Princes Parade, Hythe

Planning Application Y17/1042/SH

Additional Information and Clarification - February 2018

Appendix 06

Lighting Impact Assessment

PRINCES PARADE
LIGHTING IMPACT ASSESSMENT
APRIL 2017

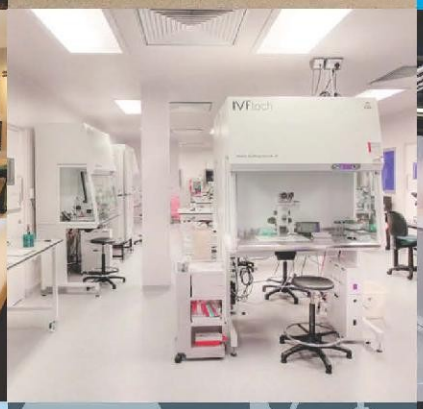
elementa
Member of Integral Group






THE BRUNSWICK




IVFlab





102
01/04/2009





TABLE OF CONTENTS

DOCUMENT CONTROL

Issue	Description	Date	Prepared By	Signed Off
1.0	Draft for Comment	30/06/17	I. Segre	P. Hender
2.0	Final Draft including Comments	11/08/17	I. Segre	P. Hender
3.0	Incorporating omitted Appendices	04/09/17	I. Segre	P. Hender
4.0	Incorporating illustrative concept residential development for outline planning	25/01/18	I. Segre	P. Hender

1 INTRODUCTION

The Lighting Impact Assessment (LIA) forms part of the wider Environmental Impact Assessment (EIA) for the proposed Princes Parade development. The report provides an assessment of the likely impact the artificial lighting of the proposed development will have upon the bat foraging habitats/foraging bats and the local environment.

The report includes a review of current legislation and policy relating to artificial light, as well as best practise guidance, background research, planning requirements and relevant British Standards.

The report assesses the existing baseline conditions including the current horizontal illuminance levels, the environmental zone types, the location of current exterior lighting equipment and identifies potential sensitive receptors; such as the bat foraging habitats/foraging bats and neighbouring residential properties with a direct line of sight to the proposed development.

The report also assesses the future sensitive receptors; such as the future residential properties.

Guidance and design recommendations are provided for the exterior lighting of the proposed development, taking into account planning and design guidance in conjunction with supporting background research, relevant British Standards and local planning requirements.

Finally, a desktop 3D computer simulation, utilising the architectural 3D massing model, provides a conceptual lighting design proposal following the guidance and design recommendations, utilising the latest light source, luminaire, optical and control technology

This defines a “best practise” lighting design strategy that provides the correct levels of illumination to the various areas of the site, whilst minimising and controlling obtrusive light within the environment, enabling the residual impacts upon sensitive receptors and the wider local environment to be accurately analysed.

2 SUMMARY

The proposed ARC Leisure Centre development site, proposed access road and future residential development have been analysed by on-site surveys, to establish a detailed understanding of the current baseline conditions with regards to the lit environment.

This was achieved through measuring the illuminance levels at 40 locations, in and around the development site, together with a photography survey documenting the illuminated appearance of the area and a visual appraisal to further identify sensitive receptors.

In order to aid in the assessment and understanding of lighting related impacts from the proposed development upon sensitive receptors and the local environment, the significance of effects criteria was used following the DCLG guidance:

- Major Negative
- Moderate Negative
- Minor Negative
- Negligible
- Minor Positive
- Moderate Positive
- Major Positive

The baseline measurements together with the local context have enabled the categorisation of the illuminated environment following CIE 150:2003 and ILP GN01:2011 guidance on obtrusive light.

The results has determined that the development area falls within an E1 environmental zone (intrinsically dark).

The background research reviewing current legislation, national and local planning policy, national and international standards, best practise guidance and current exterior lighting research was included in order that all aspects are considered, from a technical performance specification of the lighting strategy to bats; such as habitats, foraging and human factor related issues; such as good facial recognition for enhanced feelings of safety and security for pedestrians.

This forms a holistic guidance document for the future lighting of the proposed site.

The proposed development was assessed using 2D CAD masterplanning drawing, 3D computer model and the concept presentation ARC leisure centre documents to fully understand the architectural intent and proposed use for each area, enabling the development of a detailed lighting performance strategy.

The current architectural design was at the conceptual “massing” stage of the design process, so no detailed design documents have been provided.

Therefore the proposed lighting design for the ARC leisure centre development was unknown making it difficult to accurately analyse the likely impacts the lighting will have upon the local environment.

In order to address this issue, a conceptual lighting design strategy was developed by Elementa Consulting following the guidance and specification previously defined for each area.

The future residential properties were modelled from the illustrative masterplan and elevations, representing a concept and not detailed design option in which the parameters applied for in the outline part of the application can be interpreted.

Lighting equipment from a reputable manufacturer was selected based upon their suitability for the task, aesthetic styling and technical performance characteristics.

The lighting, together with the architect 3D massing model was imported into DAILux evo (Lighting design and engineering software) enabling accurate calculations and visualisations for the intended design to be realised.

Virtual light meters were positioned across the ground measuring horizontal illuminance upon the areas identified as sensitive receptors.

An obtrusive light assessment was carried out within the software analysing compliance in conjunction with E1 environmental zone requirements for both pre and post-curfew.

The results highlighted the sensitive receptor locations where the maximum illuminance limits were not exceeded during pre and post-curfew conditions.

The predicted residual effects without addressing these issues through further mitigation measures were considered **negligible**.

Further mitigation measures, if required, would include the provisions for landscape screening at the facades of the car park areas to further reduce the residual effects.

This can be further developed through the development of the architectural design and the final lighting design.

Analysis of the lighting conditions based upon post-curfew limits identified a number of sensitive receptors along the proposed access road where the maximum allowable illuminance of 1 lux was not exceeded.

In order to further mitigate the residual effects, if required, would include the control of the light levels, possible through the implementation of dimming controls to reduce the road lighting post-curfew.

Overall, the proposed development and concept lighting design strategy implemented within the architectural 3D computer model has a negligible - minor negative effect upon the identified bat habitats, the local environment and future residential properties sensitive receptors.

Modifications to the architectural design, especially the open sides of the car parks will further help to mitigate any potential issues.

In order to ensure that the installed external lighting meets these criteria, this report should be made available to the lighting designer/engineer.

Further computer analysis should be undertaken during the design phase and prior to installation of the lighting scheme, to ensure that no significant adverse effects are introduced to the sensitive receptors.

3 LEGISLATION, POLICY AND GUIDANCE

3.1 LEGISLATIVE FRAMEWORK

3.1.1 Clean Neighbourhoods and Environmental Act (CNEA) 2005

Section 102 "Statutory nuisance - Lighting" amends section 79 of the Environmental Protection Act 1990 so as to provide that the statutory nuisances listed in that section include "artificial light emitted from premises so as to be prejudicial to health or a nuisance". This has the effect of subjecting nuisance lighting to the statutory nuisance regime in Part 3 of the Environmental Protection Act 1990.

Subsections (3) to (6) make provision about exempting artificial lighting emitted from certain premises from constituting a statutory nuisance. Such premises include:

- Airport
- Harbour premises
- Railway premises, not being relevant separate railway premises
- Tramway premises
- Bus stations and any associated facilities
- Public service vehicle operating centre
- Goods vehicle operating centre
- Lighthouse
- Prisons

3.1.2 The Clean Neighbourhoods and Environmental Bill

Research Paper 05/01 (4 January 2005) The Clean Neighbourhoods and Environmental Bill 11 of 2004-05 under Statutory Nuisances Section B Nuisance Light, Defra classifies light pollution as 'unwanted light', which is separated into three categories:

1. Light trespass: the intrusion of light into homes i.e. by badly positioned security lighting
2. Glare: unshielded bright lighting i.e. car park lighting which may be hazardous in small areas
3. Sky glow: the broad orange glow that prevents appreciation of the night sky

Currently, major developments must submit a formal environmental assessment that would include some consideration of the effects of lighting, under the Town and Country Planning (assessment of Environmental Effects) Regulations 1988. The Defra and Countryside Commission report, Lighting in the Countryside[i], suggests that it would be good practice for developers to apply such an assessment to all developments that require lighting.

3.1.3 National Planning Policy Framework (NPPF)

The National Planning Policy Framework set out the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Section 11 Conserving and Enhancing the Natural Environment, under sub section states regards to artificial light "By encouraging good design, planning policies and decisions should limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

3.1.4 Shepway District Local Plan Review

Shepway District Local Plan Review (2006) Policies Applicable 2013 onwards contains a specific policy U15 with regards to exterior lighting or the effects of light upon the environment that states *p*roposals for development which involve outdoor lighting will be permitted subject to the scheme satisfying the following criteria:

a) The quantity and illumination of the lighting proposed is the minimum necessary to meet its stated purpose.
b) The lighting is positioned and shaded so as to minimise glare and light spillage from the site, or impact on local residents, road users and pedestrians or wildlife.
c) The impact on the visibility of the night sky is reduced as far as possible.

3.1.5 British Standards

British Standards BS5489-1:2013

BS5489-1:2013 Code of practise for the design of road light – Part 1: Lighting of road and public amenity areas provide guidance and recommendations for the lighting of all types of highways, public thoroughfares, including those specifically for pedestrians and cyclist, as well as urban centres and public amenity areas.

British Standards BS13201-2:2015

BS13201-2:2015 Road lighting – Part 2: Performance requirements defines, according to photometric requirements, lighting classes for road lighting aiming at the visual needs of road users, and it considers environmental aspects of road lighting. It is intended to be read in conjunction with BS5489-1:2013

3.1.6 National Guidance

Institution of Lighting Professionals (ILP)

The Institution of Lighting Professionals (formerly Institute of Lighting Engineers) publishes Guidance Notes for the Reduction of Obtrusive Light GN01:2011 designed to aid the understanding and assessment of obtrusive light at local planning level.

The document explains the various forms of obtrusive light; including light spill, light trespass, sky glow and glare. The document defines five environmental zones, E0~E4, and provides limitations on the various forms of obtrusive light according to each zone. The ILP guidance is based upon International guidance CIE150:2003 from the Commission Internationale de L'Eclairage (CIE)

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres - high levels of night-time activity

Table 1 ILP Environmental Zones

Zone	Sky Glow ULR [Max %] (1)	Light Trespass (into Windows) Ev [Lux] (2)		Source Intensity I [kcd] (3)		Building Luminance Pre-curfew (4)
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Average L [cd/m^2]
E0	0	0	0	0	0	0
E1	0	2	0(1*)	2.5	0	0
E2	2.5	5	1	7.5	0.5	5
E3	5	10	2	10	1.0	10
E4	15	25	5	25	2.5	25

Table 2 – Obtrusive Light Limitations for Exterior Lighting Installations – General Observers

ULR = Upward Light Ratio of the Installation is the maximum permitted percentage of luminaire flux that goes directly into the sky.

Ev = Vertical Illuminance in Lux **-** measured flat on the glazing at the centre of the window.

I = Light Intensity in Candelas (cd)

L = Luminance in Candelas per Square Metre (cd/m2)

Curfew = the time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by the local planning authority. If not otherwise stated - 23.00hrs is suggested.

*** =** Permitted only from Public road lighting installations

(1) Upward Light Ratio – Some lighting schemes will require the deliberate and careful use of upward light, e.g. ground recessed luminaires, ground mounted floodlights, festive lighting, to which these limits cannot apply. However, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires and light controlling attachments.

(2) Light Intrusion (into Windows) – These values are suggested maxima and need to take account of existing light intrusion at the point of measurement. In the case of road lighting on public highways where building facades are adjacent to the lit highway, these levels may not be obtainable. In such cases where a specific complaint has been received, the Highway Authority should endeavour to reduce the light intrusion into the window down to the post curfew value by fitting a shield, replacing the luminaire, or by varying the lighting level.

(3) Luminaire Intensity – This applies to each luminaire in the potentially obtrusive direction, outside of the area being lit. The figures given are for general guidance only and for some sports lighting applications with limited mounting heights, may be difficult to achieve.

(4) Building Luminance – This should be limited to avoid over lighting, and related to the general district brightness. In this reference building luminance is applicable to buildings directly illuminated as a night-time feature as against the illumination of a building caused by spill light from adjacent luminaires or luminaires fixed to the building but used to light an adjacent area.

Chartered Institute of Building Services Engineers (CIBSE)

SLL Lighting Guide LG06/16 - The Exterior Environment (2016) details many technical and aesthetic aspects which are likely to be of interest to users and specifiers of lighting equipment in outdoor situations. The guidance document covers general design aspects, specific applications, lighting techniques, equipment and maintenance.

3.1.7 The Conservation of Habitats and Species Regulation

The Conservation of Habitats and Species regulations 2010 consolidate all the various amendments made to the Conservation (Natural Habitat, &c.) regulations 1994 in respect of England and Wales.

The Wildlife and Countryside Act 1981 that is up to date with all changes know to be in force on or before June 2017. However there are changes that may be brought into force at a future date.

All bat species and their roosts are protected under these regulations.

This legislation, unless subject to a European Protected Species Licence (EPSL), makes it an offence to recklessly or intentionally disturb a bat, specifically affect the local distribution or abundance and to damage or destroy a bat's breeding site or resting place.

Shepway District Council does not appear to have a specific lighting policy. The general light pollution information and guidance taken the Shepway District Council website relates to artificial light problems in public and private premises.

3.1.8 International Guidance

Commission Internationale de L'Eclairage (CIE)

CIE 150 (2003): Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations, is an International guidance document designed to help formulate guidelines for assessing the environmental impacts of outdoor lighting and to give recommended limits for relevant lighting parameters to contain the obtrusive effects of outdoor lighting within tolerable levels.

Lighting is often the focus of complaints because it is, by nature, highly visible and is the means by which the conduct of the night activity is made possible. The potential effects of the lighting should therefore be assessed, as part of the overall impacts of a development, by the relevant development approval authority.

The impact of a lighting installation on the environment is not limited to the imposition of obtrusive light. The designers of a lighting installation should be encouraged to utilize luminaires and light sources that efficiently direct the light into the area required, thereby minimizing the energy consumption and waste light.

4 ASSESSMENT METHODOLGY

4.1 INTRODUCTION

An initial desktop study has been undertaken to identify local designations, potential sensitive receptors and local planning policy. This was followed by two night-time surveys of the area to identify existing lighting equipment, to photograph the night-time lit appearance and to measure current light levels in and around the site boundary.

4.2 ASSESSMENT AREA

The assessment area comprises the proposed site boundary, as shown in Figure 1, incorporating Seapoint Canoe Centre, Shepway District Council Car Park, the Royal Military Canal, Princes Parade, and the Promenade, with neighbouring Royal Military Road (Cycle Track), Seabrook Road and Cliff Road.

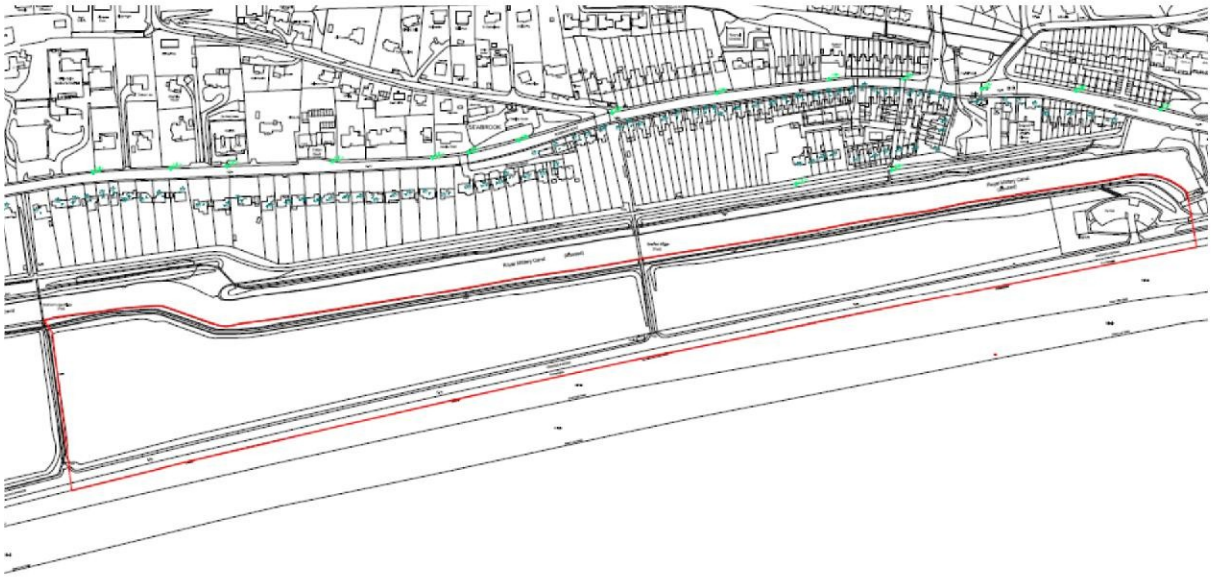


Figure 1 Proposed Development Site Boundary

4.3 SITE SURVEY

A site survey was undertaken on Friday 25th November 2016 between the hours of 19:30 ~ 23:00, where sky conditions were partly cloudy and weather conditions dry until.

A visual assessment of the current lighting equipment was undertaken, plotting and column locations on or around the site plan.

Photographic assessments of the current lighting conditions were also undertaken, in order to record the baseline lighting conditions and illuminated appearance of the site night-time scene.

A second site visit was carried out on Tuesday 23rd May 2017, between the hours of 21:00 ~ 23:00. Sky conditions were perfectly clear and weather conditions were dry.

A series of light measurements were recorded (40 readings) at strategic locations across the site. Illuminance level measurements were recorded horizontally at ground level in Lux units, using an Irradian L203 light meter (Serial No. D005/0032).

The measured illuminance values are illustrated on drawing P16206-XX-XX-DR-EX-97001 (See Appendix 1).

4.4 SENSITIVE RECEPTORS

During the site survey, the locations of potential sensitive receptors were identified. These mainly consist of the canal footpath, canal embankment, bat foraging habitats/foraging bats and some residential properties bordering the north side of the Royal Military Canal with a direct line of sight to the proposed site development.

Receptors have been categorised as Low, Medium and High according to their proximity and potential exposure to the proposed development lighting.

Drawing P16206-XX-XX-DR-EX-97001 (See Appendix 1) illustrates the location and category of sensitive receptors identified.

An assessment of the likely impact of the proposed development, upon the sensitive receptors, will be later analysed in accordance with ILP GN01:2011

4.5 SIGNIFICANCE OF EFFECTS CRITERIA

In order to categorise the likely impact of the proposed development upon the local environment, during both the construction (temporary) and operational (permanent) phases of the development, a significance of effects criteria has been devised following DCLG guidance. https://www.gov.uk/government/organisations/department-for-communities-and-local-government

The significance of effects criteria considers the nature (type), scale (area effected) and duration (time period) of the potential impact upon the identified sensitive receptors and the magnitude of change from the baseline conditions, in accordance with ILP GN01:2011 and CIE 150:2003 guidance.

The significance of effects criteria is based on four magnitudes of effect, whether positive (beneficial) or negative (adverse):

- Major
- Moderate
- Minor
- Negligible

The magnitudes of effect consists of seven levels, based upon comparative assessment and expert judgement.

Major Negative	Deemed a statutory nuisance: • Excessive Upward Light Ratio (ULR), beyond the recommended limits, according to environmental zone E4, as define by GN01:2011 giving rise to significant waste light and excessive levels of sky glow. and/or • Excessive light trespass and light spill upon local sensitive receptors, & neighbouring properties, beyond the recommended limits, according to environmental zone E4, as defined by GN01:2011 and/or • Excessive source intensity, beyond the recommended limits, according to environmental zone E4, as defined by GN01:2011leading to issues of glare and potential visual impairment to road users.
Moderate Negative	Potential for statutory nuisance. • Increased levels of Upward Light Ratio (ULR) beyond the recommended limits, according to the relevant environmental zone, as defined by GN01:2011. and/or

	• Increased light trespass and light spill upon local sensitive receptors & neighbouring properties, compared to current baseline conditions and exceeding the recommended limits, according to the relevant environmental zone, as defined by GN01:2011. and/or • Source intensity exceeding the recommended limits, according to the relevant environmental zone, as defined by GN01:2011.
Minor Negative	Not considered a statutory nuisance. • Minor increase in levels of Upward Light Ratio (ULR) compared to baseline conditions, but within recommended limits, according to the relevant environmental zone, as defined by GN01:2011. and/or • Minor increase in light trespass and light spill upon local sensitive receptors & neighbouring properties, compared to baseline conditions, but within recommended limits, according to the relevant environmental zone, as defined by GN01:2011. and/or • Minor increased of source intensity, compared to baseline conditions, but within recommended limits, according to the relevant environmental zone, as defined by GN01:2011.
Negligible	Not considered a statutory nuisance. Little or no change from the existing baseline conditions and within the recommended limits, according to the relevant environmental zone, as defined by GN01:2011.
Minor Positive	Considered a positive impact on the environment. • Minor decrease in levels of Upward Light Ratio (ULR), compared to the baseline conditions and recommended limits, according to the relevant environmental zone, as defined by GN01:2011. and/or • Minor decrease in light trespass and light spill upon local sensitive receptors & neighbouring properties, compared to the baseline conditions and recommended limits, according to the relevant environmental zone, as defined by GN01:2011. and/or • Minor decrease of source intensity compared to the baseline conditions and recommended limits, according to the relevant environmental zone, as defined by GN01:2011.
Moderate Positive	Consider a beneficial impact on the environment. • Decreased levels of Upward Light Ratio (ULR), below the current baseline conditions and recommended limits, according to the relevant environmental zone, as defined by GN01:2011.

	and/or • Decreased light trespass and light spill upon local sensitive receptors & neighbouring properties, below the current baseline conditions and recommended limits, according to the relevant environmental zone, as defined by GN01:2011. and/or • Decrease in source intensity, below the current baseline conditions and recommended limits, according to the relevant environmental zone, as defined by GN01:2011.
Major Positive	Consider a major benefit to the environment. • Negligible Upward Light Ratio (ULR), far below the baseline conditions and recommended limits, according to the relevant environmental zone, as defined by GN01:2011. Little if any contribution to the effects sky glow. and/or • Zero light trespass and light spill upon local sensitive receptors, & neighbouring properties, far below the baseline conditions and recommended limits, according to the relevant environmental zone, as defined by GN01:2011. and/or • Low source intensity, far below the baseline conditions and recommended limits, according to the relevant environmental zone, as defined by GN01:2011.

