



Gravesham Borough Council
Lighting Assessment Peer Review
Lower Thames Crossing Project
June 2023

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Document Control Sheet

Identification	
Client	Gravesham Borough Council
Document Title	Air Quality Assessment Peer Review – Lower Thames Crossing Project
Bureau Veritas Project No.	9584787

Contact Details		
Company Name	Bureau Veritas UK Limited	Gravesham Borough Council
Contact Name	Daniel Clampin	Tony Chadwick
Position	Senior Air Quality Consultant	Principal Transport and NSIP Project Manager
Address	Fifth Floor 66 Prescot Street London E1 8HG	Regulatory Services Gravesham Borough Council Civic Centre Windmill St Gravesend DA12 1AU
Telephone	[REDACTED]	[REDACTED]
e-mail	[REDACTED]@bureauveritas.com	[REDACTED]@gravesham.gov.uk
Websites	www.bureauveritas.co.uk	www.gravesham.gov.uk

Configuration				
Version	Date	Author	Reason for Issue/Summary of Changes	Status
1	30/6/23	D Clampin	Issued to Client	Draft

	Name	Job Title	Signature
Prepared By	D Clampin	Senior Consultant	[REDACTED]
Approved By	H Pearson	Senior consultant	<i>H Pearson</i>

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Registered Office: Suite 206, Fort Dunlop, Fort Parkway, Birmingham B24 9FD



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1 Introduction

Bureau Veritas has been appointed by Gravesham Borough Council (“The Council”) to peer review the lighting information submitted by Highways England, as part of the Environmental Statement (ES) assessing the impacts of the A122 Lower Thames Crossing Project.

Lighting information was submitted as part the application. Whilst no standalone Lighting ES Chapter has been submitted; the effects of lighting are considered in multiple documents which form the application. The below documents have been reviewed to inform this review:

- APP-145 6.3 Environmental Statement Chapter 7 – Landscape and Visual
- APP-146 6.3 Environmental Statement Chapter 8 – Terrestrial Biodiversity
- APP-199 6.2 Environmental Statement - Figure 7.3 - Environmental Lighting Zones
- APP-378 6.3 Environmental Statement Appendix 7.3 – Landscape and Visual Assessment Methodology
- APP-407 6.3 Environmental Statement Appendix 8.15 – Construction and Operational Light Spill Calculations

Lighting is considered with regards to the potential impact of the construction and operational phases of the scheme on sensitive human and ecological receptors including dark landscapes.

2 The Proposal

2.1 The Proposal as it relates to Lighting

The application is known as the A122 Lower Thames Crossing and would provide a connection between the A2 and M2 in Kent and the M25 south of junction 29, crossing under the River Thames through a tunnel. The A122 would be approximately 23km long, 4.25km of which would be in tunnel. On the south side of the River Thames, the Project route would link the tunnel to the A2 and M2. On the north side, it would link to the A13, M25 junction 29 and the M25 south of junction 29. The tunnel portals would be located to the east of the village of Chalk on the south of the River Thames and to the west of East Tilbury on the north side.

There will be new lighting installed at lengths along the scheme including within Gravesham. Changes in lighting have the potential to affect residential amenity, sky glow and can have a significant impact on light sensitive species (such as habitats).

Lighting has the potential to affect residential receptors in the following locations in Gravesham along the route:

- Chalk, Gravesend
- Thong, Gravesend
- Singlewell, Gravesend

Lighting also has the potential to affect the following sensitive ecological areas within Gravesham:

- West Kent Downs (sub area Shorne)
- West Kent Downs (sub area Cobham)
- Shorne and Higham Marshes

Lighting also has a potential to affect people's enjoyment of the night sky through causing excessive sky glow, making it difficult for recreational stargazing and astronomical study.

The West Kent Downs within Gravesham is considered an 'Intrinsically Dark Landscape' and has been assessed as such.

2.1.1 Construction Phase

Within the Gravesham Borough area, the application proposes the construction of a new A-road (A122) connection between the A2 and M2 and a new tunnel portal west of Gravesend. Works will take place at night and as such require some temporary construction lighting to be used as part of the scheme.

