



LIGHTING CONSULTANCY
Exterior Lighting Design Specialists

Ford Road, Arundel

Lighting Strategy

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FORD ROAD, ARUNDEL
LIGHTING STRATEGY

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1.0

INTRODUCTION

- 1.1 This lighting strategy document has been prepared on behalf of Norfolk Estate for the proposed development located at Ford Road, Arundel in West Sussex, which is located near South Downs Area of Outstanding Natural Beauty (AONB). The land is proposed for the construction of a residential development.
- 1.2 The report has been prepared to assess, in terms of artificial lighting, the likely effects of the proposed development. The lighting assessment includes information on the baseline lighting conditions within the area and considers possible mitigation measures to reduce potential light spill into neighbouring properties and ecology receptors, upward light (which can create sky glow), and visual source intensity (glare). Lighting class proposals will be included as part of this assessment.
- 1.3 This new development will require external private lighting for all areas of the development. The safety of the pedestrians and vehicles within this new development should be considered as one of the priorities along with minimising the impact of the artificial lighting on the 'Dark Skies' and the local wildlife. As such a good quality sustainable external lighting solution will be required to ensure the safety and security of users whilst very carefully considering the South Downs AONB, ecological restraints and local residents.
- 1.4 The lighting design of this site should be carried out by a competent person governed by the Institution of Lighting Professionals.
- 1.5 The report has been prepared by MMA Lighting Consultancy Ltd to the best of our knowledge using information provided by the client.
- 1.6 MMA Lighting Consultancy Limited accepts no responsibility or liability for:
 - a) The consequence of this documentation being used for any purpose or project other than that for which it was commissioned;
 - b) The issue of this document to any third party with whom approval for use has not been agreed.

2.0

SITE DESCRIPTION

Existing site

- 2.1 Arundel is a market town and civil parish in the steep vale of the South Downs, West Sussex. The application site is approximately 10.18 ha of arable land. The site mainly comprises a single field bounded by hedgerows and trees. A site location plan is shown below in Figure 1:



Figure 1: Site Location

Proposed Development

- 2.2 The proposed development comprises of the construction of 90 dwellings and the site will be access off Ford Road.
- 2.3 Development layout shown below in Figure 2:

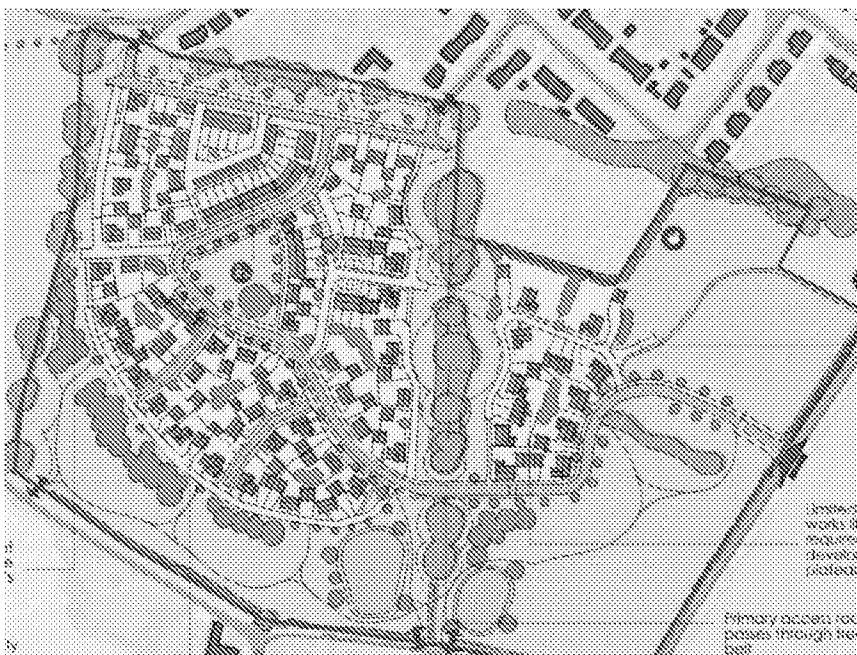


Figure 2: Development site

3.0

POLICY & GUIDANCE

Environmental Protection Act 1990 / Clean Neighbourhoods and Environment Act 2005

- 3.1 Light pollution was introduced within the Clean Neighbourhoods and Environment Act (2005) as a form of statutory nuisance under the Environmental Protection Act (the 'EPA', 1990), states: "artificial light emitted from premises so as to be prejudicial to health or nuisance."

