



Kronospan Lorry Park & Access Road
[Ecological Lighting Assessment](#)

[Prepared for:](#) Axis

[Date:](#) March 2024

EXECUTIVE SUMMARY

Outline Scope

Strenger Ltd was appointed by Axis to undertake an ecological light spill assessment for the northern sector of a proposed lorry park & access road, associated with the Kronospan plant, Chirk (hereon in, the 'Proposed Development').

This report shall be read in conjunction with the following accompanying drawings produced by Strenger:

- SK-06 Ecological Assessed Scheme of Lighting
- SK-07 Ecological Receptor Location Plan
- SK-08 Ecological Light Spill

The assessment is required in order to satisfy the requirements of the Local Planning Authority Ecology Officer with regard to the effects of light spill associated with the northern sector of the Proposed Development on potential light-sensitive ecological receptors. Specifically, the effects of the proposed access road lighting and lighting associated with the most northern lorry parking bays on proposed future habitat created by the introduction of suitable landscaping; including interconnection with the western boundary of the Proposed Development site across the access road.

The Developer is fully committed to achieving the ecological requirements for the site and has therefore (following detailed risk assessment) taken the decision not to purposefully illuminate the access road until the junction with the lorry parking area itself. Only waymarking lighting will be installed along the access road in order to provide visual guidance for drivers. Even then, the proposed waymarking lighting will be via means of narrowband long wavelength amber LED light sources. As requested by the LPA, only bollard lighting has been used along the access road and they are of a very low-lumen output. Whilst this assessment focuses on the most stringent light spill criteria (for particularly light-sensitive bats) and adopts the most stringent assessment methodologies, it should be noted that the entire stretch of access road would be suitable for more light-tolerant bat species undertaking foraging & commuting activities, subject to suitable landscape planting.

Assessment

In order to assess the potential ecological impacts associated with the Proposed Development, the following has been undertaken:

- review of pertinent policy and guidance;
- review of the site and surrounding area using aerial photography and OS mapping;
- identification of potential light-sensitive ecological receptors through discussions with the Project Ecologist and Project Landscape Consultant;
- outline specification of mitigation measures
- detailed 3D modelling of the Ecological Assessed Scheme of Lighting;
- calculation of light spill (illuminance – lux) at ecological receptors;
- comparison of the predicted light spill levels against the adopted criterion;
- production of ray-traced light model imagery; and
- production of CAD drawings, including light spill contours.

Conclusions

Based on the Assessed Scheme of Lighting, the predicted levels of light spill associated with the Proposed Development are compliant with the adopted 0.5 lux light spill criterion for bat foraging & commuting activities at light-sensitive ecological receptors.

Compliance with the ecological light spill criterion has been achieved with the adoption of a well-designed environmentally sympathetic scheme of lighting incorporating mitigation measures. The following mitigation measures specific to the control of light spill affecting light-sensitive ecological receptors have been included in the Assessed Scheme of Lighting:

- using 'warm-white' (3000K) light source colour temperatures generally;
- the use of LED light sources with minimal UV and blue light spectral content;
- the use of presence detection controls;
- the use of luminaires with minimal to zero direct contribution to upward light where possible;
- using zero degree uplift angles to column-mounted luminaires;
- careful aiming and positioning of luminaires;
- careful selection of luminaires;
- the use of optimal light distributions for their specific location and orientation;
- optimisation of mounting heights;
- the use of bollard lighting;
- the use of narrowband long wavelength amber light sources;
- the adoption of the lowest intensity LED modules practicable; and
- minimising the task illuminance level.

The following mitigation measures, which serve a hybrid function with regard to the control of noise, and light spill affecting light-sensitive ecological receptors are embedded in the Proposed Development by design:

- the erection of a 3.0m high close-boarded timber fence as set out in Axis drawing ref: Figure 4.3a Proposed Development – Illustrative Landscape Masterplan.