During all construction packages, temporary construction compounds and working areas would require lighting during hours of darkness to provide a safe and secure working environment.

Night Time Visual Impact

Lighting would also be designed, positioned and directed to prevent or minimise light disturbance to nearby residents, ecological receptors, as well as motorists and rail and marine operations. This provision would apply particularly to sites where night working or security lighting would be required. It has been assumed that temporary lighting would include tower lighting, mounted on a mast up to a maximum height of 9m, though 3.2.2. of Appendix 8.15 states that these would be at 12m. This should be clarified.

6.1 Environmental Statement Chapter 7 – Landscape and Visual states that there would be the following significant effects in Gravesham as a result of light sources:

- A 'Large adverse' effect on the West Kent Downs LCA 1A (comprising the sub areas of Shorne and Cobham). This is as a result of Adverse change in landscape character due to partial loss of mature woodland, the perception of large-scale construction activity along the existing A2/M2 corridor and associated light sources, resulting in a further reduction in relative tranquillity.
- A 'Very Large Adverse' effect at Higham Arable Farmland (sub area Thong and chalk) LLCA as a result of an adverse change in landscape character due to loss of arable land and mature woodland, and the perception of large-scale construction activity for the M2/A2/A122 Lower Thames Crossing junction, including substantial earthworks and associated light sources, resulting in a further reduction in relative tranquillity
- A 'Moderate adverse' effect at Istead Arable Farmlands LLCA as a result of adverse change in landscape character due to loss of vegetation to the north within Claylane Wood, Gravelhill Wood and the A2 corridor, and the perception of large-scale construction activity for the M2/A2/A122 Lower Thames Crossing junction and associated light sources within the Higham Arable Farmland (sub area Thong LLCA), resulting in a further reduction in relative tranquillity

This significance is based on a number of factors and not just lighting and would be temporary in nature.

Dark Skies

Table 3.2 of 6.3 Environmental Statement Appendix 8.15 – Construction and Operational Light Spill Calculations states that construction compounds would require some upward lighting, specifically at the segment casting factory, but all compounds would require at least a 10° tilt on lighting columns. This would inevitably result in some sky glow from construction compounds within Gravesham. However, as these effects would likely be short-term and temporary in nature, this is not considered to be significant.

Light Spill to Sensitive Species

6.3 Environmental Statement Appendix 8.15 – Construction and Operational Light Spill Calculations includes light spill calculations for proposed construction compounds within Gravesham. These show that there would be minimal light spill on to sensitive receptors. Figures in Appendix 8.15 (3.3 to 3.7) at 30m the lux value would be 0.5lx. It would be good to confirm that no sensitive species would be present within 30m.

Light Spill to Residential Receptors

6.3 Environmental Statement Appendix 8.15 – Construction and Operational Light Spill Calculations demonstrates there are not predicted to be any exceedances of ILP limits at sensitive residential receptors in either the pre- or post-curfew periods. As such, the impact on amenity as a result of construction lighting is considered to be negligible.

2.1.2 Operational Phase

All highway areas from the South Portal southwards to the southern end of the Project at the M2 sections with existing lighting are proposed to be lit as part of the operational phase of the project.

The Highways Lighting Appraisal document gives details of the economic justifications behind the decisions whether or not to provide lighting in each area. This document concluded that the full area to the south of the river should be lit. This is considered appropriate and justified.

Works in the West Kent Downs (sub area Shorne and sub area Cobham) areas would include replacement of street lighting (new LED (light emitting diode) luminaires on columns at a reduced height to the existing columns) and existing gantries and installation of new road signage. This would

likely improve existing conditions, though as no assessment of baseline has been completed, this is not possible to determine.

Night Time Visual Impact

6.3 Environmental Statement Appendix 7.9 – Schedule of Landscape Effects concludes that there would be limited perceived change in the night-time environment as a result of construction activity and new light sources evident along the widened A2 corridor, experienced in the context of existing street lighting along the A2.

