



Hulme Primary Substation

Manchester

Bat Lighting Strategy

Prepared For: Electricity North West Ltd.

Document Reference: 10454.010

April 2025

Version: 1.0

TEP
401 Faraday Street,
Birchwood Park,
Warrington,
WA3 6GA

Tel: 01925 844004
Email: tep@tep.uk.com

Offices in Warrington, Market Harborough, Gateshead, London and Cornwall

Project Name:	Hulme Primary Substation
Location:	Manchester
Document Title:	Bat Lighting Strategy
Client:	Electricity North West Ltd
Prepared by:	The Environment Partnership Ltd
Office:	Warrington
Document Ref:	10454.010

Document history and status:

Version	Date	Description of Issue	Author	Checked	Approved
1.0	April 2025	Original issue	JC	LR	LR

The Environment Partnership Ltd is a private limited company registered in England. Registered number 7745159. Registered office: 401 Faraday Street, Birchwood Park, Warrington, WA3 6GA.

© Copyright 2025 The Environment Partnership Ltd. All Rights Reserved.

This document has been prepared by The Environment Partnership Ltd (“TEP”) for sole use of our Client in accordance with the provisions of the contract between TEP and the Client. No third party may use or rely upon this document or its content. TEP accepts no liability or responsibility for any such use or reliance thereon by any third party.



TEP is a is a Registered Practice of the Chartered Institute of Ecology and Environmental Management. The content of this document has been prepared in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) Code of Professional Conduct and is compliant with British Standard BS42020:2013 Biodiversity Code of Practice for Planning and Development.

The conclusions and recommendations contained in this document are based upon information gathered by TEP and provided by third parties. Information provided by third parties and referred to herein has not been independently verified by TEP, unless otherwise expressly stated in the document.

Nothing in this report constitutes legal opinion. If legal opinion is required, the advice of a qualified legal professional should be secured.

Contents	Page
1.0 INTRODUCTION.....	3
2.0 REVIEW OF LIGHTING LAYOUT	5
Site Description.....	5
Existing Habitats	5
Proposed Habitats	6
Lighting Impacts on Bats.....	6
Proposed Lighting Design.....	7
3.0 SUMMARY	8

Figures	
Figure 1: Site Location.....	5

Appendices

Appendix A:	
ENWL Southern Gateway Proposed New-build Substation – Proposed External Lighting Plan	
Drawing: 100145-SKETCH-001_Rev.001_March 2025	
ENWL Lighting Design Report Hulme Primary Substation Design Document dated 3rd February 2025	
DIALux Hulme Primary – Layout Design New Primary Substation on Birchall Way, Manchester dated 10th January 2025	

1.0 Introduction

- 1.1 TEP was commissioned by Electricity North West Ltd. (ENWL) in November 2024 to complete a Bat Lighting Strategy for the proposed development at land between Birchall Way and Upper Medlock Street in Manchester, hereafter referred to as 'the site').
- 1.2 TEP submitted a full planning application (Application Reference: 140484/FO/2024) for the 'erection of a substation including switch house, transformers and compounds as well as new security fence and access' at the site to be known as 'Hulme Primary Substation'. The full planning application was approved on 24th October 2024.
- 1.3 An Ecological Desk Study (TEP Report Ref: 10454.004) and Ecological Impact Assessment (EcIA) (TEP Report Ref: 10454.003) were provided by TEP in 2024, to inform the proposed development at the site. This Bat Lighting Strategy should be read in conjunction with the Ecological Desk Study and EcIA.
- 1.4 The EcIA (TEP Report Ref: 10454.003) identified that sensitive lighting measures should be implemented within the proposed development to ensure that lighting levels do not have an adverse impact on bats within the locality. Planning Condition 14 of the Decision Notice issued for the site, states the following:

'Prior to the commencement of above ground works, details of any lighting scheme and how this has been designed and would be operated to ensure that any impact on foraging bats would be negligible shall be submitted to an approved in writing by the City Council as Local Planning Authority. The strategy shall:

a) identify those areas/features on site that are particularly sensitive for bats and that are likely to cause disturbance in or around their breeding sites and resting places or along important routes used to access key areas of their territory, for example, for foraging; and

b) show how and where external lighting will be installed (through the provision of appropriate lighting contour plans and technical specifications) so that it can be clearly demonstrated that areas to be lit will not disturb or prevent the above species using their territory or having access to their breeding sites and resting places.

All external lighting shall be installed and operated in accordance with agreed specifications and locations set out in the strategy.

Reason: In the interests of the protection of bat roosts and associated foraging and commuting areas pursuant Section 15 of the National Planning Policy Framework and pursuant to Policies EN15 and SP1 in the Manchester Core Strategy.'

1.5 This Bat Lighting Strategy provides a review of the lighting design for the proposed development and the measures advised on to prevent lighting impacts upon bats foraging and commuting within the area and indirect impacts upon any nearby bat roosts. The Bat Lighting Strategy has been informed by the following documents provided at Appendix A:

- ENWL Southern Gateway Proposed New-build Substation – Proposed External Lighting Plan Drawing: 100145-SKETCH-001_Rev.001_March 2025;
- ENWL Lighting Design Report Hulme Primary Substation Design Document dated 3rd February 2025; and
- DIALux Hulme Primary – Layout Design New Primary Substation on Birchall Way, Manchester dated 10th January 2025.

2.0 Review of Lighting Layout

Site Description

- 2.1

The site (approximate central grid reference SJ 83898 96718) is located on an area of unused land between Birchall Way and Upper Medlock Street in Manchester. The location of the site is depicted by the red line shown in Figure 1.
- 2.2

The site lies within a residential area, surrounded by residential and commercial buildings and associated infrastructure on all sides.
- 2.3

The wider area comprises buildings and infrastructure associated with Manchester city centre. This includes new and renovated residential and commercial buildings.

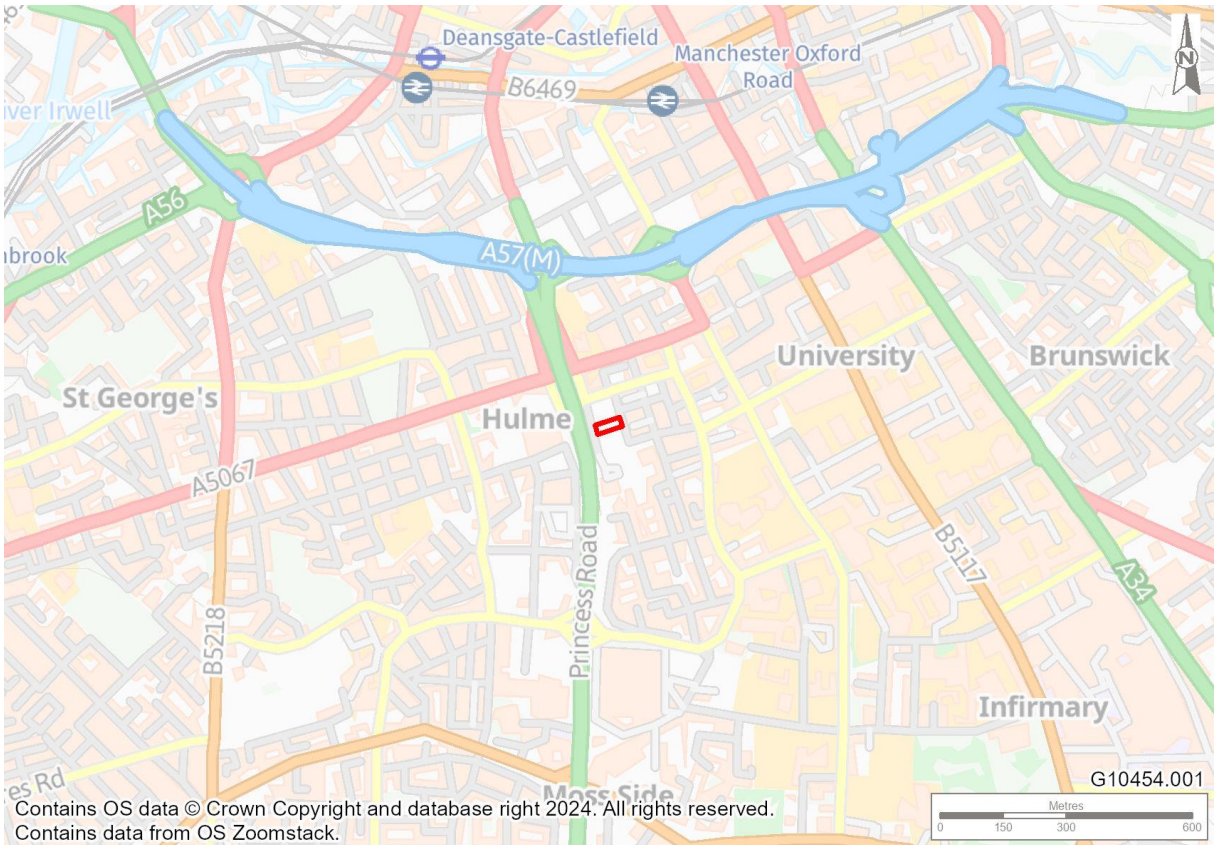


Figure 1: Site Location

Existing Habitats

- 2.4

Habitats within the site will be cleared to allow development of the electricity substation, including areas of modified grassland, trees and dense scrub, which offer some limited suitability for commuting and foraging bats as part of the wider mosaic of urban

greenspaces. However, the site is within a heavily developed area and is surrounded by residential and commercial development and main roads, which fragment the green areas within the wider landscape. No roost habitat is present on site.

Proposed Habitats

- 2.5 There will be a small strip of new planting along Poynton Street. It shall be low level shrub planting to consist of holly, privet laurel and rhododendron bushes between the fence and road.
- 2.6 Habitats within the site post-development will therefore only provide limited foraging resources for bats and will not contribute 'stepping-stone' habitat for bats commuting through the urban landscape.

Lighting Impacts on Bats

- 2.7 Artificial lighting can disturb crepuscular and nocturnal fauna, in particular bats. Where artificial lighting is excessive it can prevent bats from using commuting routes, foraging habitats and using roosts due to disturbance and can also cause congregation of prey under lighting therefore reducing availability for more light sensitive species. To avoid impacts on bats associated with artificial lighting, schemes should be designed in line with the Institution of Lighting Professionals Guidance Note 08/23: Bats and Artificial Lighting at Night¹.
- 2.8 The Ecological Desk Study identified records of brown long-eared bat *Plecotus auritus*, Daubenton's bat *Myotis daubentonii*, *Myotis Myotis* sp., noctule *Nyctalus noctule*, common pipistrelle *Pipistrellus pipistrellus* and soprano pipistrelle *Pipistrellus pygmaeus* within 2 km of the site. Habitats within the site and the immediate locality are likely to support more light tolerant species, such as; common and soprano pipistrelle, given the surrounding density of urban development and as these species have more flexible habitat foraging preferences. Species such as brown long-eared bat and *Myotis* sp, are more typically associated with more cluttered and edge habitats with dark environments such as woodlands and wetlands and whilst present in the wider landscape, these species are not likely to make use of habitats within the site and the immediate locality for roosting, foraging or commuting.

¹ Bat Conservation Trust and Institution of Lighting Professionals (2023) Bats and Artificial Lighting at Night. Guidance Note 08/23.

Proposed Lighting Design

- 2.9 On lighting plan ENWL Southern Gateway Proposed New-build Substation – Proposed External Lighting Plan Drawing: 100145-SKETCH-001_Rev.001_March 2025, the lux levels in terms of light spill into surrounding habitat areas, range up to 35 lux. Lighting with lux levels <1.0 have been shown to impact species foraging, commuting and roosting behaviour. However, the main external luminaires used are to be of a bulkhead type fitting, which directs light evenly over a surface area to create local lighting and flood lighting within the transformer compounds will be used to illuminate equipment for essential spot access and inspections only.
- 2.10 Proposed lighting specifications include; Thorn Lighting IS XS 12L105-730 NR CL1 WS0.3 M60 GY-S [STD], Unilamp Mini Flat DRIFT and V-TAC Floodlights, which provide light sources with >2700Kelvin. To avoid impacts on bats associated with artificial lighting, the Institution of Lighting Professionals Guidance Note 08/23² recommends the use of warm white light sources with <2700Kelvin, to reduce blue light components that can cause higher levels of disturbance to bats and alterations in invertebrate prey abundance. However, the lighting proposed will not be in permanent or regular use.
- 2.11 The proposed development will have external lighting controlled centrally within the main substation building and will only be operational when the main internal lights are switched on. The lighting will not be controlled by any timers or day/night sensors and will only be in use during short operational visits for management and maintenance.

² Bat Conservation Trust and Institution of Lighting Professionals (2023) Bats and Artificial Lighting at Night. Guidance Note 08/23.

3.0 Summary

- 3.1 The site will be cleared and only a small area of limited new habitats suitable for bat foraging will be created therefore, bats are not likely to be directly impacted by lighting within the site post-construction.
- 3.2 Whilst lux levels and Kelvin lighting specifications are higher than the levels that are accepted as having a lesser impact on foraging, commuting and roosting bats, the proposed new lighting will only be on for short periods when operational visits to the electricity substation take place. The proposed lighting design therefore adheres to recommendations for proportional use for the task required.
- 3.3 The site also sits within a highly built-up area within Manchester and as shown in the ENWL Lighting Design Report Hulme Primary Substation Design Document (February 2025) the external streetlighting surrounding the site, creates light spill with lux levels ranging from 10-30 lux. The DialLUX Simulation Results within the ENWL Lighting Design Report Hulme Primary Substation Design Document (February 2025), also demonstrate that lux levels within most of the site will be maintained at <0.75 lux when lighting is not operational. Given the urban habitats surrounding the site and the existing light levels within the locality, it is likely that bats in the wider landscape will be habituated to the existing higher urban light levels and additional, temporary lighting will not have significant effects on bat foraging and commuting behaviour, particularly given the distance from the site and greenspace corridors in the wider landscape.
- 3.4 Providing lighting use is maintained only for required periods of management and maintenance and given the above factors it is likely there will be negligible impacts associated with lighting from the electricity substation on foraging, commuting and roosting bats within the wider landscape.

