

Lighting Impact Assessment Report for Elmfield Residential Development

At Elmfield,
Ninth Lock Road,
Clondalkin,
Dublin 22,

Document Control:

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A Future Built On Sustainable Design

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1.0 Introduction

Lawler Consulting Engineers have been commissioned by Thornmeadow Developments Ltd to design an external lighting scheme, prepare an external lighting layout drawing and a lighting impact assessment report for the proposed Residential Development at Elmfield, Clondalkin, Dublin 22. The following report addresses the lighting services issues raised by the planning authority.

This document summarises the information taken from a fully designed, comprehensively and accurately scaled, 3D parametric model with computer calculated illuminations levels of the proposed site but also the site perimeter.

This process reviews the baseline conditions in a worst case scenario and the impact that the lighting will have on the surrounding area and residential properties whilst ensuring the proposed lighting scheme is suitable for the intended use and that all applicable regulatory requirements are achieved.

Careful consideration has been taken into lighting design to ensure local habitat and ecology will not be affected by the proposed lighting scheme.

2.0 Executive Summary

The assessment below provides design evidence that the designed lighting scheme shall be fit for purpose, achieve all applicable regulatory requirements and concludes that the light spill and glare from the car park, pathways and roadways within the development boundaries will have minimal impact on the surrounding area.

The recommendations made in this report for the area lighting are as follows;

- Zero Upwards Light Output Ratio (ULOR) lanterns and wall fittings are used.
- The height of all area lighting columns and wall fitting mounting points are restricted to an 6-metre maximum.
- The lighting installation shall be controlled via a combination of timeclock and photocell operation which will restrict the lighting operation to only when essential.

3.0 Design Guidelines

The preliminary lighting design and associated mitigations and assumptions for the proposed residential development at Elmfield, Clondalkin, Dublin 22 and have been based upon the following British Standards and best practice guidelines;

- BS EN 12464-2:2014 'Lighting of Work Places – Part 2 – Outdoor Workplaces'
- BS5489-1 (2020) – Code of practice for the Design of Road Lighting – Lighting of roads and public amenity areas
- Guidance note for the Reduction of Obtrusive Light – GN01:2021, produced by the Institute of Lighting Professionals (ILP)
- Society of Light and Lighting (SLL) – Lighting Handbook 2012
- CIBSE Environmental considerations for External Lighting – Factfile no.7 (2003)
- SDCC Public Lighting Specification

4.0 Methodology

4.1. General

This report assesses the impact of the external lighting for the proposed residential development and associated grounds, on the surrounding residential properties, ecology, environment and public roadways and pathways.

This report is based upon a preliminary calculation and site layout. The lighting used within the preliminary design is indicative of the standards of lighting currently being installed on similar sites.

Briefly, these light sources consist of;

- 6-meter columns with area lighting, Philips Citysoul Gen2 luminaires lighting the carpark and amenity areas.

4.2. Environmental Zones

The ILE guidance note for the reduction of obtrusive light, recommends that local planning authorities specify the environmental zones for external lighting control.

The Categories are as follows;

Table : Environmental Zones

Source: ILP GN01:2021

Table 2: Environmental zones

Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness (SQM ~15 to 20)	Sparsely inhabited rural areas, village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	Urban	High district brightness	Town / City centres with high levels of night-time activity

For the purpose of this report, and based upon the evidence gained through the site survey, topographical information and surrounding areas, the environmental zone for this site has been specified as E3, this being considered the 'worst case' scenario for the area.

Selection of the environmental category sets out specific guidelines for the allowable light spillage to both nearby properties and 'skyglow' or upwards light output ratio. These values are shown with the table below.

