LIGHTING IMPACT ASSESSMENT

PROJECT: MEMORIAL HALL FIELD, SONNING COMMON

PREPARED FOR: SONNING COMMON PARISH COUNCIL

JUNE 2021

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1. Introduction

1.1 General

1.1.1 This lighting strategy is provided by Designs for Lighting Ltd, a specialist lighting design consultancy with experience and knowledge in lighting impact assessments, mitigation and lighting design.

1.1.2 Full details relating to the Application Site and Proposed Development descriptions are provided within the supporting planning statement for the application. In summary, Memorial Hall Field is located to the North of War Memorial Hall, Reades Lane and is approximately 10 Acres in size. The Proposed Development is for a new Multi Use Games Area (MUGA) and walking/running/learn to cycle track. The MUGA forms part of a wider development of the site into a sports and recreation ground. Lighting is required to allow the safe use of the MUGA and walking/running/learn to cycle track during the hours of darkness.

1.1.3 The Proposed Development requires a lighting strategy to ensure lighting associated with the MUGA and track is unlikely to give rise to obtrusive light.

1.1.4 This document shall outline light technical parameters to reduce the potential impact of the lighting associated with the Proposed Development. Lighting design calculation reports accompany this document and confirm compliance with relevant Environmental Zone criteria for light spill and glare towards sensitive receptors (**Appendix 1**).

1.1.5 The lighting design shall be sensitive to the surrounding environment and residential receptors through use of optically efficient luminaires, which control the light distribution to minimise light spill.

1.1.6 A review of site drawings and images was undertaken to identify potential sensitive receptors.

1.1.7 Whilst the lighting associated with the Proposed Development comprises two separate components (lighting for the MUGA and separate lighting for the walking/running/learn to cycle track), this document aims to assess the worst-case scenario. by considering the likely combined impacts of MUGA floodlighting and wayfinding lighting on the walking/running/learn to cycle track.

2. Legislative and Policy Framework

2.1 Introduction

2.1.1 This lighting design has been prepared with consideration towards the following legislation, policy and guidance:

2.2 National Policy and Legislation

- Environmental Protection Act 1990 / Clean Neighbourhoods and Environment Act 2005.
- National Planning Policy Framework: 2019.

2.3 Local Policy

2.3.1 The Local Planning Authority is South Oxfordshire District Council whose local plan is relevant to the Proposed Development. The most applicable policies for the development relating this project are:

2.3.2 Lighting related polices outlined within the South Oxfordshire Core Strategy, adopted 2012: Policy CSEN1 – Landscape. The Core Strategy does not make specific reference to exterior lighting, however Policy SCEN1 should be considered due to considerations required in proximity to the Chilterns and North Wessex Downs Areas of Outstanding Natural Beauty (AONBs).

2.3.3 Further lighting related polices outlined within the South Oxfordshire Local Plan 2011-2034, adopted January 2019: Policy ENV12: Pollution. The policy reads:

"*1. Development proposals should be located in sustainable locations and should be designed to ensure that they will not result in significant adverse impacts on human health, the natural environmental and/or the amenity of neighbouring uses.*

2. The individual and cumulative impacts of development on human health, the natural environment and/or local amenity will be considered when assessing development proposals.

3. The consideration of the merits of development proposals will be balanced against the adverse impact on human health, the natural environment and/or local amenity, including the following factors:
- noise or vibration;
- smell, dust, odour, artificial light, gases and other emissions;
- air pollution, contamination of the site or its surroundings and hazardous substances nearby;
- land instability; and
- any other relevant types of pollution. "

2.3.4 Lighting related text within the Sonning Common Neighbourhood Plan, Policy HS1, which details:

"*The development of this space must reflect and respect the AONB and rural surroundings and will include the following:*
- a community sports hall located in the south western corner of the site that in its design and materials will minimise visual impact on the AONB and rural situation
- vehicular access for the community leisure/sports space from Reade's lane at the western end of the site alongside Kidmore End Memorial Hall
- a car park of at least 60 spaces, including an appropriate landscape strategy to soften its appearance
- lighting designed to minimise light pollution"

2.4 Relevant Lighting Standards

2.4.1 The most applicable Lighting Standard that relates to Multi Use Game Areas (MUGA) is:

- BS EN 12193:2018 (Light and Lighting- Sports Lighting) Class III

This standard proposes lighting levels according to the class of activity. Class III is defined as follows:

Lighting Class III: Low level competition such as local or small club competition which generally do not involve spectators. General training, physical education (school sports) and recreational activities will also come into this category.