Within the Kent Downs Area of Natural Beauty (AONB), there would be a perceived increase in night-time lighting along the A2 corridor due to vegetation removal, and along the western margin of the AONB due to lighting within the A2 compound and at the M2/A2/A122 Lower Thames Crossing junction. However, this change would only be perceived in localised areas, where existing lighting sources are apparent along the A2 and within Gravesend.

Dark Skies

6.3 Environmental Statement Appendix 7.9 – Schedule of Landscape Effects states that existing dark night skies of the AONB would be unaffected. With appropriate lighting selection which would not produce any upward light spill as set out in 6.3 Environmental Statement Appendix 8.15 – Construction and Operational Light Spill Calculations, this is considered to be achievable.

Light Spill to Sensitive Species

Lighting has been designed to avoid and reduce impacts on important biodiversity features such as retained areas of ancient woodland and bat roosts. This includes low column heights to reduce light spill, with lighting columns being placed in verges projecting towards the central reserve wherever practicable to reduce light spill into adjacent areas, unlit sections of road to provide dark corridors for photosensitive species and warm white luminaires to reduce the impacts on insects and bats.

Plate 4.11 of 6.3 Environmental Statement Appendix 8.15 – Construction and Operational Light Spill Calculations appears to show that there would be high lux levels at invertebrate sites at the South of River M2/LTC West Side. No conclusions or additional mitigation appear to be provided for this

It is not clear from the lighting assessment that values would be less than 0.5 lux at these sensitive sites with the vertical calculation figures provided with maximum vertical calculated values at Shorne Woods Ancient Woodland sites along the A2 being up to 59.2 lux. If the assessment is stating that this ancient woodland would exceed 0.5 lux at the first row of trees by the highway and then reduce to 0.5 lux as a result of the shielding effects of the trees behind this then it should be clarified that the effect on the first row of trees is not significant.

Plates 4.15 to 4.21 of 6.3 Environmental Statement Appendix 8.15 – Construction and Operational Light Spill Calculations shows the vertical light spill at bat roosts along the M2 corridor. It is not clear where the bat roosts are located on this figure. It is assumed that they would be at the top of the surface where lux levels are modelled to be below 0.5lux and thus unlikely to be affected.

6.1 Environmental Statement Chapter 8 – Terrestrial Biodiversity states for sites along the M2 Corridor (e.g. Shorne and Ashenbank Woods) that the operation phase lighting design would be designed as part of the Project design and mitigation measures to preserve nocturnal character and habitats, and maintain dark corridors for wildlife. The lux contours modelled have shown that within the woodland areas around the A2/M2, the lux level would fall to 0.5 lux immediately behind the treeline from the operational lighting of the Project. Around the South Portal, the lighting levels would fall to 0.5 lux within 30m of the Project.

Light Spill to Residential Receptors

There is not predicted to be any significant light spill causing exceedances of relevant ILP criteria at residential receptors. This is accepted.

2.2 Proposed Mitigation and Compensation for Lighting

2.2.1 Construction Phase

Construction lighting during utility works and main Project works have been considered together in the assessment of night-time construction effects.

Design principles for construction lighting are set out in 6.3 Environmental Statement Appendix 8.15. These are sensible and welcomed. It is stated within 6.3 Environmental Statement Appendix 2.2 – Code of Construction Practice, First iteration of Environmental Management Plan - Annex C - Preliminary Works Environmental Management Plan, that Construction lighting would be at the appropriate luminance required to provide safe working conditions. Where needed and appropriate, lighting to site boundaries would be provided, and illumination would be sufficient to provide a safe route for the passing public. Precautions would be taken to avoid shadows cast by the site hoarding on surrounding footpaths, roads and amenity areas. Where appropriate, lighting would be activated by motion sensors to prevent unnecessary usage.

Good practice methods for construction lighting are set out as:

- a. Close monitoring of these mobile lighting units would be required when they are needed to supplement lighting around the boundary.
- b. Knowledge of where the key sensitive receptors are in relation to night-time operations and careful placement of mobile lighting units to ensure that no extraneous light is falling onto these locations.
- c. Mobile units require backlight shields and need to be directed away from the key sensitive sites.
- d. The contractor would be responsible for training the operatives in how to correctly position the mobile units and make them aware of the locations of the key sensitive receptors. The temporary lighting would be monitored by the contractor's Environmental Clerk of Works.