1. LEGISLATION POLICY & GUIDANCE

Legislation

Clean Neighbourhoods and Environment Act (CNEA), 2005

- 1.1 Light pollution was introduced within the Clean Neighbourhoods and Environment Act 2005 ('CNEA 2005') as a form of statutory nuisance under the Environmental Protection Act 1990 (the 'EPA 1990') which was amended in 2006 to include the following nuisance definition:
"(fb) artificial light emitted from premises so as to be prejudicial to health or nuisance;"
- 1.2 Guidance produced in Sections 101 to 103 of the CNEA 2005 by the Department of Environment, Food and Rural Affairs (DEFRA) in April 2006 extends the duty on local authorities to ensure their areas are checked periodically for existing and potential sources of statutory nuisances including nuisances arising from artificial lighting. Local authorities must take reasonable steps to investigate complaints of such nuisances from artificial light. Once satisfied that a statutory nuisance exists or may occur or recur, local authorities must issue an abatement notice (in accordance with section 80(2) of the EPA 1990, requiring that the nuisance cease or be abated within a set timescale.
- 1.3 Although light was described as having the potential to cause statutory nuisance in the CNEA 2005, no prescriptive limits or rules were set for impact assessment purposes. The Guidance Notes for the Reduction of Obtrusive Light produced by the ILP has, therefore, been referred to for the purposes of this assessment.
- 1.4 Guidance produced by DEFRA, Statutory Nuisance from Insects & Artificial Light (2006) on s101 to s103 of the CNEA has also been referred to which places a duty on local authorities to ensure that their areas are checked periodically for existing and potential sources of statutory nuisances - including nuisances arising from artificial lighting. Local authorities must take reasonable steps to investigate complaints of such nuisances from artificial light. Once satisfied that a statutory nuisance exists or may occur or recur, local authorities must issue an abatement notice (in accordance with s80(2) of the EPA 1990), requiring that the nuisance cease or be abated within a set timescale.

National Planning Policy

National Planning Policy Framework (NPPF), 2023

- 1.5 The National Planning Policy Framework (NPPF) states that the purpose of the planning system is to contribute to the achievement of sustainable development and constitute the Government's view on what sustainable development in England means in practice for the planning system. A principal concept contained within the NPPF is the presumption in favour of sustainable development and with regard to artificial lighting, the NPPF states:
'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:

... (c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.'

National Guidance

Institute of Lighting Professionals (ILP) PLG 04 - Guidance on Undertaking Environmental Lighting Impact Assessments, 2013 (*update pending*)

- 1.6 The aim of the Guidance on Undertaking Environmental Lighting Impact Assessments (ILP PLG04:2013) is to outline good practice in lighting design and provide practical guidance on production and assessment of lighting impacts within new developments.
- The document was produced following the publication of the NPPF in April 2012 and the importance of lighting design being part of a planning application, this document aims to:
- provide an explanation of, and guidance on, the process for producing a lighting assessment;
 - prompt the lighting designer on important aspects of specific projects which should be used to remove or minimise potential environmental problems; and
 - look at the overall processes and evaluation procedures regarding lighting which are considered to be relevant.

Buglife - The Invertebrate Conservation Trust - A review of the Impact of Artificial Light on Invertebrates, 2011

- 1.7 A review of the Impact of Artificial Light on Invertebrates is a published literature review on how humans are changing the light environment and the impact that this has on insects and other invertebrates. It makes various recommendations and identifies several further research areas.

Institute of Lighting Professionals Guidance Note 08/23 Bats artificial lighting in the UK: Bats and the Built Environment series, 2023

- 1.8 This working document produced by the ILP in conjunction with the Bat Conservation Trust (BCT), is aimed at lighting professionals, lighting designers, planning officers, developers, bat workers/ecologists and anyone specifying lighting. It is intended to raise awareness of the impacts of artificial lighting on bats but also the potential solutions to avoid and reduce this harm. However, it is not meant to replace site-specific ecological and lighting assessments. The document also incorporates a number of useful case studies; the ecological lighting design and assessment for Case Study 2: Dark Corridors at Foxlydiate was undertaken by Strenger.

The Royal Commission on Environmental Pollution (RCEP) – Artificial Light in the Environment, 2009

- 1.9 This RCEP document discusses the social benefits and drawbacks of outdoor lighting, the impacts of light pollution on organisms and ecosystems, discusses road lighting technology, and makes various concluding recommendations.

2. CRITERIA

- 2.1 Although research into lighting and ecological effects is currently underway, there are currently no definitive guidelines in wide acceptance setting out absolute light pollution limits affecting light-sensitive ecological receptors. However, limited research into lighting and ecological effects has been undertaken and potentially suitable light spill level limits are in existence.
- 2.2 For the purposes of this assessment, 0.5 lux has been utilised as the average level of illuminance to be met at potential light-sensitive ecological receptors. A 0.5 lux criterion is commonly adopted for particularly light-sensitive bat species such as horseshoe bats, undertaking commuting and foraging activities.