National Planning Policy Framework

- 3.2 The National Planning Policy Framework (NPPF), published in February 2019, sets out the governments planning policies for England and how they are expected to be applied and provides a framework for local plans. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.
- Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.
- Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

Relevant British Standards

- 3.3 The most applicable British Standards for lighting that relates to the proposed development are:
- BS5489-1:2020 Code of practice for the design of road lighting Part 1: Lighting of roads and public amenity areas
 - BS EN 13201 2015 – Road Lighting. Performance Lighting
 - BS 12464-2:2014 – Light and Lighting. Lighting of Work-Places. Outdoor Lighting.

Institution of Lighting Professionals, Bat Conservation Trust Lighting Guidance (August 2018)

- 3.4 The Bat Conservation Trust and the ILP produced a paper in 2018, "Bats and Lighting in the UK", discussing the appropriate lighting levels, types of lamps, colour temperatures etc. which are suitable for lighting areas adjacent to bat houses.

Bat Conservation Trust 2014 Interim Guidance

- 3.5 The Bat Conservation Trust 2014 interim guidance provides recommendation to help minimise the impact of artificial lighting.

Guidance Notes for the Reduction of Obtrusive Light; 2020 Institution of Lighting Professionals (ILP)

- 3.6 Guidance notes produced by the Institution of Lighting Professionals are among the most commonly referenced guidance notes for good practice within the lighting design industry.
- 3.7 Obtrusive light (or sometimes referred to as light pollution) refers to any light emitted in a direction in which it is not required or wanted and as such is detrimental to other users. The assessment has been carried out in accordance with the published guidance documents from the ILP.
- 3.8 Light intrusion refers to the spilling of light beyond the boundary of the area to be lit. This includes the intrusion of light into bedroom windows.
- 3.9 Sky glow refers to the brightening of the sky above towns caused by direct or reflected upward light.
- 3.10 Glare refers to the uncomfortable brightness of a light source when viewed against a dark background. Figure 3: illustrates the different types of intrusive light taken from Guidance Notes for the Reduction of Obtrusive Light; 2020 Institution of Lighting Professionals (ILP).

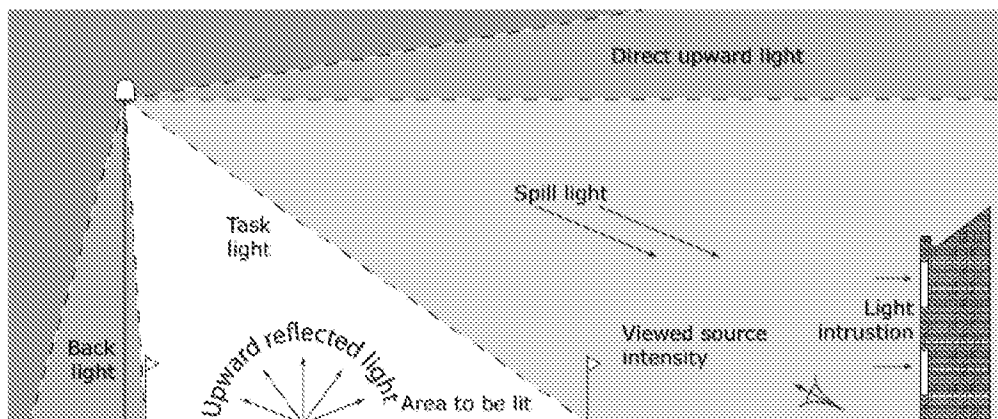


Figure 3: Light Obtrusion characteristics

4.0 ASSESSMENT METHODOLOGY

- 4.1 A desk-top study has been undertaken to identify relevant legislation, planning policy and good practice guidance in relation to lighting. The methodology takes guidance from the Institution of Lighting Professionals PLG 04 document "Guidance on Undertaking Environmental Lighting Impact Assessments". This sets out good practice which was followed during the assessment.
- 4.2 The scope of the assessment shall cover the effects of artificial lighting as a result of the proposed development. The assessment will consider the following:
- Assess the existing baseline lighting conditions on the immediate surroundings.
 - Assessment of the proposed lighting performance requirements for the various components of the proposed development site, with reference to the Environmental Zone Criteria set out in the Guidance Notes for the Reduction of Obtrusive Light (ILP, 2020)
 - To limit light pollution and sky glow

- To limit obtrusive light, spill light and glare to neighbouring land and properties.
- To limit potential light spill to vegetation and wildlife.