These measures are welcomed.

2.2.2 Operational Phase

Environmental impact has been considered in the lighting design in the following ways:

- a. Column heights have been kept as low as practicable while still providing a compliant lighting design. Column heights used would vary between 5m and 15m.
- b. Luminaires have been selected which would emit no light above the horizontal to reduce skyglow and ensure light is only projected to where it is needed.
- c. Light Emitting Diode (LED) light sources would be used to reduce energy consumption and offer a more readily recyclable product at the end of life, compared to traditional light source lamps and luminaires.
- d. As LED light sources require less energy to operate, they require smaller cables, which reduces the amount of copper required for the installation.
- e. Lighting levels can be linked to the live traffic flow, so that during quiet periods the lighting is dimmed to reduce energy consumption. The lighting columns would be placed in the verges

projecting towards the central reserve wherever practicable to reduce light spill into adjacent areas.

- f. The unlit sections of the Project road would provide 'dark corridors' for photosensitive species such as bats to cross or feed near the highway.
- g. Luminaires have been selected with warm white (3,000K) LEDs to reduce the impact on wildlife of any light spill, as research has shown insects and bats, for example, are less attracted to warm white compared to cool white light due to the reduced UV emissions. Also, ongoing research shows that warm white light reduces 'white line loss' on wet highways when compared to cool white (i.e. warm white light gives a better contrast between the road surface and road markings on a wet road).

In addition to this, as part of the design development there is a commitment for low energy light sources to be used within the Project lighting systems to reduce energy consumption during operation and offer a more readily recyclable product at the end of life compared to traditional lighting.

These measures are welcomed and considered reasonable.

3 Methodology and Assumptions

3.1.1 Legislative and Policy Context

The NPPF has been considered within the context of the scheme in 6.1 Environmental Statement Chapter 7 – Landscape and Visual, but not specifically with regards to the requirements therein which pertain to lighting within the context of the planning system. The Planning Policy Guidance (PPG) has not been discussed with regards to lighting within the planning system. This document sets out guidance for what is expected to be considered for lighting as part of planning system.

The Institute of Lighting Professionals (ILP) has produced a guidance note ‘Guidance on Undertaking Environmental Lighting Impact Assessments’ which has been used for the purpose of assessing the effect of light spill from the development.

The ILP has also produced a document ‘PLG04 Guidance on Undertaking Environmental Lighting Impact Assessments’. This has not been referenced within the submitted documents for the scheme. This document gives advice on completion of baseline lighting reviews which has not been completed.

It is stated within 6.3 Environmental Statement Appendix 8.15 – Construction and Operational Light Spill Calculations Lighting has been designed in accordance with:

- British Standard BS EN 13201:2015 ‘Road Lighting’; and
- British Standard BS 5489:2003 ‘Design of Road Lighting’.
- British Standard BS 12464 – 2014 Light and lighting of workplaces - Part 2 - outdoor workplaces

There is a more up to date version of British Standard BS 5489 released in 2020. This should be used when finalising lighting designs.

3.1.2 Baseline Conditions

No quantification of lux levels at existing sensitive areas has been undertaken as part of the scheme. However, it is safe to assume that most ecological receptor locations are currently dark and experience only minimal levels of residual light if any.

No quantification of existing Sky Quality has been completed. This could be completed with a Unihedron Sky Quality Meter or similar.

Environmental Lighting Zones have been defined for the project study area. These are shown in 6.2 Environmental Statement Figure 7.3 Environmental Lighting Zones. These have been determined appropriately with any areas within the Kent Downs designated as an ‘E1’ representative of ‘Areas of Intrinsically Dark Landscapes -National Parks or Other Rural Landscapes with Strict Limits on Light Trespass’. All other areas are defined as ‘E2’ representative of sparsely inhabited rural areas, village or relatively dark outer suburban locations with some suburban centres in Shorne and Gravesend being designated E3, representative of ‘Well inhabited rural and urban settlements, small town centres of suburban locations’. This is considered appropriate.