Table: Obtrusive Light Limitations

Source: ILP GN01:2021

Table 3 (CIE 150 table 2): Maximum values of vertical illuminance on premises

Light technical parameter	Application conditions	Environmental zone				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane (E_v)	Pre-curfew	n/a	2 lx	5 lx	10 lx	25 lx
	Post-curfew	n/a	<0.1 lx*	1 lx	2 lx	5 lx

Table 4 (CIE 150 table 3): Limits for the luminous intensity of bright luminaires⁴

Light technical parameter	Application conditions	Luminaire group (projected area A_p in m ²)					
		$0 < A_p \leq 0.002$	$0.002 < A_p \leq 0.01$	$0.01 < A_p \leq 0.03$	$0.03 < A_p \leq 0.13$	$0.13 < A_p \leq 0.50$	$A_p > 0.5$
Maximum luminous intensity emitted by luminaire (I in cd) ⁵	E0 Pre-curfew	0	0	0	0	0	0
	E0 Post-curfew	0	0	0	0	0	0
	E1 Pre-curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	2,500
	E1 Post-curfew	0	0	0	0	0	0
	E2 Pre-curfew	0.57 d	1.3 d	2.5 d	5.0 d	10 d	7,500
	E2 Post-curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	500
	E3 Pre-curfew	0.86 d	1.9 d	3.8 d	7.5 d	15 d	10,000
	E3 Post-curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	1,000
	E4 Pre-curfew	1.4 d	3.1 d	6.3 d	13 d	26 d	25,000
	E4 Post-curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	2,500

Table 6 (CIE 150 table 5): Maximum values of upward light ratio (ULR) of luminaires

Light technical parameter	Environmental zones				
	E0	E1	E2	E3	E4
Upward light ratio (ULR) / %	0	0	2.5	5	15

For the selected environmental zone, E3, the above table recommends that the upwards light output ratio (ULOR) is restricted to a maximum of 5% of the ground illuminance levels. It also recommends that the light output into residential windows is restricted to 10000 Candelas or 10 lux pre and 1000 candelas or 2 lux post curfew times. The curfew times are usually dictated by the planning authority, however for the purpose of this report the standard maximum night time curfew of 23:00 hours through 07:00 hours, as recommended by the ILP, shall be used.

Warm white LED lighting has been used in the lighting design with careful consideration to local ecology.

4.3. Residential Lighting

The parking and amenity areas within the boundaries of the site have been designed to the illuminance levels set out within British Standards BS12464-2 and BS5489 and EN13201-2015. Lighting class has been determined to be P3 lighting class for residential Urban areas

Table 2-3 Residential Lighting Requirements

Source: EN13201-2015

Table 3 — P lighting classes

Class	Horizontal illuminance		Additional requirement if facial recognition is necessary	
	$\bar{E}^a$ [minimum maintained] lx	E_{min} [maintained] lx	$E_{v,min}$ [maintained] lx	$E_{sc,min}$ [maintained] 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		

4.4. Calculation Procedure

The proposed lighting scheme has been designed using the lighting design software Dialux to ensure all regulations are achieved and to review its effects on the local residents, ecology and environment.

The lighting design within the site boundary shall generally be carried out utilising 6 metre high lighting poles, flat glass lanterns with LED light sources with supplementary wall mounted and ceiling mounted bulkheads to illuminate perimeter. The lighting shall be automatically controlled via photocell and timeclock combination.

All light fittings used shall comply with the requirements set out within table 2.2 of section 4.2 Environmental Zones of this report and comply with the 'Dark Skies' Initiative, as detailed within the ILP Guidance notes for the reduction of obtrusive light (2021).

5.0. Proposed Lighting Scheme Results

5.1. Proposed Lighting Scheme Results within Boundary

To ensure the proposed lighting scheme design achieves all the required regulation we have input data for the light fittings, their respective locations, pole heights etc. into the Lighting Reality software. This is a re-iterative process, running the calculations and making small adjustments until we achieved the regulation whilst not affecting adjoining properties, roadway traffic etc.

The lighting scheme which best achieves all of the above items is shown on the site lighting drawing accompanying this report. Referring to table 2.3 “Residential Lighting Requirements” within section 5.9.2 above we need to achieve an average lighting level of 7.5 lux.

The types of light fittings used within the calculation are LED fittings, very energy efficient, long lifetime running (reduced need for maintenance) and will provide a good lighting scheme with low running costs when compared to conventional outdated luminaires.

