

LIGHTING IMPACT REVIEW AND PROPOSALS

COBHAM HOUSE VINEYARD WINERY LIGHTING REVIEW – COBHAM,
GRAVESEND, KENT, DA12 3AA.

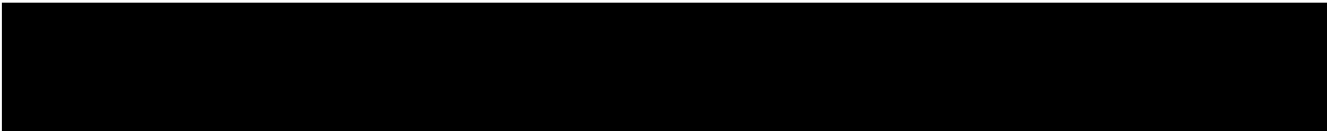
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Executive Summary

A high-level review has been completed from the planning application information provided. This has been benchmarked against British and industry standards in relation to the proposed use of the winery building, its location within the landscape and its potential to impact human and ecology receptors.

Several areas of concern are noted within this review which are explored in the report. Suggested improvements and solutions are detailed to find a compromise outcome for all parties so that this scheme can progress without impacts to any party or the environment.

Introduction

It does [REDACTED] have been commissioned to provide a lighting review based on the information provided by our client in relation to the proposed winery building which, in its current proposed location, will negatively impact the local area and its receptors. This lighting review has been undertaken to clarify objections from local residents regarding the sensitive nature of the Site, the nearby AONB, its E1 Environmental Zone classification and its ecology.

The review has assessed the potential for nuisance light, glare, sky glow from the proposed building, its interior and perimeter lighting as well as how this is likely to affect ecological and human receptors. It also details alternative choices of luminaires that will likely further reduce this impact whilst still allowing operatives to work safely at nighttime.

The lighting review of this Site has been produced by [REDACTED] [REDACTED] who is a competent person (level 4) as assessed under the Institution of Lighting Professionals (ILP) competency framework. [REDACTED] is a Fellow of the Institution and has 38 years' experience in the field of lighting engineering, consultancy and design. She has written and co-authored a range of industry guidance and standards, trained others within this field and is currently undertaking her PhD in how artificial light affects health and wellness. [REDACTED] has been at the forefront of lighting innovation in the UK and continues to push the boundaries of research to further develop the industry's knowledge.

The aim of the review is to assess:

- The proposed location of the building with relation to lighting and its visibility within the visual field.
- Reasons for lighting the proposed Site
- Legislative, national and local parameters for lighting of the Site
- Potential for nuisance light and its possible affects upon human and ecological receptors from any proposed lighting.
- Appropriate luminaire choices for lighting of the Site
- Solutions for mitigation against any potential negative consequences of the lighting for the Site or the position of the building within the landscape.

The review has been based on information provided by our client that consists of daytime viewpoint photography, night-time visual assessment, and the applicants lighting consultant's information around proposed lighting design and its expected impacts, from which the review of proposed lighting can be quantified and assessed.

Factors that have been considered when assessing the lighting required and its potential impact include:

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- Ambient illuminance and environmental zone classification.
 - Appropriate lighting levels for the area (E1 Zone and AONB).
 - Control of spill light and glare in relation to receptors and adjacent land.
 - Lighting standards, legislation and parameters placed upon any potential lighting installation
 - Mitigation to reduce unavoidable impact through introduced lighting.

Method of assessment

A desk top review has been carried out to determine the strength of the applicants proposals and where any common ground can be established to ensure next steps suit all parties.

Lighting proposals have been reviewed, based on the Site's location, the standards and guidance which have been listed within References and Documents. Following the review of the proposals additional mitigation has then been considered and proposed.



The Site

Site location

The Site is located at Gold Street, Cobham, Gravesend, Kent, DA12 3AA and consists of rural landscape with a potentially high degree of ecology present within the area and within the surrounding AONB. This site forms part of an intrinsically dark E1 environmental zone and has extensive countryside views which are likely to be interrupted by the location of the proposed winery building.

The following observations have been made regarding the proposed building and its lighting which is to be located in and around the building along with potential solutions to minimise impacts to receptors within the field of view of the proposed winery, its building and infrastructure.

