visible and interpreted, OR
(2) Involving at least two external partners in dark sky restoration efforts (e.g. chamber of commerce, power utility, university research, tribal nations, environmental groups, conservation groups, natural history association), OR
(3) Cooperation with at least two nearby municipalities that results in adoption of lighting codes that improve sky conditions in the Park, OR
(4) Inventorying and monitoring night sky quality and using results to educate the public, OR
(5) A combination of the above or an alternative restoration project may be suggested."

We would hold the position that the light meter readings survey from Pages 60-64 of our application already cover part (4) of that requirement, and item 7 on Page 97 states our continued commitment, but what was not made clear was that at the two "Solar events" on 16th March and 22nd June 2014, displays were setup and **manned** so we were able to discuss with attending members of the public the state of the Elan's DS Park application, demonstrate the light reading data already collected, and discuss lighting issues in general, thus meeting the "education" requirement of the second part of (4). Some of the photo's on Pages 114,115 and 116 display a portion of the lighting exhibition. I also had the opportunity to "discuss and educate" with those attending the two "Solar System walks" that are mentioned on Page 120.
I also show two emails from Powys County Council, relating to our application and then to LED street lighting in the area. I feel that these show that we have significant support and assistance from the **largest County Council in Wales**. Powys CC constitutes approx **25%** of the Welsh landmass and I offer the opinion that, the measure of support and involvement surpasses possibly (2) and (3) of the above minimum requirements.

I trust the Committiee sees that this demonstrates our requirement and involvment in *…..the restoration of dark skies.....*

Re Elan Valley Estate's IDA Dark Sky Park application

2 messages

Leslie Fry 28 February 2015 at 15:28
To: leigh.williams

Hello Leigh

Just to let you and your team know that we have finished compiling the application and it has been sent to the States for submission to the IDA review panel.

We wait with baited breath to hear back from them after March 24th which is this sessions review deadline.

Thank you for your support and assistance.

Kind regards
Kris and Les Fry
Elan Valley Astronomy

Leigh Williams (CSP - Local Environment) 2 March 2015 at 08:08
To: Leslie Fry <

Thanks Both,

I look forward to hear if you get it and also look forward to working with you in the future to ensure Elan Valley is untouched by obtrusive light.

Regards

Leigh Williams
Street Lighting Operations Manager
Unit 1 Ddole Road Enterprise Park
Llandrindod Wells
Powys
LD1 6DF
Tel: 01597829859
Mob: 07917090980

Fwd: Dark Skies - LED lights.

1 message

Parsons Edmund 6 March 2015 at 17:02
To: Leslie Fry

Hi Les,

Please find email from Kelvyn below, further document to follow from Al tomorrow

Please let us know if you require any further info.

Many thanks,

Ed

Sent from my iPhone

From: "Kelvyn Watson Curry (CSP - County Councillor)"
@powys.gov.uk>
Date: 16 January 2015 14:09:26 GMT
To: Parsons Edmund
Cc: "
Subject: Dark Skies - LED lights.

Dear Ed,

You may remember that when the Minister visited the Centre many months ago I brought up the issue of the Dark Skies initiative and the fact that although PCC were converting to LED lights in Rhayader, Cwmdauddwr and the Elan Valley the Trunk Road Agency on the A470 through Rhayader were not. Well, although it has taken a long time, work will begin tomorrow (Saturday 17th January) to convert all the street lights on the A470 through the town to LEDs thus reducing a considerable amount of light pollution. It is anticipated that the work will be completed in a couple of weeks.

Please let me know if you require more details.

Kind regards,

Kelvyn