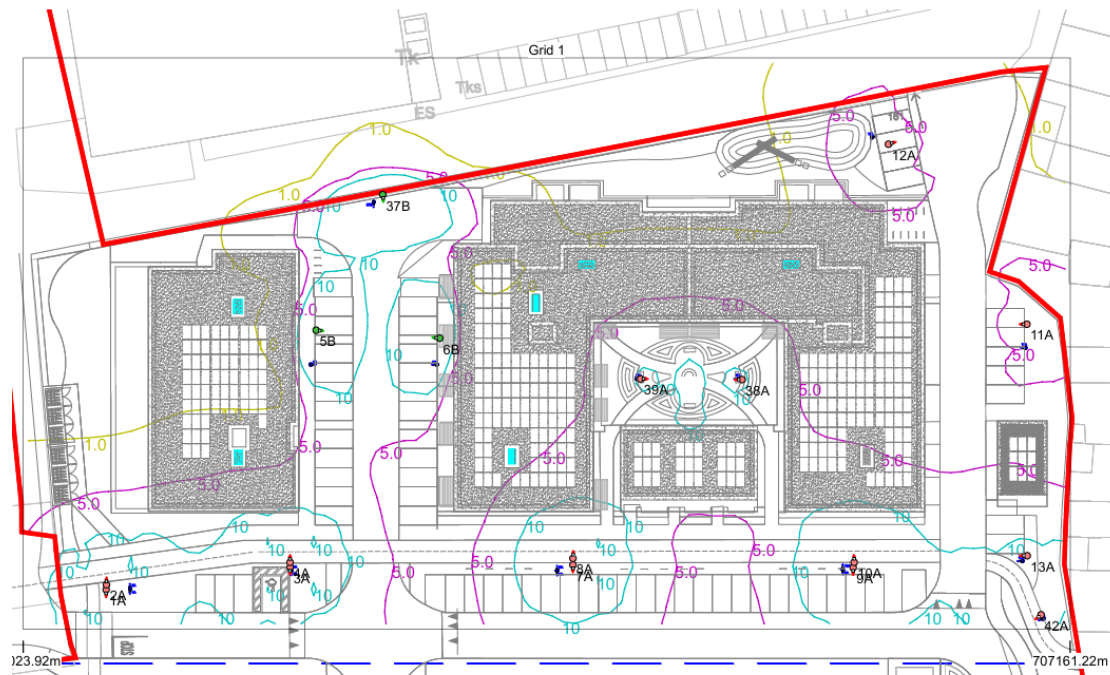
5.2. Luminaire Parts List: Elmfield Housing

34 Pieces	Philips Citysoul Gen2 Article No.: BGP530 T35 S GRN50 Luminous flux (Luminaire): 5000 lm Luminous flux (Lamps): 5000 lm Luminaire Wattage: 38 W Luminaire classification according to CIE: 100 CIE flux code: 37 81 98 100 100 Fitting: 1 x LED 3000K Ra70 (Correction Factor 1.000).	
8 Pieces	Philips Citysoul Gen2 Article No.: BGP530 T35 DM GRN50 Luminous flux (Luminaire): 5000 lm Luminous flux (Lamps): 5000 lm Luminaire Wattage: 38 W Luminaire classification according to CIE: 100 CIE flux code: 37 81 98 100 100 Fitting: 1 x LED 3000K Ra70 (Correction Factor 1.000).	

5.3. Calculation Results: Elmfield

Horizontal Illuminance (lux)