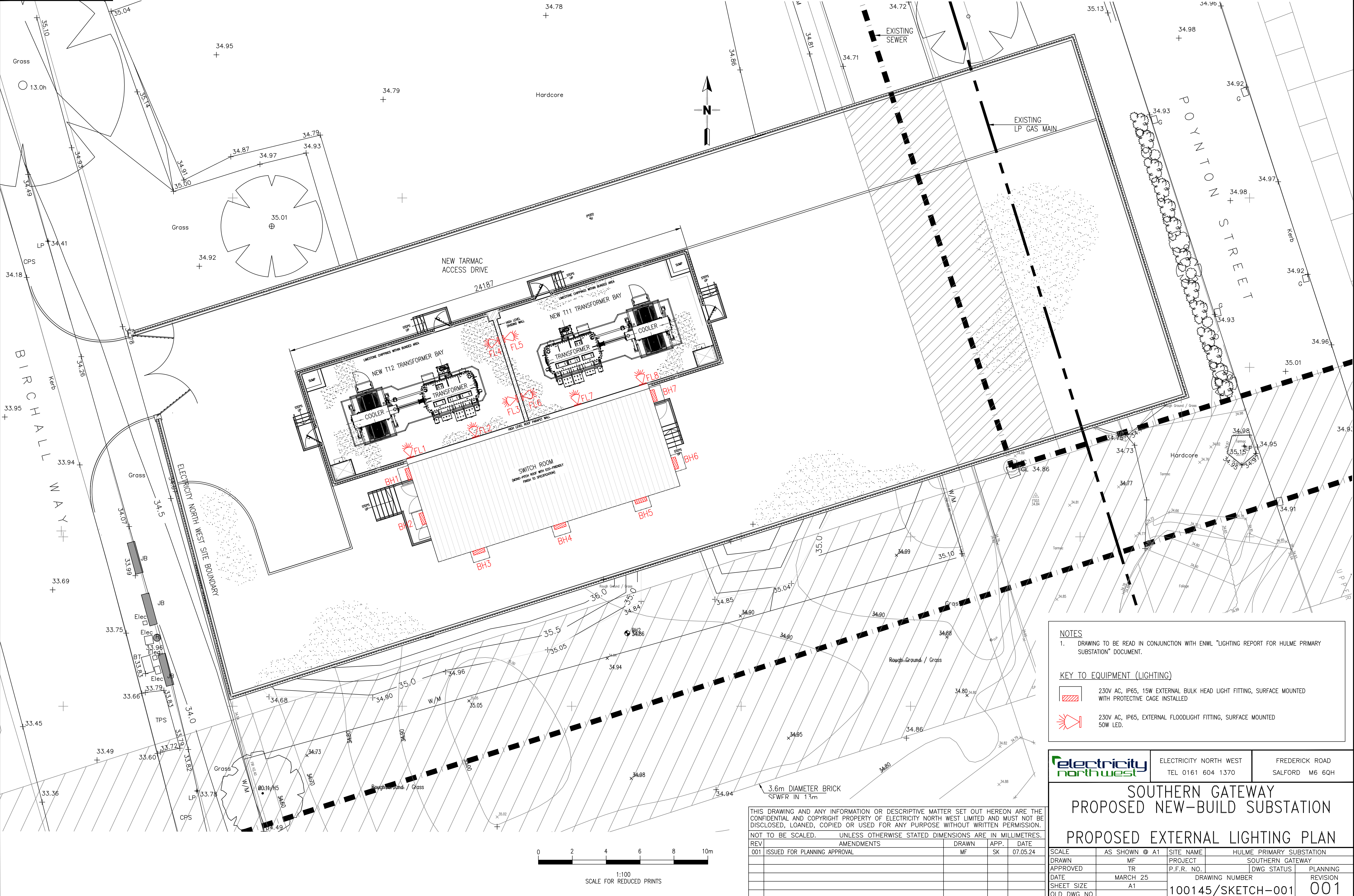
Appendix A:

ENWL Southern Gateway Proposed New-build Substation – Proposed External Lighting Plan
Drawing: 100145-SKETCH-001_Rev.001_March 2025

ENWL Lighting Design Report Hulme Primary Substation Design Document dated 3rd February 2025

DIALux Hulme Primary – Layout Design New Primary Substation on Birchall Way, Manchester dated 10th January 2025

DO NOT SCALE



A large green decorative shape on the left side of the page, resembling a stylized 'L' or a corner bracket.

Lighting Design Report Hulme Primary Substation

Design Document

Produced by: Stephen Kaliski

Date: 03rd February 2025

Revision No: 001

Revision History

Revision	Description of Change	Issued By	Approved By	Date
001	First Issue – For Comment	S.Kaliski		03.02.25

Circulation

File

Bat Impact Assessment for Substation Lighting

1. Introduction

This report assesses the potential impact of substation lighting on local bat populations and compares it to the potential impact of street lighting. The goal is to demonstrate that the substation lighting, as designed, presents minimal risk to bats and that street lighting is a more significant factor for consideration.

2. Methodology

This assessment considers the following factors:

- **Lighting Design Specifications:** Analysis of the substation lighting design, including light levels, spectral characteristics, luminaire type (e.g., full cut-off), and lighting direction.
- **Bat Ecology:** Review of the bat species likely to be present in the area, their foraging and roosting habits, and their sensitivity to light.
- **Existing Environment:** Assessment of the surrounding environment, including proximity to bat roosts, foraging areas, and flight paths. This includes the presence and characteristics of existing street lighting.

3. Substation Lighting Design Analysis

- **Light Levels:** The substation lighting design specifies an average ground luminance of 20 / 30 lux around the immediate perimeter of the building. These levels are designed to be to give sufficient light around the building for safe operation access and security while minimising light spill into the surrounding areas. External lighting is to be of the bulkhead type to give localised light distribution. Additional temporary portable lighting will be installed for any essential work activities that are required overnight time periods.
- **Luminaire Type and Direction:** The main external luminaires used are to be of a bulkhead type fitting which directs light evenly over a surface area to create a local lighting pattern compatible with personnel access. Only flood lighting is to be installed within the transformer compounds where it will be used to illuminate the equipment for any essential spot access and inspections required.
- **Light Control:** The external lighting is to be controlled centrally within the main substation building and will only be operational when the main internal lights are switched on, the lighting will not be controlled by any timers or day/night sensors and only be operational during short operational visits by engineers.

4. Bat Ecology and Potential Impacts

- **Species Presence:** Desk top studies have shown that the closest bat species recorded in the area are the common pipistrelle and pipistrelle sp which were recorded 400m south-west of the proposed site.
- **Habitat:** The site has no trees suitable for roosting bats and the surrounding area offers limited suitability for commuting and foraging bats.
- **Potential Impacts:** Artificial light can disrupt bat foraging and commuting behaviour, delay emergence from roosts, and increase predation risk.

5. Comparison with Street Lighting Impacts

- **Street Lighting Characteristics:** Street lighting in the vicinity uses an LED head type luminaire with a bright white light and spread characteristics, the actual type of light was unknown at the time of

study. An assumption was made as to the luminaire type used in the simulations with a conservative approach taken as the power output and spread.

- **Relative Impact:** Street lighting typically has a much broader spatial extent and higher light levels than the proposed for the substation lighting, while the substation lighting is confined to the site and emits limited lux at the boundary the street lighting fully surrounds the site.
- **Cumulative Impact:** The cumulative impact of existing street lighting is likely to be a more significant factor for local bat populations compared to the minimal additional contribution from the substation lighting.

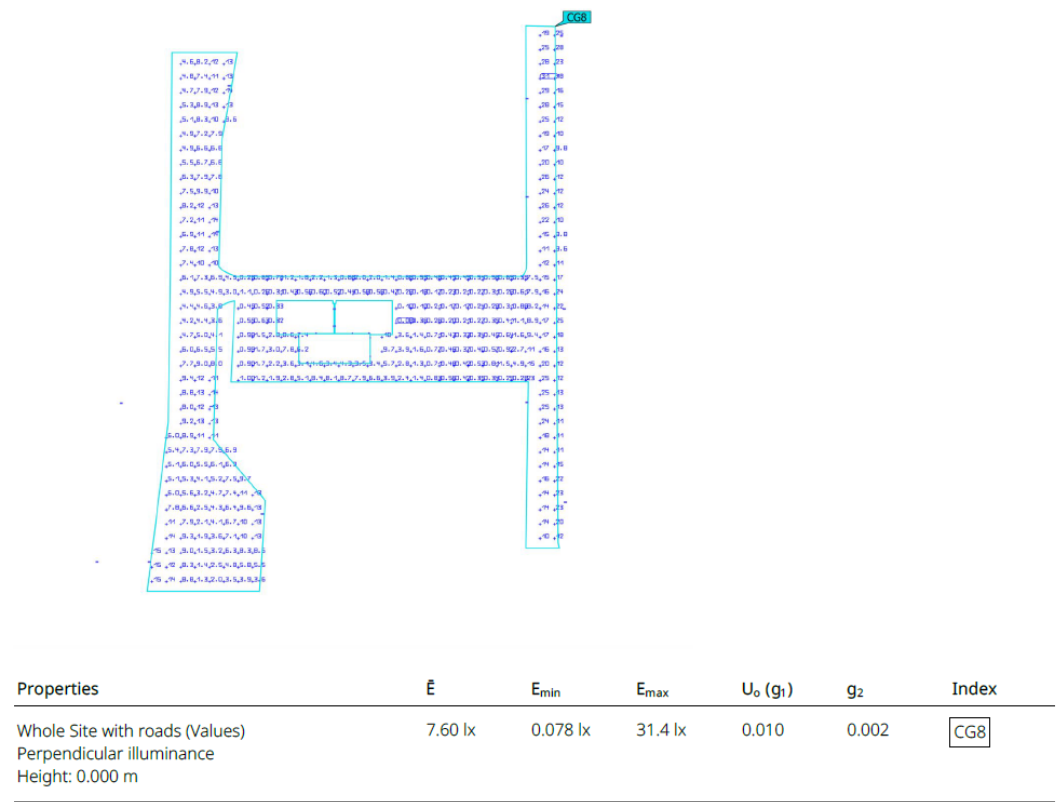
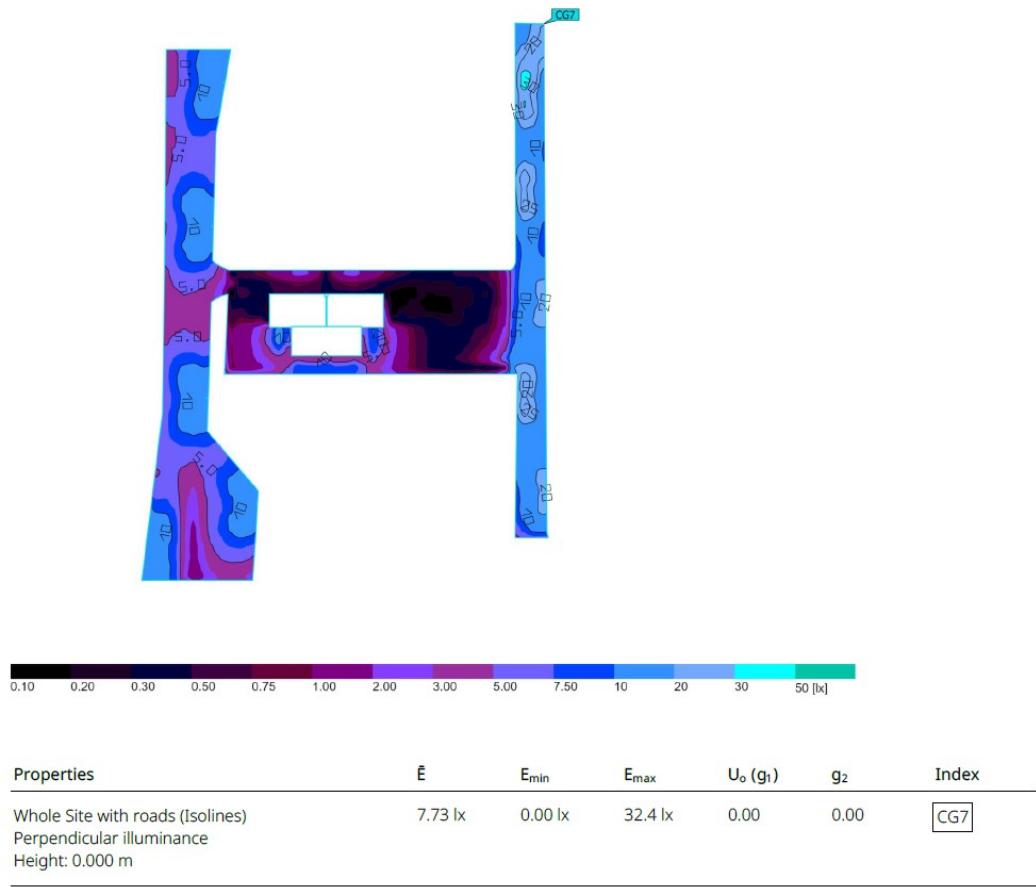
6. Mitigation Measures

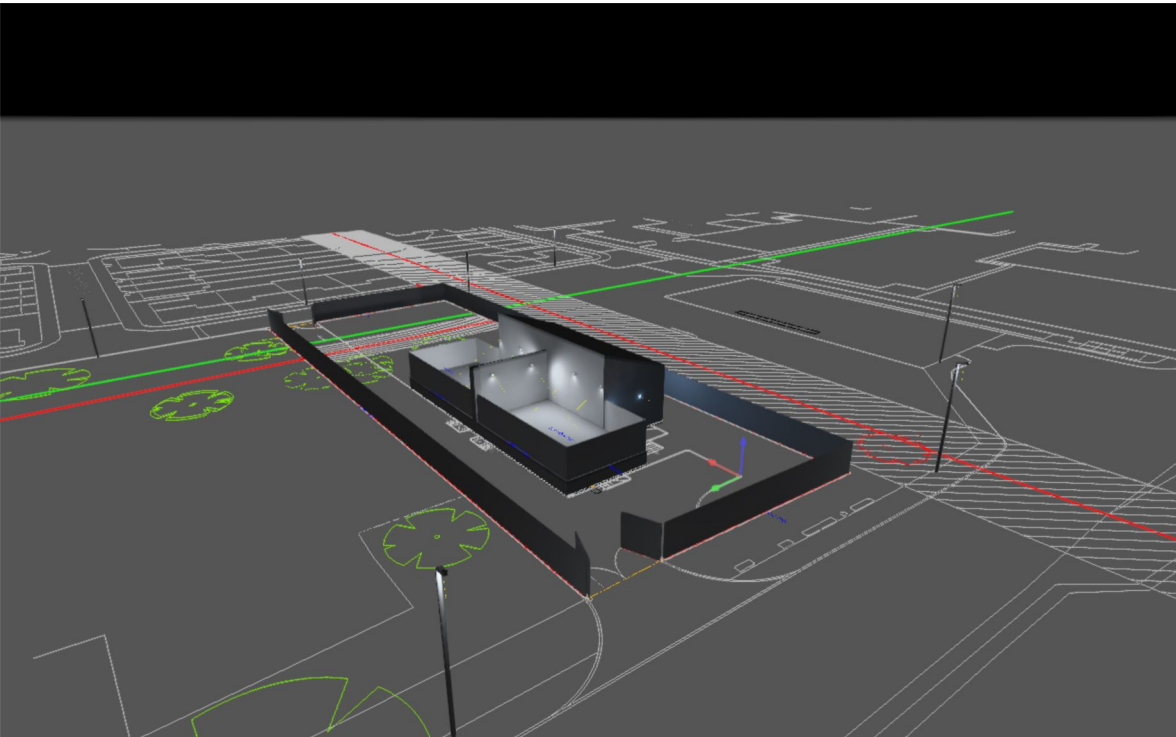
- The external lighting is controlled by a combination of the internal lighting of the substation and an additional external lighting switch, this design requires the internal lighting to be switched on before the external lighting will become operational. The interlocking between the two light systems minimises and almost removes the possibility of the external lighting being accidentally switched on and left for a prolonged period.