5.0 BASELINE CONDITIONS

- 5.1 The application site comprises a single field bounded by hedgerows and trees.
- 5.2 The proposed development is accessed off Ford Road that runs east of the site. Ford Road is owned maintained by West Sussex County Council and is currently unlit as shown in Figure 4 below:



Figure 4: Ford Road

- 5.3 The proposals for the development site also links onto an existing residential estate. There are two accesses, one roadway link onto High Ridge Close and one roadway link onto Dalloway Road. Both these roads are owned and maintained by West Sussex County Council and are currently lit with high pressure sodium (SON) lanterns mounted on 5m street lighting columns as shown in Figure 5 & 6:



Figure 5: High Ridge Close



Figure 6: Dalloway Road

- 5.3 The scheme is located in Arundel which is a market town and civil parish in the steep vale of the South Downs. Arundel is in a rural environment and there are some existing residential properties and a number of large open fields and woodlands. According to Arundel District Council's interactive mapping system, the development site is located very close to the South Down National Park as shown below in Figure 7:

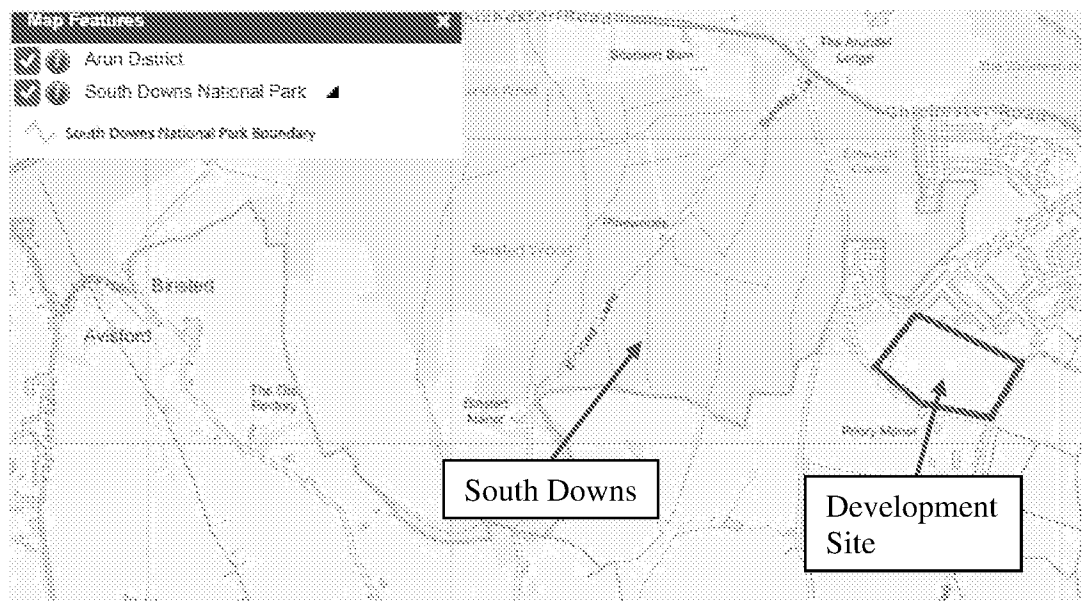


Figure 7: Arundel District Council Interactive Mapping System

- 5.4 The environment surrounding the application site is 'Dark', categorised as an E1 Environmental Zone in accordance with the ILP Guidance Notes.
- 5.5 The new lighting installation shall consider all aspects of the surrounding area and the environment and shall comply with BS589-1:2020 & BS EN 13201-2:2015.