Grid 1

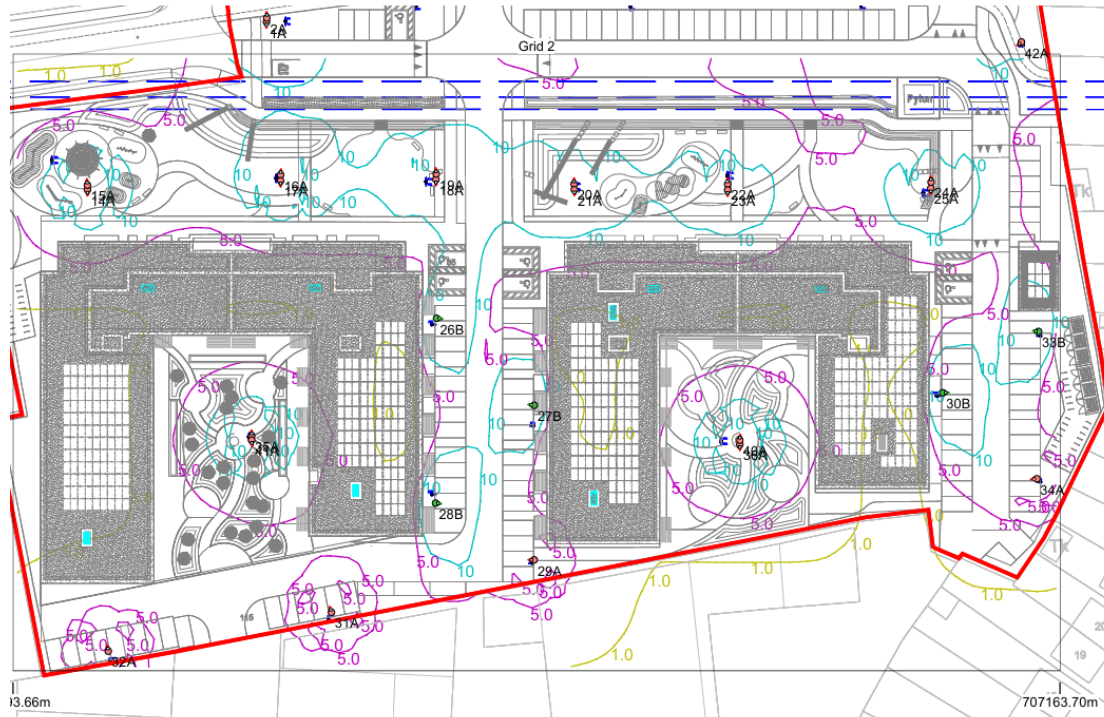


Results

Eav	8.44
Emin	1.52
Emax	32.12
Emin/Emax	0.05
Emin/Eav	0.18

Horizontal Illuminance (lux)

Grid 2



Results

Eav	8.13
Emin	1.55
Emax	31.00
Emin/Emax	0.05
Emin/Eav	0.19

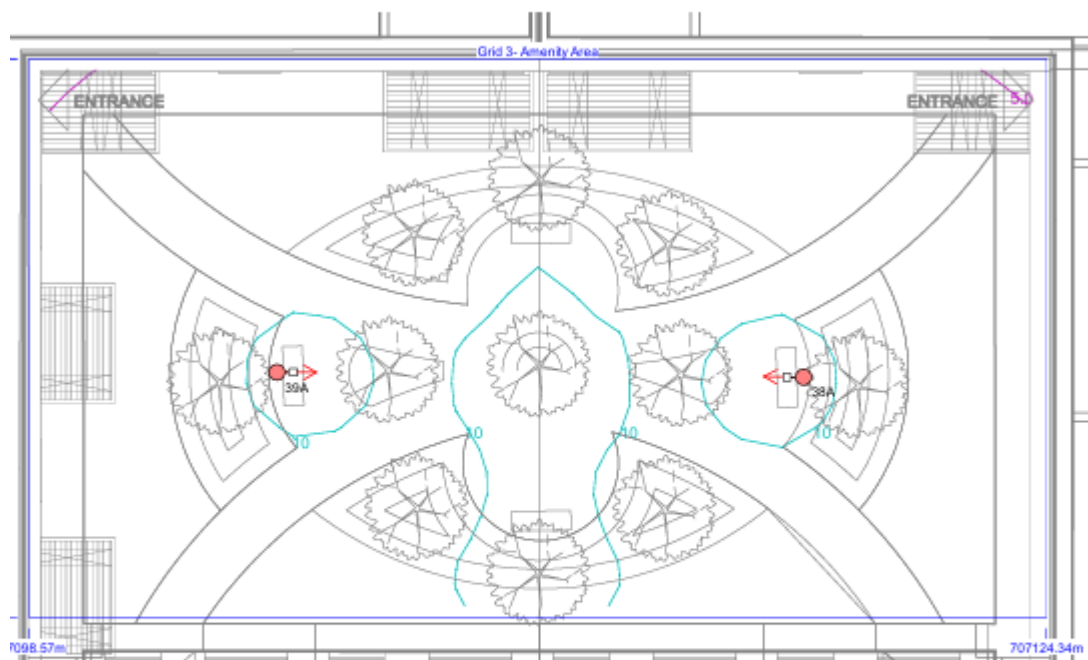
The proposed lighting scheme for the residential areas comply with the minimum requirements set out in EN13201-2015 which requires an average of 7.50[lx] and a min of 1.5 lux. The above lighting scheme achieves as follows:

Average → 8 [lx]

Min → 1.5 [lx]

Horizontal Illuminance (lux)

Grid 3- Amenity Area

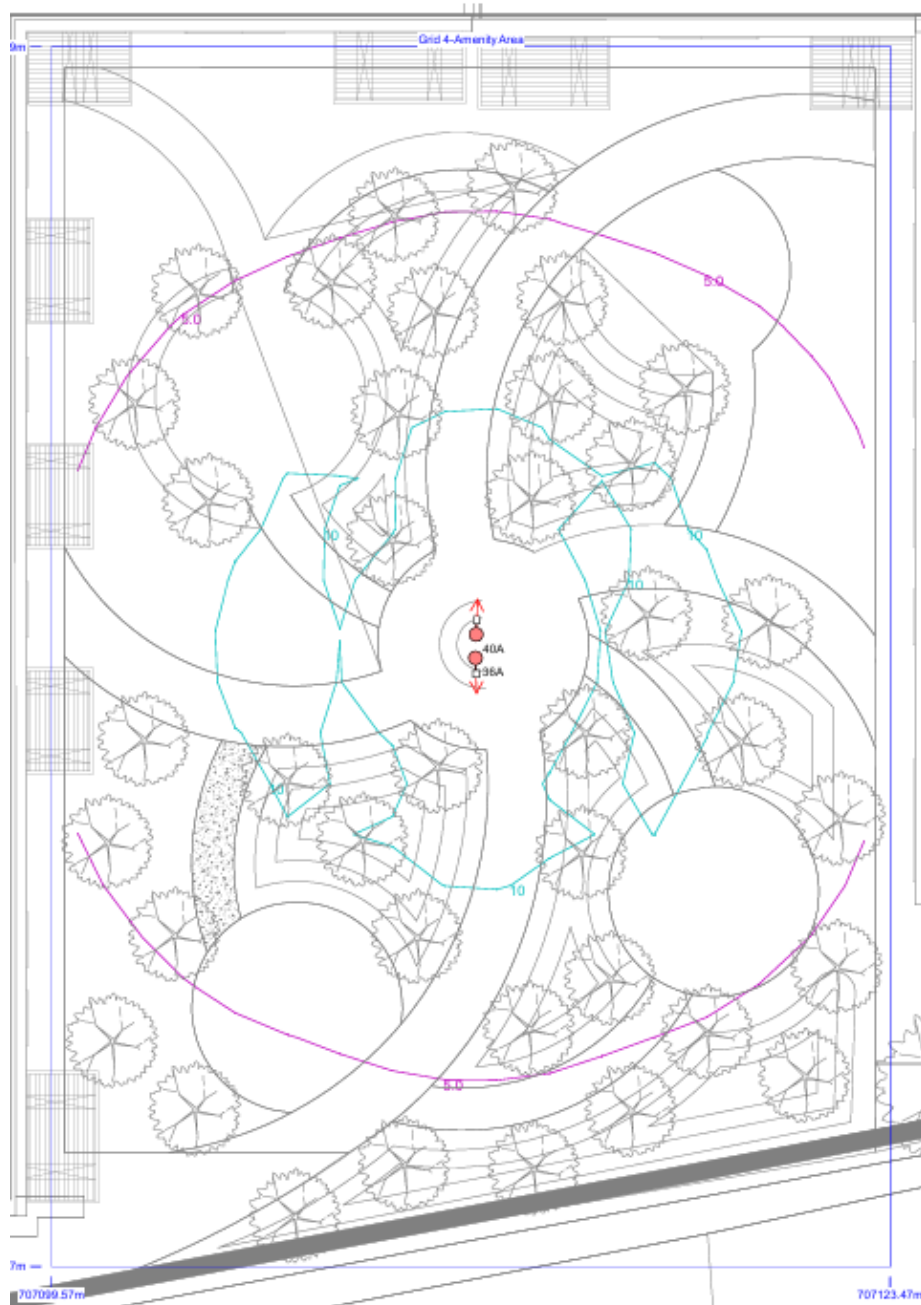


Results

Eav	8.28
Emin	5.57
Emax	11.49
Emin/Emax	0.48
Emin/Eav	0.67

Horizontal Illuminance (lux)