3. RECEPTORS

- 3.1 Within the context of this assessment, ecological receptors are taken as those which have been identified as being potentially light-sensitive and having the potential to be affected by light spill from lighting associated with the Proposed Development. Key ecological receptors have been identified and adopted as receptor locations within this assessment.
- 3.2 The assessed ecological receptors are set out in Strenger drawing ref: SK-07 Ecological Receptor Location Plan and are summarised in (Table 3.1) below. Screenshots of the lighting model with the ecological receptor calculation planes shown are provided in Appendix A of this report.

Table 3.1: Ecological Receptors		
Receptor	Description	Receptor Extents (m)
ECO-01	Southern landscaping facing south south-west	Modelled LGL+0.0 to LGL+6.0
ECO-02	Southern dark crossing at canopy level facing south	Modelled LGL+3.0 to LGL+6.0
ECO-03	Southern dark crossing at canopy level facing north	
ECO-04	Northern dark crossing at canopy level facing south	
ECO-05	Northern dark crossing at canopy level facing north	

4. LIGHTING

- 4.1 An indicative scheme of exterior lighting has been produced for the Proposed Development (the Assessed Scheme of Lighting), for the purpose of environmental assessment. The Assessed Scheme of Lighting adopts LED luminaires; such technology offers significant energy savings and provide a high degree of optical control, thus minimising light spill. With regard to this assessment, the luminaires - whilst specific, can be considered to be relatively generic; provided that sensible selection of another manufacturer's luminaires is made by a competent Lighting Consultant. The final selection of luminaires and their positioning shall be determined by the Responsible Lighting Consultant in order to meet the Proposed Development site final design lighting requirements but bearing in mind any light pollution impact that the selection may have.
- 4.2 The following scheme of lighting (Table 4.1), was modelled for the purposes of this environmental assessment (Ecological Assessed Scheme of Lighting) and is set out in Strenger drawing ref: SK-06 Ecological Assessed Scheme of Lighting.

Table 4.1: Ecological Assessed Scheme of Lighting			
Reference	No. off	Manufacturer	Luminaire (dimming)
LUM-A	2	Philips	BVP650 LED130 830 DX51
LUM-B	7	Philips	BVP650 LED220 830 DX51
LUM-C	8	Philips	BVP650 LED70 830 DM10
LUM-D	36	Ligman	Prague 2 PRA-10011-M-Turtle-DI (50%) long wavelength narrowband amber light source $\lambda_{\text{peak}} = 630\text{nm}$ $\lambda_{\text{lower cutoff}} = 560\text{nm}$
LUM-E	2	Innolumis	Mini-Victoria BAT-lamp 20W Wide long wavelength narrowband amber light source $\lambda_{\text{peak}} = 593\text{nm}$ $\lambda_{\text{lower cutoff}} = 540\text{nm}$
LUM-F	5	Innolumis	Mini-Victoria BAT-lamp 40W Wide long wavelength narrowband amber light source $\lambda_{\text{peak}} = 593\text{nm}$ $\lambda_{\text{lower cutoff}} = 540\text{nm}$

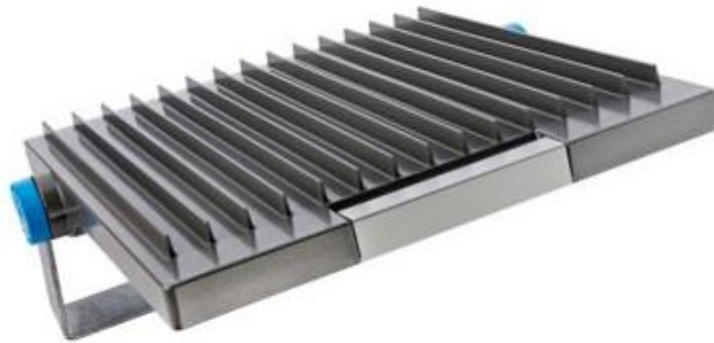


Figure 4.1: Philips ClearFlood



Figure 4.2: Ligman Prague 2



Figure 4.3: Innolumis Mini-Victoria

Bat lamp

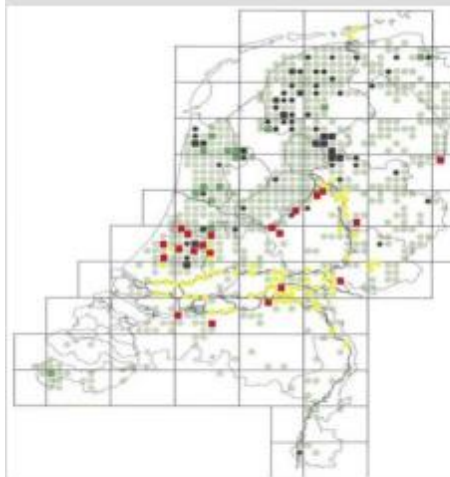
Innolumis constantly strives to improve its products and applications to sustainably improve our environment and offer convenience.