Outdoor			Reference area		Number of grid points	
			Length m	Width m	Length	Width
Tennis	PA		30	15	13	7
	TA		36	18	15	7
Padel [a]	PA		20	10	13	7
Class	Horizontal illuminance		Horizontal illuminance TA		R_G	R_a
	$E_{hor\ Ave}$ lx	$U2_{hor}$	$E_{hor\ Ave}$ lx	$U2_{hor}$		
I	500	0,70	75 % PA	75 % PA	50	70
II	300	0,70	75 % PA	75 % PA	50	60
III	200	0,60	75 % PA	75 % PA	55	60

[a] A safety zone around both entrances of width 2 m, height 4 m and extending 4m from the centre to both sides is to be kept clear of any obstacles.

Table 1 BS EN 12193-1:2018 – Outdoor Tennis Lighting Performance Criteria

2.4.2 This standard requires a relatively high level of lighting, which may not be suitable for the environment surrounding the proposed development. Further to this standard, Designs for Lighting have been provided with draft Outline Performance Specifications, which are currently being considered by Sport England to allow lower lighting levels for recreational facilities. The aim of this seeks to ensure that recreational sports facilities are illuminated more sensitively, helping to reduce the potential effects of lighting of these facilities on sensitive receptors. **Table 2** outlines lighting performance specifications for recreational sports facilities. *Category 4* is applicable to the Proposed Development.

	Lighting – Outline Performance Specification
Category 1 – walking, jogging and running for fun and health (as opposed to training for competition or competition)	5 lux
Category 2 – cycling for fun and health (as opposed to training for competition or competition)	10 lux
Category 3 – recreational skills-based activity – bouldering/climbing wall, skateboarding, parkour, general fitness training	30 lux
Category 4 – recreational fundamentals of sport for fun and health (as opposed to training for competition or competition)- football kick about spaces, hoop and backboard spaces, rebound walls,	75 lux
Category 5 – Outdoor gyms and interactive spaces	30 lux

Table 2 Draft Lighting Performance Criteria (Sport England Consultation)

2.4.3 This lighting strategy is based upon lighting the MUGA to Category 4, a 75 lux average. Sports England have not provided guidance on uniformity requirements, so indicative light spill modelling will assume uniformity must meet at least 0.6.

2.4.4 Lighting of the walking/running/learn to cycle track will be provided by illuminated bollards in accordance with *category 1* as outlined in **Table 2.**

2.5 Relevant Guidance from the Institution of Lighting Professionals (ILP)

GN01: 2021 Guidance Notes for the Reduction of Obtrusive Light; 2021- ILP

2.5.1 GN01:2021 – *Guidance Notes for the Reduction of Obtrusive Light* – This document provides detailed information regarding types of obtrusive light and the mitigation that can be implemented to help prevent obtrusive light occurring.

2.5.2 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. This can be limited by reducing the inclination of the luminaire to ensure as much light as possible is focussed onto the task area.

2.5.3 The lighting design has been undertaken in accordance with the published guidance documents from the ILP.

2.5.4 The quantitative limits are the same for both guidance documents. They quantify the levels of Direct Upward Light, Light Intrusion and Viewed Source Intensity (Glare) regarded as acceptable for varying environmental zones.

2.5.5 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. Sky Glow refers to the brightening of the sky above towns cause by direct or reflected upward light.

2.5.6 Glare refers to the uncomfortable brightness of a light source when viewed against a dark background. **Figure 1** illustrates the different types of obtrusive light.