Grid 4-Amenity Area

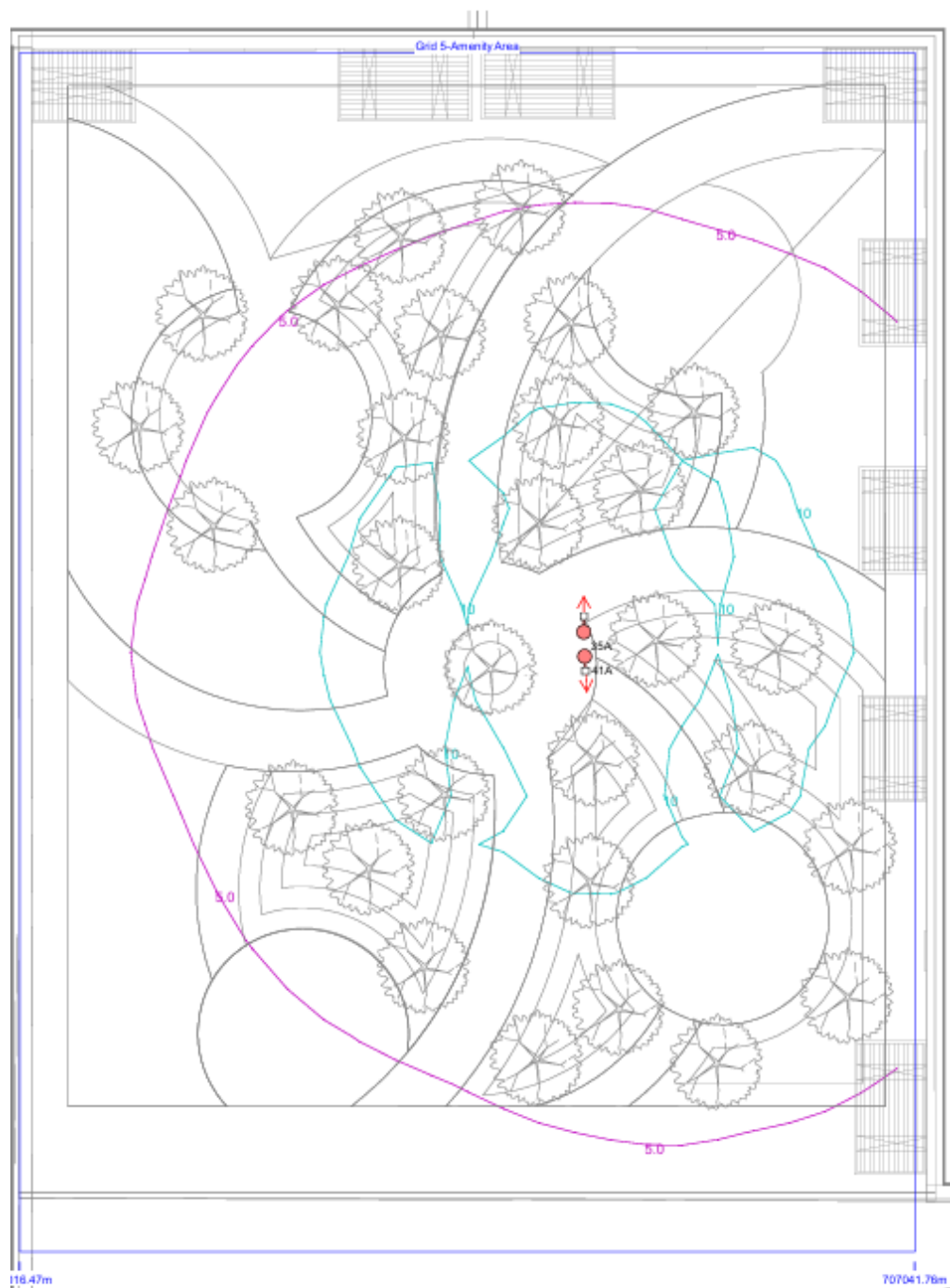


Results

Eav	6.70
Emin	1.83
Emax	16.24
Emin/Emax	0.11
Emin/Eav	0.27

Horizontal Illuminance (lux)

Grid 5-Amenity Area



Results

Eav	7.19
Emin	1.86
Emax	16.64
Emin/Emax	0.11
Emin/Eav	0.26

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5.4. Proposed Lighting Scheme Results outside Boundary

To analyse the potential light intrusion/spill and skyglow issues surrounding the proposed redevelopment another set of calculations were undertaken.