7. Conclusion

Based on the analysis presented in this report, the substation lighting design, incorporating the specified mitigation measures, is expected to have a negligible impact on local bat populations. The existing street lighting in the area represents a far greater potential source of disturbance to bats. Therefore, focusing mitigation efforts on street lighting modifications would be a more effective strategy for bat conservation.

DIALLUX Simulation Results.





Hulme Primary

New Primary Substation on Birchall Way, Manchester

Object

Birchall Way,
Hulme,
Manchester,
M15 6DU

Table of Contents

Cover	1
Table of Contents	2
Contacts	4
Description	5
Luminaire list	6

Product data sheets

Thorn Lighting - IS XS 12L105-730 NR CL1 WS0.3 M60 GY-S [STD] (1x LED 41 W)	7
Unilamp - Mini Flat DRIFT (1x LED Plate 12W 1200lm 4000K Square With Sensor)	8
V-TAC - Floodlight (1x VT- 57)	9

Hulme Primary

Luminaire layout plan	10
Luminaire list	14
Calculation objects / Light scene 1	15
Birchall Way / Light scene 1 / Perpendicular illuminance	17
Upper Medlock Street / Light scene 1 / Perpendicular illuminance	18
Whole Site with roads (Isolines) / Light scene 1 / Perpendicular illuminance	19
Whole Site with roads (Values) / Light scene 1 / Perpendicular illuminance	20

Hulme Primary

Site

Description	21
Images	22
Calculation objects / Light scene 1	23
Whole Site / Light scene 1 / Perpendicular illuminance	25

Hulme Primary

T11 Transformer Compound

Description	26
Images	27
Calculation objects / Light scene 1	28
T11 Transformer Bay / Light scene 1 / Perpendicular illuminance	30

Hulme Primary

T12 Transformer Compound

Description	31
-------------------	----

Table of Contents

Images 32

Calculation objects / Light scene 1 33

T12 Transformer Bay / Light scene 1 / Perpendicular illuminance 35

Hulme Primary

Working Area

Description 36

Images 37

Calculation objects / Light scene 1 38

Working Area / Light scene 1 / Perpendicular illuminance 40

Glossary 41

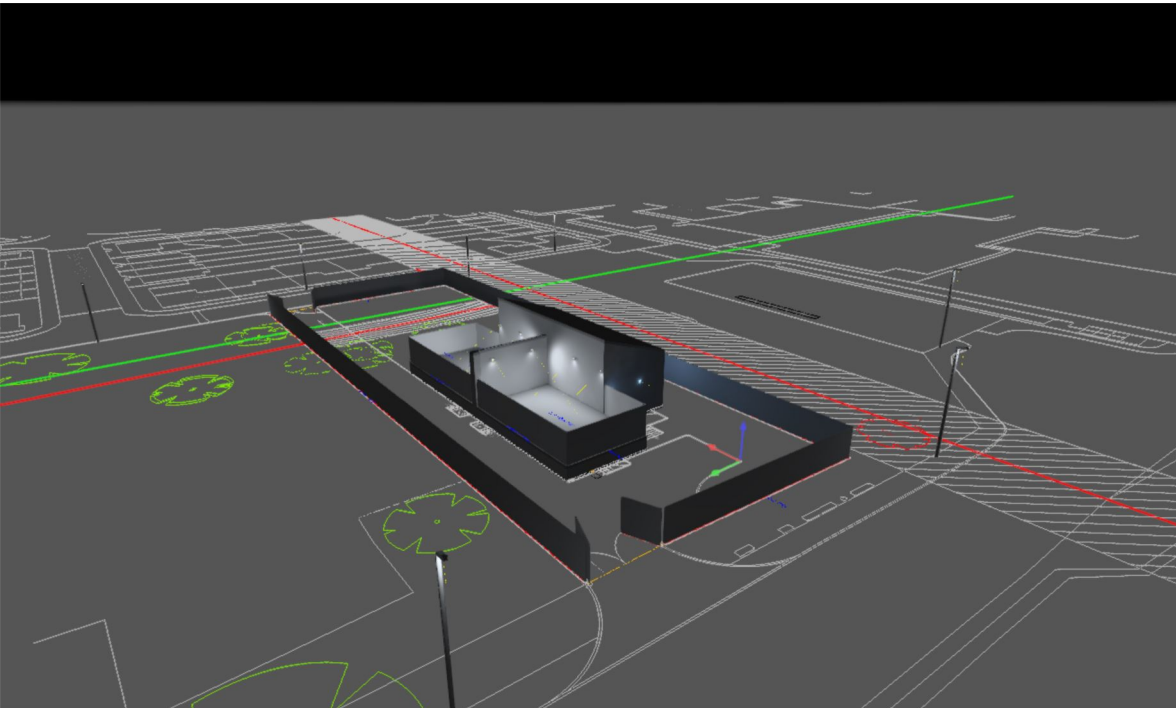
Contacts



Layout Design Engineer
Mike Flannigan

Electricity North West Ltd.
Grid & Primary Design,
Frederick Road,
Salford,
M6 6QH.

T 0843 311 3378
mike.flannigan@enwl.co.uk



Description

Lighting design calculations for new primary substation known as "Hulme Primary", located on Birchall way in Manchester.

Layout Design Engineer

Mike Flannigan

Electricity North West Ltd.
Grid & Primary Design,
Frederick Road,
Salford,
M6 6QH.

T 0843 311 3378

mike.flannigan@enwl.co.uk

Luminaire list

Φ_{total} 111576 lm	P_{total} 1017.2 W	Luminous efficacy 109.7 lm/W
------------------------------------	--------------------------------	---------------------------------

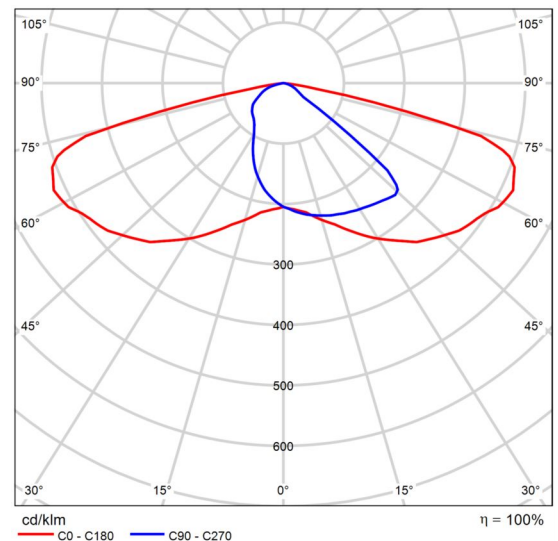
pcs.	Manufacturer	Article No.	Article name	P	Φ	Luminous efficacy
13	Thorn Lighting	96636134	IS XS 12L105-730 NR CL1 WS0.3 M60 GY-S [STD]	41.0 W	5032 lm	122.7 lm/W
7	Unilamp	7024-0-3-808-XX	Mini Flat DRIFT	15.0 W	752 lm	50.2 lm/W
8	V-TAC		Floodlight	47.4 W	5112 lm	107.9 lm/W

Product data sheet

Thorn Lighting - IS XS 12L105-730 NR CL1 WS0.3 M60 GY-S [STD]



Article No.	96636134
P	41.0 W
Φ_{Lamp}	5032 lm
$\Phi_{\text{Luminaire}}$	5032 lm
η	100.01 %
Luminous efficacy	122.7 lm/W
CCT	3000 K
CRI	70



Polar LDC

A discrete and flexible road and street lantern with durable high performance. Programmable LED driver, set for fixed output, driving 12 LEDs at 1050mA. Body: extra small size, die-cast aluminium (EN AC-44300), powder coated textured Light grey textured (150) - partly painted. Shaft: unpainted. Cover: Extra White glass. Fixings: stainless steel with anti-galvanic treatment. narrow road optic, with Colour Rendering Index min.: 70, Correlated colour temperature*: 3000 Kelvin LEDs supplied. Class I electrical, Impact strength: IK08, IP66, Ta max.: 35°C. Supplied with Ø60mm spigot adaptor which can be fitted for post-top (0°/5°/10° tilt) or side-entry (-20°/-15°/-10°/-5°/0° tilt). Pre-wired with 0.3m, 1.5mm² H07RN-F cable.

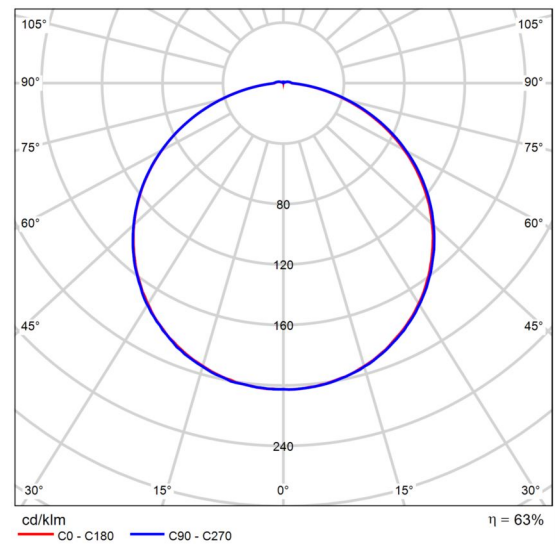
Dimensions: 508 x 180 x 157 mm
 Luminaire input power: 40.6 W
 Luminaire luminous flux: 5032 lm
 Luminaire efficacy: 124 lm/W
 Weight: 3.33 kg
 Scx: 0.028 m²

Product data sheet

Unilamp - Mini Flat DRIFT



Article No.	7024-0-3-808-XX
P	15.0 W
Φ_{Lamp}	1200 lm
$\Phi_{\text{Luminaire}}$	752 lm
η	62.70 %
Luminous efficacy	50.2 lm/W
CCT	4000 K
CRI	80



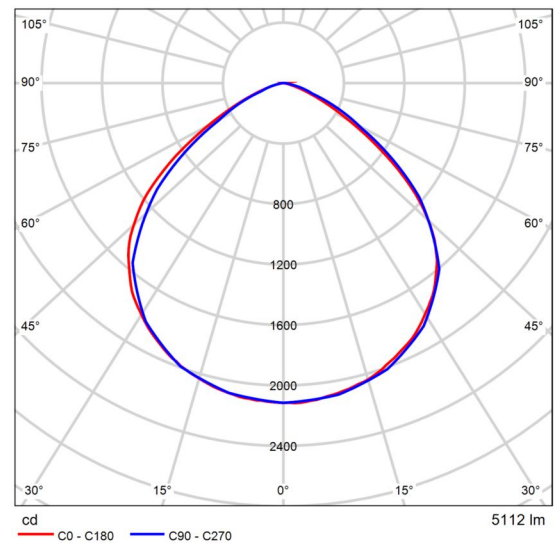
Polar LDC

Product data sheet

V-TAC - Floodlight

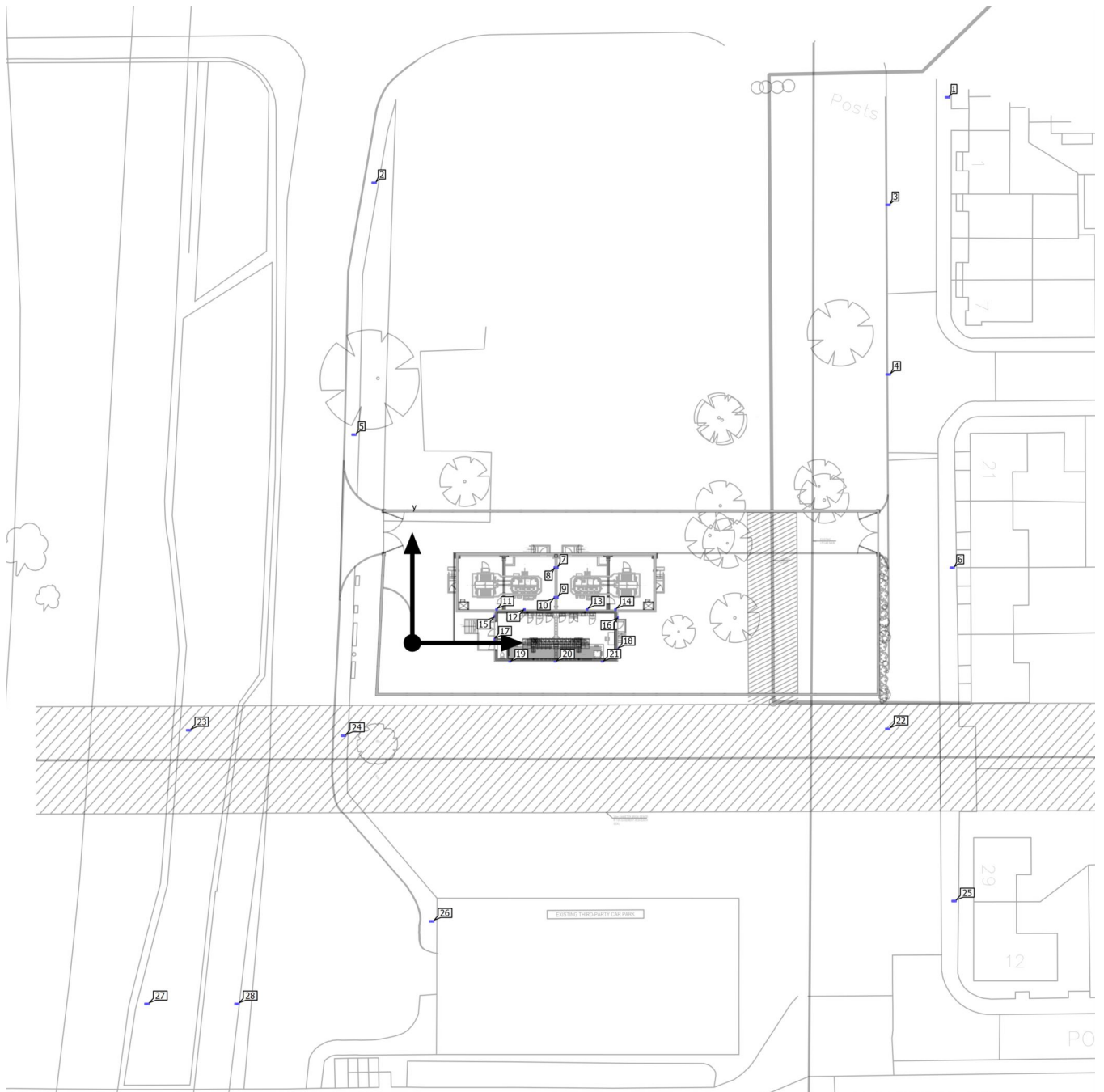


P	47.4 W
Φ_{Lamp}	–
$\Phi_{\text{Luminaire}}$	5112 lm
η	–
Luminous efficacy	107.9 lm/W
CCT	3000 K
CRI	100

