



**LONDON SQUARE DEVELOPMENTS LTD**

**FORMER GREGGS BAKERY SITE  
TWICKENHAM  
TW2 6RT**

**Exterior Lighting Assessment**

**Desco (Design & Consultancy) Ltd**

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**SCHEDULE OF REVISIONS**

| <b>Revision</b> | <b>Date</b> | <b>Changes</b>                      | <b>Author</b> | <b>Checked</b> |
|-----------------|-------------|-------------------------------------|---------------|----------------|
| 01              | 31/01/2019  | DRAFT FOR COMMENT                   | JC            | AD             |
| 02              | 18/02/2019  | SUBMITTED FOR PLANNING              | JC            | AD             |
| 03              | 16/10/2019  | UPDATED TO LATEST LANDSCAPE LAYOUTS | JC            | AD             |



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## **1.0 INTRODUCTION**

This report outlines the preliminary external lighting design for the proposed residential development at the former Greggs Bakery site in Twickenham. The project comprises construction of 51 new townhouses and 65 new apartments. Also included in the proposal is car parking, vehicle access roads, cycle and refuse storage and two storeys of commercial space at the south of the site.

The site is located within the London Borough of Richmond upon Thames and is situated in the centre of an established low-rise residential area mainly comprising townhouses. The development is accessible via both Gould and Crane Road, and Twickenham station sits approximately 900 metres due East of the site.

## **2.0 LIGHTING DESIGN**

The external lighting design needs to satisfy various design criteria set out by professional bodies as detailed below.

The design will comply with the Society of Light and Lighting's CIBSE LG6: The Outdoor Environment – 2016. The class of lighting proposed for the development has been selected as E3 for 'small town centres or suburban locations' as outlined within Table 2.1 below, extracted by CIBSE from CIE 150 : 2003 (Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations) and used in section 2.1.10 of LG6.

In this section of LG6, the document states that the local context should be considered when designing the lighting so that the building does not appear visually out of keeping with its immediate surroundings; E0 being protected areas such as a dark sky park where no lighting is permitted, and E3 (our selection) being suburban areas with medium district brightness.

**Table 2.1 Environmental zones**

| Zone | Surroundings | Lighting environment       | Examples  |
|------|--------------|----------------------------|---|
| E0   | Protected    | Dark                       | IDA Dark Sky Parks, UNESCO Starlight Reserves                           |
| E1   | Natural      | Intrinsically dark         | Areas of Outstanding Natural Beauty, relatively uninhabited rural areas |
| 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 and city centres, commercial areas                                 |

Source: CIE 150: 2003.

When designing in an E3 classification area the designer must ensure that upwards light is no greater than 15% (Upward Light Ratio – ULR) as stated in table 6.3, chapter 6 of the Society of Light and Lighting handbook.

| Environmental zone | Maximum upward light output ratio (%) |
|--------------------|---------------------------------------|
| E1                 | 0                                     |
| E2                 | 5                                     |
| E3                 | 15                                    |
| E4                 | 25                                    |

The referenced E3 environmental zone is outlined in the Institution of Lighting Engineers Guidance Notes for the Reduction of Obtrusive Light GN01:2011, shown below:

| Environmental Zone | Sky Glow ULR [Max %] <sup>(1)</sup> | Light Intrusion (into Windows) $E_v$ [lux] <sup>(2)</sup> |             | Luminaire Intensity $I$ [candelas] <sup>(3)</sup> |              | Building Luminance Pre-curfew <sup>(4)</sup> |
|--------------------|-------------------------------------|---|-------------|---|--------------|--|
|                    |                                     | Pre-curfew  | Post-curfew | Pre-curfew  | Post-curfew  | Average, $L$ [cd/m <sup>2</sup> ]            |
| E0                 | 0                                   | 0   | 0           | 0   | 0            | 0  |
| E1                 | 0                                   | 2   | 0 ( 1*)     | 2,500   | 0            | 0  |
| E2                 | 2.5                                 | 5   | 1           | 7,500   | 500          | 5  |
| <b>E3</b>          | <b>5.0</b>                          | <b>10</b>   | <b>2</b>    | <b>10,000</b>                                     | <b>1,000</b> | <b>10</b>                                    |
| E4                 | 15                                  | 25  | 5           | 25,000  | 2,500        | 25   |

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

**$E_v$**  = **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/m<sup>2</sup>)**

**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

The road lighting illuminance will comply with the levels outlined in BS5489-1:2013 Code of practice for the design of road lighting, lighting of roads and public amenity areas. Table A.6 (below) provides lighting classes for subsidiary roads with mainly slow moving vehicles, cyclists and pedestrians. As this is a residential site, a quite traffic flow has been selected which relates to a P6 lighting class.