In the European Union, all bat species are protected by law. Disruption of their permanent residence, routes and hunting areas, threatens the bat groups. This disturbance in the Netherlands under the Flora and Fauna considered a violation.



Bats are sensitive to light disturbance. Both in their habitats, air routes and in their hunting area. Especially street lighting can lead to painful glare in these nocturnal animals. Research by Rijkswaterstaat (2012) showed that bats eyes are especially sensitive to blue and ultraviolet light. Much less orange and red. On this basis, we developed an amber-colored, UV free LED luminaire: the "Bat lamp".

In the Netherlands officially 21 species of bats. Seven species are threatened. Two are so rare that they are regarded as extinct.



Bat distribution over The Netherlands

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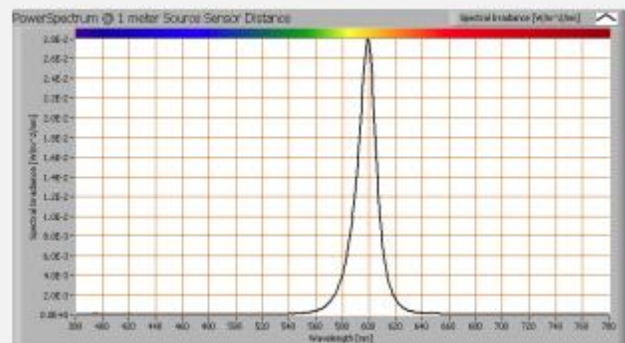
Fitting material	Aluminium, LM6 quality
Finishing	Antifouling powder coating (dirt repellent)
Fitting colour	All RAL colours available, RAL 7035 standard
Optics materials	Safety glass and aluminium (miro6)

Driver	MeanWell® / CLQ Quad Output
Dimmable	Yes, 0 - 10 V (from 14 W)
Recommended dimmers	Dynadimmer, Liandimmer, SDU, OLC, PLM
Power	9 to 31 W
Power factor	> 0.95
Connector	Connector for a 3 or 5 conductor cable I and II
Protection class	I and II
Source	100 - 240 VAC 50/60Hz
Ambient temperature	-40 to +50 °C

Number of light compartments	4
LEDs per compartment	10 x amber

Light current	9 W: 760 lumen	System power	9 W
	14 W: 1020 lumen		16 W
	22 W: 1300 lumen		24 W
	31 W: 2000 lumen		33 W

Colour point	x/y = 0.6004 / 0.3956
Wavelength	592-594 nm



The Nicole luminaire has been developed in accordance with

IEC 60598-1:	Luminaires - Part 1: General requirements and tests
IEC 60598-2-3:	Requirements - Luminaires for road and street lighting
IEC 62031:	LED modules for general lighting - Safety specifications
IEC 62471:	Photobiological safety of lamps and lamp systems
IEC 55015:	Radio disturbance characteristics of electrical lighting
IEC 61547:	EMC immunity requirements
IEC 61000-3-2:	Limits for Harmonics
IEC 61000-3-3:	Limits for Voltage Fluctuations and Flicker

RoHS: The products meet the RoHS standard, based on the European RoHS Directive 2002/95/EC.

KEMA certification is comparable to TÜV, ENEC and VDE.

5. MITIGATION

5.1 The following mitigation measures specific to the control of light spill affecting light-sensitive ecological receptors have been included in the Assessed Scheme of Lighting:

- using 'warm-white' (3000K) light source colour temperatures generally;
- the use of LED light sources with minimal UV and blue light spectral content;
- the use of presence detection controls;
- the use of luminaires with minimal to zero direct contribution to upward light where possible;
- using zero degree uplift angles to column-mounted luminaires;
- careful aiming and positioning of luminaires;
- careful selection of luminaires;
- the use of optimal light distributions for their specific location and orientation;
- optimisation of mounting heights;
- the use of bollard lighting;
- the use of narrowband long wavelength amber light sources;
- the adoption of the lowest intensity LED modules practicable; and
- minimising the task illuminance level.