Table 3 - Significance of effect criteria definitions

4.6 BASELINE CONDITIONS

4.6.1 Baseline Conditions

On Friday 25th November 2016, between the hours of 19:30 - 23:00, 53 horizontal illuminance (Lux) measurements were recorded at strategic locations in and around the site boundary using an Irradian L203 light meter (Serial No. D005/0032). For reasons of health & safety measurements were not recorded on the public highways.

Drawing P16206-XX-XX-DR-EX-97001 (See Appendix 1) details the illuminance levels recorded at each location. Table 4 below summarises the values recorded.

Measurement Area	Units	Maximum	Minimum	Points	EZ
Seapoint Canoe Centre	Lux	0.12	0.12	3	E1
Shepway District Council Public Car Park	Lux	0.15	0.12	14	E1
Playground	Lux	0.12	0.12	3	E1
Cycle Area	Lux	0.12	0.12	1	E1

Footpath Steps	Lux	0.12	0.12	3	E1
Canal Footpaths	Lux	0.12	0.12	14	E1
Shrub Area Footpaths	Lux	0.12	0.12	2	E1
Seaview Footbridge	Lux	0.12	0.15	3	E1
Princes Parade Public Footpath	Lux	0.15	0.15	10	E1

Table 4 – Horizontal illuminance measurements results summary

4.6.2 Seapoint Canoe Centre

The proposed site boundary incorporate the Seapoint Canoe Centre accommodation/storage containers. There was no exterior lighting presence on the accommodation/storage containers.

Figure 2 – Seapoint Canoe Centre

4.6.3 Shepway District Council Public Car Park

Located on the west of the Seapoint Canoe Centre is the Shepway District Council pay and display public car park. There was no exterior lighting presence within the public car park.

Figure 3 – Shepway District Council Public Car Park

4.6.4 Royal Military Footpath and Embankment

Located on the north of the site boundary is the Royal Military Canal. There was no exterior lighting presence on the steps from the public car park down to the footpath and embankment.

From the public car park, along the embankment towards Seaview and Seabrook Lodge foot bridges crossing the canal, there was no exterior lighting presence. With the exception of very low level light trespass from Seabrook Road and associated residential properties on the opposite side of the canal.

Figure 4 – Royal Military Canal Footpath and Embankment

5 REASEARCH AND GUIDANCE

5.1 INTRODUCTION

As this document forms part of the initial and outline planning stages, the final lighting scheme has not been fully designed. The purpose of this section is to provide background research relating to exterior lighting and to set out a design master plan for the future lighting scheme.

Drawing upon current guidance, standards and research, the first part of this section provides important background information relating to urban exterior lighting, focusing on human factors, to ensure that good amenity lighting is provided for pedestrians.

5.2 AMENITY LIGHTING

Amenity lighting should serve to provide general illumination for seeing, facilitating safe movement and orientation. It should also provide a sense of well-being, therefore removing the potential fear of crime, whilst making the environment pleasant or visually attractive.

This can be achieved by a coherent, well balanced and appropriate scheme.

Lighting is for people, providing our physical safety, psychological well-being and arousing our interest in the environment around us. Thus, to achieve good 'amenity', the lighting must address these three fundamental aspects; safety, well-being and attractiveness.

5.3 HUMAN FACTORS

Any lighting must meet the visual needs of the people who use the area, to better understand how these needs can be met it is first necessary to consider what are the visual tasks of a pedestrian.

Tasks can be broken down in a number of ways to define the requirements of pedestrian as follows:

- Safe movement
- Visual orientation
- Visual comfort
- Facial recognition
- General feeling of safety
- Night-time appearance

Clearly these factors interact, for example if facial recognition is easily achieved then a feeling of security may be induced.

Moreover, a lighting system that helps meet one of the above objective for pedestrians is also likely to help address the others.

However, it is worth looking at how lighting can address each element separately in order to understand the total set of requirements placed upon a lighting scheme.

5.3.1 Safe Movement

The amount of light needed for safe movement is relatively low, as the visual tasks in walking along a road are limited to checking for obstacles on the footpath and gathering information about orientation and position.

The level of illumination required to enable safe movement can be as low as 1 lux, however, this level may not be sufficient for good facial recognition, which in turn helps to promote a general feeling of safety.

It can be considered that safe movement will be achieved if other aspects such as good facial recognition are addressed.

5.3.2 Visual Orientation

Visual orientation is achieved if pedestrians can identify features of the environment and from them deduce their location in order to plan their route.

In residential areas orientation is relatively easy as the majority of the pedestrians will be familiar with the area and so large objects such as houses and trees can serve as land marks and provide pedestrians all the information that they need to navigate their surroundings.

In complex environments, such as urban town centres, it should be assumed that people are less familiar with their surroundings and thus it is important to provide signage to aid way finding.

Lighting can significantly aid in this process, after hours of darkness, both in terms of good lighting of signage, but also through general lighting of the environment and emphasis of key features such as the cinema, hotel, retail buildings, footpaths, car parks, as well as emphasis of elements such as trees and landscaping. Illuminance on vertical surfaces, particularly signs, is important in revealing the form of features and thus helping the process of orientation.

In pedestrian areas the lighting should promote easy movement of pedestrians, attempt to create a feeling of general security and well-being and attempt to encourage people to visit and make use of the facilities. Recognition of the behaviour and intentions of other pedestrians is important, and for this purpose good colour rendering as recommended in BS 5489-1:2013 and adequate facial illuminance should be provided.

5.3.3 Visual Comfort

Visual comfort is generally related to the luminance pattern of the lit environment and is particularly affected by the presence of glare.

Glare is a highly complex phenomena that is generally split into two categories;

- Disability glare
- Discomfort glare

Disability glare occurs when excessive light, present at the observer's eye, makes it harder to see and thus visibility is reduced or impaired.

Discomfort glare is a subjective impression that is formed by the lit environment and so it is far harder to characterise the exact circumstances that give rise to discomfort.

Researchers have extended the concept of visual comfort to include a large number of other features of the visual environment ranging from the modelling of people's faces to the nature of the light source and the extent to which light penetrates into private houses.

Other researchers have developed some of these ideas into the concept of "pleasantness" and then derived recommendations for lighting systems for shopping centres to achieve pleasantness.

5.3.4 Facial Recognition

It has long been established people like to maintain a personal space around them.

The basic ideas of personal spaces were developed by researchers where he categorised personal space as intimate (up to 0.5 m), personal (up to 1.2m) and social consultative (up to 3m). Space outside this area is termed public space.

Researchers discussed the importance of these zones to people and why people felt uncomfortable with letting strangers enter their personal space.

Researchers used these basic ideas to explain why pedestrians at night did not like coming too close to people they did not recognise and thus realised the importance of facial recognition. Researchers then came up with the criteria that the lighting should be such as to permit the recognition of a face at a distance of 4m.

They then went on to establish that semi-cylindrical illuminance on a person's face is the best lighting metric to determine how easy it is to recognise a person's face. The link between facial recognition and semi-cylindrical illuminance has also been tested by a number of other researchers.

A review of these studies found that the relationship between facial recognition distance and semi-cylindrical illuminance was basically sound, however, it was found to be the case that when light incident from behind formed a significant part of the semi-cylindrical illuminance the facial recognition distance was shorter than expected. Researchers suggested the solution would be to adopt a truncated form of semi-cylindrical illuminance.

Many researchers, looking at recognition distance, found that older people need more light to be able to recognise a face at a given distance and found that the colour rendering ability of the light is important, a source of low colour rendering (Ra20) giving the same recognition distance as a source of high colour rendering (Ra80) at only half the level of illuminance.

5.3.5 A General Feeling of Safety

Researchers, argue that facial recognition is one of the key ways to promote a feeling of safety, however, feelings of safety and fear are dependent on factors other than just the lighting. A further study in city areas showed that in general the greater the amount of light provided the greater the feeling of safety.

Analysis of the experimental findings also revealed that in general, men felt safer than women. The difference in sense of safety was noted other researchers who found that older people felt less safe than young people.

Researcher's studies also looked at a series of car parks and compared the feeling of safety during the day and at night. In all cases they was found that people felt safer during the day. Moreover, they were able to relate the change in the feeling of safety between day and night to illuminance at night, the higher the illuminance the less the change in feeling of safety.

The main factor working against a feeling of safety is a fear of crime. Fear of crime is a very complex phenomenon that is loosely related to the risk of being a victim of crime. For example Researchers found that young men were many times more likely to be victims of crime than elderly women, however, their fear of crime was much less.

In some instances fear of crime and crime are related. Researchers found that good street lighting reduced the amount of crime; in fact they were able to establish that the cost saved by the community in one year from reduced crime was greater than the cost of installing the new lighting system.

Whilst they did not come to a conclusion as to how this effect was created one of the plausible explanations was that good lighting reduced the fear of crime and thus more people used the streets at night, therefore making it harder to commit a crime unobserved.

In general lighting can help reduce the fear of crime, however there are some cases where lighting alone may not have any effect on the felling of safety. Researchers reported that lighting has little effect in areas of low crime and found that in an area where there was a perceived threat from young people loitering at night, extra lighting did not help to reduce the perceived fear of crime alone.

5.3.6 Night-Time Appearance

An aspect of planning any lighting scheme is the positive contribution it can make to the improvement of the night-time environment. Much can be done in basic design to ensure that the lighting directly helps to create a pleasant and attractive after-dark atmosphere, especially for areas of civic importance.

While efficient lighting for traffic and pedestrian safety is essential, consideration of the whole visual scene at night is highly desirable for many reasons. In lighting urban and residential roads, amenity and environmental requirements should always be given full consideration and there should be an evaluation of the assistance lighting can afford to crime prevention.

Careful consideration should be given to the colour rendering index of the lamp (Ra). In civic centres, shopping streets, boulevards, promenades and other places that are the hub of social activity and have a high night-time pedestrian use, light sources with a Ra 60+ should be used.

Where street crime is a major problem and the police use CCTV for prosecution, the use of light sources with a Ra 80+ should be adopted.

6 DESIGN STRATEGY

6.1 LIGHTING STRATEGY

The lighting strategy for the proposed development has been specifically designed to pay particular attention to the sensitive bat foraging habitats/foraging bats and nature designations.

The following section looks at the various areas of the site and their associated use.

A technical lighting specification is detailed for each area taking into account current British Standards, industry guidance from The Institution of Lighting Professionals (ILP) and The Society of Light & Lighting (SLL), as well as other relevant published documents.

A site plan has been provided as a guide to the various areas of the site which are colour coded according to area type and associated lighting requirements.

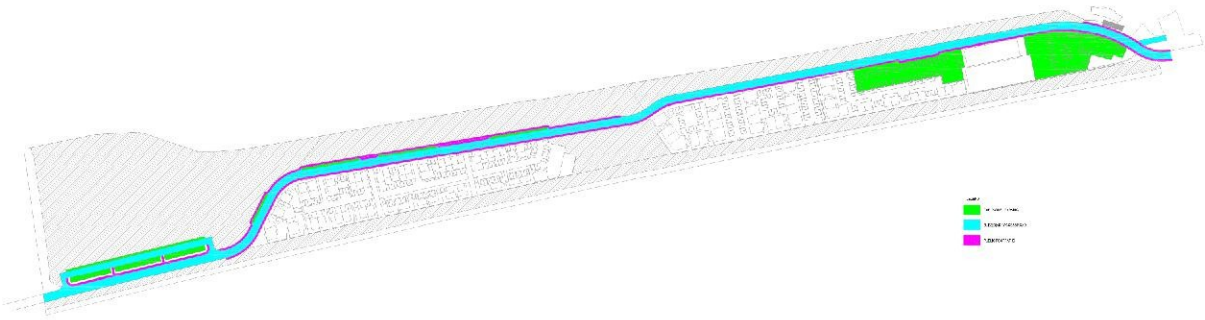


Figure 5 – Drawing P16206-XX-XX-DR-EX-97002 (See Appendix 2) illustrates the proposed site showing areas colour coded area type and lighting requirements.

The purpose of car park lighting is to enable users to proceed safely and reduce the fear of crime.

Lighting is needed for both pedestrians and motorists. For pedestrians lighting for good viewing conditions and avoidance of dark areas is necessary. For motorists the emphasis is on good lighting for vehicle movement and parking.

The variation in character of car parks in terms of size, structure, location and access means that different lighting techniques are necessary and pedestrian access points to car parks should have appropriate lighting provisions.

Lamps of a high colour rendering Ra80+ "White Light" should be used for all general illumination in order to provide good colour rendering of the scene, improve facial recognition distances, promote a general sense of well-being and to aid CCTV.

It is recommended that Light Emitting Diodes (LED) are the preferred choice of lamp source to minimise the infrared and UV light components, providing a low energy/maintenance, high colour rendering "White Light " approach to the lighting strategy.

LED technology can also bring additional benefits to the scheme through the wide variety of optical distributions, the ability to instantly switch the lamps on/off without any deterioration to the lamp itself and the ability to dim the light output for post-curfew compliance.

Luminaires should have a semi/full cut-off type distribution, compliant with class G4, G5 or G6 BSEN13201-1:2003 Table A.1, therefore minimising the direct upward light from the whole installation to 0% in-line with ILP GN01:20111, classifying the site as an Environmental Zone E1: Intrinsically dark area. With this in mind, floodlight type luminaires should not be used for car park areas, as source intensity will be too high.

Luminaires should have appropriate IP rating and comply with BSEN60598.

In addition, the aesthetic quality of the luminaires should be taken into account so that both the day-time and night-time appearance are attractive. Luminaires utilising optional optic configurations are preferable due to having the ability to tailor the light distribution to the different areas.

6.2 EXTERNAL CAR PARK

The external car parks are located at road level, at a higher level to the canal, this therefore means that the luminaires at mounted high above the canal and neighbouring properties below.

Therefore the lighting design should minimise the light spill and light trespass into canal and neighbouring properties, through the careful location of luminaires on the outer edge of the car parks.

Luminaires should be carefully selected to ensure that the photometric distribution further reduces any spill light outside the boundary of the car park. Optics should be also be utilised in order to prevent direct viewing of the light source (LED's) from the canal footpath, neighbouring streets and properties below. In any case, the source intensity for all luminaires, should not exceed 10,000 candela (cd) pre-curfew and 1,000 candela (cd) post-curfew.

The illuminance levels within external car park areas, in accordance with BS 5489-1:2013 heavy traffic areas, should be as follows:

Type of area and usage	Eav_e	Uo
Light traffic, e.g. parking areas of shops, terraced and apartment houses.	5	0.25
Medium traffic, e.g. parking areas of department stores, office buildings, plants, sports and multipurpose building complexes.	10	0.25
Heavy traffic, e.g. parking areas of schools, churches, major sports and multipurpose sports and building complexes.	20	0.25

Table 5 – Lighting levels for external car parks BS 5489-1:2013

Note: This also complies with BS 5489-1:2013 class CE2, mixed vehicle & pedestrian traffic, under normal traffic flow conditions, within an E3 environmental zone.

6.3 SUBSIDIARY ROADS AND PAVEMENTS

A new mixed vehicle and pedestrian subsidiary road running through the centre of the proposed development, linking to the existing Princes Parade.

Roads of this type are covered by the P-class of lighting recommendations within BS EN 13201-2:2015

The road is considered a subsidiary road with a moderate level of crime (estimated) and a high traffic flow (pedestrian). Therefore, these areas fall into the P and SC-series of lighting classes, predominately P2, as long as lamps of colour rendering Ra80+ are utilised.

The required illuminance levels, according to BS EN13201-2:2015 are as follows:

Horizontal illuminance		
Class	E_{ave} (lx) [minimum maintained]	E_{min} (lx) [maintained]
P1	15	5
P2	10	3
P3	7.5	1.5
P4	5	1
P5	3	0.6
P6	2	0.6
P7	performance not determined	performance not determined
To provide for uniformity, the actual value of the maintained average illuminance may not exceed 1.5 times the minimum E value indicated for the class.		

Table 9 — P-series of lighting classes BS EN 13201-2:2015

In addition to the general P-class horizontal illuminance recommended by BS EN132012:2015, the ES class is intended as an additional class for pedestrian areas with the aim of reducing crime and suppressing the fear of crime through good facial modelling thereby increasing the facial recognition distances.

Read in conjunction with BSEN13201-1:2004, BS EN 13201-2:2015 recommends SC-class 5 (SC5), requiring a semi-cylindrical illuminance (Esc) of 2lux (min maintained). Esc min should be measured at 1.5m above ground.

Lighting equipment should complement the architecture and be of high quality with a high aesthetic value and must not detract from the appearance of the area.

Lamps of a high colour rendering Ra80+ "White-Light" should be used for all general illumination in order to provide good colour rendering of the scene, improve facial recognition distances, promote a general sense of well-being and to aid CCTV.

6.4 ILLUMINATED SIGNAGE

Illuminated signage will inevitably form part of the design solution, especially on the retail, hotel and cinema façades.

In accordance with the recommendations of CIE 150:2003, the maximum permissible luminance of the signage, within an E1 environmental zone, should not exceed 50 cd/m^2.

Signage should be restricted on the south and east side of the development, adjacent to the realigned Princes Parade, due to the proximity of sensitive receptors.

7 ASSESSMENT OF EFFECTS AND SIGNIFICANCE

7.1 CONSTRUCTION PHASE SHORT/MEDIUM TERM

During construction of phase of the proposed development it is highly likely that temporary illumination will be required for the purpose of site safety and security during the hours of darkness, for both site operatives and the general public.

Typically this will include bulkhead type luminaires mounted to fencing and hoardings around the perimeter of the site, together with building or column mounted area floodlight style luminaires.

The Construction Industry Research and Information Association (CIRIA) provide good practice guidance documents noting that lighting on construction sites is typically required as part of on-site health and safety requirements.

The document also highlights the potential negative impacts upon surrounding sensitive and the need to minimise these effects through the controlled application of lighting, in accordance with current standards.

Sensitivity receptors have been previously identified as canal and residential properties neighbouring in direct line sight of the development. The most sensitive areas being the bat foraging habitats/foraging bats, other nature designations and the footpath/embankment along the canal.

There is the potential for Major Negative impacts on these sensitive receptors, if the lighting is not carefully considered during the design and erection of the temporary site illumination.

In general the ILP GN01:2011 guidance on obtrusive light should be adhered to, thereby limiting the amount of upward light (ULR) to prevent sky glow, and the amount of spill light into neighbouring properties, to avoid light trespass.

The type of equipment employed, including lamp type and optics should be carefully selected to provide a controlled distribution of lighting, within the site boundary, whilst limiting the luminous intensity to be low 10,000 cd, as per GN01:2011.

In general, site floodlights should be mounted around the perimeter of the site, directed inwards to avoid direct light being projected outside of the boundary.

The type of floodlights employed should have asymmetric optic to provide light distribution and excellent light control (0cd at 90°) with no need to tilt.

Wide angle, symmetric floodlights mounted at low level, with a high tilt angles should not be used as the majority of the light is at or above the horizontal and will have a major negative effect upon surrounding sensitive receptors.

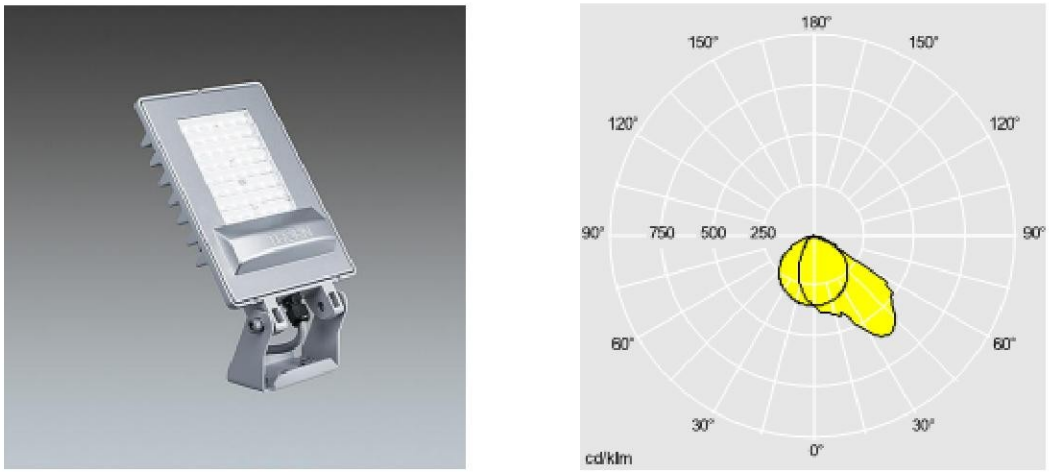


Figure 6 – Thorn LED Fit - Example of suitable asymmetric floodlight with glass flat to ground

Additional site lighting, such as hoarding mounted bulkheads and emergency lighting should be low power, low intensity with zero upward light output ratio (ULOR). This ensures that light is directed downwards, towards the task plane such as pathways, steps and stairs, resulting in zero upward light ratio (ULR) from the site.

Site security lighting should be carefully considered to ensure that points of access to the site and areas of equipment and materials storage are illuminated in accordance with the SLL Lighting Handbook (Chapter 18: Security Lighting).

Large open, secure areas, such as storage yards, require an average horizontal illuminance of 5 lux with a uniformity of 0.1.

White light sources of Ra 80+ should be utilised throughout in order to aid CCTV and facial recognition. Where possible LED technology should be employed, due to the solid state nature of the light source (no breakable lamps), the wide range of beam types available, as well as their compact nature and energy efficiency.

In addition, LED technology does not suffer the same problems as HID (high Intensity discharge) light sources typically employed in floodlights, whereby the lamps cannot be instantaneously switch on/off.

By utilising LED technology in conjunction with passive infrared detectors (PIR), the security lighting can remained switched off until it is activated by the presence of people within the immediate vicinity.

This is especially important in post-curfew conditions (after 23:00) where GN01:2011 obtrusive light requirements become more stringent.

If carefully designed, following best practise guidance, with suitable luminaire selection and expert lighting design, as detail above, the impact on sensitive receptors should be negligible / minor negative.

In addition to the type of lighting equipment utilised, the light levels employed and the location and aiming of suitable luminaires, further mitigation measures could include additional screening of the site, from the perspective of sensitive receptors and the inclusion of additional luminaire optic controls, such as cowls, shields, baffles, and louvres.

7.2 OPERATIONAL PHASE LONG TERM

The long term operational phase of the proposed development will require exterior and interior lighting for numerous tasks and applications.

At this early, conceptual, stage of the architectural design no formal lighting design has been prepared, as this will form part of the later stages of the design development.