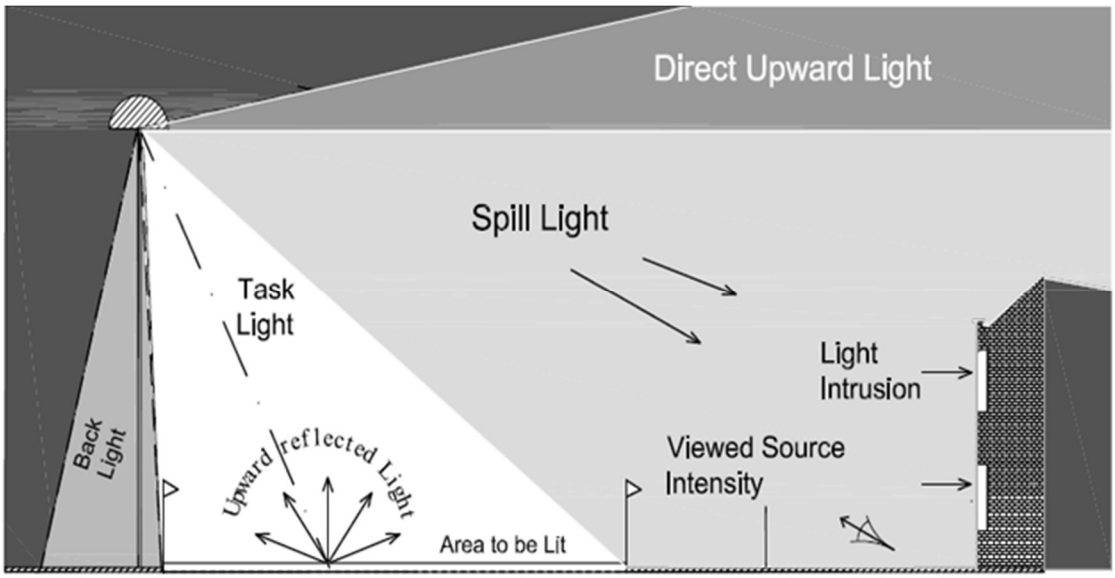

Figure 1- Obtrusive light diagram

2.6 Environmental limits

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Intrinsically 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 3 Obtrusive light limitations

Environmental Zones	Sky Glow ULR (Max %)	Light Trespass (into Windows) E_v (lux)	
		Pre- Curfew*	Post-Curfew*
E0	0	0	0
E1	0	2	0 (1*)
E2	2.5	5	1
E3	5	10	2
E4	15	25	5

Table 4- Maximum obtrusive light permitted for exterior lighting installations

**Curfew: the time after which stricter requirements (for the control of obtrusive light) will apply*

2.6.1 The environmental class is assessed as **E2** as the application site is located in an area of relatively low district brightness, which resembles that of a rural area. The existing public lighting, sports lighting and the luminance of the surrounding environment contributes towards the level of brightness within the surrounding environment.

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)	E0						
	Pre-curfew	0	0	0	0	0	0
	Post-curfew	0	0	0	0	0	0
	E1						
	Pre-curfew	0.29 *d*	0.63 *d*	1.3 *d*	2.5 *d*	5.1 *d*	2,500
	Post-curfew	0	0	0	0	0	0
	E2						
	Pre-curfew	0.57 *d*	1.3 *d*	2.5 *d*	5.0 *d*	10 *d*	7,500
	Post-curfew	0.29 *d*	0.63 *d*	1.3 *d*	2.5 *d*	5.1 *d*	500
	E3						
	Pre-curfew	0.86 *d*	1.9 *d*	3.8 *d*	7.5 *d*	15 *d*	10.000
	Post-curfew	0.29 *d*	0.63 *d*	1.3 *d*	2.5 *d*	5.1 *d*	1,000
	E4						
	Pre-curfew	1.4 *d*	3.1 *d*	6.3 *d*	13 *d*	26 *d*	25,000
	Post-curfew	0.29 *d*	0.63 *d*	1.3 *d*	2.5 *d*	5.1 *d*	2,500
Aid to gauging A_p		2 to 5cm	5 to 10cm	10 to 20cm	20 to 40cm	40 to 80cm	>80cm
Geometric mean of diameter (cm)		3.2	7.1	14.1	26.3	56.6	>80
Corresponding A_p representative area (m^2)		0.0008	0.004	0.016	0.063	0.251	>0.5

Notes:

1. d is the distance between the observer and the glare source in metres;
2. A luminous intensity of 0 cd can only be realised by a luminaire with a complete cut-off in the designated directions;
3. A_p is the apparent surface of the light source seen from the observer position
4. For further information refer to Annex C of CIE 150
5. Upper limits for each zone shall be taken as those with column $A_p>0.5$

Table 5 Light Source Intensity limits

2.6.2 **Table 5** provides the maximum criteria for viewed source intensity (glare) from luminaires, towards sensitive receptors as outlined in ILP GN01:2021.

2.6.3 Methodology for assessing viewed source intensity has been updated within the latest revision of GN01, to allow consideration towards the distance between the light source and the receptor, whilst also considering the size of the light source within the assessment criteria.

2.6.4 The dimensions of the proposed luminaire have been calculated to identify the relevant A_p. Taking this into consideration, the relevant multiplication factor is highlighted in green in **Table 5.** The values presented are multiplied by the distance between the light source and the receptor to determine the maximum luminous intensity criterion for each individual receptor. Calculations are then undertaken to ensure that the lighting proposals are compliant with the criterion.