- Proximity to the receptors –
 - bats, badgers, newts and other endangered species surround the site and require protection from artificial light. It is suggested warm colour temperature LEDs should be used of between 2200K and 2700K to further reduce blue light impacts from those of the 3000K colour temperature LEDs that the application has proposed. Although 3000K are considered warm white there are many options for the warmer still LED's which in such a sensitive area should certainly be adopted. This is because blue light is a known disruptor of human and ecology natural rhythms, overall health and breeding patterns. Furthermore, it is detrimental at a biological level to mitochondria and the accumulative effects reduce mitochondrial health with severe impacts on overall wellness increasing the likelihood of shortened lifespans.
- E1 Environmental Zone –
 - Considered intrinsically dark and where lighting should be used *only when necessary* to protect its integrity. We are proposing that along with relocation of the building to a less invasive location it be considered that light levels are lowered around the building and lighting within the building restricted further than the proposals outline. It is noted that whilst the interior lighting of the bottling floor has been considered the increased office lighting levels are not included and these have the potential to increase spill light from within the building significantly especially through the proposed sky lights.
- AONB – Kent Downs National Landscape –
 - Protected area that should be kept dark to support receptor habitats. Although this location borders some semi suburban locations the Site itself and its surroundings are dark and recognised to be an E1 Zone. Therefore, all possible measures should be taken to maintain the integrity of this location to protect its local wildlife, flora and respect the expectation of darkness from the human receptors located nearby.
- Luminaire choices and proposed options –
 - Proposed luminaires could be changed to ensure no margin for changing aiming and therefore causing future glare, spill and sky glow are adopted. Outputs of luminaires should be reduced, colour temperatures changed to warmer and different optics with shields considered to deliver as many aspects of mitigation as possible. For instance, instead of using a floodlight where aiming can later be changed it may be more prudent to design with fixed street lights that can have inbuilt optical rear and forward light control, additional rear shields and no chance of the aiming being altered by ill-informed contractors later after installation. The wall lights should also be altered to a lower lumen



package luminaire or different product as its our view that these are over specified and too bright for the location. The interior luminaires also need to be warm in colour temperature and have glare as a consideration as wide beam angles can provide more impact when viewed from outside than narrower ones, the lighting design should prove its covered this element within the submission.

- Emergency Lighting
 - There is no mention of required emergency lighting for interior or exterior areas and the potential impact of these should they be lit all of the time as opposed to just in the case of an emergency. The green indicator light may also be impactful to ecology and mitigation should be considered around this where possible to do so. Options may be to provide a shield for the indicator light or to place the indicators remotely within a utilities cupboard.
- Lighting controls with proposed options –
 - Although PIR sensors could be part of a suitable solution it should be considered that nuisance tripping can be highly impactful and this could cause more problems to ecology and human receptors than a constant dimmed level. This means that the harsh visual impact of potential nuisance tripping is reduced as it's not going from complete darkness to light and looking like a flashing effect from a distance. Wildlife is likely to be prevalent within the area and this can impact the effectiveness of switching off luminaires as by the time the timer finishes it could be switched back on again. This would catch the eye from a distance and provide the opportunity for natural surveillance of the property to be reduced as people would dismiss any tripping. It may be prudent to lower perimeter lighting levels from 25 lux taking into consideration the opportunity within standards to reduce light levels based on ecology receptor presence and in some location pedestrian only activity. For instance, for a pedestrian walkway/footpath within BS5489-1:2020 we can consider a lighting class of only P6 which gives a lighting level of 2 lux average and 0.4 lux minimum. This should be suitable for the perimeter of the building where vehicles are not used therefore reducing the need for the proposed 13 lux with 25% uniformity.
- Car parking areas –
 - In these locations we could look at Table 4 within BSEN12464-1 where for light traffic areas for outdoor car parks then a lighting level of 5 lux average and 25% uniformity is considered, we would suggest this should be the highest proposed level on the site's exterior areas and is also balanced then with the P6 perimeter lighting which shouldn't be more than two lighting class difference for eye adaptation purposes. 5 lux from table 4 is similar to that of a P4 level which then provides balance to the overall levels on the site. This is also an option from table 5.9 for parking areas within the same standard. It could be argued that there will be some fork lift activity however these have their own lighting and specific building lighting could be added in areas where this is likely to be needed but only switched on during times of the evening when product is being moved. Its not required for constant use around the building and is also possibly unlikely to be used at all after dark as potentially most work will be completed during daylight hours except in the darkest winter months.
- The access road to the Winery and any future buildings –
 - These should not be lit and should consider a cat eye style waymarking to provide guidance but little impact to the receptors ensuring a reduce perimeter of impact on the building's surroundings. Cats' eyes are now available as a solar product for full night use and can provide sufficient way finding for vehicles using a private road in such a dark area. It should be considered that the eye



of the driver will likely be dark adapted on their approach to the winery having driven through either low lighting levels or darkness on their way there. A solar cat's eye product will also reduce the energy consumption for the site and reduce its overall impact on the environment and maintenance going forward. Capped versions are available to ensure no direct upward light further reducing impacts on bat and bird flight paths.