Table A.6 Lighting classes for subsidiary roads with mainly slow-moving vehicles, cyclists and pedestrians

| Traffic flow         | Lighting class                                  |  |
|----------------------|---|--|
|                      | Ambient luminance:<br>very low (E1) or low (E2) | Ambient luminance:<br>moderate (E3) or high (E4) |
| Busy <sup>A)</sup>   | S4 or P4  | S4 or P4   |
| Normal <sup>B)</sup> | S5 or P5  | S5 or P5   |
| Quiet <sup>C)</sup>  | S6 or P6  | S6 or P6   |

NOTE 1 If facial recognition is important then an ES lighting class from BS EN 13201-2:2003, Table 5, or an E<sub>sc</sub> lighting class from CIE 115:2010 [N1], Table 7, can be selected as an additional criterion. Good colour rendering contributes to a better facial recognition. (The ES lighting class in BS EN 13201-2:2003 is expected to be replaced by SC upon publication of the revised edition.)

NOTE 2 To ensure adequate uniformity, the actual value of the maintained average illuminance is not to exceed 1.5 times the value indicated for the class.

NOTE 3 It is recommended that the actual overall uniformity of illuminance U<sub>o</sub> be as high as reasonably practicable.

NOTE 4 Grey highlighting indicates situations that would not usually occur in the UK.

NOTE 5 The ambient luminance descriptions E1 to E4 refer to the environmental zone as defined in ILP GN01 [N5].

<sup>A)</sup> Busy traffic flow refers to areas where the traffic usage is high and can be associated with local amenities such as clubs, shopping facilities, public houses, etc.

<sup>B)</sup> Normal traffic flow refers to areas where the traffic usage is of a level equivalent to a housing estate access road.

<sup>C)</sup> Quiet traffic flow refers to areas where the traffic usage is of a level equivalent to a residential road and mainly associated with the adjacent properties or properties on other equivalent roads accessed from this road.

The referenced P6 lighting class is outlined in BS EN 13201-2:2015 Table 3 below and will achieve a minimum maintained average illuminance within road and pathway areas of 2 lux and a minimum level of 0.4 lux.

Table 3 — P lighting classes

| Class | Horizontal illuminance                    |                                 | Additional requirement if facial recognition is necessary |                                    |
|-------|---|---------------------------------|---|------------------------------------|
|       | $\bar{E}^a$<br>[minimum maintained]<br>lx | $E_{min}$<br>[maintained]<br>lx | $E_{v,min}$<br>[maintained]<br>lx                         | $E_{sc,min}$<br>[maintained]<br>lx |
| P1    | 15,0                                      | 3,00                            | 5,0   | 5,0                                |
| P2    | 10,0                                      | 2,00                            | 3,0   | 2,0                                |
| P3    | 7,50                                      | 1,50                            | 2,5   | 1,5                                |
| P4    | 5,00                                      | 1,00                            | 1,5   | 1,0                                |
| P5    | 3,00                                      | 0,60                            | 1,0   | 0,6                                |
| P6    | 2,00                                      | 0,40                            | 0,6   | 0,2                                |
| P7    | performance not determined                | performance not determined      |   |                                    |

<sup>a</sup> To provide for uniformity, the actual value of the maintained average illuminance shall not exceed 1,5 times the minimum  $\bar{E}$  value indicated for the class.

NOTE 4 A high colour rendering contributes to a better facial recognition.

The lighting design for the car park areas is based on a light traffic level and will achieve a minimum maintained average illuminance of 5 lux and a minimum uniformity of 0.25 lux as defined in Table 5 of BS 5489-1:2013.

**Table 5 Maintained lighting levels for outdoor car parks**

| Type of area and usage  | $\bar{E}$<br>lx | $U_o$ |
|---|-----------------|-------|
| Light traffic, e.g. parking areas of shops, terraced and apartment houses; cycle parks  | 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  |

The lighting layout has been modelled using Dialux lighting design software to ensure that the above criteria are adhered to.

The proposed design will generally comprise luminaires mounted on 4m columns throughout, supplemented with wall mounted bulkheads at the exit/entrance routes from the buildings.



| Area                         | Description   | Fittings Used   |
|------------------------------|---|---|
| <b>Main Vehicle Roadways</b> | Roadways illuminated to an average of 2 lux and maintain a minimum of 0.4 lux.  | 31W LED luminaire mounted on 4 metre columns complete with optics specific for use on roadways. Elongated light distribution to improve uniformity. Colour rendering index is 70+ for good facial recognition.  |
| <b>Car Parks</b>             | Car parks illuminated to 5 lux with a uniformity of 0.25.                       | A combination of 15W LED wall mounted bulkheads and 24W LED bollard luminaires are proposed to minimise the impact on the nocturnal wildlife. Refer to supplementary external lighting report '1823-63-RPT-02.' |
| <b>Footpaths</b>             | Footpaths illuminated to an average of 2 lux and maintain a minimum of 0.4 lux. | A combination of 15W LED wall mounted bulkheads and 24W LED bollard luminaires are proposed to minimise the impact on the nocturnal wildlife. Refer to supplementary external lighting report '1823-63-RPT-02.' |