3. Baseline Conditions

3.1 Application Site

3.1.1 Memorial Hall field is located adjacent to a residential area approximately 0.5km West of the Village Centre. It is bounded on the North, South, and East by housing, mostly detached or semi-detached, set in moderate gardens, and to the South by Maiden Erlegh Chiltern Edge secondary school.

3.1.2 The application site is bordered to the South by Reade's Lane, to the North by the Sonning Grove development, and to the East by properties on Farm Close and Ashford Avenue. There is some existing street lighting adjacent to the application site.

3.2 Proposed Development

3.2.1 The proposal is to build 1 No. Multi Use Games Area (MUGA), a walking/running/learn to cycle track, landscaping features, carparking and walkways throughout the site. An outline lighting strategy has been prepared to support a planning application to include floodlighting for the MUGA, and/or lighting for the proposed walking/running/learn to cycle track.

3.3 Site Survey

3.3.1 A desktop assessment of the Application Site and surrounding environment was undertaken to inform this section. Site measurements were taken from drawings, and existing site conditions were appraised using mapping software.

3.3.2 There is some existing lighting at the eastern boundary of the application site, lighting the existing access road to the Sonning Grove development.

Figure 2 Application site – Indicative view

3.4 Sensitive Receptors

3.4.1 The primary purpose of the assessment is to assess the potential for nearby residential properties and environmental receptors to be affected by obtrusive light, resulting from the introduction of artificial lighting required for the proposed development.

3.4.2 A number of residential properties & environmental receptors were identified as sensitive receptors for the proposed lighting scheme.

	Application Site
	Potential Environmental Sensitive Receptors
	Potential Human Sensitive Receptors *New housing developments not included on aerial photography
	Existing Natural Shielding

Figure 3 Indicative view of potentially sensitive residential receptors

3.4.3 The potentially sensitive receptors are identified as:

- (1) Maiden Erlegh playing fields and adjacent woodland, located to the South of the Application Site. This area has relatively low sensitivity, however, some sensitive environmental receptors may be present.
- (2) Grassland adjacent to Reade's Lane, to the West of the Application Site. Desktop assessment indicates this land is currently used as a maintained lawn or grazing land, and so has a very low sensitivity.
- (3) Grassland adjacent to farm buildings on Reade's Lane, to the North of the Application Site. Currently used for agriculture, and accordingly has relatively low sensitivity.
- (4) Sonning Grove residential development; located to the North East of the Application Site. Properties to the South East of this development are most at risk from stray light, due to the absence of natural screening. The receptors are separated from the application site by the newly constructed road to the Sonning Grove development, which includes some existing lighting.
- (5) Residential properties on Farm Close and Ashford Avenue, to the East of the Application Site. Properties with Westward facing 1st Floor windows are most at risk from stray light.
- (6) Residential property on Reade's Lane; to the South of the Application Site. Gaps in existing natural barriers present a risk of stray light onto the frontage.

4. Lighting Strategy

4.1 General

4.1.1 This section outlines the lighting strategy to inform any future detailed lighting design which aims to ensure that fit for purpose lighting design will be suitably implemented whilst ensuring the effects on the surrounding environment and residual receptors are minimised.

4.1.2 Luminaires will be focussed directly onto the task area and away from the overlooking properties & environmental receptors within a configuration that matches the layout provided in **Appendix 1**.

4.2 MUGA Lighting

4.2.1 To ensure lighting of the MUGA is sensitive to the surrounding environment and sensitive receptors, a robust lighting strategy has been formulated to ensure good practise is applied to the detailed lighting design.

4.2.2 Lighting will be switched off when the MUGA closes at 22:30 hours and will be sensor controlled between dusk and 22:30 to ensure the lighting levels are dimmed whilst the MUGA is not in use.