- The visual impact on the landscape –
 - Proposed location of the building is high up on the landscape which lends itself to increased visibility and a higher impact for viewing its lighting – it is proposed that alternative locations be developed with our clients to ensure that visibility of the building is reduced, its impact on the landscape diminished and light from the building contained not only by the suggested reductions but also by the less prominent location therefore improving the outcome not only for the applicant but also for the ecology and human receptors impacted by the development of this Site.
- Viewing angles of the site and from the site to receptors –
 - The building in its proposed elevated position in the landscape poses many unfavourable viewing angles that could be avoided by positioning the building in other proposed locations from my client, where direct view would be diminished. Receptor flight paths and breeding areas would also be impacted by the visibility of nighttime light and the alternative locations offered up by my client should be considered to minimise light and noise impacts. Receptors often follow tree/hedgerow lines along with ridge lines so if the latter can be avoided by the re-positioning of the building, then it will certainly lessen the impacts for all receptors.
- Potential health and safety implications for the site's workforce and visitors –
 - the proposed location is, by default, enforcing a lower lighting level due to the higher visibility and that it will be more easily seen for some miles. This may well impact the safety of those entering and exiting the site after dark as mitigation needs to be provided. If the location were to be positioned elsewhere with less visibility to all receptors, then future site expansion and its required lighting may be more acceptable if delivered with sensitivity against British and Industry guidance.
- Key ecology locations that are likely to experience nuisance light after dark from the proposed building, its perimeter lighting and road access once erected –
 - Moving the building will significantly reduce these impacts as will additional trees (evergreen), hedging (evergreen) and fencing or bunds to reduce lines of sight and provide additional habitat to offset that taken by the new building and its supporting infrastructure. Viewing angles of the roof lights from receptors is another significant impact and even if blinds were installed there is no guarantee of them being used. It's noted that the glass will reduce light transition however its suggested that all roof windows be removed to eliminate all possibilities of upward light and receptor impacts.
- Signage –
 - There has been no mention of signage for the winery and how this will be lit. Due to its location and the winery's desire to have visitors there is a likelihood of a requirement for signage and some form of illumination. Details of this would be appreciated for review.



Options to the above proposals

- As mentioned previously the choice of luminaires could be improved to remove the opportunity for later alterations and therefore increased glare and spill after installation. Floodlighting should be swapped to something like a fixed streetlight with optical control and a zero-degree uplift which will still provide area lighting for the sites exterior but not give the opportunity for floods to be elevated later. Should elevation of the luminaires happen there is a significant rise in the potential for glare and it will certainly increase sky glow and spill light. Although the contractor may well install them correctly at the outset it's unlikely they will stay correct after maintenance or as the site develops and this risk should therefore be eliminated from the outset. Part night dimming should be considered regardless of the PIR's to ensure that post curfew lights are dimmed to a low level until dawn.
- Wall lights proposed are of a high lumen output and more suitable luminaires with a decreased lumen output and better optical control should be considered as they are over lighting the area and could be reduced to provide a better outcome. As this is an E1 zone then the use of lighting should only be where really necessary to use it, and all measures should be taken to reduce the impacts on what is an extremely sensitive environment. As above part night dimming should be implemented to ensure light is appropriate for the time and usage of the site.
- The area around the proposed building is intrinsically dark so any lighting provided will significantly impact not only the view of it from a distance but also provide eye adaptation issues with staff and visitors as they come and go from the site. The eye can take up to 30 minutes to fully dark adapt and that then means the risk to road users and pedestrians in the vicinity is significantly increased and safety is likely to be an issue.
- Direct view of light sources will make navigation of all areas dangerous as the eye would not see detail. Although the light sources are aimed downward and there is no direct upward light (at present whilst aimed properly) the sites currently proposed location means that it sits up above the properties below and therefore they will be looking up into it. Those driving along the adjacent road infrastructure could also potentially be affected by this lending itself to disability glare and increasing risk. Although ILP guidance for obtrusive lighting is mentioned the second table around glare wasn't fully explored by the applicant and the floodlights should certainly be measured against these criteria before proposing them. The tables are shown later in this document for reference. Street lighting is already assessed for glare around its G class when installed at a zero degree uplift and this could further ensure any exterior lighting meets and maintains its lighting class through life although due to the higher elevation within the landscape this would still need to be explored around the Environmental Zone tables and their glare calculations.
- Unlit areas will appear darker and as visitors to the site may not be familiar with the location this again increases the risk when moving from the lit Site to dark areas. Ensuring the Site and its surroundings are of comparable lighting levels will help to deliver a safe ingress/egress to the site and reduce eye adaptation issues when leaving the site into a potentially darker environment.