|   |  |
|---|--|
|  <p><i>THORLUX STARBEAM</i></p>  | <p>LED floodlight luminaires mounted on 4 meter columns will be located along roadways.</p> <p>Each fitting comprises a die cast aluminium housing, polycarbonate cover and high efficiency 31W LED 4000k lamp source.</p> <p>Specific optics designed for use in car parks and roadways ensure that minimum lighting levels can be achieved using a reduced number of fittings.</p> |
|  <p><i>THORLUX PROBE XL</i></p> | <p>1 meter tall LED bollard luminaire positioned on the perimeter of car parks and footpaths.</p> <p>Each fitting will comprise an aluminium housing finished in black, complete with integral diffuser to direct the light in a downward direction, thus minimising the impact on the local nocturnal wildlife.</p>   |
|  <p><i>DEXTRA AMEX LED</i></p> | <p>Wall mounted circular bulkhead luminaire positioned at low level along the Northern wall of the site adjacent to river Crane.</p> <p>Each fitting will comprise IP65 die-cast aluminium housing and eyelid cover to minimise upward light spill.</p>  |

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## **Biodiversity Design Considerations**

As part of the design process, the impact of external lighting on the local biodiversity has been considered, in particular to bats which currently commute across and forage over the site. In order to minimise any disturbance to the local bat population (and other nocturnal wildlife), the proposed lighting scheme shall incorporate the following measures:

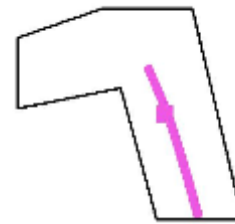
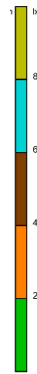
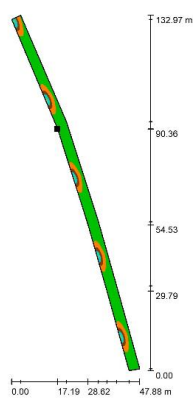
- The use of mercury or metal halide lamps which emit high levels of UV have been avoided. External luminaires comprise LED lamps which produce light with a wavelength of 590nm to minimise disturbance to bats. Also, the LED lamps produce no UV emissions which ensures insects are not attracted away from neighbouring habitats.
- The proposed luminaires comprise integral reflectors which control the direction and spread of the light so that only the immediate area is illuminated. The design of the light fittings ensures minimum upward light spill as detailed in section 2.0 LIGHTING DESIGN of this report.
- Illuminance between lighting columns generally drops below 1 lux. These lower lighting levels will encourage bats to fly between columns and prevent the formation of a 'light barrier' which can be detrimental to some species of bat.
- The luminaires shall comprise louvres and diffusers which reflect/direct light to the required areas, thus avoiding unnecessary light spillage and upward light pollution.
- The external lighting has been modelled using lighting design software, the calculation outputs of which are enclosed within this report. This has enabled lighting levels and spill across the space to be accurately predicted, thus ensuring that light is not provided to areas which do not require illumination.
- There is no proposed uplighting to trees and other landscape features, both new and existing, which will avoid illuminating bat foraging and commuting habitats, as well as any bat boxes installed on retained trees.
- Refer to supplementary external lighting report '1823-63-RPT-02' for further details on the lighting design to mitigate impact on nocturnal wildlife.

### 3.0 LUMINAIRE PARTS LIST

|           |  |   |   |
|-----------|--|---|---|
| 17 Pieces | <p>Doxtra Group AMEX L16 E C84 AMEX LED<br/>                     Article No.: AMEX L16 E C84<br/>                     Luminous flux (Luminaire): 759 lm<br/>                     Luminous flux (Lamps): 1600 lm<br/>                     Luminaire Wattage: 15.2 W<br/>                     Luminaire classification according to CIE: 57<br/>                     CIE flux code: 16 42 71 57 47<br/>                     Fitting: 2 x STARK LLE-G3-24-140-650-840-CLA 28000392 (Correction Factor 1.000).</p> |     |    |
| 5 Pieces  | <p>Thorlux PRB17522 PROBE XL LED<br/>                     Article No.: PRB17522<br/>                     Luminous flux (Luminaire): 1944 lm<br/>                     Luminous flux (Lamps): 1040 lm<br/>                     Luminaire Wattage: 28.0 W<br/>                     Luminaire classification according to CIE: 78<br/>                     CIE flux code: 12 45 82 78 100<br/>                     Fitting: 1 x 24W LED (Correction Factor 1.000).</p>   |     |    |
| 2 Pieces  | <p>Thorlux SB17553 STARBEAM LED AREA<br/>                     Article No.: SB17553<br/>                     Luminous flux (Luminaire): 3504 lm<br/>                     Luminous flux (Lamps): 3500 lm<br/>                     Luminaire Wattage: 35.0 W<br/>                     Luminaire classification according to CIE: 98<br/>                     CIE flux code: 25 59 90 98 100<br/>                     Fitting: 1 x 31W LED (Correction Factor 1.000).</p>  |    |    |
| 6 Pieces  | <p>Thorlux SB17561 STARBEAM LED ROADWAY<br/>                     Article No.: SB17561<br/>                     Luminous flux (Luminaire): 3700 lm<br/>                     Luminous flux (Lamps): 3700 lm<br/>                     Luminaire Wattage: 33.0 W<br/>                     Luminaire classification according to CIE: 99<br/>                     CIE flux code: 42 76 97 99 100<br/>                     Fitting: 1 x 31W LED (Correction Factor 1.000).</p>                                       |  |  |