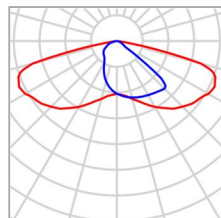


Polar LDC

Hulme Primary
Luminaire layout plan



Hulme Primary

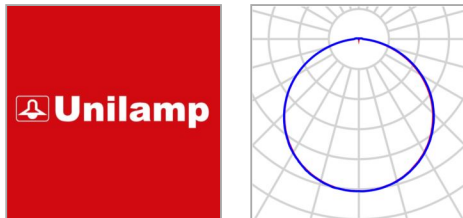
Luminaire layout plan

Manufacturer	Thorn Lighting	P	41.0 W
Article No.	96636134	Φ _{Luminaire}	5032 lm
Article name	IS XS 12L105-730 NR CL1 WS0.3 M60 GY-S [STD]		
Fitting	1x LED 41 W		

Individual luminaires

X	Y	Mounting height	Luminaire
65.039 m	66.047 m	6.000 m	1
-4.385 m	55.696 m	8.000 m	2
57.339 m	53.022 m	6.000 m	3
57.362 m	32.500 m	6.000 m	4
-6.817 m	25.214 m	8.000 m	5
65.600 m	9.100 m	6.000 m	6
57.300 m	-10.400 m	6.000 m	22
-27.345 m	-10.564 m	5.000 m	23
-8.103 m	-11.228 m	8.000 m	24
65.831 m	-31.251 m	6.000 m	25
2.588 m	-33.704 m	8.000 m	26
-32.400 m	-43.700 m	5.000 m	27
-21.500 m	-43.700 m	8.000 m	28

Hulme Primary

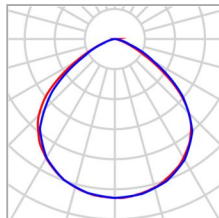
Luminaire layout plan

Manufacturer	Unilamp	P	15.0 W
Article No.	7024-0-3-808-XX	$\Phi_{\text{Luminaire}}$	752 lm
Article name	Mini Flat DRIFT		
Fitting	1x LED Plate 12W 1200lm 4000K Square With Sensor		

Individual luminaires

X	Y	Mounting height	Luminaire
9.959 m	3.231 m	2.800 m	15
24.844 m	3.100 m	2.800 m	16
9.959 m	0.400 m	2.800 m	17
24.844 m	-0.800 m	2.800 m	18
11.800 m	-2.243 m	2.800 m	19
17.300 m	-2.243 m	2.800 m	20
23.000 m	-2.243 m	2.800 m	21

Hulme Primary

Luminaire layout plan

Manufacturer	V-TAC	P	47.4 W
Article name	Floodlight	$\Phi_{\text{Luminaire}}$	5112 lm
Fitting	1x VT- 57		

Individual luminaires

X	Y	Mounting height	Luminaire
17.564 m	9.100 m	4.500 m	7
17.242 m	9.100 m	4.500 m	8
17.564 m	5.511 m	4.500 m	9
17.242 m	5.500 m	4.500 m	10
10.200 m	4.037 m	4.500 m	11
13.573 m	4.037 m	4.500 m	12
21.159 m	4.034 m	4.500 m	13
24.600 m	4.034 m	4.500 m	14

Hulme Primary Luminaire list

 Φ_{total}

111576 lm

 P_{total}

1017.2 W

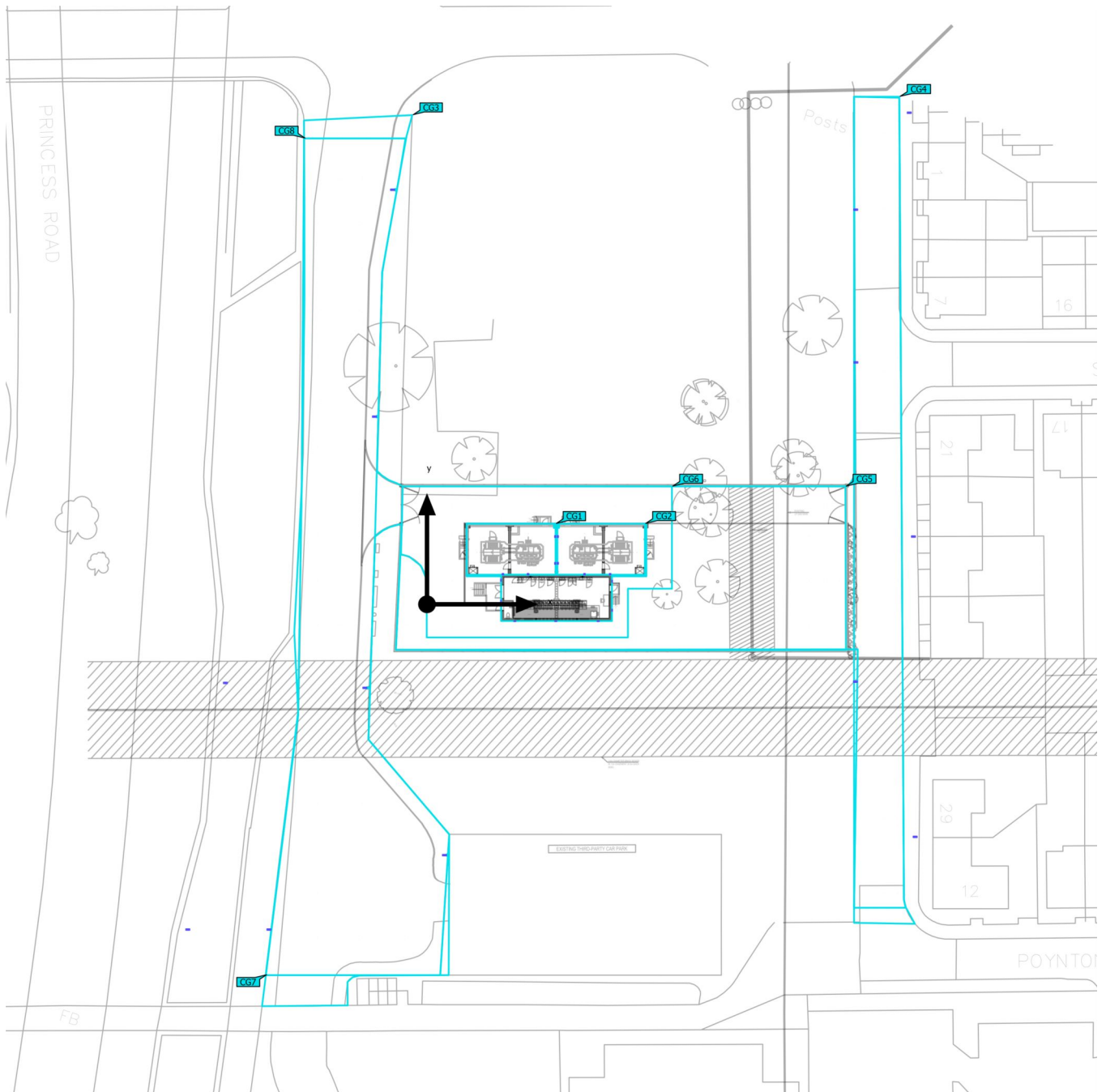
Luminous efficacy

109.7 lm/W

pcs.	Manufacturer	Article No.	Article name	P	Φ	Luminous efficacy
13	Thorn Lighting	96636134	IS XS 12L105-730 NR CL1 WS0.3 M60 GY-S [STD]	41.0 W	5032 lm	122.7 lm/W
7	Unilamp	7024-0-3-808-XX	Mini Flat DRIFT	15.0 W	752 lm	50.2 lm/W
8	V-TAC		Floodlight	47.4 W	5112 lm	107.9 lm/W

Hulme Primary (Light scene 1)

Calculation objects



Hulme Primary (Light scene 1)

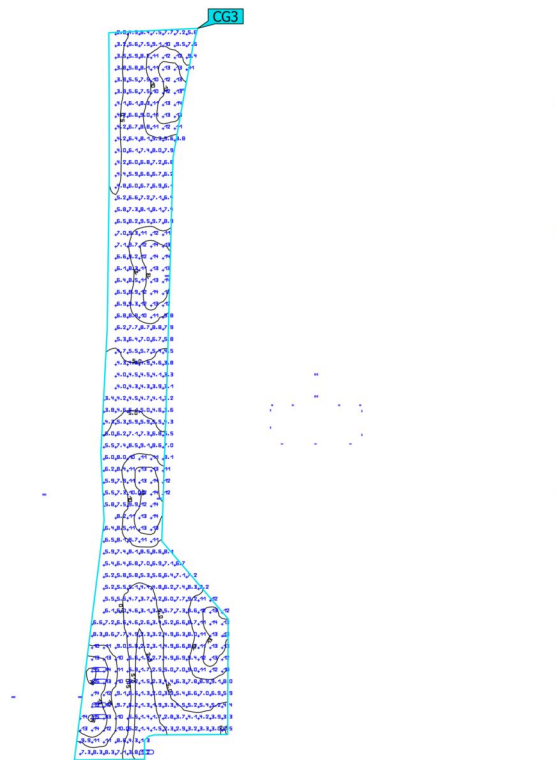
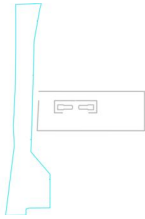
Calculation objects

Calculation surfaces

Properties	$\bar{E}$	E_{min}	E_{max}	$U_o (g_1)$	g_2	Index
T12 Transformer Bay Perpendicular illuminance Height: 0.080 m	108 lx	26.7 lx	196 lx	0.25	0.14	CG1
T11 Transformer Bay Perpendicular illuminance Height: 0.080 m	110 lx	25.6 lx	200 lx	0.23	0.13	CG2
Birchall Way Perpendicular illuminance Height: 0.000 m	7.67 lx	1.21 lx	15.5 lx	0.16	0.078	CG3
Upper Medlock Street Perpendicular illuminance Height: 0.000 m	17.7 lx	3.57 lx	33.2 lx	0.20	0.11	CG4
Whole Site Perpendicular illuminance Height: 0.000 m	1.42 lx	0.00 lx	13.2 lx	0.00	0.00	CG5
Working Area Perpendicular illuminance Height: 0.000 m	1.44 lx	0.00 lx	11.5 lx	0.00	0.00	CG6
Whole Site with roads (Isolines) Perpendicular illuminance Height: 0.000 m	7.73 lx	0.00 lx	32.4 lx	0.00	0.00	CG7
Whole Site with roads (Values) Perpendicular illuminance Height: 0.000 m	7.60 lx	0.078 lx	31.4 lx	0.010	0.002	CG8

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

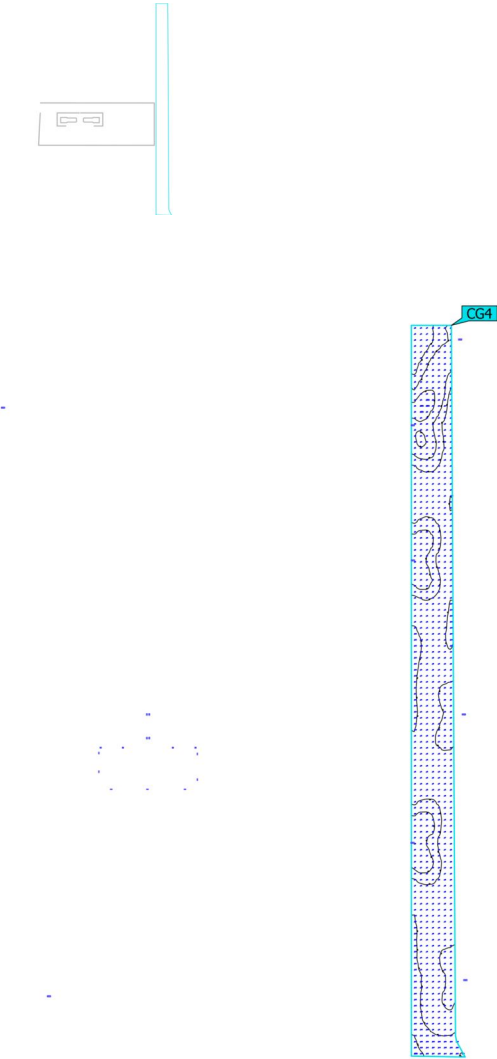
Hulme Primary (Light scene 1)

Birchall Way

Properties	$\bar{E}$	$E_{\min}$	$E_{\max}$	$U_o (g_1)$	g_2	Index
Birchall Way Perpendicular illuminance Height: 0.000 m	7.67 lx	1.21 lx	15.5 lx	0.16	0.078	CG3