4.2.3 Lighting of the MUGA will comply with the technical performance criteria outlined in **Table 6.**

4.2.4 An indicative light spill diagram and lighting layout is provided in **Appendix 1**.

Equipment Specification	Description
Location	MUGA
Correlated Colour Temperature (K)	3000K (max)
Luminaire Manufacturer	Philips (or equivalent)
Luminaire Model	Clear flood (or equivalent)
Luminaire Style	Area luminaire
Light Source	LED
Height	8.0m (max above finished floor level)
Mounting Type	Column Mounted
Luminaire tilt	0°
Luminaire Peak Beam	≤70°
Example Luminaire	
Design Guidance	
Luminous Intensity Class	G3 (minimum)
Lighting Performance	Average illuminance: 75.0 Lux / Uniformity: 0.60
Controls	On: Dusk – 22:30 hours (Sensor control during this time to allow luminaire dimming when MUGA not in use). Switched off from 22:30 hours - Dusk

Table 6 MUGA lighting performance criteria

4.3 Walking/running/learn to cycle Track

4.3.1 The lighting for the walking/running/learn to cycle track is proposed to be provided by column mounted luminaires. Lighting of the walking/running/learn to cycle track is to be provided for the purposes of amenity, as the track is not intended for competition level sport.

4.3.2 Criteria in **Table 7** applies to the lighting performance parameters for lighting of the track.

4.3.3 Indicative light spill and lighting layout for the walking/running/learn to cycle track is included with the MUGA layout shown in **Appendix 1**.

Equipment Specification	Description
Location	Walking/running/learn to cycle track
Correlated Colour Temperature (K)	3000K (max)
Luminaire Manufacturer	DW Windsor (or equivalent)
Luminaire Model	Kirium Pro Mini (or equivalent)
Luminaire Style	Streetlight
Light Source	LED
Height	4.0m (max above finished floor level)
Mounting Type	Post Top
Example Luminaire	
Design Guidance	
Luminous Intensity Class	G3 (minimum)
Lighting Performance	Average illuminance: 5.0 Lux / Minimum: 1.0 lux
Controls	On: Dusk – 22:30 hours (Sensor control during this time to allow luminaire dimming when track is not in use). Switched off from 22:30 hours - Dusk

Table 7 Walking/running/learn to cycle track Lighting Performance Criteria

4.4 Lighting Performance

4.4.1 The luminaires shall be arranged as shown in **Figure 4**.

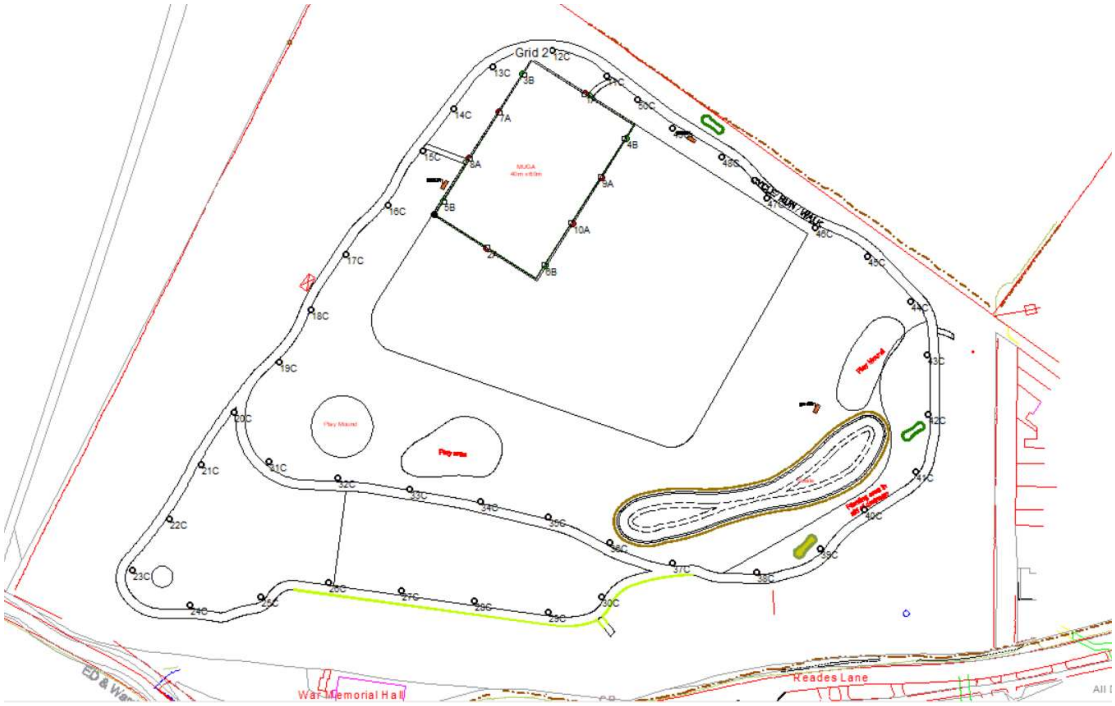

Figure 4 Indicative Luminaire Layout

4.4.2 With the lighting arrangement in **Figure 4**, the calculated lighting performance achieves both the recommended lighting performance and GN01:2021 obtrusive light criteria detailed in **Section 2**.