### 4.0 CALCULATION SURFACES

#### Main Roadway



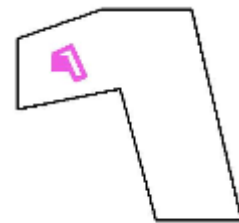
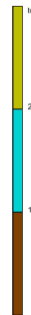
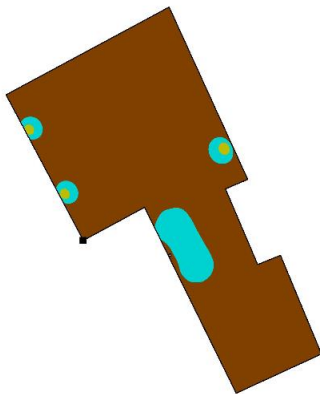
$E_{av}$  [lx]  
15

$E_{min}$  [lx]  
1.02

$E_{max}$  [lx]  
88

$u_0$   
0.067

#### North West Car Park



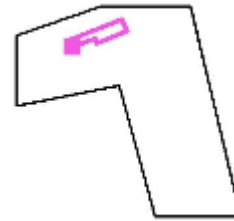
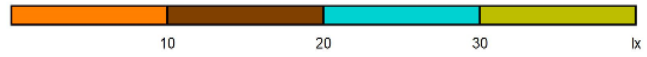
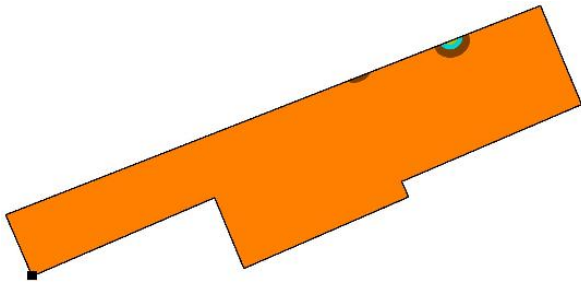
$E_{av}$  [lx]  
8.13