In order to provide meaningful analysis of the likely impacts of the lighting upon the local environment, and to highlight potential issues that may arise from exterior lighting of the site, Elementa Consulting have produced a conceptual exterior lighting scheme, based upon the architectural massing model and following the Research and Guidance (Chapter 4) and the Design Specification (Chapter 5) of this report.

In order to accurately simulate the effects of exterior lighting upon the environment, a 3D computer massing model of the proposed development, including any existing buildings immediate surrounding the site, has been utilised in conjunction with specialist lighting design and analysis software DAILux evo.

DAILux evo is fundamentally an accurate lighting calculation, analysis and visualisation package capable of analysing both natural and artificial lighting within a 3D computer model.

For the purpose of this assessment, the exterior lighting of the ARC leisure centre, access road, residential properties and car parks (ARC leisure centre and future residential properties) have been included. No architectural lighting, such as building floodlighting and illuminated signage or landscape lighting has been included, as there is no requirement for these lighting elements within the scheme.

Furthermore, it should be noted that the light spill from the interior of the ARC leisure centre and illustrative future residential properties have been taken into consideration.

The effects of external light spill from the future residential properties were analysed based on the illustrative masterplan and elevations representing a concept option, to ensure that levels are within the ILP GN01:2011 guidelines.

Figure 7 Illustrative Masterplan

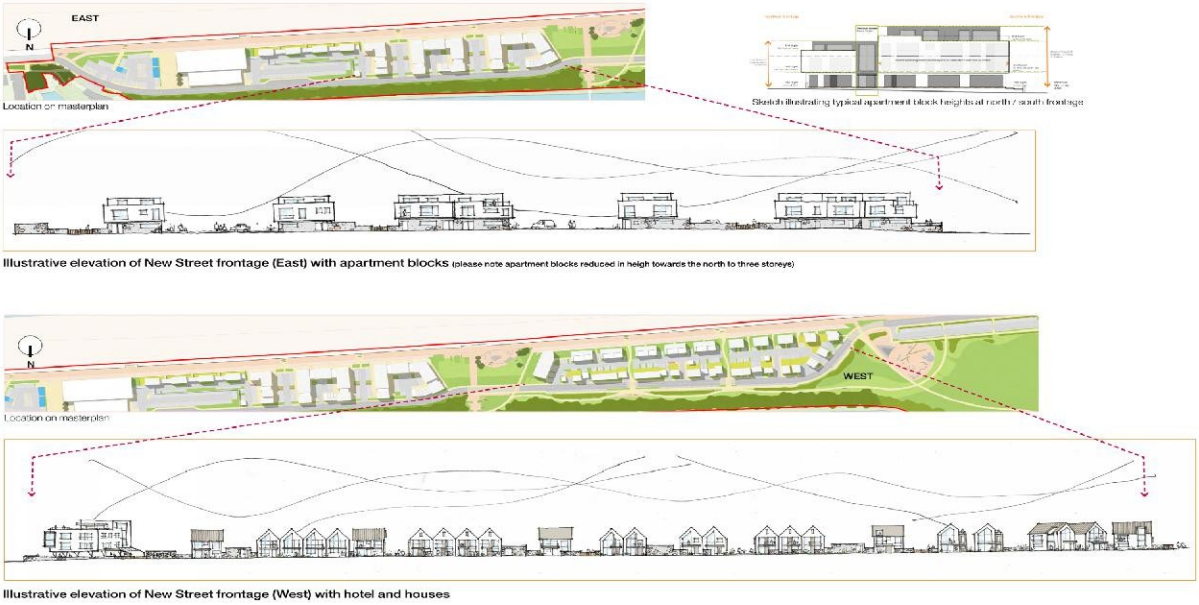


Figure 8 Illustrative Elevations

Finally, no existing or proposed vegetation in and around the site has been included in the computer simulation, which could potentially provide both a visual barrier and aid in obstructing spill light across property boundaries.

This cannot be accurately simulated and in the case of deciduous trees during winter months would provide a worst case scenario, both in terms of trees shedding their leaves and the extended use of exterior lighting due to limited daylight hours.

This assessment therefore appraises a worst-case scenario.

7.3 LIGHTING EQUIPMENT

For the purposed of the conceptual design simulation and analysis, luminaires from Kingfisher Lighting have been selected due to their suitability, aesthetic and technical performance characteristics.

However, it is the responsibility of the appointed lighting designer/engineer to ensure that the most suitable lighting equipment specification is provided and the design specification is in compliance with this report.

Two different and Quarto LED luminaire types have been incorporated into the conceptual lighting scheme using white light sources (Ra 80+). Full product technical specifications can be found in the technical appendix.

Kingfisher Lighting – Italo 1 The Italo luminaire offers high performance functionality, versatility and a wide variety of optics. A versatile solution suitable for any street application. The luminaire is manufactured from high pressure die-cast aluminium and has an LED efficacy of 138 luminaire lm/W, capable of producing up to 32,510 luminaire lumens at 4000K with a CRI>70, with dimmable option. The luminaire has a number of optics are available and the luminaire is be rated at IP66 and IK09. The luminaire optical design is a reflector-based optic with glass screen. The luminaire will be post-top mounted on 6m columns within exterior car parks and on the access road. Photometric settings have been selected based upon the area type.	
Kingfisher Lighting – Quarto LED The Quarto offers a modern style bulkhead available with LED emergency and photocell, suited for building perimeter lighting. The LED luminaire is manufactured from high pressure die-cast aluminium. The luminaire is capable of producing 1,900 luminaire lumens at 400k with a CRI>70. The luminaire is rated at IP65. The luminaire will be wall mounted above the building final exits.	

Table 10 - Two luminaire types incorporated into the conceptual lighting design

7.4 CONCEPT DESIGN ANALYSIS

A conceptual lighting scheme has been developed following the Research and Guidance (Chapter 4) and in-line with the Design Specification (Chapter 5) sections of this document, using the proposed luminaire types.

The concept lighting scheme illumination values are illustrated on drawing P16206-XX-XX-DR-EX-97003 (See Appendix 3) Kingfisher/Elementa Consulting

Calculations have been carried out within a 3D computer massing model of the proposed development, supplied by the GT3 architects, for the proposed lighting scheme and analysis software DAILux evo.

Photometric data accurately describing the light distribution of each luminaire and optic type has been obtained from the manufacturers and implemented within the software.

A generic light loss or maintenance factor of 0.8 has been used for each luminaire type, due to parameters such as maintenance and cleaning regime not yet being defined.

7.5 CONCEPT DESIGN OVERVIEW

The following section provides an overview of the proposed concept lighting scheme. Results are analysed area-by-area and with predictions of the likely residual impact upon identified sensitive receptors, bat foraging habitats/foraging bats and the general local environment.

7.5.1 General Site

The computer lighting simulation carried out in DAILux evo provides guidance on expected horizontal illuminance levels at ground level together with vertical illuminance results upon the façades of nearby sensitive receptors.

An obtrusive lighting compliance test has been undertaken in-line with CIE150:2004 & ILP GN01:2011 to analyse which areas exceed the limitations of E1 environmental zone limitations of 2 lux (pre-curfew) and 1 lux (post-curfew).

Following ILP GN01:2011 the curfew time has been define as 23:00 onwards.

The obtrusive light analysis has highlighted areas of concern pre-curfew, both caused by spill light from the two car parks and access road within Phase 1 and future residential properties and car parks within Phase 2 of the development.

The areas affected are the canal footpath, canal embankment and residential properties north of the canal, related to the levels of illuminance upon these areas.

During the post-curfew (after 23:00) period of operation additional properties along the access road are predicted to receive levels less than or equal to the post-curfew limit of 1 lux.

The entire site Upward Light Ratio (ULR) has also been calculate and the analysis shows an ULR of 0%, which does not exceed the maximum permissible level of 0% for an E1 environmental zone.

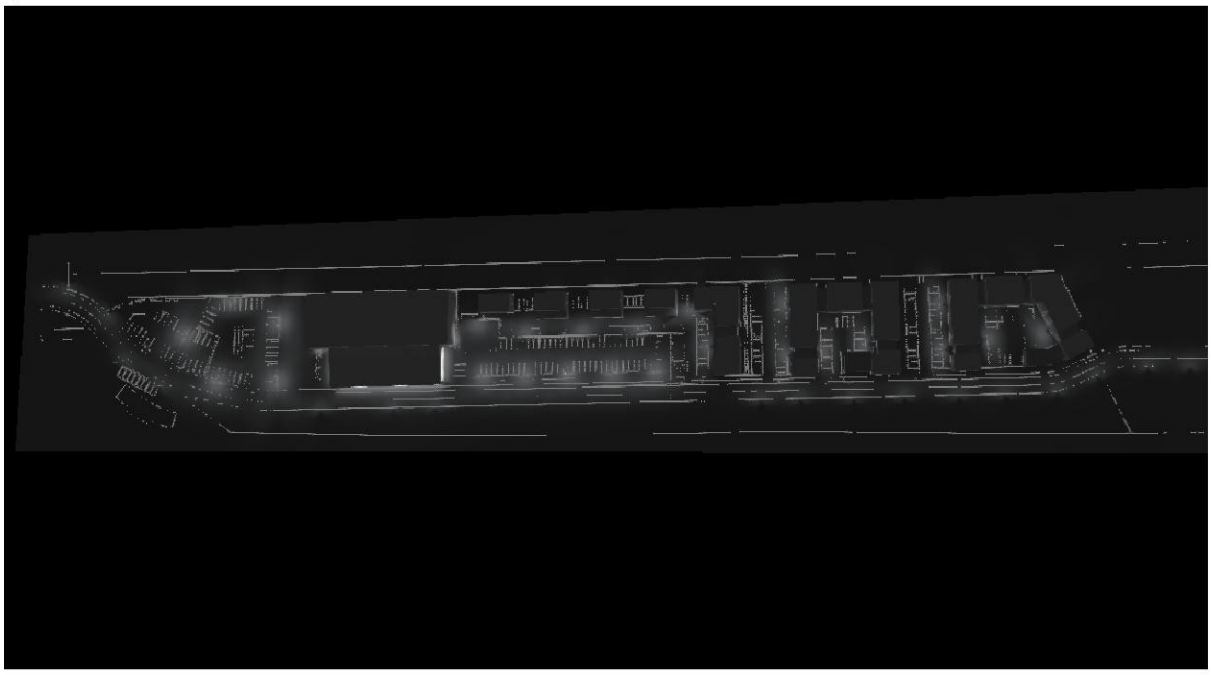


Figure 9 Aerial Plan - Site Overview

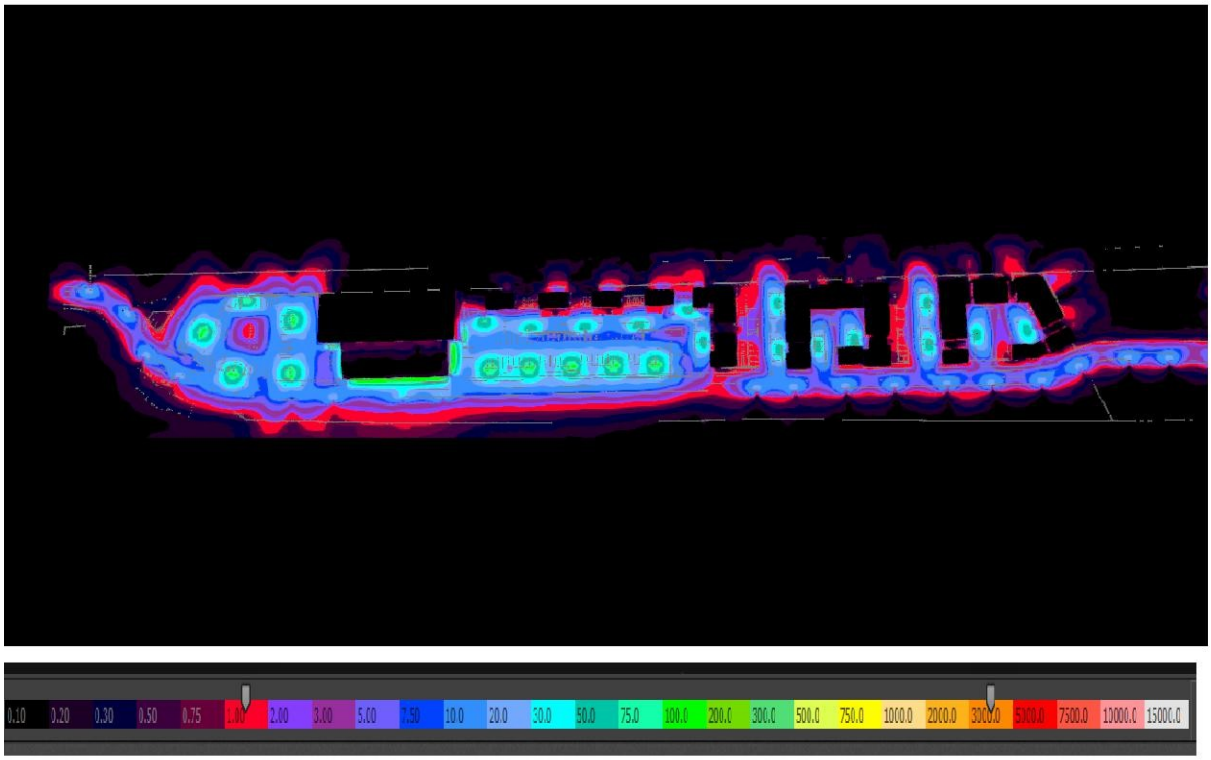


Figure 10 Aerial Plan - Site Overview (Pseudo colour illuminance)

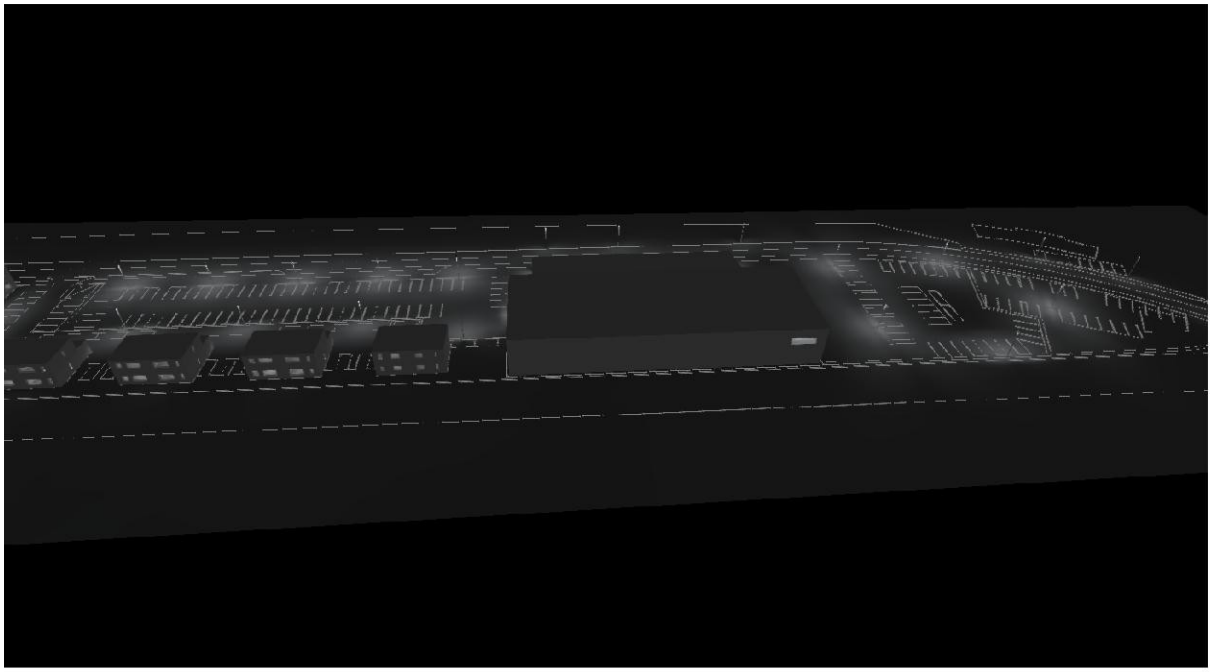


Figure 11 Aerial Perspective Looking North - Site Overview

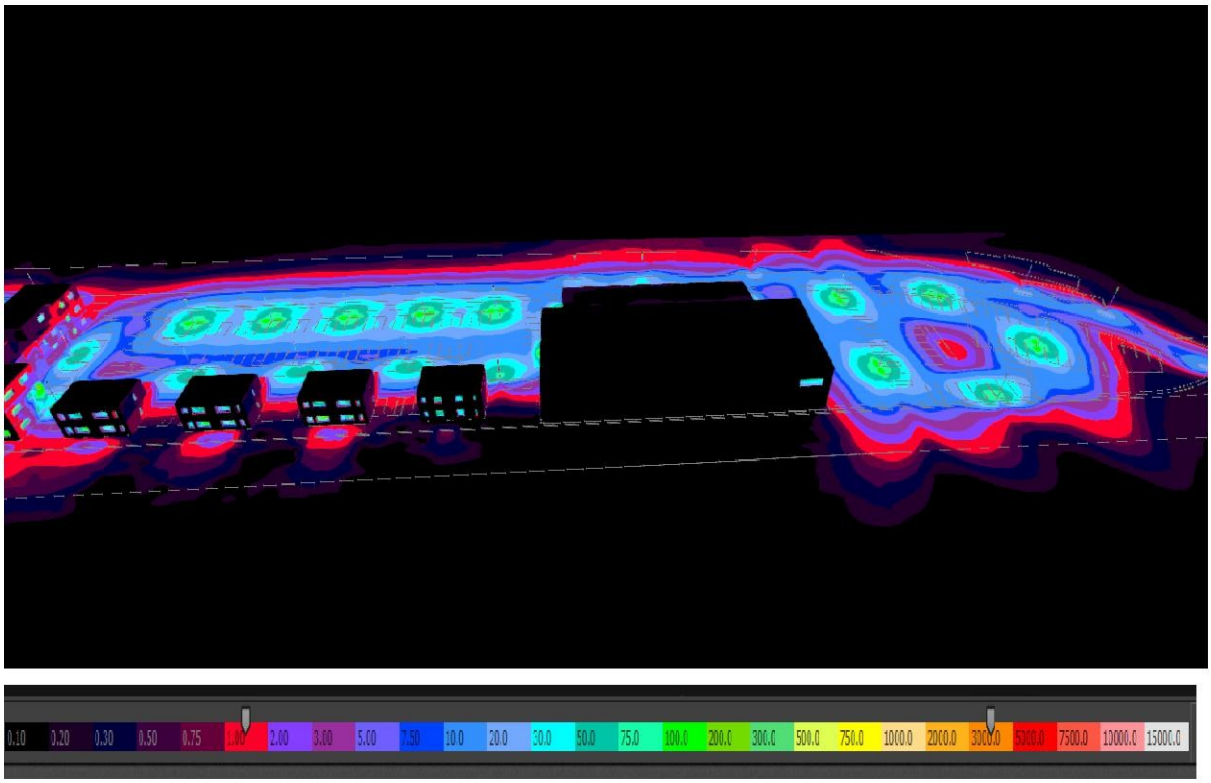


Figure 12 Aerial Perspective Looking North - Site Overview
(Pseudo colour illuminance)

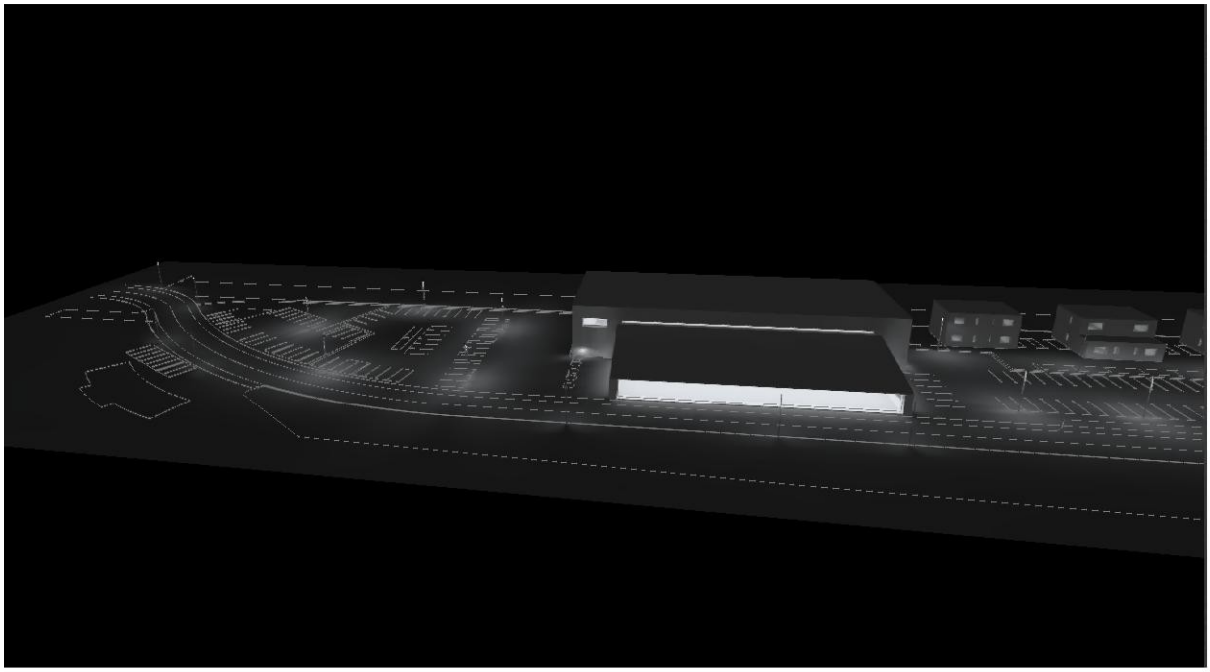


Figure 13 Aerial Perspective Looking South - Site Overview

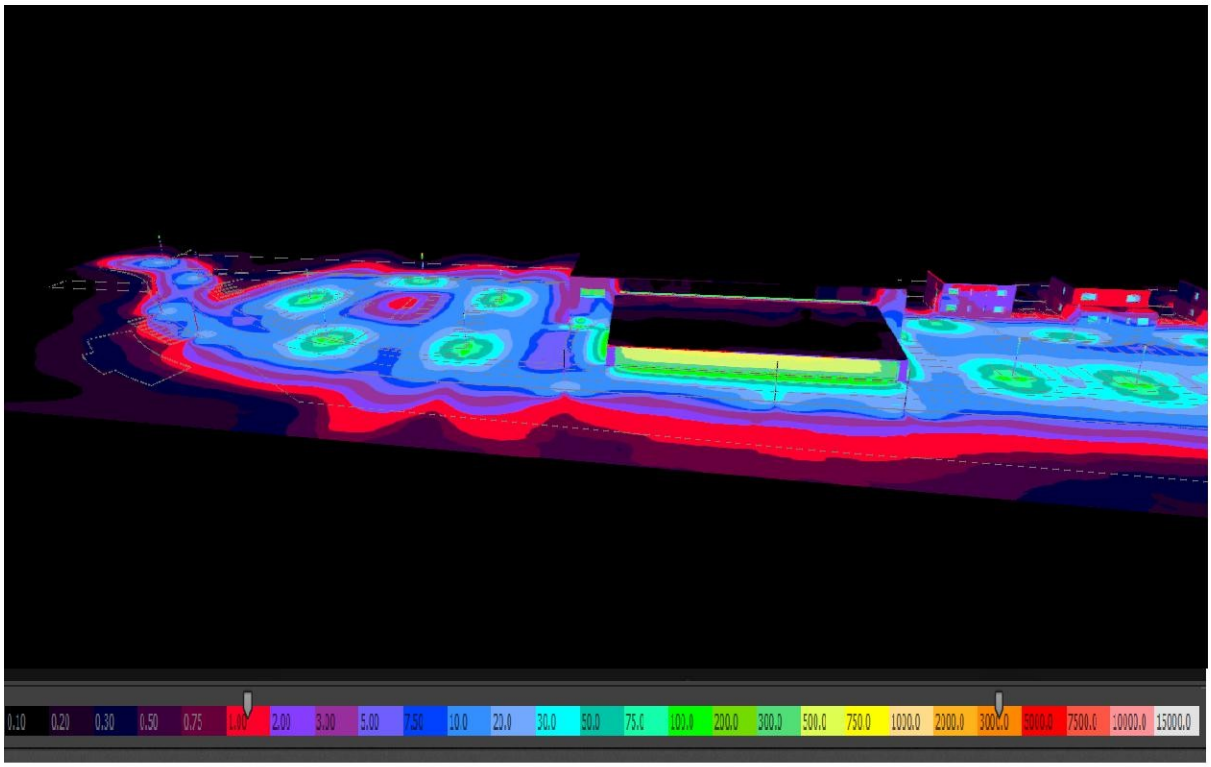


Figure 14 Aerial Perspective Looking South - Site Overview
(Pseudo colour illuminance)