5.2 The following mitigation measures, which serve a hybrid function with regard to the control of noise, and light spill affecting light-sensitive ecological receptors are embedded in the Proposed Development by design:

- the erection of a 3.0m high close-boarded timber fence as set out in Axis drawing ref: Figure 4.3a Proposed Development – Illustrative Landscape Masterplan.

6. ASSESSMENT

Light Spill (illuminance - lux)

- 6.1 The levels of light spill associated with the Proposed Development have been predicted at light-sensitive ecological receptors. The resultant levels of light spill are set out in (Table 6.1) against the adopted 0.5 lux criterion for bat foraging & commuting activities. Each receptor has been assigned a PASS / FAIL outcome accordingly.

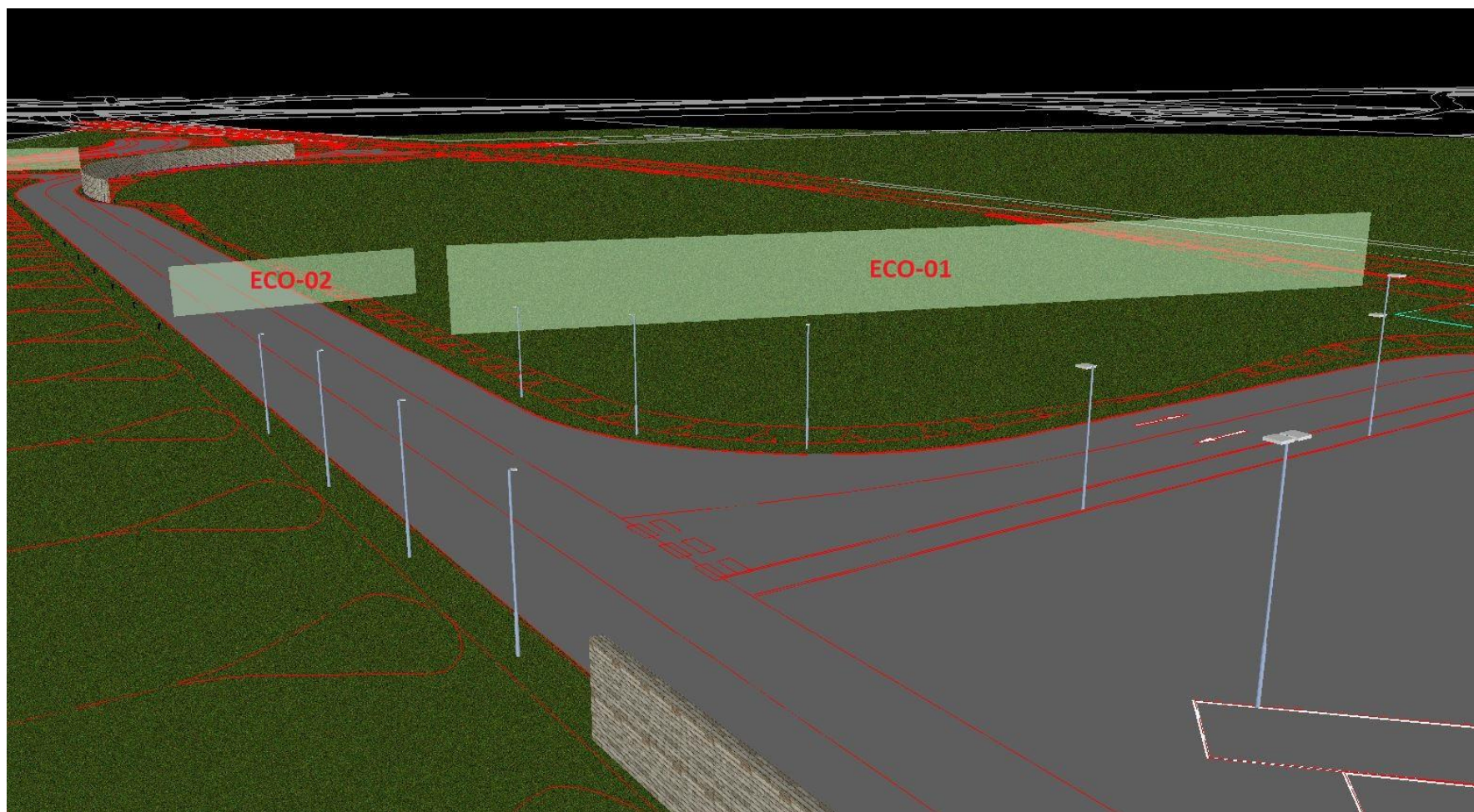
Table 6.1: Light Spill to Ecological Receptors			
Receptor	Target Average Light Spill Criterion - E (lux)	Predicted Average Vertical Light Spill - E (lux)	Outcome
ECO-01	0.5	0.37	PASS
ECO-02	0.5	0.49	PASS
ECO-03	0.5	0.45	PASS
ECO-04	0.5	0.48	PASS
ECO-05	0.5	0.44	PASS