$E_{min}$  [lx]  
0.65

$E_{max}$  [lx]  
56

$u_0$   
0.080

North Car Park



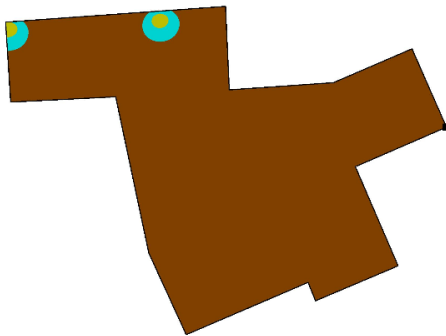
$E_{av}$  [lx]  
3.27

$E_{min}$  [lx]  
0.92

$E_{max}$  [lx]  
40

u0  
0.283

North East Car Park



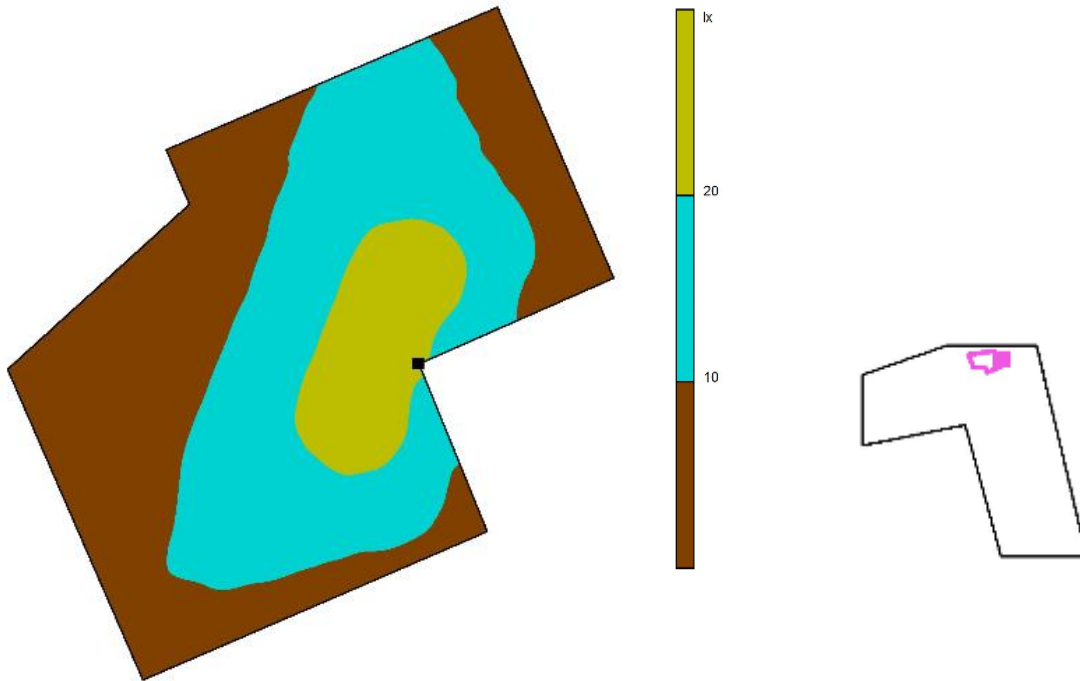
$E_{av}$  [lx]  
4.02

$E_{min}$  [lx]  
0.64

$E_{max}$  [lx]  
53

u0  
0.158

North East Car Park 2



$E_{av}$  [lx]  
12

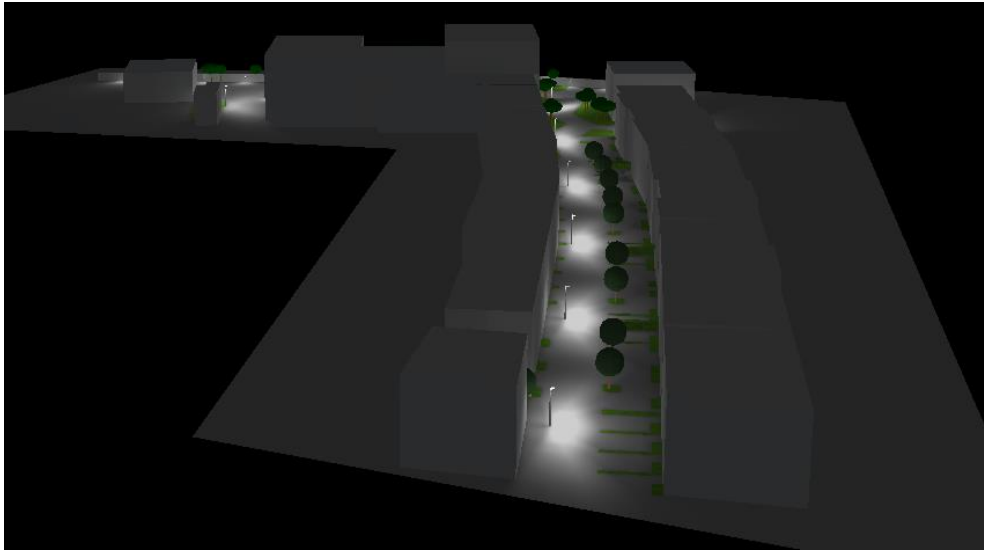
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1.63

$E_{max}$  [lx]  
28

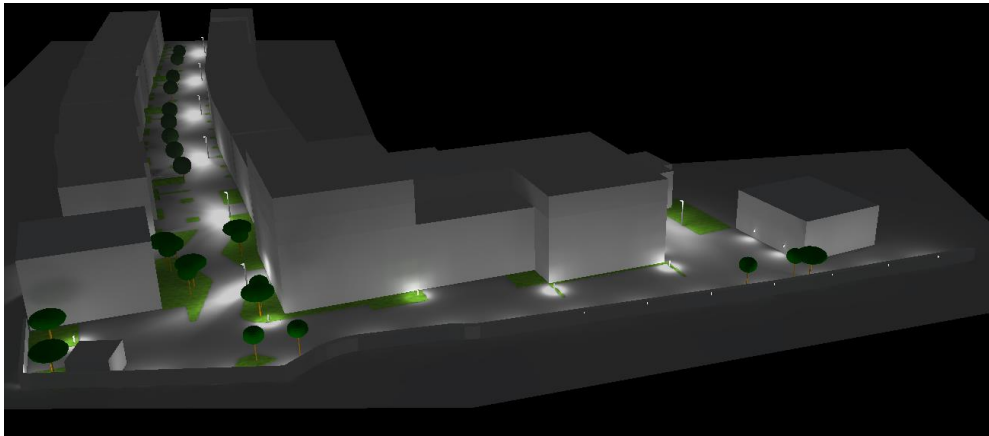
$u_0$   
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**5.0 3D RENDERING**