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- The proposed sky lights within the building should be removed as the light levels within the building are likely to be higher than those proposed as the office areas on the mezzanine will need to be lit to a higher level than the bottling floor. This light is likely to escape and whilst blinds have been proposed the likelihood of these being used are small after the initial habitation of the building. Also blinds break and they won't be easily accessible therefore its significantly likely light will escape from these sky lights and affect not only the sky glow in a protected environmental setting adjacent to an AONB but could also impact bats and birds flying above the building during the night. The chances of sky glow in an E1 area will be hugely increased by the use of any sky lights.
 - Placing the proposed building at a location where it's not visible against the skyline will not only help those with the potential to view it but also help with potential ecology receptor impacts. A building set into the landscape rather than on top of it reduces potential viewing angles to the structure itself, the lights that surround it and provides a natural barrier from the rising landscape to buffer any outcomes. This type of location will also remove the potential for additional objections should the winery further their plans for expansion later on.
 - Screening of the building with evergreen trees, hedging and fencing should certainly be implemented to lessen the impacts on the significant ecology receptors, the AONB and those viewing the site, this will also reduce any noise impacts.
 - Warmer colour temperatures of luminaires should also be used as some are available at 2200K and 2700K which further reduces the blue light impact of suggested luminaires. It has been found within published research that the large blue content of LED light sources has a hugely detrimental effect on mitochondrial health of both humans and ecology. Their largely blue light output slowly kills mitochondria leading to long term health issues and these effects can also be found in tree health, plant health and of all species on earth. Light at night therefore, especially within the E1 zone and adjacent to the AONB, should be reduced to the bare minimum for safety of those working and visiting the site but not to the detriment of the environment and receptors. This should factor into the design of any building, its lighting and its impacts on an intrinsically dark area. The use of InfraRed light within all light sources should be considered as its known to reverse the impacts of blue light and help to redress the balance with mitochondrial health.
 - Receptors in the area are known to be bats, newts, badgers and other endangered species there appears to be no EIA report to show the mitigation provided for building the winery, its lighting or noise and those impacts on the receptors.

Environmental zone classification

The Environmental zone for the area has been assessed against the parameters below. There are five different zones which are listed in the ILP (Institution of Lighting Professionals) Guidance notes and are as follows:

Table 2: Environmental zones

Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness (SQM ~15 to 20)	Sparsely inhabited rural areas, village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	Urban	High district brightness	Town / City centres with high levels of night-time activity

Table 4 (CIE 150 table 3): Limits for the luminous intensity of bright luminaires⁴

Light technical parameter	Application conditions	Luminaire group (projected area A_p in m ²)					
		$0 < A_p \leq 0.002$	$0.002 < A_p \leq 0.01$	$0.01 < A_p \leq 0.03$	$0.03 < A_p \leq 0.13$	$0.13 < A_p \leq 0.50$	$A_p > 0.5$
Maximum luminous intensity emitted by luminaire (I in cd) ⁵	E0 Pre-curfew Post-curfew	0 0	0 0	0 0	0 0	0 0	0 0
	E1 Pre-curfew Post-curfew	0.29 d 0	0.63 d 0	1.3 d 0	2.5 d 0	5.1 d 0	2,500 0
	E2 Pre-curfew Post-curfew	0.57 d 0.29 d	1.3 d 0.63 d	2.5 d 1.3 d	5.0 d 2.5 d	10 d 5.1 d	7,500 500
	E3 Pre-curfew Post-curfew	0.86 d 0.29 d	1.9 d 0.63 d	3.8 d 1.3 d	7.5 d 2.5 d	15 d 5.1 d	10,000 1,000
	E4 Pre-curfew Post-curfew	1.4 d 0.29 d	3.1 d 0.63 d	6.3 d 1.3 d	13 d 2.5 d	26 d 5.1 d	25,000 2,500

Note 1 d is the distance between the observer and the glare source in metres;

Note 2 A luminous intensity of 0 cd can only be realised by a luminaire with a complete cut-off in the designated directions;

Note 3 A_p is the apparent surface of the light source seen from the observer position

Note 4 For further information refer to Annex C of CIE 150

Note 5 Upper limits for each zone shall be taken as those with column $A_p > 0.5$



The Site will be adjacent in all directions to open fields with natural borders and sporadic residential properties in a dark AONB area (E1).