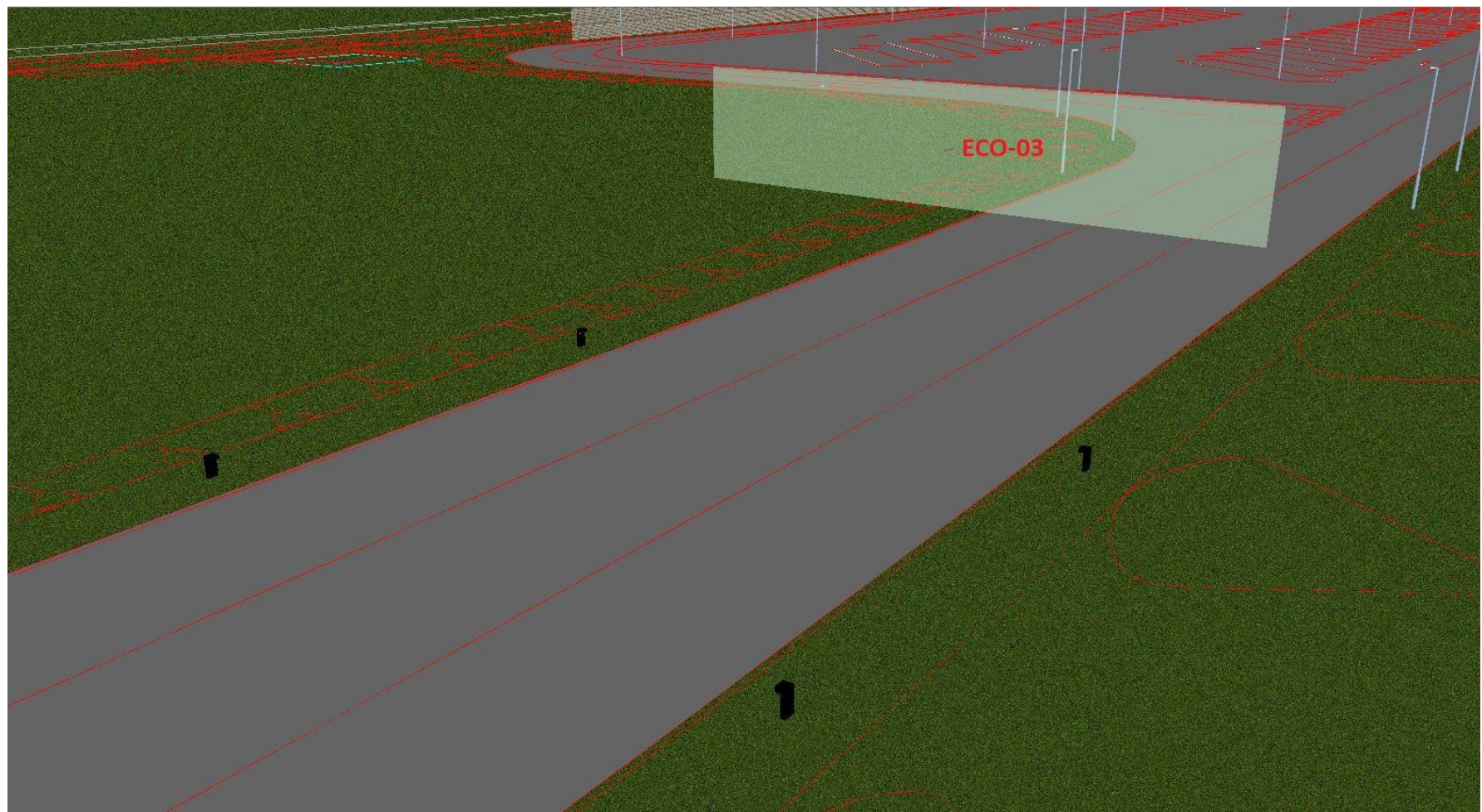
- 6.2 As can be seen from (Table 6.1) above, all predicted levels of light spill associated with the Proposed Development are compliant with the adopted 0.5 lux light spill criterion for bat foraging & commuting activities at light-sensitive ecological receptors.