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

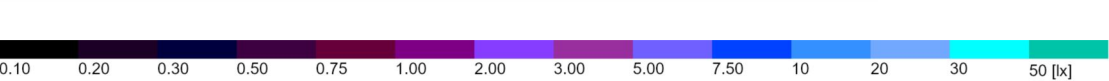
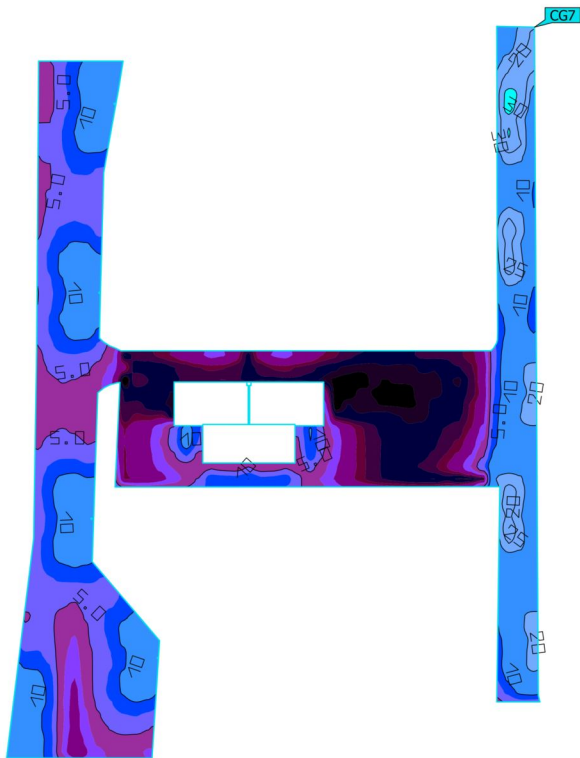
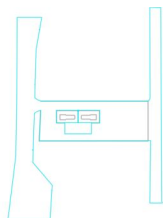
Hulme Primary (Light scene 1)
Upper Medlock Street



Properties	$\bar{E}$	E_{min}	E_{max}	$U_o (g_1)$	g_2	Index
Upper Medlock Street Perpendicular illuminance Height: 0.000 m	17.7 lx	3.57 lx	33.2 lx	0.20	0.11	CG4

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

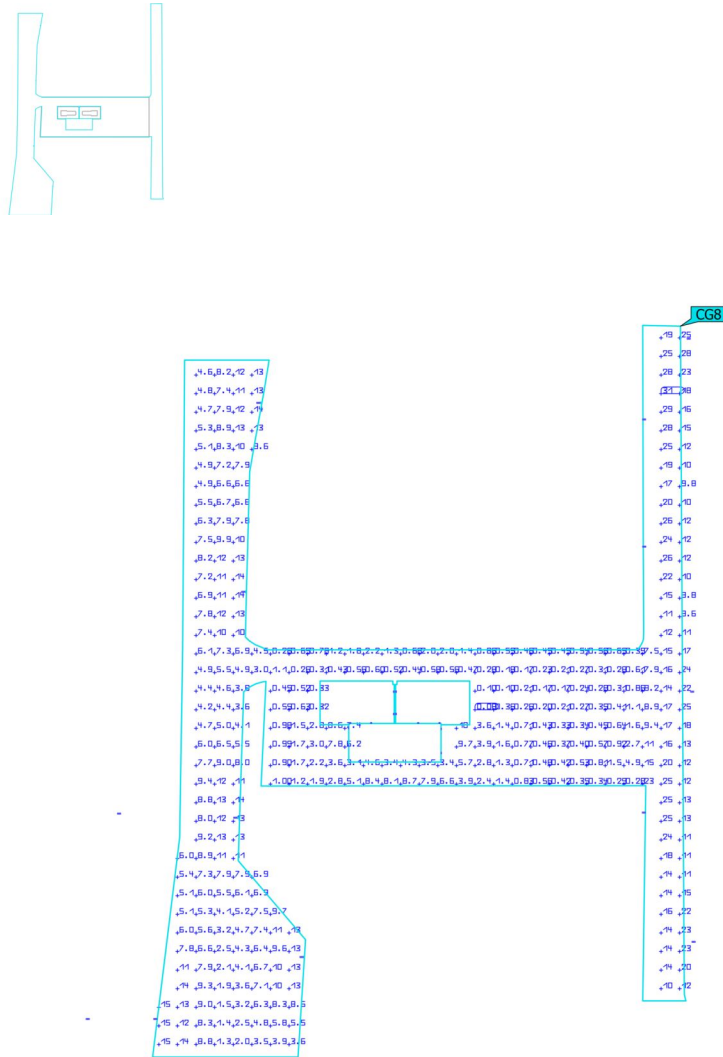
Hulme Primary (Light scene 1)
Whole Site with roads (Isolines)



Properties	$\bar{E}$	E_{min}	E_{max}	$U_o (g_1)$	g_2	Index
Whole Site with roads (Isolines) Perpendicular illuminance Height: 0.000 m	7.73 lx	0.00 lx	32.4 lx	0.00	0.00	CG7

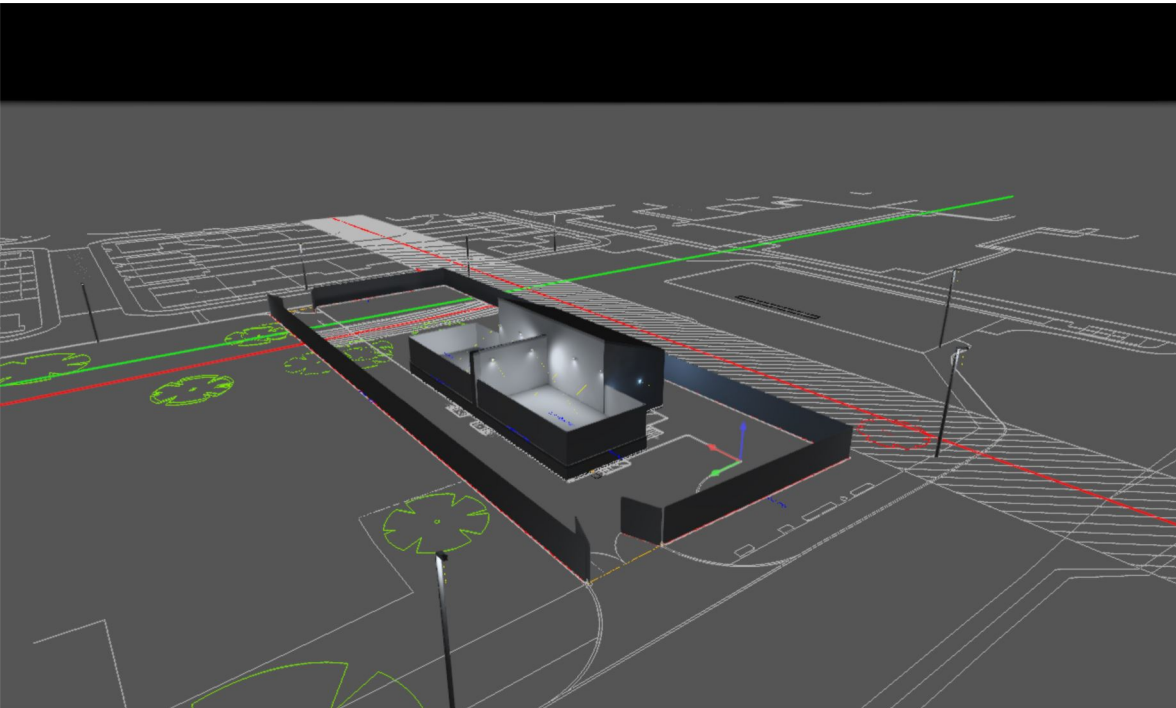
Utilisation profile: DIALux presetting (5.1.4-Standard (outdoor transportation area))

Hulme Primary (Light scene 1)

Whole Site with roads (Values)

Properties	$\bar{E}$	E_{min}	E_{max}	$U_o (g_1)$	g_2	Index
Whole Site with roads (Values)	7.60 lx	0.078 lx	31.4 lx	0.010	0.002	CG8
Perpendicular illuminance						
Height: 0.000 m						

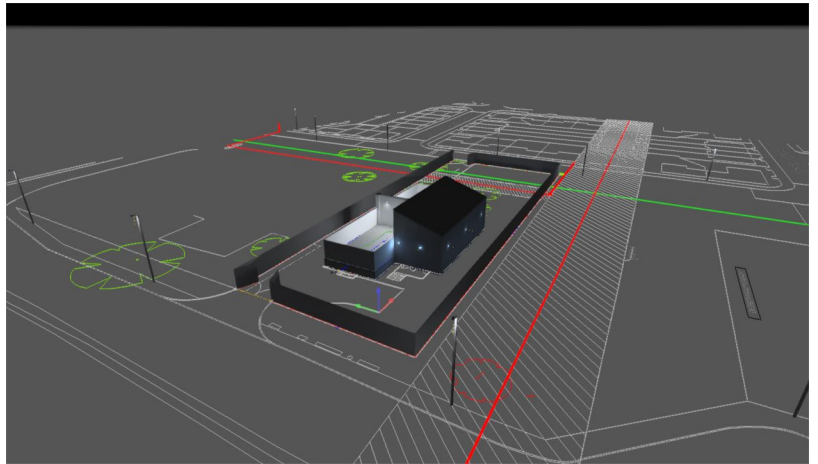
Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))



Site
Description

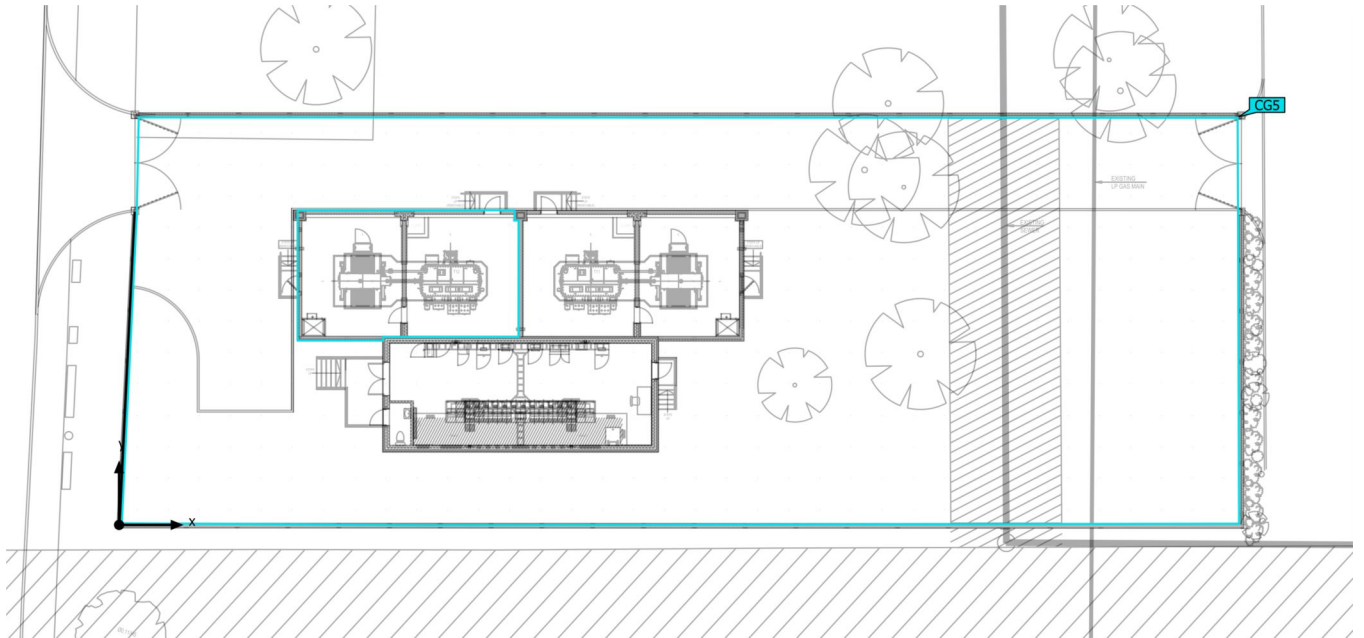
Site
Images

Site View C



Site (Light scene 1)

Calculation objects



Site (Light scene 1)

Calculation objects

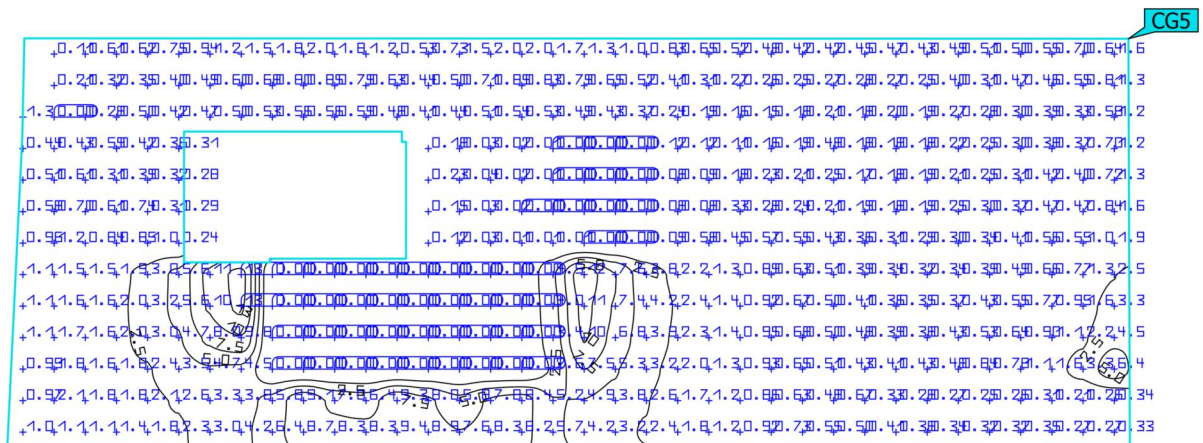
Calculation surfaces

Properties	$\bar{E}$	$E_{\min}$	$E_{\max}$	$U_o (g_1)$	g_2	Index
Whole Site Perpendicular illuminance Height: 0.000 m	1.42 lx	0.00 lx	13.2 lx	0.00	0.00	CG5