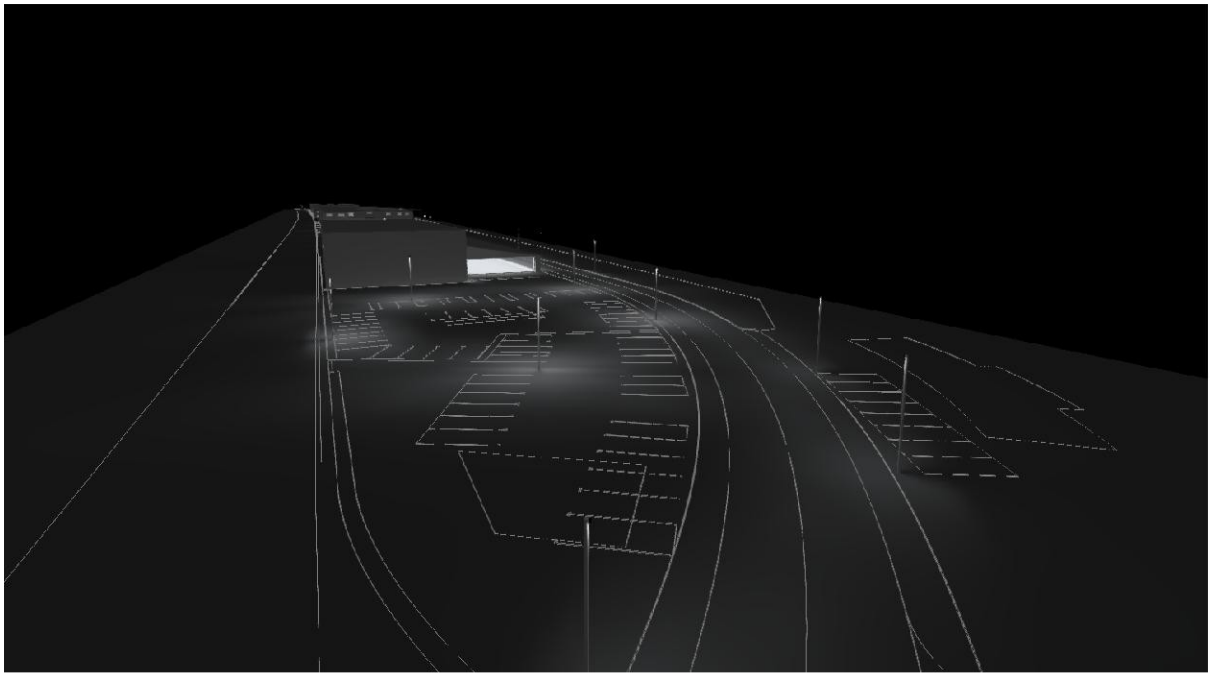


Figure 15 Aerial Perspective Looking East - Site Overview

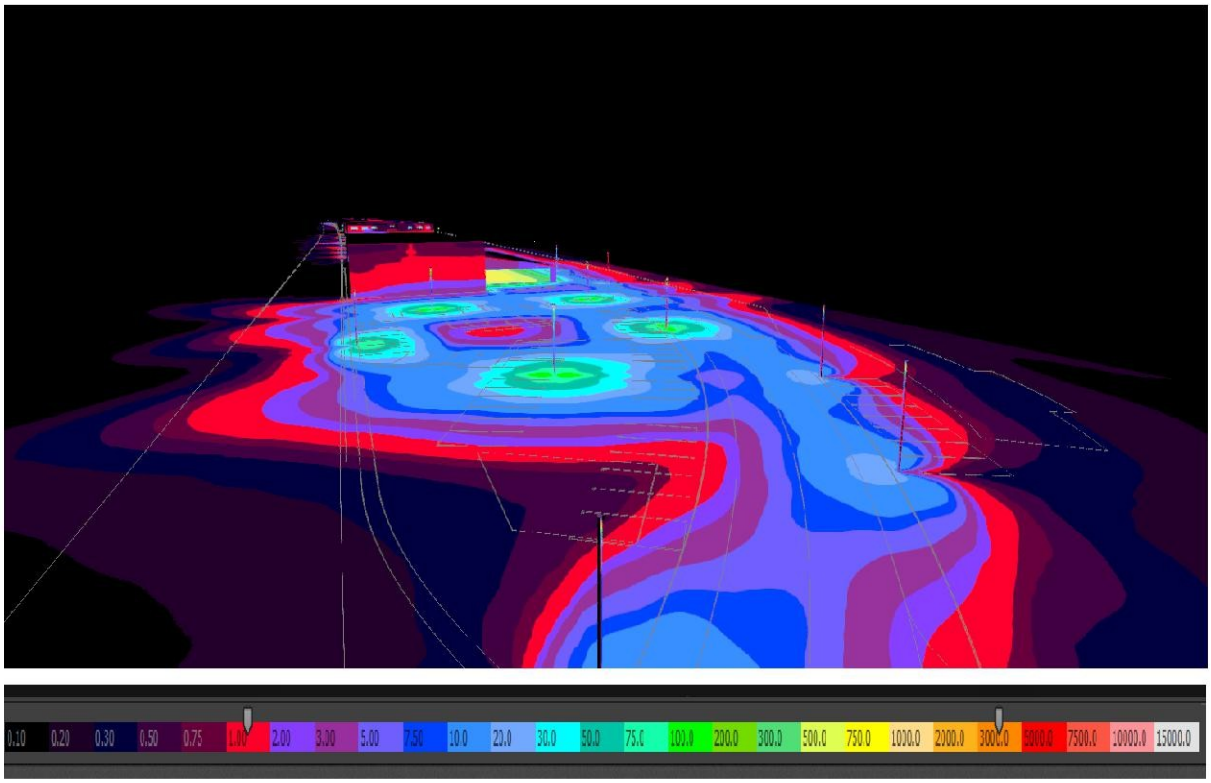


Figure 16 Aerial Perspective Looking East - Site Overview
(Pseudo colour illuminance)

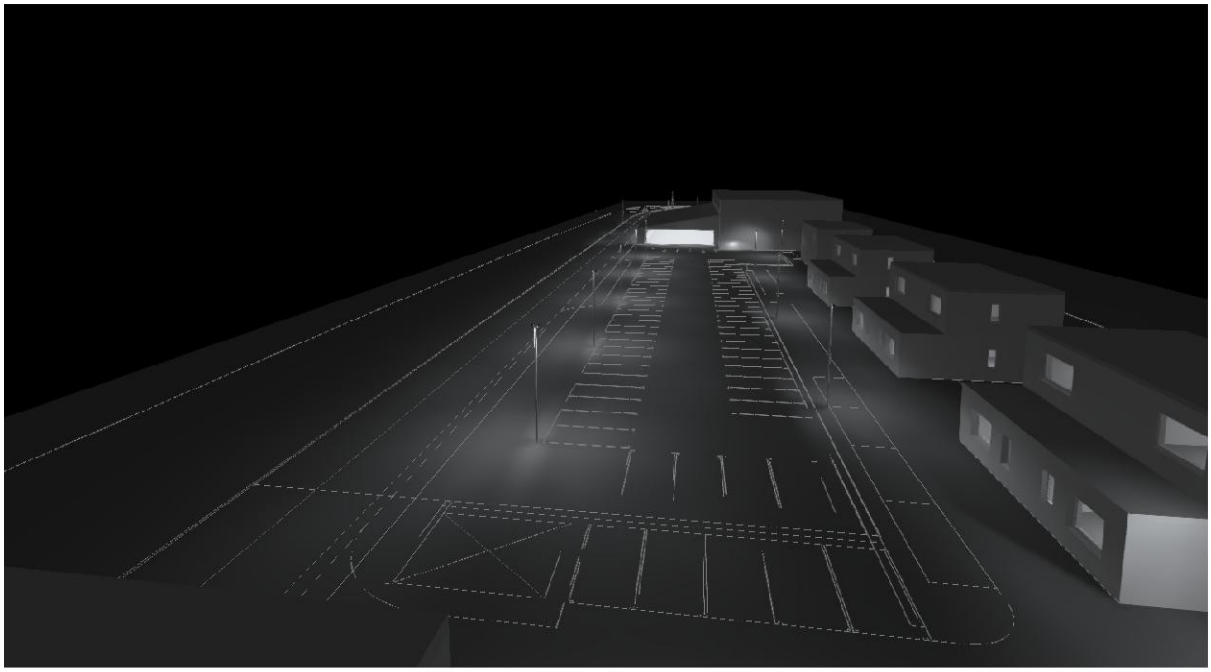


Figure 17 Aerial Perspective Looking West - Site Overview

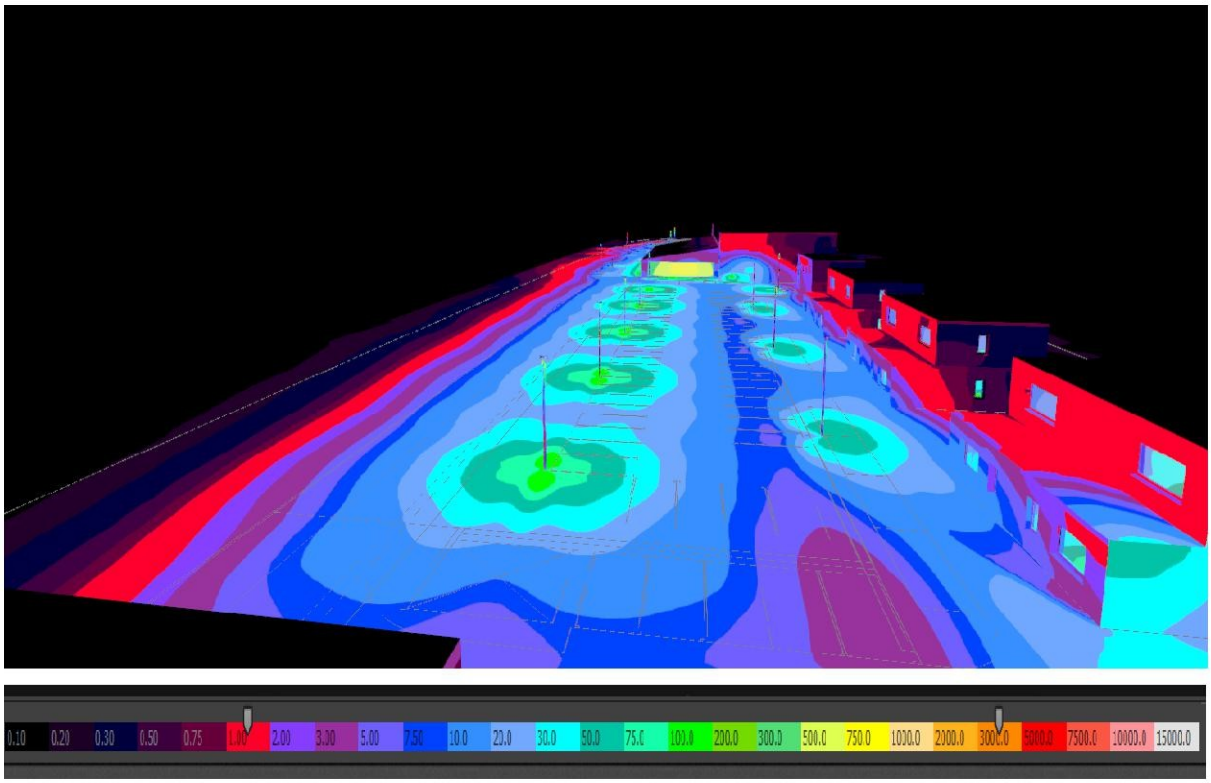


Figure 18 Aerial Perspective Looking West - Site Overview
(Pseudo colour illuminance)

7.5.2 Phase 1 - ARC Leisure Centre and Car Parks

The proposed ARC leisure centre and the proposed east/west car parks, form part of the Phase 1 development.

It is possible that the ARC leisure centre will inevitably require illuminated signage to the building façades and there is the possibility of some form of architectural building façade lighting treatment.

The design of both of these elements is unknown at this stage and it is therefore not possible to analyse the full impact within the computer simulation.

However, any building façade lighting or signage should adhere to the CIE 150:2003 limits of 0-5 cd/m^2 and 50-400 cd/m^2 respectively, for E1 environmental zone and any building façade lighting should adhere to the E1 limitations from GN01:2011, hence an average surface luminance should not exceed 0 cd/m2.

In addition, the overall upward light ratio for the entire site lighting should be 0%.

If these measures are adhered too and a sensible scheme is implemented then likely residual impact on sensitive receptors would be **negligible**.

The car parks consists of two external ground level car parking areas. The lighting for each area has been incorporated into the concept computer simulation.

The external ground level car parks is proposed to be illuminated by Kingfisher Lighting Italo 1 post top luminaires mounted on 6m columns to achieve 20 lux average as per BS 5489-1:2013.

A symmetric, area lighting optic setting has been select with columns mounted on the perimeter of selected parking bays only and to illuminate a section of the adjacent proposed new access road.

Figure 19 ARC Leisure Centre and Car Park External Lighting – Site Overview Phase 1

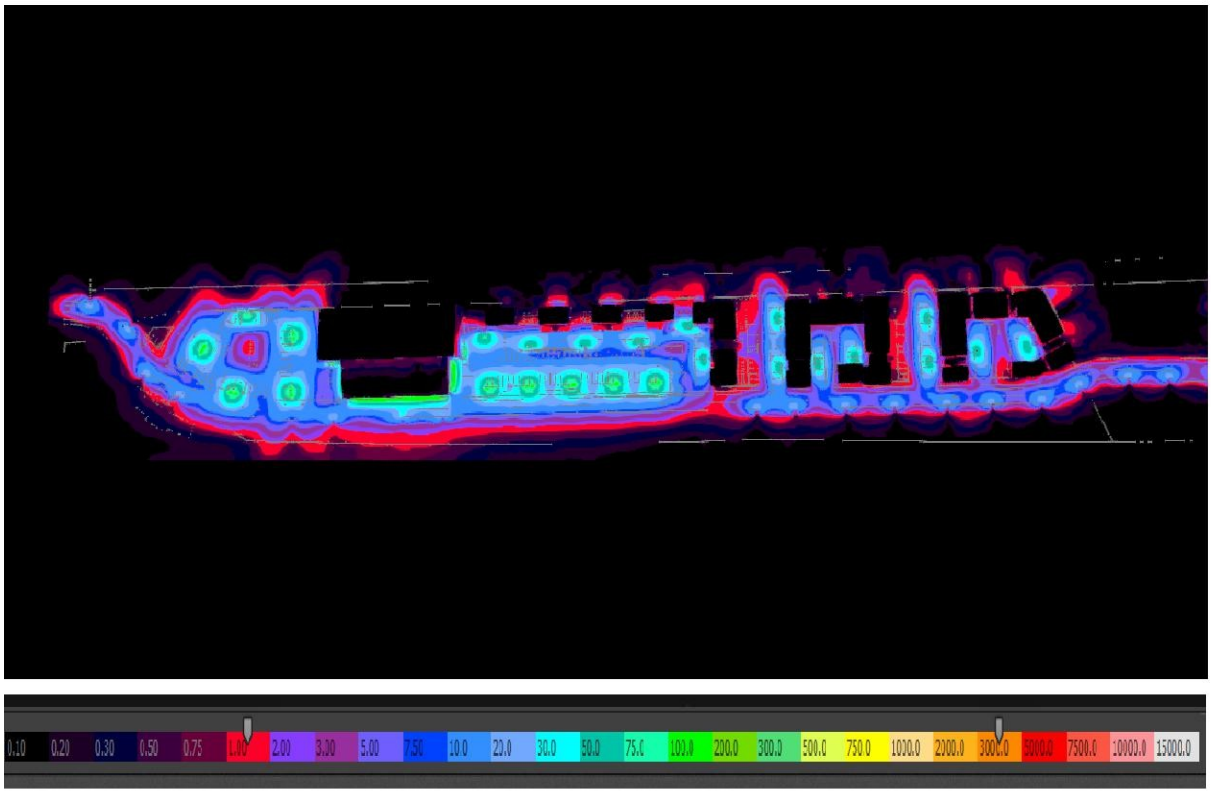


Figure 20 ARC Leisure Centre and Car Park Lighting – Site Overview Phase 1
(Pseudo colour illuminance)

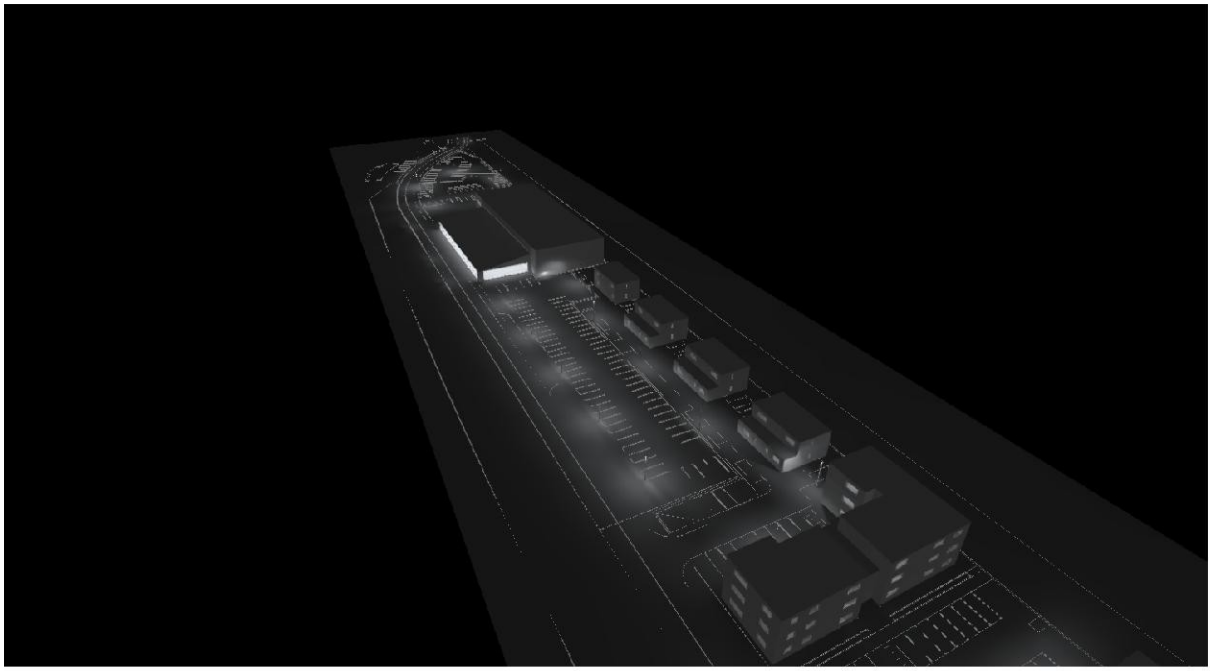


Figure 21 View towards rear of the ARC Leisure Centre and Car Park Phase 1 – South-East