6.0

ECOLOGY

- 6.1 Several areas within the proposed development have been identified by the ecological consultants 'Engain' as being sensitive to wildlife. These include areas of trees and hedgerows that provide habitat for nocturnal wildlife and opportunities for roosting bats. Monthly transect and static monitoring were undertaken on-site by the ecologist in September and October 2019 and an additional survey in August 2020. The surveys revealed that the site is used by *Myotis* species.
- 6.2 Within the ecology report, Engain advises the following, *"The site's boundary hedges are functionally very suitable as navigational routes for bats and as foraging areas. The mature oaks dotted around the site all have features such as standing dead wood, flaking bark and broken-off branches where bats could roost."*
- 6.3 Engain provided a Bat Transect Route & Static Detector Location Plan, which are shown below in figures 8 & 9:



Figure 8: Bat Transect Route



Figure 9: Static Detector Location Plan

- 6.4 Within the development it is proposed that LED lighting with a correlated colour temperature of 1750 kelvin is used. LED light sources contain no UV wavelengths and the warmer colour temperatures reduce the light emitted beyond the 550 nanometer wavelengths. These requirements are consistent with current research on the impact of artificial lighting on bats, as published by the Bat Conservation Trust.
- 6.5 Light spill has the potential to affect both flora (plants etc) and fauna (from insects through to bats. Light spill can disrupt feeding patterns and force ecological receptors to leave their habitat. The lighting strategy will seek to avoid and mitigate light spill where there are potential ecological receptors that could be adversely affected. This will be sought through guidance provided by the ILP for the reduction of obtrusive light.
- 6.6 In order to minimise the impact of light spill onto the site boundary and any sensitive areas, rear light shields should be specified on lighting units proposed for the development.
- 6.7 Due to the site being located in a rural area, it is important that the lighting can be minimised by using accepted methods of lighting control, essentially limiting illuminance and controlling light spill. It is proposed that the external lighting shall be installed on 6m street lighting columns in areas that are to be adopted. In non-adoptable and sensitive areas where lighting can affect ecology, 4m lighting columns are proposed. Generally lighting shall be selected to provide safety and security without polluting the site boundary.

7.0 DESIGN PROPOSALS

- 7.1 Ford Road, Arundel proposals shall be designed in accordance with BS5489-1:2020 & BS EN 13201-2:2015 and designed to ensure that external lighting is focused in the appropriate areas, preventing upward light. Design proposals should aim to reduce unnecessary light pollution, energy consumption, nuisance light spill onto neighbouring properties, as well as reducing negative impacts on surrounding local wildlife. Selected luminaires shall prevent upward light spill and should have a colour rendering index (Ra) greater than or equal to 60Ra. Colour rendering index relates to the accuracy of colours perceived, relative to daylight.
- 7.2 As part of this assessment we considered the use of 4m & 6m columns with post top mounted luminaires which have a 1750 Kelvin LED light source.
- 7.3 Arundel development shall be classed as a “P Class” in accordance with BS5489-1:2020, BS EN 13201-2:2015 & GN01: 2020 Table 2 - Environmental Zone and the ILP ‘Guidance Notes for the Reduction of Obtrusive Light’ GN01.
- 7.4 Guidelines for the environmental zones published by the Institution of Lighting Professionals, provides Guidance Notes for the Reduction of Obtrusive Light (GN01: 2020). The environmental zone for Arundel is considered to be an E1 Zone as shown in Figure 10 below:

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

Figure 10: Environmental Zone Table from ILP GN01/20

7.5 Based on an Environmental Zone classification of E1, the likely effects of the proposals are as follows:

- A slight increase in sky glow, in the absence of avoidance or mitigation measures, such as any lighting exclusion zones or luminance design this may result in the alteration of wildlife patterns in the area.
- A possible increase in the light 'glare' which may have an effect on the visual comfort of local residents.

7.6 The recommended lantern for use for Ford Road, Arundel development is the TRT Aspect Amber LED lantern. Figure 11 shows image of the luminaire:

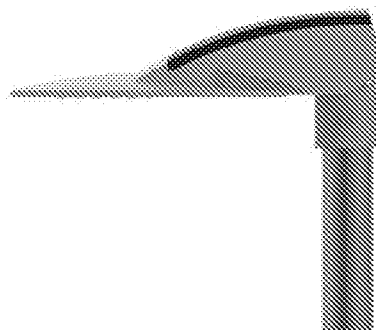


Figure 11: TRT Lighting Aspect Amber

7.7 The TRT Lighting Aspect Amber offers a Ra value of ≥ 70 , the correlated colour temperature (CCT) arrays from 1750 to 4000 Kelvin, has an IP rating of IP66 and is an LED light source.