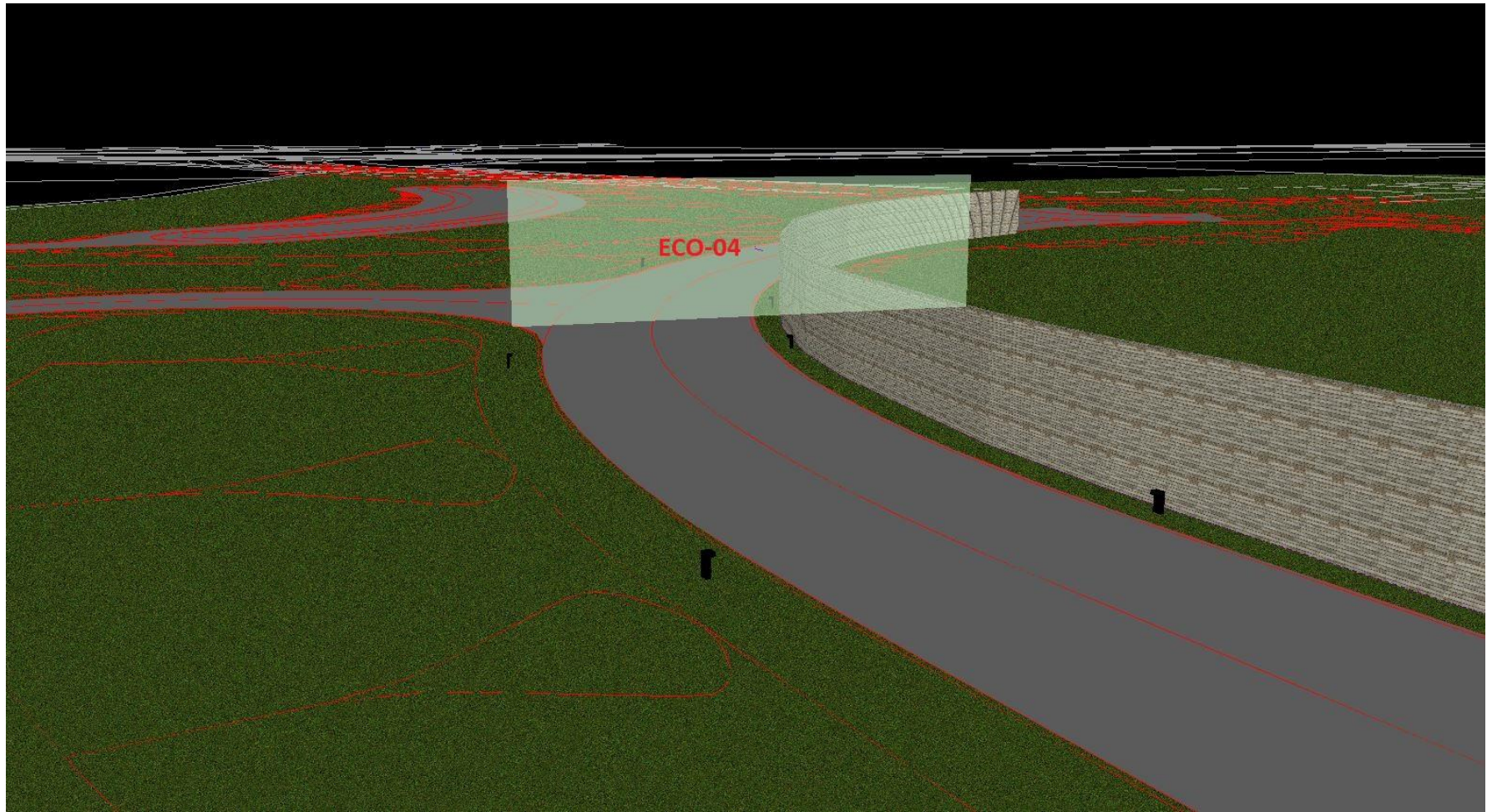
7. CONCLUSIONS

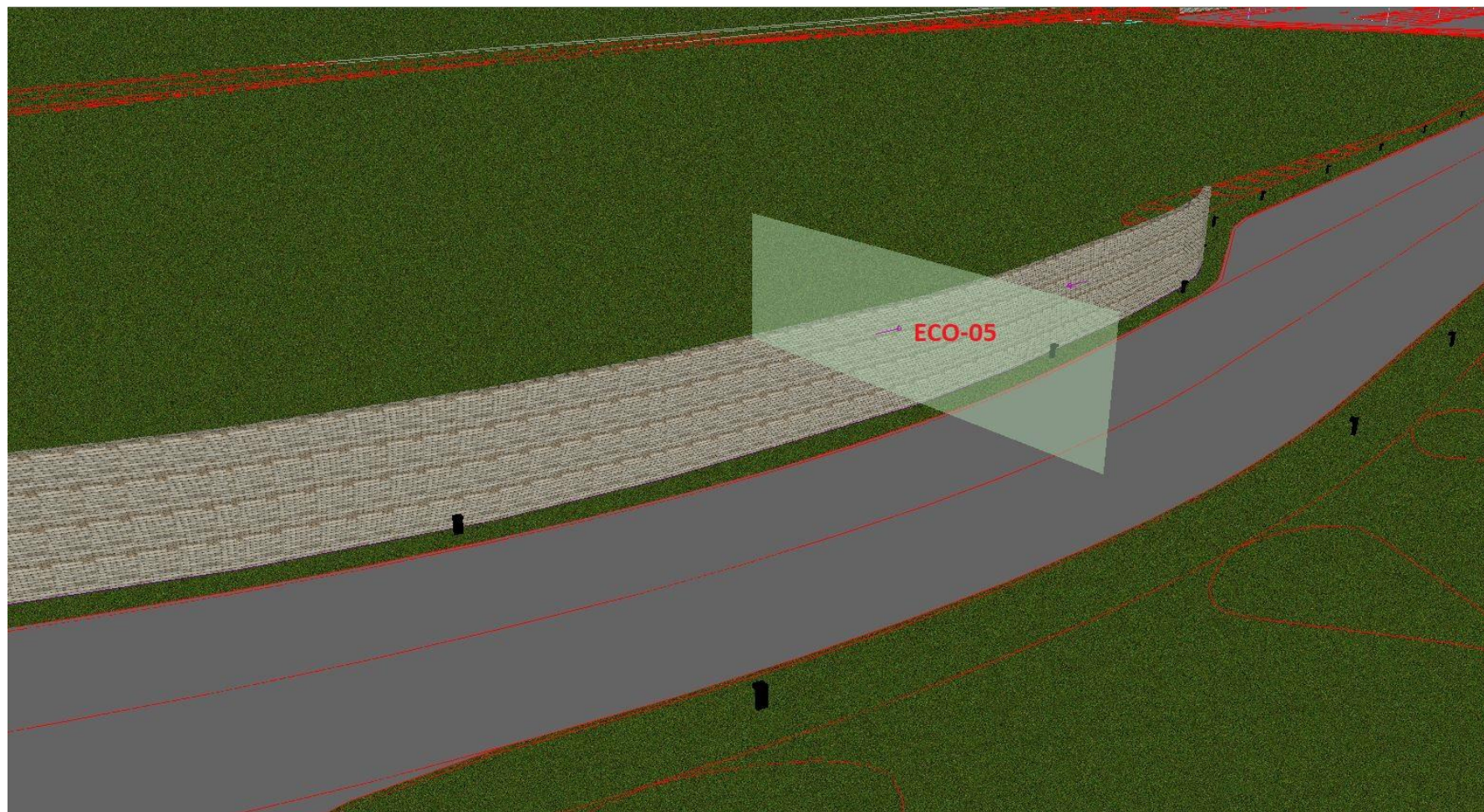
- 7.1 Based on the Assessed Scheme of Lighting, the predicted levels of light spill associated with the Proposed Development are compliant with the adopted 0.5 lux light spill criterion for bat foraging & commuting activities at light-sensitive ecological receptors.
- 7.2 Compliance with the ecological light spill criterion has been achieved with the adoption of a well-designed environmentally sympathetic scheme of lighting incorporating mitigation measures. The following mitigation measures specific to the control of light spill affecting light-sensitive ecological receptors have been included in the Assessed Scheme of Lighting:
- using 'warm-white' (3000K) light source colour temperatures generally;
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 - the adoption of the lowest intensity LED modules practicable; and
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- 7.3 The following mitigation measures, which serve a hybrid function with regard to the control of noise, and light spill affecting light-sensitive ecological receptors are embedded in the Proposed Development by design:
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Appendix A – Ecological Receptor Calculation Planes









Appendix B – Ray-traced Lighting Model Imagery