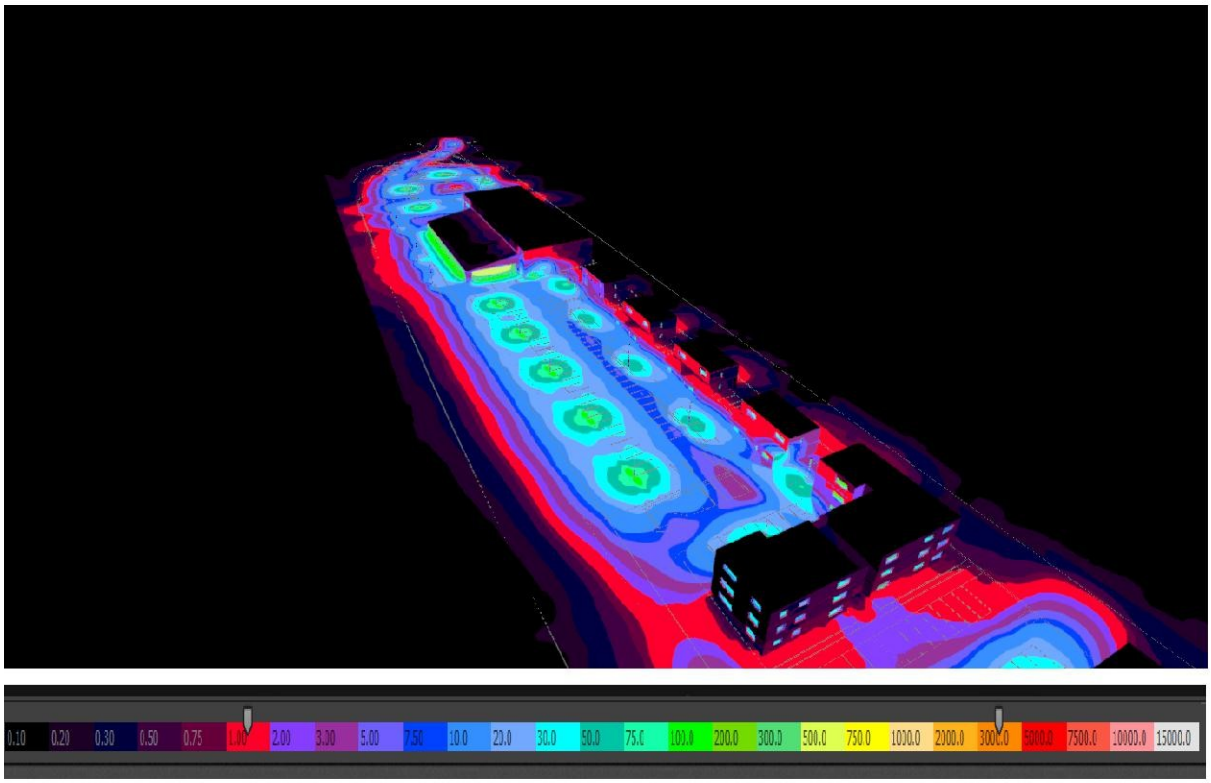


Figure 22 View towards rear of the ARC Leisure Centre and Car Park Phase 1 – South-East (Pseudo colour illuminance)

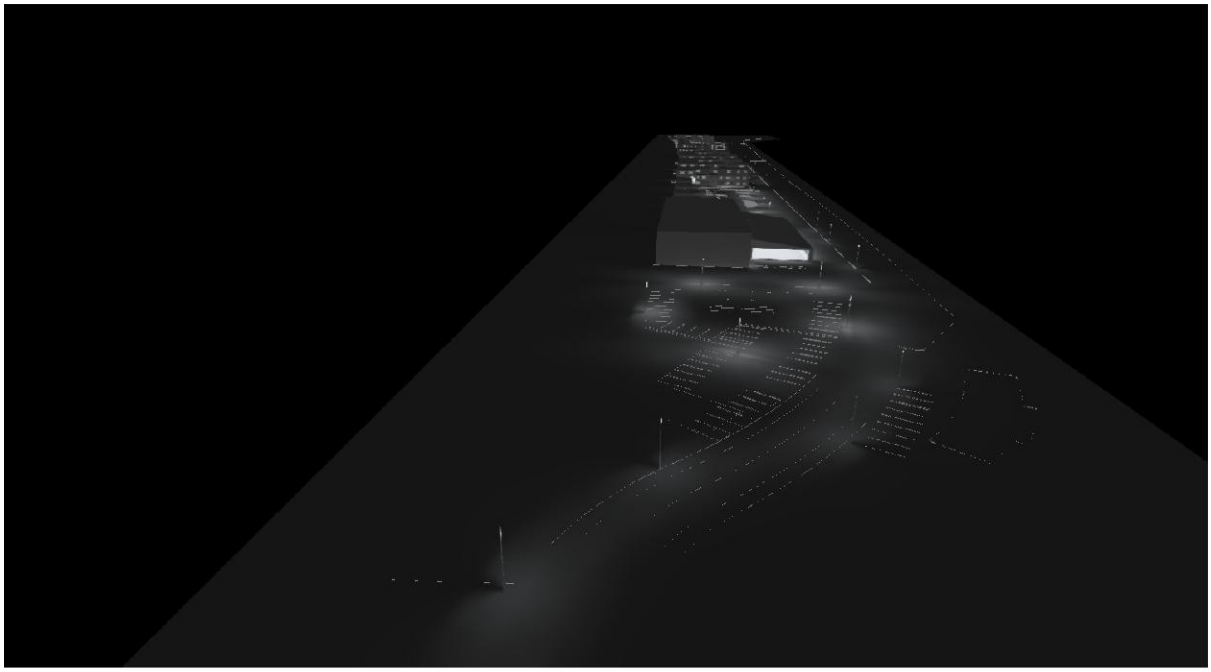


Figure 23 View towards rear of the ARC Leisure Centre and Car Park Phase 1 – North-West

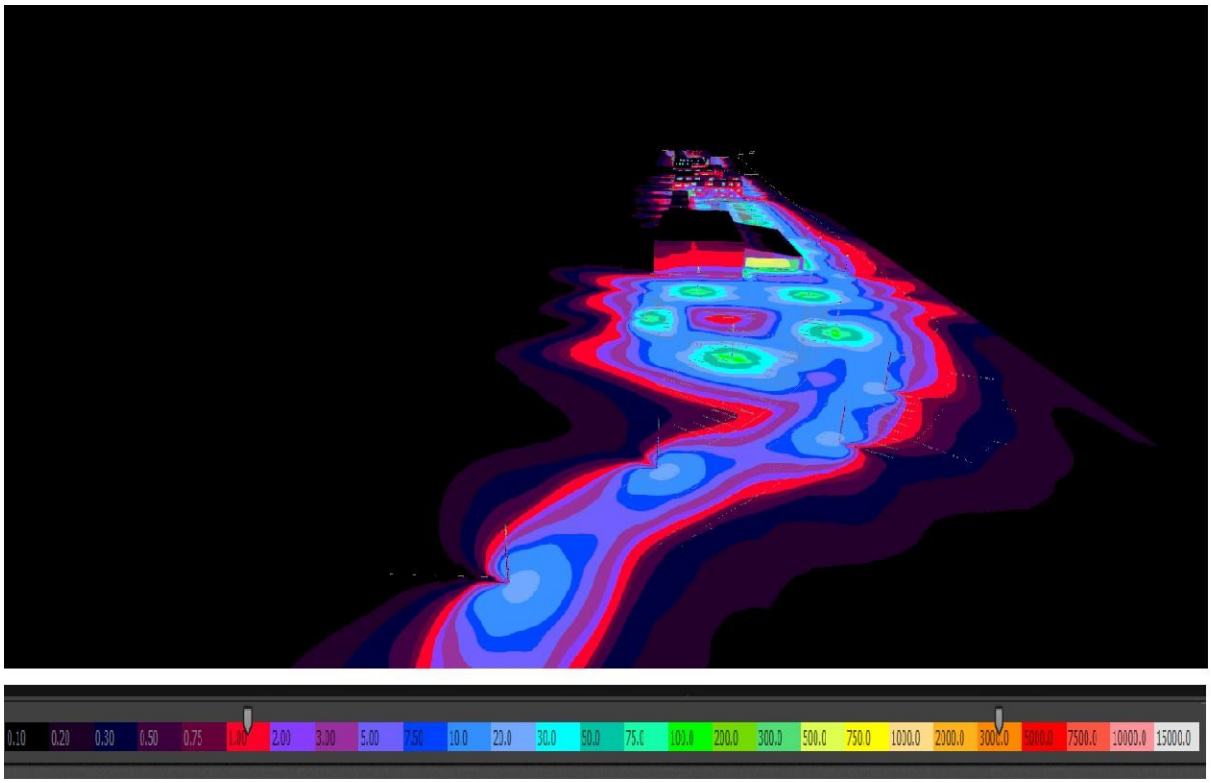


Figure 24 View towards rear of the ARC Leisure Centre and Car Park Phase 1 – North-West (Pseudo colour illuminance)

7.5.3 Access Road

There will be new subsidiary access road linking the development to Princes Parade at the east and west end of the site. The two leisure centre car parks, future residential properties car parks and the canoe centre will be accessed from the access road. The residential properties and canoe centre are considered as future sensitive receptors.

The road is illuminated by King Fisher Lighting Italo 1 post top luminaires with road lighting optic settings on 6m columns. Light levels comply with P2 & SC5 of BSEN13201-2:2015 and due to the choice of optic and lighting column positions, spill light onto the current and future sensitive receptors is below the post-curfew 1 lux limit, defined by ILP GN01:2011 environmental zone E1 and therefore the predicted residual effects is considered negligible.

The computer simulation shows that the illuminance upon the footpath and canal embankment, at ground level, will be less than 1 lux and would therefore be considered a **negligible** residual effect both pre and post-curfew.

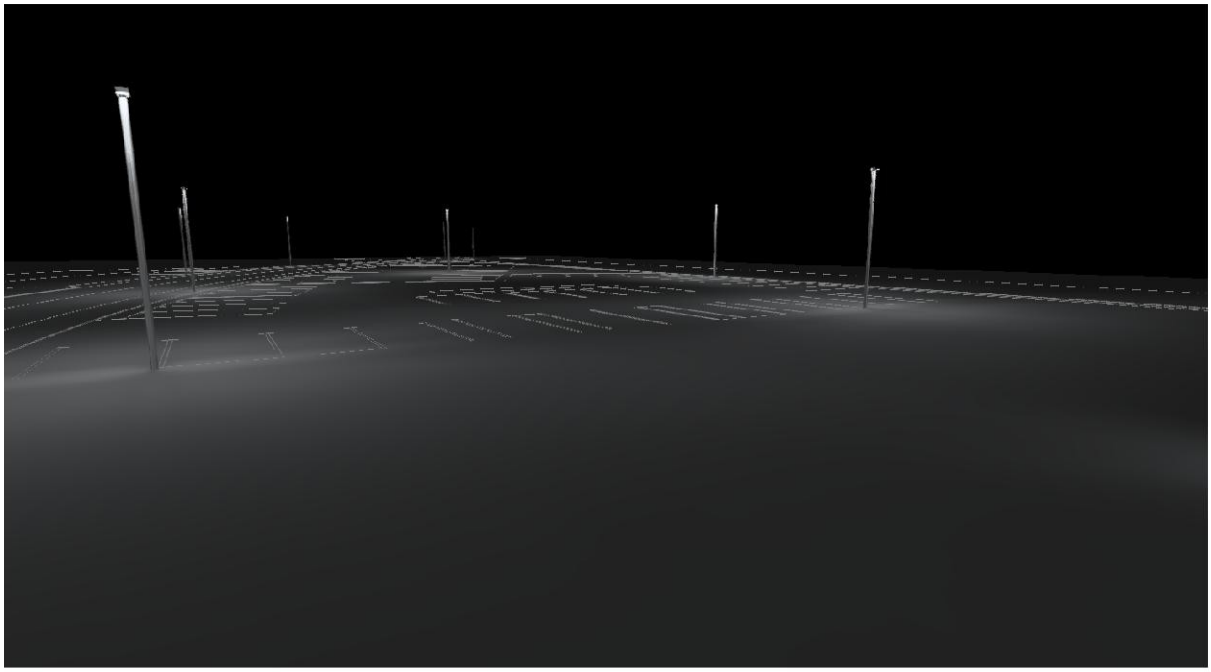


Figure 25 Access Road – Arc Leisure Centre Car Park North-East

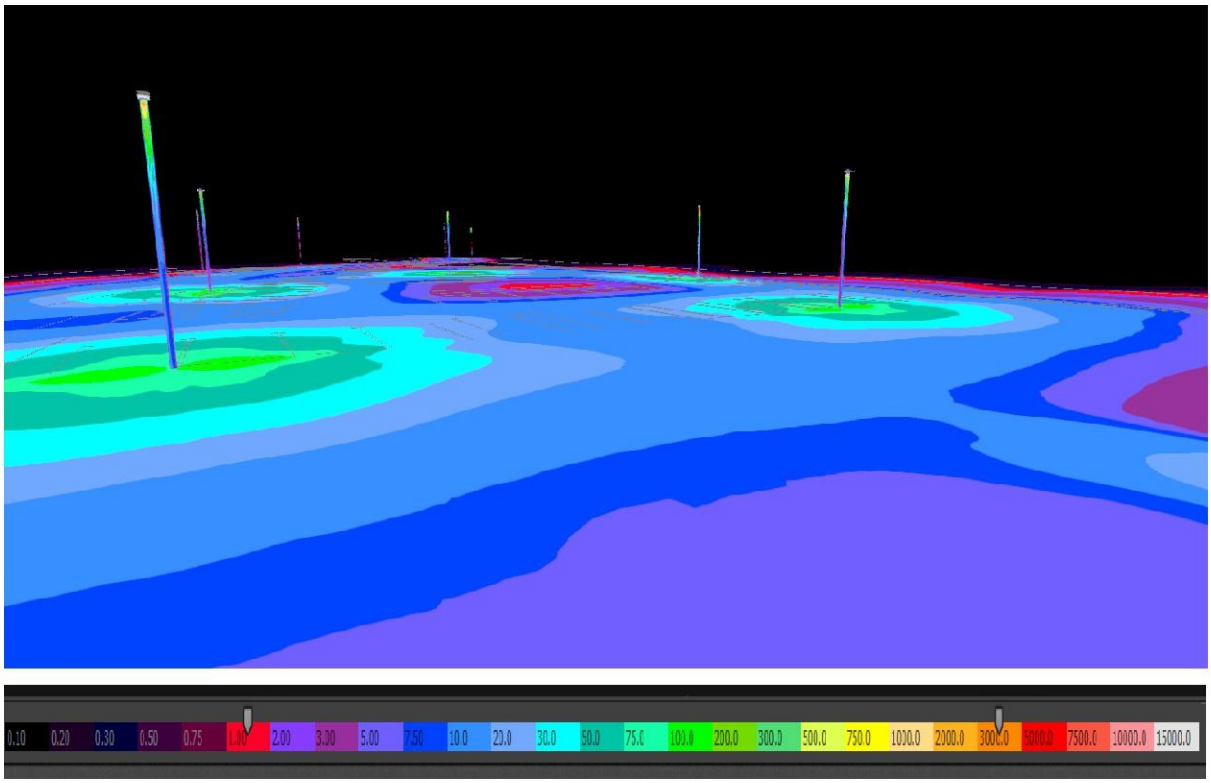


Figure 26 Access Road – Arc Leisure Centre Car Park North-East
(Pseudo colour images showing illuminance)

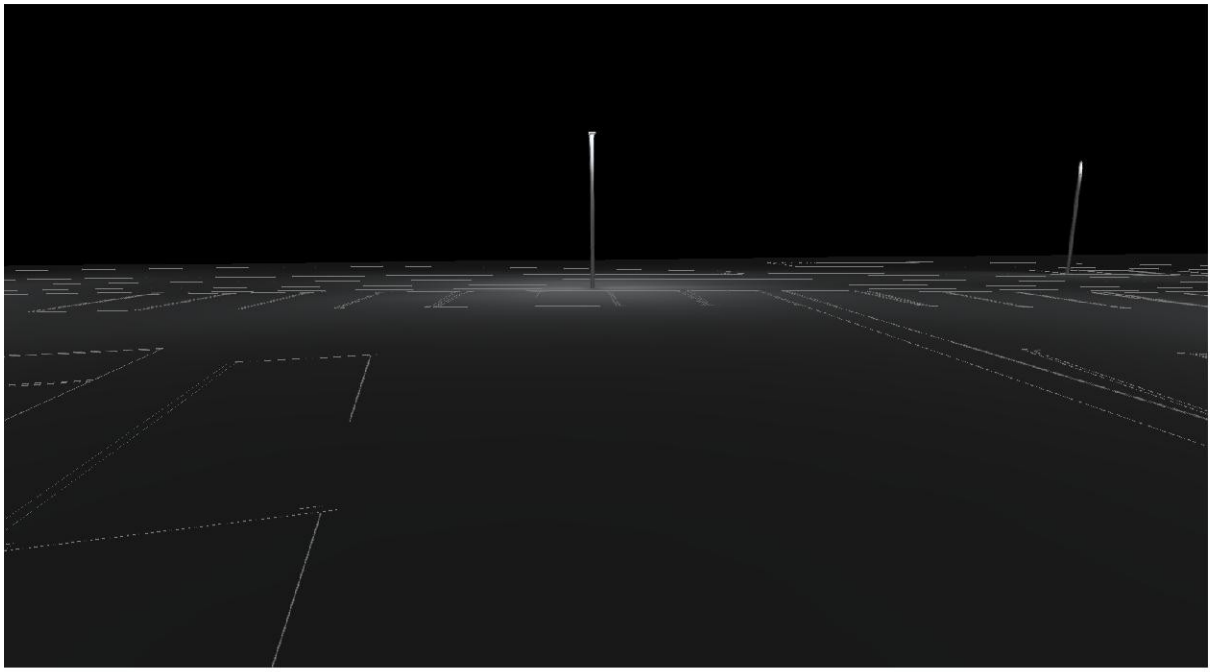


Figure 27 Access Road – Arc Leisure Centre Car Park North-West

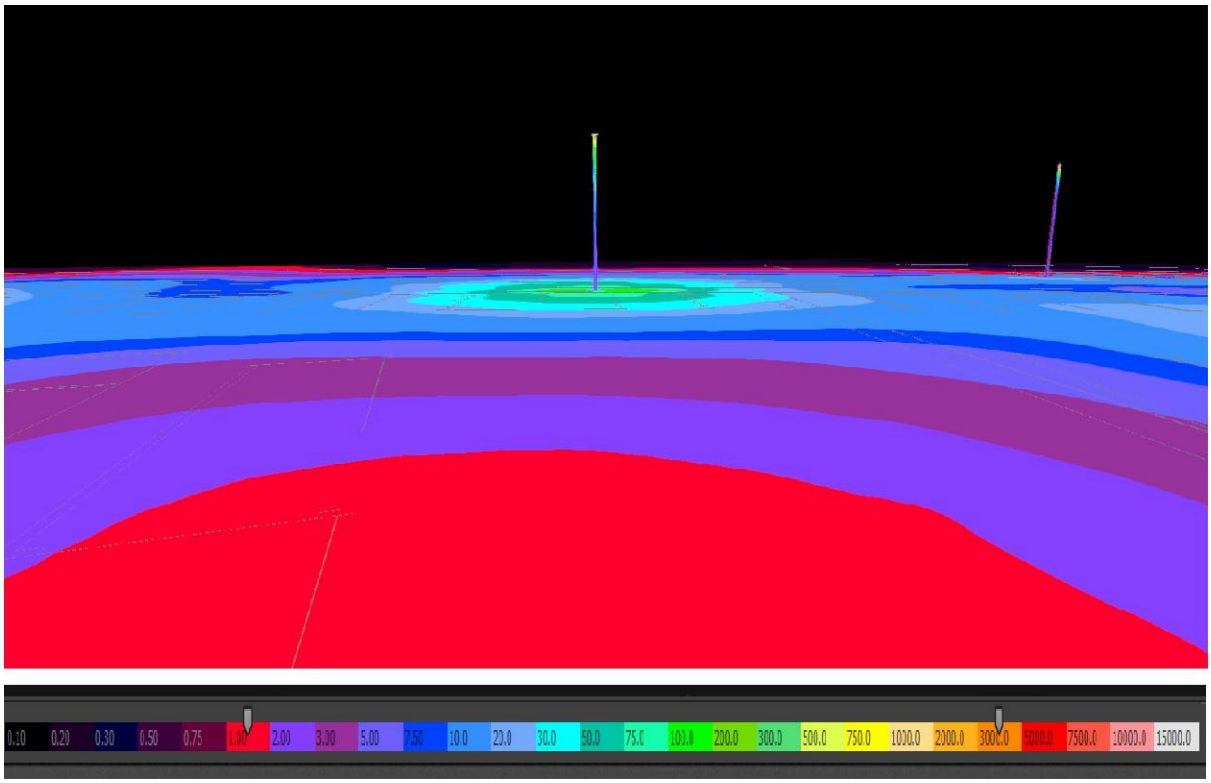


Figure 28 Access Road – Arc Leisure Centre Car Park North-West
(Pseudo colour images showing illuminance)