The design takes into account the general area lighting requirements for car parks, pathways, roadways and shared surfaces, as defined with sections 4.2. Environmental Zones.

To ensure compliance with the ILP guidance all light fittings used within the preliminary design emit <2% upwards light.

The light intrusion calculations take minimal account of screening via vegetation or fencing, either existing or proposed.

5.5. Light Intrusion/ Light Spill – Area Lighting only

The light spill from the proposed external lighting installation has been determined where there is open land directly adjacent to the site boundary as shown on the image above.

All light fittings proposed comply with the requirements set out within section 2.2 of this report and comply with the 'Dark Skies' Initiative, as detailed within the ILP Guidance notes for the reduction of obtrusive light (2021).

5.6. Upwards Light Output Ratio (ULOR)

The lighting design utilised lanterns with less than 1% upwards light output on 6 metre columns. Therefore the ULOR is less than 5% across the entire site. This is in compliance with ILP guidance.

6.0. Impact on surrounding area due to proposed lighting scheme

6.1. Light pollution reduction

Careful consideration was taken when preparing our lighting schemes to ensure there is no risk of light pollution. Lighting systems frequently emit light that, in addition to performing their primary function of illumination of exterior functions, illuminate beyond what is necessary. Light Pollution is often considered a nuisance, a safety hazard when it causes 'blind' spots to pedestrians and drivers and also poses environmental concerns as it disrupts human health, affects bird migration patterns and other natural cycles. Another negative condition that arises from light pollution is the inability to view the night sky by the general public.

The requirements which we shall be following in our design of the relevant lighting schemes shall be as follows:

- BSEN 12464-2:2014 'Lighting of Work Places – Part 2 – Outdoor Workplaces'
- BS5489-1 (2020) – Code of practice for the Design of Road Lighting – Lighting of roads and public amenity areas
- Guidance note for the Reduction of Obtrusive Light – GN01:2020, produced by the Institute of Lighting Professionals (ILP)
- We shall specify Light Emitting Diode (LED) lamps and fixtures for all exterior lighting including parking lots and streets.
- SDCC Public Lighting Specification.

As highlighted within our calculations and within Section 5.1 of this report we achieve all regulations in relation to potential light intrusion/spill and skyglow.

6.2. Impact upon wider urban area and landscape

Careful consideration was taken when preparing our lighting schemes to ensure there is no risk of upsetting the existing lighting schemes throughout the local area. The proposed lighting scheme will only enhance the lighting within our boundary thus enhancing the general feel while driving through the area.

6.3. Impact upon Vehicular / Pedestrian Safety

The lighting scheme will not have any adverse effect on the lighting of the existing public road, there is no risk of additional brightness or glare effecting oncoming traffic.

The lighting scheme will only enhance pedestrian safety as all footpaths achieve the required lighting regulations.

6.4. Justification of level and type of lighting

Careful consideration was taken when preparing our lighting schemes to ensure we designed a scheme which achieved all required regulations and didn't have any adverse effect on surrounding residents. It was important within our lighting scheme that we also provided our client with the most energy efficient, cost effective and easily maintainable solution going forward.

The above reasons are why we designed the lighting scheme with L.E.D luminaires. As discussed within the report the lighting will be controlled via a combination of timeclock and photocell operation which will restrict the lighting operation to only when essential. A maximum night time curfew of 23:00 hours through 07:00 hours, as recommended by the ILP, shall be used also.

7.0. Maintenance Programme

Careful consideration was taken when selecting our proposed light fittings with respect to maintenance. The fitting selected, **Philips Citysoul** have been accredited with maintenance of lumen output - L80F10 which in turn means the fittings have a life cycle of 50,000 hours. This illustrates that these fittings will not need a lot of maintenance. It is the client's responsibility to monitor the performance of the lighting installation and Lawler Consulting Engineers have advised that Philips Lighting have a facility to set up a maintenance agreement on their installations. Going forward a maintenance agreement will ensure the lighting scheme is operating to its full potential thus ensuring the client has a solution still achieving the regulations whilst operating at its most energy efficient.