7.8 The correlated colour temperature adopted for Ford Road, Arundel development is 1750 Kelvin, as this CCT emits minimal blue light as shown in the diagram Figure 12 below:

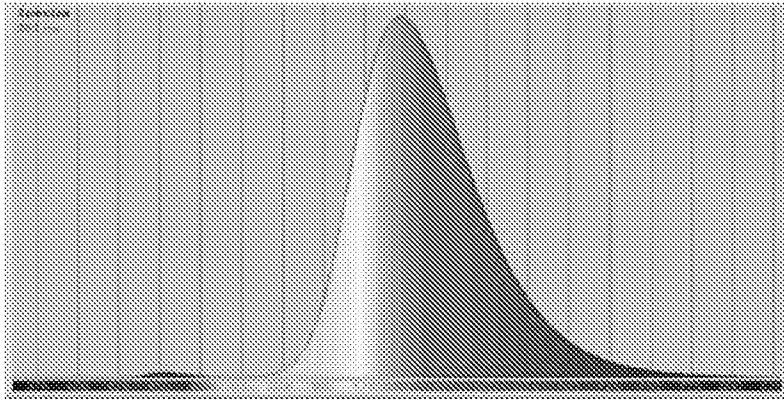


Figure 12: TRT Lighting Aspect Amber CCT Diagram

- 7.9 All luminaires proposed to adoptable roadways shall be post top mounted on 6m columns.
- 7.10 The luminaire has a range of optics, for this site the optic for the residential roads is the TRT Lighting Aspect Amber GR5 optic. Correlated colour temperature is 1750 kelvin warm white LED. This optic has an acceptable glare rating of G3, thus minimising the spread of light above horizontal. All luminaires are to have a dimmable electronic control gear which could allow the luminaires to be dimmed down during the evening. However, if the client wanted to pursue alternative options e.g. switching off the luminaires please refer to section 7.15
- 7.11 The Aspect Amber luminaire has good light control and cut off angles to reduce light spillage. Where possible luminaires are orientated towards the site, away from the land outside the site to make them less intrusive. Rear shields should be fitted if necessary.
- 7.12 Similarly, street lighting will be positioned to avoid light spill into the boundary hedgerows in order to avoid and minimise effects on sensible ecological habitats.
- 7.13 MMA Lighting Consultancy Limited has recommended the use of the TRT Lighting Aspect Amber lantern due to ecology constraints and the site being in Environmental Zone E1, which is categorised as 'dark'. As stated above, this lantern emits minimal blue light and as such, we consider this a viable option for a sensitive scheme such as Arundel. However, for adoptable roads, West Sussex County Council may offer an alternative luminaire in line with their specification.

Private Areas

- 7.14 The proposals for the private areas are the use of the TRT Aspect Amber luminaire mounted on 4m columns. The luminaire also offers a CCT of 1750 Kelvin, rear shields, and low-level LED lumen packages. In addition to this, the column height of 4m allows the spacings between columns to be increased, thus, minimising the number of units. The number of columns required is 34 to meet current British Standards. An extract of the lighting calculation is demonstrated in Section 8.
- 7.15 We considered the use of low-level LED bollards, however, due to the bollards' limited height of 1m, the spacing between the bollards is minimal, and as such 104 bollards are required to meet current British Standards.

Switching Regimes

- 7.16 The use of time clocks or part-night photocells allows the luminaires to be switched off during the hours of darkness. This type of solution, if considered acceptable for this area, could further assist with minimising the potential impact of any proposed lighting on the local wildlife in the surrounding area to the development site. Proposed timeclocks are installed within a supply point to switch off during specified hours, e.g. 22:00 – 06:00. Photocells which are installed in the luminaire are available to be pre-programmed to switch the lighting off at specified hours. Due to the sensitive ecological matters within the development, MMA would recommend that the proposed lighting shall operate on a part-night bases.

