



Manchester City, Etihad Stadium

**Existing Lighting Condition
Survey & Assessment**

NSE-MEE-NS-ZZ-RP-EL-00001

Revision: P01

6th February 2023

Manchester City, Etihad Stadium
Existing Lighting Condition Survey & Assessment

Issue and Revision Record

Rev/ Issue	Date	Description	Revision Details	Prepared	Checked
P01	06/02/2023	For Information	-	X. Fulbright	P. White

This document has been prepared for the titled project or named part thereof and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and prior written authority of M-E Engineers Limited being obtained. This document, which may include extracts from or refer to British Standards, is the sole copyright of M-E Engineers Limited. It shall not be reproduced in whole or in part without written permission of M-E Engineers Limited. M-E Engineers Limited accepts no responsibility or liability for the consequences of this document being used for a purpose other than the purposes for which it was commissioned. Any person using or relying on the document for such other purpose agrees, and will by such use or reliance be taken to confirm his agreement to indemnify M-E Engineers Limited for all loss of damage resulting therefrom. M-E Engineers Limited accepts no responsibility or liability for this document to any party other than the person by whom it was commissioned.

CONTENTS

Section	Title	Page No
1	LIGHT SURVEY	4
1.1	Overview	4
1.1.1	Referred Units and Terminology	4
1.2	Assessment Criteria	4
1.2.1	Preamble.....	5
1.2.2	Regulating Light Spill	5
1.3	Survey	6
1.3.1	Methodology.....	6
1.3.2	Test Apparatus.....	7
1.3.3	Field Results	7
2	APPENDIX A: SURVEY PHOTOS	8
3	APPENDIX B: COMMENTARY	14
3.1	Comments	14
3.2	Summary	14

1 LIGHT SURVEY

1.1 Overview

A key requisite of any exterior lighting installation is to minimise consequent obtrusive spill light which might adversely affect local residential communities, vehicular traffic routes or surrounding environmental areas.

The proposed works to the project will involve a new exterior amenity lighting system for the public realm as well as façade illumination of the building. The installation of a media façade is also being proposed.

The primary purpose of this report is to record the existing lighting conditions to allow reference to be made during the planning process, however commentary is also made in areas that are considered key focal points in the success of the redevelopment works.

An ambient light level survey has been carried out at the site to ascertain the base-line spill light levels within the immediate surrounding area of the development. The results are presented in this report.

1.1.1 Referred Units and Terminology

Where referred to in the report, the following units and terminology are used to define the associated lighting phenomena and/or illuminance plane

Candela:	unit used to define the intensity of a light source.
Lumen:	unit used to define luminous flux. 1 lumen is defined as the luminous flux passing through a 1-foot opening in the surface of a sphere with a radius of 1-foot and a 1-candela light source at its centre.
Lux:	unit used to define illumination. 1 lux is equal to 1-lumen falling on an area of 1-square meter.
Horizontal Light Level:	the illumination on a horizontal plane. Readings taken with the light meter in the horizontal position.
Vertical Light Level:	the illumination on a vertical plane. Readings taken with the light meter in the vertical position.
Maximum Vertical Light Level:	the illumination measured on the vertical plane with the meter facing the brightest light source.
Line of Sight:	term used to express the condition in which a person's view is directly in line with a light source.
Spill Light:	for the purpose of this report spill light can be defined as the illumination that is produced by a light source or light sources at a point or surface on which the light is not intended or desirable.
Glare:	the discomfort or impairment of vision experienced when the image is excessively bright compared to the general surroundings.

1.2 Assessment Criteria

The light level study has been completed with reference to the following industry standard guidelines:

- CIE 150:2003 – Guide on the limitation of the effects of obtrusive light from outdoor lighting installations.
- ILP: Guidance Notes for the Reduction of Obtrusive Light GN01:2011

1.2.1 Preamble

Spill light is normally related to interruption of sleep but may also interfere with other light-sensitive areas. The effect of light is often determined by the contrast posed with the immediate background.