4.4.3 Luminaires are to be mounted at a height no greater than 4.0m, ensuring the lighting performance remains fully compliant with **E2** environmental zone obtrusive light criteria and lighting performance criteria detailed in **Table 7**.

5. Obtrusive Light

5.1 Obtrusive Light Analysis

5.1.1 During the lighting design process, a series of calculations were completed to test the lighting strategy and to ensure that the indicative lighting design is compliant with obtrusive light guidance, produced by the Institution of Lighting Professionals (ILP GN01:2021). The calculations show the highest possible level of light spill by considering the initial luminaire light output in the calculations.

5.1.2 An indicative lighting layout is provided in **Appendix 1** that demonstrates the compliance of the lighting design. This is summarised in **Figure 5**, provided for information detailing where the observer positions have been located, for the purpose of assessing obtrusive light.

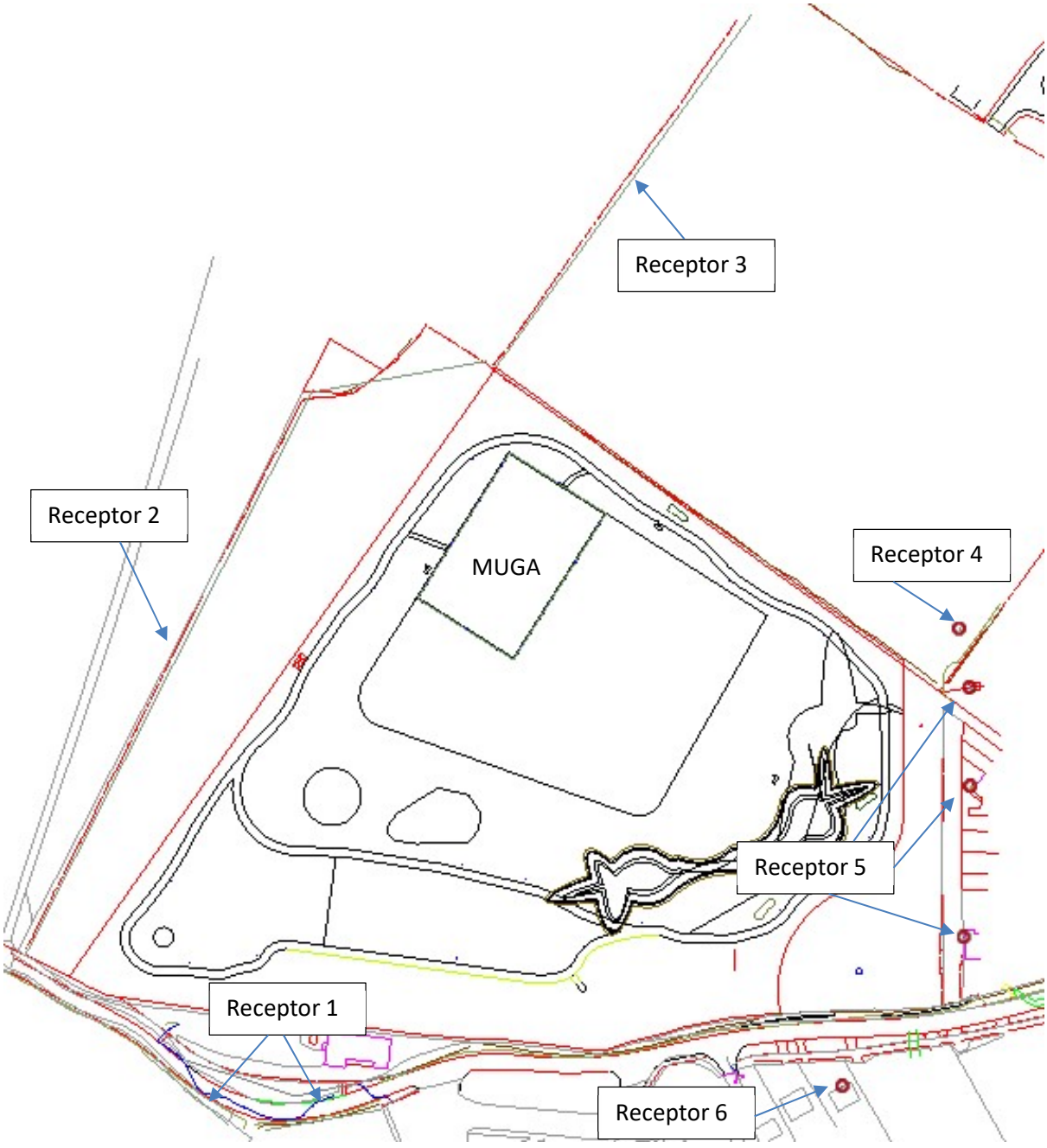

Figure 5- Glare assessment positions

5.1.3 **Table 8** details the obtrusive light criteria for **E2** Environmental Zones and provides the results of obtrusive light calculations for sensitive receptors, as indicated in **Figure 5.**

		E2 Zone Limits (Pre-Curfew)		Achieved	
Loc	Receptor Location	Light Intrusion (Lux)	Viewed Source Intensity (I_{cd})	Light Intrusion (Lux)	Viewed Source Intensity (I_{cd})
1.1	Maiden Erlegh Woodland	5.0	N/A	0.02	N/A
1.2	Maiden Erlegh Playing Fields	5.0	N/A	0.02	N/A
2.1	Western Site Boundary	5.0	N/A	0.21	N/A
2.2	North Western Site Boundary	5.0	N/A	0.81	N/A
3	Grassland adjacent to Reade's Lane Farm	5.0	N/A	0.50	N/A
4	Sonning Grove Residential Receptor	5.0	189.5	0.08	19
5.1	Ashford Avenue Sensitive Receptor	5.0	175.3	0.08	21
5.2	Farm Close Sensitive Receptor	5.0	161.8	0.07	19
5.3	Farm Close Sensitive Receptor	5.0	245.8	0.03	19
6	Reade's Lane Sensitive Receptor	5.0	333.3	0.03	19
--	Upward Light Ratio (ULR)	Limit		Achieved	
		2.5%		0%	

Table 8 Obtrusive Light Calculation Results

5.1.4 **Table 8** indicates the light spill onto windows of sensitive receptors and the viewed source intensity (glare) does not exceed the **E2** Zone Limit values when the proposed lighting is viewed through windows.

5.1.5 The upward light ratio (ULR) is calculated as 0%, which complies with the **E2** Environmental Zone maximum (2.5%).

5.1.6 Lighting would not operate outside of the standard curfew hours (23:00), as such the lighting will automatically comply with the 'post curfew' criteria as it will be switched off.