8.0 LIGHTING LEVELS

- 8.1 Artificial lighting will be required as part of amenity, safe passage, security and health and safety requirements during periods of darkness. The associated potential obtrusive light effects toward surrounding light-sensitive receptors would be minimised through the controlled application of lighting in accordance with current best practice.
- 8.2 The indicative lighting criteria adopted for the purposes of this assessment are taken from relevant British Standards and recognised national guidance documentation. All criteria adopted for the final scheme of lighting shall be subject to appropriate risk assessment.
- 8.3 The development has been identified as a subsidiary access road, within environmental zone E1 with quiet traffic flow at a speed limit ≤ 30 mph. Therefore, in accordance with BS 5489-1:2020 Table A.5 the lighting class P5 has been selected as shown below in Figure 13:

Table A.5 — Lighting classes for subsidiary roads

Traffic flow	Lighting class		
	E1 to E4 ⁽¹⁾	E1 to E2 ⁽¹⁾	E3 to E4 ⁽¹⁾
	Pedestrian and cyclists only	Speed limit ≤ 30 mph	Speed limit ≤ 30 mph
Busy ⁽²⁾	P6	P4	P3
Normal ⁽³⁾	P5	P5	P4
Quiet ⁽³⁾	P6	P5	P4

NOTE 1 Table A.5 assumes no parked vehicles; see risk assessment in A.3.3.2.

NOTE 2 An EV lighting class using vertical illuminance from BS EN 13301-2:2015, Table 6, can be specified in addition to the general lighting class when there are particular concerns about crime and personal safety. EV is calculated at the typical height of a human face (1.5 m) and in relevant viewing orientations.

NOTE 3 To ensure adequate uniformity, the actual value of the maintained average illuminance is not to exceed 1.5 times the value indicated for the class.

NOTE 4 The actual overall uniformity of illuminance, U_{a} , needs to be as high as reasonably practicable (see 7.2.6).

NOTE 5 The ambient luminance descriptions E1 to E4 refer to the environmental zone as defined in ILP 0001 (N2).

NOTE 6 The illuminance classes are suggested minimum levels. A risk assessment needs to be carried out to ensure that the light levels are adequate, particularly for pedestrians and cyclists.

Figure 13: Table A.5 from BS 5489-1:2020

- 8.4 However, following the guidance provided in the British Standard it is necessary to undertake a risk assessment for this road which will evaluate the risks associated with a number of parameters to assess if the selected lighting class should be increased or decreased. Therefore, as a result of the risk assessment the selected lighting class has been decreased to P6 (Average illuminance 3.00 lux and minimum illuminance 0.40 lux – from the guidance provided in BS EN 13201-2:2015 & CIE 115:2010). Risk Assessment shown below in Figure 14:

Risk Assessment P Class Roads			Calculate the weighted value for each lighting design
CIE 115:2010		Selection of 'P' lighting class	
Parameter	Options	Weighting Value	Select one figure from each Parameter
Speed	Low v ≤ 30 mph	1	0
	Very low ≤ 20mph	0	
	Very high	1	
Traffic Volume	High	0.5	1
	Moderate	0	
	Low	-0.5	
	Very Low	-1	
Traffic Composition	Pedestrians, cyclists and motorized traffic	2	1
	Pedestrians and motorized traffic	1	
	Pedestrians and cyclists	1	
	Pedestrians only	0	
	Cyclists only	0	
Complexity of task	High Risk - parked cars, school entrances, traffic calming features	2	1
	Medium Risk - parked cars, school entrances, traffic calming features	1	
	Low Risk - low number parked cars not causing a visibility issue	0	
Ambient Luminance	High	1	1
	Moderate - Normal	0	
	Low - Rural	-1	
Sum of Weighted Values		Vws3	0
		P=8-Vws3	6
		Lighting Class (P)	6
		E _{av}	3.0
		E _{min}	0.4
		E _{av}	2.0-3.0

Figure 14: Risk Assessment

- 8.5 For the roads offered for adoption, the image shown below in Figure 15 indicates the proposed lighting levels and Isolux contours using the TRT Lighting 'Aspect Amber' LED Luminaires:



Figure 15: ISO Lux Contour Layout for Adoptable Roads

Notes to Contour Layout:

- 8.6 Dark Blue = 2.00 Lux
Red = 1.00 Lux
Purple = 0.40 Lux
Light Blue = 0.10 Lux
- 8.7 For the private roads, the image shown below in Figure 16 indicates the proposed lighting levels and Isolux contours using the TRT Lighting 'Aspect Amber' mounted on 4m columns. The Isolux contour values are set to a worst-case scenario as the luminaires are shown without a rear shield fitted. Back spill of light is deemed acceptable; however, it can be further reduced by the introduction of factory fitted rear shields.