View Looking North

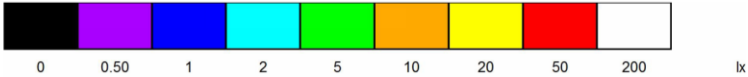
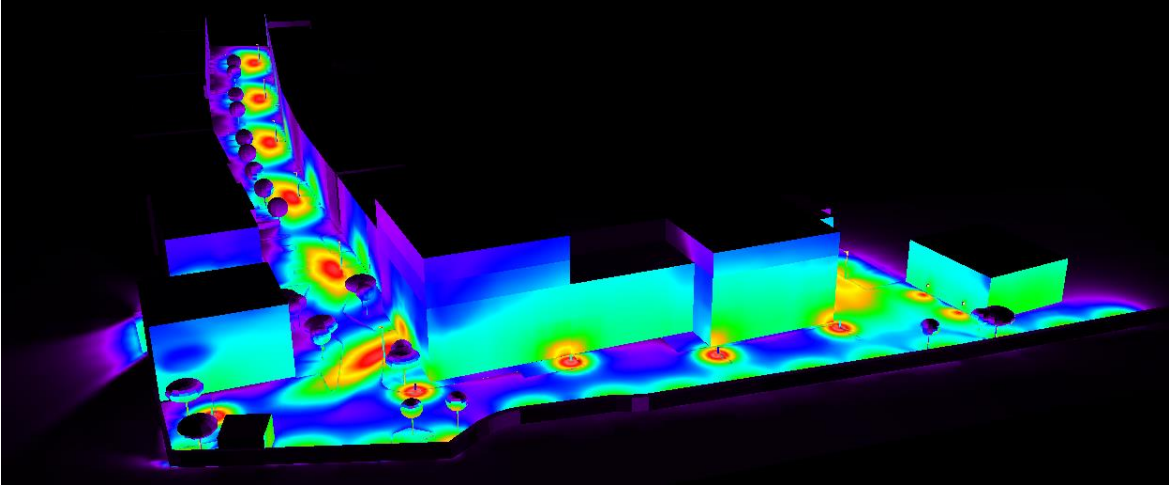


View Looking South





3D Colour Rendering



## 6.0 LIGHTING DATASHEETS

### *Thorlux Starbeam Area and Roadway*



#### LED AREA FLOODLIGHTS AND STREET LIGHTS

IP66 IK10 CE LED

WINDAGE - small: 0.06m<sup>2</sup> large: 0.07m<sup>2</sup>

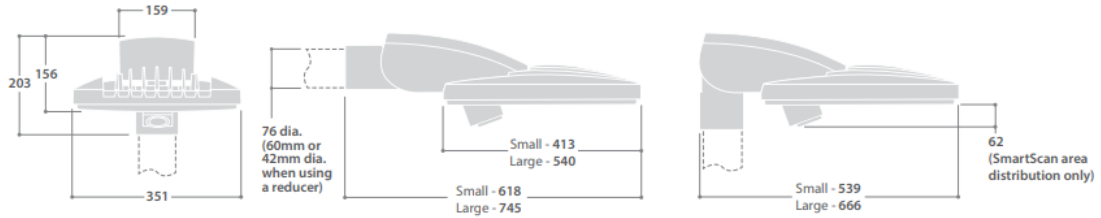
#### SPECIFICATION

- Die-cast aluminium body and gear compartment finished polyester silver RAL9006
- Die-cast aluminium, fast release gear compartment lid finished polyester graphite
- Polycarbonate cover and acrylic high efficiency LED lenses
- Area or roadway optical distributions
- Integral high efficiency driver
- Extremely efficient and long system life up to 100,000 hours
- Suitable for ambient temperatures up to 50°C
- Smart External versions with intelligent lighting control for use up to 12 metres mounting height
- SmartScan wireless technology removes the need for control cabling. Ideal for retro-fit
- Pole top 76mm as standard, adjustable through 90°
- Wall mounting bracket accessory
- Wide range of mounting options (see page 5 for details)
- Photocell option
- Fitted with 4000K or 5700K LEDs

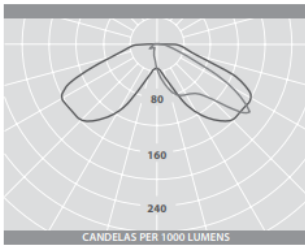
#### RANGE

|          | LED                  | AREA DISTRIBUTION | ROADWAY DISTRIBUTION | APPROX. kg |
|----------|----------------------|-------------------|----------------------|------------|
| STANDARD | <b>Small Version</b> |                   |                      |            |
|          | 31W - 4000K          | SB 17553L         | SB 17561L            | 8.0        |
|          | 62W - 4000K          | SB 17554L         | SB 17562L            | 8.0        |
|          | 31W - 5700K          | SB 15800L         | SB 15801L            | 8.0        |
|          | 62W - 5700K          | SB 15802L         | SB 15803L            | 8.0        |
|          | <b>Large Version</b> |                   |                      |            |
|          | 88W - 4000K          | SB 17555L         | SB 17563L            | 9.2        |
|          | 123W - 4000K         | SB 17556L         | SB 17564L            | 9.2        |
|          | 161W - 4000K         | SB 18350L         | SB 18351L            | 9.2        |
|          | 88W - 5700K          | SB 15804L         | SB 15805L            | 9.2        |
|          | 123W - 5700K         | SB 15806L         | SB 15807L            | 9.2        |
|          | 161W - 5700K         | SB 18362L         | SB 18363L            | 9.2        |