In defining the intensity of light, the terms maximum vertical and maximum horizontal are used. These terms relate to the orientation of the light meter measuring the light level. In the horizontal conditions, the meter is oriented horizontally aiming straight up. In the maximum vertical condition, the meter is pointed directly at the light source. The maximum vertical condition is considered the worst-case measure of light intensity.

1.2.2 Regulating Light Spill

The following tables are excerpts from the Guidance Notes for the Reduction of Obtrusive Light by the Institute of Lighting Engineers. The tables provide the limits of illuminance to minimise light spill, depending on different darkness zones and road classifications

Obtrusive Light Limitations for Exterior Lighting Installations – General Observers						
Environmental Zone	Sky Glow ULR [Max %]	Light Intrusion (into Windows) Ev [lux]		Luminaire Intensity I [candelas]		Building Luminance Pre-curfew
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Average, L [cd/m ²]
E0	0	0	0	0	0	0
E1	0	2	0 (1*)	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5.0	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,500	25

Environmental Zone:

- E0 – Protected surrounding, dark lighting environment
- E1 – Natural surroundings, intrinsically dark lighting environment
- E2 – Rural surrounding, low district brightness lighting environment
- E3 – Suburban surrounding, medium district brightness lighting environment
- E4 – Urban surrounding, high district brightness lighting environment

Abbreviations:

- ULR = Upward Light Ratio of the installation
- Ev = Vertical illuminance in Lux
- I = Light intensity in Candelas (cd)
- L = Luminance in candelas per square metre (cd/m²)
- Curfew = the time after which stricter requirements (for the control of obtrusive light) will apply.
- * = Permitted only from only public road lighting installations

Table 1.2.2a – Guidance Notes for the Reduction of Obtrusive Light by the Institute of Lighting Engineers, table 2

Obtrusive Light Limitations for Exterior Lighting Installations – Road Users		
Road Classification ⁽¹⁾	Threshold Increment (TI)	Veiling Luminance (Lv)
No road lighting	15% based on adaption luminance of 0.1cd/m ²	0.04
ME6 / ME5	15% based on adaption luminance of 1cd/m ²	0.25
ME4 / ME3	15% based on adaption luminance of 2cd/m ²	0.40
ME2 / ME1	15% based on adaption luminance of 5cd/m ²	0.84

⁽¹⁾ Road Classification:

As defined in EN 13201-2(2015) road lighting performance requirements

Abbreviations:

- TI = Threshold increment
- Lv = Veiling luminance

Table 1.2.2b – Guidance Notes for the Reduction of Obtrusive Light by the Institute of Lighting Engineers, table 3

For the purpose of comparison with the collated baseline readings, the current environmental zone for the site is considered to be best represented by E3– Suburban surrounding, medium district brightness lighting environment.

Based upon the above, the two main criteria which need to limit obtrusive light for general observers are:

- Light trespass on the vertical plane of any adjacent building should be less than 10 lux and 2 lux during pre and post curfews respectively.
- Source Intensity of the luminaire should be less than 10,000cd and 1,000cd during pre and post curfews respectively.

It shall be noted that these figures are for guidance only and can be supplemented or replaced by the Local Planning Authorities own guidance on sky glow ULR, light intrusion, luminaire intensity and specific pre-curfew and post-curfew limitations defined within planning approval requirements.