3.1.3 Assessment Methodology

Visual Impact

The assessment of lighting for visual impact is considered sensible and is set out in 6.3 Environmental Statement Appendix 7.2 - Landscape and Visual Assessment Methodology.

Light Spill

The indicative light spill calculations have focussed on the potential sensitive ecological receptors and support the Terrestrial Biodiversity Assessment chapter and the Habitats Regulations Assessment. These are shown in 6.3 Environmental Statement Appendix 8.15 – Construction and Operational Light Spill Calculations.

It is not clear what software was used to produce these lighting calculations, though it appears to have provided industry standard outputs. Clarity around this would be welcomed, though it is unlikely that any software has been used which would be unreliable.

The light spill calculations include assessments of the following sites within Gravesham:

Construction

- A226 Gravesend Road compound – predicted light spill on adjacent Thames Estuary and Marshes SPA/Ramsar functionally linked land
- A2 Compound – predicted light spill at Shorne and Ashenbank Woods.
- Southern tunnel entrance compound – predicted light spill in relation to bat roost areas north of compound

Operation

- Highways lighting on junction between the Project and the A2

The lighting calculations shown light spill beyond these assessed areas on to surrounding habitats. While the assessment level for effect on habitats is not explicitly stated, a minimum value of 0.5 Lux is frequently cited as the level which has been designed to not be exceeded. It is assumed that this has been used within the design process to inform any exceedances of this level being likely to have an adverse impact on surrounding wildlife. The source for using this particular limit is not stated but is considered reasonable for the purposes of the assessment.

4 Asks

The following clarifications would be welcomed to determine the overall effect from Lighting as a result of the development.

- There is a more up to date version of British Standard BS 5489 released in 2020 than that cited in 6.3 Environmental Statement Appendix 8.15. This should be used when finalising lighting designs.
- Construction lighting would also be designed, positioned and directed to prevent or minimise light disturbance to nearby residents, ecological receptors, as well as motorists and rail and marine operations. This provision would apply particularly to sites where night working or security lighting would be required. It has been assumed that temporary lighting would include tower lighting, mounted on a mast up to a maximum height of 9m, though 3.2.2. of Appendix 8.15 states that these would be at 12m. This should be clarified.
- A finalised lighting scheme has not been produced as the technology in lighting is expected to change between the time of the application and the likely time of installation of any lights. This is accepted but an appropriate condition would be for the applicant to submit a detailed lighting design for each phase of works prior to each phase of construction.
- Plate 4.11 of 6.3 Environmental Statement Appendix 8.15 – Construction and Operational Light Spill Calculations appears to show that there would be high lux levels at invertebrate sites at the South of River M2/LTC West Side. No conclusions or additional mitigation appear to be provided for this. It is not clear from the lighting assessment that values would be less than 0.5 lux at these sensitive sites with the vertical calculation figures provided with maximum vertical calculated values at Shorne Woods Ancient Woodland sites along the A2 being up to 59.2 lux. If the assessment is stating that this ancient woodland would exceed 0.5 lux at the first row of trees by the highway and then reduce to 0.5 lux as a result of the shielding effects of the trees behind this then it should be clarified that the effect on the first row of trees is not significant.
- Plates 4.15 to 4.21 of 6.3 Environmental Statement Appendix 8.15 – Construction and Operational Light Spill Calculations shows the vertical light spill at bat roosts along the M2 corridor. It is not clear where the bat roosts are located on this figure. It is assumed that they would be at the top of the surface where lux levels are modelled to be below 0.5lux and thus unlikely to be affected. It would be beneficial to clarify this with the project ecologist.
- 6.3 Environmental Statement Appendix 8.15 – Construction and Operational Light Spill Calculations includes light spill calculations for proposed construction compounds within Gravesham. These show that there would be minimal light spill on to sensitive receptors. Figures in Appendix 8.15 (3.3 to 3.7) at 30m the lux value would be 0.5lx. It would be good to confirm that no sensitive species would be present within 30m.