**DIMENSIONS**

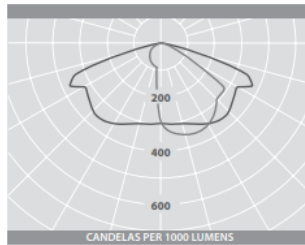


**PHOTOMETRIC GUIDE**



**AREA DISTRIBUTION**

Luminaire Lumen Output:  
 31W = 3500lm  
 62W = 6750lm  
 88W = 10150lm  
 123W = 13550lm  
 161W = 17250lm



**ROADWAY DISTRIBUTION**

Luminaire Lumen Output:  
 31W = 3700lm  
 62W = 7100lm  
 88W = 10700lm  
 123W = 14250lm  
 161W = 18150lm

**Thorlux Probe XL**



IP66 BOLLARD LUMINAIRES



**SPECIFICATION**

- Surface or root mounted accessories
- Integral control gear
- Fused mains terminal block
- Fitted with 4000K or 5700K LEDs

**PROBE**

- Low glare, round top bollard, aluminium construction finished black
- Clear polycarbonate cover

**PROBE-XL**

- High efficiency flat top bollard, aluminium construction finished black
- Linear prismatic polycarbonate cover

**RANGE**

| LED         | PROBE VERSION | PROBE-XL 790mm VERSION | PROBE-XL 1040mm VERSION | APPROX. kg |
|-------------|---------------|------------------------|-------------------------|------------|
| 24W - 4000K | PRB 17521L    | PRB 17522L             | PRB 17523L              | 9.8        |
| 24W - 5700K | PRB 14443L    | PRB 14530L             | PRB 14442L              | 9.8        |

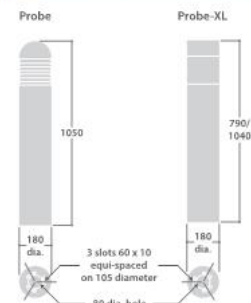
CIRCUIT TYPE - L - non-dimming (LED)

**LED CHARACTERISTICS**

|                    |                |
|--------------------|----------------|
| CRI                | 70             |
| COLOUR TEMPERATURE | 4000K/5700K    |
| RATED LIFE (HOURS) | 100K - L80/B10 |
| PROTECTION         | LUX GUARD      |
| DRIVER EFFICIENCY  | >85%           |
| REPLACEABLE        | YES            |
| POWER FACTOR       | >0.95          |
| <b>LL/CW</b>       | <b>37.1</b>    |

For LED characteristics explanation see [www.thorlux.com/led-guide](http://www.thorlux.com/led-guide)

**DIMENSIONS**



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***Dextra Amex LED***



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**SPECIFICATION**

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**Construction**

- Die cast aluminium housing.
- Supplied with Eyelid cover

**Performance**

- Up to 99 luminaire lumens per circuit watt.
- Philips Lumileds LM80 verified: 90% LED lumen maintenance at 60,000 operating hours.
- Standard Deviation Colour Match – 3 Step Macadam’s Ellipse.

**Control**

- Available with Switch dimming, DALI dimming, HFR 1-10v Analogue dimming and Digital dimming.
- Integral microwave sensor option.

**Emergency**

- Available with standard, self test and autotest dimming.

**Installation**

- Suitable for rear cable entry only.

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## **7.0 CONCLUSION**

The results obtained from the Dialux lighting calculations indicate that the illuminance and uniformity criteria set out in section 2.0 of this report are achieved using the luminaires and lighting layout proposed. The exception to this is the car park area to the North of the site adjacent to the river, where low level lighting has been employed to reduce impact on nocturnal wildlife in line with the Ecologist's recommendations. For further details refer to supplementary external lighting report '1823-63-RPT-02'.