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

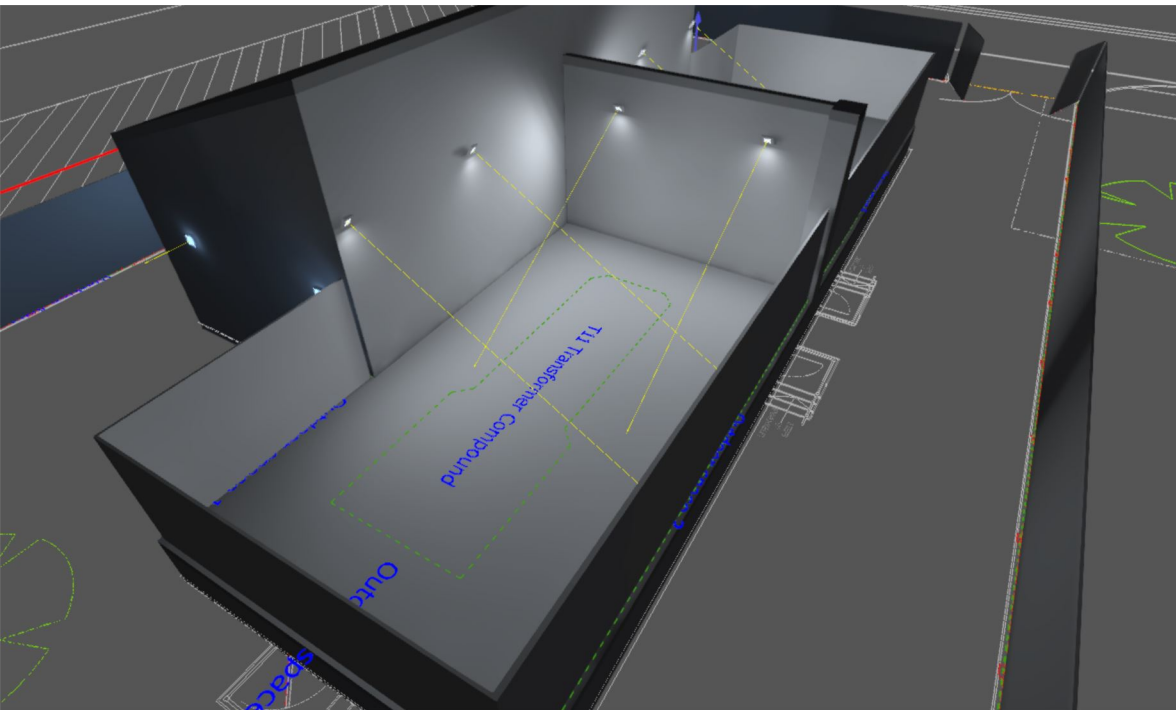
Site (Light scene 1)

Whole Site



Properties	$\bar{E}$	E_{min}	E_{max}	$U_0 (g_1)$	g_2	Index
Whole Site Perpendicular illuminance Height: 0.000 m	1.42 lx	0.00 lx	13.2 lx	0.00	0.00	CG5

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

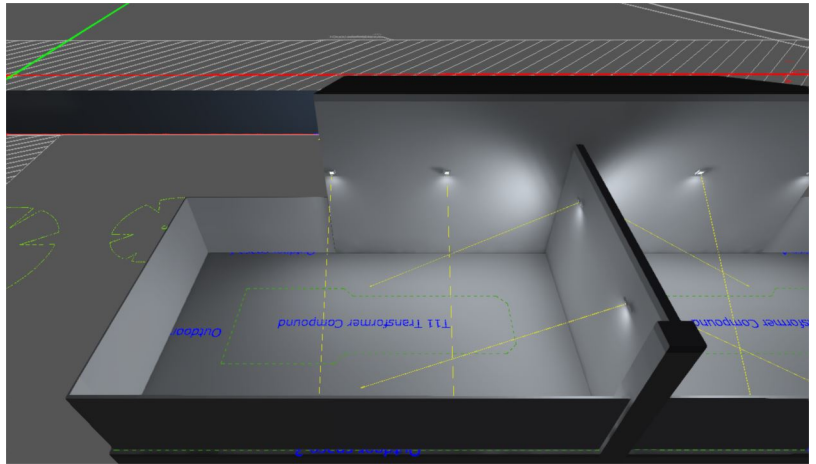


T11 Transformer Compound

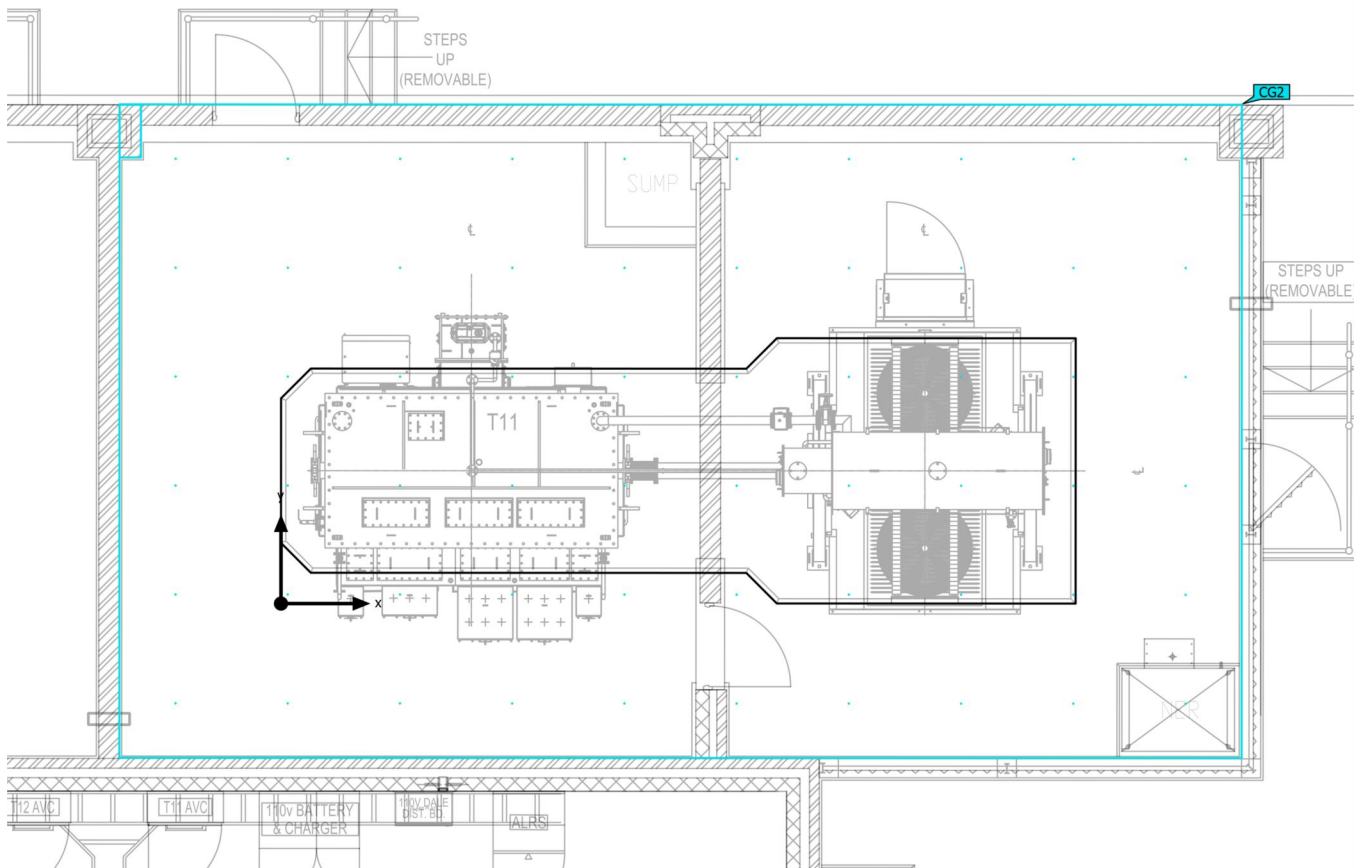
Description

T11 Transformer Compound Images

T11 View B



T11 Transformer Compound (Light scene 1)

Calculation objects

T11 Transformer Compound (Light scene 1)

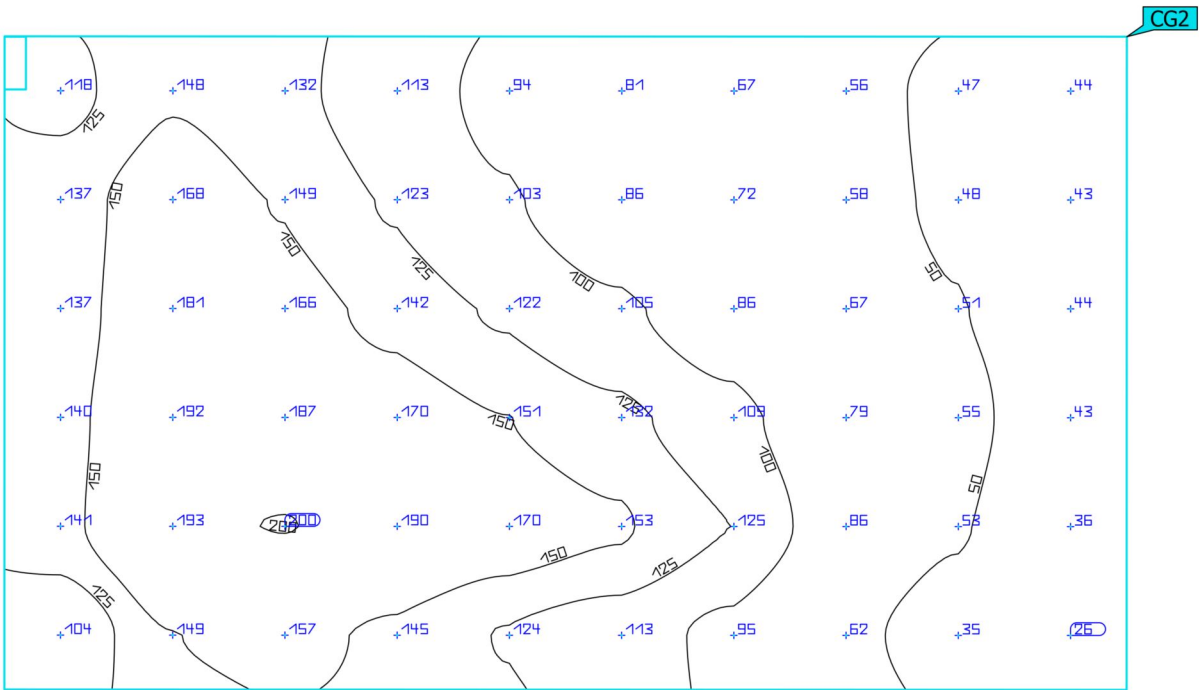
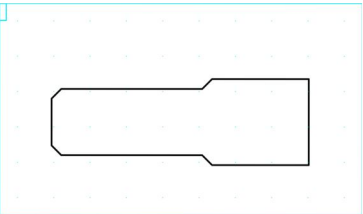
Calculation objects

Calculation surfaces

Properties	$\bar{E}$	$E_{\min}$	$E_{\max}$	$U_o (g_1)$	g_2	Index
T11 Transformer Bay Perpendicular illuminance Height: 0.080 m	110 lx	25.6 lx	200 lx	0.23	0.13	CG2

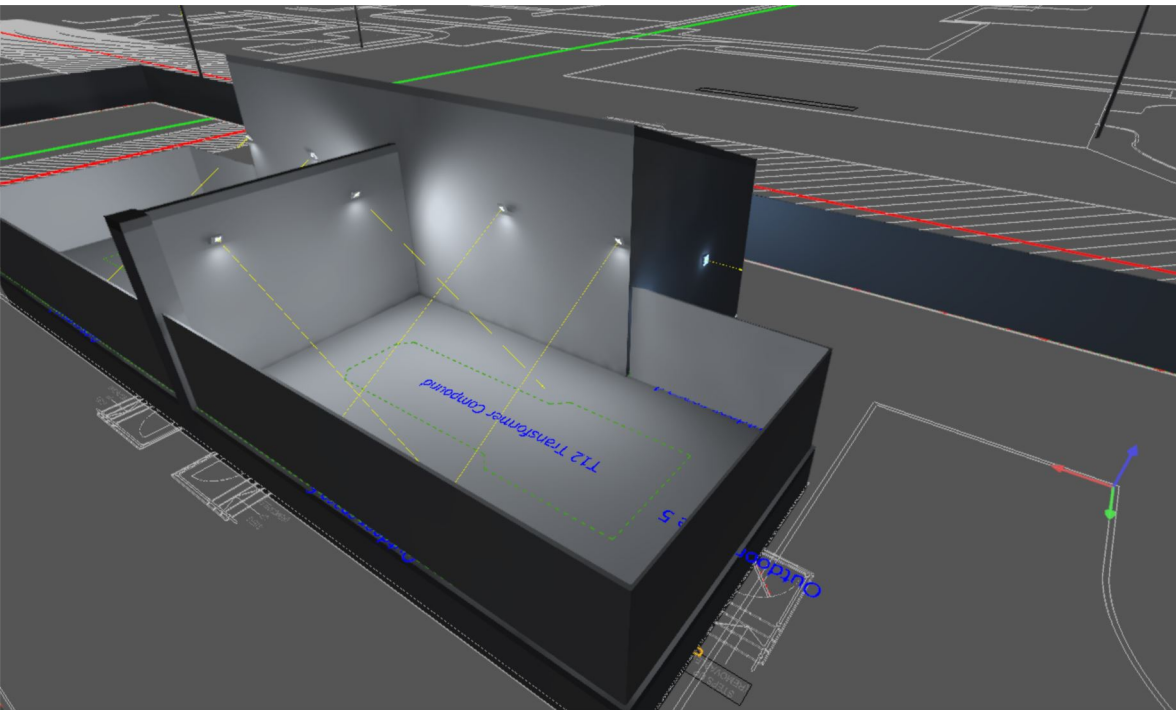
Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

T11 Transformer Compound (Light scene 1)
T11 Transformer Bay



Properties	$\bar{E}$	E_{min}	E_{max}	$U_o (g_1)$	g_2	Index
T11 Transformer Bay Perpendicular illuminance Height: 0.080 m	110 lx	25.6 lx	200 lx	0.23	0.13	CG2