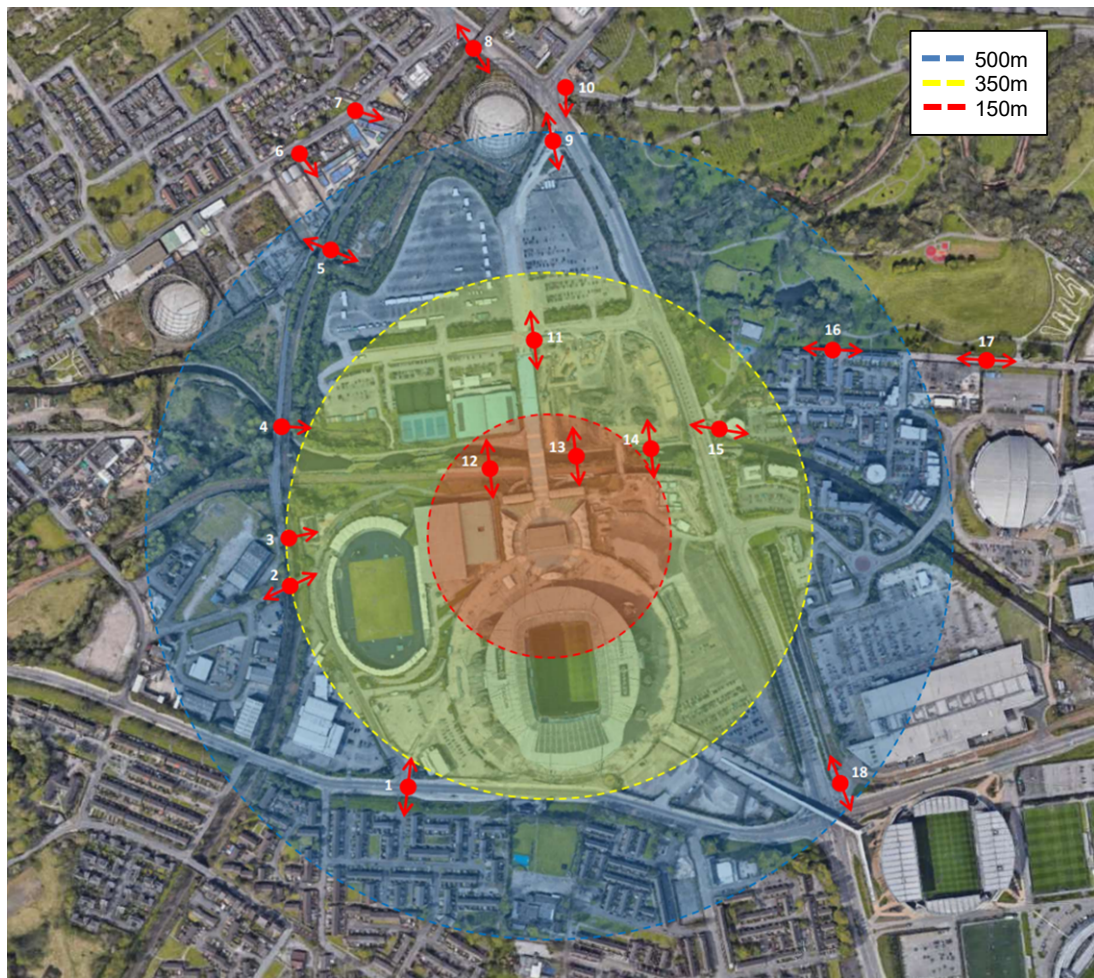
1.3 Survey

1.3.1 Methodology

At various points within the immediate surrounding of the development, a horizontal illuminance reading is presented which was taken at floor level with the light meter orientated so as aiming straight up. Additional vertical illuminance readings are taken with the light meter orientated directly towards the development and when deemed relevant away from it. These are taken at 2m above ground level.

The illuminance levels presented within the results is the measurement of a single point reading of lux at the relevant location.

Locations of measurement positions are as indicated in the map below, with the measure light levels recorded and summarised within section 1.3.3 of this report.



Measurements were taken at a distance with 500m and slightly beyond from the proposed development. The selected measurement points are spot-checks based and selected based on their positions relative the site, views within the immediate vicinity and to record the effect of the various luminaire typologies within the area. Further measurements were taken at areas where residents are most likely to be affected. This primarily focuses on the residential buildings North of New Viaduct Road (points 5 to 8) and South of Philips Park (points 15 to 18) as indicated above.