The current ambient luminance for the Site should be considered as Intrinsically dark (E1), which is comparable to other rural locations around the country.

The Site is an E1 Environmental Zone after considering its rural location, likely night-time activity (low) and current district brightness (low).

Human receptors

Local residents bordering the site have commented on the potential for glare from the proposed lighting and its visibility against an otherwise dark landscape. The proposed location does not provide sufficient mitigation for this and therefore its proposed the building should be located elsewhere so it doesn't stand out against the skyline. Glare from artificial light at night (ALAN) has been shown to be hugely detrimental to human and ecology receptors and all attempts should be made to reduce initially designed lighting and to dim when possible to do so further reducing potential impacts. Risk assessment should be undertaken for this area and the winery to ensure lighting is in fact required and whether other measures could be taken to reduce the need and the implementation of it. No risk assessment was supplied with the applicants submission regarding this.



Conclusion

In providing a review of the proposed lighting, consideration has been given to:

- Proposed lighting, spill, glare, and light pollution
- Requirements and limitations for lighting
- Proposals for appropriate replacement lighting
- The impact on identified receptors around and within the Site
- Potential mitigation

The review has highlighted the need to modify the proposals within all areas of the Site to promote the safety and security of users along with reducing impacts on ecology and human receptors. It has concluded that the current proposals can be further improved by changing the choice of luminaires, decreasing colour temperature and reducing lighting levels which will improve the outcomes from the building lighting wherever its located. However, it is also strongly recommending an alternative location for the building to fully realise those reductions in impacts and to ensure all parties are properly considered within the application.

The review has assessed the current ambient light and district brightness of the area and has concluded that the proposed lighting will have a noticeable effect on the overall ambient light levels, sky glow and light pollution on and around the site. The proposed changes should reduce this to acceptable levels but only in a more suitable, less visible, location for the building.

The review has assessed the impacts on both human and ecology receptors in and around the Site and found these all to be potentially noticeable. Our proposed changes should reduce this impact to slight.

The review has concluded that further reductions on the potential impacts on ecology are possible with the use of proposed equipment and lighting reduction methods. Use of this equipment should be considered and is highly recommended.

It is the conclusion of this review that lighting improvements, including moving the building's location, can be made that are more appropriate for the Site.

It is therefore the opinion of it [REDACTED] that the introduction of the proposed exterior lighting, for all areas of the site is reduced and that the building is located away from the skyline to further reduce impacts and enable site expansion later if required.



Abbreviations and Definitions

- **Luminance** The intensity of light in a given direction from a surface. The surface may be a light source (such as a lamp), or a reflector (such as a road surface). The unit is candelas per metre squared (cd/m^2).
- **Illuminance** The luminous flux density at the surface being lit. Usually measured with a light meter. The unit of measure is lux, one lumen per square metre.
- **Average illuminance (Avg.)** Illuminance averaged over a specified surface.
- **LED** Lighting Emitting Diodes.
- **Colour temperature (K)** It is the value given to the colour of the light in degrees' kelvin. In artificial lighting terms it normally ranges from 1500K to 7000K, 1500k being warm/red to 7000K being cool/bluish white.
- **Luminaire** Combination of a light source, a housing, and electronics, with the purpose of providing light.





Reference Documents

Regulations and References.

- Health and Safety at Work Act, 1974;
- BS 5489: 2020, Code of practice for the design of road lighting;
- BSEN 12464-2, Code of practice for outdoor workplaces.
- BSEN 1246-1, Code of practice for indoor workplaces
- LG06 for exterior lighting
- LG07 for lighting of offices
- Institution of Lighting Professionals: 'Guidance Notes for the Reduction of Light Pollution' GN01 2021
- Institution of Lighting Professionals 'Guidance on Undertaking Environmental Lighting Impact Assessments' (PLG-04)
- Department of the Environment and Countryside Commission document 'Lighting in the Countryside – Towards good practice'
- ILP and CIBSE document 'Lighting the Environment – A guide to good urban lighting'
- ILP GN08/23 bats and artificial lighting at night