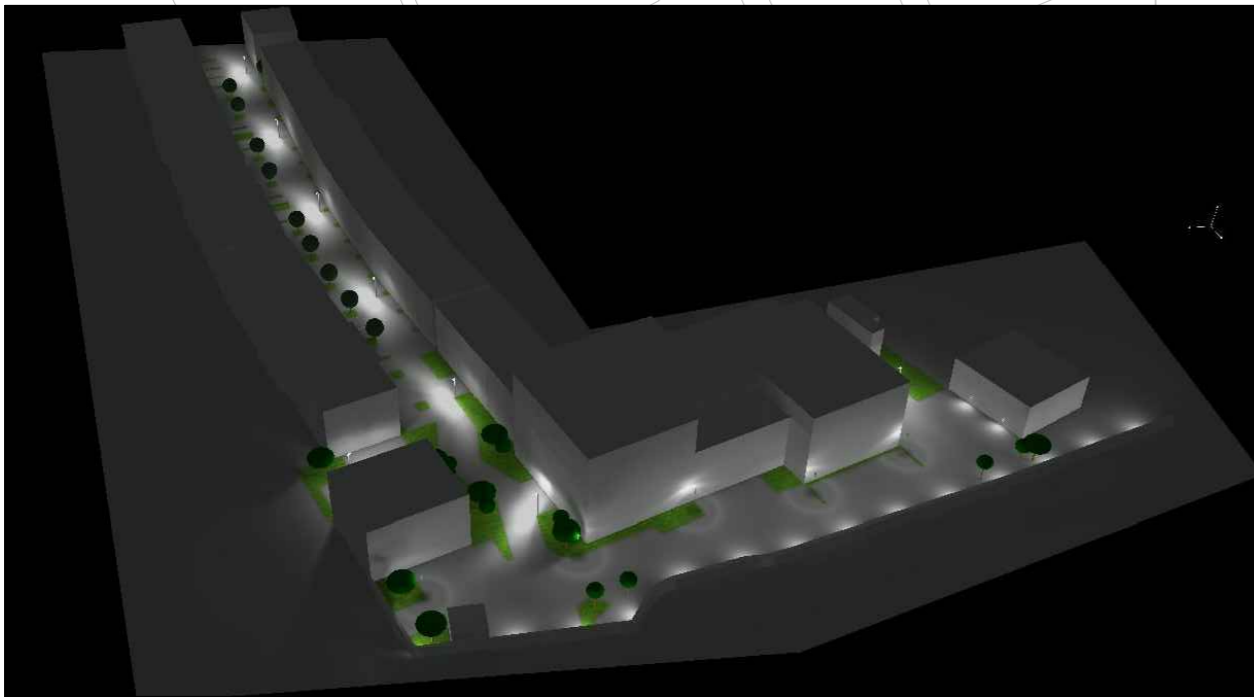
A copy of the overall lighting layout has been appended to this report.

The calculations also show that upward light spill has been kept to a minimum thanks to the optics integral to each luminaire which direct the light downwards to the areas requiring illumination. This, together with the use of modern high efficiency LED lamps will reduce the impact of the lighting installation on local biodiversity in the area.



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**8.0 APPENDIX A – PHASE 1 LIGHTING LAYOUT**



Original drawing size A1  
Original line length 35mm

THIS DRAWING HAS BEEN DEVELOPED FROM THE FOLLOWING DESIGN DRAWINGS:  
ASSAEL ARCHITECTURE LIMITED  
GREGGS BAKERY  
Proposed Ground Floor Landscape General Arrangement  
DRAWING No. A394-100 Rev - P2  
DATE RECORDED 25th October 2019  
THIS DRAWING REFERS TO THE FOLLOWING XREF FILES:  
XB\_Site.dwg

**NOTES**  
1. THIS DRAWING TO BE READ IN CONJUNCTION WITH:  
THE PROJECT SPECIFIC PMR SPECIFICATIONS.  
THE PROJECT SPECIFIC DESIGNERS RISK ASSESSMENTS.

- LEGEND:**
- X1 THORLUX 'STABEAM' 3W 400K LED LUMINAIRE C/W ROADWAY LIGHT DISTRIBUTION MOUNTED ON LH COLUMN.
  - X2 THORLUX 'STABEAM' 3W 400K LED LUMINAIRE C/W AREA LIGHT DISTRIBUTION MOUNTED ON LH COLUMN.
  - B1 DEKTRA LIGHTING 'AMENITY' EXTERIOR LED 'D'W WALL MOUNTED LUMINAIRE
  - C1 THORLUX 'PROBE XL' 2W 400K LED BOLLARD LUMINAIRE



| REV | DATE     | BY | DESCRIPTION  | CHK/APP |
|-----|----------|----|--------------|---------|
| B1  | 31/10/19 | LA | FOR PLANNING | JC      |

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| DRAWING TITLE | SCALE | SHEET |
| PLANNING      | 1:250 | A0    |

PROJECT  
LONDON SQUARE

ARCHITECT  
ASSAEL

PROJECT  
GREGGS BAKERY SITE  
TWICKENHAM

PROJECT  
ELECTRICAL SERVICES  
EXTERNAL LIGHTING LAYOUT

|                  |     |
|------------------|-----|
| DRAWING NUMBER   | REV |
| 1823-S-63-LAY-01 | 01  |