Where measurement points are located local to residential properties, the readings are taken as close to the residential boundary as possible whilst keeping within the public realm.

1.3.2 Test Apparatus

Instrument: Konica Minolta illuminance meter
Model: T-10
Serial Number: 61731077-41721019
Calibration Certificated attached in Appendix B

1.3.3 Field Results

The following observations are made for the baseline spill light levels taken at key point areas around the site.

Readings are intended to establish existing conditions for future comparison and are not intended to be a random sampling that would be required in order to determine a statistical average for the given area and street.

It shall be noted that the survey carried out is an initial study to obtain the base-line spill lighting conditions within immediate surrounding of the development. Consequently, any light generated by other external sources e.g. floodlighting during a match day, should also be considered when assessing the contribution of spill lighting by the new development.

To obtain the base-line spill lighting conditions within the immediate surrounding of the proposed works area, a survey was carried out on 24th of January 2023. The survey was carried out during low-light hours (21.30-12.00).

Point	Illuminance		
	Horizontal	Vertical	
		Towards the Site	Away from the Site
1	30.12	11.71	5.06
2	4.50	0.32	2.37
3	14.61	1.61	-
4	10.43	0.33	-
5	4.52	7.92	0.31
6	4.43	6.06	-
7	4.05	26.05	-
8	13.72	10.63	6.56
9	30.21	10.56	11.01
10	10.08	6.41	-
11	51.35	0.90	21.51
12	4.32	0.98	0.54
13	4.02	1.00	0.22
14	3.43	7.23	0.67
15	3.43	1.17	0.23
16	11.80	0.28	0.15
17	13.57	16.04	6.67
18	13.57	2.73	8.35

Manchester City, Etihad Stadium Lighting Survey & Assessment

2

APPENDIX A: SURVEY PHOTOS

	Calculation Point: 1 (View towards the site) Subject: Etihad Stadium and Manchester Regional arena High illuminance levels due to the street lighting. Additional flood lighting during match days
	Calculation Point: 1 (View away from the site) Subject: Properties South of Ashton New Road The Etihad Campus obstructs direct view of the site from these properties
	Calculation Point: 4 Subject: View up New Viaduct Street Subsidiary road lit by LED lighting columns. Foliage next to the rail lines
	Calculation Point: 5 Subject: View down New Viaduct Street Subsidiary road lit by LED lighting columns. Foliage next to the rail lines obstructs direct view of the site

Manchester City, Etihad Stadium Lighting Survey & Assessment



Calculation Point: 3
Subject: View up New Viaduct Street

Subsidiary road lit by LED lighting columns. Foliage next to the rail lines obstructs direct view of the site



Calculation Point: 6
Subject: View up Barking Street

Subsidiary road lit by LED lighting columns



Calculation Point: 7
Subject: View down Broxton Street

Residential road lit by LED lighting columns. Road at lower level than the site. Properties subjected to no light spill or glare from the site as they sit at lower level. Also, the rail bridge provides an obstruction



Calculation Point: 8
Subject: View up Alan Turing Way

Highway illuminated by LED lighting columns

Manchester City, Etihad Stadium Lighting Survey & Assessment

	Calculation Point: 8 Subject: View down Alan Turing Way Highway illuminated by LED lighting columns
	Calculation Point: 10 Subject: View down Alan Turing Way Highway illuminated by LED lighting columns
	Calculation Point: 11 Subject: View down Joe Mercer Way Street illuminated by LED lighting columns.
	Calculation Point: 11 Subject: View from Joe Mercer Way to the site Highway illuminated by LED lighting columns

Manchester City, Etihad Stadium Lighting Survey & Assessment



Calculation Point: 11
Subject: View east on the canal

Canal path illuminated by LED lighting columns



Calculation Point: 14
Subject: View west on the canal

Canal path illuminated by LED lighting columns



Calculation Point: 15
Subject: View southeast to residential building

Highway illuminated by LED lighting columns. Building has direct line of sight to the site