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

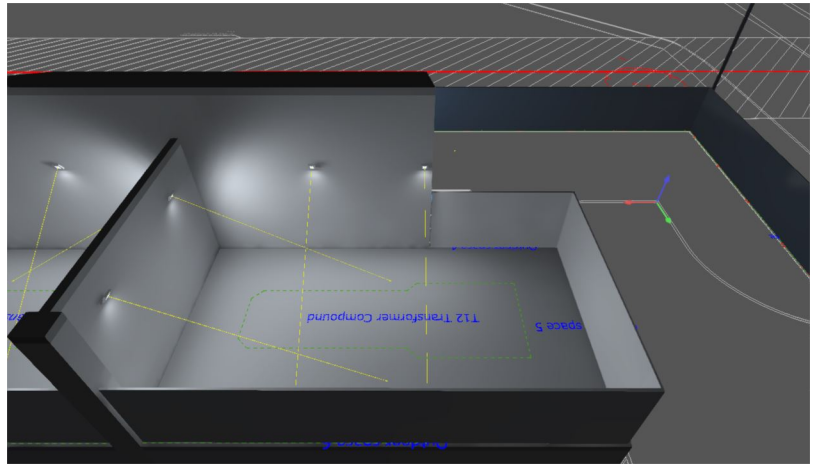


T12 Transformer Compound

Description

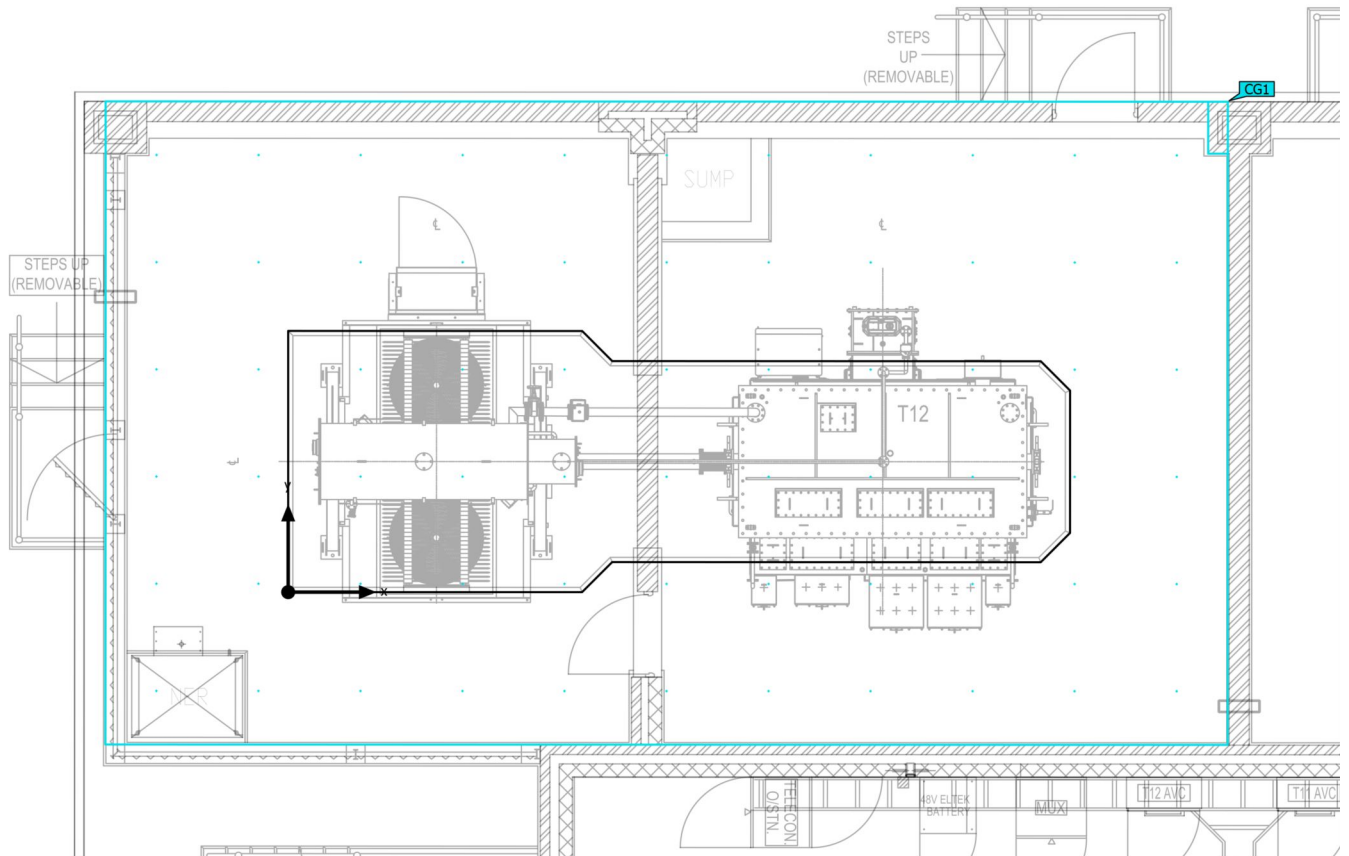
T12 Transformer Compound Images

T12 View B



T12 Transformer Compound (Light scene 1)

Calculation objects



T12 Transformer Compound (Light scene 1)

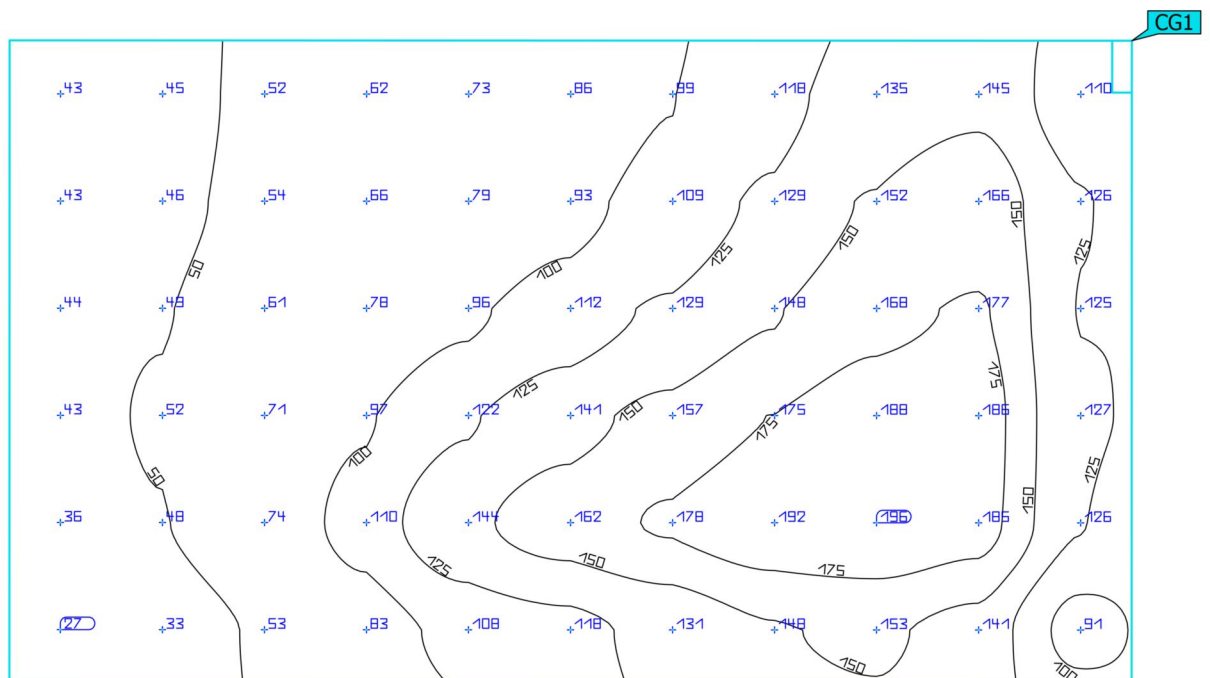
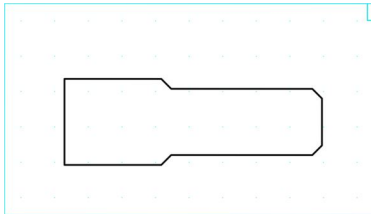
Calculation objects

Calculation surfaces

Properties	$\bar{E}$	E_{min}	E_{max}	$U_o (g_1)$	g_2	Index
T12 Transformer Bay Perpendicular illuminance Height: 0.080 m	108 lx	26.7 lx	196 lx	0.25	0.14	CG1

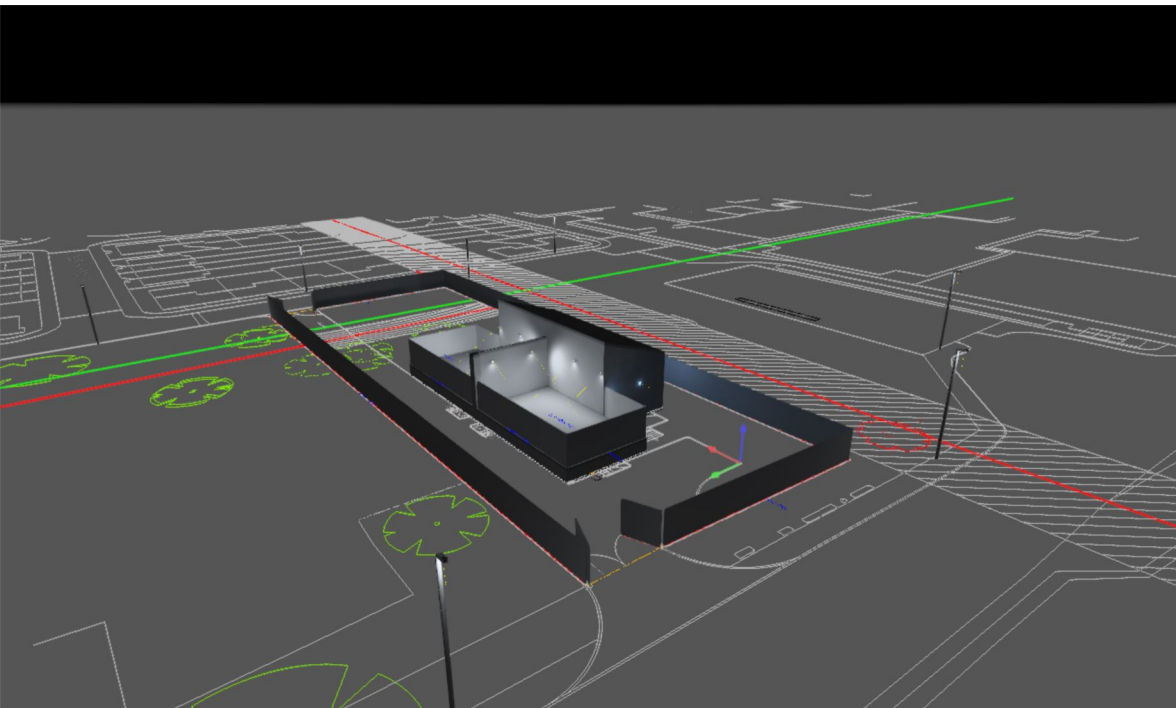
Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

T12 Transformer Compound (Light scene 1)

T12 Transformer Bay

Properties	$\bar{E}$	E_{min}	E_{max}	$U_o (g_1)$	g_2	Index
T12 Transformer Bay Perpendicular illuminance Height: 0.080 m	108 lx	26.7 lx	196 lx	0.25	0.14	CG1

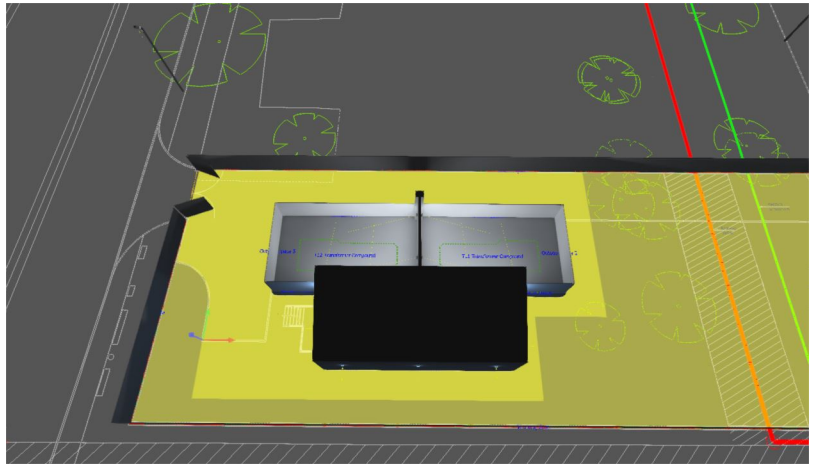
Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))



Working Area
Description

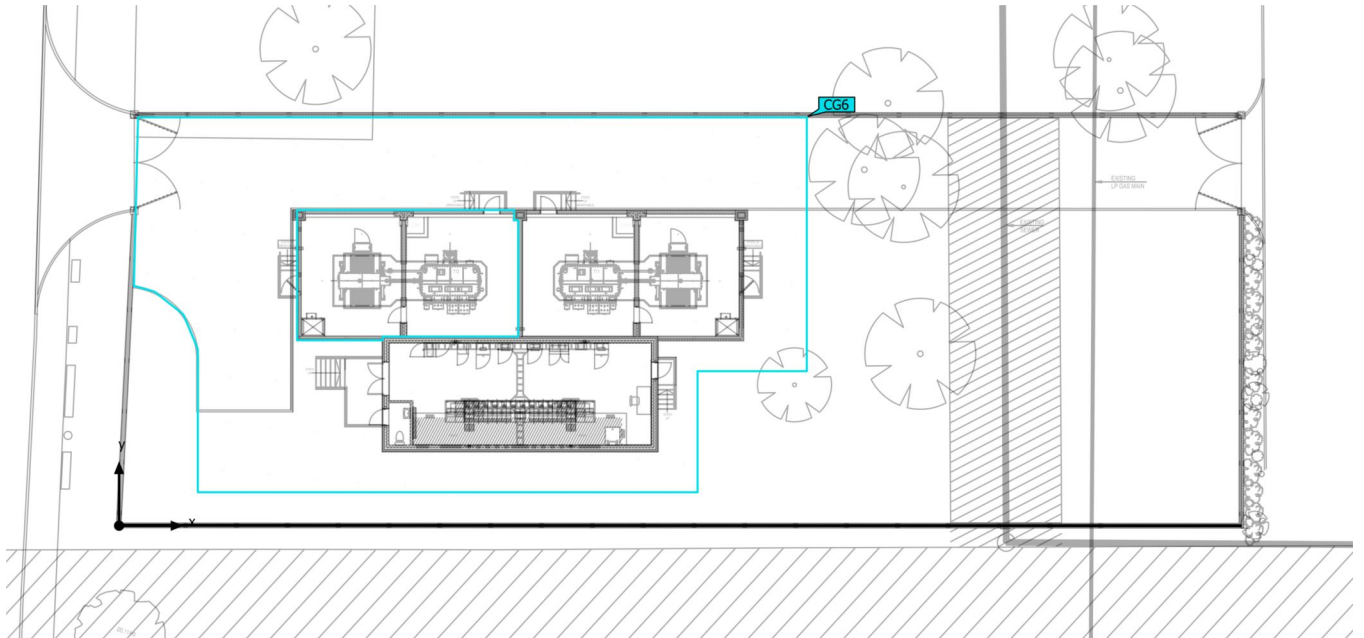
Working Area Images

Working Area



Working Area (Light scene 1)

Calculation objects



Working Area (Light scene 1)