Figure 16: ISO Lux Contour Layout for Private Roads (4m Columns)

Notes to Contour Layout:

- 8.8 Dark Blue = 2.00 Lux
Red = 1.00 Lux
Purple = 0.40 Lux
Light Blue = 0.10 Lux

9.0

IMPACTS

During Construction

- 9.1 During construction phase, it is likely that the site will be affected through the use of temporary site lighting either for health and safety purposes, site security, or both. It is assumed that the main impacts will be spill light and luminous intensity. These levels relate to residential areas.
- 9.2 Lighting for health and safety will be needed where work is required to take place during the hours of diminishing ambient lighting levels which is likely to occur if the construction works are carried out in the winter months or if night-time working is required. Security lighting is often required to deter crime in both compounds and in areas where plans and materials are stored overnight.

Post Construction

- 9.3 The site is classified as Environmental Zone E1, with the proposed lighting for the site being assessed in accordance with the limiting criteria for that zone, Figure 17 illustrates GN01:2020 Table 2 – Obtrusive light limitations for exterior installations.

Table 3 (CIE 150 table 2): Maximum values of vertical illuminance on properties.

Light technical parameter	Application conditions	Environmental zone				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane (E_v)	Pre-curfew	n/a	2 lx	5 lx	10 lx	25 lx
	Post-curfew	n/a	<0.1 lx*	1 lx	2 lx	5 lx

Figure 17 GN01:2011 Table 3 – Obtrusive light limitations for exterior installations

- 9.4 Notes to table:
- E_v is Vertical illuminance in Lux measured flat on the glazing at the centre of the window.
 - Curfew = the time after which stricter requirements (for the control of obtrusive light) will apply subject to the conditions of the local planning authority.
- 9.5 The effect of artificial light associated with the site is predicted to have a minor adverse effect on the environment. Modern road lighting luminaires, when mounted with 0° tilts, do not typically produce significant upward light, therefore the effects of upward light/ULR (upward light ratio) are predicted to be negligible.

10.0

MITIGATION MEASURES

During Construction

- 10.1 Mitigation of the effects of the lighting installation during construction phase will include the following:
- Specifying working hours, use of lighting, location of temporary floodlights in the construction compound and agreeing these with the local council. Lighting to be switched off when not required specifically for construction activities or required health and safety or security.

- Adhere to best practice measures as recommended by the Institution of Lighting Professionals (ILP), Health & Safety Executive (HSE) and CIE (International Commission on Illumination) guidance. Lighting solutions will be selected to reduce light pollution.
- Specifically, designed luminaires will be selected to minimise upward spread of light. The optics in the lanterns will control the distribution of light to avoid overspill, sky glow and glare.
- Glare will be kept to a minimum by ensuring 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.
- Restrict lighting to the task area using horizontal cut-off optics and zero tilts.
- Operate curfew and minimise the duration of any lighting (switch off or part-night dimming).

Post Construction

- 10.2 The detailed lighting design will be designed to use current best practice and technology. The impacts of external lighting will be minimised by the installation of lighting to the minimum specification required to provide a safe night-time environment for residents, therefore lighting will be designed to comply with the minimum illuminance levels given within the appropriate guidance. The detailed lighting design will be in keeping with the ecology report in order to maintain the integrity of habitats for wildlife within and around the site.
- 10.3 Designing out and minimising the need for lighting to be installed is always the best method of reducing light pollution. However, where this is not possible, the careful choice of illuminance and luminance criteria is key to successfully limiting the impact that light may have on its surrounding environment.
- 10.4 Care should be taken to minimise glare from all luminaires installed, by ensuring the correct luminaires are selected and installed correctly, in line with the recommendations within the ILP Guidance Notes for the Reduction of Obtrusive Light.
- 10.5 Restriction of luminaire mounting heights would be one of the key means of mitigating the environmental impact of external lighting. Luminaires that are column mounted can be restricted to a maximum height of 6 metres. It should be noted that as the mounting is reduced the number of luminaires would have to be increased.
- 10.6 Lighting would need to be provided in the form of column mounted lanterns. Where possible, lanterns would need to be pointed into the development and away from the adjacent sites. The optics in the lanterns would need to be specified to control the distribution of light avoiding overspill, sky glow and glare. Back shields shall be fitted to columns where appropriate.