Calculation Point: 15
Subject: View southeast to residential building

Highway illuminated by LED lighting columns. Building has direct line of sight to the site

Manchester City, Etihad Stadium Lighting Survey & Assessment

	Calculation Point: 25 Subject: View down Alan Turing Way Highway illuminated by LED lighting columns
	Calculation Point: 9 / 10 Subject: View up Alan Turing Way Highway illuminated by LED lighting columns
	Calculation Point: 16 Subject: View down Wesham Road Street illuminated by LED lighting columns
	Calculation Point: 16 Subject: View up Wesham Road to the park Street illuminated by LED lighting columns

Manchester City, Etihad Stadium Lighting Survey & Assessment



Calculation Point: 18
Subject: View up Alan Turing Way

The Etihad Campus obstructs direct view to the site

3 APPENDIX B: COMMENTARY

3.1 Comments

The proposed site is surrounded by areas that could be sensitive to light such as residential blocks, parks and the canal.

The Etihad Campus and the stadium itself obstructs direct view from the residencies located south of Ashton New Road and potential light spill to them (points 1 and 2).

Areas within 500m west of the New Viaduct Street are not subject to glare or ambient light spill from the site as they are obstructed by the foliage of trees next to the trainline (points 3 to 7). Also, they are at lower level than the site. The road is lit by street lighting, and it slopes down towards the north where views to the site are obstructed by a rail bridge (point 8).

On the west the main contribution of ambient illumination is by the street lights illuminating Alan Turing Way (points 9 to 11, 15 to 18). The light levels are quite high as this is a traffic route for motorized vehicles of medium to high driving speeds with conflict areas e.g. intersections and pedestrian passages.

The residential area south of Philips Park is at lower level than the site. There is a direct line of sight from the buildings adjacent to Alan Turing Way (points 15) but not from other location in this area. The horizontal light levels next to the park are quite high (points 16 and 17). These streets are well lit by post top luminaires.

In a radius within 150m of the ground the only sensitive area is the canal which is currently lit by LED lighting columns (points 12 to 14). The vertical light levels are high due to the contribution of light from the street columns. During the site survey we recorded bats flying above the canal.

The part of the canal which is east of Alan Turing Way is lit mainly by bollards.

Areas further than 500m from the site are very unlikely to suffer from light spill (due to distance) or direct glare from a façade installation.

3.2 Summary

Exterior illumination of the building and the façade might have an impact on the surrounding areas.

The areas most likely to be affected by the new development those with a direct view of the proposed development to the north. The potential sensitive receptors include the ecology immediate the canal and residential buildings. The residential buildings within view of the development are located at the intersection of Alan Turing Way and on Stuart Street (Philips Park beside the canal) and there are residences further away along New Viaduct Street.

The residences at New Viaduct Street have views towards the proposed development significantly baffled by foliage and blocked by the massing of Excel House and the National Squash Centre. These residences will not have views of the landscape lighting treatments but may have views of upper levels of the proposed development and any media façade or advertisements applied to the buildings. At 450m to 500m distance away, the illuminated effect of any media façade system will be negligible, though it is recommended any media façade installation is fully dimmable and controlled via timeclock functions.

The residences at Philips Park have views towards the proposed development and these are unobstructed direct views particularly on the upper levels of the buildings. These residences may have oblique views of any media façade or advertisements applied to the buildings, though at roughly 350m, the illuminated effect of any media façade system will be negligible. It is recommended any media façade installation is fully dimmable and controlled via timeclock functions.

Manchester City, Etihad Stadium Lighting Survey & Assessment

Because the canal is a bat corridor, it is recommended any functional and landscape lighting be orientated and directed away from the canal. It should be noted the existing train station canopies, existing trees and change in topographical levels will help to mitigate any effects and views of the external lighting of the proposed development.

In conclusion the new development could affect some surrounding residencies as well as the bat corridor. Therefore, the design should take into account the lines of direct sight and try to minimize light spill on the canal.