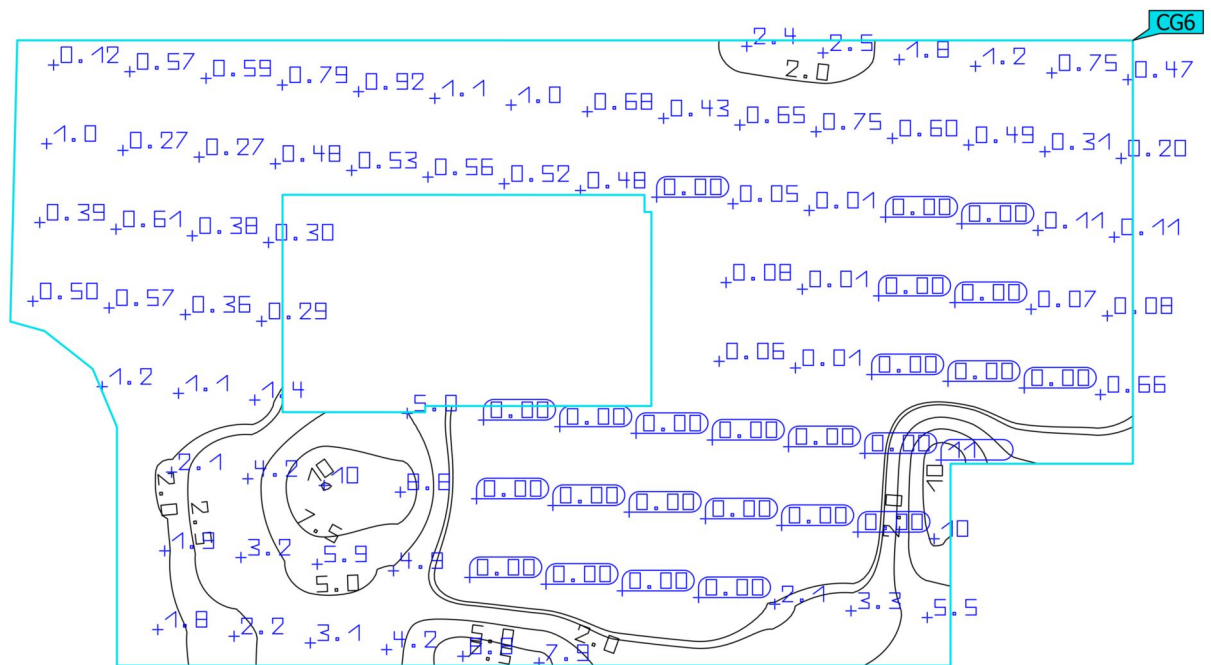
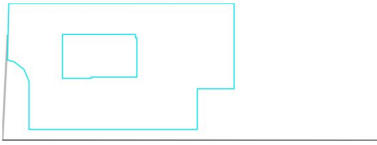
Calculation objects

Calculation surfaces

Properties	$\bar{E}$	$E_{\min}$	$E_{\max}$	$U_o (g_1)$	g_2	Index
Working Area Perpendicular illuminance Height: 0.000 m	1.44 lx	0.00 lx	11.5 lx	0.00	0.00	CG6

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

Working Area (Light scene 1)

Working Area

Properties	$\bar{E}$	E_{min}	E_{max}	$U_o (g_1)$	g_2	Index
Working Area Perpendicular illuminance Height: 0.000 m	1.44 lx	0.00 lx	11.5 lx	0.00	0.00	CG6

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

Glossary

A

A	Formula symbol for a surface in the geometry
---	--

B

Background area	The background area borders the direct ambient area according to DIN EN 12464-1 and reaches up to the borders of the room. In larger rooms, the background area is at least 3 m wide. It is located horizontally at floor level.
-----------------	--

C

CCT	(Engl. correlated colour temperature) Body temperature of a thermal radiator which serves to describe its light colour. Unit: Kelvin [K]. The lesser the numerical value the redder; the greater the numerical value the bluer the light colour. The colour temperature of gas-discharge lamps and semi-conductors are termed "correlated colour temperature" in contrast to the colour temperature of thermal radiators. Allocation of the light colours to the colour temperature ranges acc. to EN 12464-1: Light colour - colour temperature [K] warm white (ww) < 3,300 K neutral white (nw) ≥ 3,300 – 5,300 K daylight white (dw) > 5,300 K
-----	--

Clearance height	The designation for the distance between upper edge of the floor and bottom edge of the ceiling (in the completely furnished status of room).
------------------	---

Control group	A group of luminaires that are dimmed and controlled together. For each lighting scene, a control group provides its own dimming value. All luminaires within a control group share this dimming value. The control groups with their luminaires are automatically determined by DIALux on the basis of the created light scenes and their luminaire groups.
---------------	--

CRI	(Engl. colour rendering index) Designation for the colour rendering index of a luminaire or a lamp acc. to DIN 6169: 1976 or CIE 13.3: 1995. The general colour rendering index Ra (or CRI) is a dimensionless figure that describes the quality of a white light source in regards to its similarity with the remission spectra of defined 8 test colours (see DIN 6169 or CIE 1974) to a reference light source.
-----	---

Glossary

D

Daylight autonomy	Describes what percentage of the daily working time the required illuminance is met by daylight. The nominal illuminance is used from the room profile, unlike described in EN 17037. The calculation is not done in the centre of the room but at the placed sensor measuring point. A room is considered sufficiently supplied with daylight if it achieves at least 50% daylight autonomy.
Daylight factor	Ratio of the illuminance achieved solely by daylight incidence at a point in the inside to the horizontal illuminance in the outer area under an unobstructed sky. Formula symbol: D (Engl. daylight factor) Unit: %
Daylight quotient effective area	A calculation surface within which the daylight quotient is calculated.

E

Energy evaluation	Based on an hourly calculation procedure for daylight in indoor spaces, considering the project geometry and any existing daylight control systems. Orientation and location of the project are also considered. The calculation uses the specified system power of the luminaires to determine the energy demand. A linear relationship between power and luminous flux in the dimmed state is assumed for daylight-controlled luminaires. Times of use and nominal illuminance are determined from the usage profiles of the spaces. Switched-on luminaires that are explicitly excluded from control also consider the specified times-of-use. The daylight control systems use a simplified control logic that closes them at an outdoor horizontal illuminance of 27,500lx. The calendar year 2022 is used as a reference only. It is not a simulation of this year. The reference year is only used to assign the days of the week to the calculated results. The changeover to summer time is not considered. The reference sky type used is the average sky described in CIE 110 without direct sunlight. The method was developed together with the Fraunhofer Institute for Building Physics and is available for review by the Joint Working Group 1 ISO TC 274 as an extension of the previous annual regression-based method.
Environmental zones	The assessment of intrusive light and light immission depends on the environment of the lighting installation. Depending on the standard, 4-6 different zones are defined, ranging from highly protected areas in natural settings to urban areas, commercial zones, and industrial zones.
Eta (η)	(light output ratio) The light output ratio describes what percentage of the luminous flux of a free radiating lamp (or LED module) is emitted by the luminaire when installed. Unit: %

Glossary

G

g_1	Often also U_o (Engl. overall uniformity) Designates the overall uniformity of the illuminance on a surface. It is the quotient from E_{min} to $\bar{E}$ and is required, for instance, in standards for illumination of workstations.
g_2	Actually it designates the "non-uniformity" of the illuminance on a surface. It is the quotient of E_{min} to E_{max} and is generally only relevant for certifying the emergency lighting acc. to EN 1838.

I

Illuminance	Describes the ratio of the luminous flux that strikes a certain surface to the size of this surface ($lm/m^2 = lx$). The illuminance is not tied to an object surface. It can be determined anywhere in space (inside or outside). The illuminance is not a product feature because it is a recipient value. Luxometers are used for measuring. Unit: Lux Abbreviation: lx Formula symbol: E
Illuminance, adaptive	For the determining of the middle adaptive illuminance on a surface, this is rastered "adaptively". In the area of large illuminance differences within the surface, the raster is subdivided finer; within lesser differences, a rougher classification is made.
Illuminance, horizontal	Illuminance that is calculated or measured on a horizontal (level) surface (this can be for example a table top or the floor). The horizontal illuminance is usually identified by the formula letter E_h .
Illuminance, perpendicular	Illuminance that is calculated or measured plumb-vertical to a surface. This needs to be taken into account for tilted surfaces. If the surface is horizontal or vertical, then there is no difference between the perpendicular and the horizontal or vertical illuminance.
Illuminance, vertical	Illuminance that is calculated or measured on a vertical surface (this can be for example the front of some shelves). The vertical illuminance is usually identified by the formula letter E_v .

K

k_s	The glare effect of a light source can be described by the glare metric k_s . It relates the solid angle of the glaring light source as seen from the point of immission, the ambient luminance, and the maximum allowable luminance.
-------	---

Glossary

L

LENI	(Engl. lighting energy numeric indicator) Lighting energy numeric indicator acc. to EN 15193 Unit: kWh/(m² * a)
LLMF	(Engl. lamp lumen maintenance factor)/acc. to CIE 97: 2005 Lamp flux maintenance factor that takes the luminous flux reduction into account of a luminaire or an LED module in the course of the operating time. The lamp flux maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no luminous flux reduction existing).
LMF	(Engl. luminaire maintenance factor)/acc. to CIE 97: 2005 Luminaire maintenance factor that takes the soiling into account of the luminaire in the course of the operating time. The luminaire maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no soiling existing).
LSF	(Engl. lamp survival factor)/acc. to CIE 97: 2005 Lamp survival factor that takes the total failure into account of a luminaire in the course of the operating time. The lamp survival factor is specified as a decimal digit and can have a maximum value of 1 (no failures existing within the time concerned or prompt replacement after the failure).
Luminance	Dimension for the "brightness impression" that the human eye has of a surface. The surface itself can emit light thereby or light striking it can be reflected (emitter value). It is the only photometric value that the human eye can perceive. Unit: Candela per square metre Abbreviation: cd/m² Formula symbol: L
Luminous efficacy	Ratio of the emitted luminous flux Φ [lm] to the absorbed electrical power P [W] Unit: lm/W. This ratio can be formed for the lamp or LED module (lamp or module light output), the lamp or module with control gear (system light output) and the complete luminaire (luminaire light output).
Luminous flux	Dimension for the total light output that is emitted from one light source in all directions. It is thus an "emitter value" that specifies the entire emitting output. The luminous flux of a light source can only be determined in a laboratory. A difference is made between the lamp or LED module luminous flux and the luminaire luminous flux. Unit: Lumen Abbreviation: lm Formula symbol: Φ

Glossary

Luminous intensity	Describes the intensity of the light in a certain direction (emitter value). The luminous intensity is a matter of the luminous flux Φ that is emitted in a certain spherical angle Ω. The radiation characteristics of a light source are presented graphically in a light distribution curve (LDC). The luminous intensity is an SI base unit. Unit: Candela Abbreviation: cd Formula symbol: I
M	
Maintenance factor	See MF
MF	(Engl. maintenance factor)/acc. to CIE 97: 2005 Maintenance factor as decimal number between 0 and 1 that describes the ratio of the new value of a photometric planning parameter (e.g. of the illuminance) to a maintenance value after a certain time. The maintenance factor takes into account the soiling of luminaires and rooms as well as the luminous flux reduction and the failure of light sources. The maintenance factor is taken into account either overall or determined in detail acc. to CIE 97: 2005 by the formula $RMF \times LMF \times LLMF \times LSF$.
O	
Obtrusive light/Light immission	To protect the nocturnal environment and minimize problems for humans, flora, and fauna, it is necessary to limit obtrusive light (also known as light pollution), which can cause serious physiological and ecological issues for individuals and the environment. Light immission refers to the disturbing influence of emitted light from artificial light sources.
Operating times	The assessment of obtrusive light and light immission depends on the operating times of the lighting installation. Depending on the standard, 1-3 different operating times are specified. In the absence of specific details, an operating time between 06:00 and 22:00 can be assumed.
P	
P	(Engl. power) Electric power consumption Unit: watt Abbreviation: W

Glossary

R

$R_{(UG) \max}$	Measure of the psychological glare in indoor spaces. In addition to the luminance of luminaires, the level of the $R_{(UG)}$ value also depends on the observer position, the viewing direction and the ambient luminance. The calculation is made according to the table method, see CIE 117. Among other things, EN 12464-1:2021 specifies maximum permissible $R_{(UG)}$- values $R_{(UGL)}$ for various indoor workplaces.
R_{DLO}	The ratio of the luminous flux emitted below the horizontal plane to the total lamp luminous flux of a luminaire or lighting installation in its operational position.
R_G	The glare directly caused by luminaires of an outdoor lighting installation is determined using the CIE Glare Rating (RG) method. To calculate this, the equivalent veiling luminance of the surroundings is needed. There are four options for determining this: • An exact calculation according to CIE 112, based on the scene area. • A simplified method according to EN 12464-2, based on the scene area. • Using a custom calculation area to determine the equivalent veiling luminance. • Specifying a fixed value for easy comparability.
R_{UF}	upward flux ratio The ratio of the luminous flux emitted directly or reflected above the horizontal plane to the luminous flux that cannot be avoided under ideal conditions to achieve the illuminance level on a deliberately illuminated area.
R_{UL}	upward light ratio The ratio of the luminous flux emitted above the horizontal plane to the luminous flux of a luminaire or lighting installation in its operational position. The luminaire efficiency is considered in this calculation.
R_{ULO}	upward light output ratio The ratio of the luminous flux emitted above the horizontal plane to the total lamp luminous flux of a luminaire or lighting installation in its operational position.
Reflection factor	The reflection factor of a surface describes how much of the striking light is reflected back. The reflection factor is defined by the colour of the surface.
RMF	(Engl. room maintenance factor)/acc. to CIE 97: 2005 Room maintenance factor that takes the soiling into account of the space encompassing surfaces in the course of the operating time. The room maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no soiling existing).
$RUG \text{ (max)}$	(unified glare rating) Measure for the psychological glare effect in interiors. In addition to luminaire luminance, the RUG value also depends on the position of the observer, the viewing direction and the ambient luminance. Among other things, EN 12464-1 specifies maximum permissible RUG values for various indoor workplaces.

Glossary

RUG observer	Calculation point in the room, for the DIALux the RUG value is determined. The location and height of the calculation point should correspond to the typical observer position (position and eye level of the user).
S	
Surrounding area	The ambient area directly borders the area of the visual task and should be planned with a width of at least 0.5 m according to DIN EN 12464-1. It is at the same height as the area of the visual task.
V	
Visual task area	The area that is needed for carrying out the visual task in accordance with DIN EN 12464-1. The height corresponds with the height at which the visual task is executed.
W	
Wall zone	Circumferential area between working plane and walls which is not taken into account for the calculation.
Working plane	Virtual measuring or calculation surface at the height of the visual task that generally follows the room geometry. The working plane may also feature a wall zone.

HEAD OFFICE
WARRINGTON

01925 844004
tep@tep.uk.com

MARKET HARBOROUGH

01858 383120
mh@tep.uk.com

GATESHEAD

0191 605 3340
gateshead@tep.uk.com

LONDON

020 3096 6050
london@tep.uk.com

CORNWALL

01326 240081
cornwall@tep.uk.com