11.0 CUMULATIVE EFFECT AND RESIDUAL EFFECTS

Cumulative

- 11.1 The appearance of sky glow was considered as part of the assessment of the external lighting conditions. During the lighting assessment, it was noted that the Arundel is partially surrounded by an existing lit environment and is adjacent to an established village location.

- 11.2 Although the introduction of artificial lighting at the site could have an effect, the mitigation measures incorporated into the lighting strategy would mean that the significance of the overall impact is reduced.

Residual during construction

- 11.3 It is considered that following the implementation of the mitigation measures outlined in Section 10.0, overall, there will be minor adverse residual effect of lighting during the construction phase of the development site on sensitive habitats for wildlife. Subject to sensitive lighting design, the effects on key areas of wildlife habitat identified in the ecology report is expected to be negligible. The development area is assumed to currently fall into Environmental Zone E1 in accordance with a natural location with a lighting environment categorised as 'Dark'.

Residual post construction

- 11.4 It is considered that there will be overall minor negative effects from the lighting of the proposed scheme on residential receptors and road users. The use of well located, modern light fittings, will minimise glare, light spill and reduce sky glow contributions to the existing sky glow above Arundel. Subject to sensitive lighting design, including positioning and design of luminaires and use of remote monitoring systems, the effects on key areas of wildlife habitat identified in the ecology report is expected to be negligible.

12.0 CONCLUSION AND SUMMARY

- 12.1 In conclusion, subject to the implementation of the above proposals and agreements with the client and the Highway Authority, a compliant lighting scheme can be designed and installed and an acceptably low impact on the residential properties and wildlife can be achieved.
- 12.2 During the construction phase, the lighting impacts are likely to be associated with the requirements for temporary lighting to illuminate the contractor's compound and work areas. Installed lighting will involve the use of well located, modern light fittings which are directionally controlled and will be in accordance with current best practice standards and the developers' requirements. Overall, where an effect arises the effect on sensitive receptors during the construction phase will be short term and temporary in nature and considered to be of minor negative significance. However, as lighting would be temporary and mobile, units can and should be relocated if recognised as having a negative impact on sensitive receptors.
- 12.3 During the operational phase, the likely impacts include the introduction of artificial light sources as part of the proposed development, which will result in changes to the current baseline conditions. The proposed lighting scheme will comply with all relevant British Standards and the Institution of Lighting Professionals lighting guidelines and will serve to ensure that the safety and security of all areas of the development can be effectively maintained.
- 12.4 Potential effects would be managed such that the potential increase in the general ambience of the area would be balanced against the overall existing illuminance in order to minimise sky glow.
- 12.5 The effects on sensitive receptors will be mitigated through the implementation of a stringent lighting design, which will include the use of low light pollution fittings which retain light spill within the development area, minimising the loss of light to the night sky and glare discomfort to on-site or neighbouring receptors.

- 12.6 In our considered opinion, if the measures detailed above are undertaken then we anticipate the proposed development will not have a negative impact on the immediate environment with respect to light pollution. The likely cumulative effect of artificial lighting may be a slight increase in sky glow. However, as the street lighting installed surrounding the development does not utilise dark sky technology, the visual glow of the existing estate would be greater than the proposed development site.
- 12.7 All lighting column locations are indicative and could be subject to change once the proposed utility plans have been developed and overlaid onto the lighting layout plan.
- 12.8 This report has been prepared to the best of our knowledge, any lighting designs proposed shall be carried out by a competent lighting consultant in accordance with BS5489-1:2020, BS EN 13201-2:2015 and West Sussex County Council's requirements.

Prepared By: -

..... (Signed) Aimie Loveday 4th December 2020 (Print Name) (Date)

Reviewed By: -

..... (Signed) Mark Chandler 4th December 2020 (Print Name) (Date)