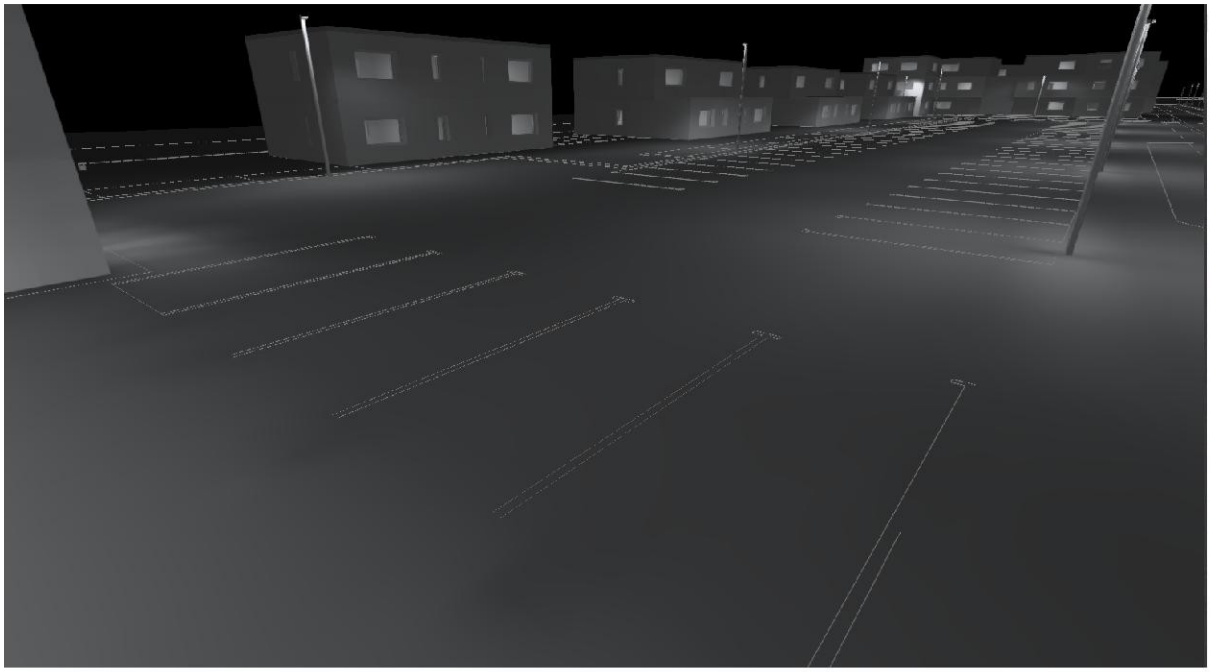


Figure 29 Access Road –South-West

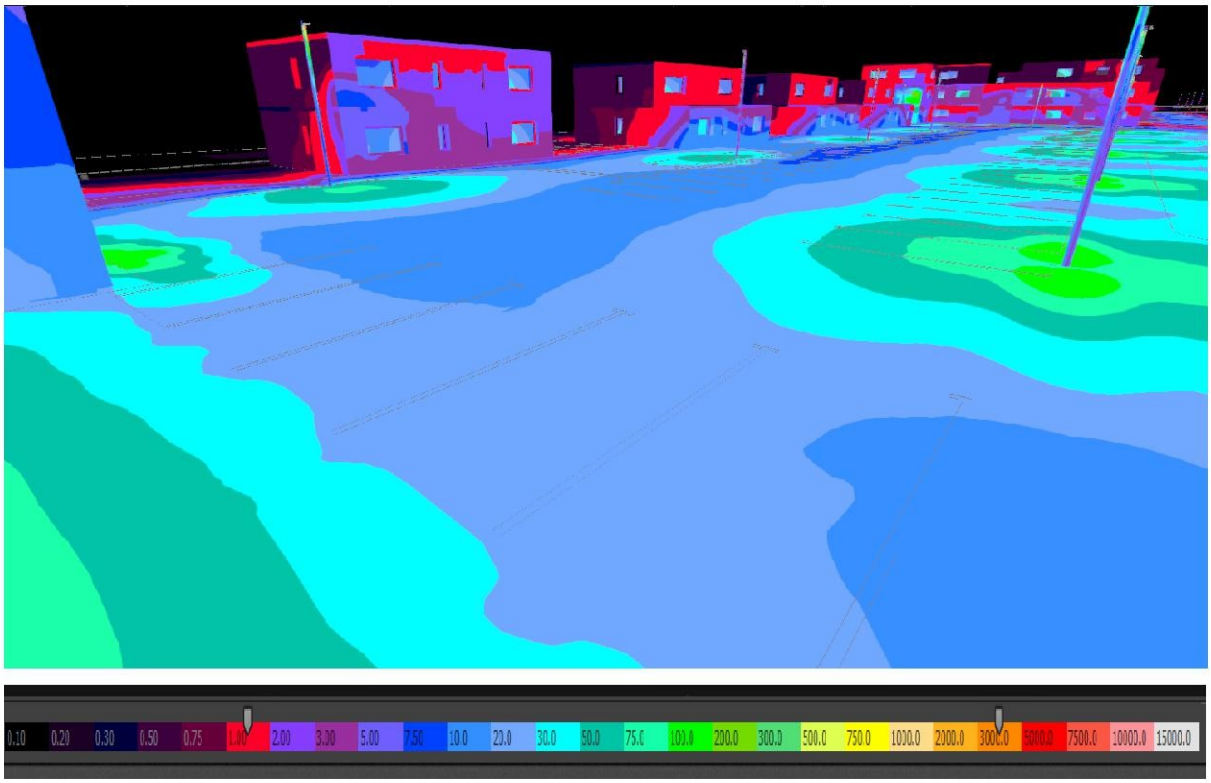


Figure 30 Access Road – South-West
(Pseudo colour images showing illuminance)

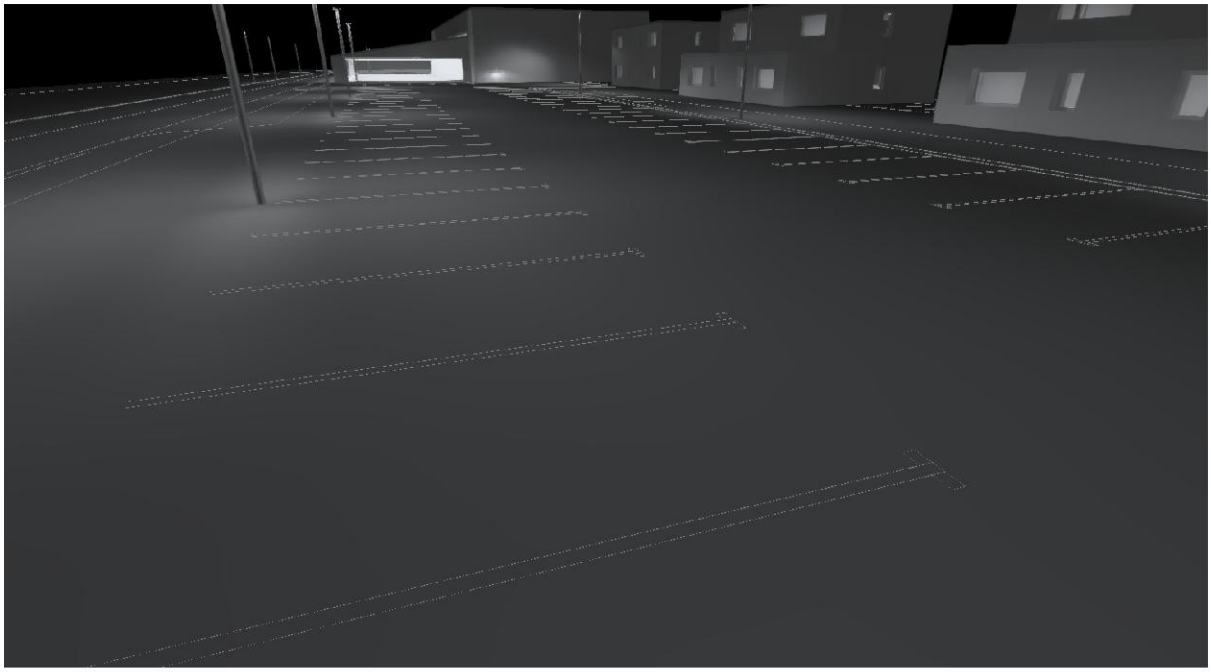


Figure 31 Access Road –East

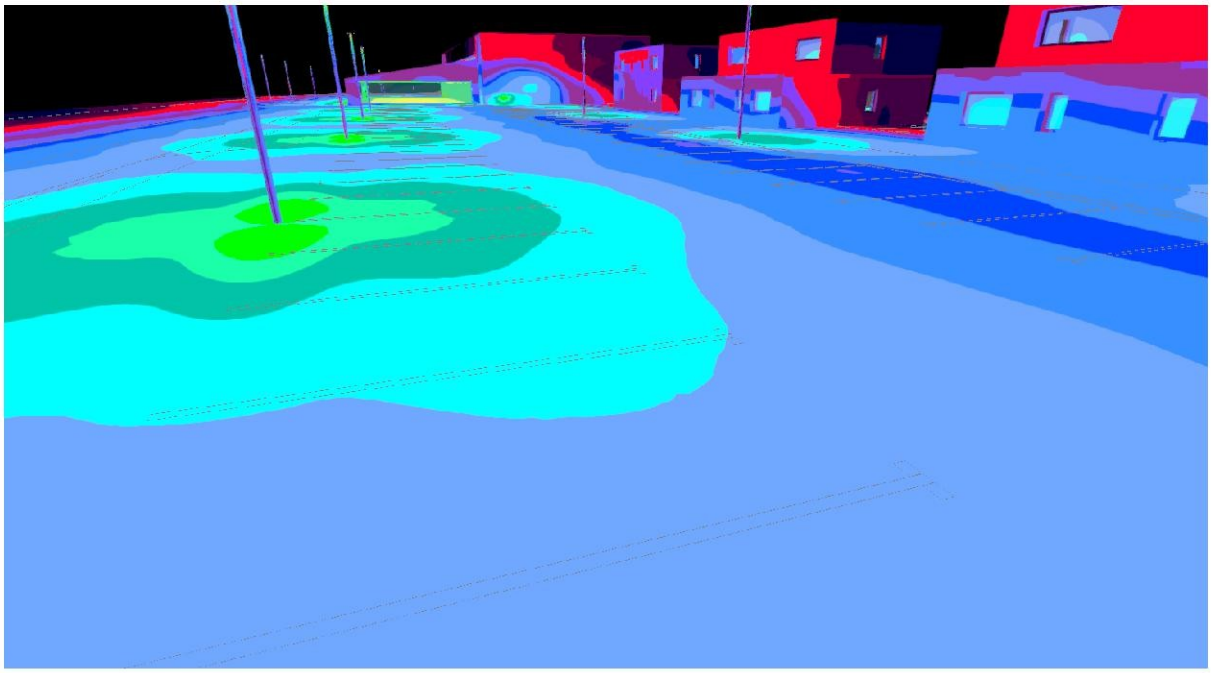


Figure 32 Access Road – East
(Pseudo colour images showing illuminance)

7.5.4 Seapoint Canoe Centre and Local Authority Car Park

The existing Seapoint Canoeing Centre on the east intersection of Princes Parade, together with the Shepway District Council public car park form part of the development and will be relocated within the development.

It is envisaged that the new location of the canoe centre and associated car park will inevitably not require illuminated signage

Immediately to the east of the east car parks, opposite the main entrance to the ARC leisure centre, is the Seapoint Canoe Centre and proposed associated car park.

The computer simulation shows that the illuminance upon the canoe centre will be less than 1 lux and would therefore be considered a **negligible** residual effect both pre and post-curfew.

Immediately to the north of the proposed car parks, lies the proposed new residential access road and footpath/canal embankment.

7.5.5 Phase 2 - Future Residential Properties

Directly to the west of the development and north/west development west car park will be the proposed new residential developments identified as future sensitive receptor, especially those properties facing the development west car park.

The simulation has identified that the spill light from primarily the car park lighting and future residential properties, will have a **negligible** residual effect, during pre-curfew, with a maximum calculated illuminance of less than 1 lux on the front of the properties.

During post-curfew (after 23:00) the impact would be considered a **negligible** residual effect due to numerous points along the line of the properties remaining less than 1 lux threshold as defined by GN01:2011 E1 environmental zones.

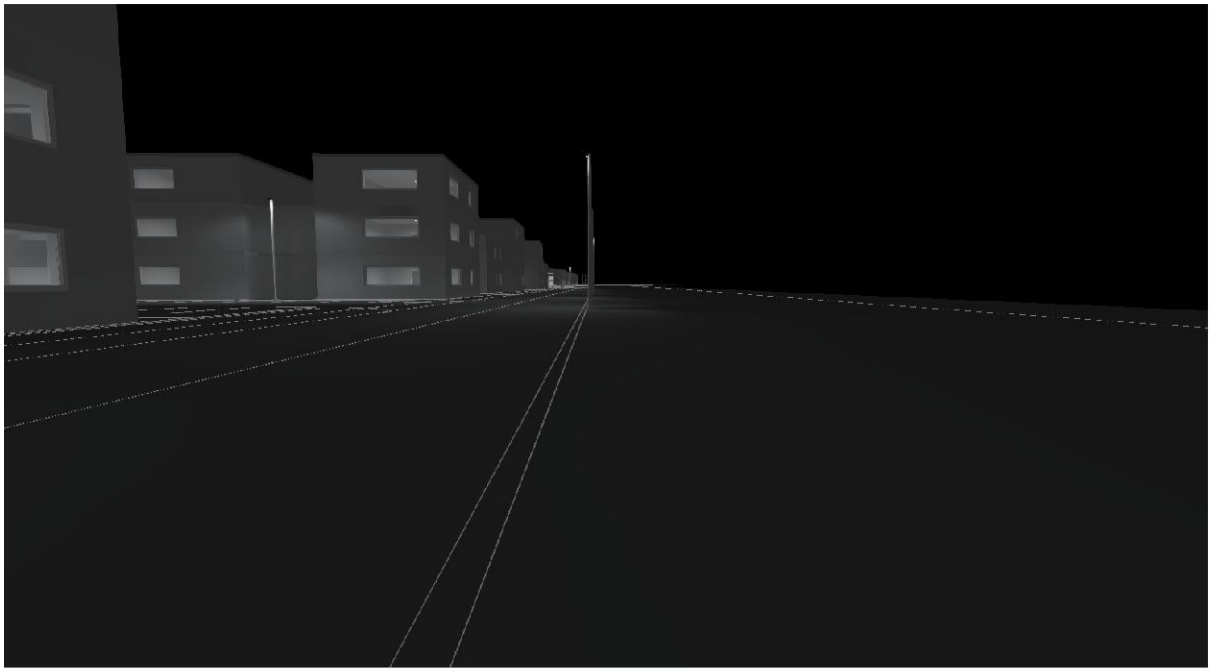


Figure 33 Future Residential Properties and Car Parks – West

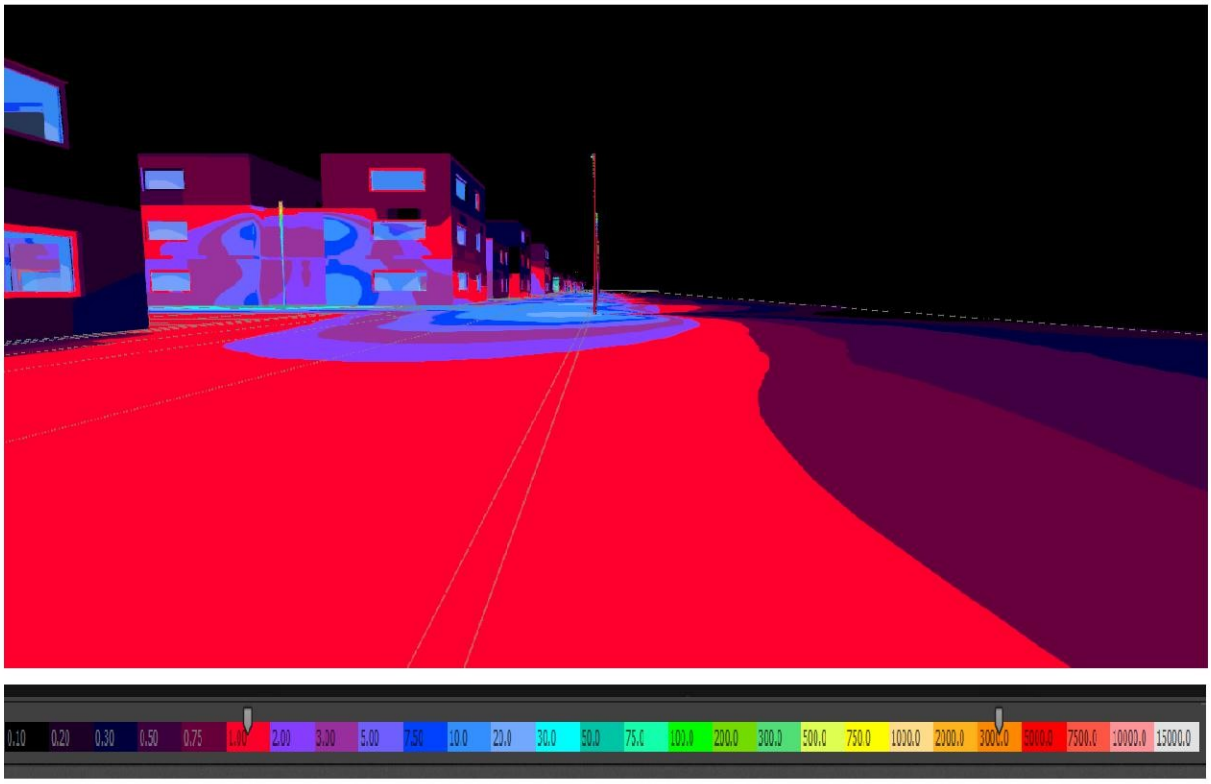


Figure 34 Future Residential Properties and Car Parks – West
(Pseudo colour illuminance)

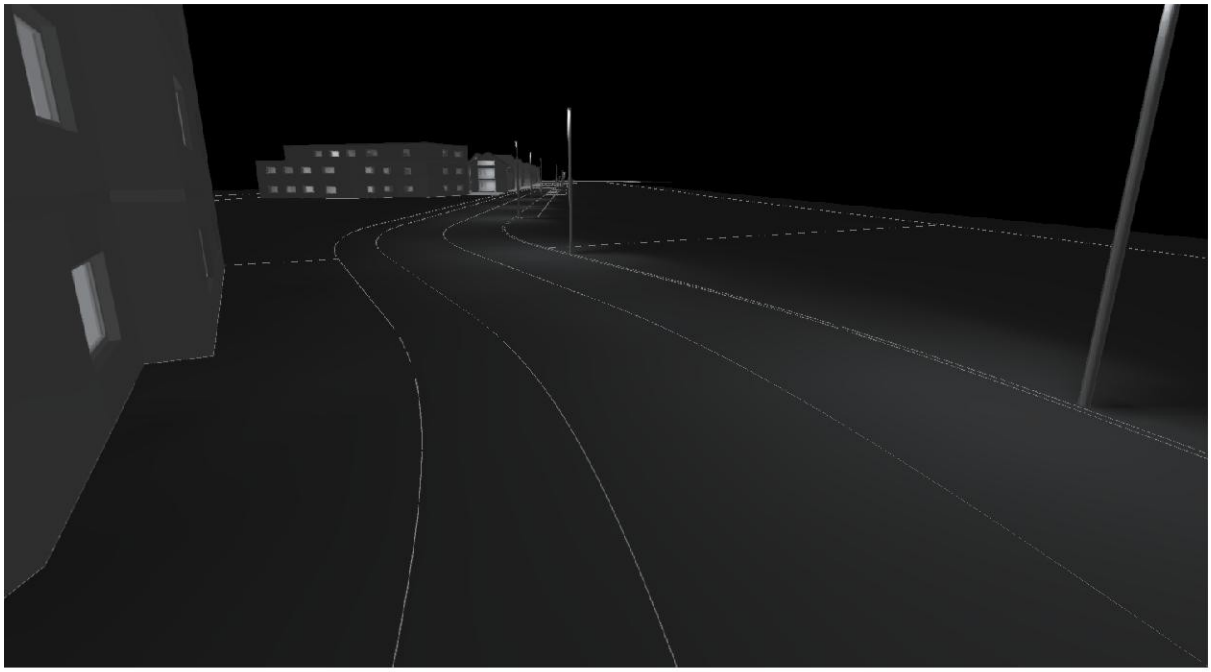


Figure 35 Future Residential Properties and Car Parks – East

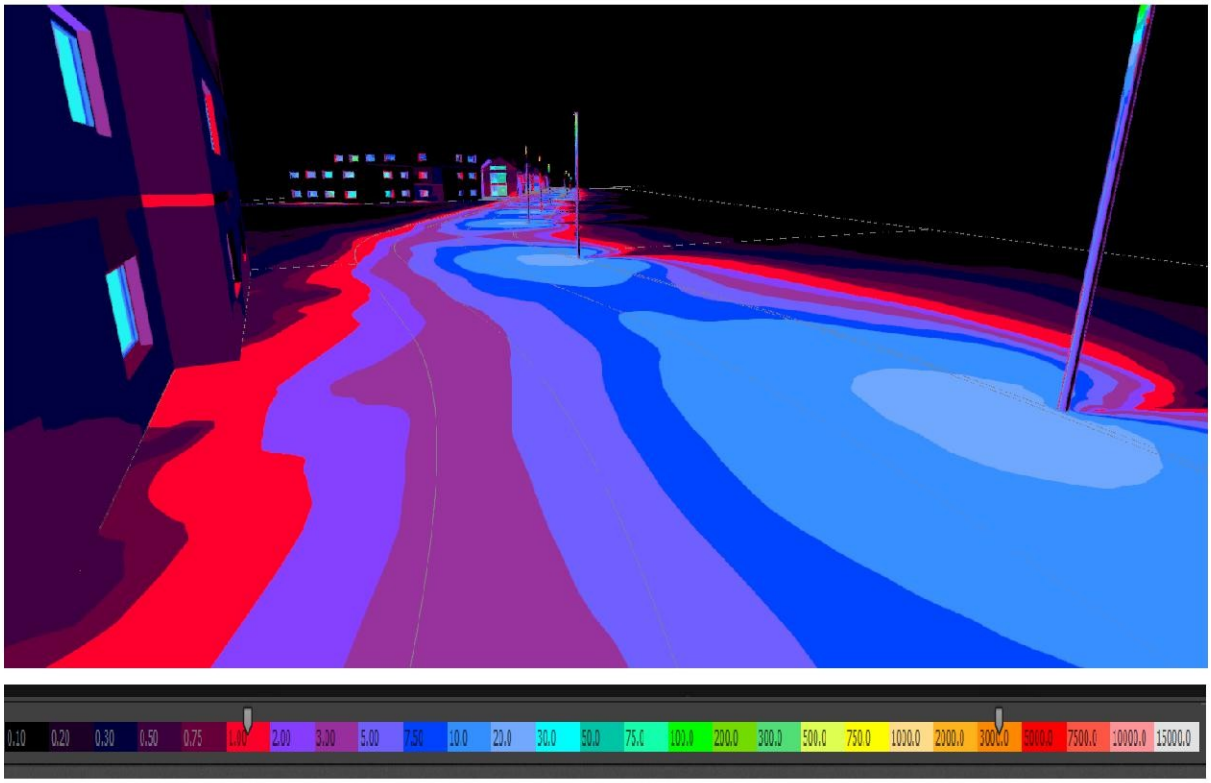


Figure 36 Future Residential Properties and Car Parks – East
(Pseudo colour illuminance)