5.1.7 **Table 9** demonstrates the maximum recorded obtrusive light values associated with the lighting of the Application Site does not exceed the criteria for an **E2** environmental zone. Therefore, it is unlikely that neighbouring residential properties will be subjected to adverse levels of obtrusive light. As can be seen by the results outlined in **Table 5**, the achieved levels are significantly lower than the maximum criteria for **E2** Zone Limits.

5.1.8 Obtrusive light calculations do not consider the blocking effects of obstacles between the Application Site and the sensitive receptors, such as trees, foliage, or fencing; this presents a worst-case scenario in terms of the obtrusive light values presented in **Table 9**, whereas actual site conditions are likely to be more favourable, slightly reducing the obtrusive light values.

6. Mitigation

6.1 Introduction

6.1.1 In addition to the light levels complying with the limits prescribed within GN01 for minimising obtrusive light, there are various mitigation measures available which will further limit the obtrusive light towards sensitive receptors.

6.2 Lighting Design

6.2.1 The lighting has been designed and luminaires orientated in order to both achieve sufficient lighting to the MUGA for safe use and to minimise any light spill outside of the area, in particular onto adjacent properties. The lighting is orientated in the horizontal plane (0° max inclination) in order to minimise upward light and light spill onto adjacent properties.

6.3 Luminaire shields

6.3.1 Due to the level of compliance with obtrusive light guidance produced by the Institution of Lighting Professionals (ILP GN01:2021), additional luminaire shielding is not regarded as necessary for this project.

6.4 Topography

6.4.1 Between the Application Site and the sensitive receptors on all sides, there are existing natural barriers in the form of tree lines and well-established foliage. Several receptors have no direct line of sight to the Application Site due to these barriers, and the light falling onto these properties or sensitive environmental receptors will be blocked.

6.4.2 Specifically, the retained land to the west of the application site will be planted with trees and whips, enhancing screening to the wider AONB.

6.4.3 The area to the north of the site has also been planted, which will further enhance screening to the wider AONB once established. It should be noted that planting against clauses **6.4.2** & **6.4.3** are the responsibility of the developers of the adjacent site, Linden Homes & Vistry Group.