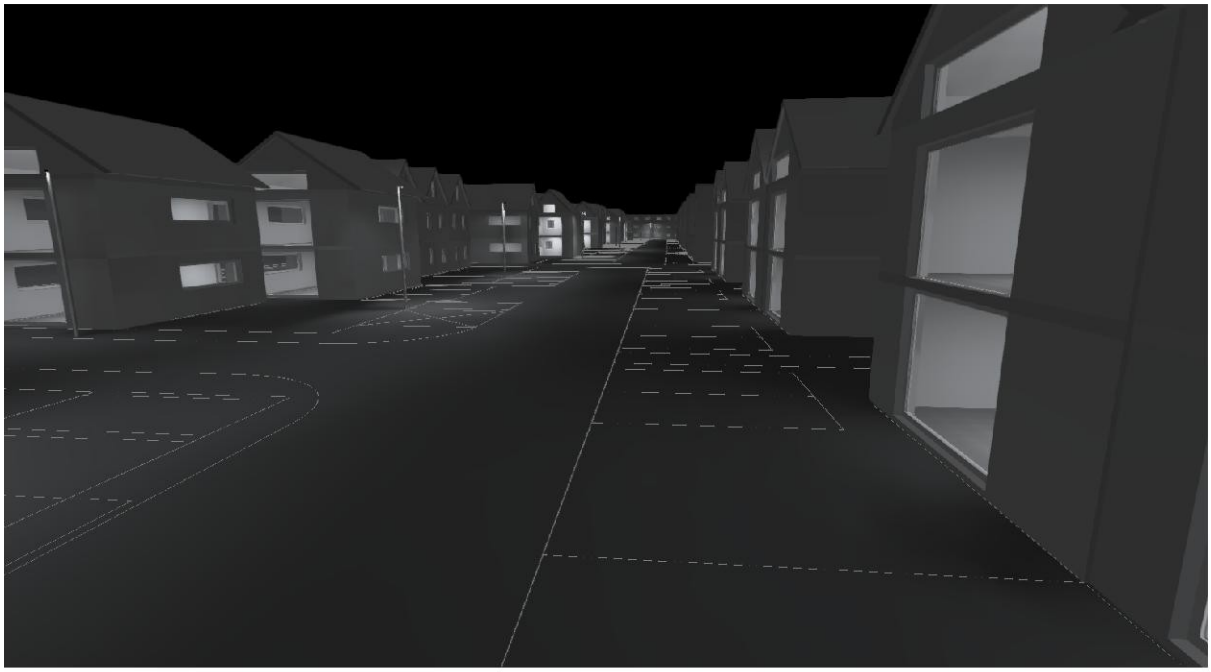


Figure 37 Future Residential Properties and Car Parks – East

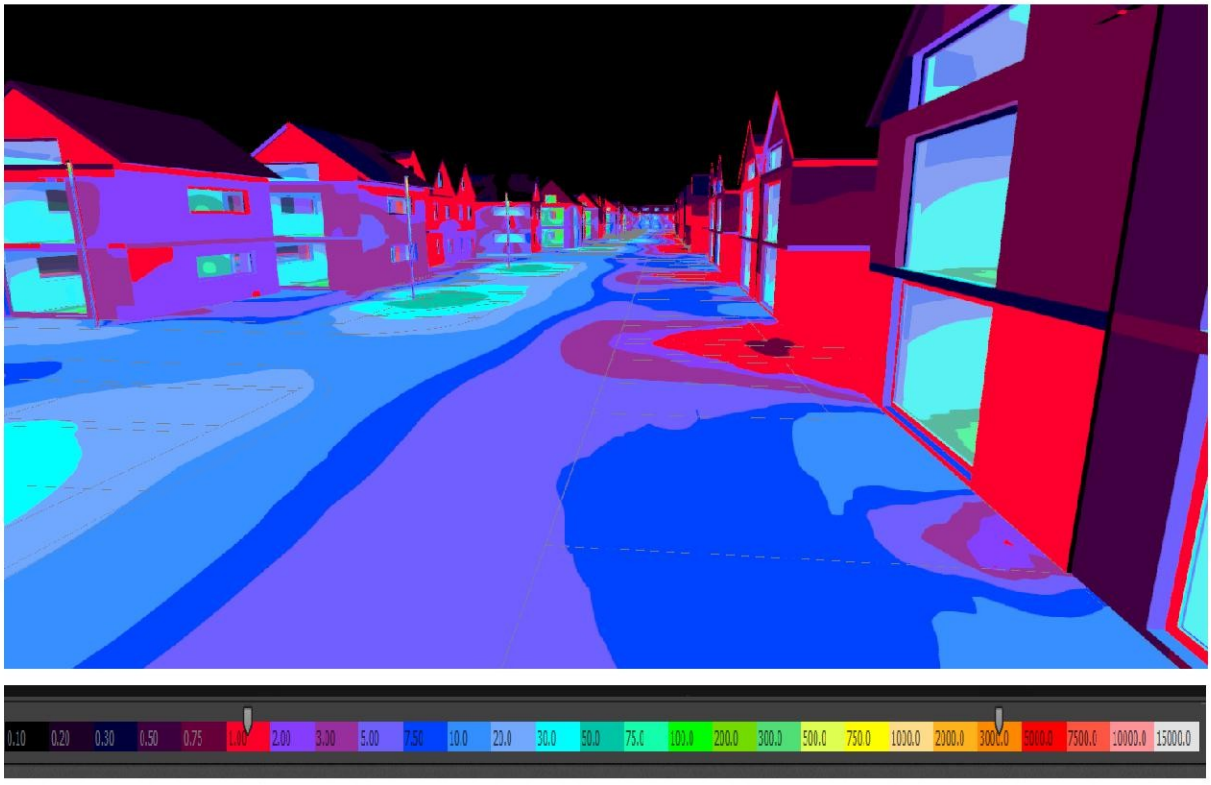


Figure 38 Future Residential Properties and Car Parks – East
(Pseudo colour illuminance)

7.5.6 Mitigation Opportunities

In order to reduce the potential light spill to nearby sensitive receptors, screening could be applied to the car park façade thereby reducing the amount of light emitted from the car park and at the same time reducing the visual impact by screening direct view of the luminaires and interior surface brightness.

8 CONCLUSION

In summary and in our considered opinion from the assessment and surveys carried out, the lighting strategy for the development residual effects will be negligible – minor negative on the immediate physiological and ecological environment with respect to obtrusive and trespass lightings.

The significance of the development lighting strategy sensitivity, magnitude of impact, duration and effects are negligible for the sensitive receptors.

In conclusion the development lighting strategy will safeguard enhance the night-time environment, but ensure that the neighbouring properties and more sensitive receptors will not be subjected to obtrusive light commonly referred to as light pollution that would be deemed to unacceptable in line with current guidelines.

To minimise the physiological and ecological impact of the development lighting scheme on the bat foraging habitats/foraging bats and nature designations careful consideration will not only be given to the direction and level of lighting, but careful consideration will also be given to the choice of lamp sources to be utilised throughout the design of the scheme.

The LED lamp source have minimal Infrared and UV lighting component, which will be more sympathetic to the bat foraging habitats/foraging bats and will have a neutral effect on the nature designations.

It is proposed that the lighting impact can be further minimised by using accepted methods of lighting control, essentially limiting the luminance and controlling light pollution.

Lighting control consideration should include a combination of photocell control to automatically turn the lighting 'On' at dusk and time-clock control to turn 'Off' post-curfew when the development is not use. Alternatively passive infrared detectors (PIR) to only activate the lighting temporarily when required to reduce obtrusive light and reduce unnecessary energy consumption or dimming to control the lighting levels.

The lighting strategy is designed to limit obtrusive light outside the boundary over the sensitive areas to 1 lux or less, when this is considered against moonlight at 1 lux the levels designed to will be extremely low.

The more sensitive receptors, with reference to the development, would be the bat foraging habitats/foraging bats and nature designations located on the proposed development.

The site survey assessment and desktop study of the existing site and proposed development indicate (with respect to identified sensitive receptors) that overall obtrusive levels will not be significantly influenced by the development.

The lighting impact can be further minimised by using accepted methods of lighting control, essentially limiting luminance and controlling obtrusive light pollution.

9 REFERENCES

Clean Neighbourhoods and Environmental Act (CNEA) 2005

The Clean Neighbourhoods and Environmental Bill

National Planning Policy Framework (NPPF)

Shepway District Local Plan Review

British Standards BS5489-1:2013

British Standards BS13201-2:2015

Institution of Lighting Professionals (ILP)

The Conservation of Habitats and Species Regulation

International Guidance

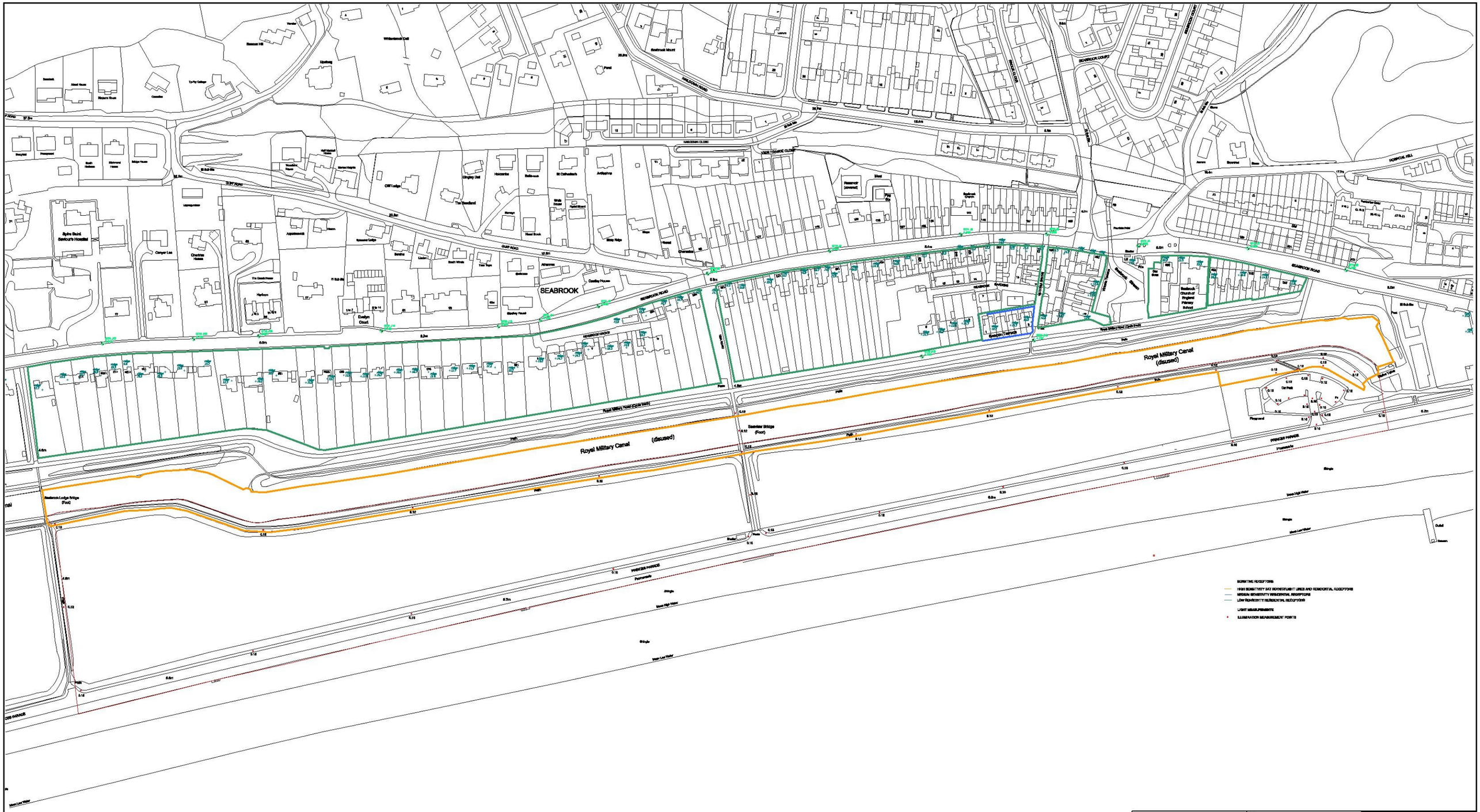
Society of Light & Lighting Handbook.2009

Society of Light & Lighting Code for Lighting 2012

10 APPENDICES

10.1 APPENDIX 1

Drawing P16206-XX-XX-DR-EX-97001 details the horizontal illuminance levels recorded at each location.



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. THE CONTRACTOR MUST VERIFY ALL DIMENSIONS TOLERANCES AND REFERENCES BEFORE PROCEEDING WITH WORKS.
3. ANY DISCREPANCY FOUND BETWEEN THIS DRAWING AND ANY OTHER DOCUMENTS MUST BE REPORTED IMMEDIATELY TO THE CONTRACT ADMINISTRATOR.
4. REMOVE THIS DRAWING FROM CURRENCY WHEN REVISED DRAWING IS ISSUED.
5. COPYRIGHT OF DESIGNS SHOWN ON THIS DRAWING REMAINS WITH ELEMENTA CONSULTING LTD.
6. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE SPECIFICATION AND ALL OTHER CONTRACT PROJECT DOCUMENTS.
7. THE CONTRACTOR SHALL REFER TO ARCHITECTS OR INTERIOR DESIGN DRAWINGS INCLUDING REFLECTED CEILING PLANS AND OTHER SPECIALIST DRAWINGS FOR SETTING OUT ALL VISIBLE AND CEILING MOUNTED EQUIPMENT.

A0 ORIGINAL SIZE OF DRAWING

No.	REVISION	CHK	DATE
P1	PRELIMINARY ISSUE	IS	19.04.17

Elementa Consulting Ltd
60 Cheapside
London
EC2V 6EE
t: +44(0)203 6979990
www.elementaconsulting.com

elementa
Member of Integral Group

CLIENT
SHEPWAY DISTRICT COUNCIL

PROJECT
PROPOSED DEVELOPMENT
PRINCES PARADE HYTHE
EXTERIOR LIGHTING SURVEY

TITLE
EXTERIOR LIGHTING SURVEY AND HORIZONTAL ILLUMINANCE

DATE	SCALE
MAY 2017	1:1000 @ A0

DESIGNED	CHECKED	APPROVED
RH	IS	IS

DRAWING STATUS
PRELIMINARY

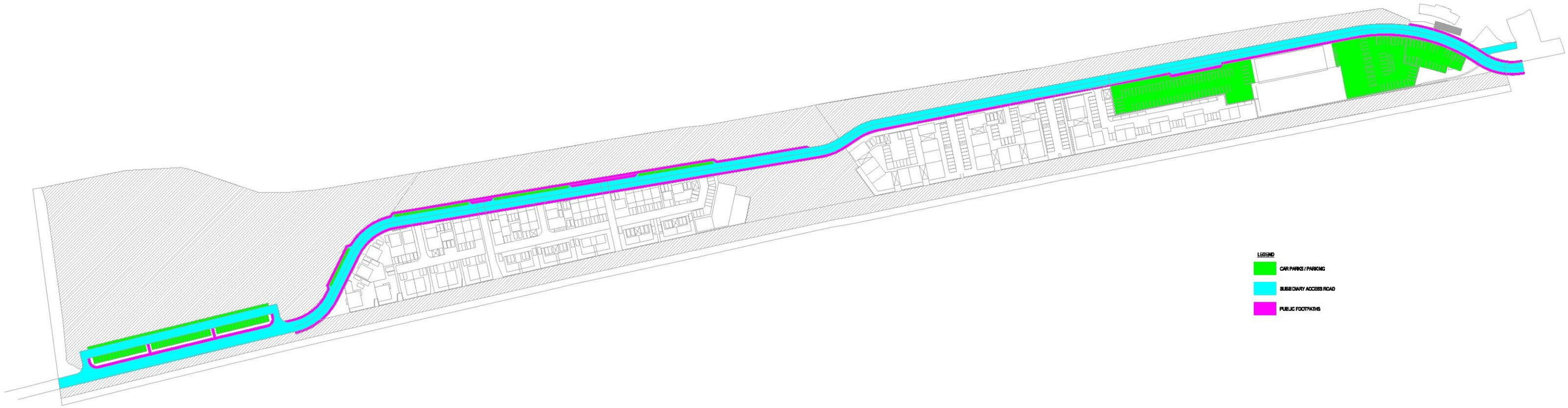
PAPER SIZE A0

DRAWING No.
P16206-ELE-XX-XX-DR-EX-97001

REVISION
P1

10.2 APPENDIX 2

Drawing P16206-XX-XX-DR-EX-97002 illustrates the proposed site showing areas colour coded area type and lighting requirements.



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. THE CONTRACTOR MUST VERIFY ALL DIMENSIONS TOLERANCES AND REFERENCES BEFORE PROCEEDING WITH WORKS.
3. ANY DISCREPANCY FOUND BETWEEN THIS DRAWING AND ANY OTHER DOCUMENTS MUST BE REPORTED IMMEDIATELY TO THE CONTRACT ADMINISTRATOR.
4. REMOVE THIS DRAWING FROM CURRENCY WHEN REVISED DRAWING IS ISSUED.
5. COPYRIGHT OF DESIGNS SHOWN ON THIS DRAWING REMAINS WITH ELEMENTA CONSULTING LTD.
6. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE SPECIFICATION AND ALL OTHER CONTRACT PROJECT DOCUMENTS.
7. THE CONTRACTOR SHALL REFER TO ARCHITECTS OR INTERIOR DESIGN DRAWINGS INCLUDING REFLECTED CEILING PLANS AND OTHER SPECIALIST DRAWINGS FOR SETTING OUT ALL VISIBLE AND CEILING MOUNTED EQUIPMENT.

A0 ORIGINAL SIZE OF DRAWING

No.	REVISION	CHK	DATE
P1	PRELIMINARY ISSUE	RS	19.06.17

Elementa Consulting Ltd
60 Cheapside
London
EC2V 6EE
t: +44(0)203 6972000
www.elementaconsulting.com

elementa
Member of Integral Group

CLIENT
SHEPWAY DISTRICT COUNCIL

PROJECT
PROPOSED DEVELOPMENT
PRINCES PARADE HYTHE

TITLE
PROPOSED SITE AREAS COLOUR CODED FOR THE AREA TYPE AND LIGHTING REQUIREMENTS

DATE	SCALE
MAY 2017	1:1000 @ A0

DESIGNED	CHECKED	APPROVED
RH	RS	RS

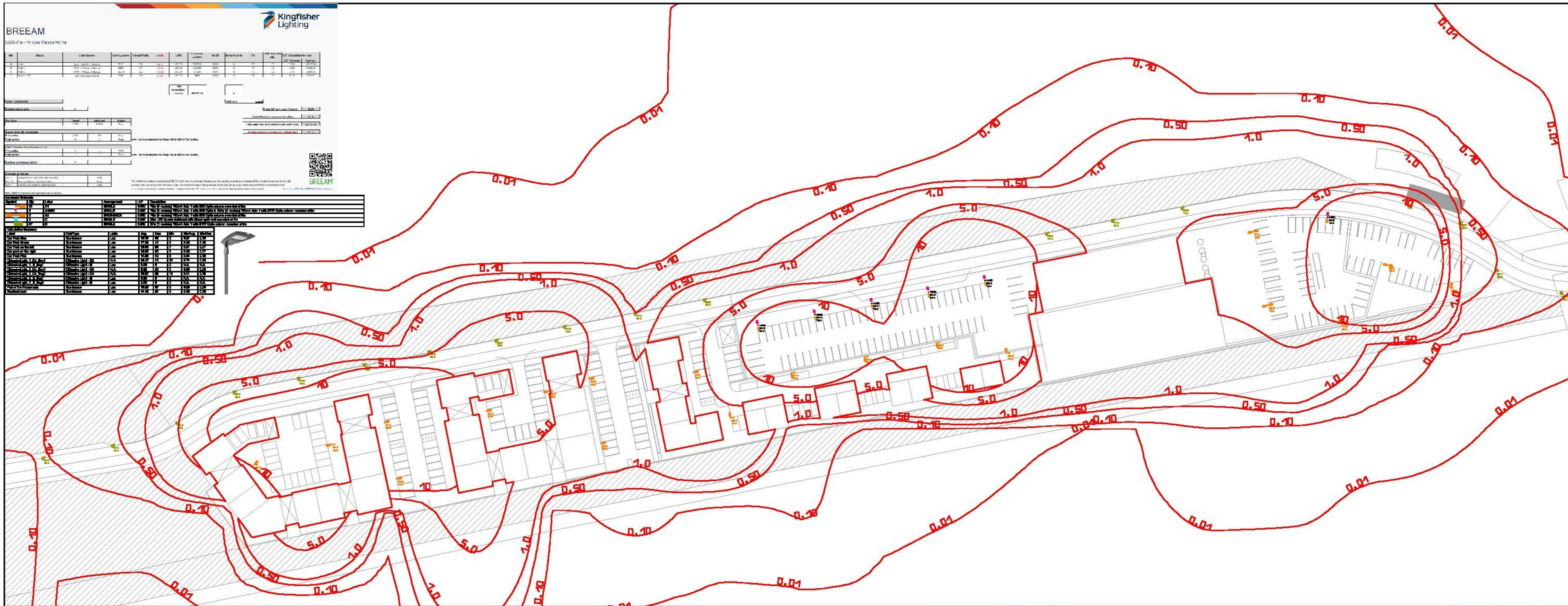
DRAWING STATUS
PRELIMINARY

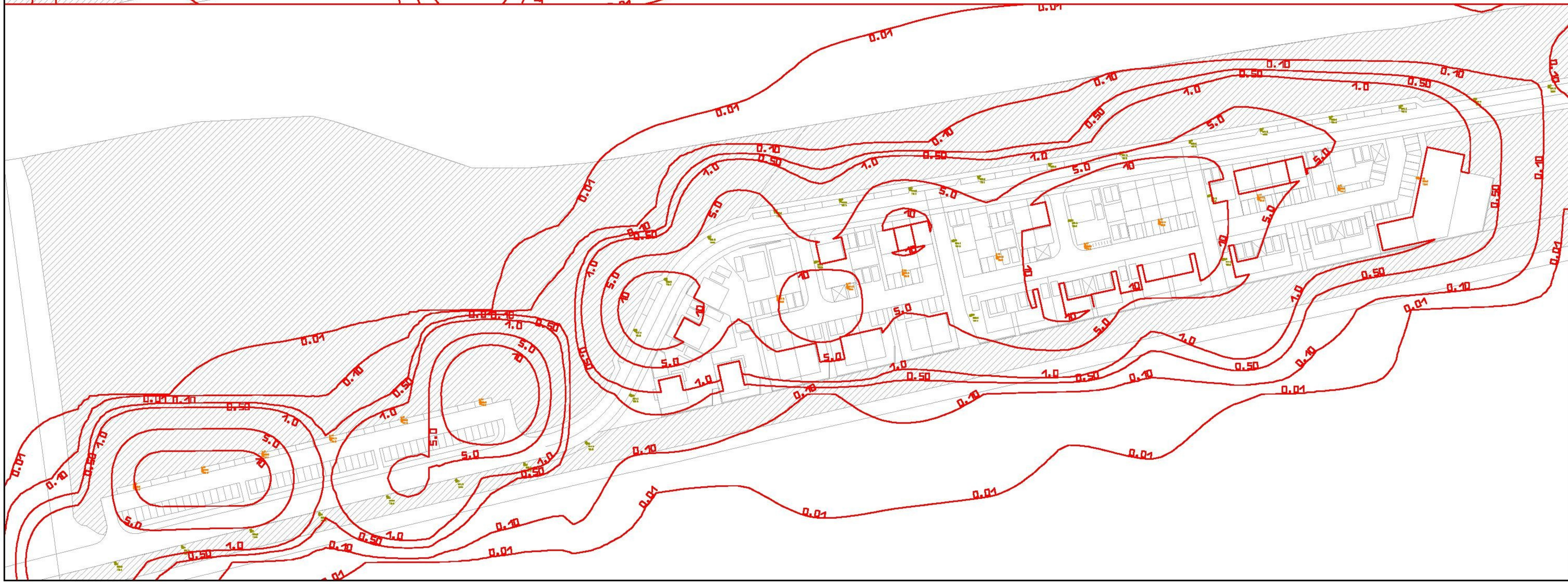
DRAWING No.
P16206-ELE-XX-XX-DR-EX-97002

REVISION
P1

10.3 APPENDIX 3

Drawing P18015-XX-XX-DR-EX-97003 details the concept lighting scheme horizontal illumination levels at each area of sensitive receptors





NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. THE CONTRACTOR MUST VERIFY ALL DIMENSIONS TOLERANCES AND REFERENCES BEFORE PROCEEDING WITH WORKS.
3. ANY DISCREPANCY FOUND BETWEEN THIS DRAWING AND ANY OTHER DOCUMENTS MUST BE REPORTED IMMEDIATELY TO THE CONTRACT ADMINISTRATOR.
4. REMOVE THIS DRAWING FROM CURRENCY WHEN REVISED DRAWING IS ISSUED.
5. COPYRIGHT OF DESIGNS SHOWN ON THIS DRAWING REMAINS WITH ELEMENTA CONSULTING LTD.
6. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE SPECIFICATION AND ALL OTHER CONTRACT PROJECT DOCUMENTS.
7. THE CONTRACTOR SHALL REFER TO ARCHITECTS OR INTERIOR DESIGN DRAWINGS INCLUDING REFLECTED CEILING PLANS AND OTHER SPECIALIST DRAWINGS FOR SETTING OUT ALL VISIBLE AND CEILING MOUNTED EQUIPMENT.

A0 ORIGINAL SIZE DRAWING

No.	REVISION	CHK.	DATE
P3	PRELIMINARY ISSUE INCORPORATING OUTLINE PLANNING ILLUSTRATIVE MASTERPLAN & ELEVATIONS FOR THE FUTURE RESIDENTIAL PROPERTIES	IS	22/01/18
P2	PRELIMINARY ISSUE	IS	4/09/17
P1	PRELIMINARY ISSUE	IS	26/07/17

Elementa Consulting Ltd
80 Cheapside
London
EC2V 6EE

elementa
Member of Integral Group

t: +44(0)203 6979300
www.elementaconsulting.com

CLIENT
SHEPWAY DISTRICT COUNCIL

PROJECT
PROPOSED DEVELOPMENT
PRINCES PARADE HYTHE

TITLE
CONCEPT LIGHTING SCHEME
HORIZONTAL ILLUMINAITION LEVELS
AT EACH AREA OF SENSITIVE RECEPTIORS

DATE	SCALE
JULY 2017	NTS @ A0

DESIGNED | CHECKED | APPROVED

SUITABILITY CODE | SUITABILITY DESCRIPTION

DRAWING STATUS
PRELIMINARY

DRAWING No.
P18015-ELE-XX-XX-DR-ES-97003

REVISION
P3

10.4 APPENDIX 4

Luminaire datasheets

Kingfisher Lighting

Datasheet

Italo Street

One product, three sizes. The Italo series offers high performance functionality, versatility and a wide variety of optics. A versatile solution suitable for any street application.

Key Features

- 525mA & 700mA
- Efficacy 138 luminaire lm/W
- 4000K, CRI >70
- Lifetime >100,000hr L80
- Post Top 76mm, side entry 76mm
- Driver included

60mm post-top and side-entry spigots available.
76mm recommended. Call for further details.

Applications

- Street lighting
- Highways
- Area lighting
- Car parks
- Parks & plazas

LED | IP66 | IK09 | DIM | Controls Compatible

Italo also available in urban and flood options.
See separate datasheets for details.

Fitting		Luminaire Lumens	LED Lumens	Power	Optics
S05	Italo 1	1,520 - 8,210	1,841 - 9,820	15.5W - 76W	S05 asymmetrical suburban street optic
	Italo 2	8,310 - 16,240	9,697 - 19,640	74W - 152W	
	Italo 3	15,280 - 31,000	17,455 - 36,825	131W - 286W	
STU-S	Italo 1	1,520 - 8,210	1,841 - 9,820	15.5W - 76W	STU-S asymmetrical suburban street optic
	Italo 2	8,310 - 16,240	9,697 - 19,640	74W - 152W	
	Italo 3	15,280 - 31,000	17,455 - 36,825	131W - 286W	

Fitting		Luminaire Lumens	LED Lumens	Power	Optics
STU-M	Italo 1	1,520 - 8,210	1,841 - 9,820	15.5W - 76W	STU-M asymmetrical suburban street optic
	Italo 2	8,310 - 16,240	9,697 - 19,640	74W - 152W	
	Italo 3	15,280 - 31,000	17,455 - 36,825	131W - 286W	
SV	Italo 1	1,520 - 8,210	1,841 - 9,820	15.5W - 76W	SV asymmetrical suburban street optic
	Italo 2	8,310 - 16,240	9,697 - 19,640	74W - 152W	
	Italo 3	15,280 - 31,000	17,455 - 36,825	131W - 286W	
STE-S	Italo 1	2,010 - 11,270	2,475 - 13,200	20W - 102W	STE-S asymmetrical suburban street optic
	Italo 2	11,450 - 19,030	13,035 - 23,100	98W - 183W	
	Italo 3	19,550 - 32,510	23,463 - 39,600	173W - 303W	
STE-M	Italo 1	2,010 - 11,270	2,475 - 13,200	20W - 102W	STE-M asymmetrical suburban street optic
	Italo 2	11,450 - 16,630	13,035 - 19,800	98W - 148W	
	Italo 3	17,670 - 32,510	20,856 - 39,600	150W - 303W	
STW	Italo 1	2,010 - 11,270	2,475 - 13,200	20W - 102W	STW asymmetrical suburban street optic
	Italo 2	11,450 - 16,630	13,035 - 19,800	98W - 148W	
	Italo 3	17,670 - 32,510	20,856 - 39,600	150W - 303W	

Specifications

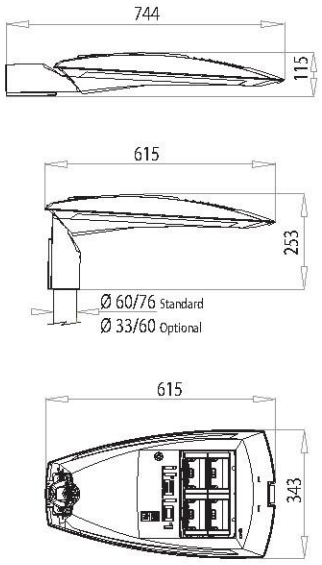
Weight	6.8-19 kg
Windage	Italo 1: 0.05-0.18m² Italo 2: 0.08-0.3m² Italo 3: 0.1-0.4m²
Material	Die-cast aluminium
Paint Finish	Graphite grey

Specification Text

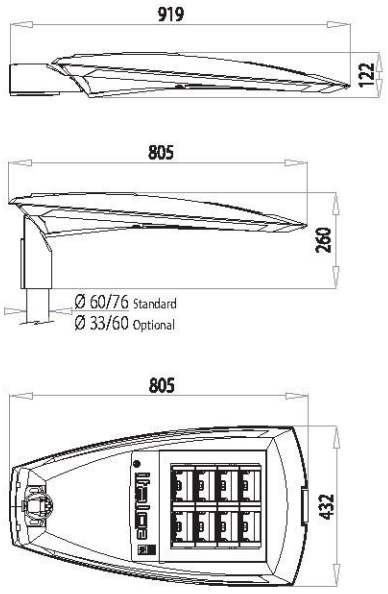
The luminaire shall be manufactured from high pressure die-cast aluminium. It shall have an LED efficacy of up to 151 luminaire lm/W and will be capable of producing up to 32,510 luminaire lumens at 4000K with a CRI >70. A number of optics will be available and the luminaire will be rated at IP66 and IK09. The optical design will be a reflector-based optic with glass screen.

Dimensions

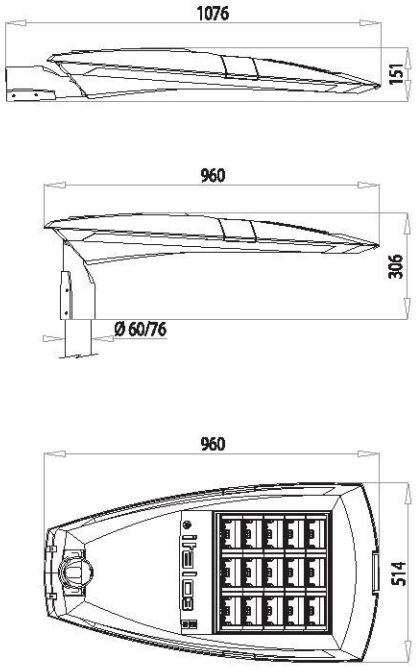
Italo 1



Italo 2



Italo 3



All units of measurement in mm.

Code	Power	Light Source	Luminaire Lumens	Optic	CCT(K)	IP	IK	Weight (kg)	Paint Finish	Product Type
S05 Optic										
IT1-SO5-4.5-1M1F	15.5W	LED	1520		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-SO5-4.5-1M1D	15.5W	LED	1520		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT1-SO5-4.7-1M1F	22W	LED	2090		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-SO5-4.7-1M1D	22W	LED	2090		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT1-SO5-4.5-2M1F	31W	LED	3290		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-SO5-4.5-2M1D	31W	LED	3290		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT1-SO5-4.7-2M1F	40.5W	LED	4160		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-SO5-4.7-2M1D	40.5W	LED	4160		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT1-SO5-4.5-3M1F	44.5W	LED	4930		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-SO5-4.5-3M1D	44.5W	LED	4930		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT1-SO5-4.7-3M1F	58W	LED	6210		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-SO5-4.7-3M1D	58W	LED	6210		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT1-SO5-4.5-4M1F	57W	LED	6510		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-SO5-4.5-4M1D	57W	LED	6510		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT1-SO5-4.7-4M1F	76W	LED	8210		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-SO5-4.7-4M1D	76W	LED	8210		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT2-SO5-4.5-5M1F	74W	LED	8310		4000	IP66	IK09	12.00	Graphite grey	Fixed
IT2-SO5-4.5-5M1D	74W	LED	8310		4000	IP66	IK09	12.00	Graphite grey	Dimmable
IT2-SO5-4.7-5M1F	99W	LED	10600		4000	IP66	IK09	12.00	Graphite grey	Fixed
IT2-SO5-4.7-5M1D	99W	LED	10600		4000	IP66	IK09	12.00	Graphite grey	Dimmable
IT2-SO5-4.5-6M1F	89W	LED	9930		4000	IP66	IK09	12.00	Graphite grey	Fixed
IT2-SO5-4.5-6M1D	89W	LED	9930		4000	IP66	IK09	12.00	Graphite grey	Dimmable
IT2-SO5-4.7-6M1F	117W	LED	12520		4000	IP66	IK09	12.00	Graphite grey	Fixed
IT2-SO5-4.7-6M1D	117W	LED	12520		4000	IP66	IK09	12.00	Graphite grey	Dimmable
IT2-SO5-4.5-7M1F	104W	LED	11440	Asymmetrical suburban street optic (SO5)	4000	IP66	IK09	12.00	Graphite grey	Fixed
IT2-SO5-4.5-7M1D	104W	LED	11440		4000	IP66	IK09	12.00	Graphite grey	Dimmable
IT2-SO5-4.7-7M1F	136W	LED	14360		4000	IP66	IK09	12.00	Graphite grey	Fixed
IT2-SO5-4.7-7M1D	136W	LED	14360		4000	IP66	IK09	12.00	Graphite grey	Dimmable
IT2-SO5-4.5-8M1F	116W	LED	12970		4000	IP66	IK09	12.00	Graphite grey	Fixed
IT2-SO5-4.5-8M1D	116W	LED	12970		4000	IP66	IK09	12.00	Graphite grey	Dimmable
IT2-SO5-4.7-8M1F	152W	LED	16240		4000	IP66	IK09	12.00	Graphite grey	Fixed
IT2-SO5-4.7-8M1D	152W	LED	16240		4000	IP66	IK09	12.00	Graphite grey	Dimmable
IT3-SO5-4.5-9M1F	131W	LED	15280		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-SO5-4.5-9M1D	131W	LED	15280		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-SO5-4.7-9M1F	175W	LED	19120		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-SO5-4.7-9M1D	175W	LED	19120		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-SO5-4.5-10M1F	142W	LED	16940		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-SO5-4.5-10M1D	142W	LED	16940		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-SO5-4.7-10M1F	194W	LED	21120		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-SO5-4.7-10M1D	194W	LED	21120		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-SO5-4.5-11M1F	157W	LED	18540		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-SO5-4.5-11M1D	157W	LED	18540		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-SO5-4.7-11M1F	213W	LED	23110		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-SO5-4.7-11M1D	213W	LED	23110		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-SO5-4.5-12M1F	173W	LED	19970		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-SO5-4.5-12M1D	173W	LED	19970		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-SO5-4.7-12M1F	232W	LED	25100		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-SO5-4.7-12M1D	232W	LED	25100		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-SO5-4.5-13M1F	188W	LED	21660		4000	IP66	IK09	19.00	Graphite grey	Fixed

Code	Power	Light Source	Luminaire Lumens	Optic	CCT(K)	IP	IK	Weight (kg)	Paint Finish	Product Type
IT3-STE-M-4.5-13M1D	246W	LED	28370	Asymmetrical suburban street optic (STE-M)	4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-STE-M-4.5-14M1F	263W	LED	30370		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STE-M-4.5-14M1D	263W	LED	30370		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-STE-M-4.5-15M1F	282W	LED	32510		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STE-M-4.5-15M1D	282W	LED	32510		4000	IP66	IK09	19.00	Graphite grey	Dimmable
STW Optic										
IT1-STW-4.5-1M1F	20W	LED	2010	Asymmetrical suburban street optic (STW)	4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-STW-4.5-1M1D	20W	LED	2010		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT1-STW-4.7-1M1F	28W	LED	2800		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-STW-4.7-1M1D	28W	LED	2800		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT1-STW-4.5-2M1F	39.5W	LED	4570		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-STW-4.5-2M1D	39.5W	LED	4570		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT1-STW-4.7-2M1F	52W	LED	5730		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-STW-4.7-2M1D	52W	LED	5730		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT1-STW-4.5-3M1F	58W	LED	6790		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-STW-4.5-3M1D	58W	LED	6790		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT1-STW-4.7-3M1F	76W	LED	8490		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-STW-4.7-3M1D	76W	LED	8490		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT1-STW-4.5-4M1F	75W	LED	9030		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-STW-4.5-4M1D	75W	LED	9030		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT1-STW-4.7-4M1F	102W	LED	11270		4000	IP66	IK09	6.80	Graphite grey	Fixed
IT1-STW-4.7-4M1D	102W	LED	11270		4000	IP66	IK09	6.80	Graphite grey	Dimmable
IT2-STW-4.5-5M1F	98W	LED	11450		4000	IP66	IK09	12.00	Graphite grey	Fixed
IT2-STW-4.5-5M1D	98W	LED	11450		4000	IP66	IK09	12.00	Graphite grey	Dimmable
IT2-STW-4.7-5M1F	127W	LED	14110		4000	IP66	IK09	12.00	Graphite grey	Fixed
IT2-STW-4.7-5M1D	127W	LED	14110		4000	IP66	IK09	12.00	Graphite grey	Dimmable
IT2-STW-4.5-6M1F	115W	LED	13470		4000	IP66	IK09	12.00	Graphite grey	Fixed
IT2-STW-4.5-6M1D	115W	LED	13470		4000	IP66	IK09	12.00	Graphite grey	Dimmable
IT2-STW-4.7-6M1F	148W	LED	16630		4000	IP66	IK09	12.00	Graphite grey	Fixed
IT2-STW-4.7-6M1D	148W	LED	16630		4000	IP66	IK09	12.00	Graphite grey	Dimmable
IT2-STW-4.5-7M1F	132W	LED	15400		4000	IP66	IK09	12.00	Graphite grey	Fixed
IT2-STW-4.5-7M1D	132W	LED	15400		4000	IP66	IK09	12.00	Graphite grey	Dimmable
IT3-STW-4.7-7M1F	183W	LED	19030		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STW-4.7-7M1D	183W	LED	19030		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT2-STW-4.5-8M1F	150W	LED	17670		4000	IP66	IK09	12.00	Graphite grey	Fixed
IT2-STW-4.5-8M1D	150W	LED	17670		4000	IP66	IK09	12.00	Graphite grey	Dimmable
IT3-STW-4.7-8M1F	208W	LED	21740		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STW-4.7-8M1D	208W	LED	21740		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-STW-4.5-9M1F	173W	LED	19550		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STW-4.5-9M1D	173W	LED	19550		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-STW-4.7-9M1F	231W	LED	24460		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STW-4.7-9M1D	231W	LED	24460		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-STW-4.5-10M1F	191W	LED	21850		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STW-4.5-10M1D	191W	LED	21850		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-STW-4.7-10M1F	253W	LED	26990		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STW-4.7-10M1D	253W	LED	26990		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-STW-4.5-11M1F	209W	LED	24010		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STW-4.5-11M1D	209W	LED	24010		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-STW-4.7-11M1F	278W	LED	29550		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STW-4.7-11M1D	278W	LED	29550		4000	IP66	IK09	19.00	Graphite grey	Dimmable

Code	Power	Light Source	Luminaire Lumens	Optic	CCT(K)	IP	IK	Weight (kg)	Paint Finish	Product Type
IT3-STW-4.5-12M1F	228W	LED	26200	Asymmetrical suburban street optic (STW)	4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STW-4.5-12M1D	228W	LED	26200		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-STW-4.7-12M1F	303W	LED	32160		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STW-4.7-12M1D	303W	LED	32160		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-STW-4.5-13M1F	246W	LED	28370		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STW-4.5-13M1D	246W	LED	28370		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-STW-4.5-14M1F	263W	LED	30370		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STW-4.5-14M1D	263W	LED	30370		4000	IP66	IK09	19.00	Graphite grey	Dimmable
IT3-STW-4.5-15M1F	282W	LED	32510		4000	IP66	IK09	19.00	Graphite grey	Fixed
IT3-STW-4.5-15M1D	282W	LED	32510		4000	IP66	IK09	19.00	Graphite grey	Dimmable

Accessories / Options

Paint finish options	Contact us for details
Colour temperature options	3000K - Contact us for details
Photocell option	Contact us for details
NEMA socket option	Contact us for details
Post-top brackets / spigot size options	Contact us for details
Fixed or dimmable	See specification table

10.5 APPENDIX 5

Light Meter Irradian L203 light meter (Serial No. D005/0032) Calibration Certificate

CERTIFICATE OF CALIBRATION

Issued By BSRIA Instrument Solutions

Date of Issue 15 November 2016

Certificate Number
STD86313

BSRIA
Instrument Solutions
Old Bracknell Lane West, Bracknell,
Berkshire, RG12 7AH, United Kingdom
T:+44 (0) 1344 459314 F:+44 (0) 1344 465556
E:info@bis.fm W:www.bis.fm

BSRIA [redacted]

Approved Signatory

Customer : BSRIA Instrument Solutions
Old Bracknell Lane West, Bracknell
Berkshire RG12 7AH

Date Received : 26 April 2012

Instrument -

System ID :	202088	Job Number : H21144-1	
Description :	Lightmeter; Illuminance/Lumin	Ref. Number : 202088	
Manufacturer :	Irradian		
Model Number :	L203		
Serial Number :	D005/0035	Last Certificate Number : STD85568	
Procedure Version :	6F4V2	Last Calibration Date : 19/10/2016	

Environmental Conditions

Temperature :	20°C +/- 4°C	Mains Voltage :	240V +/- 10V
Relative Humidity :	50% +/- 20%	Mains Frequency :	50Hz +/- 1Hz

Comments

Instrument allowed to stabilise prior to reading.
Instrument "zeroed" prior to start of procedure.
Measurements made using a tungsten filament with colour temperature of 2856k.

2610

Traceability Information

Instrument description	*Serial number*	*Certificate number*	*Cal. Date*	*Cal. Period*
Light Bench L Range (ZZMLB02)	18425/2 & 18426/1	98544	01/12/2015	52
Light Bench H Range (ZZMLB03)	18425/1 & 18427/1	98545	01/12/2015	52
Distance Measurement System (ZZMLB04)	4816	98621	07/12/2015	52

[redacted]

Calibrated By : A. Lennard **Date of Calibration :** 15 November 2016

This certificate provides traceability of measurement to recognised National Standards, and to the units of measurement realised at the National Physical Laboratory or other recognised National Standards laboratories.

This certificate complies with the requirements of BS EN ISO 10012:2003.

CERTIFICATE OF CALIBRATION

Certificate Number
STD86313

Test Title	Tolerance	True	Indicated	% Of Spec.
CONTENTS				
Main Display	---	---	Pass	
Detector Head / Lead	---	---	Pass	
Zero Cap	---	---	Pass	
FOV Filter	---	---	Pass	
RS232 Comms Cable	---	---	Pass	
Manual	---	---	Pass	
Certificate	---	---	Pass	
Case	---	---	Pass	
INSPECTION RESULTS				
Visual Inspection	---	---	Pass	
Battery Status	---	---	Pass	
Integrity Seals	---	---	Pass	
LIGHT BENCH CHECK				
Light Bench Check	---	---	Pass	
TEST RESULTS				
Illuminace Range				
Lux range	0.50Lux	5.000Lux	4.806Lux	39%
	1Lux	10.000Lux	9.678Lux	32%
	5Lux	50.00Lux	50.59Lux	12%
	10Lux	100.00Lux	100.96Lux	10%
	20Lux	200.0Lux	201.9Lux	10%
	50Lux	500.0Lux	506.4Lux	13%
	100Lux	1 000.0Lux	1 017.4Lux	17%
	200Lux	2 000Lux	2 017Lux	8%

Uncertainties

Illuminance	0 to 2000 lux; ±5% of applied value.

BUILDING SERVICES & ENVIRONMENTAL

DEEP GREEN ENGINEERING

elementa

80 Cheapside
London
EC2V 6EE
T +44(0)203 697 9300

–

Unit 1, Library Avenue
Harwell Oxford
Didcot
Oxfordshire
OX11 0SG
T +44(0)1235 820300

–

Contact
Pete Hender
pete.hender@elementaconsulting.com

–

Ian Segré
Ian.segre@elementaconsulting.com

London, UK
Oxford, UK
Oakland, CA
San Jose, CA
Los Angeles, CA
Seattle, WA
Washington, DC
Richmond, VA
Austin, TX
Atlanta, GA
Vancouver, BC
Calgary, AB
Toronto, ON
Victoria, BC