6.4.4 Planned site features, such as play areas and play mounds, will also block low level stray light from leaving the Application Site.

6.4.5 Lighting has been set within close proximity of the walking/running/learn to cycle track through the site, adding additional separation distance between these sources and any potentially sensitive receptors.

6.4.6 The maximum ULR for the **E2** environmental zone is 2.5%; whereas the maximum modelled ULR for this scheme is 0%.

6.5 Curfew

6.5.1 It is proposed that all lighting is turned off by at least 10:30pm. allows lighting design to comply with pre-curfew conditions as identified in the obtrusive light guidance produced by the Institution of Lighting Professionals (ILP GN01:2021).

6.6 Lighting Controls

6.6.1 A lighting control system will be installed to ensure that the lighting is dimmed between dusk and 22:30 hours when the MUGA and walking/running/learn to cycle track is not operational. The system will switch the lighting off at 22:30 hours when the MUGA and track closes.

6.6.2 This will ensure that the minimum amount of lighting is working at any time, thus minimising the effect of the lighting on residents & environmental receptors.

7. Conclusion

7.1 General

7.1.1 Memorial Hall Field, Sonning Common, is the Application Site upon which a MUGA and walking/running/learn to cycle track, amongst other landscaping proposals are proposed. The proposed MUGA and walking/running/learn to cycle track which will require lighting to enable safety during play in the evening as the light fades to darkness. The lighting design aims to provide an adequate quantity of light, whilst ensuring that the potential light spill is minimised.

7.1.2 Consideration has been made to nearby residents by ensuring the lighting of the MUGA & walking/running/learn to cycle track complies with good practise lighting performance criteria. An assessment of the likelihood for light spill and glare to occur has been undertaken, this has indicated minimal potential for obtrusive light to affect the potentially sensitive residential & environmental receptors.

7.1.3 The lighting design specifies that luminaires are installed with tilt angles at 0° to the horizontal to reduce the potential for light spill and light trespass, as well as eliminate direct upward light.

7.1.4 The proposed luminaires focus the light onto the MUGA and walking/running/learn to cycle track, emitting minimal light towards adjacent properties and environmental receptors.

7.1.5 **Table 4** in this report details the maximum permissible light spill on a property (pre-curfew) to be 5 lux (E_v) for an **E2** zone, of which the Application Site is located within.

7.1.6 **Table 9** within this report details the results of lighting calculations that show the extents of spill light and viewed source intensity. None of the values in this table exceed the **E2** Zone Limit values for obtrusive light. Therefore, the potential obtrusive light values are compliant with the limits set. Therefore, the effects of the proposed lighting shall be of **low to negligible significance.**

7.1.7 The MUGA lighting design contained within this document is designed to be fit for purpose without being detrimental to the surrounding environment.

7.1.8 Following the guidance for obtrusive light detailed in **Section 2** ensures that potential light spill is within guideline levels provided by the institution of lighting professionals.

7.1.9 In conclusion, potential effects of the proposed artificial lighting are likely to be of **low to negligible significance** when considered in comparison with the existing lighting on the application site**.**

7.1.10 Alternative solutions will be acceptable providing they comply with the lighting design guidance provided in **Section 2** and do not exceed light spill and glare values as assessed against the criteria for obtrusive light in **E2** Environmental Zones. Where alternative solutions required during the detailed design phase (where products are no longer available, or an engineering complication calls for a revised solution), an updated obtrusive light assessment shall be undertaken.

Appendix 1 – Indictive Lighting Layout & Obtrusive Light Values

8.1.1 The lighting calculations are provided within **Appendix 1**.

8.1.2 The calculations are completed by competent lighting professionals using industry standard calculation software; DIALux. This software takes the actual site conditions and the actual performance of the proposed floodlights to simulate the proposed light levels both for the MUGA and light spill outside the MUGA, in particular towards sensitive receptors.

8.1.3 Calculation 1716-DFL-ELG-XX-CA-EO-13001-S3-P01 provides the indicative light spill diagram for the MUGA and track lighting combined. The light distribution represents a system of lighting for the track consisting of column mounted luminaires with a maximum height of 4.0m.

8.1.4 Calculation 1716-DFL-ELG-XX-CA-EO-13002-S3-P01 provides evidence of the light spill calculations giving values for vertical light spill into bedroom windows of sensitive residential receptors as well as the glare calculation of light source intensity as viewed from those windows.